RESTRICTED

DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

TM 9-1980

DEPARTMENT OF THE
AIR FORCE MANUAL

AFM 136-7

BOMBS FOR AIRCRAFT

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

DECEMBER 1950

[redacted]

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TM 9-1980—AFM 136-7

This manual supersedes TM 9-1980, 15 November 1944; TB 9-1980-28, 10 July 1944; TB 9-1980-29, 15 July 1944; TB 9-1980-30, 22 July 1944; TB 9-1980-33, 22 September 1944; TB 9-1980-35, 4 January 1945; TB 9-1980-36, 7 February 1945; TB 9-1980-38, 19 February 1945; TB 9-1980-39, 21 February 1945; TB 9-1980-41, 22 February 1945; TB 9-1980-45, 20 March 1945; TB 9-1980-47, 5 April 1945; TB 9-1980-48, 11 April 1945; TB 9-1980-49, 24 April 1945; TB 9-1980-50, 7 May 1945; TB 9-1980-52, 19 May 1945; TB 9-1980-53, 29 May 1945; and TB 9-1980-54, 6 June 1945.

BOMBS FOR AIRCRAFT

United States Government Printing Office

Washington : 1950

[redacted]

This manual is correct to 31 July 1950

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
WASHINGTON 25, D. C., *7 December 1950*

TM 9-1980/AFM 136-7 is published for the information and guidance of all concerned.

[AG 471.6 (11 Oct 50)]

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CHAPTER 1
INTRODUCTION

1. Purpose

The purpose of this manual is to supply such information of a technical nature concerning aircraft bombs as may be necessary for their proper care, handling, identification, and use, and to supply a convenient source of reference data.

2. Scope

a. The bombs and components described herein comprise those procured and issued by the Ordnance Corps (this includes bombs and components of Navy design which are assigned an "AN" model designation). Data on chemical and Navy designed bombs and components may be found in pertinent Department of the Army and Department of the Navy publications, respectively (see app. I).

b. Basic definitions, description, and procedures are given in the first three chapters. General information, such as is common to all bombs is given in chapter 4. The subsequent chapters give detailed description of particular components and models.

c. Appendix I lists references to pertinent publications.

d. Appendix II includes tables of data pertaining to arming wires, fuzes, bombs and clusters, fin and fin lock nuts, and fuze seat dimensions. Complete round data, that is, authorized combinations of bombs and components are presented in tabular form in chapter 6.

3. Extent of Revision

This revision differs from TM 9–1980, 15 November 1944 in the following respects:

[redacted]

a. DELETIONS. Data pertaining to chemical bombs and components (except for components serving identically for ordnance procured bombs) have been deleted since the procurement and issue of these items have been made the responsibility of the Chemical Corps. Tables of data pertaining to typical bomb targets and packing and shipping have been deleted since such information is available in other publications; for typical bomb targets and the selection of bombs and fuzes, see FM 1–110; for packing and shipping data, see Department of the Army Supply Catalogs in the ORD 11 series. In addition, the following have been discontinued or classified as obsolete and have been deleted:

BOMBS AND CLUSTERS

BOMB, armor-piercing, M52, M52A1, M61, M62, M62A1, M62A2, and M63.
BOMB, depth, AN–Mk 17, AN–Mk 29, AN–Mk 37, AN–Mk 38, AN–Mk 41, AN–Mk 44, and AN–Mk 47.
CLUSTER, fragmentation bomb, M1.
CLUSTER, practice bomb, M2 and M2A1.

COMPONENTS

ADAPTER, cluster, M1, M4, M5, M6, M7 (the M4, M5, M6, and M7 are used for clusters of chemical bombs).
EXTENSION, fuze, M1, all lengths.
FUZE, bomb, nose, mechanical time, M127, M128, M135, M135A1, M136, M136A1, and M138.
FUZE, bomb, nose, AN–M104.
FUZE, bomb, nose, M126 and AN–M126A1 (for use with chemical bombs).
FUZE, bomb, tail, M106, M106A1, M121, M122, and Mk 229.
FUZE, bomb, hydrostatic (transverse), AN–Mk 224 and AN–Mk 234.

b. REVISIONS. Where necessary, information on fuzes, bombs, cluster adapters, and clusters has been revised and brought up to date.

c. ADDITIONS. Information on destruction of bombs and bomb components to prevent enemy use has been included and also tables of data on fin assemblies and fin lock nuts and fuze seat dimensions. In addition, data pertaining to the following have also been added:

BOMBS AND CLUSTERS

ADAPTER-BOOSTER, M117.
BOMB, depth, 350-lb, AN-Mk 54 Mod 0 and Mod 1.
BOMB, fragmentation, 120-lb, M86.

BOMB, GP, 12,000-lb, M109 (T10), and components.
BOMB, GP, 12,000-lb, M112.
BOMB, GP, 22,000-lb, M110 (T14), and components.
BOMB, GP, 44,000-lb, T12.
BOMB, SAP, 2,000-lb, M103 (T7).
BOMB, SAP, 25,000-lb, T28E4.
BOMB, TI, 100-lb, M84A1.
BOMB, TI, 250-lb, M89, M90, M91, M98, and M100.
CLUSTER, fragmentation bomb, 100-lb, M28 series and 500-lb, M29 series.
CLUSTER, fragmentation bomb, M26.
Clusters employing hook and cable adapters.
DEVICES, antiricochet, M16 and M17.
KIT, conversion, for 20-lb fragmentation bombs.

COMPONENTS

FIN ASSEMBLY, M120, M121, M123, and M124.
FUZE, bomb, mechanical time, M144, AN-M145, AN-M146, M147, M152, M153, and M155.
FUZE, bomb, nose, AN-M103A1, M139, M139A1, M140, M140A1, M163, M164, M165, M170, and M171.
FUZE, bomb nose, VT, AN-M166 and AN-M168.
FUZE, bomb, tail, M160, M161, and M162.
NUT, fin lock, M1, M2, and M3.
PRIMER-DETONATOR, M14, 0.24-SEC DELAY.

MISCELLANEOUS

Data pertaining to standard bomb fillers and current modifications of bombs and components.
Model designations for fin assemblies and arming wire assemblies.

4. The Bomb

a. DEFINITION. A bomb is a particular kind of ammunition which is designed to be dropped from an airplane in flight to inflict damage on the enemy. It usually consists of a metal container filled with explosives or chemicals, a device for stabilizing its flight so that it can be aimed accurately, a mechanism for exploding the bomb at the target, and such safety devices as may be necessary to make it reasonably safe to carry. The metal container, called the bomb body (figs. 7 to 9), is usually streamlined with a rounded (ogival) nose and a tapered tail. The stabilizing device (fig. 3) is attached to the tail end of the body and generally consists of a sheet metal fin assembly, although a parachute or cloth streamers may be used. The mechanism for exploding the charge is called a fuze (figs. 10 to 17) and is generally placed in the nose or in the tail end of the body. Two or more fuzes are occasionally used in the same bomb for different effects, for flexibility in use, or to insure reliability of functioning—that is, should one fuze malfunction, the other will cause the bomb to explode. The safety devices are usually built into the fuze and are held in place during storage and shipment by seal wires or cotter pins. When the bomb is prepared for use, the seal wire and cotter pins are replaced by an arming wire which is not removed till the bomb is dropped.

b. REPRESENTATIVE TYPES AND SIZES. Figures 1 and 2 illustrate various types of bombs and their comparative sizes. The following legend is keyed alphabetically to figures 1 and 2 to aid in identifying the different bombs shown therein:

A—BOMB, depth, TNT, 350-lb, AN–Mk 54 Mod 1.
B—BOMB, gas, HD, 115-lb, M70A1.
C—BOMB, photoflash, 100-lb, AN–M46 (M46).
D—BOMB, smoke, PWP, 100-lb. AN–M47A4.
E—BOMB, practice, 100-lb, M38A2.
F—BOMB, GP, tritonal, 250-lb, AN–M57A1.
G—BOMB, GP, TNT, 100-lb, AN–M30A1.
H—BOMB, fragmentation, TNT, 23-lb, M72A1.
I—BOMB. fragmentation, TNT, 20-lb, AN–M41A1.
J—BOMB, incendiary, 4-lb, AN–M50A2.
K—BOMB, fragmentation, TNT, 4-lb, M83.
L—BOMB, practice, miniature, 3-lb, Mk 23.
M—CLUSTER, fragmentation bomb, M28A2 (100-lb size).
N—BOMB, SAP, picratol, 500-lb, AN–M58A2.
O—BOMB, incendiary, 500-lb, AN–M76.
P—BOMB, gas, 1,000-lb, AN–M79.
Q—BOMB, SAP, picratol, 1,000-lb, AN–M59A1.
R—BOMB, AP, Exp D, 1,000-lb, AN–Mk 33.
S—BOMB, AP, Exp D, 1,600-lb, AN–Mk 1.
T—BOMB, GP, tritonal, 2,000-lb, AN–M66A2.
U—BOMB, LC, TNT, 4,000-lb, M56A2 (AN-M56A2).
V—BOMB, GP, tritonal, 12,000-lb, M109 (T10).
W—BOMB, GP, tritonal, 22,000-lb, M110 (T14).
X—BOMB, GP, tritonal, 44,000-lb, T12.

5. Release

The bomb is carried in a rack in the airplane's bomb bay by means of a shackle (fig. 4). Hooks on the shackle engage suspension lugs attached to the bomb body. The loop of an arming wire is attached to a separate hook (pawl) at the center of the shackle. The free ends of the arming wire are passed through safety devices in the fuze thus maintaining the fuzes in a safe (unarmed) condi-

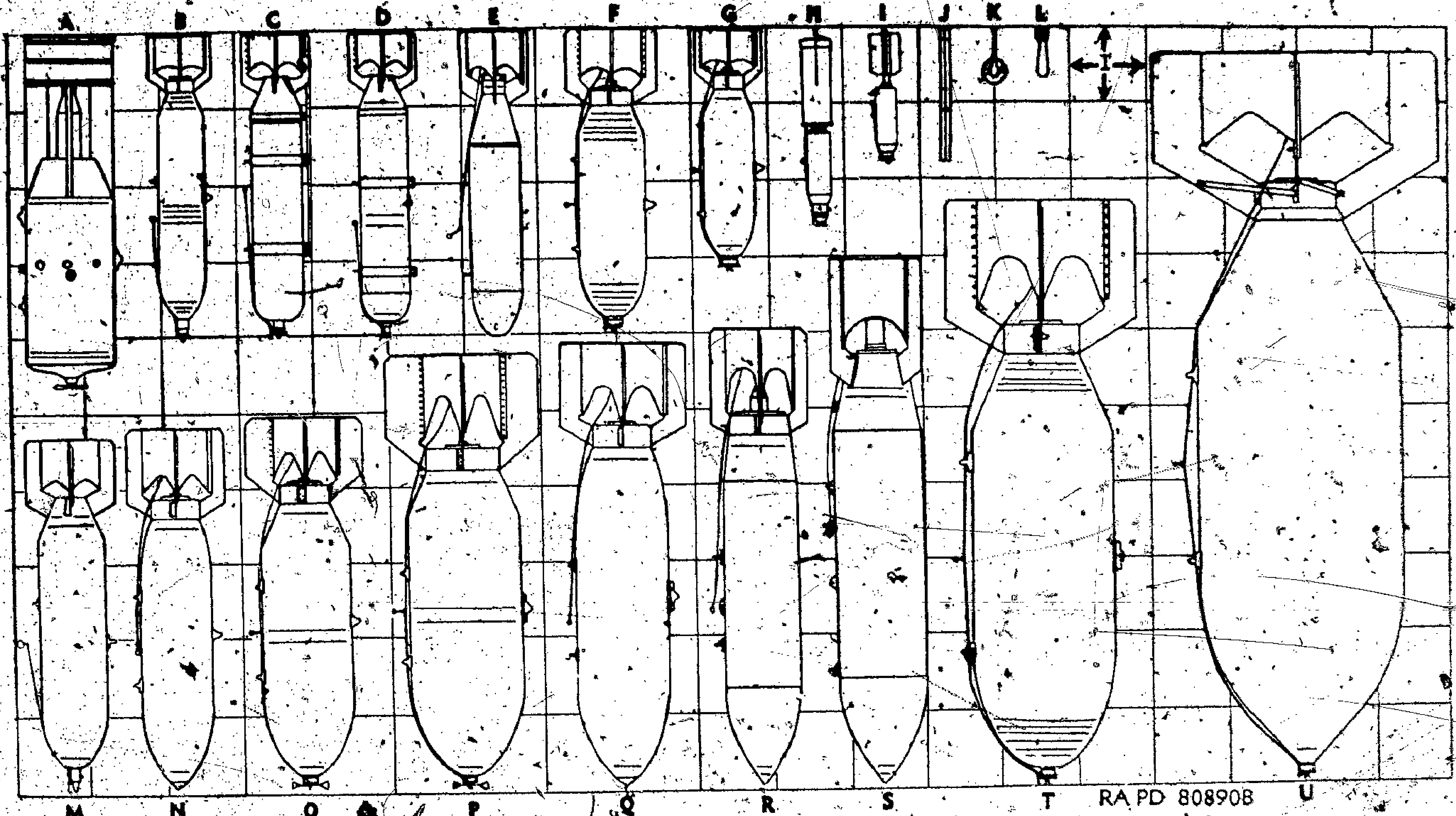

Figure 1. Bombs, representative types.

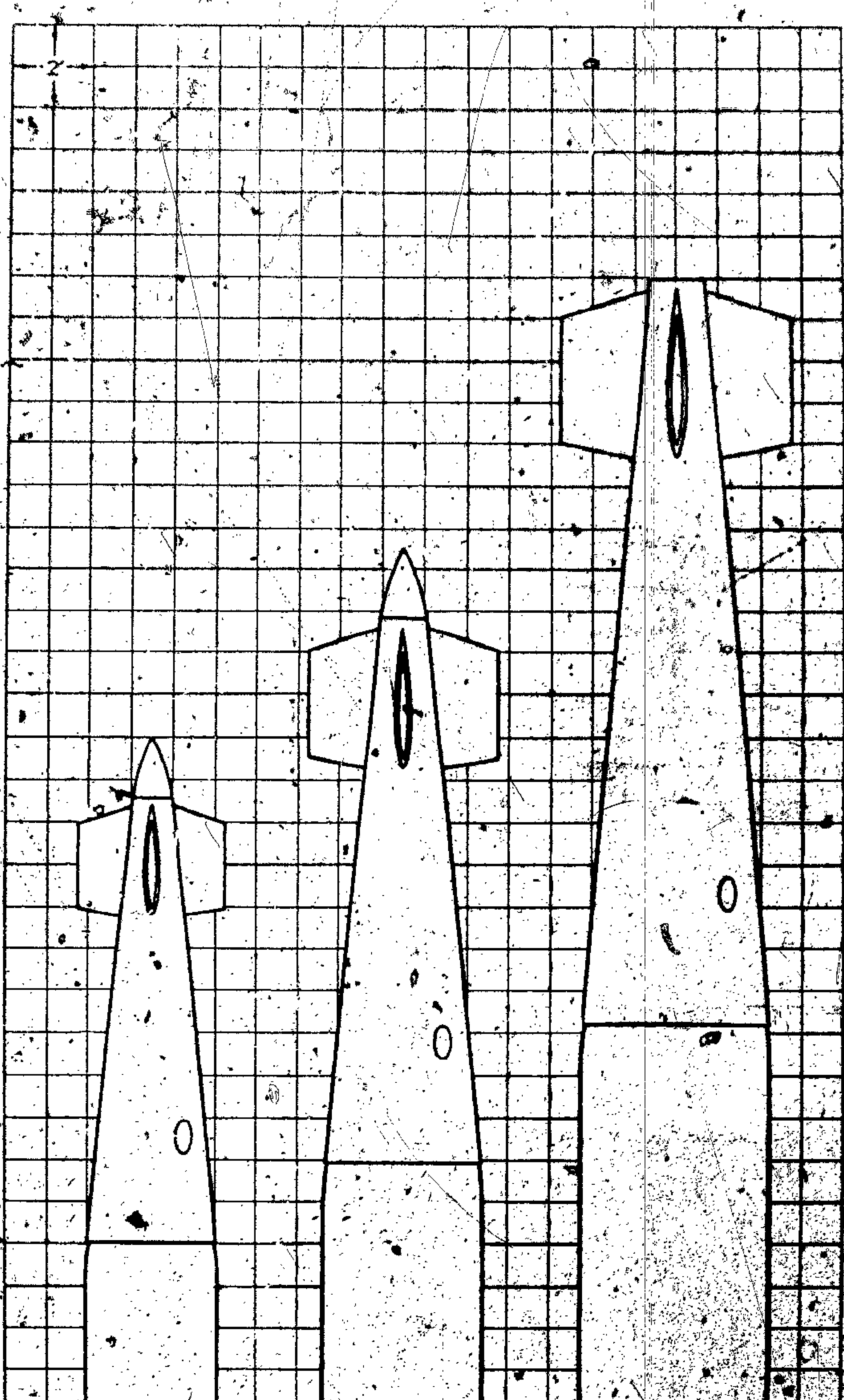

Figure 2. Bombs, representative types—Continued

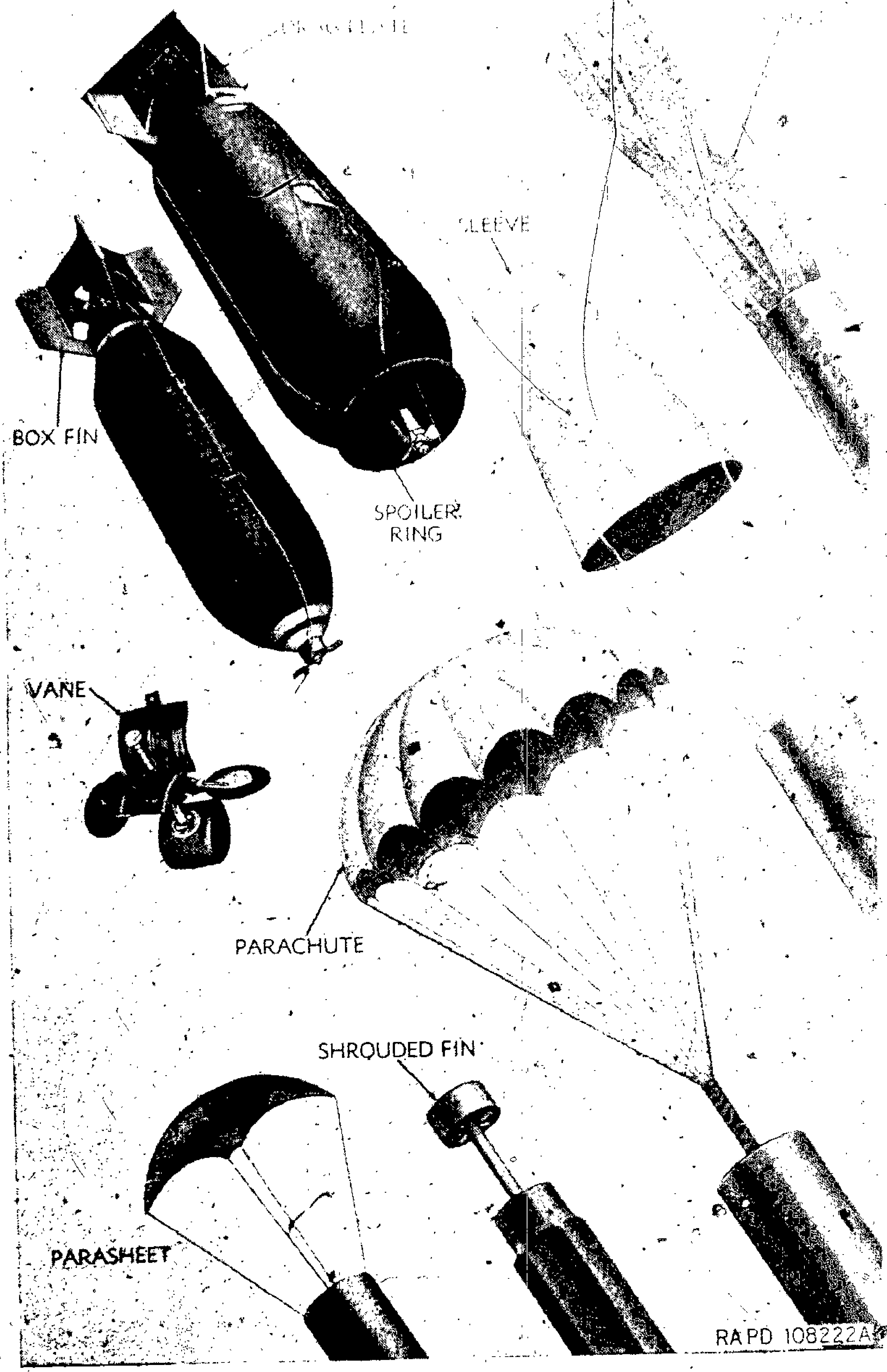

Figure 3. Methods of stabilizing flight.

Figure 4. Arming wire.

tion. Fahnestock clips are placed over the protruding ends of the arming wire to prevent the wire from slipping out of the safety devices by accidental means (such as slip stream forces) prior to bomb release. If a bomb must be released over friendly territory, the arming wire is released with the bomb and stays in place as the bomb falls and prevents the fuze from arming so that the bomb does not explode when it strikes. When the bomb is released for effect, the arming wire is retained by the pawl and as the bomb drops, the wire is pulled from the fuze which is then free to become armed, that is, in condition to operate. Some fuzes arm by spring action, others by clockwork, powder train, or electrical means, but most fuzes now in use are armed by the action of an arming vane similar to a propeller which is driven by the air stream as the bomb falls. The arming vane may drive a gear train which, after a definite interval, removes safety blocks or alines the detonator with the next element in the explosive train (par. 6), usually the booster lead. When the bomb reaches the target, the firing pin is driven into the detonator which contains a pellet of sensitive explosive about the size of an aspirin tablet. The blast from the detonator explodes a booster of less sensitive explosive—about the size of a flashlight battery—which relays and amplifies the blast in order to explode the bursting charge of the bomb. Some fuzes have delay elements between the firing pin and detonator to delay the detonation of the bomb until it has had time to penetrate the target.

6. The Explosive Train
(fig. 5)

The type of explosive used in such large quantities as the loading of bombs must be relatively insensitive to shock and heat. This is necessary for a number of reasons. It provides a reasonable degree of safety in storing, shipping, and handling; it allows the bomb to be dropped safe over friendly territory; and it permits the bomb to be used to penetrate a resistant target, such as armor plate, thick earth, or concrete, before exploding. If a bomb were to explode on impact outside such protection, the damage would be relatively slight. On the other hand, the type of explosive used in the fuze must be very sensitive, so that it will be sure to explode on impact of a firing pin. Such explosives are not safe to handle except in minute quantities which are strongly compressed in a metal capsule. These capsules—called detonators—are built into fuzes. However, the shock from the explosion of a detonator is not sufficiently strong to be reliable as a means of exploding the large amount of insensitive explosive which makes up the main charge of the bomb. So a quantity of an explosive which is more sensitive than the main charge is placed next to the detonator. This element is called the booster. The booster is small and sensitive enough to be exploded by the detonator yet large enough so that the shock of its explosion will explode the bursting charge of the bomb. Such an arrangement of elements is called the explosive train. This is the basic method of operation of all explosive ammunition.

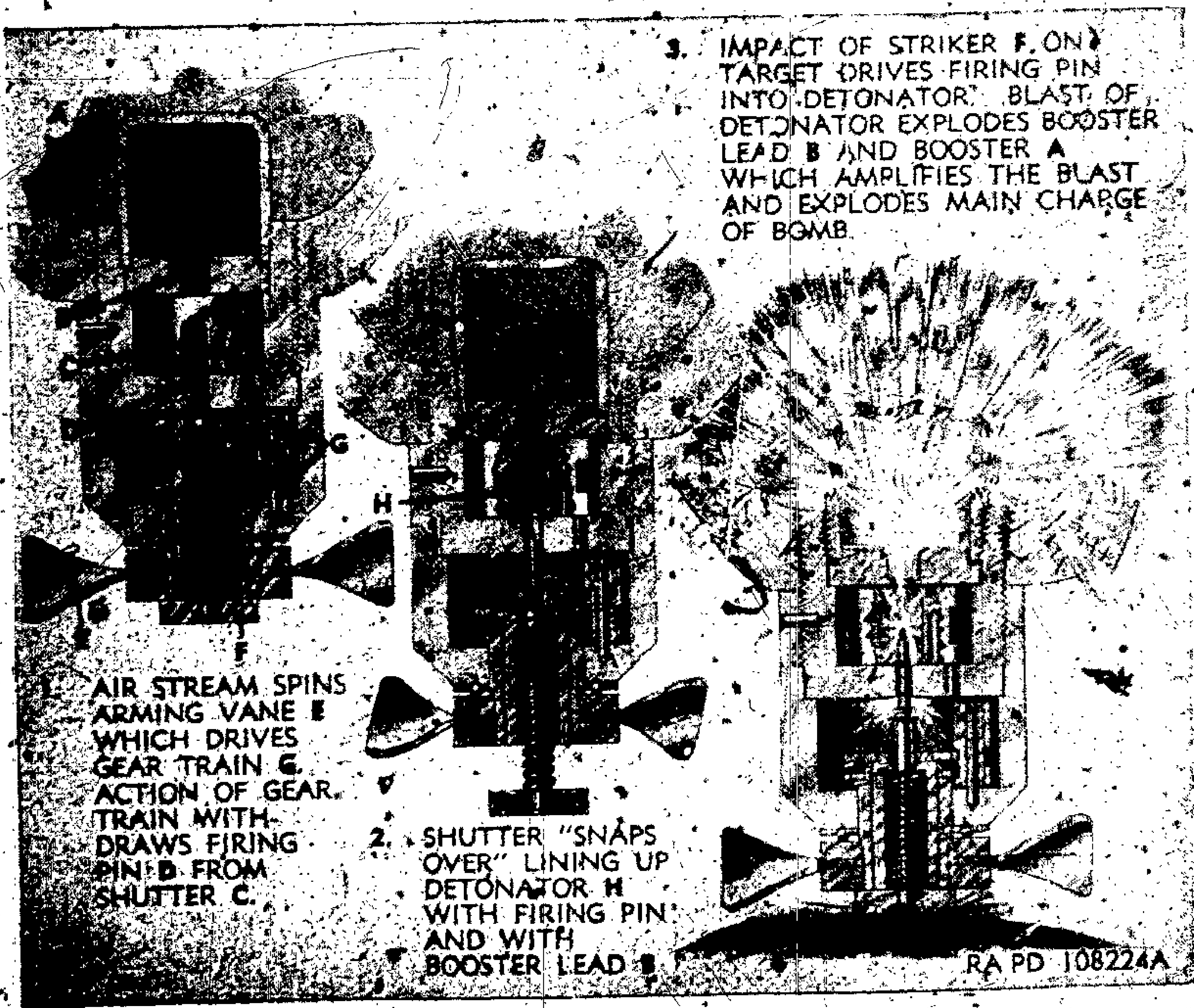

Figure 5. Explosive train.

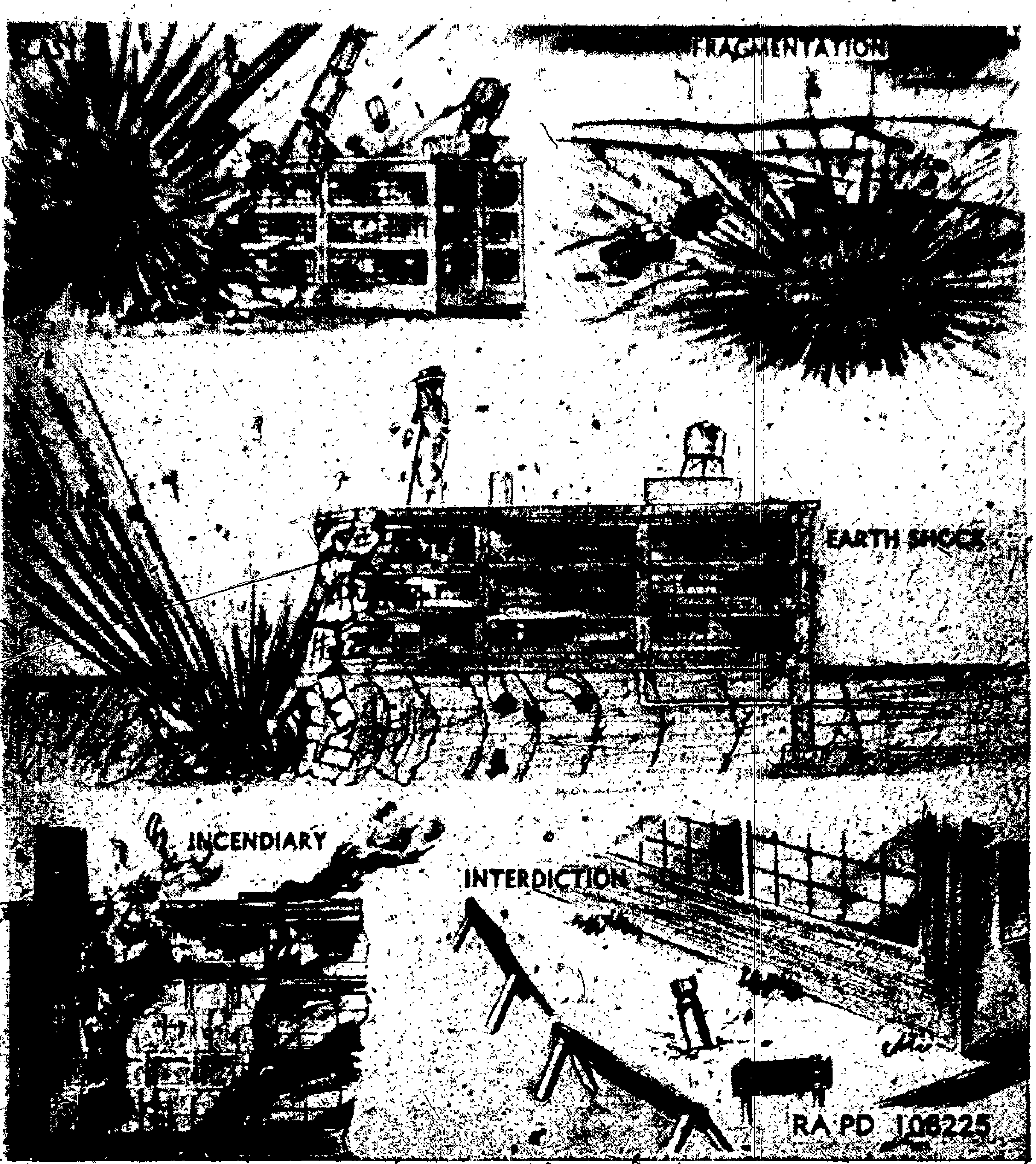

Figure 6. Effects of bomb burst.

7. Effects of Bomb Burst (fig. 6)

When a high explosive bomb is detonated, the charge is transformed in an instant (about 0.0002 sec.) into a very hot gas. This gas momentarily occupies only the volume of the solid explosive and consequently develops enormous pressure (about 100 tons per sq. in. for TNT). The gases expand violently in all directions, under influence of this pressure, shattering or displacing surrounding material, generating shock and pressure waves, and projecting fragments of the shattered case at high velocity. In the case of chemical bombs, the explosive charge is only large enough to open the bomb body and scatter the charge over the target.

CHAPTER 2

RECOGNITION

8. Classification of Bombs

In common with other types of ammunition, bombs are classified according to use as armor-piercing (AP), general-purpose (GP), light-case (LC), fragmentation, depth, semi-armor-piercing (SAP), gas, smoke, incendiary, photoflash, target identification (TI), practice, and drill. Except for practice bombs, they are further classified according to filler as follows:

EXPLOSIVE—AP, GP, LC, fragmentation, depth, and SAP.
CHEMICAL—Gas, smoke, and incendiary.
PYROTECHNIC—Photoflash and TI.
INERT—Drill.

Practice bombs are usually inert loaded except for a spotting charge of black powder or smoke mixture—a sonic device may also be used for spotting but in this case the bomb is completely inert. The percentage of explosive is often used as a description of the type of a bomb; for example, a semi-armor-piercing bomb, which contains approximately 30 percent of explosive by weight, may be described as a "30-percent bomb"; similarly, a general-purpose bomb may be described as a "50-percent bomb". Except for chemical bombs, each of the types mentioned above is described in detail in chapter 6. Classification of fuzes is given in paragraph 38.

9. Identification

a. GENERAL. Bombs and bomb components are completely identified by standard nomenclature (*c* below) and the ammunition lot number which are stenciled or stamped on all packings and, where size permits, on the item itself. In addition, fuzes may be identified by visual inspection by noting the differences in design as shown in figures 10 to 18 and as described in chapter 5.

b. PAINTING AND MARKETING.

(1) *Painting.*

(*a*) *Bombs.* Bombs are painted to prevent rust and to furnish, by color, a ready means of identification as to type (figs. 7 to 9). In addition, bombs are painted to prevent easy detection of stock piles from the air. The color scheme, except for Navy type bombs, is outlined in table I; see pertinent Department of the Navy publications for Navy color markings (see app. I).

Table 1. Color Scheme for Bombs

Type of bomb	Color of body	Identification bands: Color	Number of bands and location: Nose	Center	Tail	Color of marking
GP and LC (TNT or Amatol loaded), FRAGMENTATION, (TNT or Ednatol, loaded), AP, DEPTH, and SAP.	Olive-drab.	Yellow	1[1]	None	1[1]	Black.
GP and FRAGMENTATION (COMP B loaded).	do	do	2	do	2	Do.
GP and LC (Tritonal loaded).	do	do	1 narrow between 2 wide bands.	do	1 narrow between 2 wide bands.	Do.
TI and PHOTO-FLASH.	Gray		None	do	None	Do.
PRACTICE	Blue		do	do	do	White.
DRILL	Olive-drab.	Black	1	do	1	Black.
CHEMICAL:						
Smoke	Gray	Yellow	1	1	1	Yellow.
Incendiary	do	Purple	1	1	1	Purple.
Persistent gas	do	Green	2	2	2	Green.
Nonpersistent gas.	do	Green	1	1	1	Do.
Irritant gas	do	Red	1	1	1	Red.

[1] Small fragmentation bombs (under 90 lb.) are painted on the head and base instead of with an [illegible] color band.

(*b*) *Fuzes.* Some fuzes are painted to indicate differences in length of delay or arming time (figs. 10 to 17) or to indicate position as nose or tail (fig. 12).

(*c*) *Primer-detonators.* Primer-detonators are painted to indicate length of delay (fig. 19).

(*d*) *Packing.* Packings or packing components such as shipping bands and fin crates are painted olive-drab.

(2) *Marking.*

(*a*) Bombs are marked with the following information:

Type—as GP, AP, SAP.

Weight.

Model.

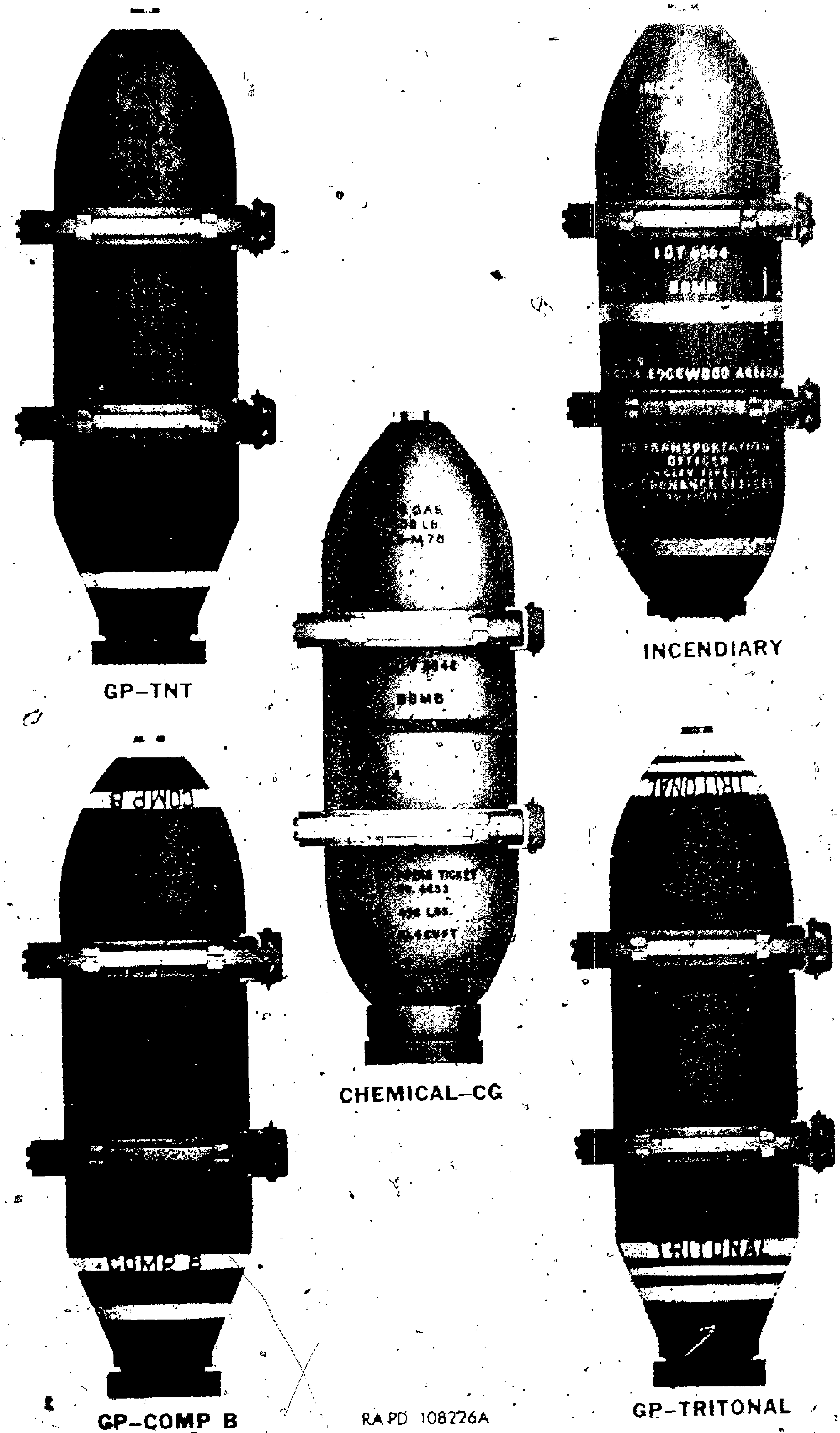

Figure 7. Typical painting and marking of bombs (explosive and chemical).

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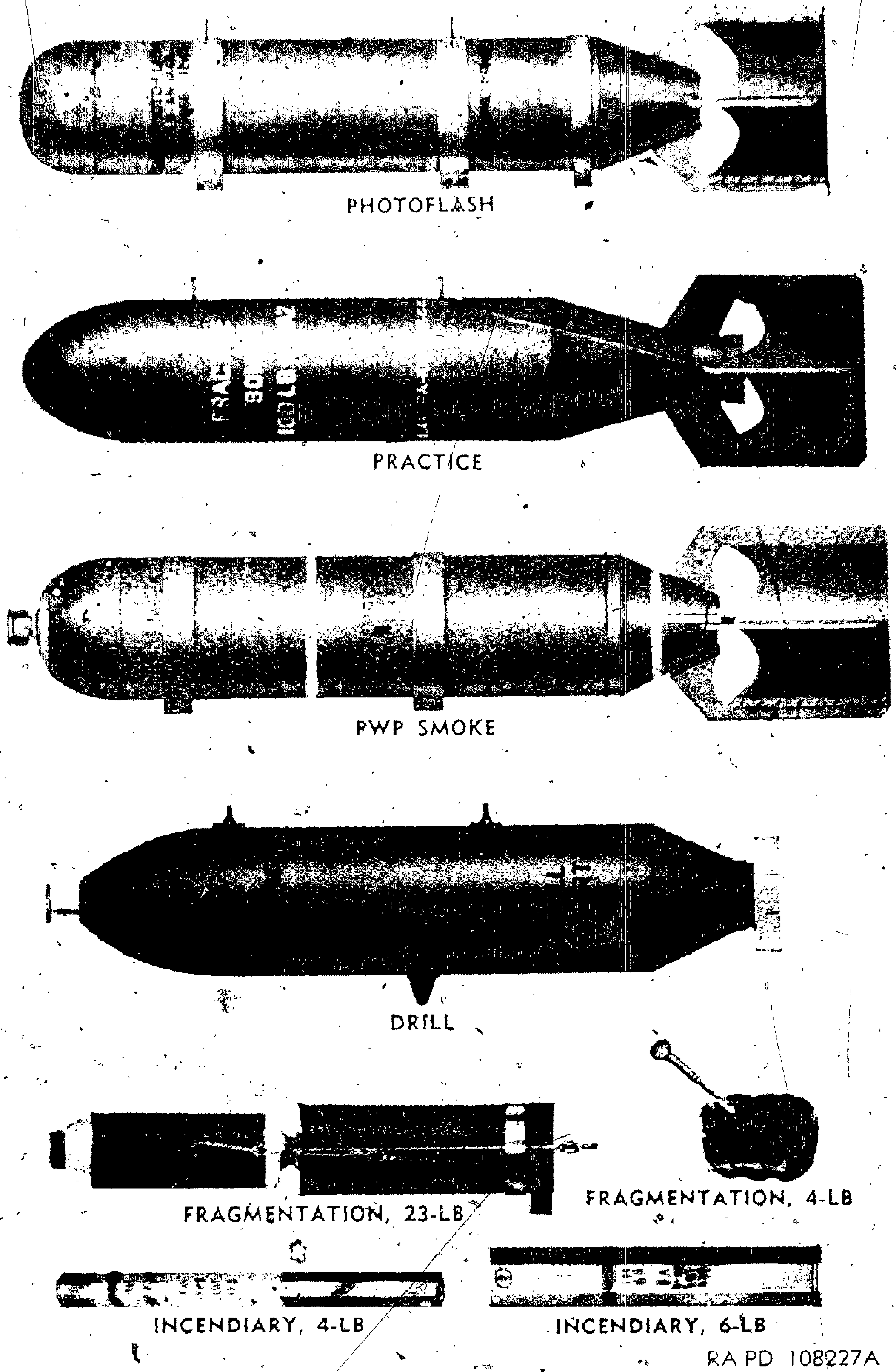


Figure 6. Typical painting and marking of bombs (pyrotechnic, chemical, inert, and explosive).

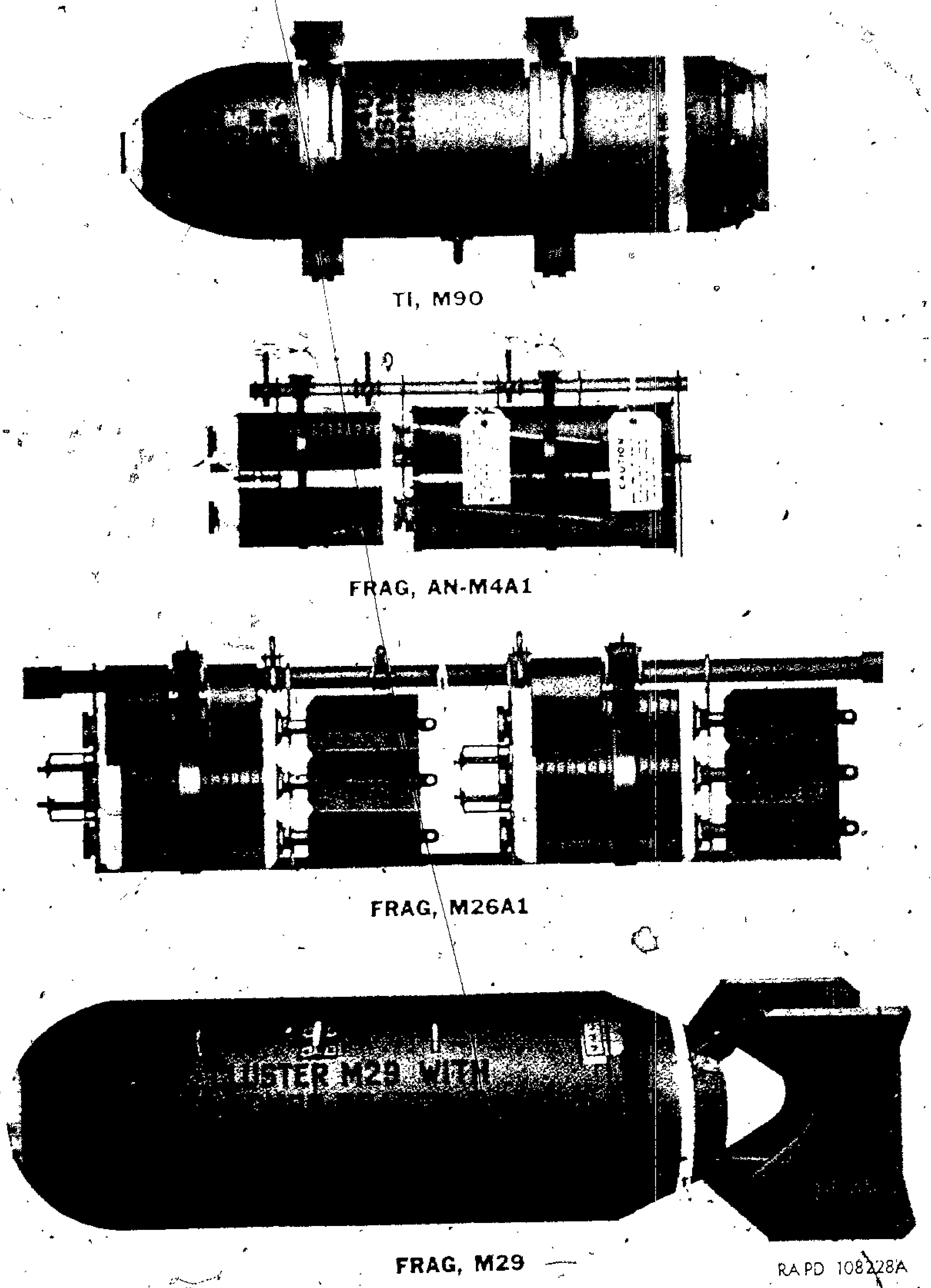


Figure 9. Bomb clusters.

Filler—as TRITONAL, TNT, EXP D.
Ammunition lot number.
AIO symbol.
ICC shipping designation.
Inspector's stamp.
The letters "US."
Displacement.
Address.
Shipping ticket number.

The last two items listed may be omitted when bombs are shipped in full carload lots.

(*b*) Fuzes are marked either by stenciling or stamping the type, model, lot number, and length of delay on the fuze body.

(*c*) Primer-detonators are marked to indicate the type, model, and length of delay.

c. STANDARD NOMENCLATURE. Standard nomenclature is established in order that each item stored and issued may be specifically identified by name. It consists of the name (basic noun), type, filler, weight, and model designation of the item. Standard nomenclature for service bombs and components is given in Department of the Army Supply Catalogs ORD 11 SNL's S–1, S–2, and S–3, and for drill bombs and components in S–6. The use of standard nomenclature is mandatory for all purposes of record except as described in *f* below.

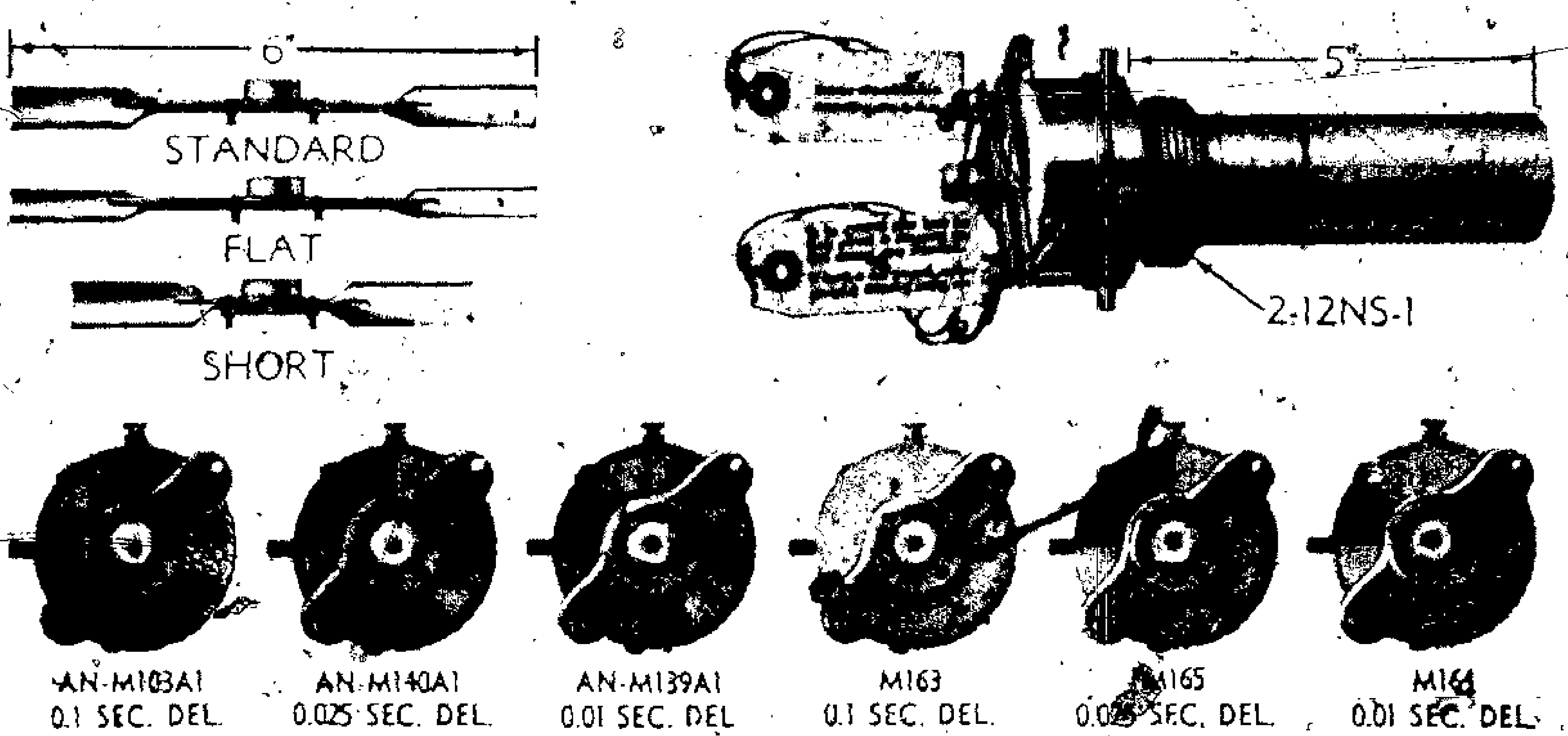
d. MODEL. In order to distinguish between different designs of the same type, a model number is assigned at the time a design is adopted as standard. The model designation consists of the letter "M" followed by an arabic numeral. Modifications of the original design are indicated by the addition of the letter "A" and the appropriate arabic numeral to the model designation. For example, M38A2 designates the second modification of the item originally adopted as M38. Certain items have been standardized for use by both the Army and Navy. The model designation of such an item is prefixed by the letters "AN–" (for example, AN–M64A1). Items of Navy design are designated by Mark (Mk) instead of model and modifications by Mod (for example, AN–Mk 24 Mod 2). When an AN item is destandardized by either the Army or Navy, the AN is deleted from the model designation; however, to preclude loss of identity, the AN designation is carried parenthetically in standard nomenclature (for example, M120A1 (AN–M120A1)). Conversely, when an item is classified as AN standard and is not modified prior to such standardization, the previous model is carried parenthetically (for example, AN–M146) (M146)).

e. AMMUNITION LOT NUMBER. When ammunition is manufactured, a lot number is assigned in accordance with pertinent instructions. The lot number designates a quantity of ammunition items or components which have been manufactured under conditions as nearly identical as possible and which may, therefore, be expected to function uniformly. It consists of a series of letters representing the loader's symbol or initials which is followed by two sets of numerals, representing the "grand" and "individual" lot designations. The ammunition lot number is required for purposes of record involving the particular ammunition, especially reports on condition, functioning, or accidents.

f. AMMUNITION IDENTIFICATION CODE (AIC). An ammunition identification code is established in order to facilitate requisitioning and record keeping in the field. The AIC symbol consists of five characters, the first two of which indicate the standard nomenclature list in which the item may be found, the other three are peculiar to the item. Once a code symbol is properly assigned to an item and published, it is never assigned to another item. Further explanation of the AIC symbol may be found in Department of the Army Supply Catalog ORD 1.

g. DATA CARD. The ammunition data card is a 5- by 8-inch card prepared for each lot of ammunition and forwarded with each shipment of ammunition. In addition to the ammunition lot number, it gives the lot numbers of the components and other pertinent information concerning the ammunition. When required, instructions for assembly are printed on the reverse side of the card.

h. ICC SHIPPING DESIGNATION. Interstate Commerce Commission (ICC) regulations require that each explosive item offered for shipment by common carrier be marked with the shipping name or dangerous commodity designation assigned by Bureau of Explosives. (See AR 55–155.)



This is the standard impact nose fuze for the larger bombs. All fuzes of this type function instantaneously or with delay. They have the same fuze body but differ in marking and internal detail which provides for difference in length of air travel (indicated by yellow head) required to arm the fuze and difference in length of delay between impact and detonation (indicated by black wedges). The standard arming vane has a 60° pitch; the short vane (for clustered 90-lb. frag. bombs)—has a 60° pitch; the flat vane (for flat-nose depth bombs) has a 30° pitch. RA PD 108234

Figure 10. Selective instantaneous or delay nose fuzes.

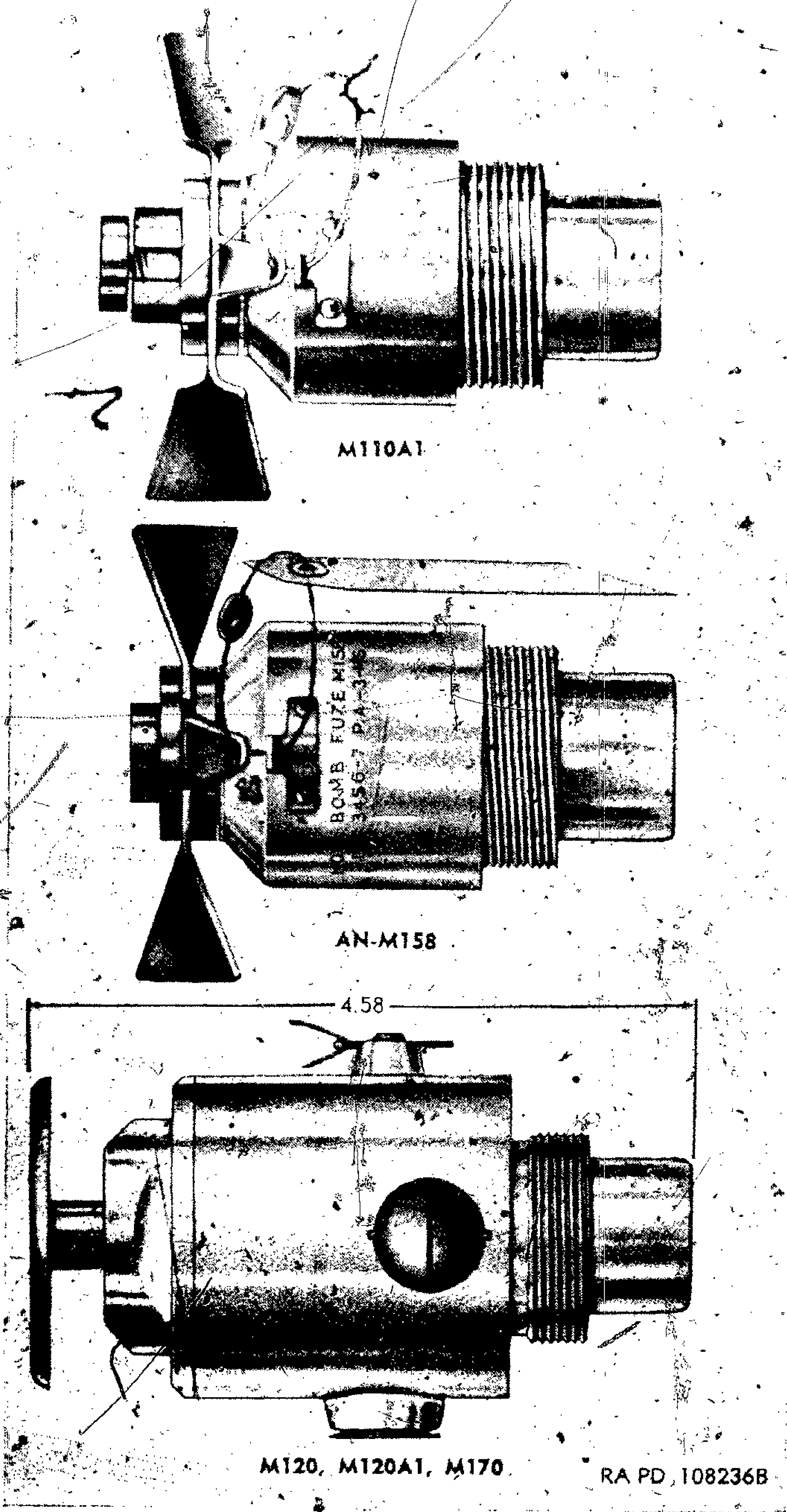


Figure 11. Impact nose fuzes—small.

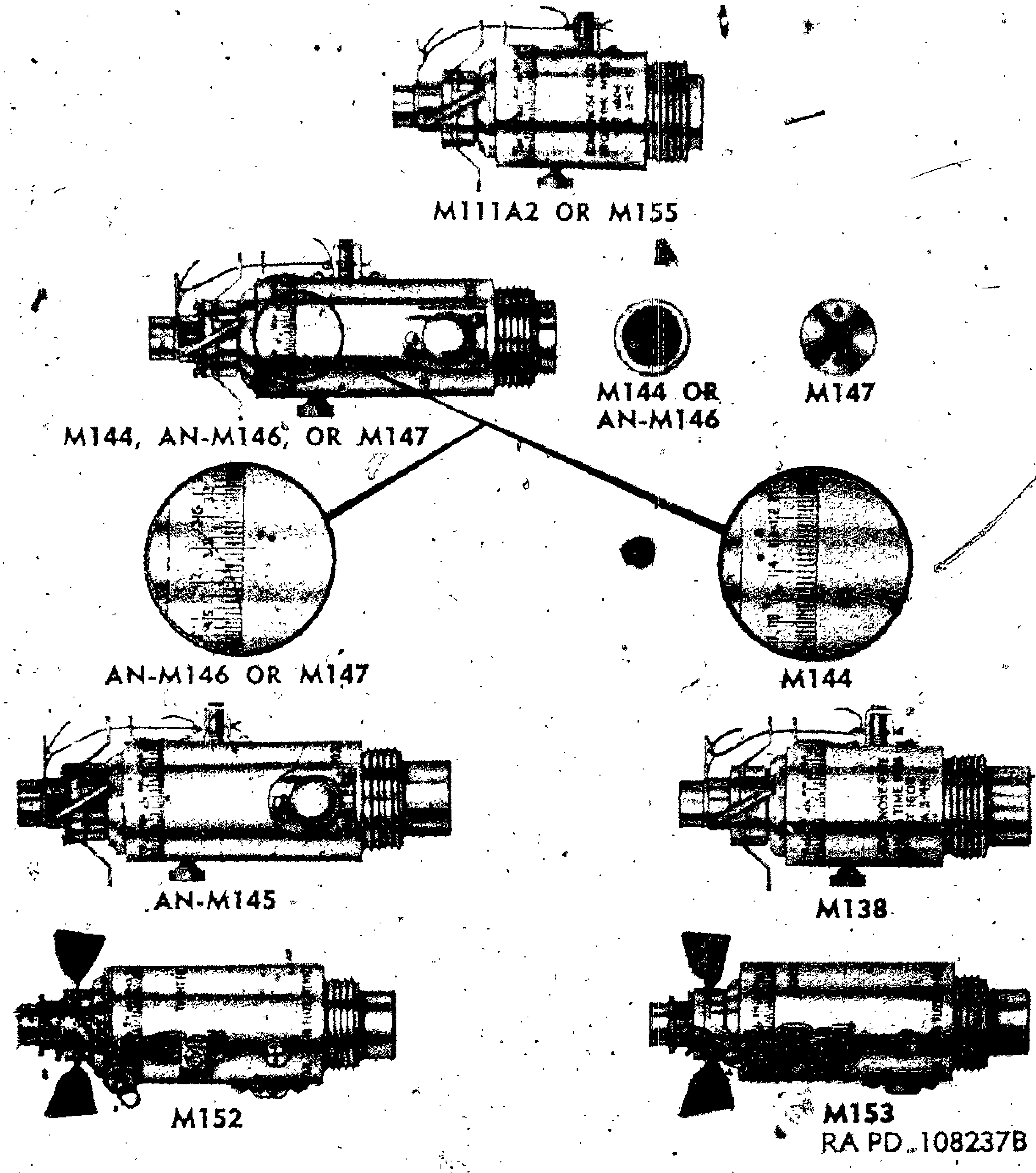
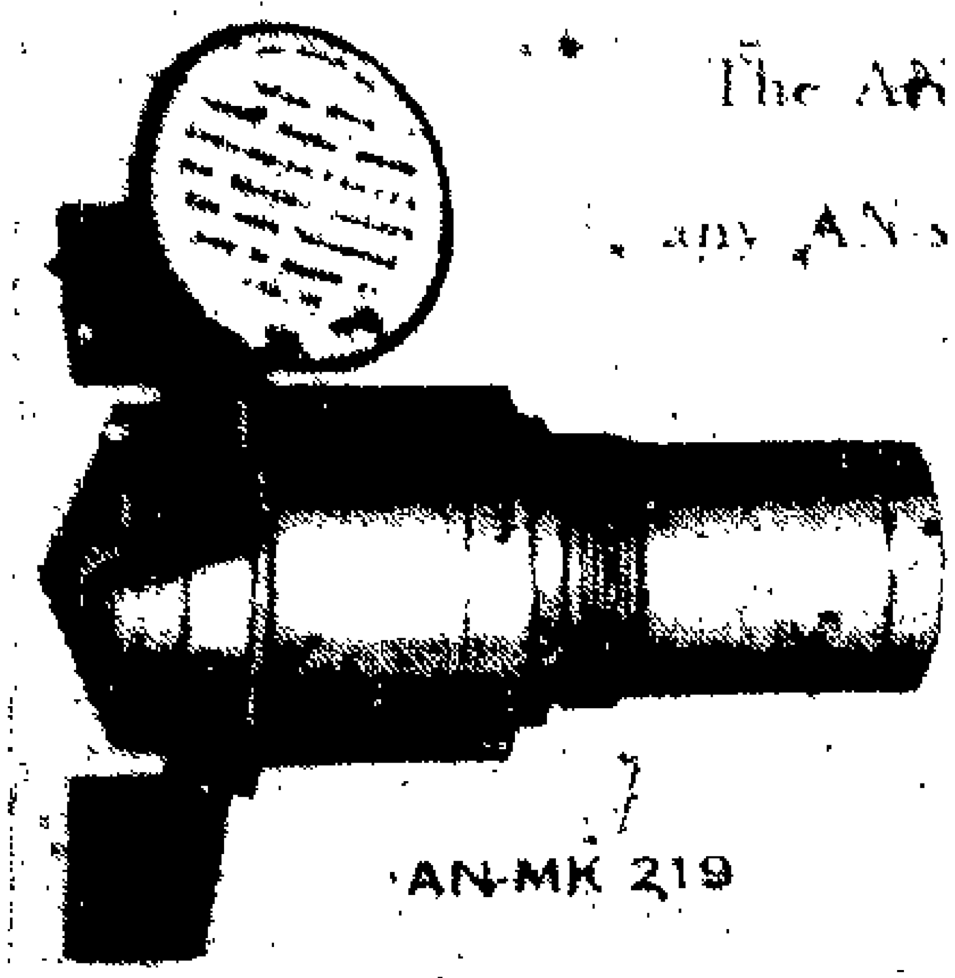


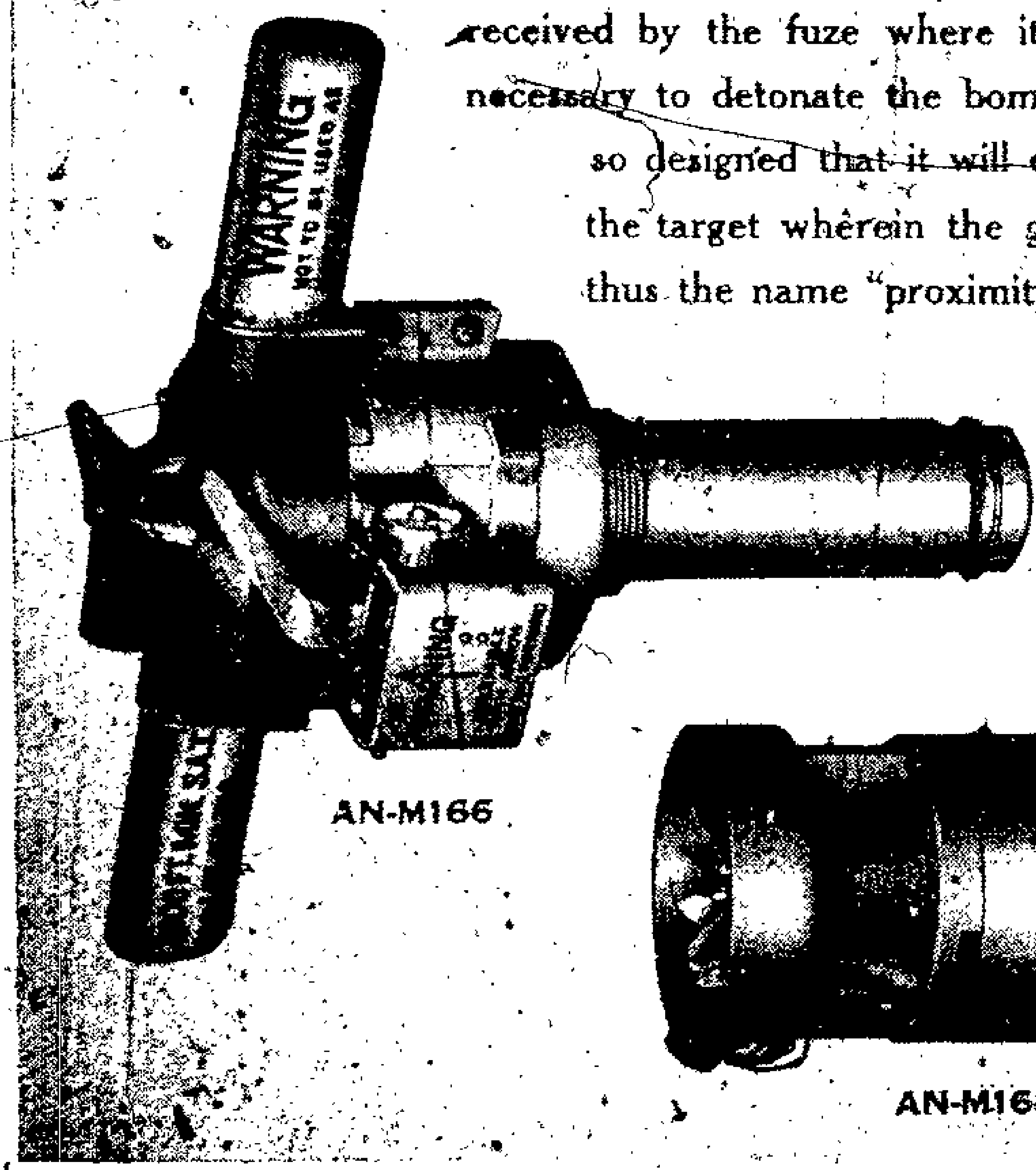
Figure 12. Mechanical time fuzes.



The AN-MK219 fuze is of navy design and may be used with any AN standard general-purpose bomb by using an auxiliary booster, MK-4 and an adapter. It is an impact fuze of the arming-vane type with mechanical arming delay. It detonates immediately on impact.

The AN-M166 and AN-M168 fuzes are used with GP, fragmentation, and may be used with chemical bombs to produce air-burst functioning. They differ from mechanical time fuzes, which may be set for air-burst, in that they contain no time regulating devices.

The AN-M166 and AN-M168 are electrically operated fuzes which rely on the reception of a self-transmitted radio wave to function. The AN-M166 is known as the bar type and the AN-M168 as the ring type. As the bomb falls these fuzes continually transmit radio waves. As the bomb nears the target the transmitted wave "echoes" from the target and is received by the fuze where it is converted into the energy necessary to detonate the bomb. In either case, the fuze is so designed that it will explode in the close vicinity of the target wherein the greatest damage will result—thus the name "proximity fuze."



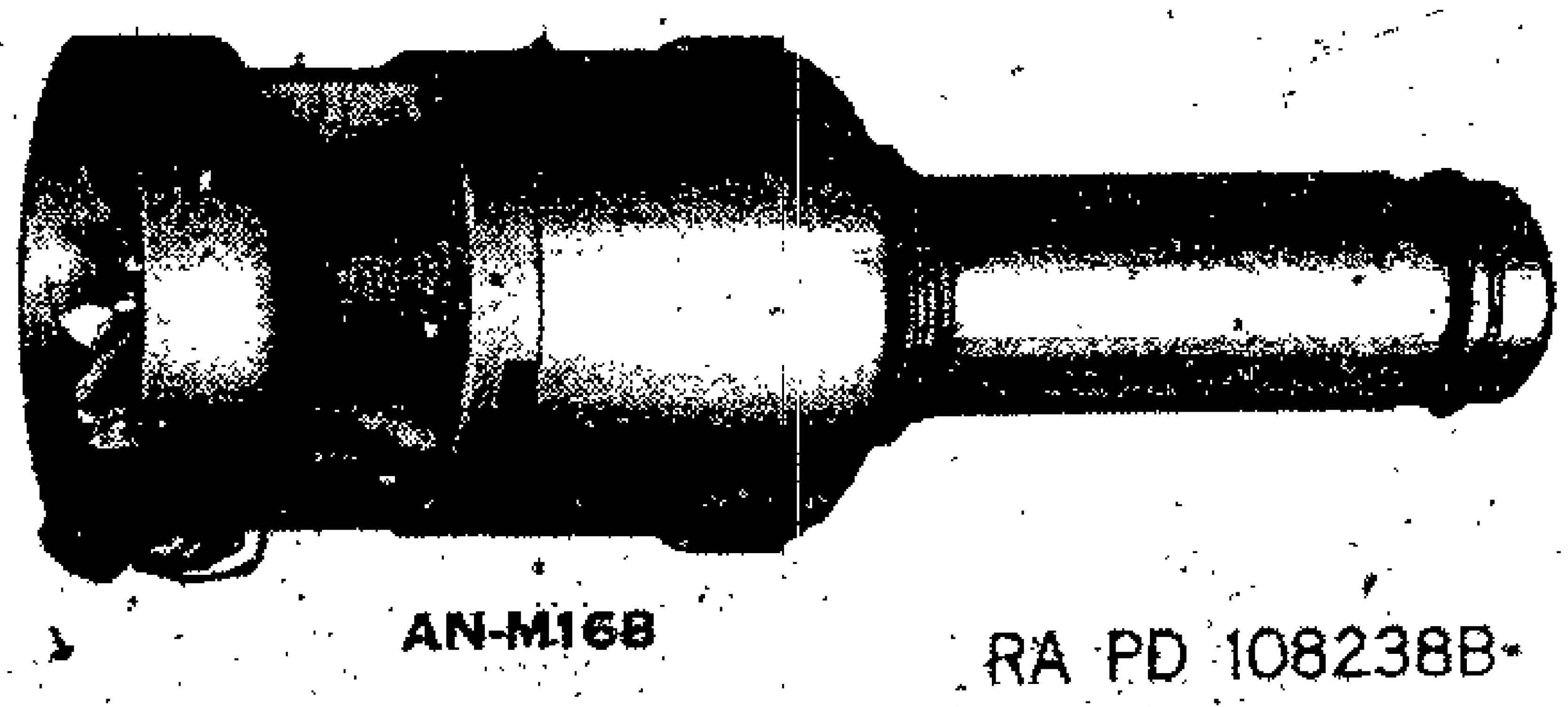
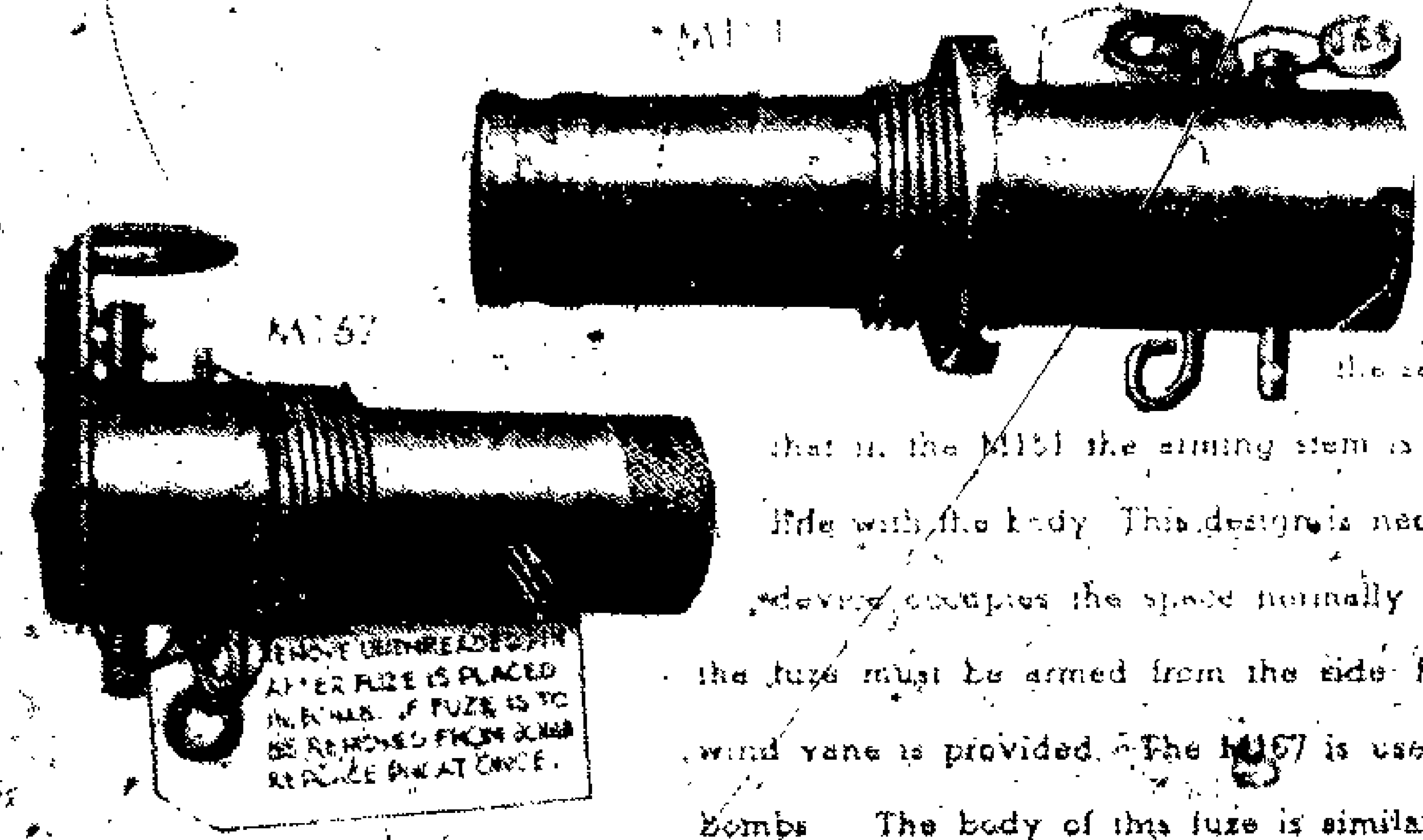
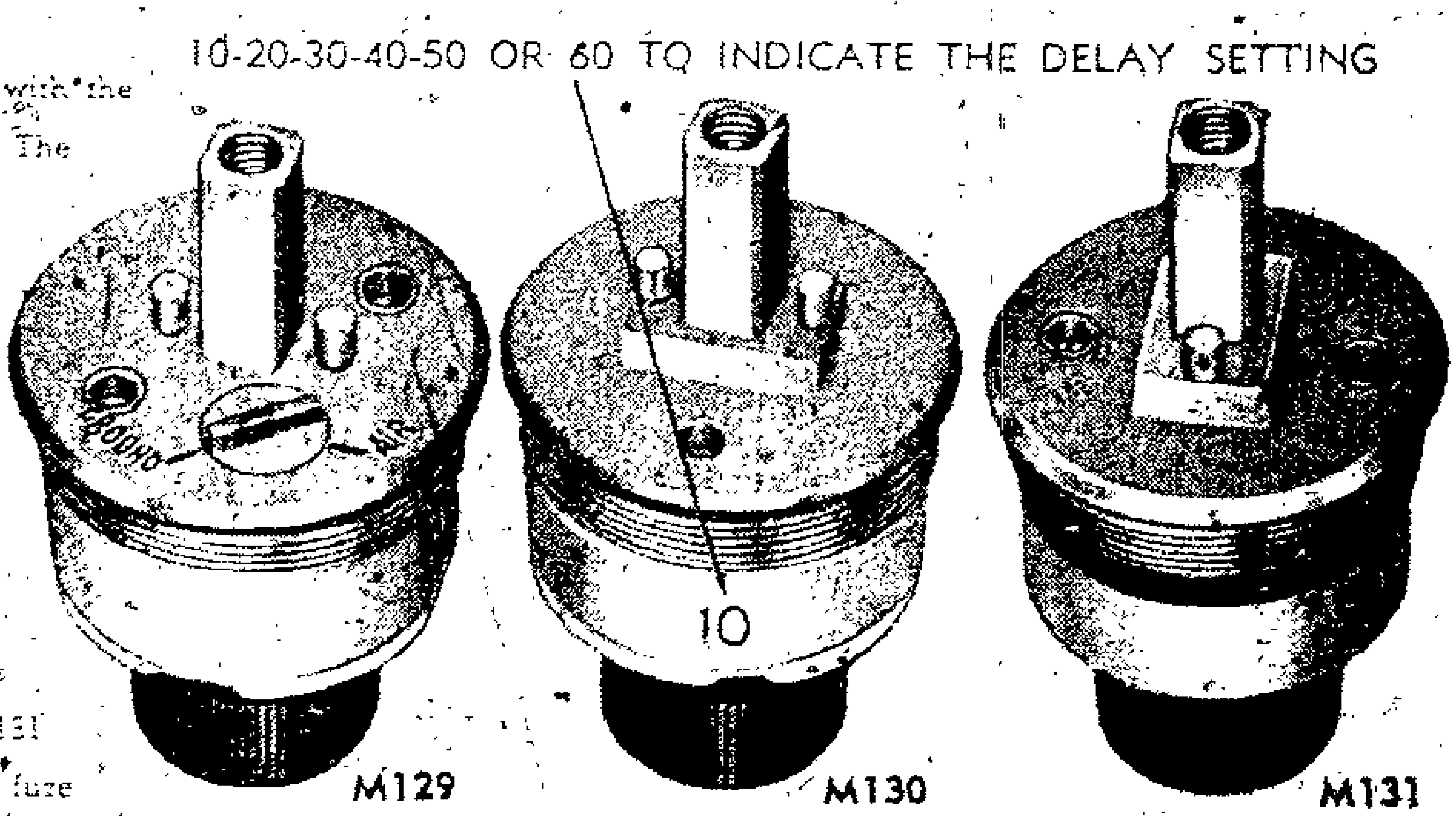


Figure 13. Nose fuzes AN-Mk 219 and VT, AN-M166 and AN-M168.



The M151 is a quick arming fuze used with antiricochet devices M16 and M17. The body of this fuze is essentially the same as the M112 tail fuze except that in the M151 the arming stem is perpendicular to rather than in line with the body. This design is necessary because the antiricochet device occupies the space normally occupied by the fin. Therefore the fuze must be armed from the side for which use an anemometer wind vane is provided. The M167 is used with the 1000-lb VB-1 (Azon) bombs. The body of this fuze is similar to the AN-M100A2 tail fuze except that the M167, like the M151, employs a transverse arming stem, for it too must be armed by a side mounted anemometer vane.

Figure 14. Miscellaneous fuzes.



These fuzes are used with the 4-lb. frag bomb M83. The M129 fuze operates to detonate the bomb either in air or on impact depending on the setting. The M130 is a mechanical time fuze which detonates the bomb 3 to 60 minutes after arming. The M131 is an anti-disturbance fuze. It becomes fully armed 2 seconds after impact. It will detonate the bomb any time thereafter when the bomb is jarred or slightly disturbed.

Figure 15. Fuzes M129, M130, and M131.

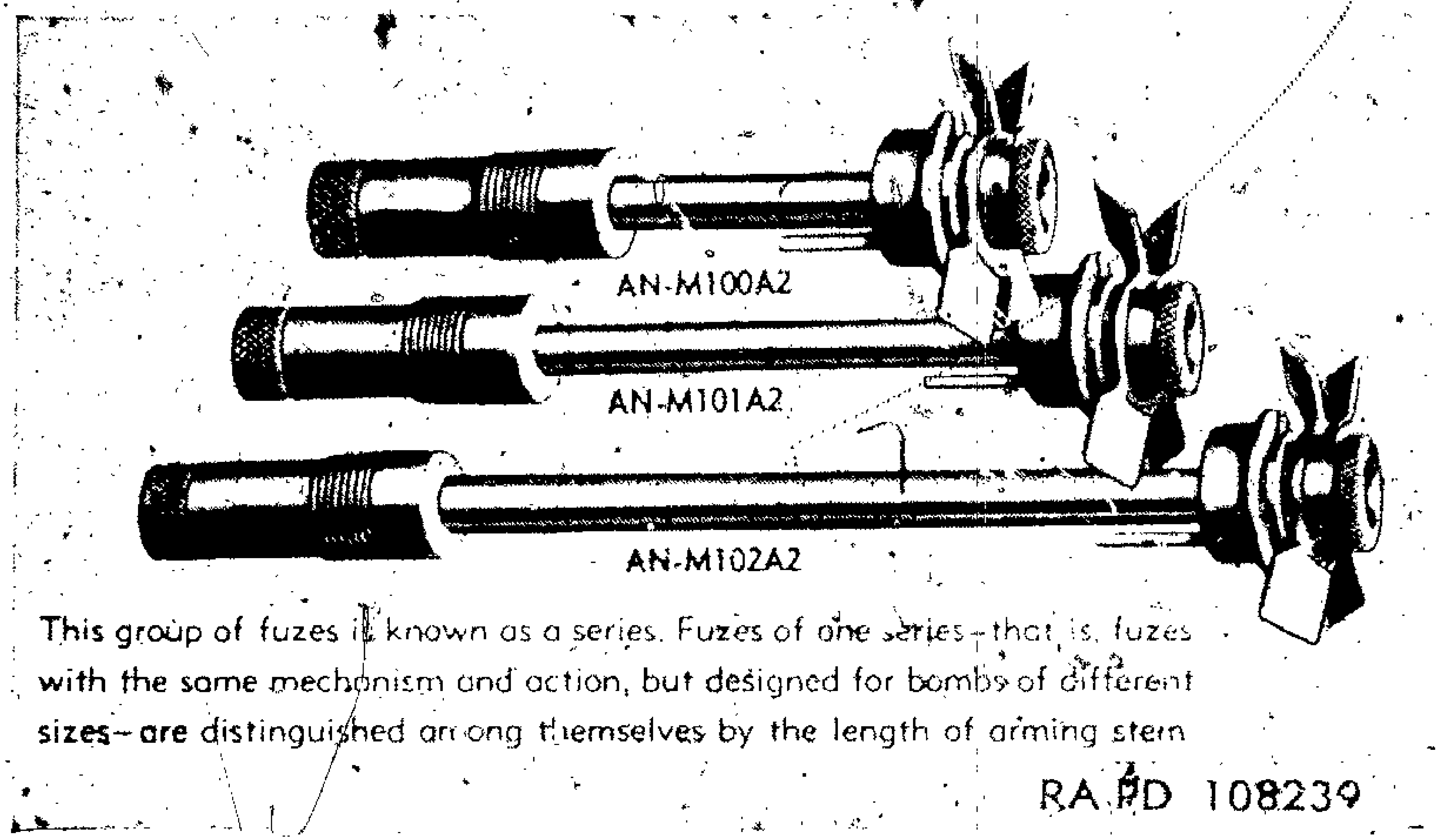
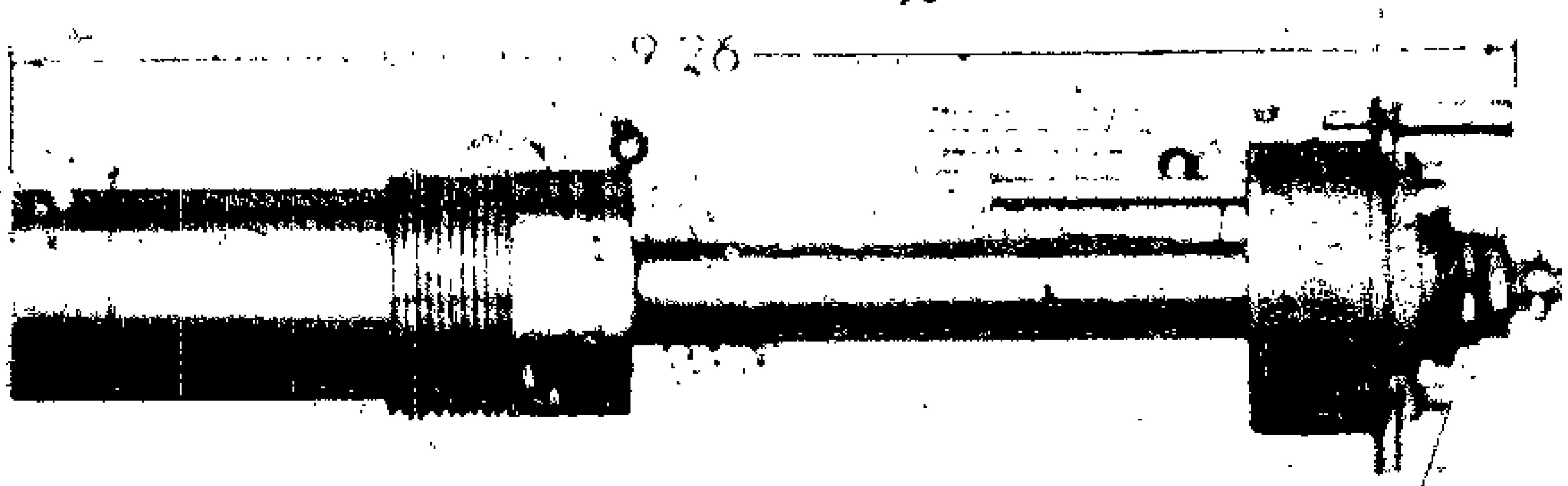
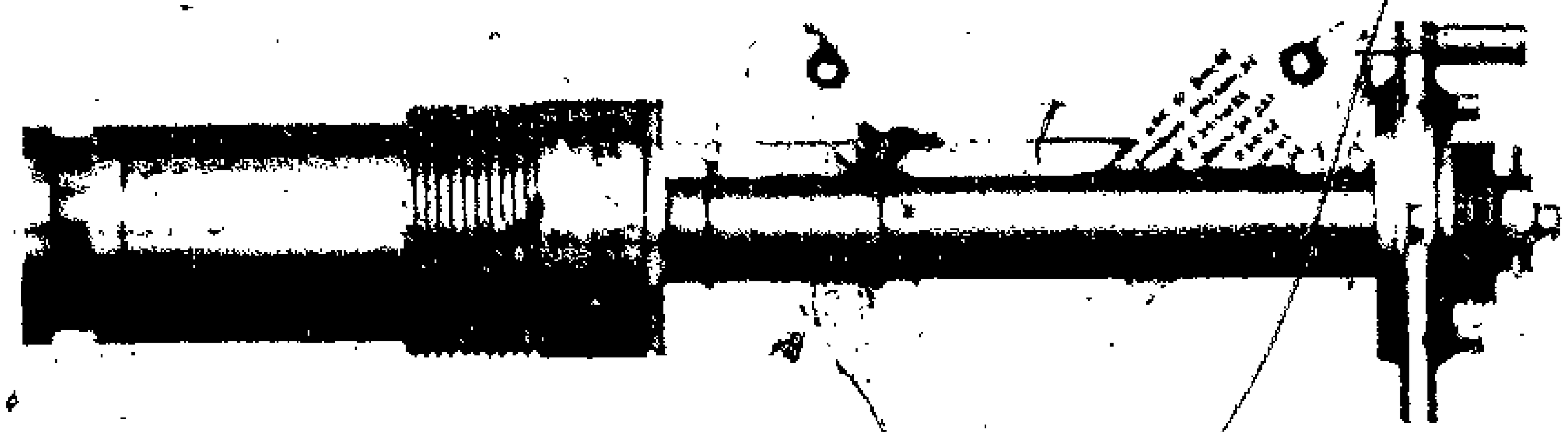


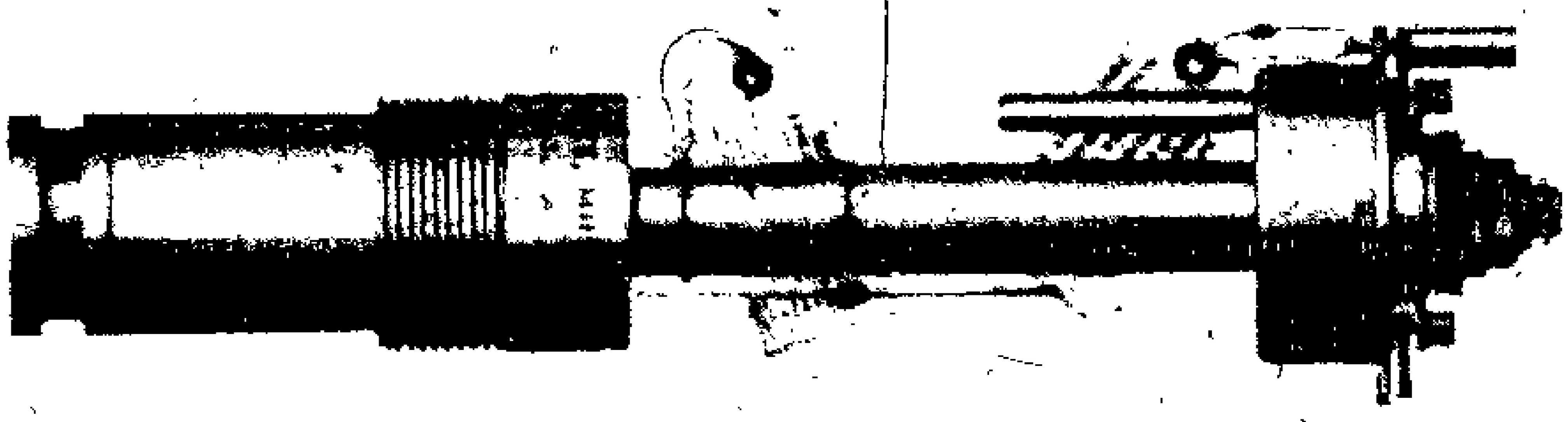
Figure 16. Tail fuze family.



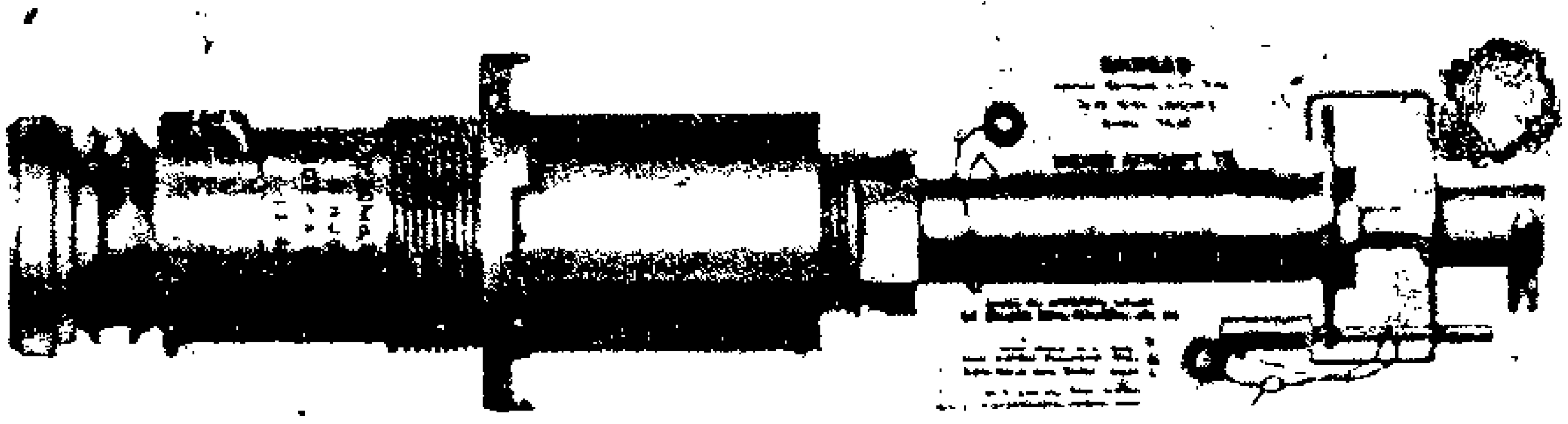
The AN-M100A2 is an arming vane type impact fuze used with GP and frag bombs. Except for their greater length, the other fuzes of this series, the AN-M101A2 and AN-M102A2, are identical to the AN-M100A2.



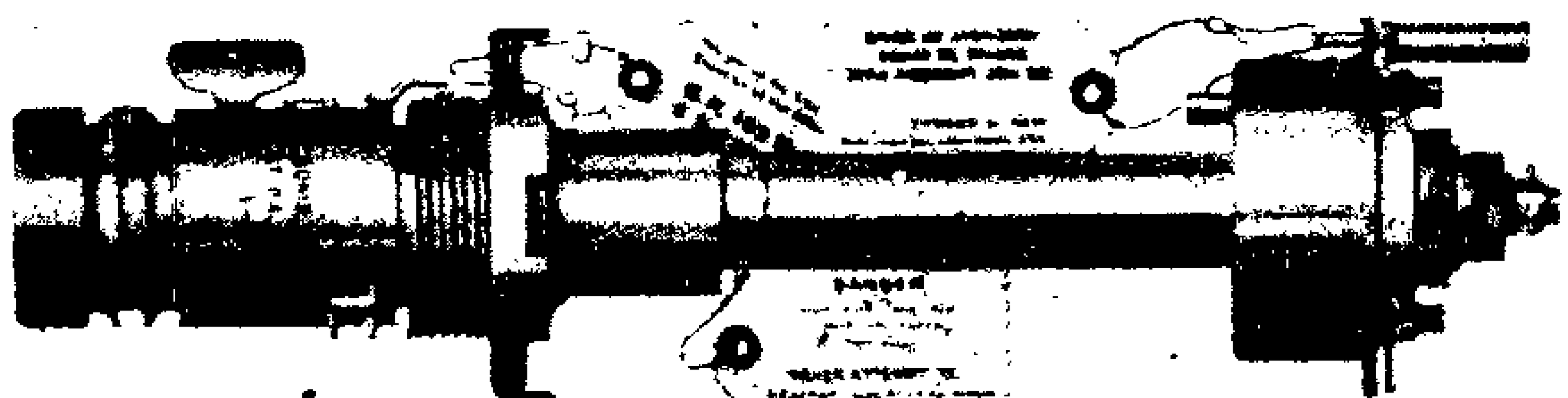
The M112A1 is a fast arming fuze for low level bombing. It is similar to the AN-M100A2 except that it has no gear train and it utilizes the primer detonator M16A1 instead of the M14. The M113A1 and M114A1 are identical in action but have longer stems.



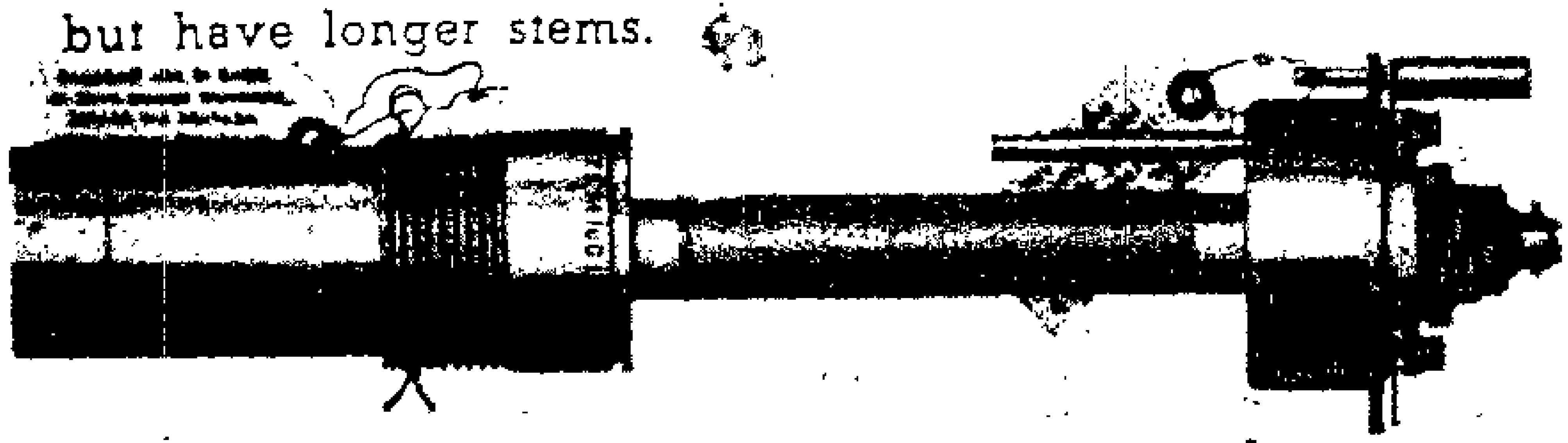
The M115 consists of the AN-M100A2 type arming head and the M112 type body. The M116 and M117 are identical in action but have longer stems.



The M123A1 is a long delay fuze. A definite length of delay (from 1 hr to 6 days) is stamped on each fuze as part of its nomenclature. This fuze contains a booby trap. Once the fuze is inserted in the bomb it cannot be removed without detonating. The M124A1 and M125A1 are identical in action but have longer stems.



The M132 is similar to the M123A1 but has a nominal delay of 10 minutes. This fuze also is booby trapped. The M133 and M134 are identical in action but have longer stems.



The M160 is similar to the AN-M100A2 but requires a longer air travel to arm. The M161 and M162 are identical in action but have longer stems.

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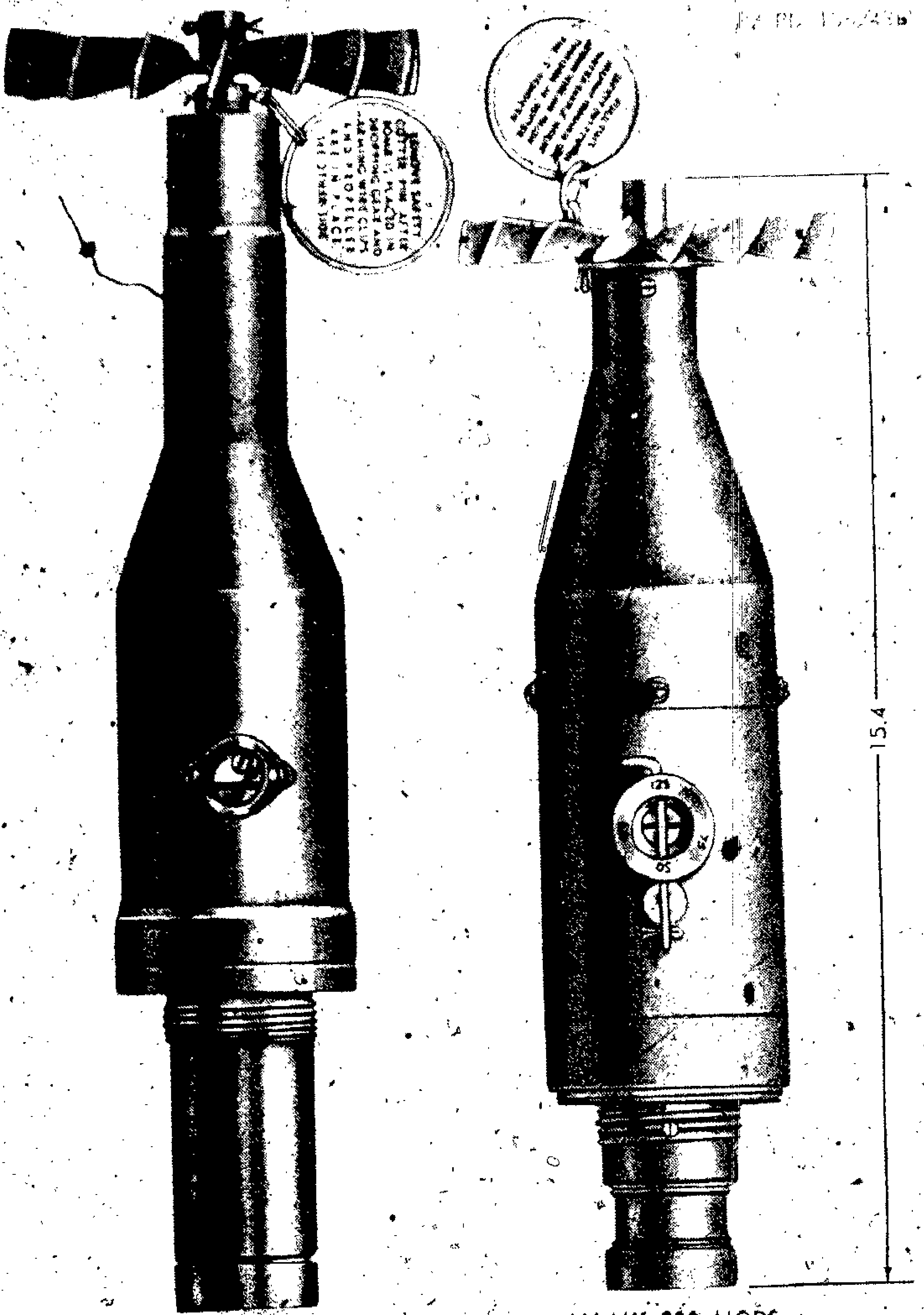
Figure 17. Tail fuzes.



AN-MK 228

AN-MK 230 MODS 4, 5, AND 6

These tail fuzes are of the arming vane type with mechanical arming delay. The AN-Mk 228 is an impact fuze used with armor-piercing bombs. It contains two explosive trains for greater reliability of functioning. The AN-Mk 230 Mods 4, 5, and 6 is a hydrostatic fuze for anti-submarine use. It functions at predetermined depth settings of 25–50–75–100 or 200 feet and is used with 500-lb, 1,000-lb, and 2,000-lb GP bombs of the "M60" series fitted with adapter booster M115 and is also used with the Mk 54 Mod 1 depth bomb. Before assembling this fuze to GP bombs, it is necessary to first remove the fuze sleeve from the adapter booster.

Figure 18. Tail fuzes, Navy type.

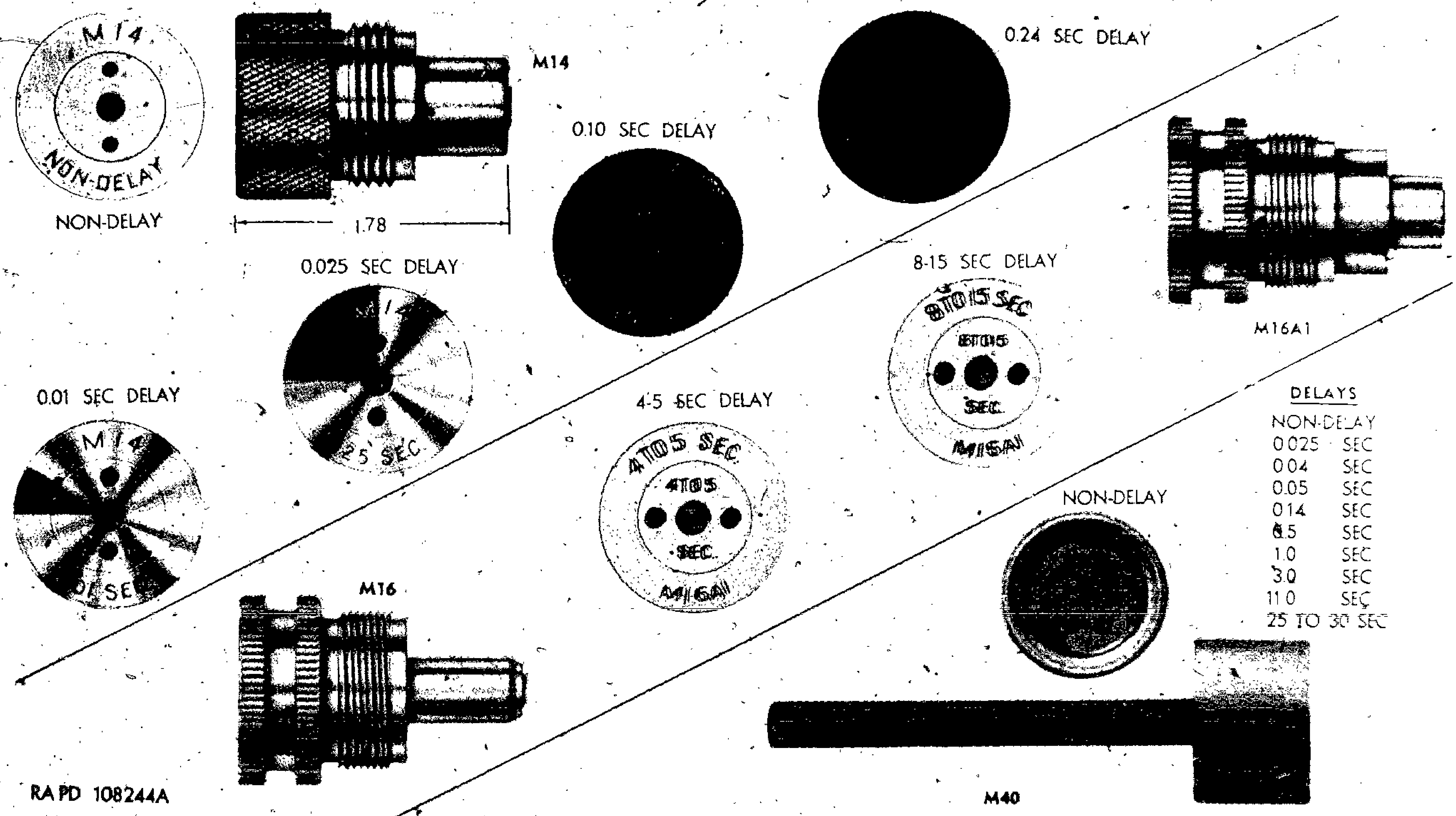


Figure 19. Primer-detonators.

CHAPTER 3

ASSEMBLY

10. Inspection Prior to Assembly

a. GENERAL. Most bombs and their components are shipped separately and are assembled in the field to form the complete rounds which are dropped from the airplane. Figure 20 shows these components and their packings as received; the bomb body fitted with nose and tail plugs, shipping bands, fin lock nut, and fin lock nut protector; the fin in metal crate; and the fuzes in hermetically sealed containers. When components are unpacked for assembly into complete rounds, they will be inspected (as outlined in *b* through *g* below) to insure that they are in serviceable condition.

b. BOMB BODY. Bombs will be inspected to insure that exposed surfaces are free of foreign material, particularly particles of explosive. The fuze cavities and threads will be inspected and cleaned if necessary. Suspension lugs should be examined for damage which might weaken the lugs or their attachment to the bomb body.

c. FUZES. If, upon the opening of packing boxes, any of the hermetically sealed containers are found to have been punctured or split, or the seal broken in any way, the fuzes contained therein are considered unserviceable and will not be used; this does not apply to fuzes repacked in the field in containers resealed with adhesive tape for temporary protection. Otherwise, inspect the fuze for defective threads, bent vanes, and corrosion, and, when required, examine the fuze to see that the proper primer-detonator is assembled. For those fuzes which require the substitution of a primer-detonator, check the primer-detonator cavity in the fuze body to insure that no foreign matter is present, as anything which prevents an easy assembly of primer-detonator into its cavity may cause a premature explosion or cause the bomb to be a dud. Inspect all fuzes for presence of safety devices—cotter pins, shear wires, and arming pins. If any of these are missing, handle the fuze with extreme care and return it to its container, marking the item for disposal as unsafe ammunition. *Only safe and serviceable fuzes will be used in the assembly of complete rounds—reject all others.*

d. PRIMER-DETONATOR. Dispose of primer-detonators which have either loose primers or show signs of corrosion or other visible defect.

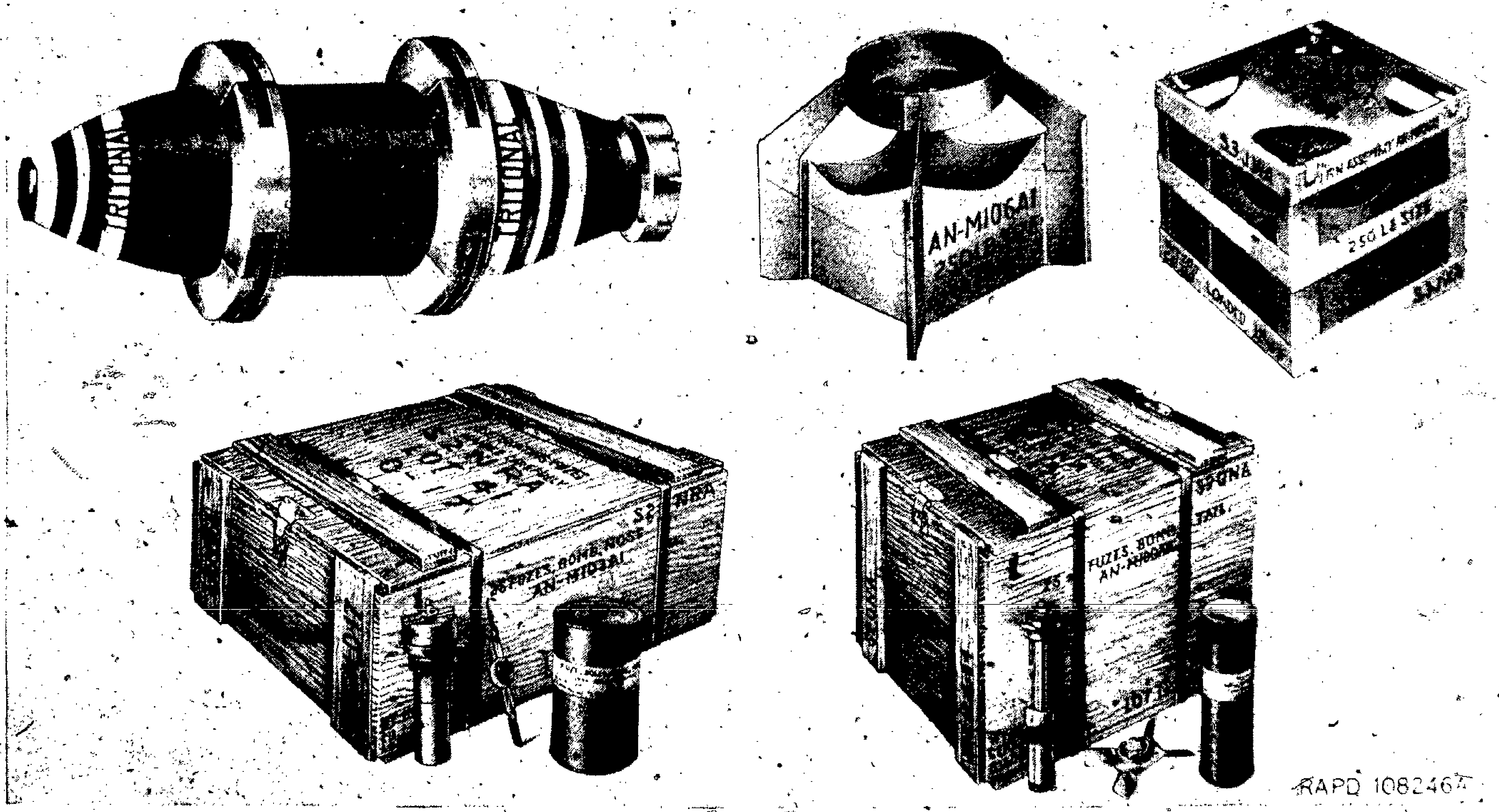


Figure 20. Components of complete round as received.

e. FIN ASSEMBLY. Use only fin assemblies that are in good condition. Reject assemblies having rusty, dented, bent, or loose fins.

f. ARMING WIRE ASSEMBLY. Be sure arming wires are in good condition. *Never* use an arming wire in which there is a kink, twist, or bur. The kinks or twists are most often caused when the arming wire assembly is carelessly handled. The burs usually occur at the ends of the arming wire as a result of cutting the wire to proper length. Burs may be removed with a file or the end of the wire may be re-cut so that there is no bur. A bur may be present at other points along the wire—*file off all burs.*

Warning: One kink, twist, or bur, even though seemingly too small to be important, may cause heavy bombs to hang in the bomb bay after release. In this condition, known as a "hung bomb," the arming wire has usually been freed from one of the fuzes (nose or tail), thus permitting the vane of that fuze to spin in the air currents of the open bomb bay and arm the fuze. Only a slight jar—as in landing—may then cause an explosion, destroying plane and crew.

g. BOMB CLUSTERS. For complete inspection of bomb clusters see chapter 8. Generally, do not use broken or loose clusters.

11. Fuzing

When practicable, bombs are fuzed after they have been secured in the bomb bay. To fuze the bomb, follow instructions set forth in figures 21 to 23.

12. Finning

To assemble the fin to the bomb when the bomb is to be carried in the bomb bay, follow instructions set forth in figures 21 to 23. If the bomb is to be carried in external suspension (under wings or fuselage of airplane), then step 6 in figure 21 requires that the blades of the fin assembly be alined at 45 degrees to the suspension lugs.

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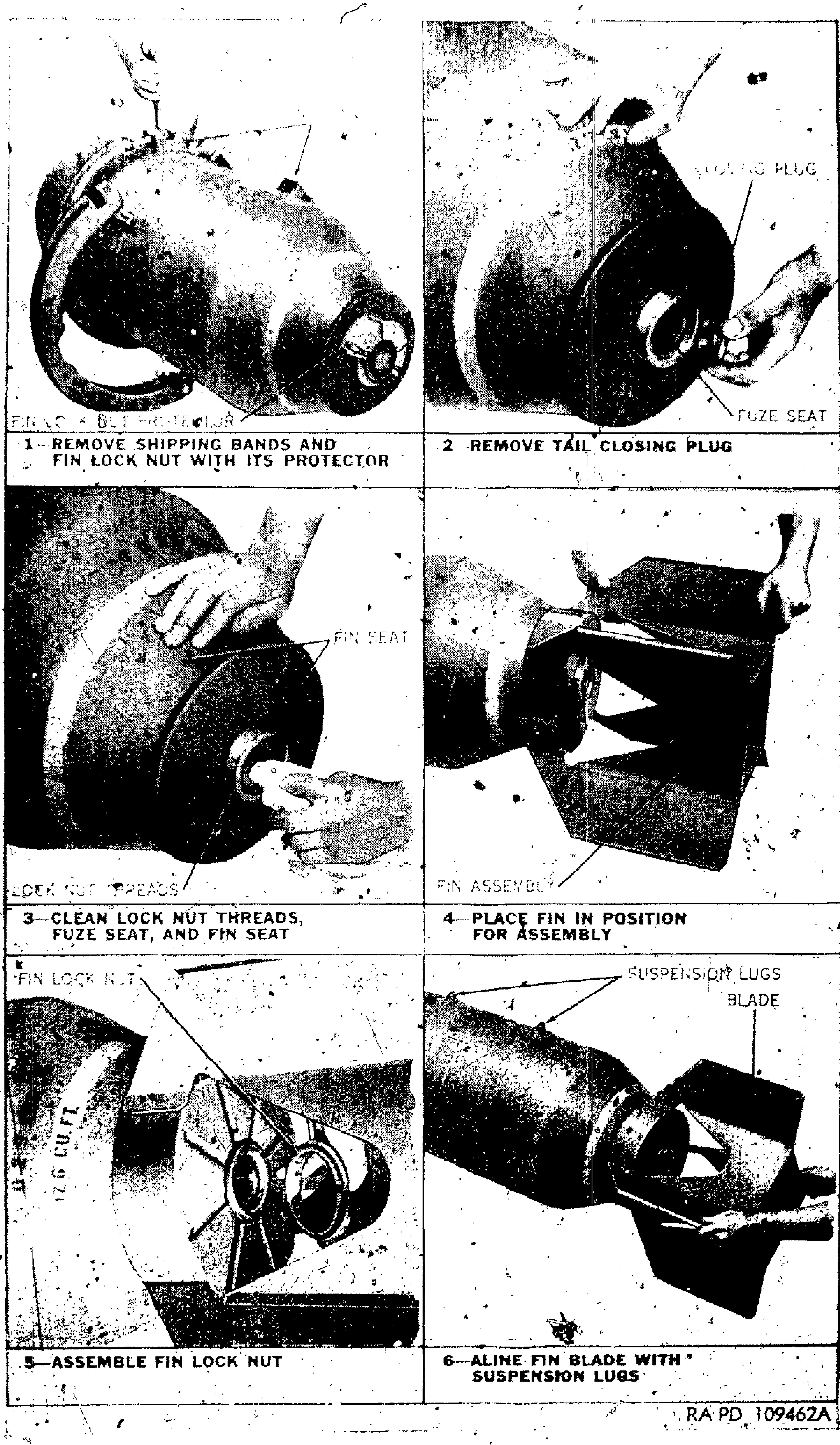
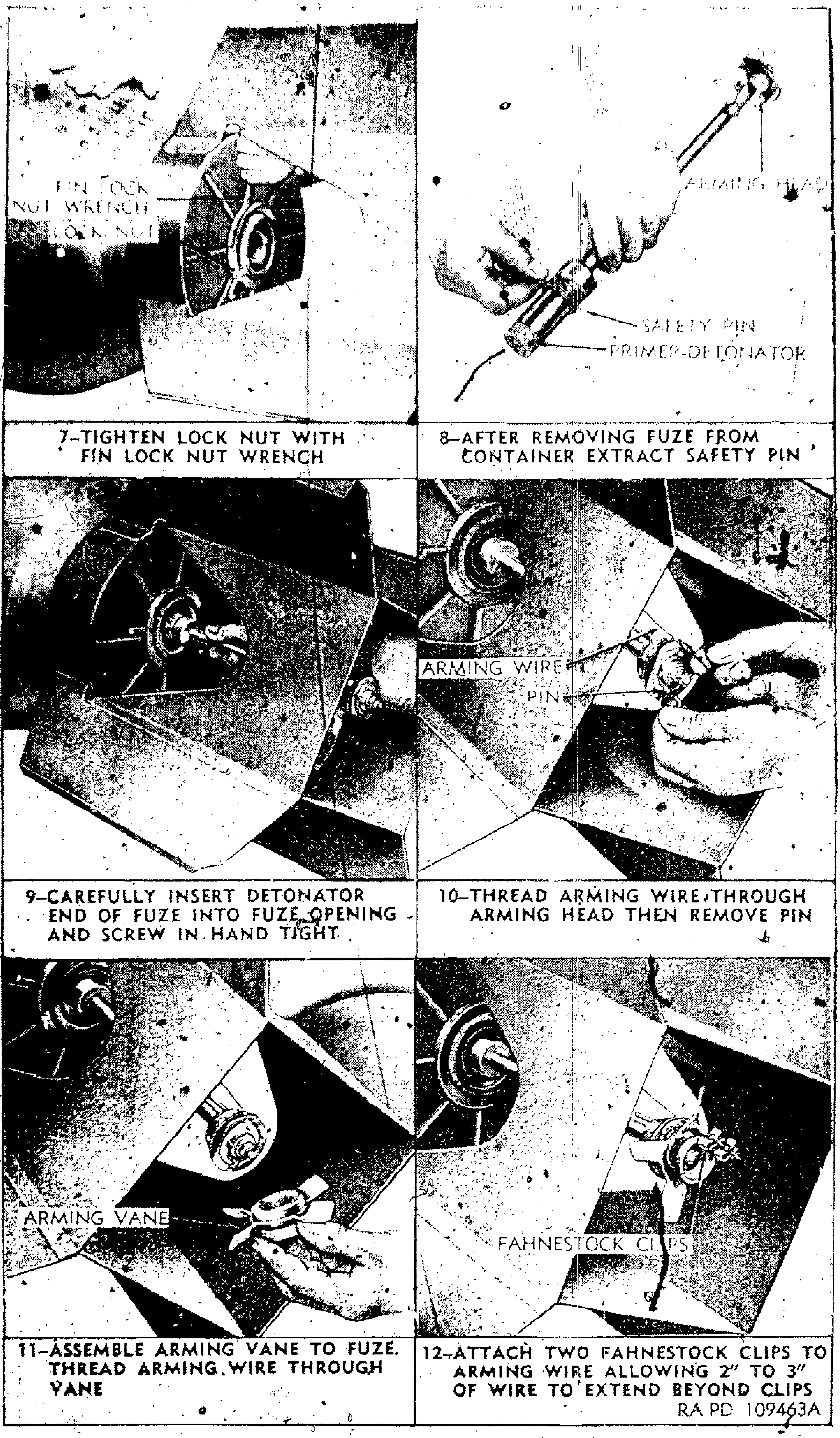


Figure 21. Finning and fuzing the bomb, steps 1 through 6.



7–TIGHTEN LOCK NUT WITH FIN LOCK NUT WRENCH

8–AFTER REMOVING FUZE FROM CONTAINER EXTRACT SAFETY PIN

9–CAREFULLY INSERT DETONATOR END OF FUZE INTO FUZE OPENING AND SCREW IN HAND TIGHT

10–THREAD ARMING WIRE THROUGH ARMING HEAD THEN REMOVE PIN

11–ASSEMBLE ARMING VANE TO FUZE. THREAD ARMING WIRE THROUGH VANE

12–ATTACH TWO FAHNESTOCK CLIPS TO ARMING WIRE ALLOWING 2" TO 3" OF WIRE TO EXTEND BEYOND CLIPS

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Figure 22. Finning and fuzing the bomb, steps 7 through 12.

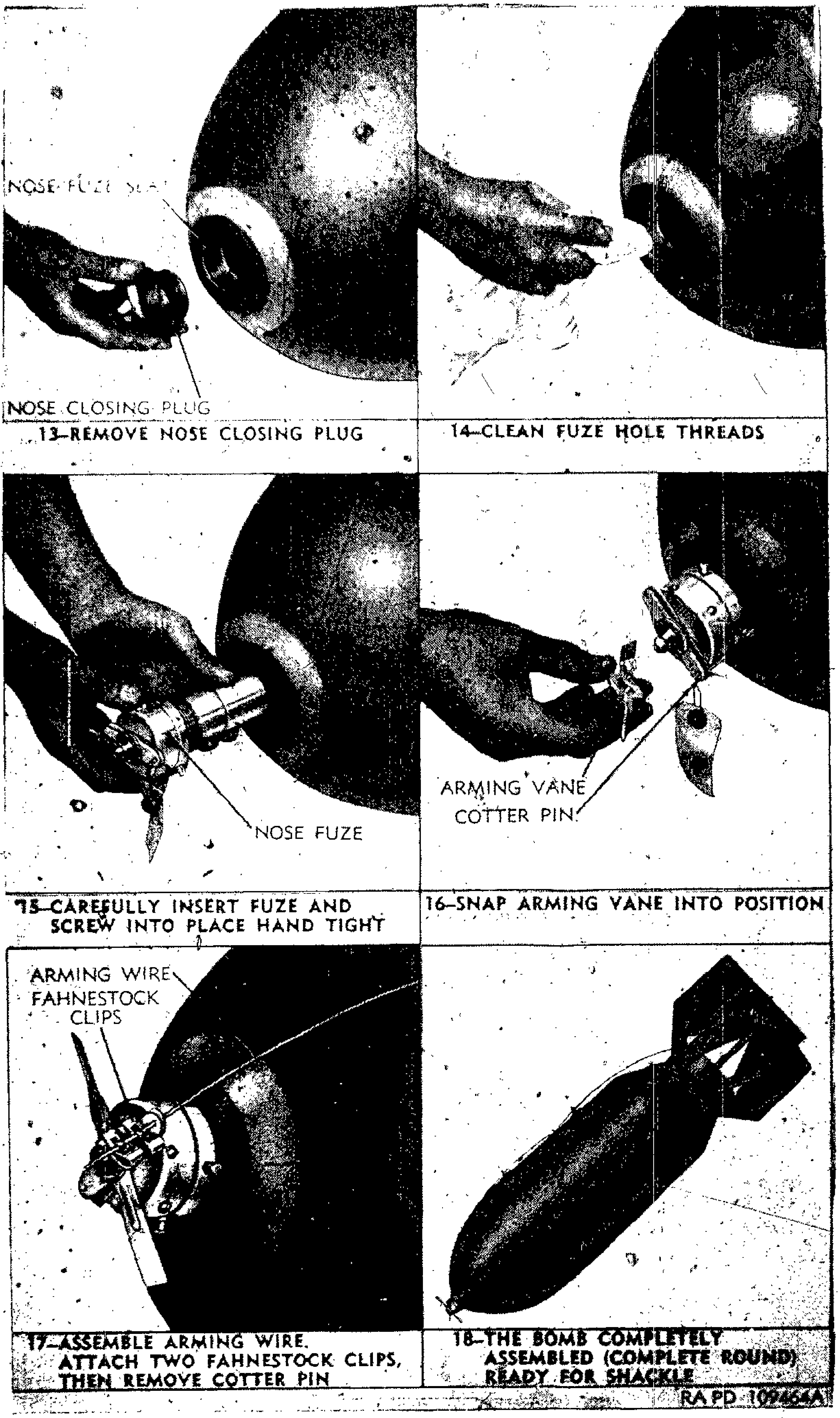

Figure 23. Finning and fuzing the bomb, steps 13 through 18.

CHAPTER 4

GENERAL DESCRIPTION OF COMPONENTS AND TYPES OF BOMBS AND METHOD OF HANDLING

Section I. COMPONENTS OF BOMBS

13. Complete Round

a. DEFINITION. A complete round (figs. 24 and 25) consists of all the components and accessories necessary for the ammunition to function in the manner intended. Strictly speaking, a complete round includes no more than the necessary number of each component. However, for purposes of supply, a complete round as issued may also include alternative components to allow for flexibility. For example, a complete round of issue may include both a delay and a nondelay primer-detonator, although only one will be used.

b. COMPONENTS OF COMPLETE ROUND AS ISSUED. In practice, it is necessary to separate various components of the complete round so that the careful handling required by one sensitive or frail component, will not be necessary with an item as large and heavy as the assembled bomb. In general, the bomb is shipped in the following assemblies:

(1) *Bomb body.* The bomb body contains the explosive charge, adapter-booster, and auxiliary booster. Suspension lugs are attached to the body and are protected by shipping bands. Fuze cavities are protected by closing plugs. The fin lock nut is attached to the base plate and is covered by a fin lock nut protector.

(2) *Fin assembly or parachute unit.* The fin or parachute unit being light sheet metal, is shipped separately, protected by a metal crate or drum.

(3) *Fuzes.* Fuzes contain sensitive explosives and consequently should be handled with extreme care. They are shipped separately so that if a fuze should accidentally explode, it cannot cause the bomb to explode.

(4) *Arming wire assembly.* This assembly, in most cases, is shipped separately, packed straight (in full length) in containers which are in turn packed in wooden boxes. The container also includes a bag of Fahnestock clips.

(5) *Trunnion band.* This item is issued only when required for dive bombing.

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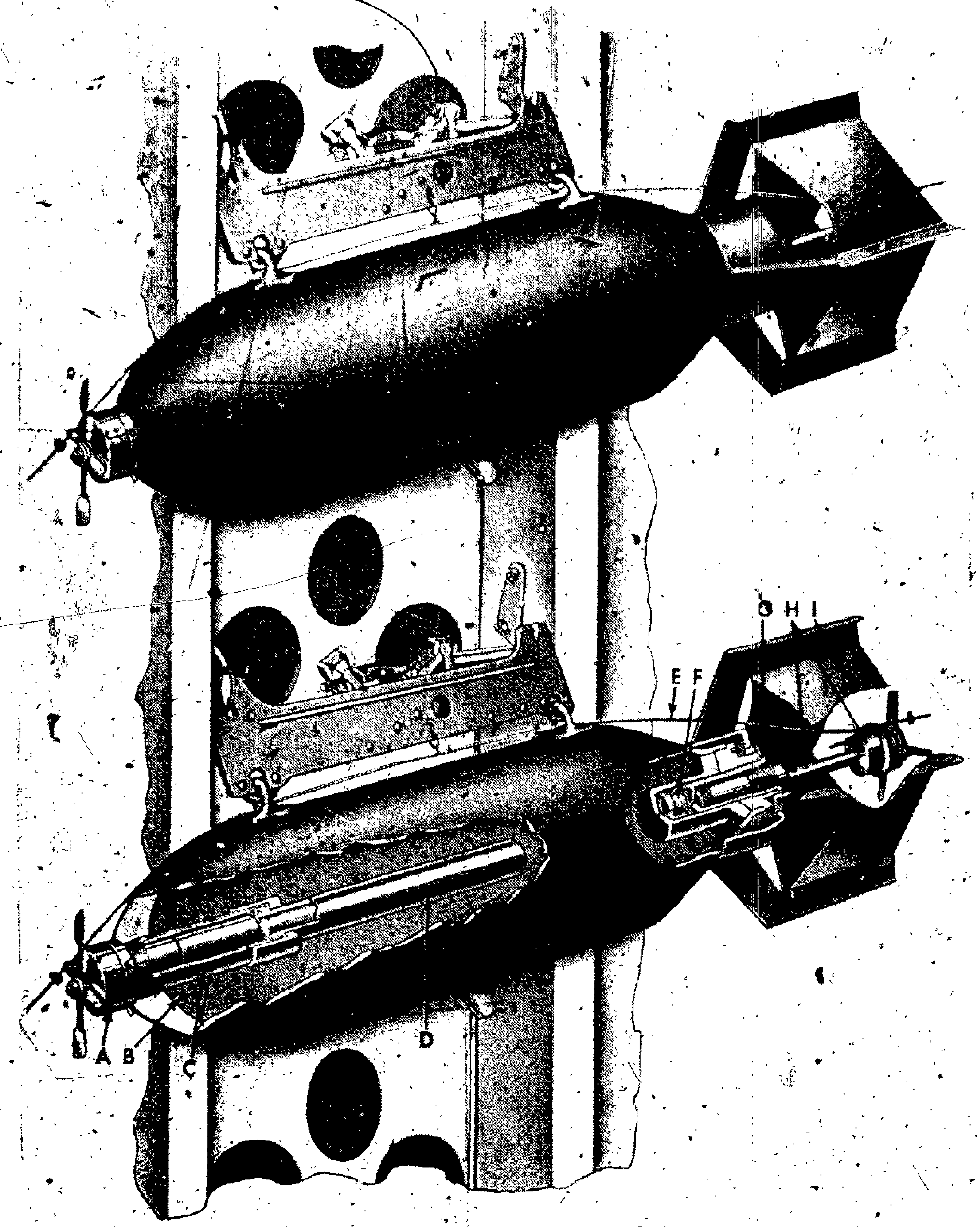

A - NOSE FUZE
B - BURSTING CHARGE
C - FUZE SEAT LINER
D - AUXILIARY BOOSTER
E - ARMING WIRE
F - ADAPTER BOOSTER
G - FIN LOCK NUT
H - TAIL FUZE
I - FIN ASSEMBLY

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Figure 24. The complete round in the bomb bay.

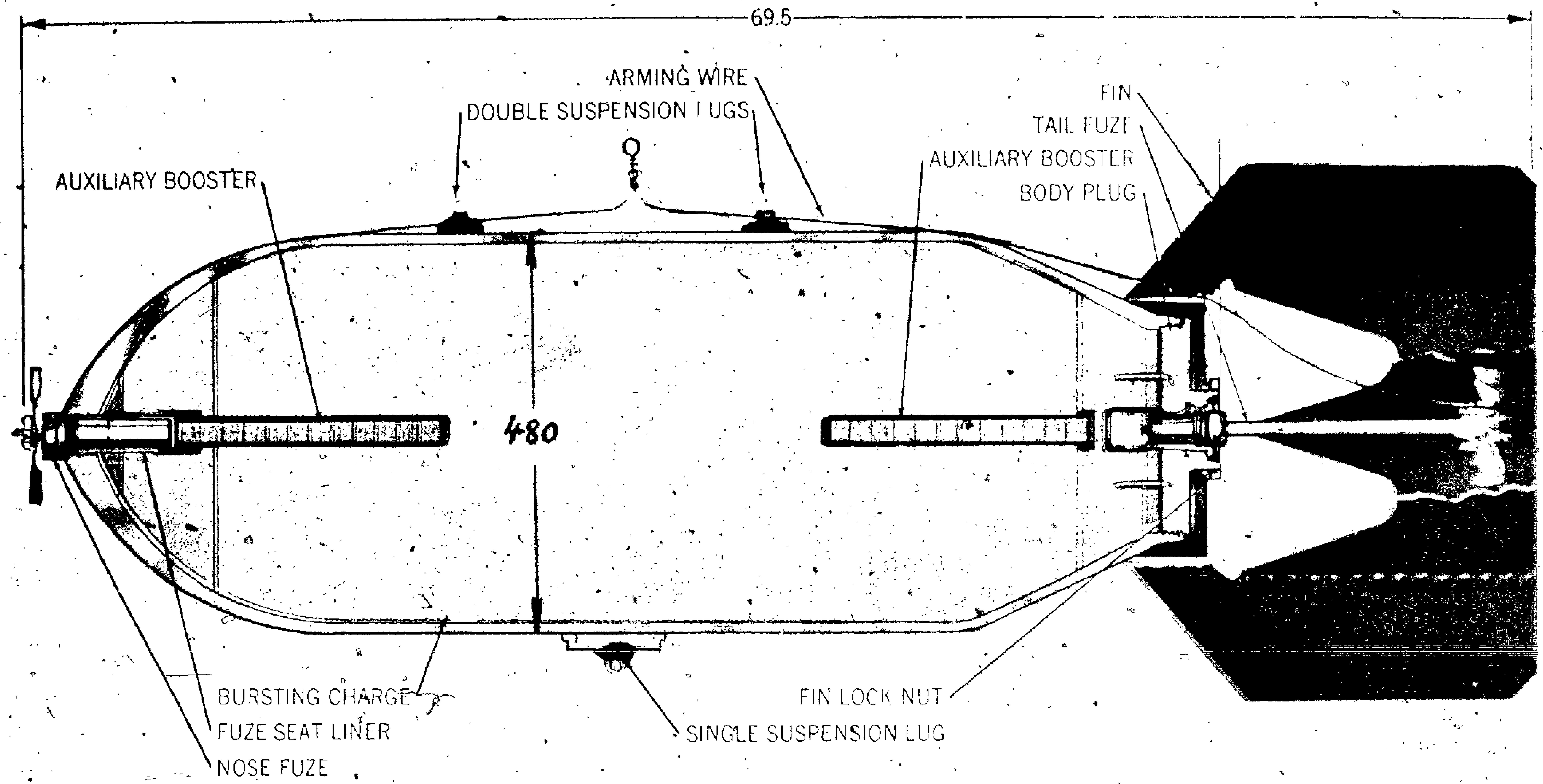


Figure 25. GP bomb-section.

14. Bomb Body

a. COMPONENTS. The bomb body consists of a steel case which contains the explosive charge and auxiliary boosters. The case is closed at the nose by the fuze seat liner and at the tail by a base plug containing an adapter booster.

b. CASE. The bomb case is steel, and is usually in the shape of a streamlined cylinder. It may be formed by forging and machining steel ingots, by shaping steel tubing, by forming and welding sheet metal or plate, or by building up rings or bar stock. The particular type for each bomb is described in paragraphs 22 through 32. Suspension lugs are usually welded to the case. However, some bombs (Navy AP and depth bombs) have drilled and tapped holes for the attachment of suspension lugs by means of machine screws. Lugs for double hook racks are located in line with the axis of the bomb, 14 inches apart for bombs up to 1,000 pounds and 30 inches apart for bombs 2,000 pounds and over. (This interlug distance furnishes a convenient reference scale in bomb recognition.) One exception is the 1,600 pound AP bomb which has provisions for attachment of suspension lugs at either 14-inch spacing or 30-inch spacing (fig. 90). The lug for single hook suspension is located diametrically opposite the double lugs in line with the center of gravity of the bomb. The forward end of the case is sized and threaded for the fuze seat liner and nose fuze or shipping plug. The rear is threaded to receive the base plug.

c. EXPLOSIVE CHARGE. The bomb case is completely filled with explosive except for thin pads of inert wax at the nose and tail. The type of explosive depends upon the prospective use of the bomb. The bursting charge in GP, LC, fragmentation, and depth bombs is generally cast and is uniform throughout except for loading with amatol or COMP B, in which case the nose and tail portions are pure TNT "booster surrounds" to provide better sealing against moisture. The inert pads serve as seals but also prevent the entrance of the explosive into crevices between threads which condition is dangerous in the event of mishandling. The bursting charge in AP bombs, explosive D, is pressed into the case to attain a uniform density.

d. FUZE SEAT LINER. The fuze seat liner is a metal cup which is assembled inside the nose of the bomb to keep a cavity clear for assembling the nose fuze.

e. AUXILIARY BOOSTER. When the type of explosive charge makes it necessary or desirable, an auxiliary booster is cast within the charge adjacent to the fuze seat liner, adapter-booster, or both. The auxiliary booster consists of a column of tetryl pellets in a suitable container. Its function is to relay and amplify the detonation wave from the booster and insure proper detonation of the main charge.

f. BASE PLUG. The base plug closes the filling hole and forms the base of the bomb. The tail fuze adapter-booster is screwed into the base plug. An extension of the plug to the rear is threaded to provide for attachment of the fin assembly by means of the fin lock nut. For shipping, the fin lock nut is covered by a fiber protector and is wired in place. In bombs of current manufacture (the A1 modification of GP bombs) the base plug has studs extending into the explosive charge to prevent removal of the plug, and the plug also has a circular groove which receives the adapter-booster lock pin.

g. ADAPTER-BOOSTER. An adapter is a bushing threaded on the outside for assembly to the bomb body and on the inside for assembly of the fuze. When a booster is assembled to the adapter, the assembly is known as an adapter-booster (fig. 40). Tail adapter-boosters (par. 15*b* and fig 27), normally assembled to high-explosive and chemical bombs as issued, are drilled for the insertion of lock pins to prevent their removal when antiwithdrawal type fuzes are to be assembled to the bomb. A nose adapter-booster is issued separately for use with GP bombs (par. 41).

h. SHIPPING BANDS. Shipping bands (figs. 21 and 26) are attached to the bomb to protect the suspension lugs. They may be compressed paper (fig. 26) with a recess for the lug or may be of metal in the form of a "U" shaped channel (fig. 21). They are not removed until the bomb is prepared for use.

i. CLOSING PLUG. The openings to the fuze cavities are closed during shipping and storage by metal plugs (fig. 21). Those plugs serve to protect the fuze seat cavity and threads. They may be removed only for inspection or for fuzing the bomb. If a bomb is returned to storage after being prepared for use, the fuzes are removed and the fuze hole plugs replaced.

j. TRUNNION BAND. When trunnion mounting is desired for dive bombing, the trunnions are mounted on a steel band (fig. 26) which is bolted to the bomb body. The single suspension lug serves to indicate the proper location of the trunnion band. AP and depth bombs are drilled and threaded so that the trunnions may be screwed into the bomb body.

15. Fuze Seat and Adapter-Booster

a. NOSE FUZE SEATS. Seats for nose fuzes (fig. 27) are usually machined in the bomb case and, in order to provide for maximum flexibility, their dimensions (thread size and depth of seat) are standardized as much as practicable. Large bombs have the GP type fuze seat which has a 2-inch thread diameter and is 5 inches

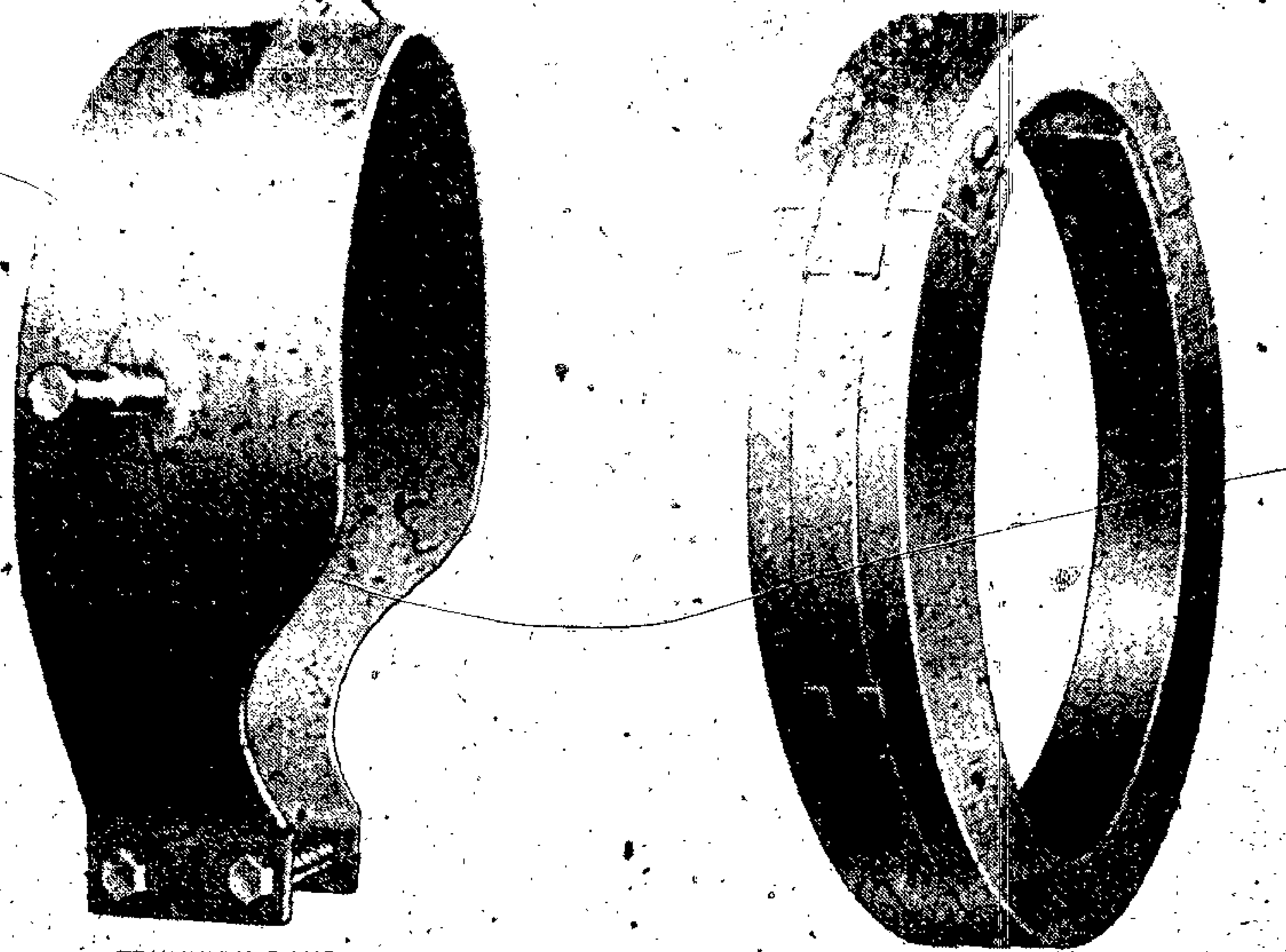


Figure 26. Trunnion and shipping bands.

deep. Smaller bombs have the fragmentation type fuze seat which is 1.5 inches in thread diameter by 1.3 inches deep. Flares, photoflash bombs, and clusters have a flare type fuze seat which is 1.5 inches in thread diameter by 0.84 inch deep. To permit the use of small (fragmentation type) fuzes in large bombs, the adapter-booster, M117 (fig. 40) is provided. Its external contour fits the GP type fuze seat, its internal contour corresponds to the fragmentation type seat, and the space between is filled with tetryl to serve as an auxiliary booster.

b. TAIL FUZE SEATS. Tail fuze seats (fig. 27) for GP, SAP, chemical, incendiary, and fragmentation bombs are provided by two models of adapter-boosters, the M102A1 and the M115A1. Adapter-booster M102A1 is 1.5 inches in thread diameter by 2.86 inches deep. This model is used on all GP bombs of early manufacture and on current models up to 250 pounds. Adapter-booster M115A1 is 2 inches in thread diameter by 2.68 inches deep, but it also includes a fuze adapter which fits this seat and provides a fuze seat similar to that of the M102A1. Both of these models are drilled for the insertion of a lock pin which locks the adapter-booster in the base plug (base plug of the "A1" modified GP bombs) while the fuze is in place. The earlier models, M102 and M115, do not have this locking device. Tail fuze seats for AP and depth bombs are provided by machining the tail fuze seat liners and are 2 inches in thread diameter by 4 inches deep.

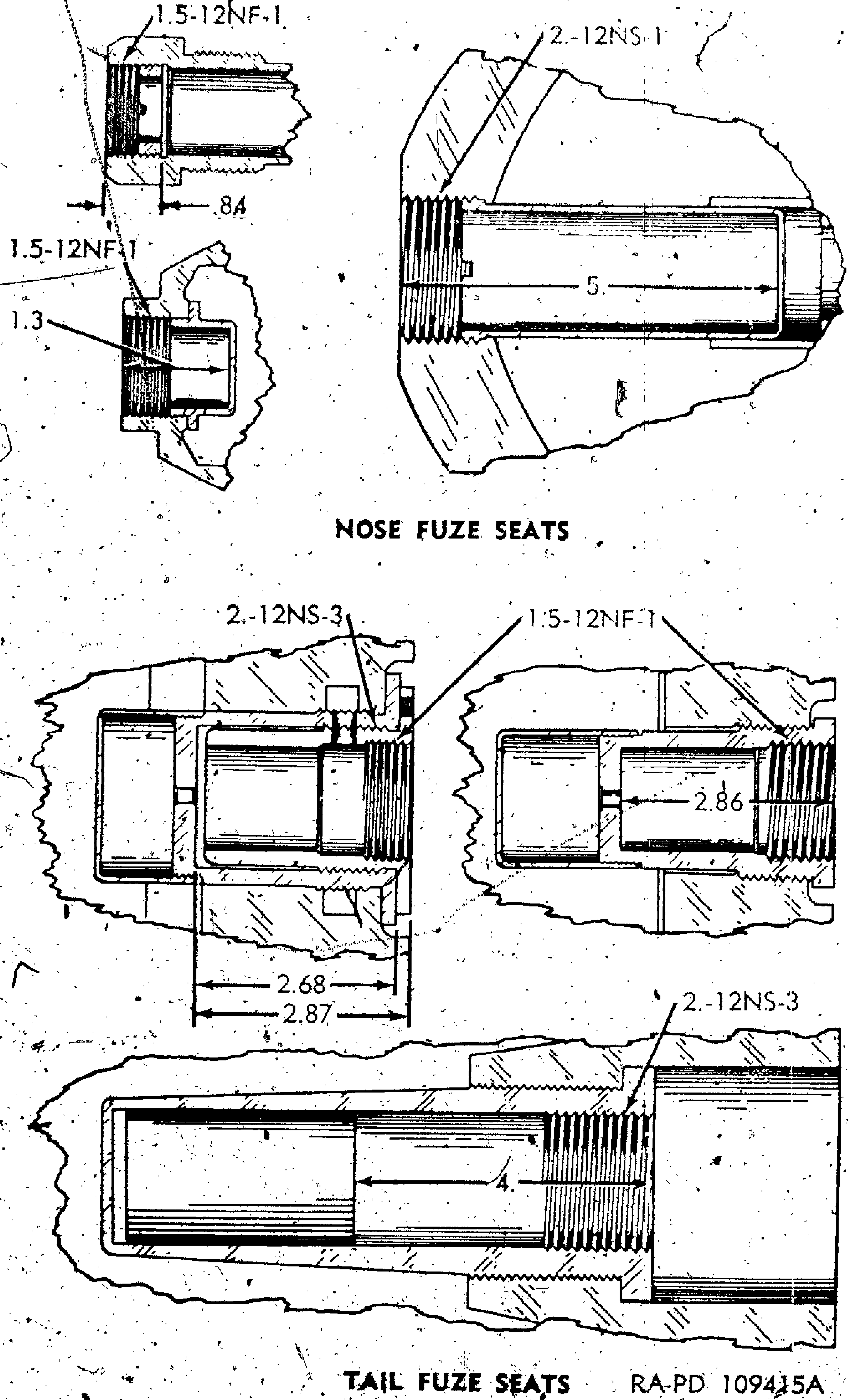


Figure 27. Fuze seats.

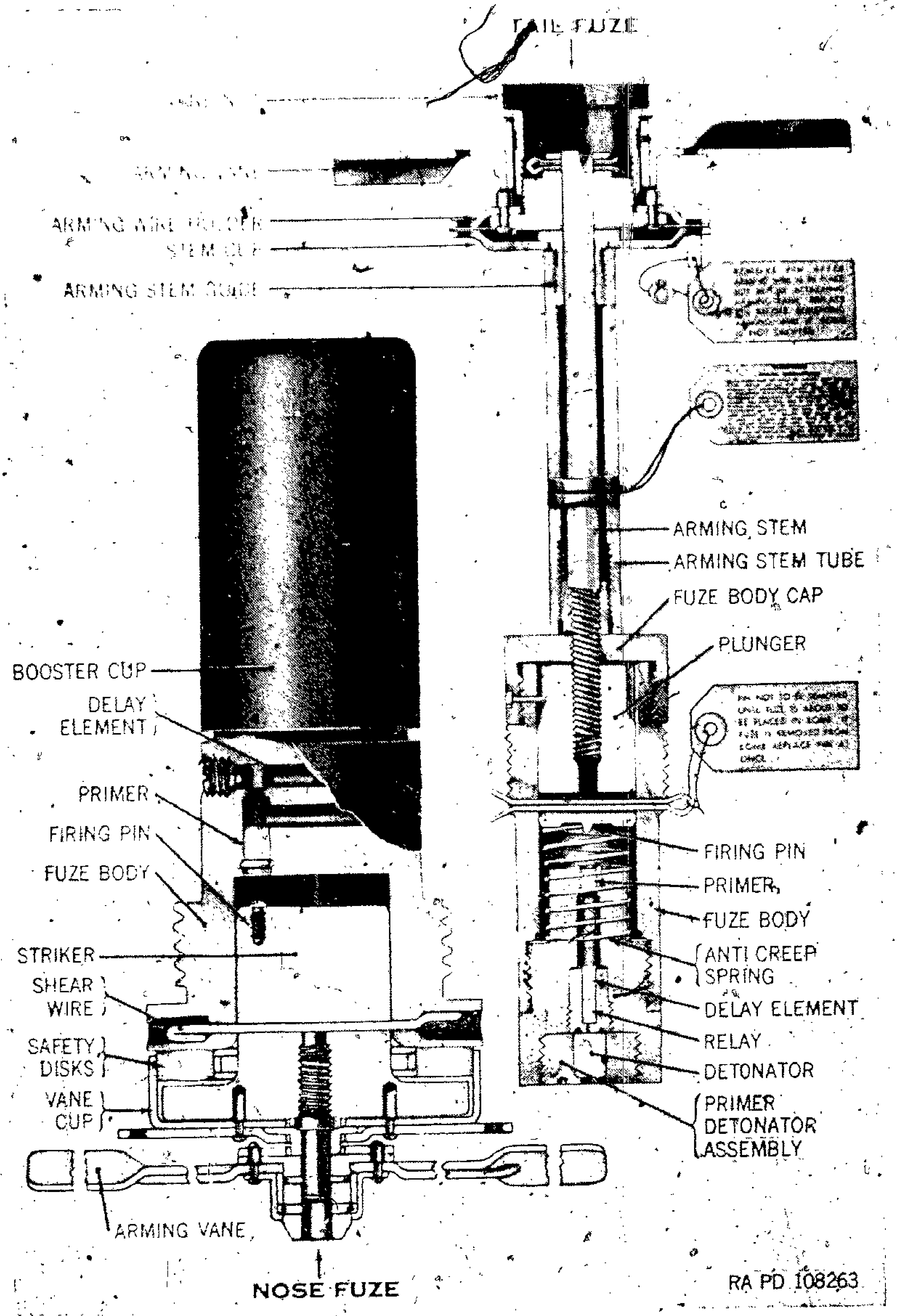


Figure 28. Nose and tail fuzes—section.

16. Fuze

a. GENERAL. The fuzes described in this manual are mechanical and electrical devices (figs. 10 to 18) designed to initiate detonation of bombs under the circumstances desired. Fuzes are classified according to position as nose, tail, and body, and according to function as time, impact, VT, and hydrostatic. Time fuzes function a predetermined number of seconds after the arming pin is released; impact fuzes function when the bomb strikes a resistant material; hydrostatic fuzes function by water pressure; and VT fuzes are operated electrically on approach to the target. Impact fuzes are classified as delay when they are designed to have a definite time-lag between the instant of impact and explosion of the bomb, and as instantaneous (nose) or nondelay (tail) when there is no delay element incorporated. Instantaneous fuzes function when the striker or firing pin strikes the target. For nondelay fuzes to function the entire bomb must be retarded sufficiently to force the inertia plunger to strike the primer. Hence, the actual delay for instantaneous fuzes is about 0.0005 second, for nondelay fuzes, about 0.0025 second. Detailed description of the various types and models of fuzes is given in chapter 5.

b. ARMING. A fuze is considered armed when the next normally expected event will initiate functioning of the fuze; that event may be impact (impact fuzes), time train running to completion (mechanical time fuzes), or approach to the target (VT fuzes). As shipped, the fuzes are in a safe (unarmed) condition. They are so constructed that while they are unarmed they cannot function. A fuze is considered "detonator-safe" when the detonator is held out of line with the firing pin and booster lead until the fuze arms.

(1) *Nose fuzes.* Nose fuzes, in general, are held unarmed by safety blocks between the striker and the fuze body, thus preventing the firing pin from being driven into the detonator. It should be noted in the case of detonator-out-of-line fuzes that if the detonator should accidentally aline itself with the booster lead, even though the firing pin is restrained by safety blocks, the fuze is considered armed.

(2) *Tail fuzes.* Tail fuzes, in general, are held unarmed by an arming stem screwed into the inertia type firing pin. The booster is not assembled to the fuze in this case; it is located in the adapter-booster assembled to the bomb.

17. Fin Assembly

a. CONSTRUCTION. The fin assembly provides for stability of the bomb in flight. Smaller bombs (usually 100 lb and under) have the fin assembled to the bomb body before shipment. Some 100-pound GP bombs and all larger bombs are shipped with fin unassembled. In the latter case, the fin assembly is shipped separately packed in a metal crate. The fin assembly generally used with bombs up to 1,000 pounds consists of a fin sleeve, which fits over the tail of the bomb (held in place by the fin lock nut), and sheet metal fin blades which are riveted or spot-welded to the fin sleeve and to each other to form a square box-like assembly. Fin assemblies were formerly made of light gage metal (0.047 in). However, increased bomb ceilings required the use of a heavier gage metal (aprx 0.06 to 0.075 in) to insure more reliable ballistics. Due to increased speeds of fast flying aircraft, it is also required that fin assemblies be strengthened even though originally constructed from heavier gage metal; this is required particularly when bombs are carried in exterior suspension—the fin assemblies M123 and M124 are current models of the strengthened type. The "Tallboy" series of GP bombs (12,000 lb and heavier) employ a fin assembly consisting of an elongated fin cone (fin sleeve) and four streamlined blades assembled perpendicularly to the cone.

b. Models. The fin assembly M118A2 and fin assemblies designated "M—A1" (lower than M118) are made of the heavier gage steel. Some heavy gage assemblies issued prior to the assignment of "M" designations may still be on hand—these were marked with the letter "A" to indicate the heavier metal. Otherwise, the basic model designations M118 and lower (except for the M118A1 which also was constructed from lighter gage metal) indicate the use of lighter gage metal. Model designations higher than M118 are being assigned to newly standardized fin assemblies and are not affected by the foregoing.

c. Precautions in Assembly. When assembling fins to bombs, care should be exercised to insure that all threads and seating surfaces of the bomb, fin assembly, and fin lock nut are clean. The fin blade should be alined with suspension lugs for internal suspension (in bomb bay) and 45 degrees thereto for external suspension (under wing or fuselage of plane). Tighten nut securely with fin lock nut wrench provided for the purpose. The fin lock nut should not be hammered to tighten or stake in place; current models (M1 to M3) are provided with a set screw for locking purposes. Bent fin blades should be straightened. *If the fin assembly is loose and turns on the bomb, it will pull the arming wire from the tail fuze, thus permitting it to arm while the bomb is still in the carrying station.*

18. Parachute Unit

For low altitude bombing, some bombs are equipped with parachute units to retard the fall of the bomb and delay impact until the plane has cleared the danger area. The parachute unit is attached to the bomb in place of the fin assembly (fig. 35). The unit consists of a closed metal case containing the parachute and its

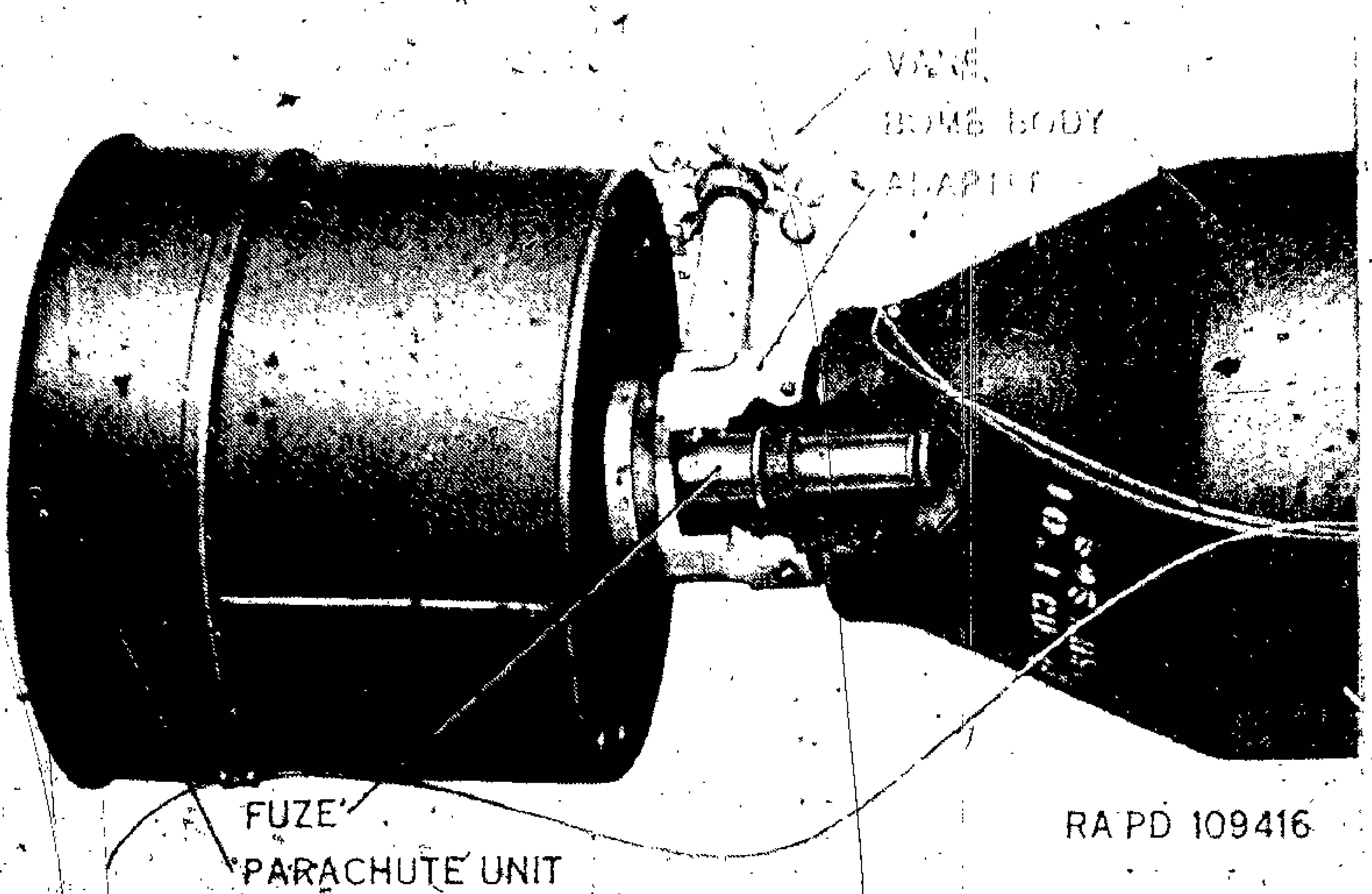


Figure 29. Fuze adapter with vane, fuze, and parachute unit—sectioned.

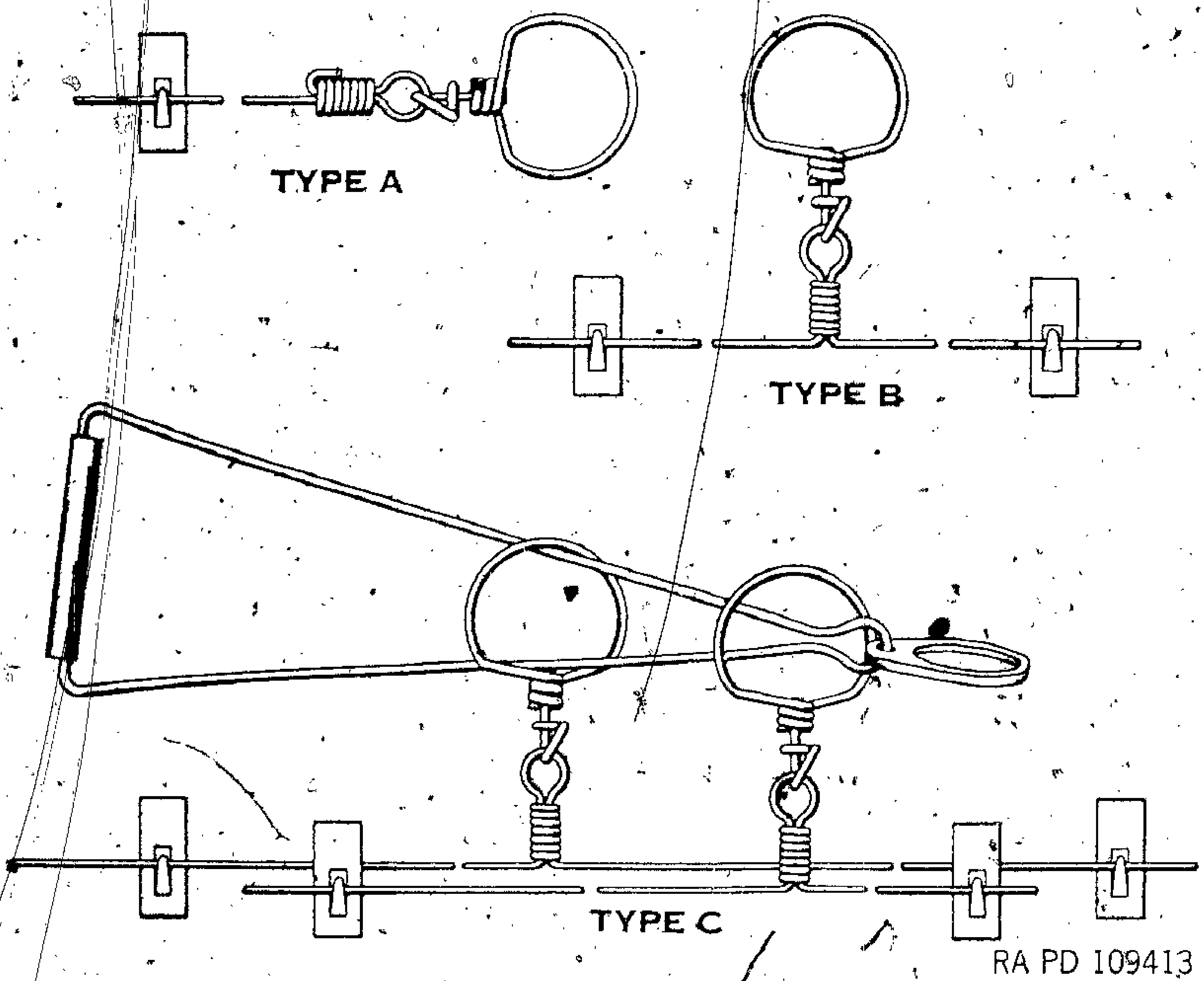


Figure 30. Arming wire assemblies.

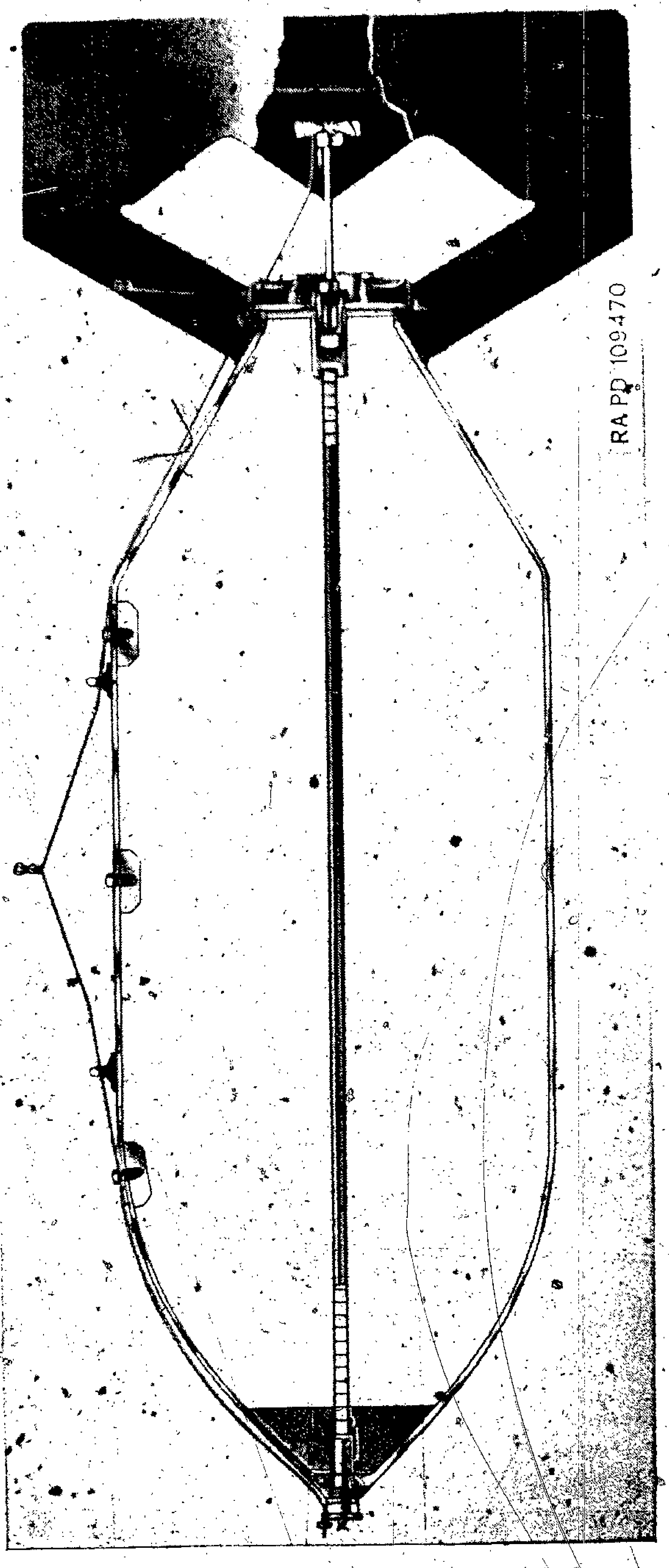


Figure 31. LC bomb—section.

attachment (par. 137c (1)). The cover is removed by withdrawal of the arming wire or by means of a hangwire when the bomb is released. Since the parachute is compressed in packing, the resilience of the cloth forces the parachute from the case when the cover is removed. When the bomb is adapted for tail fuze, a fuze adapter and a modified tail fuze are necessary. Such a kit of parachute unit (fig. 29), fuze adapter, and modified tail fuze is designated antiricochet device (par. 89b (2)).

19. Arming Wire Assembly

a. DESCRIPTION. The arming wire assembly (fig. 30) consists of a length of brass wire attached to a swivel loop. Fahnestock type safety clips are also supplied (two for each end of wire) to prevent the wire from slipping out of the fuze. The assemblies were formerly designated by piece mark but, in view of the wide interchangeability of arming wire assemblies of similar types and length, model numbers have been assigned. When intended for use with only one fuze, the swivel loop is attached at one end of the wire; when furnished for use with two fuzes, the loop is attached toward the middle of the wire in such position that the two branches of wire are of the proper length.

b. COMPONENTS. Components of arming wire assemblies are also supplied in bulk. They are—

WIRE, arming, low brass, 0.064-inch diameter (for some fuzes 0.036-in diam).
LOOP, swivel, assembly.
CLIP, safety, Fahnestock type.
FERRULE, arming wire, pc mk 82-3-234PA.

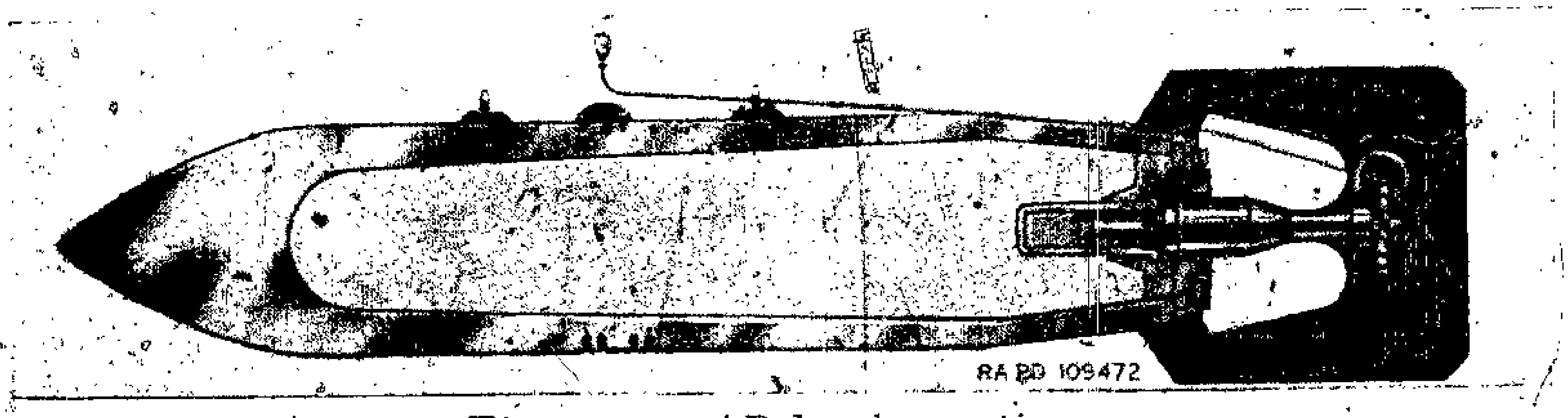


Figure 32. AP bomb—section.

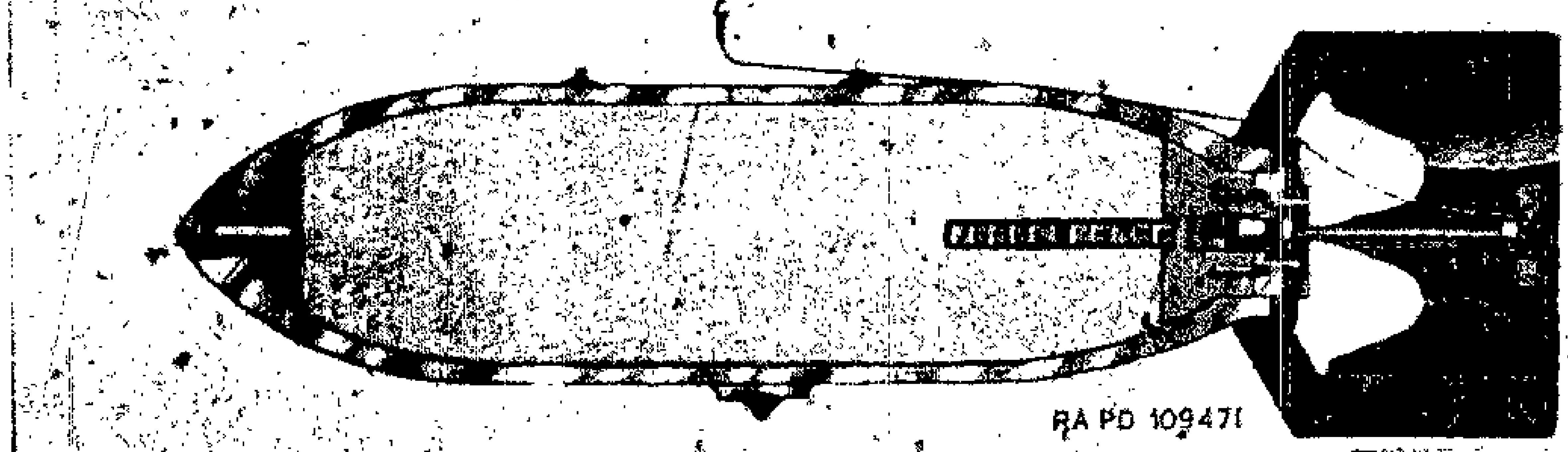


Figure 33. SAP bomb—section.

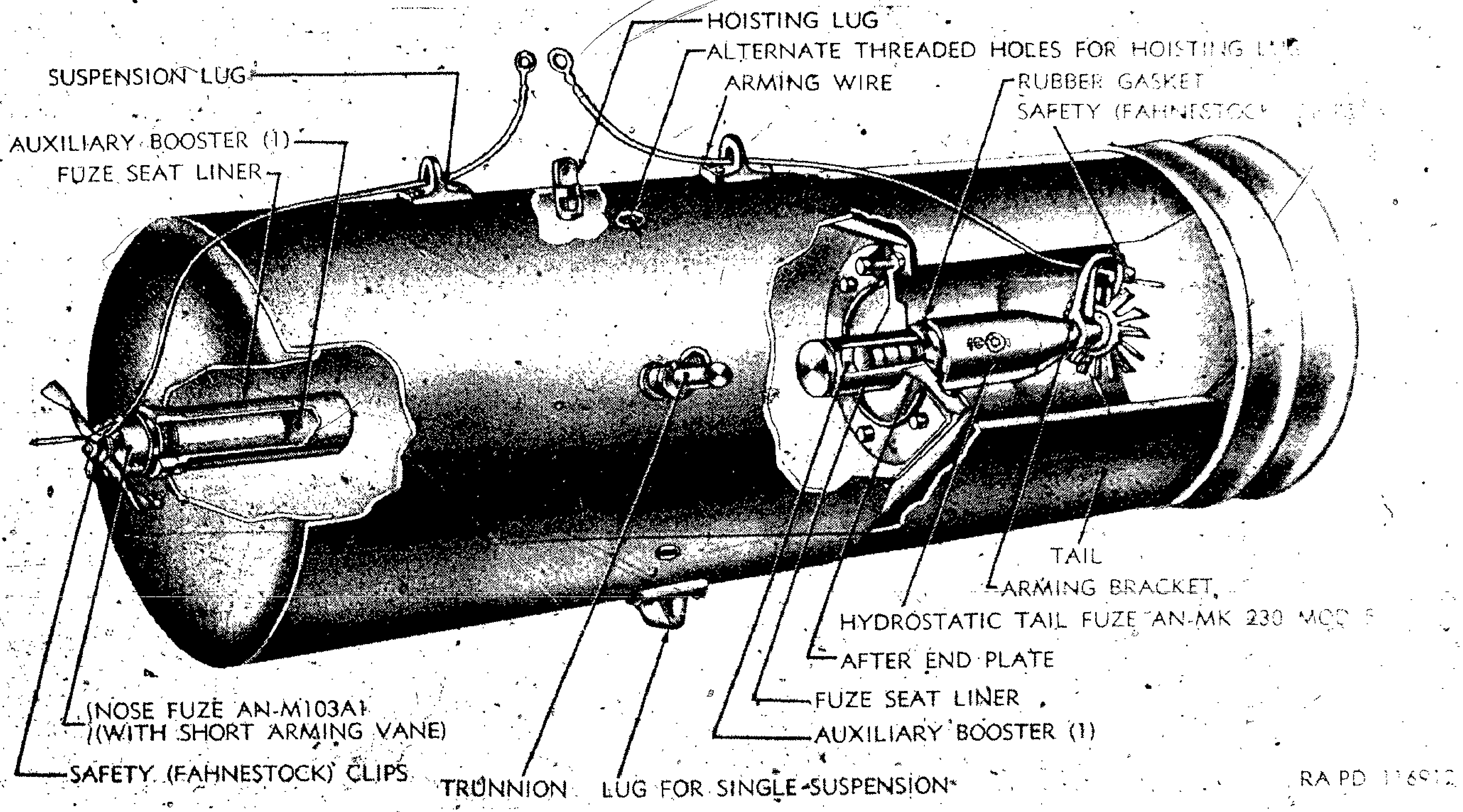
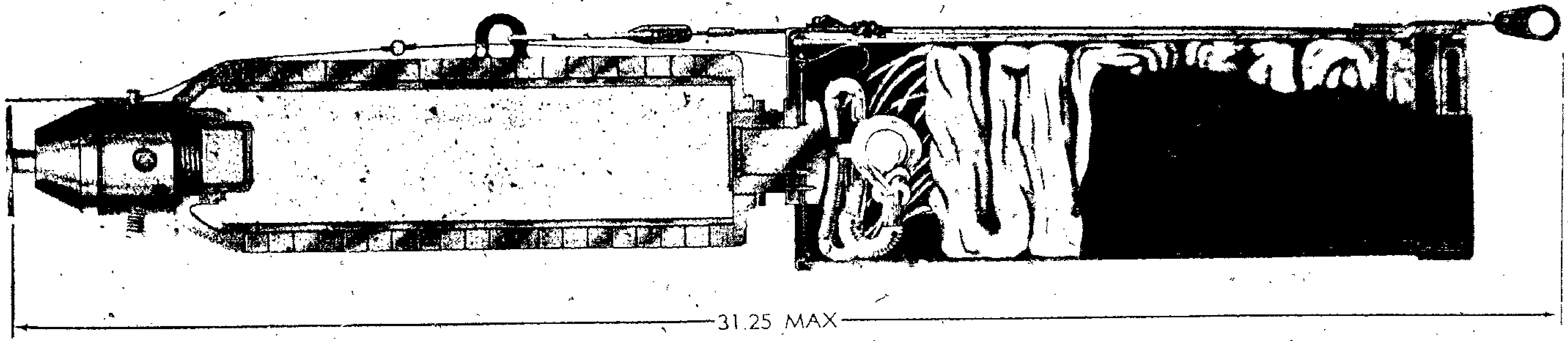
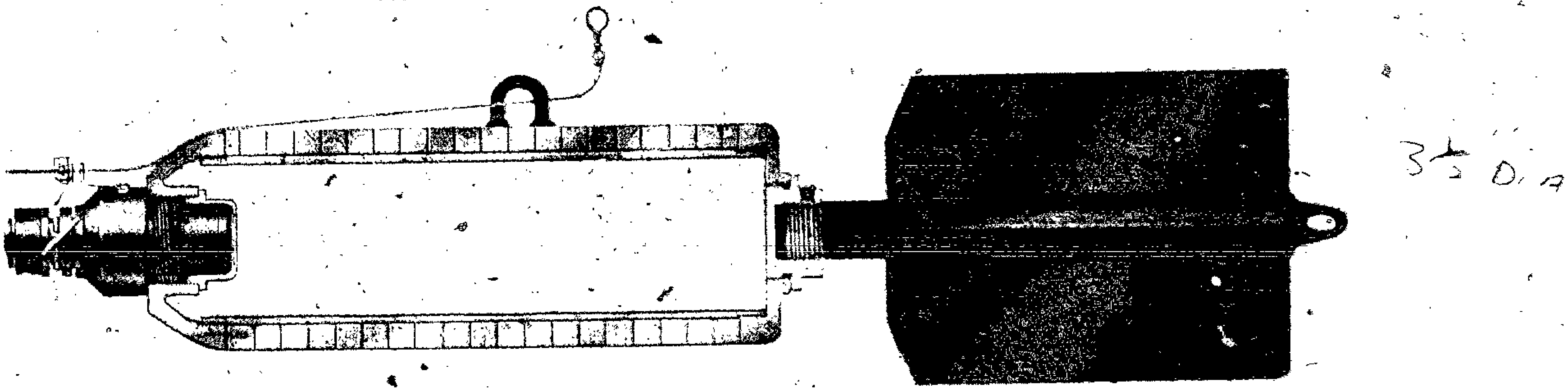


Figure 34. Depth bomb—section.



FRAGMENTATION BOMB (PARACHUTE TYPE)



FRAGMENTATION BOMB (FIN TYPE)

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Figure 35. Fragmentation bombs, 20- and 23-lb.—sections.

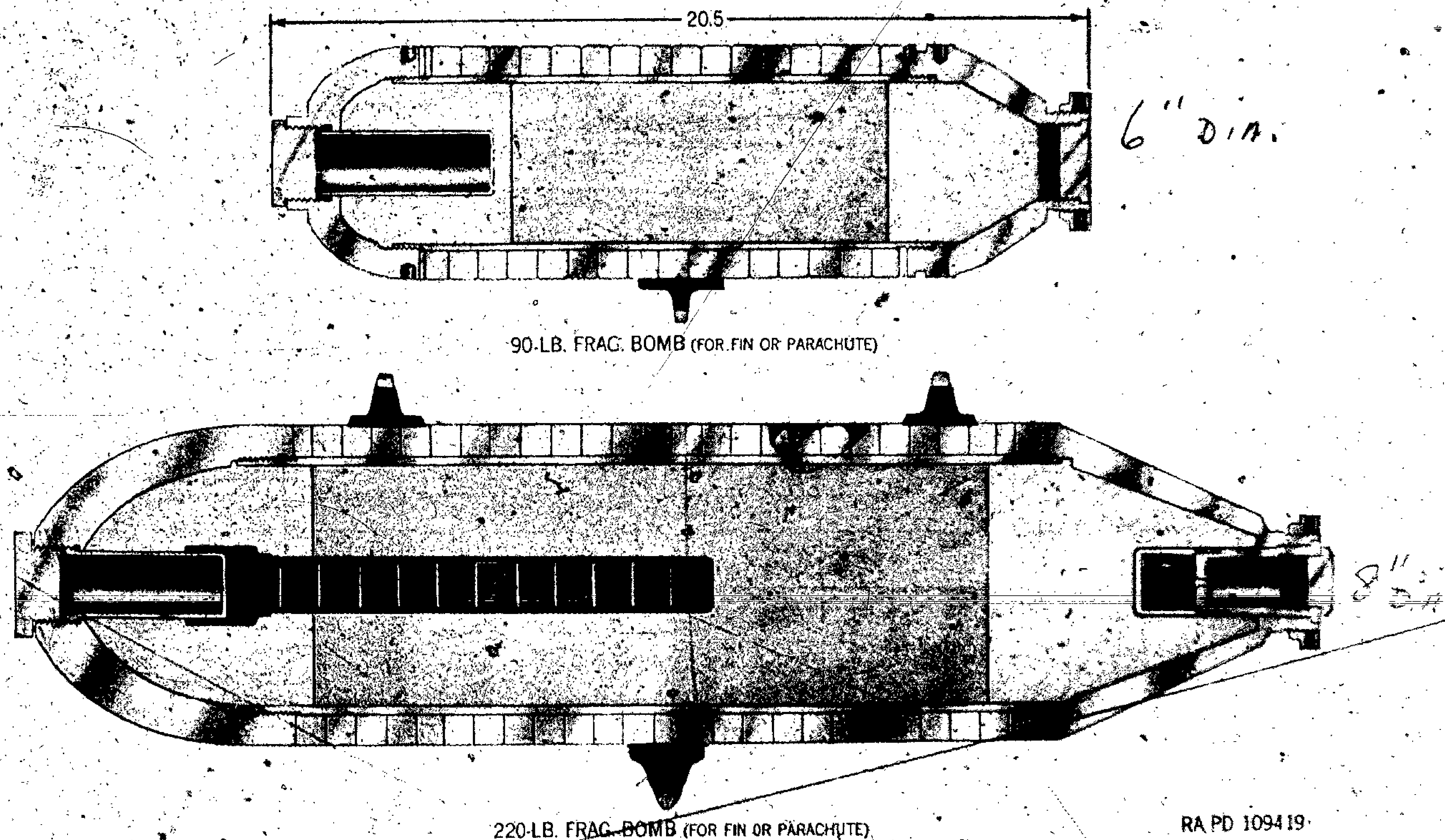

Figure 36. Fragmentation bombs, 90- and 220-lb—sections.

c. ASSEMBLY. The data necessary for the preparation of arming wire assemblies are provided in figure 30 and table XXV. Arming wire assemblies should be free of twists, kinks, and burs, and the wire should protrude approximately 2½ inches (not less than 2 in nor more than 3 in) beyond the fuze or fuzes when the bomb is installed in the rack or shackle. The dimensions indicated in table XXV are the minimum dimensions to be used when preparing arming wire assemblies. Excess wire can be cut off when the arming wire is installed. If complete arming wire assemblies are not available, they may be constructed from bulk supplies (*b* above) as follows:

(1) Cut the length of wire from the coil.

(2) With round-nose pliers or some equivalent tool, form a ⅜-inch open loop in the wire, the necessary distance from the end.

(3) Pass the wire through the smaller eye of the swivel loop assembly.

(4) Pass both branches of the wire through the ferrule. Slide the ferrule up until it closes the loop ((2) above), but does not cause the swivel loop to bind.

(5) Bend the arming wire as shown in figure 30.

(6) Remove all kinks and burs.

(7) If the arming wire is not for immediate use, place two safety clips on each end and pack the assembly at full length in a suitable container tagged for identification.

20. Cluster Adapter

A cluster adapter is a mechanical device by means of which several bombs are suspended in the carrying station for one bomb. Adapters are of three types: quick-opening (frame), aimable, and hook and cable. The three general types are as shown in figure 109 and described in chapter 7.

21. Packing

In general, bombs are shipped unfuzed with the fuze holes closed with metal closing plugs. These plugs will not be removed except for inspection and for assembly of the complete round. Most bombs are shipped with two paper or metal shipping bands to protect the suspension lugs. The fin assemblies of such bombs are shipped separately in metal crates (fig. 20). Small fragmentation bombs are packed in wooden boxes.

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22. General Purpose (GP)

This type of bomb (fig. 25) is designed to meet the requirements of the great majority of bombing situations. The various models range in weight from 100 to 44,000 pounds and the explosive in this type averages 50 percent. General-purpose bombs may be used for blast, fragmentation, or mining effect. They are adapted for (designed for use with) both nose and tail fuzes. Bombs larger than the 4,000-pound light case use only the tail fuze. Nose fuzes produce more efficient surface effect and tail fuzes produce more efficient deep (mining) effect. Both fuzes are generally used; the secondary fuze is used as insurance against malfunction. The general-purpose bomb has a cylindrical body which tapers in an ogive to the nose and in a straight cone to the base. It has two suspension lugs for double-hook suspension welded to the case on one side and, diametrically opposite, one lug for single suspension. Double suspension lugs are spaced 14 inches apart on bombs weighing 1,000 pounds and less; they are spaced 30 inches apart on bombs weighing 2,000 to 4,000 pounds. Bombs larger than 4,000 pounds have no suspension lugs, but are carried by two chain slings which are part of the bomb rack. The metal case is strong enough not to rupture on impact with normal soil when released from 8,000 feet, but it will fail on impact with heavy armor or high-strength reinforced concrete structures. General-purpose bombs are loaded with tritonal, TNT, COMP B, or amatol

23. Light Case (LC)

This type of bomb (fig. 31) is designed to carry a maximum charge. The percentage of explosive is 70 percent or more. Since strength of case has been sacrificed to obtain maximum charge, this type of bomb cannot be used for penetration and must be fuzed to explode before the case breaks up on impact. In other respects, this type resembles the general-purpose type described in paragraph 22.

24. Armor-Piercing (AP)

This type of bomb (fig. 32) is designed to pierce the heavy deck armor of modern battleships. The case is extremely heavy and, as a consequence, the percentage of explosive is about 15 percent. The weight and thickness of the metal case is concentrated toward the nose. In order to be effective, armor-piercing bombs must score direct hits. The effect of a near miss is small due to the comparatively small amount of explosive. This type should not be used against unarmored or lightly armored ships because, being fuzed with delay fuze to permit penetration of armor, the bomb would pass entirely through a light target before exploding. Armor-piercing bombs are streamlined in shape and adapted for tail fuze only. Suspension lugs are bolted to the body when the round is assembled, and in the case of the 1,600-pound AP bomb, locations are provided for either 14-inch or 30-inch spacing. Earlier models used suspension bands with the lugs welded to the bands and equipped with locating studs for the 14-inch or 30-inch spacing. AP bombs are loaded with explosive D which is sufficiently insensitive to withstand heavy impact.

25. Semi-Armor-Piercing (SAP)

This type (fig. 33) resembles general-purpose bombs except that the body of the SAP bomb is heavier and the explosive charge is approximately 30 percent. SAP bombs ~~are~~ loaded with picratol, and, generally, are only tail fuzed.

26. Depth

The depth bomb (fig. 34) is a light case type of bomb designed for use against submarines. It averages 70 percent explosive and is loaded with HBX, HBX-1, or TNT. The case is cylindrical and has a flat nose to reduce or prevent ricochet when dropped from planes flying at low altitudes. The depth bomb is fuzed with a hydrostatic fuze which functions at a predetermined depth rather than on impact. Depth bombs are usually tail fuzed, but provision is also made for nose fuze which may be used under certain tactical conditions.

27. Fragmentation

Fragmentation bombs (figs. 35 and 36) are designed to produce their effect through projection of the fragments of the body. They are intended for use against personnel and light materiel. The explosive charge of this type averages 14 percent. The body walls are of uniform thickness and may be made up of steel coils. One type of fragmentation bomb is stabilized by fins. The other, designed for low-altitude bombing, is equipped with a parachute to delay the impact of the bomb until the airplane has cleared the danger area. Fuzes for fragmentation bombs are designed to function on or above the surface of the ground. Fragmentation bombs are usually loaded with COMP B or TNT.

28. Photoflash

This type (fig. 37) is a pyrotechnic item but is classified with bombs because of its explosive effect. It is a light-case bomb with a charge of flashlight powder instead of high-explosive.

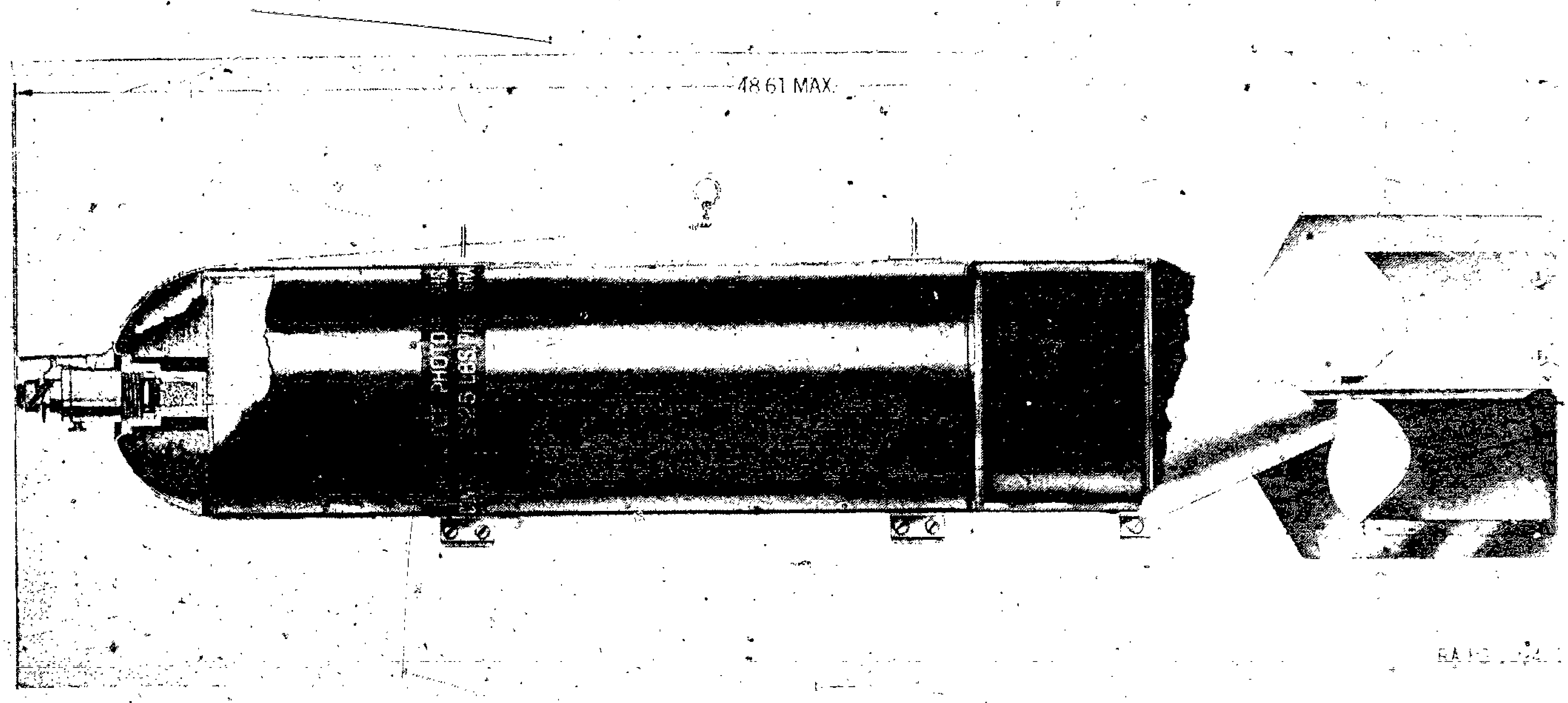

Figure 37. Photoflash bomb—section.

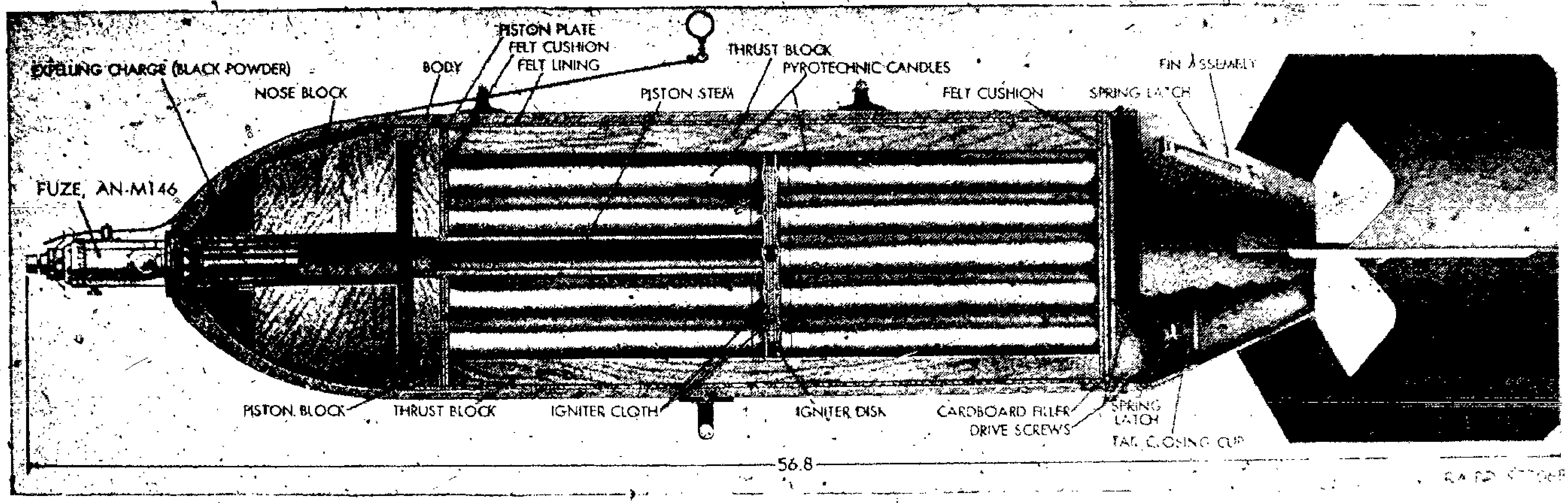

Figure 38. TI bomb—section.

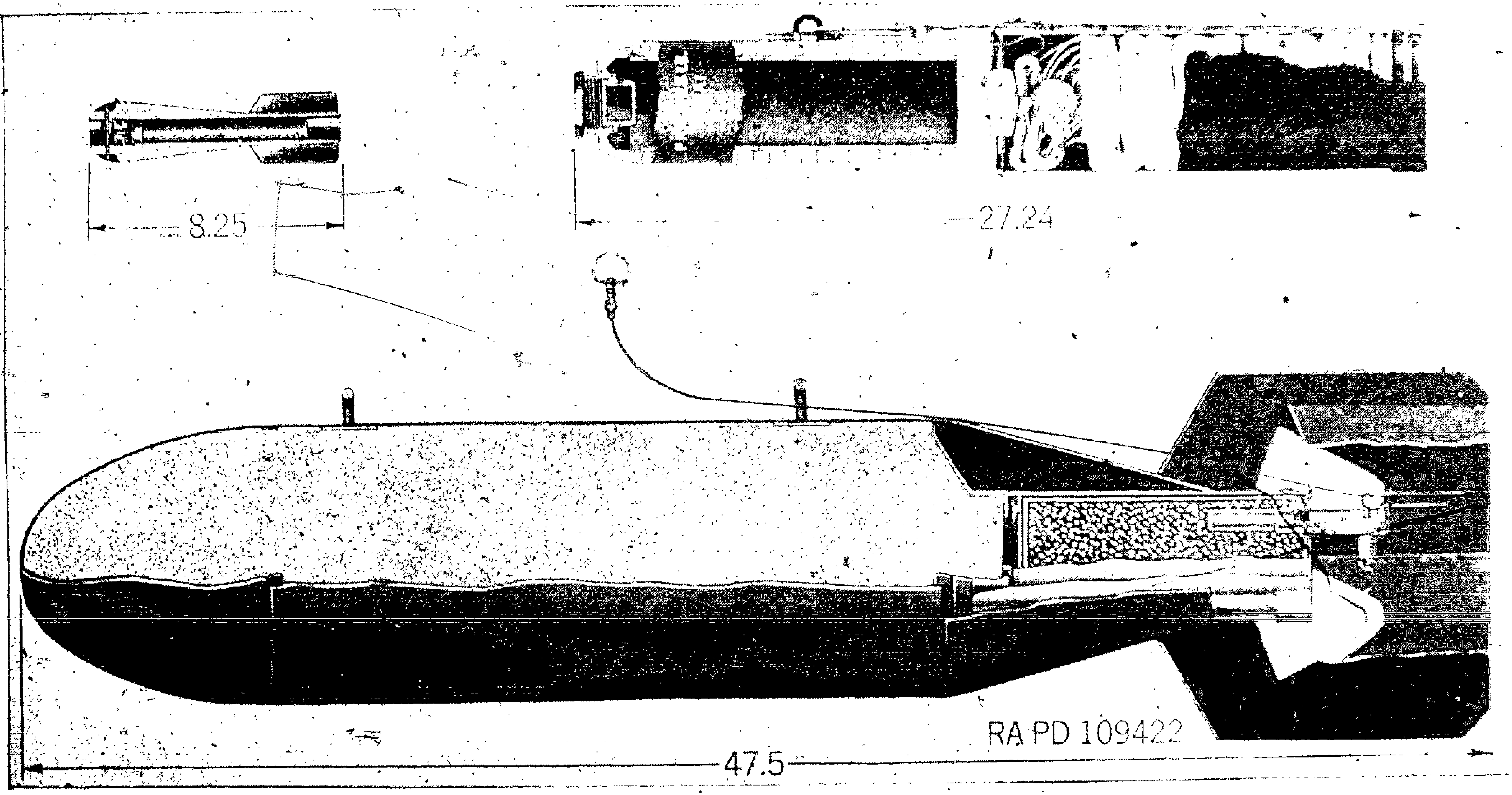

Figure 89. Practice bombs—sectioned.

29. Target Identification (TI)

This type of bomb (fig. 38) is also pyrotechnic in nature. It consists of a modified GP bomb case with a nose fuze, an expelling charge, and a number of pyrotechnic candles which are ignited by the expelling charge and burn with characteristic color and pattern. TI bombs are used by "Pathfinder" planes which precede bomb groups and designate or identify the target thus, facilitating sighting and reducing the probability of error.

30. Practice

This type of bomb (fig. 39) is provided for target practice. There is a wide range of types and weights in order to represent all types of service bombs. Some practice bombs have a fuze and a spotting charge; others are completely inert. Some are sand loaded to weight at point of use, others are constructed to weight. Each model is described in chapter 6.

31. Drill

Completely inert bombs and components are supplied for the training and practice of ground crews. Each type and weight of service bomb is represented by a corresponding drill bomb. Drill bombs are made up from the metal parts of service bombs, inert loaded when necessary. They are used for practice fuzing, unfuzing, and handling. Drill bombs, unlike inert practice bombs, are not expendable; they are not used for bombing practice.

32. Gage

Completely inert bombs are furnished to the Air Force by the Ordnance Corps for use in gaging and testing aircraft. Such bombs are not issued to the field.

Section III. HANDLING AND USE

33. Care and Precautions in Handling

a. General. Bombs are packed to withstand all conditions ordinarily encountered. However, the observance of the following general precautions is necessary to insure that bombs will be in serviceable condition when required for use. In addition, specific precautions applying to certain fuzes and bombs are included in the individual descriptions of the items in chapters 5 through 8.

(1) Bombs and bomb components will be stored as shipped. Those items shipped separately will be stored separately.
(2) Complete rounds will not be assembled in advance of requirements, and those rounds prepared for use but not used will be disassembled and returned to storage. Exceptions for alerted ammunition and special fuzing will be noted under the appropriate items.
(3) Assembled rounds will be carried with sealing wires and safety pins in place at all times up to the time of installation in the plane. The arming wire will remain in place until the bomb is released, or the safety pins and sealing wire are replaced and secured.
(4) Ground crews will be trained with drill bombs and inert components before attempting to handle service ammunition.
(5) Packings will not be opened until the items are required for use or inspection. Partly used boxes will be resealed, marked, and kept on top or in front of the pile. The partly used boxes will be used before opening other boxes. Damaged containers will be repaired or replaced, with care given to transferring the markings to the new parts of the container. Packings will not be opened, repaired, or replaced within 100 feet of a magazine or other store of explosives.
(6) Items removed from their packings and not used will be returned to their packings and resealed with adhesive tape.

b. FUZES.

(1) Fuzes are packed in sealed moistureproof containers which will not be opened until the material is required for use. Fuzes unpacked and not used will be repacked and resealed with adhesive tape.
(2) Fuzes should be protected against shock, moisture, and high temperature. Boxes must be lifted or wheeled and should not be dropped, slid, rolled, "walked" on the corners, or struck, as in lining up a stack. They should be shaded from the direct rays of the sun and protected from other sources of high temperature.

c. DESTRUCTION OF UNSERVICEABLE MATERIAL. Unserviceable material will be destroyed by authorized and experienced personnel in accordance with the provisions of TM 9-1900. Duds will be destroyed by personnel specially trained in bomb disposal activities. Bombs greater than 100 pounds will not be destroyed without authority from the Chief of Ordnance.

34. Storage and Maintenance

a. GENERAL. Explosives and ammunition will be stored in an area set aside for the purpose. Such an area will be removed from operating areas, inhabited areas, public roads, and public railroads by distances prescribed in TM-9-1900. Each type of ammunition will be stored separately and in quantities small enough to prevent sympathetic detonation of surrounding stores if one stack or magazine should explode. Such quantities and distances are given in TM 9-1900. In storage areas, smoking, carrying of matches or other flame-producing devices, use of lights other than an approved type, accumulation of inflammable trash or dead vegetation, and hunting are forbidden. Ammunition and explosives of any one size and type will be stored in as many separate storage units as storage facilities permit; in no case will the entire supply of any one size and type be concentrated in one place.

b. BOMBS.

(1) The preferred method of storage dictates the segregation of bombs by type—only one type being stored in a magazine or igloo at one time. However, where conditions do not permit individual storage of bombs by type, amatol, explosive D, picratol, and TNT loaded bombs may be stored together. Tritonal, torpex, and HBX loaded bombs may also be stored together. Such storage is permitted provided quantity-distance regulations prescribed in TM 9-1900 are observed and all requirements for each type are met. For example, such fragmentation bomb clusters as are shipped and stored with bombs fuzed may not be stored with general-purpose bombs, since the GP bombs may not be stored fuzed or with fuzes. Where fragmentation bombs are concerned, distances specified in classes 9 and 10 table will not be less than the distances stated in the CLASS 4 QUANTITY-DISTANCE TABLE (TM 9-1900) but may be one-half the distances as stated in the class 4 table when stored in concrete igloo magazines, except from the door end.

(2) General-purpose, armor-piercing, semi-armor-piercing, depth, or light-case bombs will not be stored with any other type of ammunition or explosives.

(3) Bombs shipped with fuzes in the same container will ordinarily be stored as shipped. However, for long-term depot storage, fuzes will be removed from bomb containers and stored separately.

(4) Bomb storage areas should be located at greater than missile distances from artillery ammunition storage.

(5) Bombs should be stored on steel dunnage which should be electrically connected and grounded. The use of inflammable dunnage for bombs should be avoided.

(6) Photoflash bombs may not be stored with any other type of ammunition, except when the total amount of explosive is less than 1,000 pounds photoflash bombs and small-arms ammunition may be stored together.

c. FUZES.

(1) Fuzes will be stored in dry, well-ventilated places and will be protected against sun, excess moisture, and heat.

(2) Fuzes may be stored with primers, primer-detonators, detonators, boosters, bursters, and small-arms ammunition. Under conditions of limited storage, if the total amount of explosive in one location is less than 1,000 pounds, fuzes may be stored with fixed ammunition. Chemically actuated fuzes containing ampoules, which may initiate, directly or indirectly, explosives and explosive-loaded components, must be stored separately. All chemically actuated fuzes assembled with ampoules containing acids as the reaction media must be stored separately. Chemically actuated fuzes not containing acid-filled ampoules and not containing explosives and explosive-filled components in the normal train may be stored with non-chemical fuzes only in accordance with regulations prescribed in the Ordnance Safety Manual.

d. INERT COMPONENTS. Fin assemblies, empty bomb bodies, arming wires, and similar inert components may be stored in any place which provides protection against damage by the weather.

35. Assembly (Fuzing and Finning)

Assembly of complete rounds will be done at a point (specified by appropriate Air Force commanders) located at a safe distance from explosives and operations areas. At the distributing point, all of the necessary components are loaded on the bomb service truck and bomb trailer and transported to the assembly point. At the assembly point components are removed from the packings and inspected as described in paragraph 10. Nose and tail fuze hole plugs are removed and the cavities and threads inspected. The shipping wire of the fin lock nut is cut and the nut removed from the bomb tail. The fin assembly is then attached with the fins in proper alinement and the fin lock nut tightened securely with proper fin lock nut wrench and fastened in place with set screws; earlier models may be encountered which are not provided with set screws—these cannot be locked in place. Bombs are installed in the plane and then the fuzes are assembled to the bomb as described under the particular fuze in chapter 5. When space in the bomb bay is limited, fuzes are assembled to the bomb before the bomb is installed in the plane.

36. Safe Altitudes and Distances

Altitudes and distances safe from fragmentation and blast effect will be specified by the Chief of Staff, US Air Force (SR 385-310-1—AFR 50-13). See FM 1-110.

37. Field Report of Accidents

If an accident or malfunction involving the use of ammunition occurs during training or combat, the range officer for a unit in training or the officer or noncommissioned officer in charge of the firing unit in combat will immediately discontinue firing ammunition of the lot which malfunctions and then report the occurrence and all pertinent facts of the accident or malfunction to the technical service officer under whose supervision the ammunition for the unit involved is maintained or issued in order that the action prescribed in SR 385-310-1 may be taken. If conditions of combat preclude immediate compliance, the action prescribed above will be taken as soon as practicable.

CHAPTER 5

FUZES

Section I. INTRODUCTION

38. Classification of Fuzes

a. POSITION. Fuzes are classified according to the position in which they are assembled to the bomb as nose, tail, and body.

b. ARMING. Fuzes are classified according to method of arming as arming pin type and arming vane type. These are further classified as—

(1) Direct arming, when the fuze becomes armed immediately on ejection of the arming pin or by direct unscrewing of the arming stem by the vane.

(2) Delayed arming, when the ejection of the arming pin initiates a powder train or clockwork mechanism which arms the fuze after a predetermined time, or when the arming vane is connected to the arming stem by a reduction gear assembly.

c. ACTION. Fuzes are classified according to action as time, impact, hydrostatic, and VT. A fuze in which the detonator is out of line with the booster lead until armed is classed detonator-safe.

(1) Time fuzes other than VT fuzes ((4) below) function to explode the bomb a certain number of seconds after release. Time fuzes act in a manner similar to an ordinary alarm clock. A notched disk is rotated by the clockwork under the trigger. When the time set has elapsed, the notch has turned so as to be under the trigger which drops into the notch and releases a spring-loaded firing pin. Although the fuze is generally set for the time desired when the complete round is assembled, the time setting may be changed at any time up to release, provided the fuze is accessible.

(2) Impact fuzes begin their function when the bomb strikes a resistant material. Fuzes classed instantaneous or nondelay act to explode the bomb immediately; those classed as delay contain an element which delays the explosion of the bomb until a definite time has elapsed, and allows the bomb time to penetrate the target or allows a low-altitude bomber time to clear the danger area before the bomb explodes.

(3) Hydrostatic fuzes act under the influence of water pressure to explode the bomb a predetermined depth below the surface.

(4) VT fuzes are electrically operated fuzes which operate to detonate the bomb on approach to the target at the point of optimum effect.

39. Components of Fuzes

a. NOSE FUZES. The essential parts of a nose fuze are the striker head, firing pin, safety block, arming mechanism, primer, detonator, and usually a delay element and booster, all assembled in the fuze body. In the arming pin type (fig. 47), a spring-loaded arming pin is held in place by arming wire. The wire also restrains a plate which holds the safety block in place. In the arming vane type (fig. 43), the striker is restrained by a safety block or a ring of safety disks which are released by the action of the arming vane. The arming vane is kept from rotating prematurely by the arming wire. In both types, the striker is held in place, after arming, by a shear wire.

b. TAIL FUZES. The essential parts of a tail fuze are the primer-detonator (par. 40), inertia type firing pin, and arming mechanism, all assembled in the fuze body. In the tail fuze (fig. 67), an arming stem is screwed into the firing pin to keep it from striking the primer until the action of the vane unscrews the arming stem. The firing pin is held in place, while the bomb is in flight, by a light creep spring. Dependent upon the degree of sensitivity to impact required, the firing pin may be of the simple inertia type (fig. 67), or of the cocked type (fig. 75).

c. HYDROSTATIC FUZES. This type works on the principle of a bellows or diaphragm operating against a spring of fixed strength. When the external pressure overcomes the resistance of the spring, the firing pin is released and driven against the primer by spring action. Provision is made for adjustment by a mechanism controlling the compression of the diaphragm spring. This is set by an external lever.

d. ARMING VANE. In general, vane type fuzes are packed and shipped with the arming vane disassembled but contained in the same box.

40. Primer-Detonators

In order to provide variation of the delay action in tail fuzes, the primers, delay element, and detonator are assembled in one interchangeable unit. Primer-detonators (fig. 19) of various delay times are supplied. Primer-detonator M14 is supplied with 0.24-, 0.10-, 0.025-, and 0.01-second delay and nondelay—the 0.24-second delay is provided for antisubmarine use. Primer-detonator M16 and M16A1 are supplied with 8- to 15-seconds delay and 4- to 5-

seconds delay. Primer-detonator M40, used with the 12,000 to 44,000-pound GP bombs, is supplied with 0.025-, 0.04-, 0.05-, 0.014-, 0.5-, 1.0-, 3.0-, 11.0-, and 25.- to 30.-seconds delay and nondelay.

Caution: Care should be exercised to insure that the proper model primer-detonator is used. The M14 and the M16 types are not interchangeable; the M14 has 12 threads per inch, the M16 has 20 threads per inch. An attempt to assemble the wrong type primer-detonator will ruin both the primer-detonator and the fuze.

41. Nose Adapter-Boosters

a. GENERAL. GP bombs are adapted for large diameter nose fuzes. The adapter-booster M117, which is threaded externally to fit the large fuze seat and internally to receive a small fuze, is necessary in order to use smaller special-purpose fuzes with these bombs. Tail adapter-boosters are provided as explained in paragraph 14 *g*.

b. ADAPTER-BOOSTER M117. This item (fig. 40) is issued separately to adapt large fuze seats to the smaller fuzes. Its external contour is the same as that of standard GP bomb fuzes; the fuze seat it provides receives the standard fragmentation type fuze. To install the adapter-booster proceed as follows:

(1) Unpack adapter-booster and remove shipping plug. Inspect internally and externally to be sure it is clean and threads are clear. Inspect bomb fuze seat.

(2) Screw adapter-booster into bomb until it is firmly seated but do not use force.

(3) Unless fuze is to be assembled immediately, replace shipping plug handtight.

(4) If the use of the adapter-booster becomes unnecessary, remove the unit and return it to its original packings and condition.

42. Interchangeability of Fuzes

When it is desired to use another model in place of the fuze authorized, because either the standard model is not available or the special action of another fuze is desired, the following conditions must be fulfilled:

a. THE FUZE MUST FIT MECHANICALLY. That is, the fuze must physically fit in the fuze seat of the bomb or an adapter must be used to furnish such fit.

b. THE FUZE MUST FIT FUNCTIONALLY. That is, the fuze must be able to arm and operate properly under normal conditions of use. For example, short tail fuzes will not arm if used on larger bombs. Also the arming time of selected fuze must meet safety requirements.

c. THE EXPLOSIVE TRAIN MUST BE COMPLETED BY THE COMBINATION OF BOMB AND FUZE. That is, all elements, detonator, booster, and main charge must be present. Some fuzes contain detonator only and, if these are used in a fuze seat liner without a booster, low order detonation or a dud may result. Other fuzes have a black powder igniter in place of the booster element and, if these are used in high-explosive bombs, the igniter will not reliably initiate the booster or charge.

d. THE COMPONENTS OF THE EXPLOSIVE TRAIN MUST BE IN PROXIMITY. That is, detonator, booster and main charge must be sufficiently close so that the detonation wave is not materially weakened in passing from one element to the next. Some fuzes have short boosters and if these are used in deep fuze seats, the space must be filled with an auxiliary booster or similar explosive charge, otherwise a low order detonation or dud may result.

43. Arming Altitudes and Distances

a. GENERAL. The various terms used to indicate the arming characteristics of a fuze are defined below and illustrated in figure

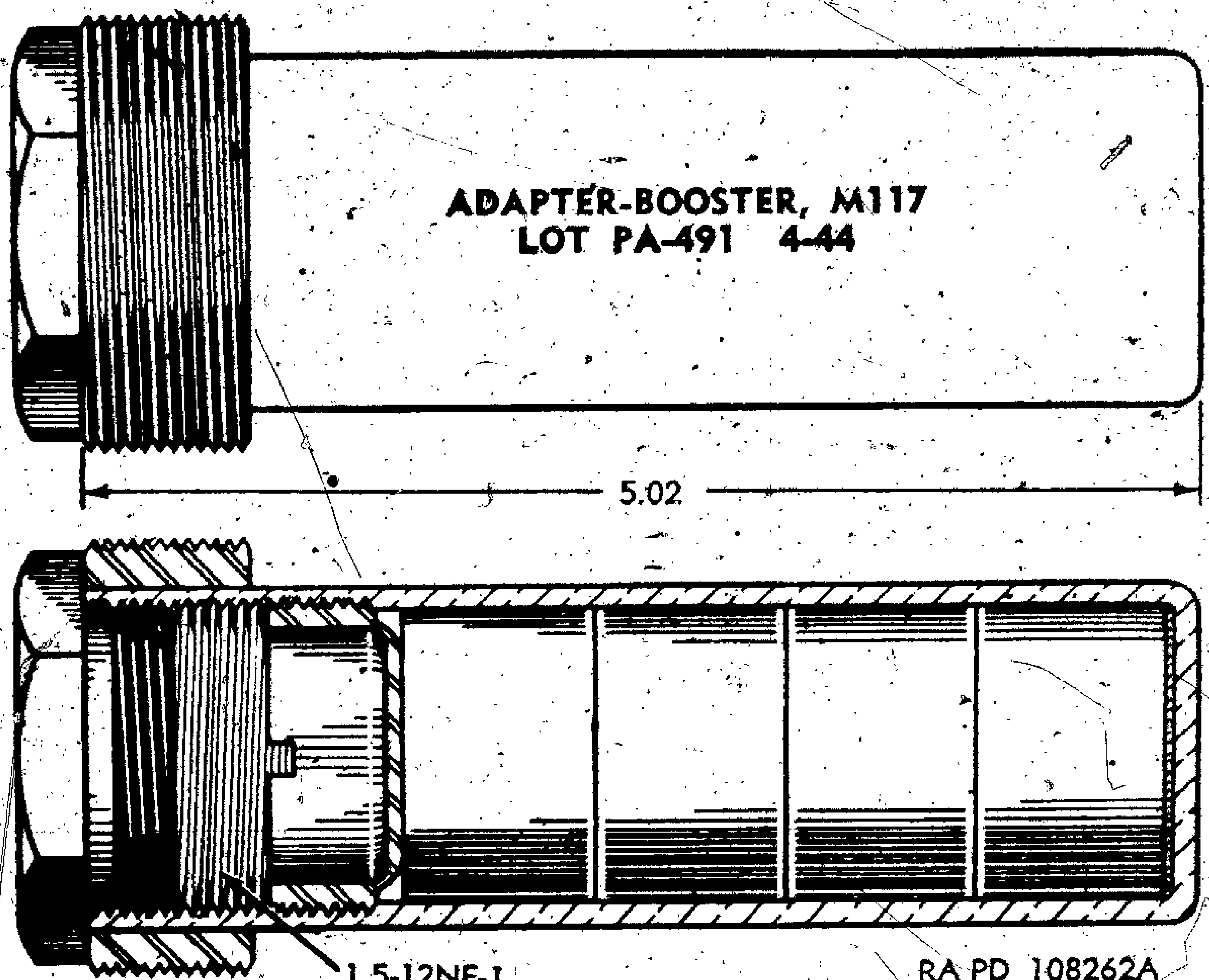

Figure 40. Adapter-booster, M117.

41. It should be noted that this diagram is for illustration only and does not necessarily indicate desirable or even permissible bombing practice. The plane speeds shown in figure 41 are given in miles per hour, knots, and feet per second.

b. VANE REVOLUTIONS. The number of revolutions of the arming vane required to arm the fuze is the only measure not dependent upon conditions of use. This figure is not absolute because the manufacturing tolerances, necessary in mass production, may accumulate to produce a variation. The data given in this manual should be regarded as maxima unless a range of values is given.

c. AIR TRAVEL. The amount of air travel required to arm the fuze is measured in feet along the trajectory. The value for a particular fuze varies with the size and shape of the bomb in which it is used. Figures for air travel given in this manual are average and are within a small percentage of actual, the variation being due to manufacturing tolerances.

d. MINIMUM SAFE AIR TRAVEL—MINSAT. Minimum safe air travel is the distance of air travel within which no fuze arms. It is the minimum value of air travel for any normal fuze of a particular model.

e. ARMING ZONE. The arming zone represents the tolerance in air travel to arm. It is the zone in which some fuzes are armed and others are not yet armed. The length of the arming zone added to minimum safe air travel gives maximum air travel after which all fuzes are armed.

f. SAFE VERTICAL DROP—SVD. Safe vertical drop is the vertical distance below the release altitude at which no fuze arms. It is the vertical component of minimum safe air travel. It should be noted here that "SAFE" refers to the condition of the fuze, that is, unarmed, and not to the security of the releasing plane. Safe vertical drop varies not only with air travel but also with speed of plane, altitude of release, size, shape, and weight of the bomb, and other factors which effect shape and direction of trajectory.

g. MAXIMUM DROP TO ARM. Maximum drop to arm is the vertical distance below release altitude at which all fuzes are armed. It has the same value as minimum arming altitude which is the lowest altitude at which bombs may be released with the probability that all fuzes will be armed.

h. SAFE ALTITUDES AND DISTANCES. Safe altitudes and distances are those at which the releasing plane incurs a specified minimum risk of damage from the bomb dropped. **Prescription of safe altitudes and distances is a command function. (See FM 1-110—FTP-224 and SR 385-310-1).**

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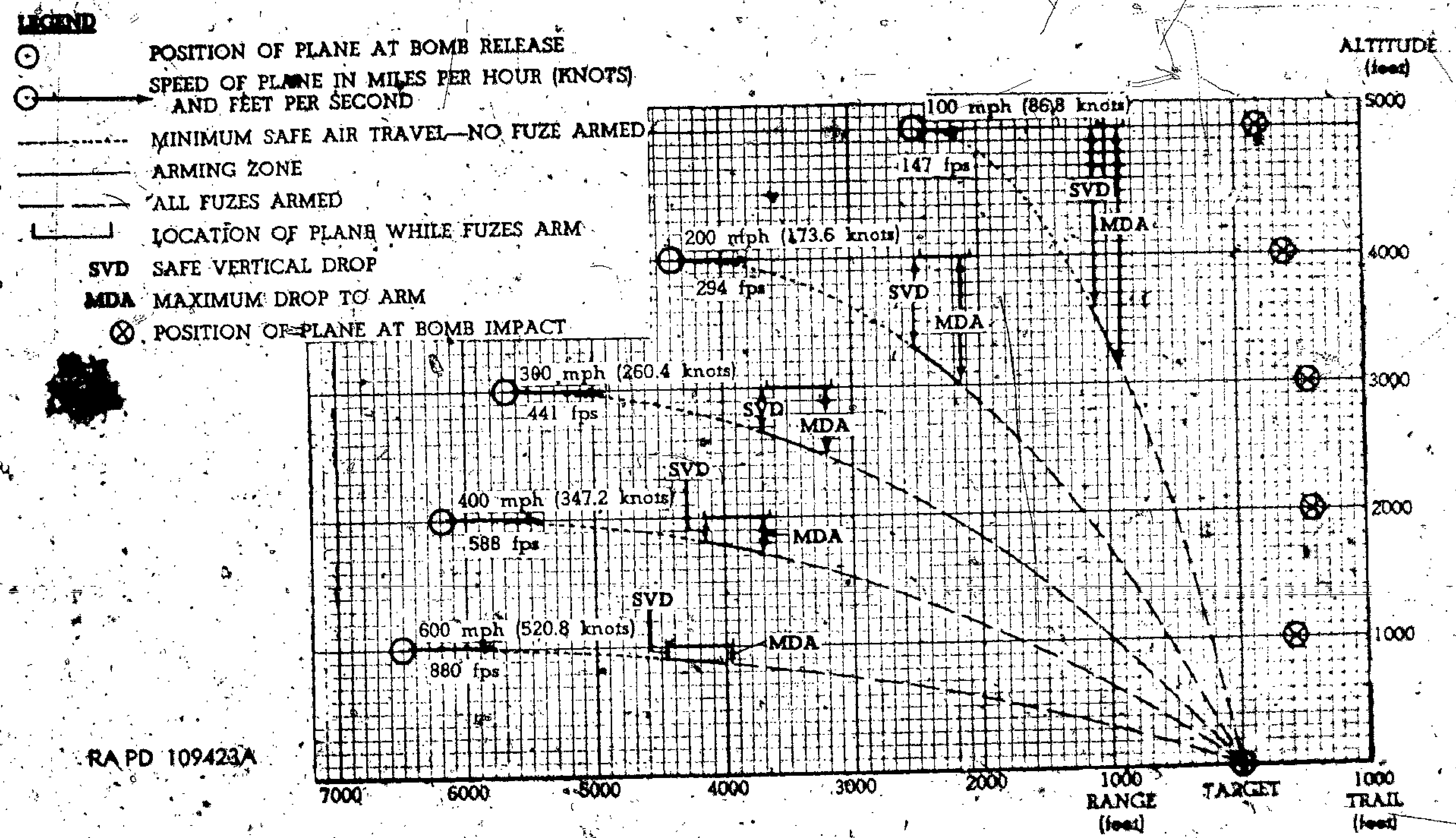

Figure 41. Fuze arming (trajectory diagram.)

44. Precautions

In addition to the general precautions given in paragraphs 33 to 35, the following will also be observed:

a. Fuzes are packed in sealed moistureproof containers. They will not be unsealed until required for use; fuzes unpacked for use and not used will be returned to their original condition and packings which will be effectively sealed with adhesive tape.

b. Fuzes will be protected against excessive heat.

c. Fuzes will be handled with care at all times. Boxes will be carried or wheeled. They must not be dropped, tumbled, dragged, or thrown; nor will they be struck with a hammer or similar tool either to open the box or aline in a stack.

d. Fuzes will not be unpacked or packed within 100 feet of a magazine containing explosives.

e. When the fuze is unpacked, it should be examined to insure that the shipping seals are intact, that the safety blocks or arming pin are in place, or that the arming stem is not unscrewed.

f. Safety cotter pins, shipping wires, and seals will be left in place until the arming wire is assembled to the fuze.

g. Care will be exercised not to bend or distort vane assemblies.

h. Only primer-detonators authorized for use with the particular fuze will be used.

i. When an authorized alteration is made to a fuze, the fuze will be so marked as to indicate clearly the nature of the modification. If the fuze is repacked after alterations, the container will also be so marked.

j. Fuzes will not be disassembled further than authorized without prior approval of the Chief of Ordnance.

k. Fuzes damaged to such extent that they appear unfit for use should be disposed of in accordance with existing regulations.

Section II. IMPACT NOSE FUZES: SELECTIVE ACTION—INSTANTANEOUS OR DELAY

45. General

The selective action, instantaneous or delay, impact nose fuzes (fig. 10) are all of the same size, weight, and contour. The various models differ in internal details (figs. 42 to 45) which control length of delay, length of air travel to arm, and detonator-safety on shearing of the vane cup. The characteristics of the various models are tabulated below, and the fuze action is described in detail in paragraphs 46 through 53.

a. DATA. All models of this type are detonator-safe, and arm by vane action with mechanical delay. They function on impact with instantaneous or delay action as determined by the presetting of a pin in the fuze body when the bomb is fuzed—as shipped the fuze is set for delay action. These models are 7.1 inches overall length and weigh 3.7 pounds. They are authorized for use with GP, demolition, and light-case bombs 100 to 4,000 pounds, fragmentation bombs 90 pounds and larger, chemical bombs 500 pounds and larger, and for depth bombs and mines when they are used for surface effect. Some lots of the FUZE, bomb, nose, M103, M103 (AN–M103), and AN–M103A1 have been modified for instantaneous action only; these are preferred for use with fragmentation and other types with which delay action is not desirable. Certain of these fuzes are shear-safe; this is a feature which prevents the detonator from becoming alined with the booster lead should the fuze be sheared at the vane cup before full arming is accomplished.

b. **Models.** The characteristics of the various models are given in table II.

Table II. Characteristics of Selective Type Impact Nose Fuzes

Model	Air travel to arm (ft)	Action	Shear-safe	Classification
M103	1,140–1,710	Inst 0.1-sec delay	No	Limited standard.
M103 (AN–M103)	510–765	Inst 0.1-sec delay	No	Do.
AN–M103A1	510–765	Inst 0.1-sec delay	Yes	Standard.
M139	510–765	Inst 0.01-sec delay	No	Limited standard.
AN–M139A1	510–765	Inst 0.01-sec delay	Yes	Standard.
M140	510–765	Inst 0.025-sec delay	No	Limited standard.
AN–140A1	510–765	Inst 0.025-sec delay	Yes	Standard.
M163	1,140–1,710	Inst 0.1-sec delay	Yes	Do.
M164	1,140–1,710	Inst 0.01 sec-delay	Yes	Do.
M165	1,140–1,710	Inst 0.025-sec delay	Yes	Do.
M171		Inst 0.025-sec delay	Yes	Do.

c. **Preparation for Use.** Aside from assembling the vane to the vane hub (*d* (6) below) the only preparation of the fuze necessary is the change of delay setting. This is done by pulling the setting pin out until the key clears the setting slots, turning the pin a quarter turn so that the key will enter the other slot, and letting the pin drop back. As shipped, the pin is set in the deep (delay) slot. It needs to be changed to the shallow (instantaneous) slot only when detonation of the bomb above ground is desired.

d. **Fuzing.** These fuzes are assembled to bombs as outlined below and shown in figure 23. The assembly of nose fuze to bomb may precede or follow the installation of fin assembly and tail fuze.

(1) Unseal the fuze container and remove fuze.

(2) Inspect the fuze to see that it is serviceable and to see that the setting is for instantaneous or delay as desired—it is set at delay as issued.

(3) Cut and remove seal wire.

(4) Screw fuze, less vane, into the bomb handtight. The use of a wrench or other tool is neither necessary nor permitted.

(5) Unpack arming wire (unless previously assembled to bomb for tail fuze installation) and thread short branch through the forward suspension lug of the bomb, then through the upper pair of eyelets in the vane stop straps. If the upper pair of eyelets is occupied by a cotter pin, place another cotter pin in the opposite eyelets and replace the original cotter pin with the arming wire.

(6) Slip an arming vane assembly over the hub so that the locating pins on the vane enter corresponding holes in the vane hub and so that the vane holder spring snaps into the groove in the hub.

(7) Adjust arming wire to protrude 2 to 3 inches beyond the vane stop. Slip two safety clips over the end of the arming wire and slide them up the wire so that the inner clip touches the face of the vane strap. *Be sure that the protruding section of wire is neither kinked nor burred.*

(8) The cotter pin and tag are removed from the vane stop when so directed by the appropriate US Air Force Commander.

e. DEFUZING. If a bomb is not dropped, the fuze will be removed and returned to its original condition and packing as follows:

(1) Replace cotter pin and tag.

(2) Remove safety clips.

(3) Remove arming vane assembly.

(4) Remove arming wire and repack it.

(5) Replace seal wire—twist ends of the wire together.

(6) Unscrew fuze from bomb and return it with arming vane to fuze container. Seal the container with adhesive tape.

f. ACCIDENTAL ARMING. If a fuze should be found with the vane cup advanced enough to have released the safety disks, it is armed and will function on receiving a blow or pressure on the striker. In such a case the first action taken will be to place improvised safety blocks between the flange of the striker and the fuze body and taping or otherwise fastening them in place.

The improvised blocks should be of a material thick enough to take up all available space between the flange and fuze body. After the blocks are in place the fuze may be handled in comparative safety. No further attempt will be made to disarm such a fuze. It should be destroyed as unserviceable ammunition in dangerous condition.

g. MARKING. The container in which the fuze is packed is marked with the nomenclature of the fuze, the ammunition lot number, the fuze assembly drawing number, and the date of its revision. The fuze has the type, model, lot number, and setting stamped in the metal of the body. Two instruction tags are attached to the fuze as shipped. One, attached to the seal wire, reads: "Remove this seal before assembling vane to fuze"; the other, attached to the safety pin, reads: "To be removed after bomb has been placed in dropping gear, arming wiring inserted. If bomb is not dropped, replace pin before removing arming wire." Long air travel fuzes have the vane cup painted yellow. Fuzes with 0.01-second delay elements have a 1/8 segment of the head painted black; those with 0.025-second delay have a 1/4 segment painted black (fig. 10).

h. PACKING. The fuze is packed with unassembled vane in an individual, sealed metal container, nine such containers per wooden box. In earlier packings, 25 containers were packed per wooden box. Still earlier, 1 fuze without vane was packed in a metal container; 25 such containers and 25 vanes, wrapped separately, were packed per wooden box.

46. Fuze, Bomb, Nose, AN–M103A1

This fuze (fig. 42) resembles the fuze M163 (par. 50) except that the arming screw has a double thread, thereby reducing the number of vane revolutions required for arming, and the arming stem continues above the upper collar and, passing through the top of the striker, bears on the reduction gear assembly.

47. Fuze, Bomb, Nose, M103 (AN–M103)

a. GENERAL. This fuze (fig. 42) resembles the AN–M103A1 except that the arming screw is smaller and there is no upper collar on the arming stem. The advance of the reduction gear with the vane cup allows the arming stem to progress and clear the detonator-slider. This fuze is not shear-safe. If the vane cup is sheared off on the first of multiple impacts, the arming stem can advance and clear the detonator. A subsequent impact on the nose will then detonate the fuze.

b. OTHER MODELS. The FUZE, bomb, nose, M103 resembles

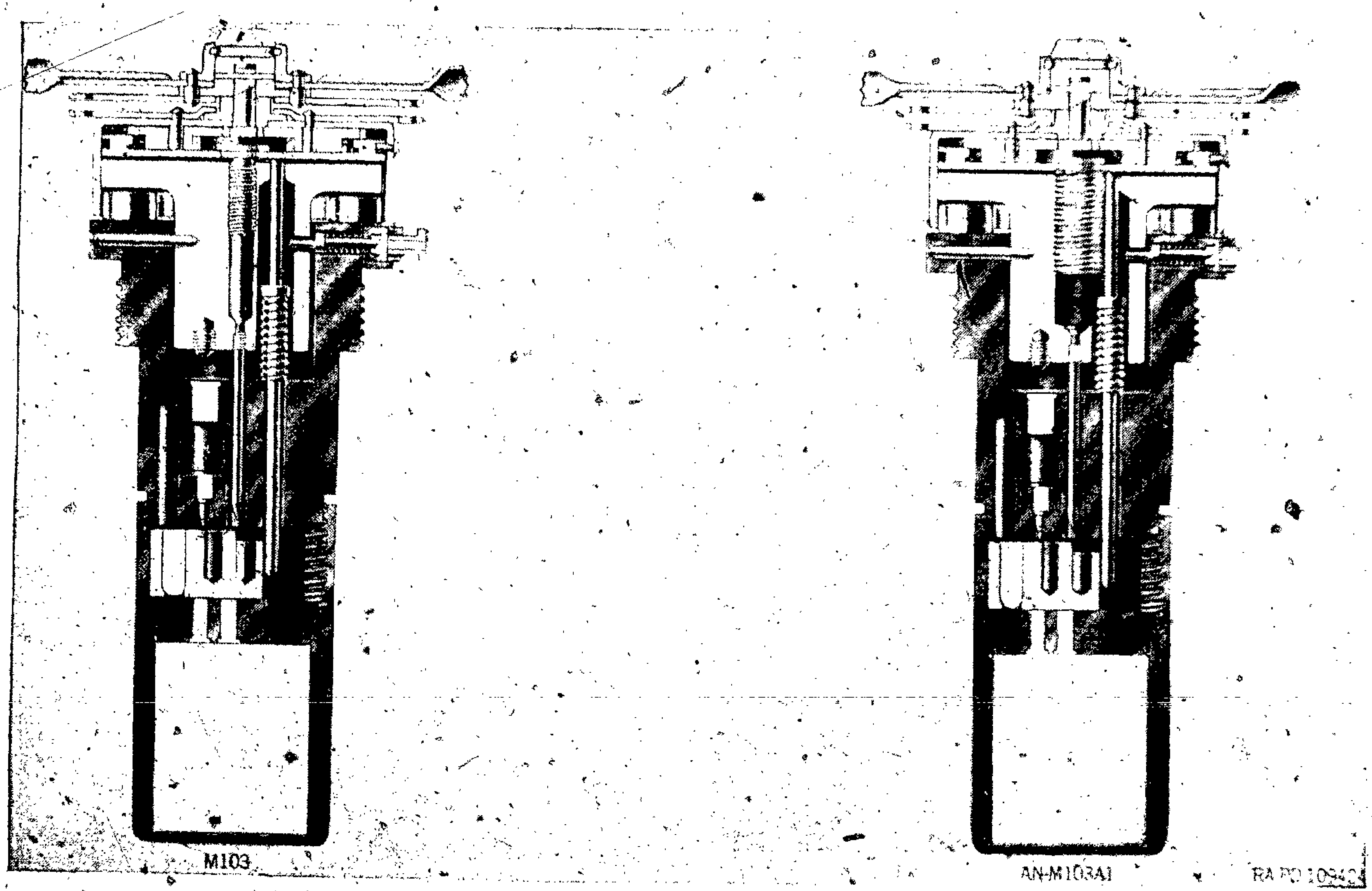

Figure 42. Comparison of nose fuzes M103 and AN-M103A1.

the M103 (AN–M103) except that the arming screw thread is single instead of double, thus making necessary longer air travel to arm. This fuze may not arm before impact when released from minimum altitudes for over-water bombing.

48. Fuze, Bomb, Nose, AN–M139A1

This fuze differs from the fuze AN–M103A1 (par. 46) in the length of delay, which is 0.01 second, and in its markings. In other respects it is similar to the model described. An earlier model, FUZE, bomb, nose, M139 is similar to the M103 (AN–M103) with the exception of delay time, 0.01 second and the markings.

49. Fuze, Bomb, Nose, AN–M140A1

This fuze differs from the fuze AN–M103A1 (par. 46) in the length of delay, which is 0.025 second, and in its markings. In other respects it is similar to the model described. FUZE, bomb, nose, AN–M140 is similar to the M103 (AN–M103) (par. 47) with the exception of delay time, 0.025 second, and the markings.

50. Fuze, Bomb, Nose, M163

a. DESCRIPTION (fig. 43). A vane assembly (1) mounted on a vane cup (2) and connected by means of a reduction gear train (3) to an arming screw (4). The arming screw is assembled to a striker (6) and dual firing pin (14 and 16), an assembly which is held in the body of the fuze by a shear wire (17) and the setting pin (13). The vane cup holds a ring of safety blocks (5) between the flange of the striker and the body of the fuze and is prevented from turning by a pair of keys on the inside of the cup, which ride in slots in the flange of the striker. The end of the arming screw bears on the upper collar of the arming stem (8), holding it in place against the action of the arming stem spring (9). The arming stem holds the detonator-slider (7), which contains the detonator (10), out of functioning position until the fuze arms. The fuze body also contains the delay train—consisting of primer (18), delay element (11), and relay (19)—the booster leads for delay (12) and instantaneous (15) action, and the booster (20). A retaining pin, not illustrated, passes through the body of the fuze and into a slot in the striker; it prevents the striker from moving outward but does not interfere with its motion inward.

b. DELAY FUNCTIONING (fig. 44). When a bomb equipped with this fuze is released armed, the air stream turns the arming vane (1) which, through the reduction gearing (3) turns the arming

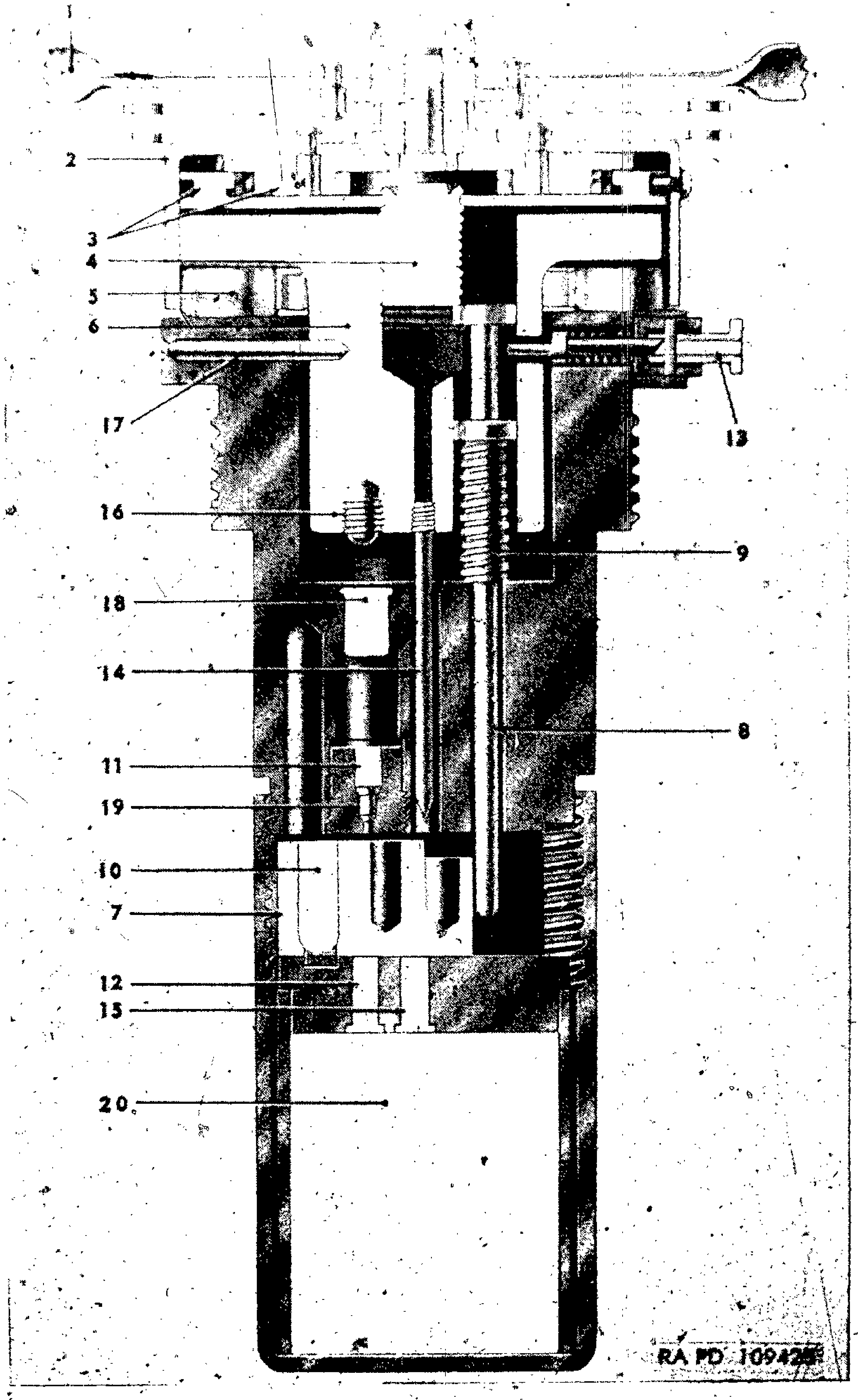

Figure 43. Fuze, bomb, nose, M163—unarmed.

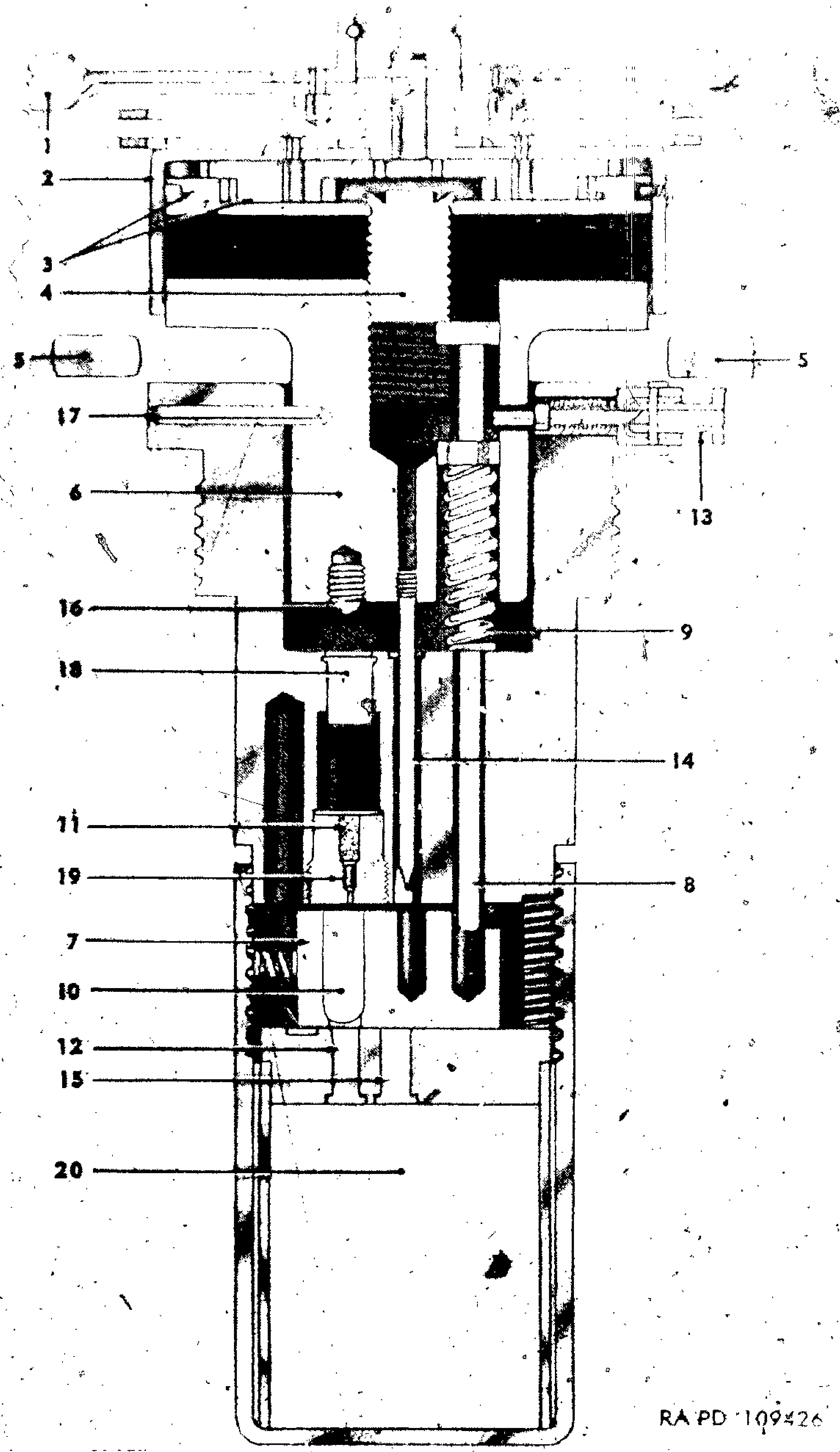

Figure 44. Fuze, bomb, nose, M163—armed for delay action.

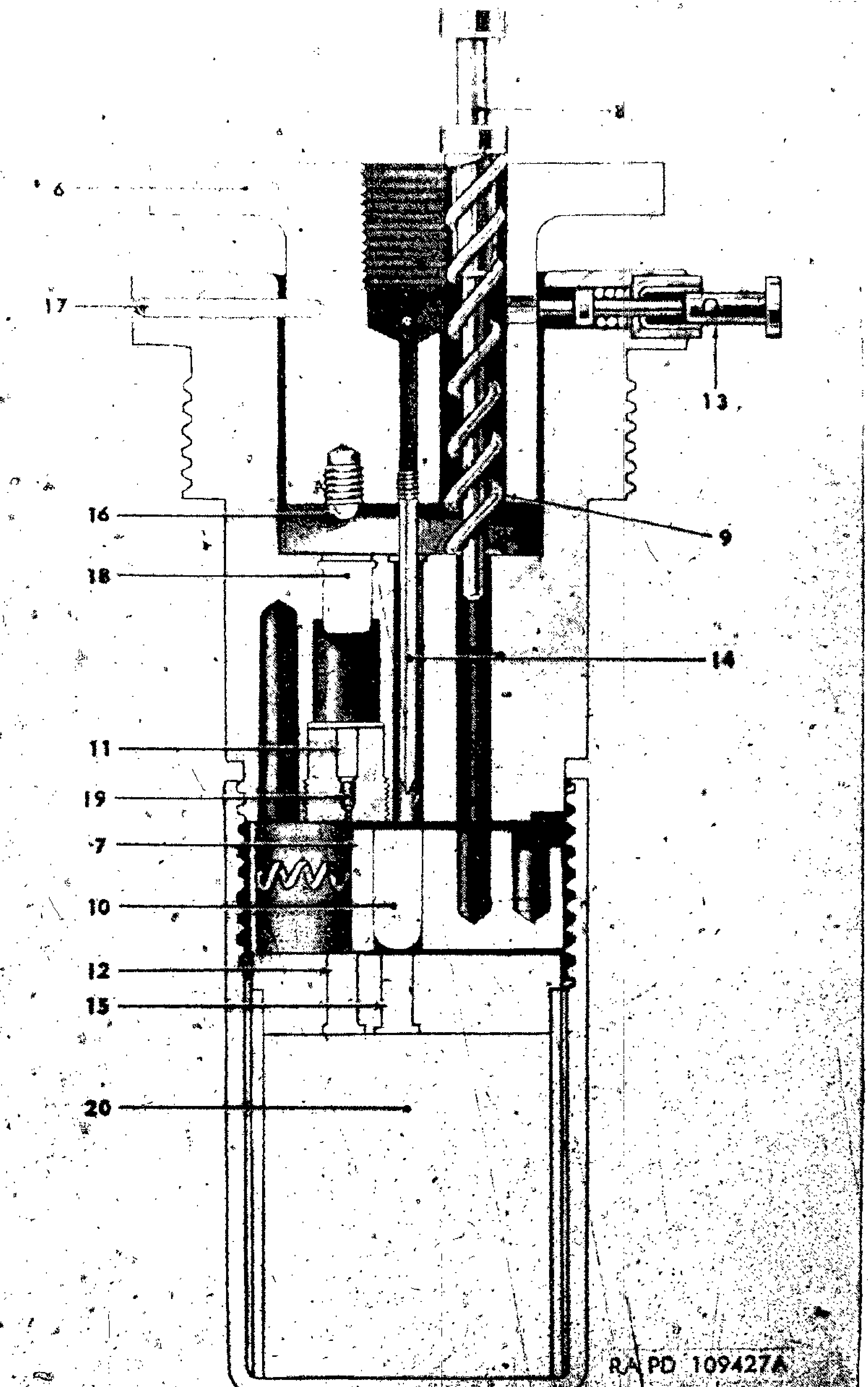

Figure 45. Fuze, bomb, nose, M163—armed for instantaneous action.

screw (4). For each 65.5 revolutions of the vane, the arming screw advances one turn, carrying the vane cup (2) forward with it. When the vane cup has progressed 1/4 inch, the safety blocks (5) are released. Positive ejection is insured by a flat spring assembled within the circle of blocks. As the arming screw advances, the arming stem (8) follows, driven by its spring (9), until the lower collar strikes the end of the setting pin (13) and further progress of the stem is stopped. By this time, however, the end of the arming stem has cleared the first step of the detonator-slider (7) which moves by spring action to line up the detonator (10) with the delay element (11) and booster lead (12). Further progress of the slider is prevented by the arming stem bearing on the second step of the slider and return of the slider is prevented by a spring detent (not illustrated) acting in a stepped groove. The arming screw continues to progress without further significance until the vane cup assembly pulls off. On impact, the striker (6) is forced into the fuze body and the delay firing pin (16) strikes the delay primer (18) which ignites the delay train (11 and 19). This burns for 0.1 to 0.15 second and initiates the relay (19), detonator, and booster (20).

c. Instantaneous Functioning (fig. 45). When the fuze is set for instantaneous action, the setting pin (13) is placed in the shallow slot and the end of the pin does not protrude into the arming pin channel. Function proceeds as with delay action except that the arming stem (8) continues to follow the arming screw and clears the second step of the detonator-slider (7) which then moves so that the detonator (10) is lined up with the instantaneous firing pin (14). On impact, the firing pin is driven directly into the detonator, initiating the explosive train.

d. Dropped Safe. When the fuze is dropped safe, the arming wire is not withdrawn, the vane cannot turn, the safety blocks are retained in place, and the detonator is held out of line. On impact, the safety blocks prevent the striker moving inward. However, on multiple impact—bouncing—the vane cup may be sheared off and the safety blocks ejected. In this case, the stub of the arming screw remains in place and, by restraining the arming stem, prevents the detonator-slider from moving to the armed position and thus prevents detonation of the bomb.

51. Fuze, Bomb, Nose, M164

This fuze differs from the fuze M163 (par. 50) in that the delay element is 0.01-second delay, and in the markings. In all other respects it is similar to the model described.

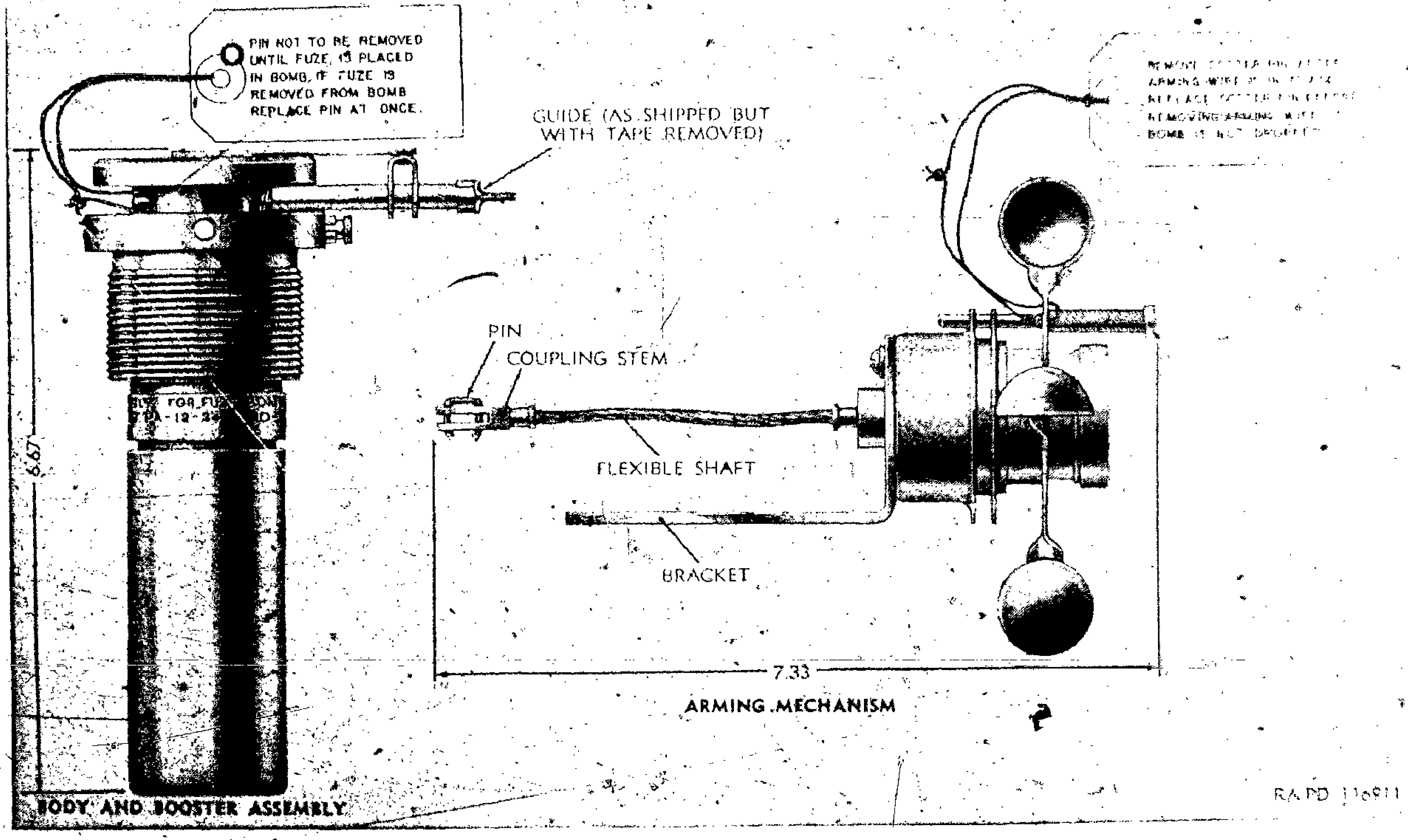

Figure 46. Fuze, bomb, nose, M171.

52. Fuze, Bomb, Nose, M165

This fuze differs from the fuze M163 (par. 50) in that the delay element is 0.025-second delay, and in the markings. In all other respects it is similar to the model described.

53. Fuze, Bomb, Nose, M171 (T85)

a. DESCRIPTION. This is a special type nose fuze (fig. 46) intended for use with a bomb currently under development. The fuze consists of two separate assemblies; a body and booster assembly and an arming device assembly. When the fuze is installed in the bomb, a flexible shaft extending from the arming device, is coupled to a flat metal guide extending from the arming screw contained in the body and booster assembly. The arming device is essentially the arming head of an AN–M100A2 tail fuze (par. 80) but is provided with an anemometer type arming vane and a bracket for attachment to the bomb. The body and booster assembly is a modified M163 type nose fuze (par. 50); the M171 body and booster differs from the M163 in that it does not have a vane cup and safety blocks, the arming screw is mounted transversely in the striker, and the delay time is 0.025 second. The body and booster assembly is 6.7 inches long and weighs 3.5 pounds; the arming device is 6.9 inches long and weighs 1.2 pounds. The fuze arms after 875 revolutions of the arming vane.

b. FUNCTIONING. The fuze may be set for instantaneous or delay action as described in paragraph 45*c*. When the bomb is dropped, the rotation of the arming vane acts through the reduction gear train, flexible shaft, and guide to unscrew the arming screw and release the arming stem and detonator-slider which function thereafter as described in paragraph 50.

c. DROPPED SAFE. The arming device is provided with a spring-loaded safety pin which prevents the arming vane from rotating; the safety pin cannot be ejected until the arming wire is withdrawn. Therefore, when the bomb is dropped safe, the arming wire, remaining in place, prevents ejection of the safety pin. The detonator, in the fuze body, being out of line with the booster leads, cannot cause functioning upon impact.

Section III. IMPACT NOSE FUZES: SINGLE ACTION

54. Fuze, Bomb, Nose, M108

a. DATA. This fuze (fig. 47) is an arming pin type which arms immediately on withdrawal of the arming wire. It acts to detonate the bomb immediately on impact. The fuze is 2.66 inches in length, 1 inch in diameter, and weighs 0.54 pound. FUZE, bomb, nose, M108 is now authorized for use only in the 100-pound practice-target bomb M75 and M75A1.

b. DESCRIPTION. The fuze body is an unthreaded cylinder with a striker assembly which protrudes ¾ inch from the head. Near the base there are two ball latches which engage a groove in the fuze seat when the fuze is assembled to the bomb. Near the head end, a spring-loaded arming pin passes through the fuze body and striker. The arming pin is held in place in transit and storage by a safety cotter pin, and, when the fuze is assembled to the bomb, by the arming wire. A fine shear wire also passes through the fuze body and striker. A spring-loaded safety block is held in position between the striker head and fuze body by a thin metal plate which is held in place by the safety cotter pin or the arming wire.

c. FUNCTIONING. When the arming wire is withdrawn (fig. 48) the arming pin and safety blocks are thrown clear by the action of their respective springs. The striker assembly is then held in place only by the shear wire. Upon impact the wire is sheared and the firing pin driven into the primer-detonator.

d. FUZING.

(1) Unseal fuze can, remove fuze from packing, and inspect.

(2) Turn safety cotter pin so that it lies across the axis of the fuze.

(3) Insert fuze into fuze seat until the ball latches engage the groove.

(4) Thread arming wire through forward suspension lug of bomb.

(5) With the thumb on the head of the arming pin and a finger on the safety block plate, depress the head of the arming pin until the inner eyelet in the arming pin is exposed above the safety block plate. Pass 2 to 3 inches of the arming wire through the inner eyelet, taking care that the wire is neither burred nor kinked. No safety clip is necessary.

(6) Remove safety cotter pin.

e. DEFUZING. If bomb is not dropped, the fuze will be returned to its original condition and packing as follows:

(1) Replace safety cotter pin.

(2) Withdraw arming wire and return it to its packing.

(3) Remove fuze from bomb and replace fuze in packing can; reseal can with adhesive tape.

f. ACCIDENTAL ARMING. If this fuze should become armed accidentally, the arming pin should be replaced or an improvised pin substituted. If the shear wire is unbroken and all components

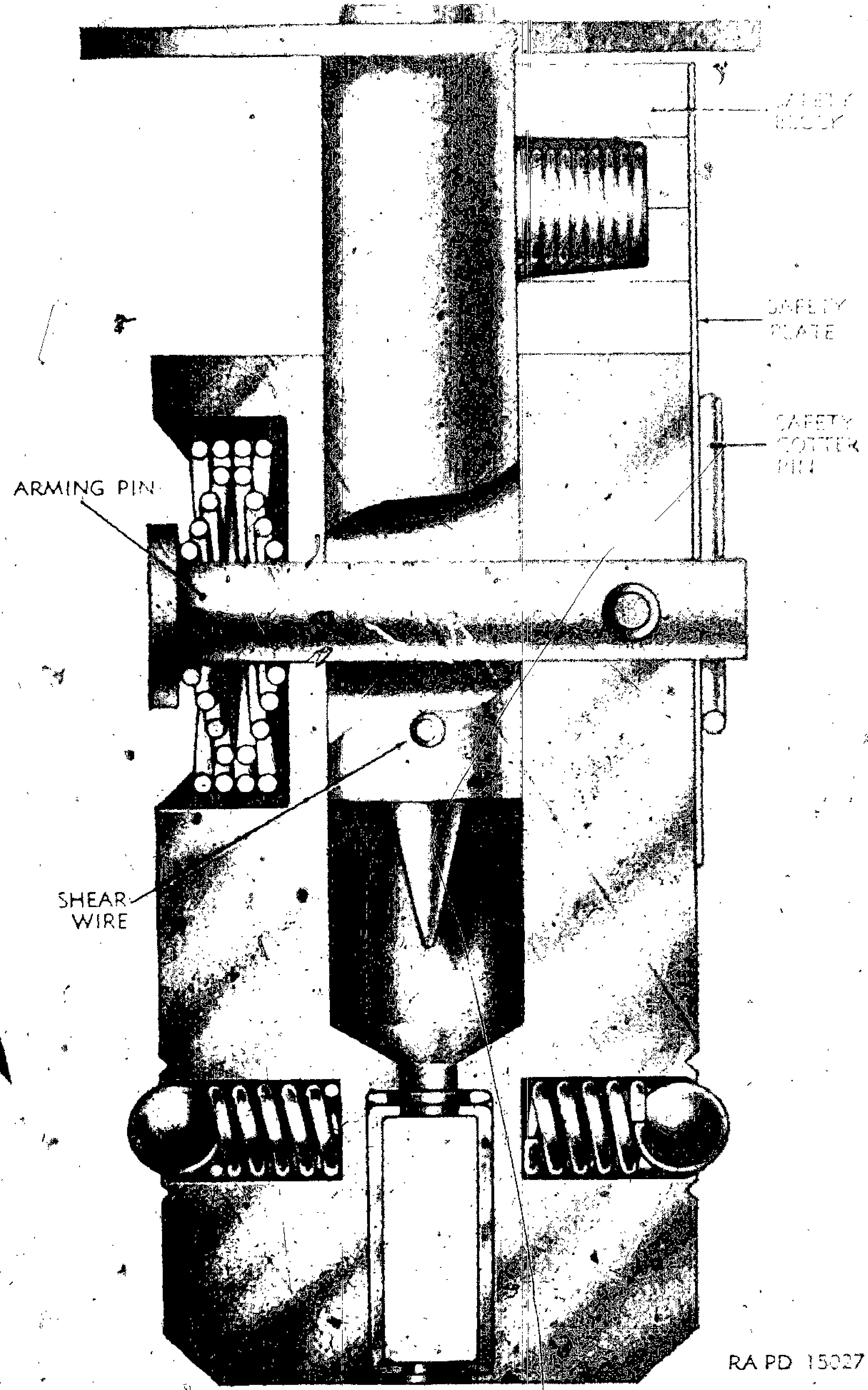

Figure 47.—*Fuze, bomb, nose, M108—section.*

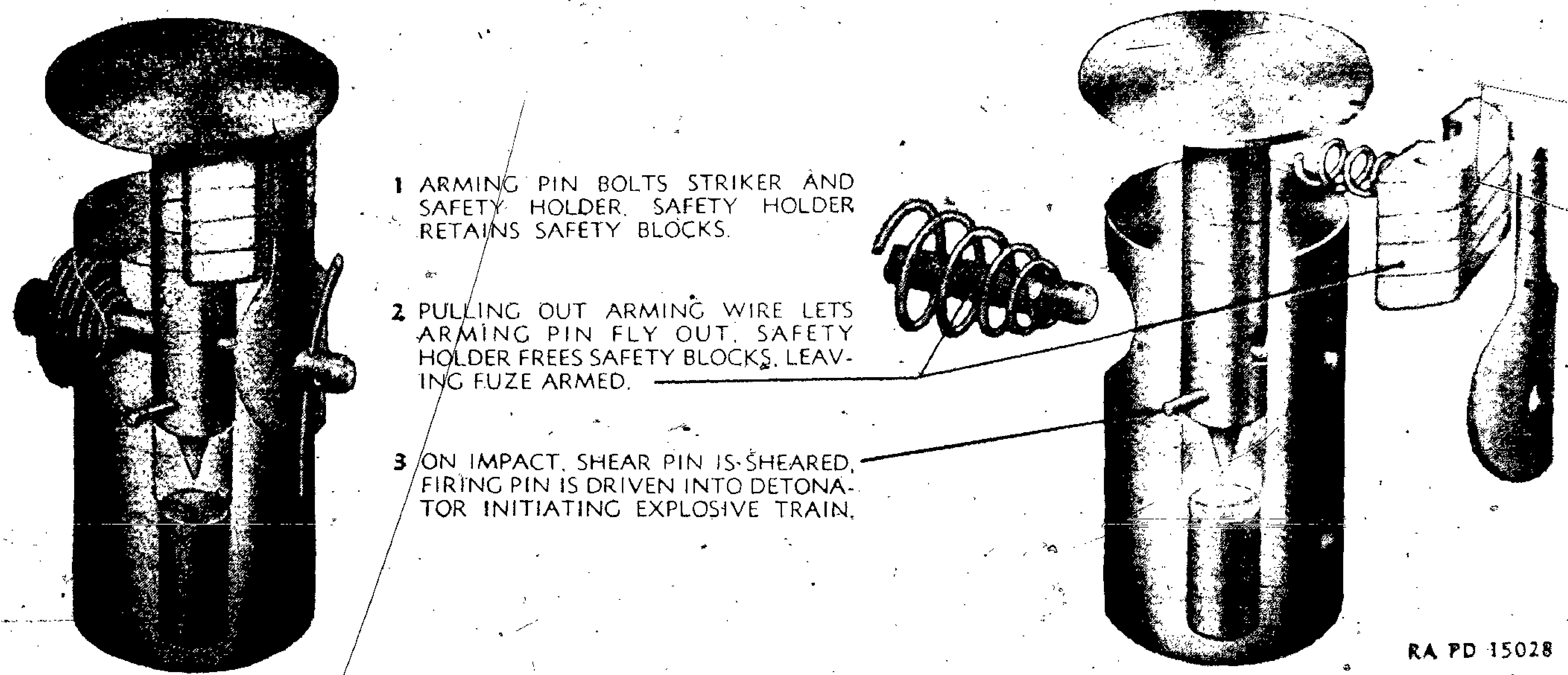

Figure 48. Fuze, bomb, nose, M108—method of arming.

—safety block with spring and plate, arming pin and spring—are available, they may be reassembled and the fuze used. *Otherwise destroy the fuze.*

Warning: The arming pin above is not sufficient to render this fuze safe. Without the safety block a small drop could cause the body to deform, and drive the firing pin into the detonator.

g. MARKING. The head of the fuze is stamped with the type and model, lot number, manufacturer's initials, and date loaded. A tag attached to the cotter pin reads: "To be removed after arming wire is inserted. If bomb is not dropped, replace pin before removing arming wire."

h. PACKING. FUZE, bomb, nose, M108 is packed one per sealed container. In general, the fuze container is packed in the box with the bomb. When issued in bulk, the fuze is packed 200 (in individual containers) per box.

55. Fuze, Bomb, Nose, M110A1

a. DATA. This fuze (fig. 49) is an arming vane type nose fuze which arms after 325 revolutions of the arming vane. It acts to detonate the bomb on impact. It is 3.7 inches long, 1.75 inches in diameter, and weighs 1.04 pounds. It is authorized for use with the fin-stabilized fragmentation bombs and 115-pound chemical bombs of M70 series. This fuze differs from FUZE, bomb, nose, M110 in that the M110 requires 455 revolutions of the vane to arm and in that the M110A1 has a "C" shaped safety block between the striker and fuze body, while the M110 has a 3-segment safety block. The M110A1 is shipped with vane assembled; the M110 is shipped with vane separate.

Note. FUZE, bomb, nose, M110 will not be used unless it has been renovated. When renovated it will be so indicated on a tag attached to the fuze.

b. DESCRIPTION. The M110A1 is cylindrical in shape with the arming vane hub and firing pin protruding from the head and the booster cup protruding from the base. The hub assembly consists of an arming sleeve, hub sleeve, upper ball race, vane, and vane nut. A gear with 33 teeth is staked to the inner end of the hub sleeve; a gear with 34 teeth is staked to the inner end of the arming sleeve which is screwed inside the hub sleeve. A pinion mounted inside the fuze body meshes with both these gears. The upper ball race, arming vane, and vane nut are assembled on the outer end of the hub sleeve in that order. The arming sleeve extends beyond the hub sleeve for 5/16 inch and holds the "C" shaped safety block between the striker disk of the firing pin and vane nut. A vane strap, stamped in one piece with the arming vane, forms the vane stop with a bracket on the fuze body. A shipping wire is sealed in the outer pair of holes in the vane stop.

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c. FUNCTIONING. When arming wire is withdrawn, the arming vane is rotated by the air stream, rotating the vane hub assembly with it (fig. 49). The vane hub gear (stationary gear) and arming sleeve gear (movable gear) are both in mesh with the pinion, but the arming sleeve gear has one more tooth than the vane hub gear. Consequently, only the teeth engaged in the pinion are actually in line and the next pair of teeth are slightly out of line. As the next pair engage the pinion, it lines them up, causing, as the gears rotate, a slow progression of the sleeve gear with respect to the hub gear. This causes the arming sleeve to unscrew from the hub and gradually withdraw into the body of the fuze. When the arming sleeve withdraws enough to clear the safety block, the block is thrown clear since the slot in the block is wide enough to clear the firing pin and spring. The sleeve continues to progress until the gear disengages from the pinion and the vane and hub continue to rotate idly. Upon impact, the firing pin is driven into the detonator which explodes, causing the detonation of the booster.

d. PREPARATION FOR USE. When FUZE, bomb, nose, M110A1 is issued, it is assembled to bombs only when the bombs are assembled in clusters. When so shipped, the fuze contains a shipping wire sealed in the vane stop and the safety blocks are fastened in place with adhesive tape. It is necessary to remove the seal wire and adhesive tape before the cluster is installed in the plane. If the safety block should fall out when the tape is removed,

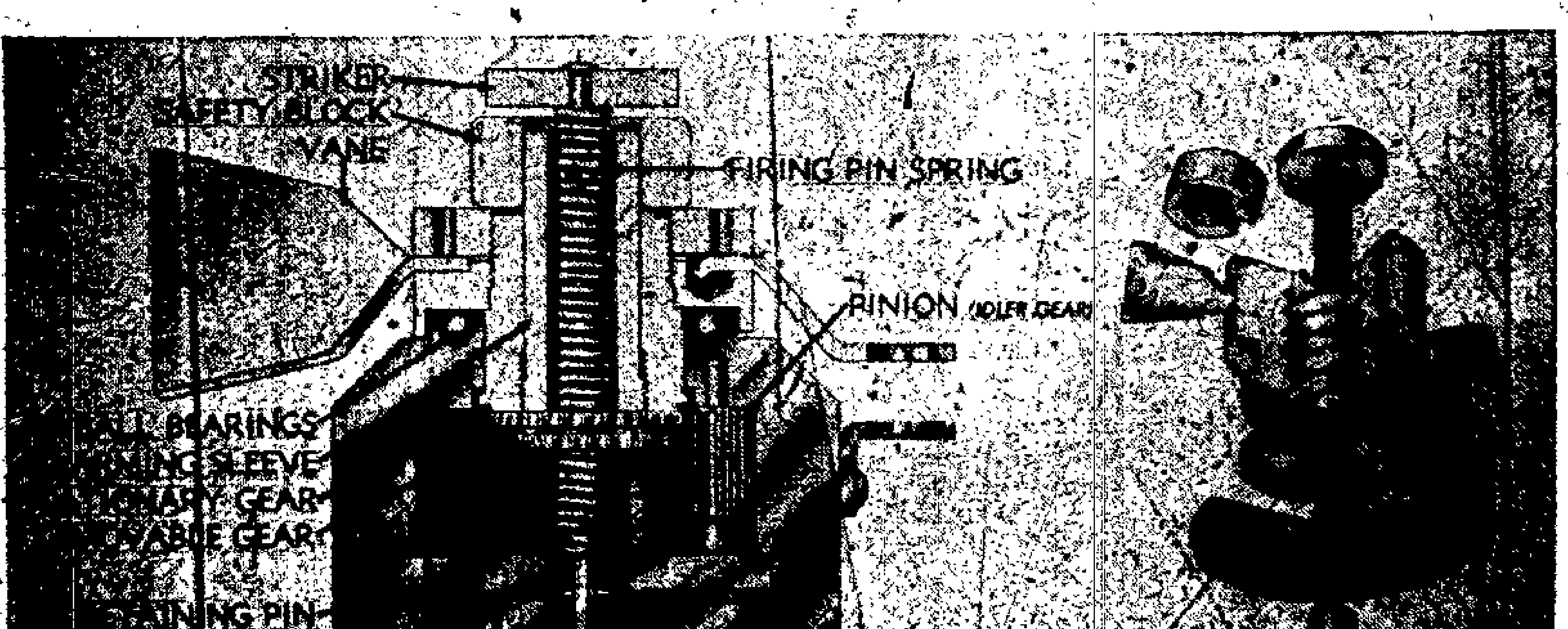

Figure 49. Fuze, bomb, nose, M110A1.

the block will be replaced and retaped and the bomb removed and unfuzed. Such fuzes will be destroyed as unserviceable ammunition in dangerous condition. When issued separately, the fuze is ready to be assembled to the bomb when unpacked.

e. FUZING. When assembling FUZE, bomb, nose, M110A1 to the bomb, the following sequence of operations will be observed.

(1) Unseal and open the metal can and remove fuze.

(2) Remove shipping supports from fuze and insure that safety block is in place.

(3) Inspect fuze to insure that it is serviceable.

(4) Screw fuze into bomb handtight.

(5) If bomb is to be clustered, assemble the bomb to the cluster adapter, taking care that vane stop of the adapter will prevent the fuze from arming, then remove shipping wire and seal.

(6) If the bomb is intended for individual suspension, insert the end of the arming wire through the forward suspension lug of the bomb and then through the inner eyelets of the fuze vane stop. Place two safety clips on the wire and slide them up until the inner one just touches the face of the vane strap. Adjust the arming wire to protrude 2½ inches beyond the clip, taking care that the wire is neither kinked nor burred.

(7) Remove the shipping wire and seal.

f. DEFUZING.

(1) If bomb was prepared for individual suspension and not dropped, the fuze will be returned to its original condition and packing as follows:

(*a*) Replace shipping wire—twist cut ends together.

(*b*) Remove safety clips and withdraw arming wire. Repack clips and wire.

(*c*) Unscrew fuze from bomb and repack in fuze container; reseal container with adhesive tape.

(2) If bomb is a part of a cluster that was not dropped, the bomb will be defuzed and the fuze returned to its original condition and packing as follows:

(*a*) Replace shipping wire in each fuze in the cluster—twist each pair of cut ends together.

(*b*) Remove bomb from cluster adapter.

(*c*) Unscrew fuze from bomb and repack fuze in metal can; reseal container with adhesive tape.

g. ACCIDENTAL ARMING. This fuze is armed when the safety block is displaced from its position between the striker and the vane hub whether the arming vane has turned or not. If a fuze should become armed accidentally, carefully replace the safety block, using improvised shims, if necessary, to take up all play between the striker and vane hub. Tape the blocks in place. The fuze may then be handled with comparative safety. No other attempt should be made to restore the fuze to its original unarmed condition; it should be destroyed.

h. MARKING. FUZE, bomb, nose, M110A1 has the type, model, lot, loader, and date loaded stamped in the body. Attached to the seal wire is a tag which reads: "Remove after arming wire is inserted and safety clip attached thereto. If bomb is not dropped, replace sealing wire before removing arming wire."

i. PACKING. This fuze is packed 1 per metal can and in quantities of either 48 or 50 per wooden box. In the 48-fuze per box packing, 12 cans are first packed in a carton and 4 such cartons placed in the box.

56. Fuze, Bomb, Nose, M120A1 (AN–M120A1)

a. DATA. FUZE, bomb, nose, M120A1 is a detonator-safe, arming pin type nose fuze which arms by mechanical time action 1.9 seconds after ejection of the arming pin. It acts to detonate the bomb instantaneously on impact. This fuze is authorized for use with parachute type fragmentation bombs. The fuze is 4.6 inches in length and 2.3 inches in diameter. FUZE, bomb, M120, an older model, arms in 2.5 seconds. It is otherwise the same as the M120A1.

b. DESCRIPTION. FUZE, M120A1 is cylindrical in shape with a mushroom-shaped striker protruding from the head and the booster cup assembled to the base (fig. 50). The arming pin housing protrudes from both sides of the fuze body.

c. FUNCTIONING. The time mechanism of this fuze drives a hollow cylinder which contains the firing pin and is concentric with the fuze axis (figs. 50 and 51). A section of this cylinder bears on the slider pin on the slider which houses the detonator and holds the slider in the safe position. A shoulder on the arming pin which also bears on the section prevents movement of the time mechanism until the arming wire is withdrawn and the arming pin is ejected. The continuation of the arming pin also blocks the slider so that the fuze cannot arm until more than half of the arming pin is expelled. When the arming pin is ejected, the time mechanism starts and rotates the cylinder section. After 1.9 seconds, the cylinder section clears the slider pin and the slider is moved by its spring so that the detonator lines up with the firing pin. The slider lock prevents any further motion of the slider. Once armed, the fuze will function from a blow on the striker in any direction.

d. PREPARATION FOR USE. When removed from its packing, the fuze is ready for use. *This fuze is very sensitive and should be handled with extreme care.*

e. FUZING. When FUZE, bomb, nose, M120A1 is used with bombs assembled in clusters, the bombs may be fuzed when issued and the only necessary action is that of removing the safety cotter pin and tag from the arming pin when the cluster is placed in the bomb rack. When such bombs are issued unfuzed, the fuze is assembled to the bomb in the following steps:

(1) Unseal fuze can and remove fuze from packings.

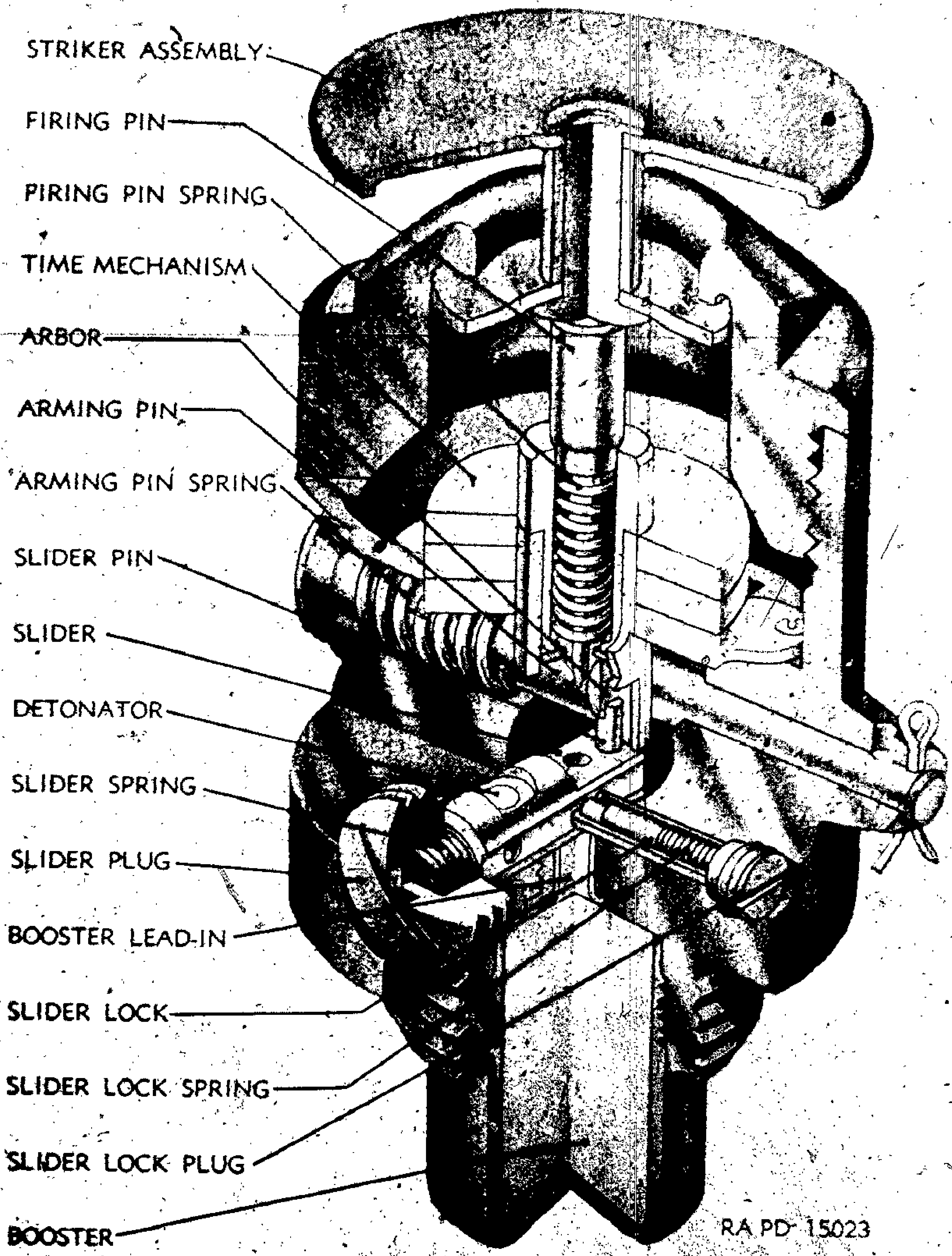

Figure 50. Fuze, bomb, nose, M120A1 (AN–M120A1)—sectioned.

Figure 51. Fuze, bomb, nose, M120A1 (AN–M120A1)—method of arming.

(2) Inspect for serviceability, clear threads, absence of corrosion, presence of arming pin, and delayed arming plug.

(3) Screw the fuze into the bomb handtight. (If the end of arming pin containing the cotter pin is not within a quarter turn of the arming cord hole in the parachute case, unscrew the fuze and insert an improvised paper gasket between the fuze and bomb so that, when screwed handtight, the arming pin and arming cord hole are within a quarter turn.)

(4) Remove the tape which holds the arming wire to the parachute case and unwind the cord from the nut between parachute case and bomb body.

(5) Press on the head of the arming pin so that the inner eyelet in the opposite end of the pin is exposed. Thread the arming wire through the inner eyelet far enough to take up the slack of the cord—no safety clip is required.

(6) Insure that there are no kinks or burs in the arming wire.

(7) Remove the safety cotter pin and tag.

f. DEFUZING. If bomb is not dropped, the fuze will be returned to its original condition and packing as follows:

(1) Replace safety cotter pin with tag still attached thereto.

(2) Withdraw arming wire from fuze.

(3) Rewind cord (attached to arming wire) around the nut between parachute case and bomb body and retape arming wire to parachute case.

(4) Unscrew fuze from bomb and replace fuze in packing can; reseal can with adhesive tape.

g. ACCIDENTAL ARMING. When the arming pin is even *partially* ejected this fuze should be regarded as extremely dangerous and will be destroyed.

h. MARKING. The type, model, lot loader's initials, and date loaded are stamped on the striker plate of the fuze. An instruction tag is attached to the cotter pin placed in the arming pin. This tag reads:

"Caution! Remove cotter pin before placing bomb or cluster in bomb rack. If bomb or cluster is not dropped, replace cotter pin on removing from bomb rack."

i. PACKING. The M120A1 fuze is packed 1 per metal can and in quantities of 24 per wooden box.

57. Fuze, Bomb, Nose, AN–M158

a. GENERAL. This fuze was developed to provide a detonator-safe replacement for the M110A1. When the latter fuze is assembled to bombs in a heavy cluster, there is some tendency that the fuze may function upon impact with a hard surface even though the fuze is unarmed. This possibility is avoided in the fuze AN–M158 by keeping the detonator out of line with the booster lead until arming is complete.

b. DATA. Fuze AN–M158 (fig. 11) is a detonator-safe, arming vane type which requires 375 to 512 turns of the vane to arm. It is 3.69 inches overall length and weighs 1.02 pounds. It is authorized for use with fin-stabilized fragmentation bombs and 115-pound chemical bombs. The fuze AN–M158 resembles the M110A1 in appearance except that the body is slightly longer and there is no safety block under the striker. In the unarmed condition, the striker is snug against the vane nut.

c. DESCRIPTION. The arming system consists of the arming hub, pinion, arming sleeve, firing pin, and detonator shutter (fig. 52). The arming hub is mounted in the forward end of the fuze body. Outside the body it carries the vane assembly, inside it carries a stationary gear with 39 teeth. The arming sleeve is screwed into the arming hub; at its inner end it carries the movable gear of 40 teeth. Both stationary and movable gears mesh with a grooved pinion in the fuze body. The arming sleeve carries within it the firing pin supported by its spring. The firing pin extends through a partition into the shutter cavity and into a recess in the detonator shutter. The shutter is mounted on a pivot and is held in the unarmed position by the firing pin. The shutter is spring-rotated and contains, in addition to the detonator, a spring detent which locks the shutter in position on arming.

d. FUNCTIONING. The airstream turns the vane and, with it, the arming hub assembly. The stationary gear drives the pinion which, in turn, drives the movable gear. Due to the different number of teeth, the movable gear lags one tooth with each rotation of the vane, screwing the arming sleeve forward in the arming hub. As the arming sleeve advances, it carries with it the striker and firing pin assembly. When the firing pin has advanced 0.25 to 0.32 inch, it clears the detonator shutter and the shutter snaps over to line up firing pin, detonator, and booster lead. The movable gear then enters the groove in the pinion and the assembly continues rotating without further action. The striker moved forward with the firing pin is ¼ to ⅓ inch above the vane nut and is supported only by its spring. On impact, the striker and firing pin are driven inward and strike the detonator, initiating the explosive train.

e. PREPARATION FOR USE. When removed from the packing, this fuze is ready for use.

f. FUZING.

(1) Remove fuze from packing and inspect to insure that it is clean and serviceable and that the striker is snug against the vane nut.

(2) Inspect bomb fuze seat to insure that it is clean and threads are in good condition.

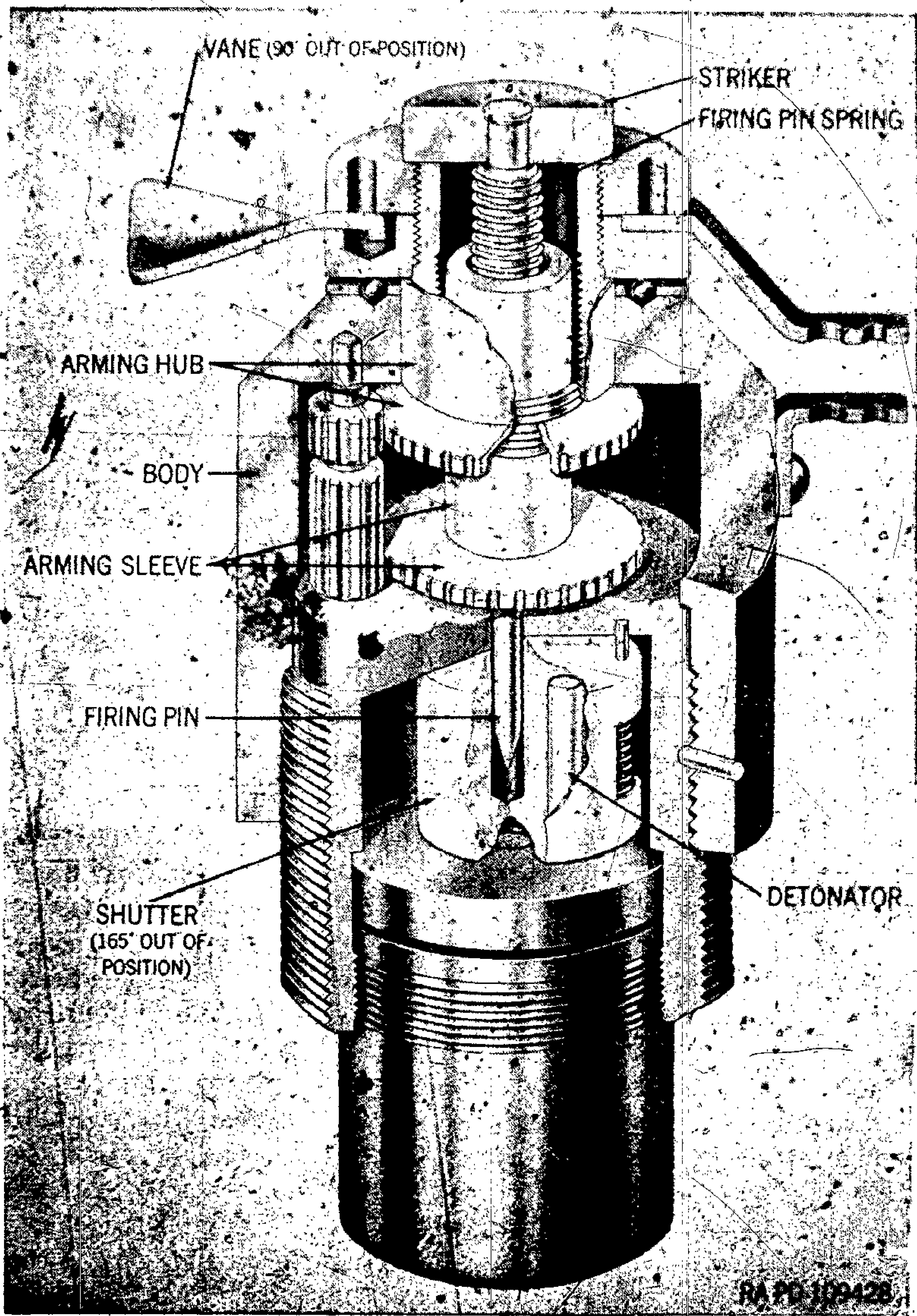

Figure 52. Fuze, bomb, nose, AN–M158—sectioned.

(3) Screw fuze into bomb handtight.

(4) If bomb is clustered, install vane lock in accordance with instructions for adapter. Be sure that vane lock prevents rotation of fuze vane. Cut and remove seal wire and tag.

(5) If bomb is for individual suspension, pass arming wire through forward suspension lug then through inner holes in arming wire bracket and vane strap, adjust wire to extend 2 to 3 inches beyond vane strap, and place two safety clips on the wire against the face of the strap. Take care that wire is not kinked or burred. Cut and remove seal wire.

g. DEFUZING.

(1) If bomb was prepared for individual suspension and not dropped, the fuze will be returned to its original condition and packing as follows:

(*a*) Replace shipping wire—twist cut ends together.

(*b*) Remove safety clips and withdraw arming wire. Repack clips and wire.

(*c*) Unscrew fuze from bomb and repack fuze in metal can; reseal can with adhesive tape.

(2) If bomb is a part of a cluster that was not dropped, the bomb will be defuzed and the fuze returned to its original condition and packing as follows:

(*a*) Replace shipping wire in each fuze in the cluster—twist each pair of cut ends together.

(*b*) Remove bomb from cluster.

(*c*) Unscrew fuze from bomb and repack fuze in metal can; reseal container with adhesive tape.

h. ACCIDENTAL ARMING. The fuze AN-M158 is armed when the detonator shutter has moved the detonator into line. External evidence of this is furnished by the striker moving away from the vane nut by more than 1/8 inch. Such a fuze may be made comparatively safe to handle by placing metal or wooden blocks between the striker and the vane nut so as to prevent inward motion of the striker; these blocks should be fastened in place. If a fuze is suspected of being armed, block the striker and dispose of the fuze as ammunition in unsafe condition.

Warning: Under no condition will any attempt be made to disarm a fuze suspected of being armed. Reverse rotation of the vane will force the firing pin into the detonator and fire the fuze.

i. MARKING. The type and model of fuze, lot number, loader's initials or symbol, and date loaded are stamped in the body of the fuze. A direction tag attached to the seal wire reads, "Remove sealing wire before placing cluster in bomb rack. If cluster is not dropped, replace sealing wire. On bombs not clustered arming wire must be inserted and safety clip attached thereto before sealing wire is removed."

j. PACKING. Fuze, AN-M158 is packed 1 per metal can, 30 cans per wooden box.

58. Fuze, Bomb, Nose, M170

FUZE, bomb, nose, M170 is similar to the fuze M120A1 (AN-M120A1) (par. 56) except that the arming delay time is 1.5 seconds. It is authorized for use with 23-pound fragmentation bombs. In other respects it is similar to the model described.

59. Fuze, Bomb, AN-MK 219 Mod 3 and Mod 4

a. DATA. This fuze (figs. 53 and 54) is a detonator-safe arming vane type nose fuze which requires 175 revolutions of the vane to arm. The modifications are identical and are used only to designate the manufacturer of the metal parts. Upon impact, it acts to detonate the bomb immediately. This fuze, in combination with AN-Mk 230 Mods. 4, 5, and 6, may be used when selective arming is available for surface demolition effect. It may be used in GP bombs by using an adapter and Mk 4 auxiliary booster. An adapter and two Mk 1 auxiliary boosters are required when this fuze is used with the 350-pound depth bomb AN-Mk 54 and Mod. 1 The fuze is 5.5 inches in length, 2.3 inches in diameter, and weighs 4 pounds.

b. DESCRIPTION. The AN-Mk 219 is cylindrical with a flat conical head (fig. 13). Below the head, which does not rotate, are the ring-shaped vane carrier, the flange of the striker, the outer sleeve, and the fuze body. Eyelets in lugs on the vane carrier and in the striker flange form a vane stop. The outer sleeve contains a lock screw which holds the arming and firing assembly in the fuze body (fig. 53). The fuze body is a cylindrical cup containing the booster and booster lead. The rest of the fuze mechanism, assembled on a central shaft, consists of arming nut, rotor, firing pin holder, striker, vane carrier with reduction gears, and head. As shipped, the detonator, the firing pin holder, and striker are out of line with the booster lead and each other and the firing pin is nested in a recess in the striker.

c. FUNCTIONING. As the arming vane is rotated by the air stream, it acts through the reduction gears to turn the central shaft which screws forward in the arming nut, advancing the striker, vane carrier, and head (figs. 53 and 54). When the firing pin is clear of the recess in the striker, the forward motion stops and the striker is turned about the central shaft. As it turns, a lug on the striker body picks up the firing pin holder and the rotor in turn, lining up the striker firing pin, detonator, and booster lead. When proper alinement is reached a spring loaded plunger drives into a recess in the striker, preventing further rotation.

d. PREPARATION FOR USE. Once removed from its packing, the fuze is ready for use.

e. FUZING. The fuze is assembled to the bomb in the following sequence:

(1) Remove fuze from sealed container and inspect for defects in threads, bent vanes, and other evidence of unserviceability.

(2) Screw the fuze into the bomb handtight.

(3) Thread one end of the arming wire through the forward suspension lug of the bomb.

(4) Remove the safety cotter pin from the vane stop and rotate the vane carrier slightly in each direction to insure that the vanes rotate freely. Thread the end of the arming wire through the uppermost eyelet in the striker flange and in the nearer lug of the vane carrier. In this step, the vane carrier must not be rotated more than a quarter turn in either direction.

(5) Slip two safety clips over the wire so that they are snug against the vane stop, and adjust the arming wire so that 2 to 3 inches will protrude beyond the vane carrier lug when the bomb and arming wire are installed in the rack. Cut off the excess wire and remove all kinks and burs.

f. DEFUZING. If the bomb is not dropped, the fuze will be returned to its original condition and packing as follows:

(1) Holding the vane to prevent rotation, remove safety clips from the arming wire, withdraw the arming wire and replace it with the safety cotter pin. Repack clips and arming wire.

(2) Unscrew fuze from the bomb and repack fuze in the metal can; reseal the can with adhesive tape.

g. PRECAUTIONS. In addition to the general precautions for handling fuzes, the following will be observed:

(1) If a fuze is dropped from a height less than 5 feet, the fuze will be examined for superficial damage to threads, vanes, booster cups, etc., and if none is apparent, the fuze will be considered serviceable.

(2) If the fuze is dropped 5 feet or more, it will be considered unserviceable and turned in for disposal.

h. ACCIDENTAL ARMING. If the flange of the striker has

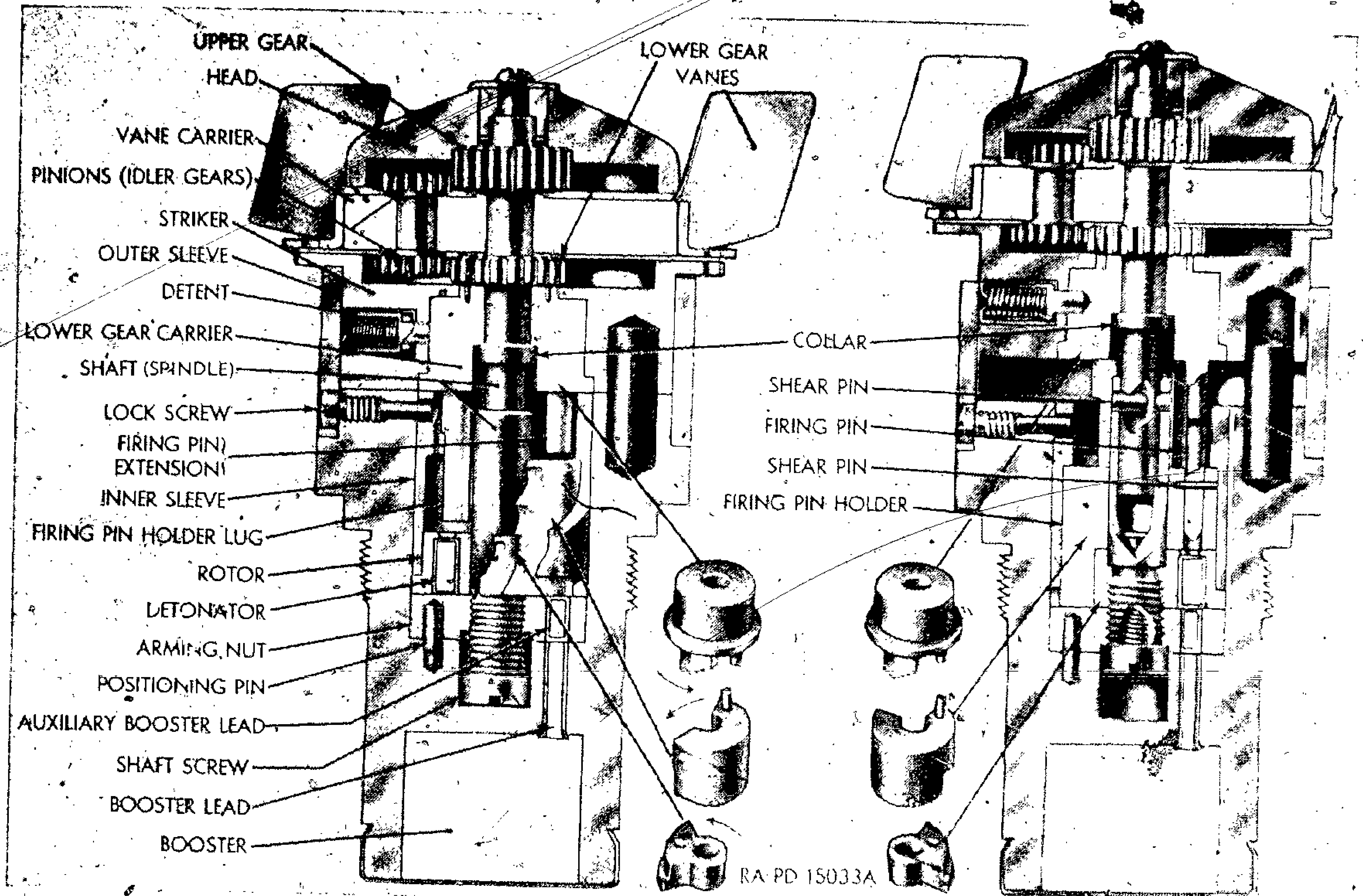

Figure 53. Fuze, bomb, nose, AN-MK 219 Mods 3 and 4—sectioned.

1 PINIONS TURN WITH VANES. LOWER GEAR IS LOCKED, UPPER GEAR IS FORCED IN CLOCKWISE DIRECTION, ONE TOOTH FOR EVERY COMPLETE ROTATION OF VANE.

2 SPINDLE IS SCREWED UPWARD UNTIL IT JAMS, THUS STOPPING UPPER GEAR.

3 LOWER GEAR IS FREE TO ROTATE, AS LOWER GEAR CARRIER HAS BEEN LIFTED OUT OF LOCK.

4 PINION NOW FORCES LOWER GEAR COUNTERCLOCKWISE.

5 THE EXPLOSIVE TRA[illegible] FOLLOWS:

(A) FIRING PIN EXTEN[illegible] FROM POSITION a TO [illegible] d.

(B) FIRING [illegible] b TO POSITION d.

(C) DETONATOR MOVES FROM [illegible] c TO POSITION d.

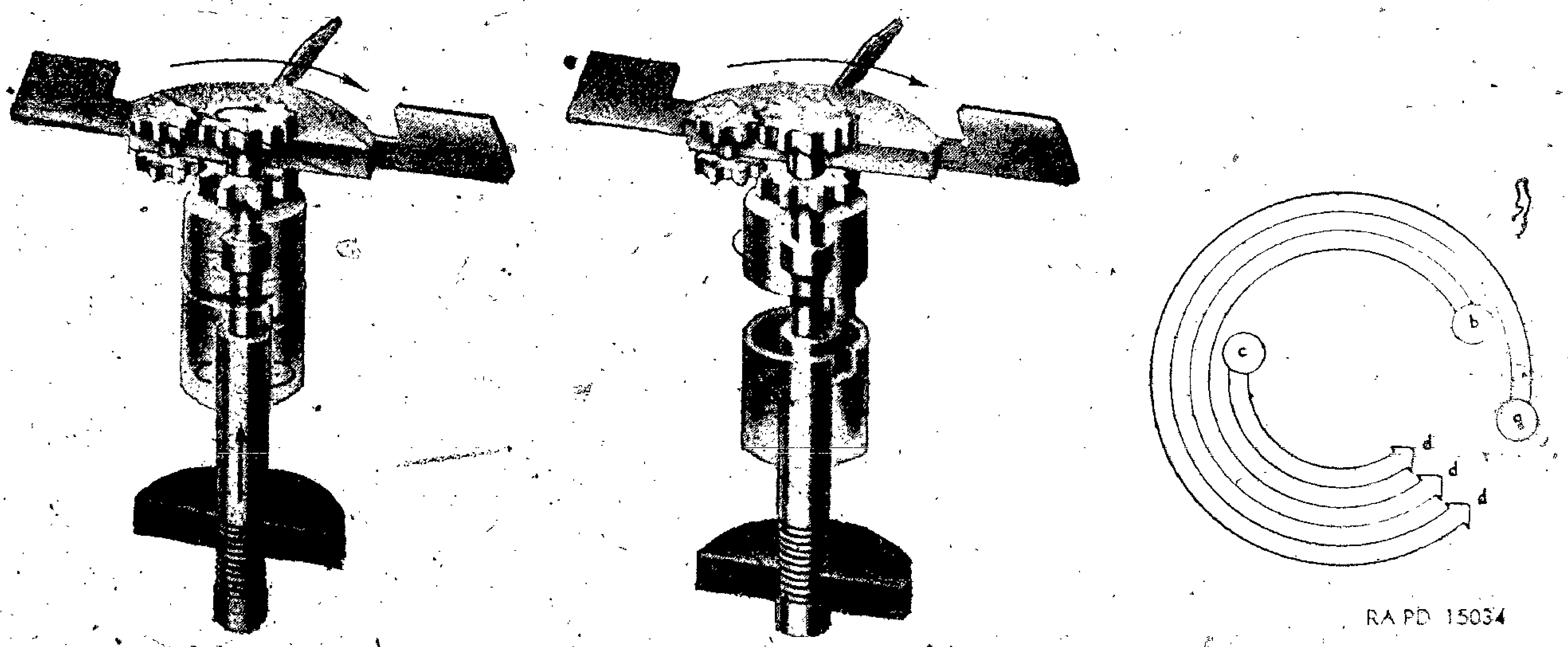

Figure 54. Fuze, bomb, nose, AN–MK 219 Mods 3 and 4—method of arming.

moved ¼ inch or more away from the edge of the outer sleeve, the fuze will be regarded as armed. In such cases the lock screw should be removed from the side of the fuze and the arming and firing mechanism should be withdrawn from the fuze body by carefully pulling the striker flange forward along the axis of the fuze until the entire assembly is clear. This assembly will be treated with extreme care until it can be disposed of safely.

i. MARKING. The fuze has the type, model, lot, loader's and inspector's initials, and the date loaded stamped on the body. A tag attached to the safety cotter pin in the vane stop reads on one side: "Remove safety cotter pin after bomb is placed in dropping gear and prior to assembling arming wire." The other side reads: "If bomb is not dropped, replace safety cotter pin before removing bomb from dropping gear." Fuzes may be marked AN–Mk 19 Mod 2 or Mk XIX–2 which are earlier designations for this fuze.

j. PACKING. This fuze is packed one per metal can and in quantities of six cans per metal crate.

Section IV. VT FUZES

60. General

VT (proximity) fuzes have also been called Influence, Special, Buck Rogers, Pozit, and Bonzo. In effect, they are automatic time fuzes which, without setting or adjustment, detonate the bomb on approach to the target at the most effective point on its trajectory. VT fuzes are essentially radio transmitting and receiving units. In flight, the fuze broadcasts a radio signal which is continuous. When this signal is reflected from any object to the armed fuze, it interacts with the transmitted wave to produce ripples or beats. When the beat reaches a predetermined intensity, it trips an electronic switch which permits an electric charge to flow through an electric detonator. VT fuzes may profitably be employed in any operation in which air burst at heights between 10 and 250 feet will increase the effectiveness of the bomb in which it is used. VT fuzes are physically interchangeable with the M163 type (par. 50) but they are not tactically interchangeable in that they function before impact. They are similar to time fuzes in production of air burst, but the time fuze is governed by distance from the origin and the VT fuze by its proximity to the target. The VT fuzes described herein are listed in table III.

61. Description

a. EXTERNAL. There are two types of VT fuzes, the bar type AN–M166 and the ring type AN–M168 (fig. 13). The bar type [illegible] can be used effectively in *any* bomb with a fuze well that will accommodate the M163 type nose fuse, while the ring type, although it fits the same fuze well, can be used only in the bomb sizes for which it is specified. In both types, the external part of the fuze body is a cylinder 3 to 4 inches in diameter and 5 inches long, with a vane at the nose. The ring type has a metal ring surrounding the vane with a vane stop pin sealed in the ring. The bar type has two 4-inch metal bars extending radially from the head, and a vane stop arm mounted on a bracket on the side. In both types, the part of the body which is assembled within the bomb conforms in size and shape to the M163 type nose fuse except that there is a safety-pin clipped around the base and extending into the end of the fuze. This safety pin is never removed until just before assembling the fuze to the bomb.

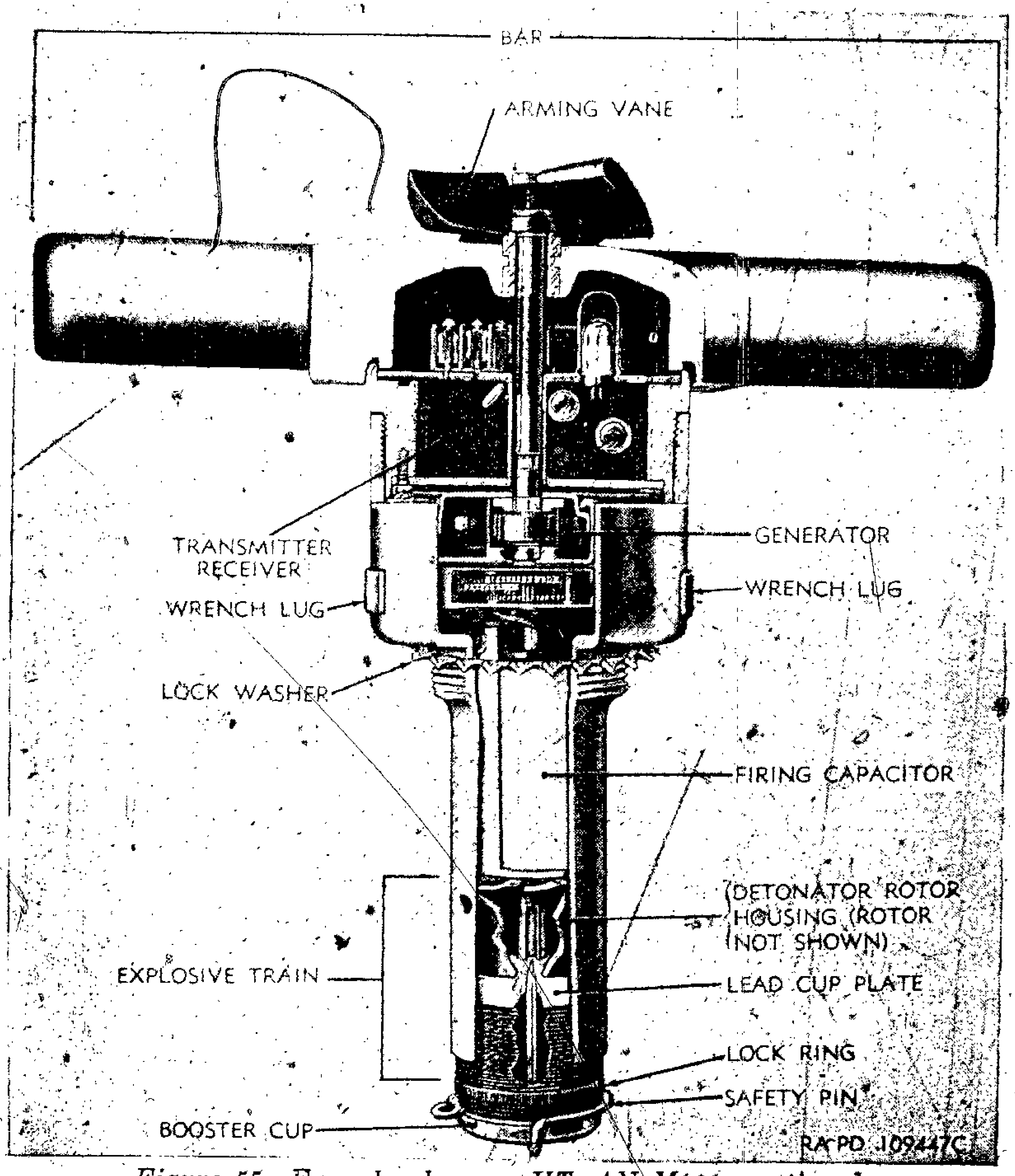

Figure 55. Fuze, bomb, nose, VT, AN-M166—sectioned.

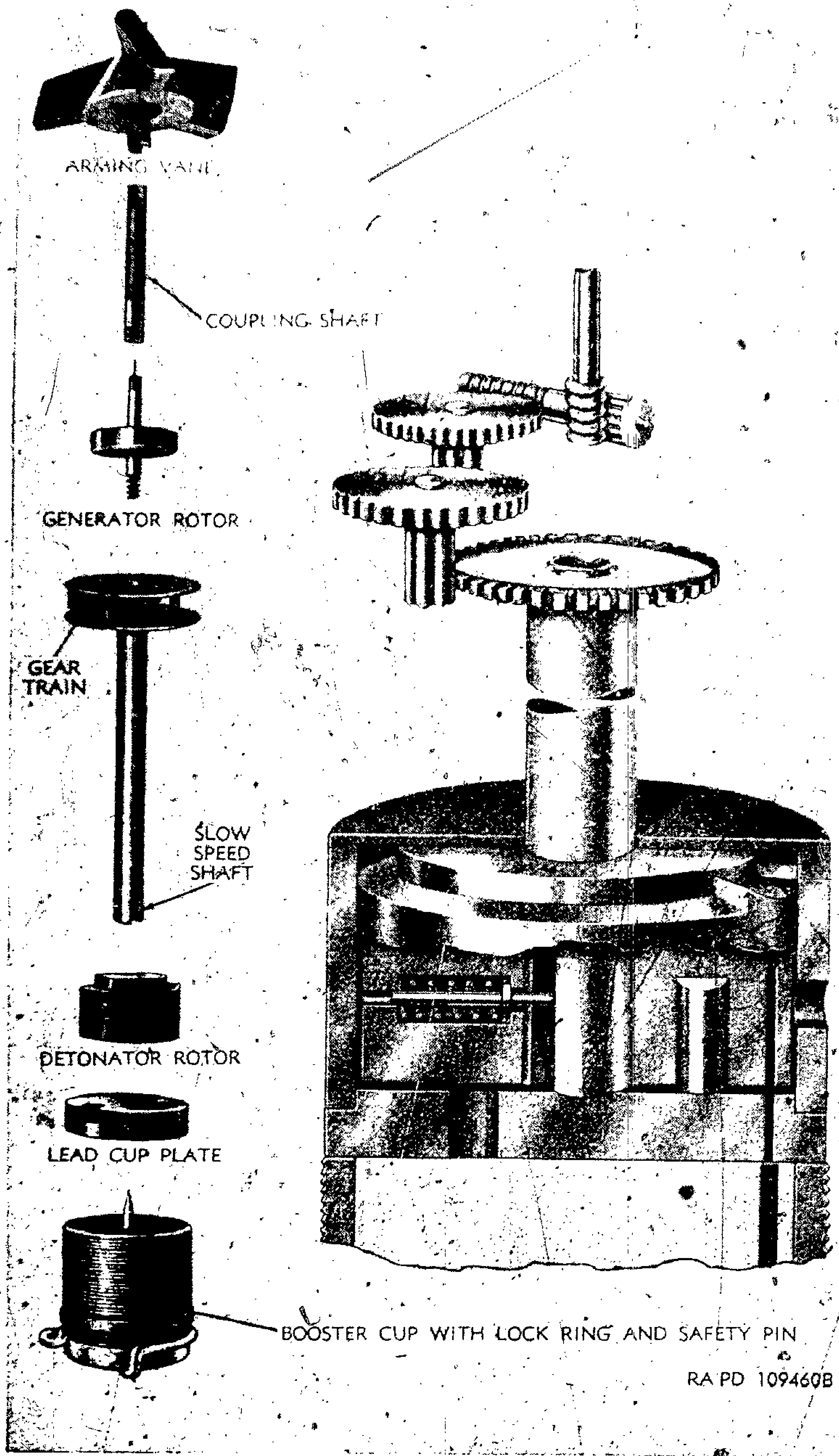

Figure 56. VT bomb fuze—details of mechanical arming system.

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b. FUNCTIONING. The arming vane drives a high speed (coupling) shaft and, through a reduction gear train, a slow speed shaft (figs. 55 and 56). There is mounted on the high speed shaft an electric generator which furnishes power to charge a firing capacitor and to operate the transmitting and receiving unit which controls the electronic switch between the firing capacitor and electric detonator. The detonator rotor is keyed to the slow speed shaft by a spring-loaded pin. The rotor controls both mechanical and electrical arming; it keeps the detonator out of line with the booster lead, and it keeps the detonator out of contact with the firing circuit, until arming is complete. As the rotor is turned to the armed position, the outer end of the key pin is driven by its spring into a recess in the rotor housing while the inner end withdraws from the keyway in the shaft. When a material object enters the zone of influence of the fuze, the reflected wave causes the firing switch to operate, passing the charge of the firing capacitor through the electric detonator, thus initiating the explosive train. Since these fuzes operate on any object, airborne or grounded, which comes within their radius of influence, the minimum safe air travel (MinSAT) is carefully calibrated for the protection of friendly planes. The MinSAT is measured for representative samples of each lot of VT fuses and is marked on every fuze of the lot. Mechanical arming delay devices are furnished by means of which MinSAT can be increased by as much as 20,000 feet.

62. Characteristics

a. GENERAL. VT fuzes function automatically, on approach to or passing any material target, causing an air burst at an effective height or distance. While only one model of each type (ring type and bar type) has been standardized, additional experimental models have been issued. These differ from the standard and among themselves in height of burst and MinSAT (table III).

b. HEIGHT OF BURST (figs. 57 through 59). Ring type fuzes produce approximate heights of burst from 10 to 250 feet depending on the size of bomb, nature of target, altitude, and speed of plane at release. Bar type fuzes give average heights of burst of approximately 25 to 125 feet depending on size of bomb and nature of target, the performance being comparatively independent of altitude and speed of release.

(1) *Effect of target.* Functioning of all types of VT fuzes is influenced by the nature of the target. Data given herein presume average dry earth; height of bursts over water, wet earth, or earth containing considerable amounts of metal may be 100 percent greater; over dry sand they may be 50 percent smaller. Dispersed trucks

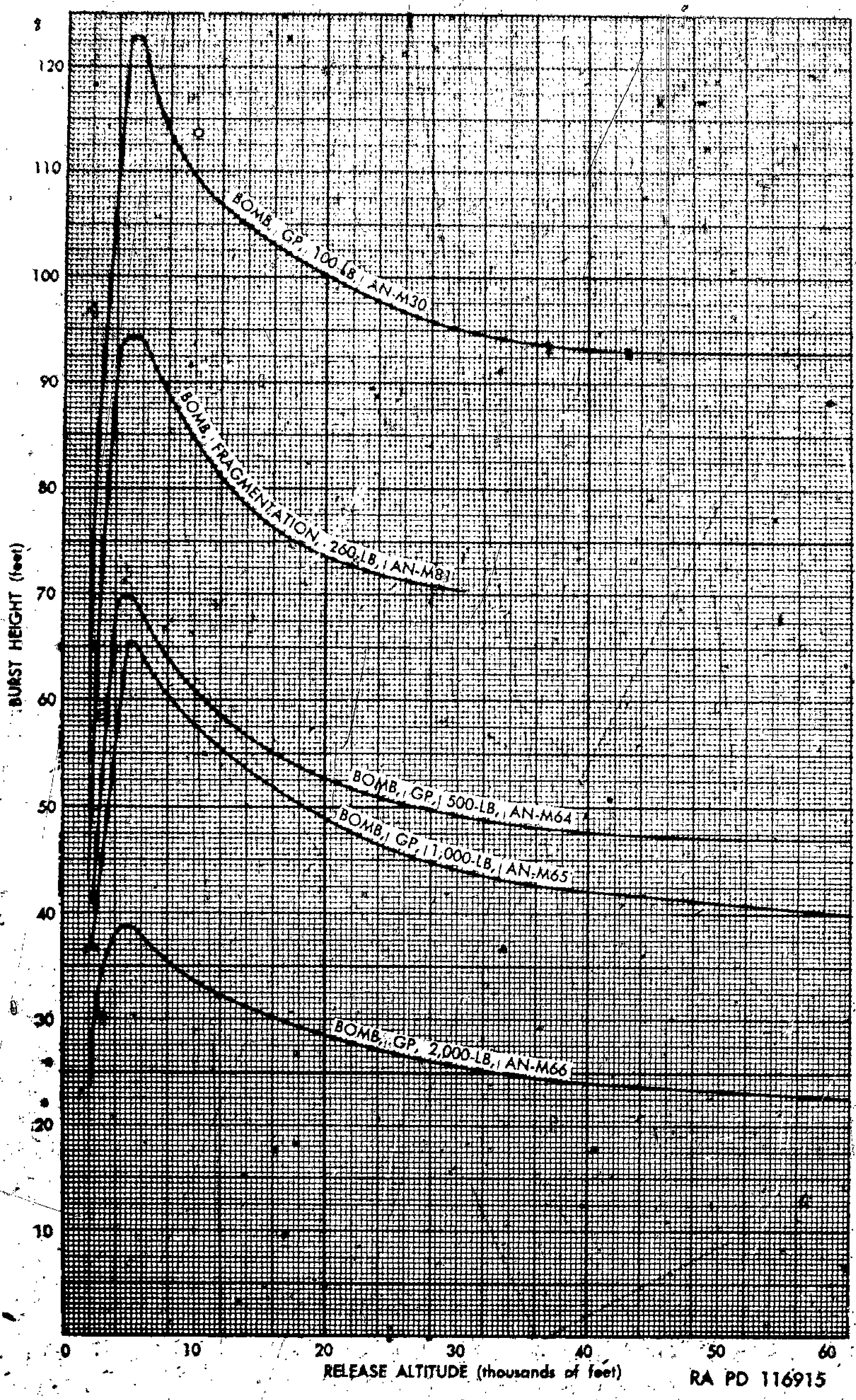

Figure 57. Theoretical burst heights for various bombs with fuze, VT, AN–M166 (T51E1) dropped from altitudes up to 60,000 feet at release speeds up to 434 knots.

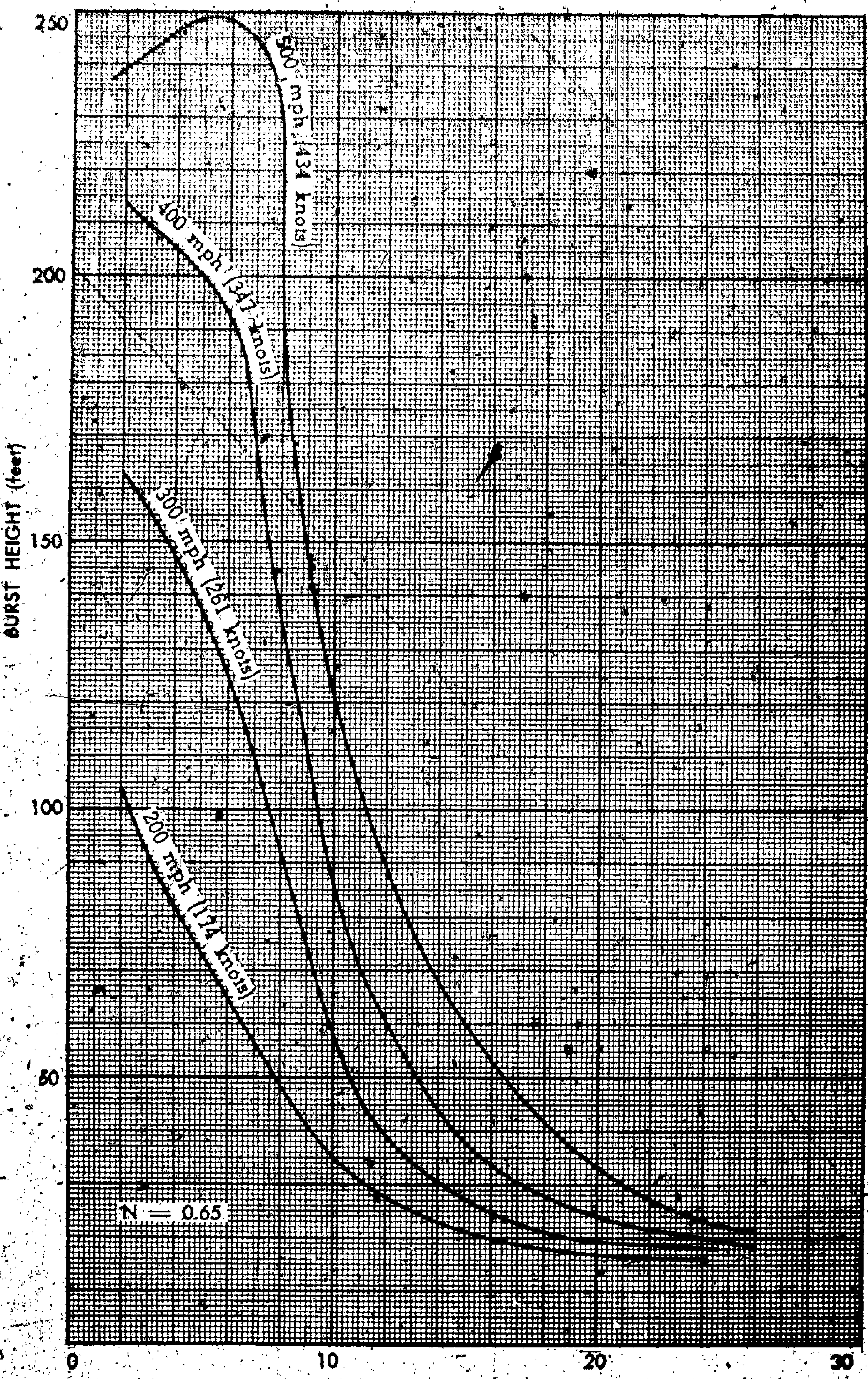

Figure 58. Theoretical burst heights for bomb, fragmentation, 260-lb, AN–M81 with fuze, VT, AN–M168 (T91E1) dropped from altitudes up to 26,000 feet at various plane speeds (knots).

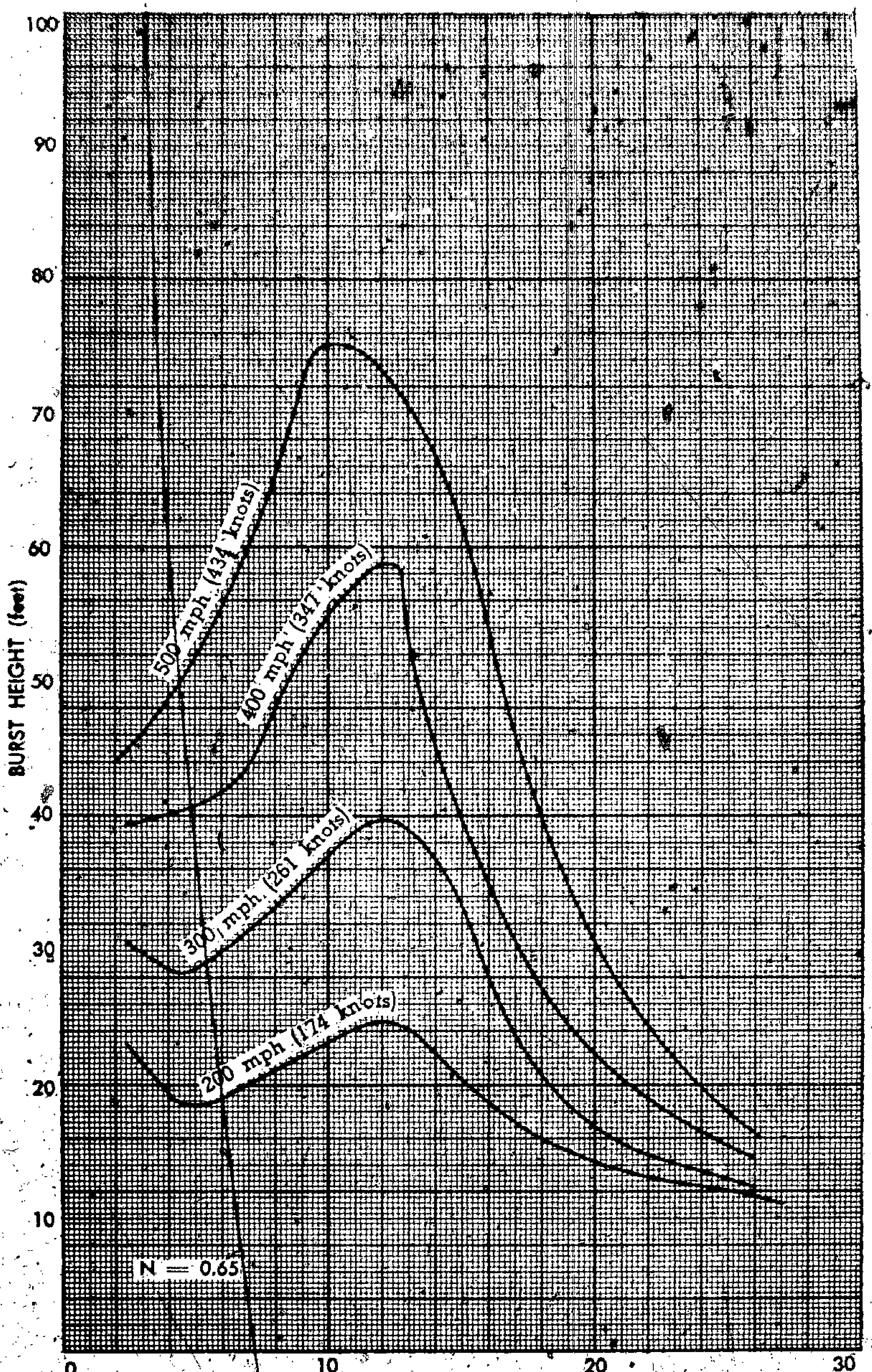

Figure 59. Theoretical burst heights for bomb, fragmentation, 260-lb, AN–M81 with fuze, VT, T89 (T50E1) dropped from altitudes up to 27,000 feet at various plane speeds (knots).

or puddles will not materially affect the height of burst, but approach to large high structures or dense foliage, however, will increase the height of burst.

(2) *Effect of altitude and speed at release.* Ring type fuzes are affected by the striking angle of the bomb which depends on altitude and true air speed at release. This dependence of height of burst on release conditions can be used to advantage since it provides a means of field control of burst height. Bar type fuzes are generally not affected by striking angles and only slightly affected by release altitudes.

(3) *Effect of bomb.* The size and shape of the bomb affect the burst height of all types of VT fuzes. See table IV.

(4) *Dispersion.* Variation and tolerance in manufacture of fuzes and components lead to variation in height of burst of fuzes of any one type, under conditions which are otherwise identical.

c. Interchangeability. VT fuzes are not functionally interchangeable with impact fuzes, however, there is more latitude among the various models of VT fuzes. Selection should be made of the particular model of fuze which will produce the desired height of burst with the bomb used (table IV and figs. 57 through 59).

d. Reliability. The present development of VT fuzes has reached the point where 85 percent normal functioning may be expected. About 12 percent may be "early," that is, they will function at some point between the MinSAT and the point of normal functioning above the target; about 3 percent will be duds. An excessive number of "earlies," 25 percent or more, indicates faulty operation due either to damaged fuzes or to improper assembly to the bomb. To reduce such excessive "earlies," inspect the fuze when removed from its packing for damage due to rough handling or previous adverse storage conditions—check also to see that all fuzes are properly assembled to the bombs. Insurance against duds may be obtained by use of a tail fuze of the M100 type (par. 80).

e. Train Spacing. Since VT fuzes are designed to respond to a sudden change in their surroundings, the detonation of a nearby bomb may cause an armed fuze to function. This restricts the minimum train spacing that can be used. "Armed Salvo" and "Minimum Train" releases will result in an increase in early functions. An intervalometer spacing of 50 feet or more for 100- to 260-pound high-explosive bombs, or 100 feet for 500-pound GP bombs is satisfactory.

f. WEATHER AND CLIMATE. Heavy rain, snow, and hail are liable to cause an excessive number of early functions. Light rain, haze, sunlight, and darkness will not affect fuze operation. Warm, humid conditions may cause rapid deterioration of exposed VT fuzes. For this reason, the sealed metal containers should not be opened until the fuzes are required for the mission at hand. Normal safety and operating characteristics are not adversely affected when the fuzes are used or stored within the temperature range $-60°$ to $+140°$ F.

g. VIBRATION. Excessive vibration of any component of the complete round during flight will cause an increase in the number of early functions. The principal causes of excessive vibration are: fin assemblies which are bent, loose, improperly seated, or poorly fabricated; fuzes which have damaged vanes, or which are loose in the fuze seat because either the lock washer is missing or the fuze was not properly tightened, and excessive bearing wear from release at high altitudes without arming delay.

h. BALLISTICS. VT fuzes are ballistically interchangeable with the M163 impact type. Special bombing tables are not required.

63. Safety Features

a. REQUIREMENTS FOR OPERATION. VT fuzes are detonator-safe and are armed by vane action with mechanical delay. In order for the fuzes to operate, the following conditions must be met:

(1) The fuze cannot be seated in the bomb and the detonator rotor of the fuze cannot be turned until the safety pin is removed.

(2) Vane lock pin (ring type) or vane lock arm (bar type) must be removed or ejected so that the vane can rotate.

(3) Vane must rotate at high speed, 2,000 rpm or more, in order to drive the generator at sufficient speed to charge the firing capacitor and furnish power to operate the transmitting and receiving unit.

(4) The vane must rotate a substantial number of times in order to turn the detonator rotor a sufficient amount to bring the detonator into line in the explosive train and to bring the electric leads of the detonator into contact with the firing circuit. The number of revolutions ranges from 1,550 for 2,000 feet MinSAT to 3,500 for 3,000 feet MinSAT.

(5) A material change within the sensitivity field of the fuze is required to cause a ripple effect of sufficient

amplitude to activate the electronic switch in the firing circuit.

(6) Normal functioning requires fulfillment of all the above conditions. It should be noted however that, due to the inherent nature of this type of fuze, some "earlies" may be expected (par. 62*d*). With any one of the above conditions not fulfilled, the fuze will not fire except under conditions of external violence which would fire any similar amount of high explosive with no fuze elements present.

b. EXTERNAL INDICATIONS OF ARMING. External evidence of safe condition is furnished by:

(1) *Safety pin.* The safety pin consists of a straight portion, at least 1.9 inches long, and a curved portion which clips around the booster end of the fuze. If the safety pin is in place or can be inserted to its full length into the base of the fuze, the detonator rotor has not moved from its original unarmed position.

Caution: If the safety pin cannot be inserted to its full depth it does not necessarily mean that the fuze is completely armed, but the fuze must be regarded as completely armed and liable to fire if the vane is spun rapidly in either direction.

(2) *Seal wire.* When the vane lock pin or vane lock arm is assembled in manufacture of the fuze, it is sealed in place with a steel wire and a lead seal. If the wire and seal are in place and unbroken, the vane has not turned either to charge the electrical elements or to turn the detonator rotor, and the fuze is safe.

c. DUDS. In the case of VT fuze duds, it must be remembered that the fuze may be armed and charged. In such condition it is liable to fire on any disturbance or on approach of personnel or materiel. A sufficient time, usually 24 hours, must be allowed for the firing charge to dissipate. After that time, VT bomb fuze duds may be handled with comparative safety if the vane is locked, since they contain no impact firing elements. However, it should be remembered that there is a complete explosive train present which may function on external violence, especially if the fuze has been deformed. When observed from the releasing aircraft, a VT dud may be identified by a characteristically circular burst, producing a crater (if a tail fuze is used).

d. DROPPED SAFE. VT fuzes are tested for drop safety. If dropped safe, they will not function on any impact that is safe for an unfuzed GP bomb, that is, from 50 feet on armor plate or 2,000 feet on normal soil.

64. Air Travel Arming Delay Mechanisms

a. GENERAL. An arming delay device is attached to the fuze to delay the start of fuze arming until a preset amount of air travel (tables VI to XIII incl) has been accomplished. The arming delay is attached to the fuze so as to hold the vane lock in position. When the desired air travel has been completed, the arming delay releases itself and is forced away from the fuze by the spring of the vane lock which is ejected, thus permitting the fuze to start to arm. The arming delay (fig. 60) consists essentially of a wind vane, a reduction gear train, a setting dial, and a lock to attach it to the ring or bracket of the fuze (fig. 13). The lock consists of fixed hooks and a movable locking hook. The movable hook is attached to a spring powered release bar which is held in the locked position (movable hook pointing down toward vane assembly) by the flange of the setting dial and which is released through a notch in the flange at zero setting. The safe air travel of the fuze with arming delay is the sum of the setting of the arming delay *plus* the MinSAT marked on the fuze.

b. ARMING DELAY, AIR TRAVEL, M1 (T2E1). The M1 (fig. 60) was manufactured in large quantities during World War II and is being issued with all VT fuzes manufactured during the same period. Its setting dial is mounted on one end of a geared shaft which is held in engagement with the gear train by a spring. The opposite end of the shaft protrudes through a slot in the housing and forms a stud which may be depressed to disengage the shaft and permit rotation of the setting dial.

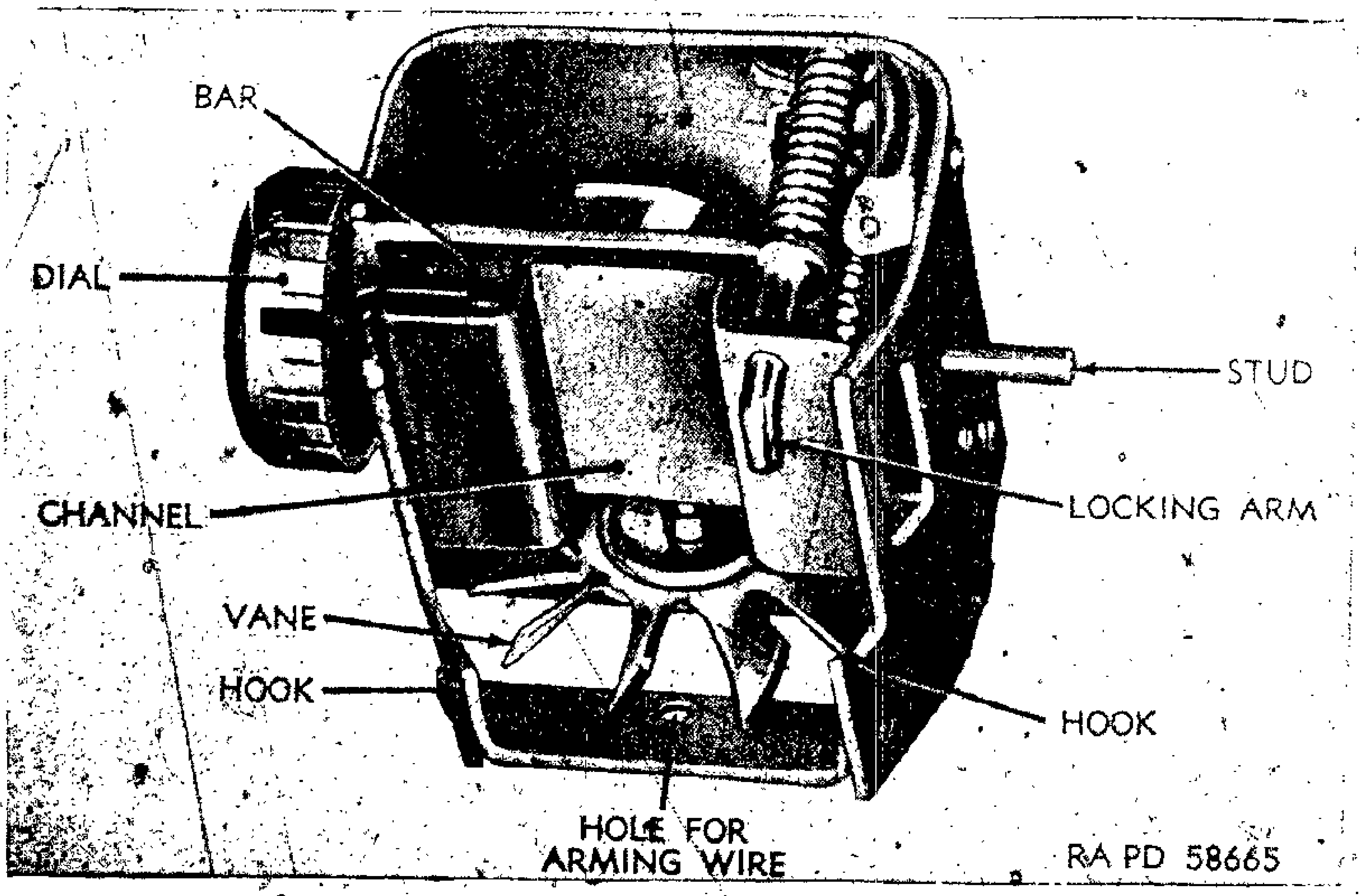

Figure 60. Arming delay, air travel, M1 (T2E1)

c. ARMING DELAY, AIR TRAVEL, M1A1 (T2E2). The M1A1 is a later development and replaces the M1. It differs from the M1 in that its design facilitates assembling the arming delay to the fuze. In addition, it is only necessary to depress the setting dial of the M1A1 to permit rotation and setting of the dial. In all other respects the M1 and M1A1 are the same.

65. Fuzing and Defuzing

a. GENERAL. VT fuzes are issued completely assembled and ready for installation on removal from the packing. Field assembly consists of removing the safety pin from the fuze, screwing the fuze into the bomb, installing the arming wire and, if required, the arming delay. It is desirable that fuzing be done after the bombs are loaded into the bomb bay, if practicable. In this case, care should be exercised to insure that fuzes are assembled sufficiently tight without causing damage to the bomb shackle. When fuzing in the bomb bay is impossible or is inconvenient, and, if regulations permit, fuzing may safely be done before loading.

b. PRECAUTIONS.

(1) If it is desired for tactical reasons to use a VT fuzed bomb in a cluster (the use of more than one VT fuzed bomb in a cluster is prohibited) suspended by means of hook and cable assemblies, the VT fuzed bomb should be attached directly to the shackle—the remaining bombs will be fitted with other than VT fuzes. Although permitted, the use of a VT fuzed bomb in a cluster is not encouraged.

(2) During flight, the accidental withdrawal of the arming wire from a VT fuzed bomb in a wing rack (exterior suspension) would allow the fuze to arm and detonate the bomb. Therefore, VT fuzed bombs in wing installations should be carefully inspected before take-off to make sure that the arming wire is properly installed, with 3 to 4 inches of the wire extending forward of the vane locking arm or pin.

(3) In general, the orientation of the bars on a bomb fitted with a bar type VT fuze is immaterial. There are two exceptions to this rule:

(*a*) When suspending 100-pound GP, 250-pound GP, or 260-pound fragmentation bombs from the bottom 100-pound stations, bar type fuzes fitted to these bombs will have the bars oriented *horizontally* in order to clear the bomb bay doors when closed.

(*b*) The same bombs, when suspended from the bottom outboard stations in a B-17 bomber should not be fuzed with bar type fuzes. If suspended from other outboard stations, these bombs, fitted with bar type fuzes will have the bars oriented *vertically* in order to clear the steps along the side of the outboard racks.

c. Assembling Fuze to Bomb. In assembling VT fuzes to bombs, the following precautions should be observed:

(1) A lock washer must be used between the fuze and bomb (fig. 55).

(2) The fuze must be tightened with the proper fuze wrench. Projecting portions of the fuze—bars or rings—must not be used for handles, lugs, or leverage. The wrench lugs welded to the fuze body should be used (fig. 55).

(3) The proper bomb and fuze combination for the desired height of burst must be selected.

(4) The proper MinSAT should be selected using arming delay, if necessary, to secure the desired safe vertical drop (SVD).

d. Fuzing, Without Arming Delay.

(1) Inspect fuze can. Do not use fuze if can is punctured, severely dented or shows other evidence of rough handling.

(2) Unpack fuze and inspect for serviceability and presence of seal wire, vane lock, and safety pin.

(3) Remove safety pin from booster and, with lock washer in place, screw fuze into bomb. Tighten securely with wrench supplied. Do not hammer fuze or wrench handle.

(4) Cut and remove sealing wire.

(5) Move lock pin and spring (ring type) or lock arm and spring (bar type) to location nearest in line with the bomb suspension lugs. Replace cotter pin in its original hole.

(6) Thread arming wire through forward suspension lug of bomb and through the hole in the vane lock which was originally occupied by the seal wire.

(7) Adjust the wire to protrude 2 to 3 inches when bomb is intended for suspension within bomb bay; 3 to 4 inches for suspension in wing stations. Remove all kinks and burs. Do not use safety (Fahnestock) clip.

(8) Remove cotter pin from vane lock.

e. Fuzing With Arming Delay.

(1) Unpack and inspect the arming delay mechanism.

(2) Fuze the bomb as directed in *d* (1) to (5) above.

(3) Place the movable locking hook in its unlocked position (with hook pointing toward the setting dial).

(a) When unlocking the movable hook of the M1, place the arming delay assembly on a flat surface, vane down and setting dial to the right. Press release stud (on left side of arming delay) to disengage dial shaft and, holding down release bar, turn the dial to zero. This alines the notch in the setting dial with the release bar, thus freeing the release bar.

Caution: Restrain the release when rotating the setting dial to free it. The release bar is actuated by a strong spring, which if not controlled, may damage the arming delay or injure the operator.

(b) When unlocking the movable hook of the M1A1, proceed as described in (a) above, except that it is only necessary to depress the setting dial, instead of the stud as in the M1, to disengage the dial shaft.

(4) Thread arming wire through forward bomb suspension lug. Next, thread it, from the outside, through the hole in the strap on the rear (vane) end of the arming delay. Then thread the wire through the hole in the vane lock which was originally occupied by the seal wire.

(5) Place arming delay, with its vane pointing down toward the bomb, so that the channel is over the vane lock and the fixed hooks engage the bottom edge of the ring or bracket.

(6) Turn release bar back into place through the notch in the setting dial flange, locking the movable hook over the upper edge of the ring or bracket.

(7) Set the dial as follows:

(a) In the case of the M1 arming delay, depress release stud and turn dial to the desired setting.

(b) In the case of the M1A1 arming delay, depress the setting dial and, while held in the depressed position, turn dial to the desired setting.

(8) Adjust arming wire to protrude 2 to 3 inches beyond fuze when bomb is intended for suspension within bomb bay; 3 to 4 inches for suspension in wing stations. Remove all kinks and burs. Do not use safety (Fahnestock) clip.

(9) Remove cotter pin.

f. **Defuzing.** **If a plane returns with VT fuzed bombs, and the use of the fuzed bombs within 48 hours is not probable, the fuzes will be removed from the bombs, returned to their packings, resealed, and tagged or marked to show date, pertinent information as to reuse (ordinarily assigned first priority for use), and** designation of person who supervised the repacking as effectively as possible. To defuze bombs:

(1) Replace cotter pin in its original position in vane lock.

(2) If arming delay is present, depress stud of M1 or the setting dial of M1A1, hold release bar, and turn dial to zero, releasing the bar. Disengage arming delay and slide it back along arming wire.

(3) Remove arming wire from vane lock. Replace seal wire and fasten in place.

(4) Loosen fuze with fuze wrench and complete removal by hand. If a spare lock washer is available, discard the used lock washer. Otherwise, recondition unserviceable lock washers by twisting the teeth with pliers.

(5) Replace safety pin in booster end of fuze.

(6) Return fuze to its original container and packings. Reseal container with adhesive tape.

g. TAIL FUZE. An instantaneous tail fuze may be employed as insurance against duds. Inspection and fuzing follow normal procedure for the fuze employed.

h. DISASSEMBLY. *VT fuzes will not be disassembled in the field under any condition.*

66. Precautions

a. SAFE VERTICAL DROP (SVD) AND MINIMUM RELEASE ALTITUDE (MRA). It is vitally important that SVD be adequate to provide clearance for the releasing plane and for friendly planes at lower altitudes. On the other hand, it is equally important that the MRA be such that all fuzes will be armed on approach to the target. Another important consideration is that the armed portion of the trajectory should not be so long as to risk bearing wear which would cause vibration and the liability of early function. The arming delay should be used whenever indicated by these considerations. For MinSAT of the various bombs, table V gives SVD and MRA, tables VI to XIII inclusive give SVD, MRA, and dial setting of arming delay.

b. SPEED AT RELEASE. VT fuzed bombs should be released at a true air speed of at least 150 mph (130 knots) and preferably 200 mph (174 knots) or over. Slow speed at release may cause excessive increase in SAT at high altitudes or failure to operate at low altitudes.

c. DAMAGED FUZES.

(1) *Unarmed fuzes.* Dropping an unarmed VT fuze in its original packing, normally, will not damage it. Dropping an unpacked fuze or a fuzed bomb may damage the fuze

but it will not make the fuze less safe to handle. Damaged fuzes should be destroyed. Since unarmed VT fuzes cannot fire, they are entirely safe to handle and remove from the bomb.

(2) *Armed fuzes.* An undamaged VT fuze will not fire, even if armed, unless the vane has been turning rapidly (2,000 rpm or more). If the fuze is intact and the vane is prevented from turning, it is safe to handle. An armed VT fuze whose vane has been turning rapidly is sensitive to shock and approach. Such a fuze whether damaged or intact should not be approached until sufficient time has elapsed for the charge to dissipate. Such time may safely be taken to be a minimum of 24 hours.

(3) *Deteriorated fuzes.* Fuzes which have deteriorated from exposure or rough handling will give an increased percentage of malfunctions but are safe to handle and use. Such fuzes, however, should be used only in cases of urgent necessity.

d. STORAGE. When packed in the original hermetically sealed container, VT fuzes may be kept for extended periods without deterioration. While in such packings they need no more care than any other ammunition except that particular attention should be given to avoidance of prolonged exposure to extremes of heat and cold. Unpacked fuzes should be exposed only for short periods of time and, if practicable, not for more than 48 hours, especially in a warm, humid atmosphere.

e. HANDLING. VT fuzes may be subjected to the same physical handling prescribed for other fuzes. Rough handling of the unpacked fuze, while not decreasing its safety, will increase the liability to malfunction.

f. FIELD TESTING. The only field testing of VT bomb fuzes possible is the service testing of representative samples from each lot. Such tests should be conducted over water or level ranges in order to assess fuze performance under uniform conditions. Height of burst over water will be about double that over normal soil.

g. DISPOSAL. Unserviceable, deteriorated, damaged, and armed or partially armed fuzes will be destroyed. For security reasons, this destruction must be complete (ch. 9). Any conventional method of destruction that meets this requirement is satisfactory. Duds may be sensitive to shock and approach (par. 63*c*). They should be handled only by authorized personnel.

67. Marking

Each VT fuze is marked with the type, model, MinSAT, lot number, loader's initials or symbol, and date loaded. Instruction tags are attached to the vane lock cotter pin, the sealing wire, and the safety pin. Metal containers and packing boxes are marked to show the quantity, nomenclature, MinSAT, lot number, and date loaded, of the fuze, and the quantity and nomenclature of arming delays.

Table III. Characteristics of Various Models of VT Fuses

Model	Type	Nominal MinSAT	Bomb size	Other characteristics
		(ft.)	(lb.)	
AN–M166 (T51E1)	Bar	3,600	100–2,000	
AN–M168 (T91E1)	Ring	2,600	100–500	
T50E1	do	3,100	100–260, 2,000	Early model—no safety pin.
T89	do	3,600	100–260, 2,000	
T91	do	2,000	100–260, 2,000	

***Table IV.** Average Height of Burst (FT) to be Expected with Various Bomb-VT Fuze **Combinations** (Over Normal Soil with Release from 10,000 FT at 200 MPH (174 **Knots**))*

Bomb (wt and type)	Fuze AN–M166 (T51E1)	Fuze AN–M168 (T91E1) and T91	Fuze T50E1 and T89
100-lb GP AN–M30	110	30	25
250-lb GP AN–M57	90	40	25
260-lb Frag AN–M81	90	40	25
500-lb GP AN–M64	65	25	20
1,000-lb GP AN–M65	60	10	10
2,000-lb GP AN–M66	30	30	30

***Table V.** Safe Vertical Drops (SVD) and Minimum Release Altitudes (MRA) for VT Bomb Fuzes at Various Speeds of Release*

Bombs	MinSAT marked on fuze	150 mph (130 knots) true air speed		200 mph (174 knots) true air speed		250 mph (217 knots) true air speed		300 mph (261 knots) true air speed		350 mph (304 knots) true air speed	
		SVD	MRA	SVD	MRA	SVD	MRA	SVD	MRA	SVD	MRA
100-lb to 260-lb GP and Frag.	2,000	900	1,460	600	1,050	400	750	300	550	200	400
	3,600	2,000	2,800	1,550	2,250	1,150	1,750	900	1,350	650	1,050
500-lb GP and Chem.	2,000	1,100	1,750	750	1,300	550	950	400	700	300	550
	3,600	2,450	3,400	1,900	2,700	1,400	2,150	1,100	1,700	850	1,350
100-lb GP and Chem.	2,000	1,350	2,100	1,000	1,650	700	1,250	500	900	400	700
	3,600	2,950	4,000	2,350	3,300	1,800	2,700	1,400	2,150	1,100	1,700
2,000-lb. GP.	2,000	1,750	2,700	1,300	2,100	950	1,650	700	1,300	500	1,000
	3,600	3,700	5,050	3,000	4,250	2,400	3,500	1,900	2,850	1,500	2,350

Table VI. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 100-lb GP Bomb AN-M30, 250-lb GP Bomb AN-M57, 260-lb Frag Bomb AN-M81 and VT Fuzes Marked for 2,000 ft MinSAT

Dial setting	130 knots		174 knots		217 knots		261 knots		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	1,500	2,100	1,100	1,650	800	1,200	600	900	450	700
2	2,100	2,850	1,650	2,300	1,200	1,800	900	1,400	700	1,100
3	2,750	3,650	2,200	3,000	1,700	2,400	1,300	1,900	1,000	1,500
4	3,400	4,450	2,750	3,750	2,200	3,050	1,750	2,500	1,350	2,050
5	4,050	5,300	3,350	4,500	2,700	3,800	2,200	3,100	1,750	2,600
6	4,700	6,100	3,950	5,300	3,250	4,500	2,700	3,800	2,200	3,200
7	5,350	6,950	4,550	6,100	3,850	5,250	3,200	4,500	2,600	3,800
8	6,000	7,800	5,150	6,900	4,400	6,050	3,700	5,200	3,050	4,450
9	6,650	8,600	5,800	7,700	5,000	6,850	4,250	5,950	3,550	5,100
10	7,350	9,400	6,500	8,500	5,600	7,550	4,800	6,600	4,050	5,700
11	7,900	10,300	7,000	9,350	6,150	8,350	5,250	7,350	4,500	6,450
12	8,550	11,100	7,650	10,150	6,750	9,150	5,850	8,100	5,000	7,150
13	9,200	12,000	8,300	11,000	7,350	9,950	6,400	8,900	5,500	7,900
14	9,850	12,850	8,900	11,850	7,950	10,700	7,000	9,700	6,050	8,650
15	10,500	13,700	9,600	12,700	8,550	11,600	7,600	10,500	6,650	9,450
16	11,200	14,550	10,200	13,500	9,200	12,400	8,200	11,300	7,200	10,200
17	11,850	15,400	10,850	14,350	9,850	13,250	8,800	12,100	7,800	11,000
18	12,500	16,300	11,500	15,200	10,450	14,100	9,400	12,950	8,350	11,800
19	13,150	17,150	12,150	16,050	11,100	14,950	10,000	13,750	8,950	12,550
20	13,800	18,000	12,800	16,900	[illegible]	15,750	10,600	14,550	9,550	13,350
21	14,500	18,850	13,500	17,800	12,350	16,600	11,250	15,400	10,150	14,150
22	15,150	19,700	14,100	18,600	13,000	17,450	11,850	16,200	10,750	14,950
23	15,800	20,550	14,800	19,500	13,650	18,300	12,500	17,050	11,350	15,800
24	16,500	21,400	15,400	20,400	14,300	19,150	13,100	17,900	12,000	16,600
25	17,150	22,250	16,100	21,300	14,950	20,000	13,700	18,750	12,600	17,400
26	17,800	23,100	16,750	22,200	15,600	[illegible]	14,350	19,600	13,250	18,250
27	18,450	23,950	17,400	23,100	16,250	21,700	14,950	20,450	13,850	19,050

68. Packing

Rubber, metal, and plastic packing materials is used to protect VT fuzes in their containers. Such packing elements should be preserved with the container in the event that it becomes necessary to repack the fuze. An arming delay, air travel, M1 or M1A1, is

Table VII. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 500-lb GP Bomb AN-M64, 500-lb CHEM BOMB and VT Fuzes Marked for 2,000 ft MinSAT

Dial setting	150 knots		174 knots		217 knots		261 knots		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	1,800	2,550	1,350	2,000	950	1,500	700	1,150	550	900
2	2,550	3,400	2,000	2,800	1,500	2,200	1,150	1,700	900	1,350
3	3,300	4,350	2,650	3,600	2,100	2,950	1,600	2,350	1,300	1,900
4	4,000	5,250	3,350	4,450	2,650	3,700	2,150	3,050	1,700	2,500
5	4,750	6,200	4,000	5,350	3,250	4,500	2,700	3,800	2,150	3,150
6	5,500	7,150	4,750	6,250	3,900	5,400	3,250	4,550	2,650	3,850
7	6,250	8,100	5,400	7,200	4,600	6,250	3,800	5,350	3,150	4,550
8	7,000	9,050	6,100	8,150	5,250	7,150	4,450	6,200	3,700	5,350
9	7,750	10,050	6,850	9,050	5,900	8,000	5,050	7,050	4,300	6,050
10	8,500	11,000	7,550	10,000	6,600	8,900	5,700	7,850	4,850	6,850
11	9,250	11,950	8,300	10,950	7,300	9,850	6,350	8,750	5,450	7,700
12	10,000	12,950	9,000	11,900	8,000	10,750	7,000	9,650	6,100	8,550
13	10,750	13,900	9,750	12,850	8,700	11,700	7,650	10,550	6,650	9,400
14	11,500	14,900	10,500	13,850	9,400	12,650	8,300	11,450	7,300	10,250
15	12,250	15,900	11,250	14,800	10,100	13,600	9,000	12,350	7,950	11,150
16	13,000	16,900	11,950	15,750	10,850	14,500	9,700	13,250	8,600	12,000
17	13,750	17,900	12,750	16,700	11,600	15,450	10,400	14,150	9,250	12,850
18	14,500	18,900	13,500	17,650	12,300	16,400	11,100	15,050	9,900	13,750
19	15,250	19,900	14,250	18,600	13,000	17,350	11,800	15,950	10,550	14,650
20	16,050	20,900	15,000	19,650	13,750	18,350	12,500	16,850	11,200	15,600
21	16,800	21,900	15,750	20,650	14,500	19,300	13,200	17,750	11,850	16,500
22	17,550	22,900	16,500	21,650	15,200	20,250	13,900	18,650	12,500	17,400
23	18,300	23,900	17,250	22,650	15,900	21,200	14,600	19,550	13,150	18,300
24	19,050	24,900	18,000	23,650	16,600	22,150	15,300	20,450	13,800	19,300
25	19,750	25,900	18,750	24,650	17,300	23,100	16,000	21,350	14,450	20,300
26	20,450	26,900	19,500	25,650	18,000	24,050	16,700	22,250	15,100	21,300
27	21,150	27,900	20,250	26,650	18,700	25,000	17,400	23,150	15,750	22,300

packed in the individual container with each fuze, and a wrench, fuze, M17, is packed in each box of fuzes. VT fuze AN–M166 is packed either one per carton with arming delay and four per metal-lined box or four fuzes per steel drum, the drum also containing four arming delays. The AN–M168 is packed one per metal can with arming delay and nine cans per wooden box.

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Table VIII. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 1,000-lb GP Bomb AN–M65, 1,000-lb Chem Bomb and VT Fuzes Marked for 2,000 ft MinSAT

Dial setting	130 knots		174 knots		217 knots		261 knots		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	2,200	3,100	1,700	2,450	1,300	1,900	950	1,500	750	1,200
2	3,100	4,100	2,450	3,400	1,900	2,750	1,500	2,200	1,200	1,750
3	3,950	5,150	3,250	4,350	2,600	3,600	2,050	2,950	1,650	2,400
4	4,800	6,200	4,000	5,400	3,300	4,550	2,700	3,800	2,150	3,100
5	5,600	7,300	4,850	6,400	4,050	5,500	3,350	4,650	2,750	3,900
6	6,500	8,350	5,650	7,450	4,800	6,500	4,000	5,550	3,300	4,750
7	7,350	9,500	6,450	8,500	5,550	7,500	4,700	6,550	3,950	5,650
8	8,200	10,600	7,300	9,600	6,350	8,550	5,400	7,500	4,600	6,500
9	9,100	11,700	8,100	10,700	7,100	9,600	6,150	8,500	5,300	7,450
10	9,950	12,850	8,950	11,750	7,900	10,650	6,900	9,500	5,950	8,400
11	10,800	13,950	9,800	12,850	8,750	11,700	7,700	10,500	6,650	9,350
12	11,550	15,050	10,650	13,950	9,550	12,800	8,450	11,550	7,400	10,300
13	12,500	16,200	11,500	15,050	10,350	13,850	9,200	12,600	8,100	11,300
14	13,400	17,350	12,300	16,150	11,200	14,950	10,000	13,650	8,900	12,350
15	14,250	18,500	13,200	17,300	12,000	16,050	10,800	14,700	9,700	13,400
16	15,150	19,600	14,050	18,400	12,850	17,150	11,650	15,800	10,400	14,400
17	16,000	20,750	14,900	19,550	13,700	18,250	12,450	16,850	11,150	15,450
18	16,900	21,900	15,700	20,650	14,500	19,350	13,250	17,900	11,950	16,500
19	17,800	23,050	16,600	21,750	15,400	20,450	14,100	19,000	12,750	17,550
20	18,650	24,200	17,500	22,850	16,250	21,550	14,900	20,100	13,550	18,600
21	19,500	25,350	18,350	23,950	17,100	22,650	15,700	21,200	14,350	19,700
22	20,450	26,500	19,200	25,050	17,900	23,750	16,550	22,300	15,150	20,800
23	21,350	27,650	20,100	26,150	18,800	24,850	17,350	23,400	15,950	21,900
24	22,250	28,800	21,000	27,250	19,600	25,950	18,200	24,500	16,750	23,000
25	23,150	29,950	21,900	28,350	20,450	27,050	19,050	25,600	17,550	24,100
26	24,050	31,100	22,800	29,450	21,300	28,150	19,900	26,700	18,350	25,200
27	24,950	32,250	23,700	30,550	22,150	[illegible],250	20,750	27,800	19,150	26,300

Table IX. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 2,000-lb GP Bomb AN-M66 and VT Fuzes Marked for 2,000 ft MinSAT

Dial Setting	130 knots		174 knots		217 knots		261 [illegible]		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	2,800	3,600	2,200	3,200	1,750	2,550	1,350	[illegible]	1,050	1,600
2	3,900	5,100	3,200	4,300	2,550	3,600	2,000	2,900	1,600	[illegible]
3	4,900	6,350	4,150	5,500	3,400	4,650	2,800	3,900	2,250	3,250
4	5,950	7,700	5,100	6,750	4,300	5,850	3,600	5,000	2,950	4,200
5	7,000	9,000	6,100	8,050	5,200	[illegible]	4,400	6,100	3,700	5,200
6	8,000	10,300	7,100	9,300	6,150	8,250	5,250	7,200	4,450	6,250
7	9,050	11,650	8,100	10,600	7,100	9,500	6,150	8,400	5,250	7,350
8	10,100	13,000	9,100	11,900	8,050	10,800	7,050	9,600	6,100	8,500
9	11,150	14,300	10,100	13,200	9,000	12,050	7,950	10,850	6,900	9,650
10	12,200	15,550	11,100	14,450	10,000	13,200	8,900	12,000	7,800	10,750
11	13,200	17,000	12,150	15,850	11,000	14,600	9,800	13,350	8,700	12,050
12	14,250	18,350	13,150	17,200	12,000	15,900	10,800	14 600	9,650	13,300
13	15,300	19,750	14,200	18,550	13,000	17,250	11,750	15,900	10,550	14,500
14	16,350	21,100	15,200	19,900	14,000	18,550	12,700	17,150	11,450	15,750
15	17,400	22,450	16,250	21,250	15,000	19,900	13,700	18,450	12,450	17,000
16	18,450	23,800	17,300	22,600	16,000	21,250	14,700	19,750	13,350	18,250
17	19,500	25,150	18,300	23,950	17,000	[illegible]	15,650	21,000	14,300	19,550
18	20,600	26,500	19,350	25,300	18,050	23,950	16,650	22,300	15,250	20,850
19	21,600	27,850	20,350	26,650	19,000	25,300	17,600	23,600	16,200	22,150
20	22,600	29,200	21,350	28,000	20,000	26,650	18,600	24,900	17,200	23,450
21	23,600	30,550	22,350	29,350	21,000	28,000	19,600	26,200	18,200	24,750
22	24,600	31,900	23,350	30,700	22,000	29,350	20,550	27,500	19,150	26,050
23	25,600	33,250	24,350	32,050	23,000	30,700	21,450	28,800	20,100	27,350
24	26,600	34,600	25,350	33,400	24,000	32,050	22,350	30,100	21,050	28,650
25	27,600	35,950	26,350	34,750	25,000	33,400	23,250	31,400	22,000	29,950
26	28,600	37,300	27,350	36,100	26,000	34,750	24,150	32,700	22,950	31,250
27	29,600	39,000	28,350	37,450	27,000	36,100	25,050	34,000	23,900	32,550

Table X. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 100-lb GP Bomb AN–M30, 250-lb GP Bomb AN–M57, 260-lb Frag Bomb AN–M81 and VT Fuzes Marked for 8,600 ft MinSAT

Dial setting	130 knots		174 knots		217 knots		261 knots		[illegible] knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	2,600	3,550	2,150	2,900	1,650	2,300	1,300	1,850	1,000	1,450
2	3,400	4,300	2,750	3,600	2,200	2,950	1,750	2,400	1,350	1,950
3	4,050	5,100	3,400	4,350	2,750	3,650	2,200	3,000	1,800	2,500
4	4,750	5,950	4,000	5,100	3,300	4,300	2,700	3,500	2,200	3,050
5	5,400	6,750	4,600	5,900	3,900	5,100	3,200	4,350	2,650	3,650
6	6,050	7,550	5,250	6,700	4,450	5,850	3,750	5,050	3,150	4,300
7	6,750	8,400	5,900	7,550	5,050	6,650	4,300	5,750	3,650	4,950
8	7,400	9,250	6,500	8,350	5,700	7,400	4,900	6,500	4,150	5,650
9	8,000	10,050	7,150	9,100	6,300	8,150	5,400	7,150	4,650	6,250
10	8,650	10,900	7,750	9,950	6,800	8,950	5,900	7,950	5,050	6,950
11	9,300	11,750	8,400	10,800	7,450	9,750	6,500	8,700	5,400	7,700
12	10,000	12,600	9,050	11,650	8,050	10,550	7,100	9,500	6,150	8,450
13	10,650	13,450	9,700	12,450	8,700	11,400	7,700	10,300	6,750	9,200
14	11,300	14,300	10,350	13,300	9,300	12,200	8,300	11,100	7,300	10,000
15	12,000	15,150	11,000	14,150	9,950	13,000	8,900	11,900	7,900	10,800
16	12,600	16,050	11,650	15,000	10,550	13,900	9,500	12,700	8,500	11,550
17	13,300	16,900	12,300	15,850	11,200	14,700	10,100	13,500	9,100	12,350
18	13,950	17,800	12,950	16,700	11,550	15,550	10,750	14,350	9,700	13,150
19	14,600	18,650	13,600	17,550	12,500	16,400	11,350	15,200	10,250	13,950
20	15,250	19,500	14,250	18,400	13,100	17,250	12,000	16,000	10,850	14,750
21	15,950	20,400	14,900	19,250	13,800	18,100	12,650	16,850	11,500	15,550
22	16,600	21,300	15,600	20,100	14,400	18,900	13,250	17,650	12,100	16,350
23	17,300	22,200	16,200	20,950	15,100	19,750	13,900	18,500	12,700	17,200
24	17,950	23,100	16,900	21,800	15,700	20,550	14,500	19,350	13,400	18,000
25	18,600	24,000	17,550	22,650	16,300	21,400	15,100	20,200	14,000	18,800
26	19,250	24,900	18,200	23,500	16,900	22,200	15,700	21,000	14,600	19,600
27	19,900	25,800	18,850	24,350	17,500	23,050	16,300	21,850	15,300	20,400

Table XI. *Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 500-lb GP Bomb AN-M64, 500-lb Chem Bomb and VT Fuze Marked for 8,600 ft MinSAT*

Dial setting	130 knots		174 knots		217 knots		261 knots		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	3,200	4,200	2,600	3,500	2,050	2,850	1,600	2,250	1,250	1,800
2	4,000	5,100	3,350	4,350	2,650	3,550	2,150	2,950	1,700	2,400
3	4,800	6,000	4,050	5,200	3,300	4,350	2,700	3,650	2,200	3,000
4	5,600	6,950	4,800	6,100	4,000	5,200	3,300	4,400	2,700	3,700
5	6,300	7,900	5,500	7,000	4,650	6,050	3,900	5,150	3,200	4,400
6	7,100	8,850	6,200	7,900	5,350	6,950	4,500	6,000	3,800	5,150
7	7,850	9,800	6,950	8,850	6,000	7,800	5,150	6,850	4,350	5,900
8	8,600	10,750	7,650	9,750	6,700	8,700	5,800	7,650	4,950	6,700
9	9,350	11,750	8,400	10,750	7,400	9,600	6,400	8,500	5,550	7,500
10	10,100	12,700	9,150	11,700	8,100	10,550	7,100	9,400	6,150	8,300
11	10,850	13,700	9,900	12,600	8,800	11,500	7,750	10,300	6,800	9,150
12	11,650	14,650	10,650	13,550	9,550	12,400	8,450	11,200	7,400	10,000
13	12,400	15,650	11,400	14,550	10,250	13,350	9,150	12,150	8,050	10,900
14	13,200	16,600	12,100	15,500	11,000	14,300	9,850	13,000	8,750	11,800
15	13,950	17,600	12,900	16,450	11,700	15,200	10,550	13,950	9,400	12,700
16	14,700	18,600	13,650	17,400	12,400	16,100	11,300	14,900	10,100	13,600
17	15,500	19,550	14,400	18,350	13,150	17,050	12,000	15,800	10,750	14,500
18	16,250	20,500	15,150	19,300	13,900	18,000	12,700	16,700	11,400	15,400
19	17,000	21,450	15,900	20,250	14,600	18,900	13,450	17,650	12,100	16,300
20	17,800	22,400	16,650	21,200	15,300	19,800	14,200	18,600	12,800	17,200
21	18,600	23,350	17,400	22,150	16,050	20,750	14,900	19,500	13,450	18,100
22	19,350	24,300	18,150	23,100	16,800	21,650	15,600	20,400	14,100	19,000
23	20,100	25,250	18,900	24,050	17,500	22,600	16,350	21,300	14,800	19,900
24	20,900	26,200	19,650	25,000	18,200	23,500	17,100	22,200	15,500	20,800
25	21,650	27,150	20,400	25,950	18,900	24,450	17,800	23,100	16,200	21,700
26	22,400	28,100	21,150	26,900	19,600	25,350	18,500	24,000	16,900	22,600
27	23,150	29,050	21,900	27,850	20,300	26,300	19,200	24,900	17,600	23,500

Table XII. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 1,000-lb GP Bomb AN-M66, 1,000-lb Chem Bomb and VT Fuzes Marked for 3,600 ft MinSAT

Dial setting	130 knots		174 knots		217 knots		261 knots		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	3,850	5,000	3,150	4,250	2,550	3,500	2,000	2,850	1,600	2,300
2	4,500	6,000	4,000	5,200	3,300	4,400	2,650	3,600	2,150	3,000
3	5,700	7,100	4,900	6,200	4,000	5,300	3,300	4,500	2,650	3,750
4	6,550	8,150	5,700	7,250	4,850	6,300	4,050	5,400	3,350	4,600
5	7,450	9,250	6,550	8,300	5,650	7,300	4,800	6,350	4,050	5,450
6	8,300	10,350	7,400	9,350	6,450	8,300	5,500	7,300	4,700	6,300
7	9,200	11,450	8,200	10,450	7,250	9,350	6,250	8,250	5,350	7,200
8	10,100	12,550	9,100	11,500	8,050	10,400	7,050	9,250	6,050	8,150
9	10,950	13,700	9,950	12,600	8,850	11,450	7,800	10,250	6,800	9,100
10	11,800	14,800	10,800	13,700	9,700	12,500	8,600	11,300	7,500	10,050
11	12,700	15,950	11,600	14,800	10,500	13,600	9,350	12,350	8,250	11,100
12	13,550	17,050	12,500	15,850	11,350	14,650	10,150	13,400	9,000	12,050
13	14,400	18,200	13,300	17,000	12,200	15,750	10,950	14,450	9,750	13,100
14	15,300	19,300	14,200	18,100	13,000	16,850	11,750	15,500	10,500	14,100
15	16,200	20,400	15,050	19,250	13,850	17,950	12,600	16,600	11,300	15,200
16	17,050	21,500	15,900	20,350	14,700	19,050	13,400	17,650	12,100	16,200
17	17,950	22,600	16,800	21,450	15,500	20,100	14,200	18,750	12,900	17,250
18	18,800	23,700	17,650	22,550	16,400	21,150	15,050	19,800	13,700	18,300
19	19,700	24,800	18,500	23,650	17,250	22,200	15,850	20,850	14,500	19,400
20	20,550	25,900	19,400	24,750	18,100	23,250	16,700	21,900	15,300	20,450
21	21,400	27,000	20,250	25,850	18,950	24,300	17,500	22,950	16,100	21,500
22	22,250	28,100	21,100	26,950	19,800	25,350	18,400	24,000	16,950	22,550
23	23,100	29,200	21,950	28,050	20,650	26,400	19,250	25,050	17,750	23,600
24	23,950	30,300	22,800	29,150	21,500	27,450	20,100	26,100	18,550	24,650
25	24,800	31,400	23,650	30,250	22,350	28,500	20,950	27,150	19,350	25,700
26	25,650	32,500	24,500	31,350	23,200	29,550	21,800	28,200	20,150	26,750
27	26,500	33,600	25,350	32,450	24,050	30,600	22,650	29,250	20,950	27,800

Table XIII. Safe Vertical Drops (SVD), Minimum Release Altitudes (MRA), M1 (T2E1) Indicator Dial Setting Table for 2,000-lb GP Bomb AN-M66 and VT Fuzes Marked for 3,600 ft MinSAT

Dial setting	130 knots		174 knots		217 knots		261 knots		304 knots	
	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)	SVD (ft)	MRA (ft)
1	4,850	6,200	4,100	5,350	3,350	4,550	2,750	3,800	2,200	3,150
2	5,950	7,450	5,100	6,550	4,300	5,650	3,550	4,800	2,950	4,050
3	7,050	8,700	6,150	7,800	5,250	6,800	4,450	5,900	3,750	5,000
4	8,100	10,000	7,200	9,050	6,250	8,000	5,350	7,000	4,500	6,050
5	9,150	11,350	8,200	10,300	7,200	9,250	6,200	8,150	5,350	7,100
6	10,250	12,650	9,250	11,600	8,200	10,500	7,150	9,300	6,200	8,250
7	11,300	14,000	10,250	12,900	9,150	11,750	8,100	10,550	7,050	9,400
8	12,350	15,350	11,300	14,200	10,150	13,000	9,050	11,800	7,950	10,600
9	13,400	16,700	12,300	15,500	11,200	14,300	10,000	13,000	8,900	11,750
10	14,400	18,000	13,350	16,850	12,150	15,600	10,950	14,300	9,800	12,950
11	15,500	19,400	14,400	18,200	13,150	16,900	11,900	15,550	10,700	14,200
12	16,550	20,750	15,400	19,550	14,150	18,200	12,900	16,850	11,650	15,450
13	17,600	22,100	16,450	20,900	15,200	19,550	13,900	18,150	12,600	16,700
14	18,650	23,450	17,450	22,250	16,200	20,850	14,850	19,400	13,550	17,950
15	19,700	24,800	18,500	23,600	17,200	22,150	15,850	20,700	14,500	19,200
16	20,750	26,150	19,550	24,950	18,250	23,450	16,850	22,000	15,450	20,450
17	21,800	27,500	20,600	26,300	19,300	24,750	17,850	23,300	16,550	21,700
18	22,850	28,850	21,650	27,650	20,350	26,050	18,850	24,600	17,400	22,950
19	23,900	30,200	22,700	29,000	21,400	27,350	19,850	25,900	18,400	24,200
20	24,950	31,550	23,750	30,350	22,450	28,650	20,850	27,200	19,350	25,450
21	26,000	32,900	24,800	31,700	23,500	29,950	21,850	28,500	20,350	26,700
22	27,050	34,250	25,850	33,050	24,550	31,250	22,850	29,800	21,350	27,950
23	28,100	35,600	26,900	34,400	25,600	32,550	23,850	31,100	22,350	29,200
24	29,150	36,950	27,950	35,750	26,650	33,850	24,850	32,400	23,350	30,450
25	30,200	38,300	29,000	37,100	27,700	35,150	25,850	33,700	24,350	31,700
26	31,250	39,650	30,050	38,450	28,750	36,450	26,850	35,000	25,350	32,950
27	32,300	41,000	31,100	39,800	29,800	37,750	27,850	36,300	26,350	34,200

Section V. MECHANICAL TIME FUZES

69. General

a. SCOPE. This section describes nose and tail mechanical time bomb fuzes (fig. 12). Certain body fuzes with mechanical time features are described in paragraphs 105 through 107.

b. CHARACTERISTICS. Nose and tail mechanical time bomb fuzes are combination vane and pin arming and time or impact functioning. The im[illegible] feature is for insurance rather than deliberate selection; it operates only when the time setting exceeds the time of flight. Current models are detonator-safe, that is, the detonator is held out of line with the booster lead until the fuze arms; earlier models have detonator in line. All mechanical time bomb fuzes are essentially of one type with variations in arming and explosive characteristics to produce the models necessary for the various conditions of use. The principle (fig. 61) is that of the common alarm clock. A trigger arm assembly (firing lever and timing disk lever), which restrains a spring loaded firing pin, rides on the edge of a circular timing disk. The disk has one notch in the edge which, in the unarmed condition, is occupied by the arming pin. When the arming pin is ejected, the clockwork turns the disk at a uniform rate until the timing disk lever drops into the notch and releases the firing lever and firing pin. The time is set by rotating the head of the fuze to locate the timing disk lever at such a distance from the arming pin as will give the time desired.

c. DESCRIPTION (fig. 12). Nose and tail mechanical time bomb fuzes consist of a body, which contains the time element and the explosive train, and a head, which contains the mechanical arming and firing system. Head and body are held together by a spring steel ring which is compressed by three screws in the fuze body. Variation of the pressure of the ring provides a means of adjusting the torque required to set the fuze. A thumbscrew is provided to lock the head in position when the setting is made. The arming pin and arming wire guide are assembled on the side of the body opposite the thumbscrew. An index mark for time setting is engraved in the body just below the head. The time graduations are engraved around the base of the head, and two stop pins are set in the time scale so as to butt against the arming wire guide at maximum and minimum time setting. The arming hub with the vane assembly, the arming sleeve, and the firing pin with striker head, project through the forward end. A "C" shaped safety block is held between the striker and the vane nut by the arming sleeve. In current models, the safety block has a collar which bears on pins in the vane nut. This insures that the block will spin with the arming vane and develop sufficient centrifugal force to throw the block clear when the arming sleeve is withdrawn. As the fuze is issued, there is a forked striker stop in place between the striker and the safety block and a cotter pin through the inner of a pair of eyelets in the arming pin. These are connected by a sealing wire which also passes through the inner of a pair of eyelets in the arming wire-guide and vane tab.

70. Models

a. VARIATIONS. The features of the basic type which produce the various models are:

(1) *Arming vane.* Propeller type for stabilized item, clockwise rotation for nose fuzes, reversed for tail fuzes; anemometer type for unstabilized items.

(2) *Arming reduction.* Rapid arming (6–9 turns) for less stable items and short time settings; slower arming (260–350 turns) preferred for use *for extra safety, where conditions permit.*

(3) *Time range.* These fuzes are calibrated either from 1.6 to 30.6 seconds or from 5 to 92 seconds.

(4) *Detonator safety.* Current models, detonator out of line; earlier models, detonator in line (figs. 63 and 65).

(5) *Explosive train.* Primer and black powder igniter for flares, photoflash bombs, target identification bombs, and fragmentation bomb clusters. Detonator and reduced tetryl booster for primacord-opened clusters; detonator only for initiating tetryl bursters (fig. 62).

b. CHARACTERISTICS OF MODELS. The characteristics of the various models are shown in table XIV and described below.

c. VISUAL IDENTIFICATION. Fuzes are identified by the marking on the item and on the packings. However, the following physical differences may be used to facilitate identification.

(1) *Vane.* Nose fuze vanes, unpainted; tail fuze vanes, painted red. Fuzes M111A1 and M111 have separate vane as issued. All others have vane permanently assembled.

(2) *Safety block.* Spinner type of later models has a flange on the safety block and pins on the vane nut. An alternative form has a lug on the flange which engages a hole in the vane nut. Fuzes M111A1 and M111 have 3-segment safety block, all others have "C" shaped block.

(3) *Time scale.* The time ring of fuzes with a 92-second range is marked to indicate every half-second and numbered to indicate every third second (6-9-12-etc.). Fuzes

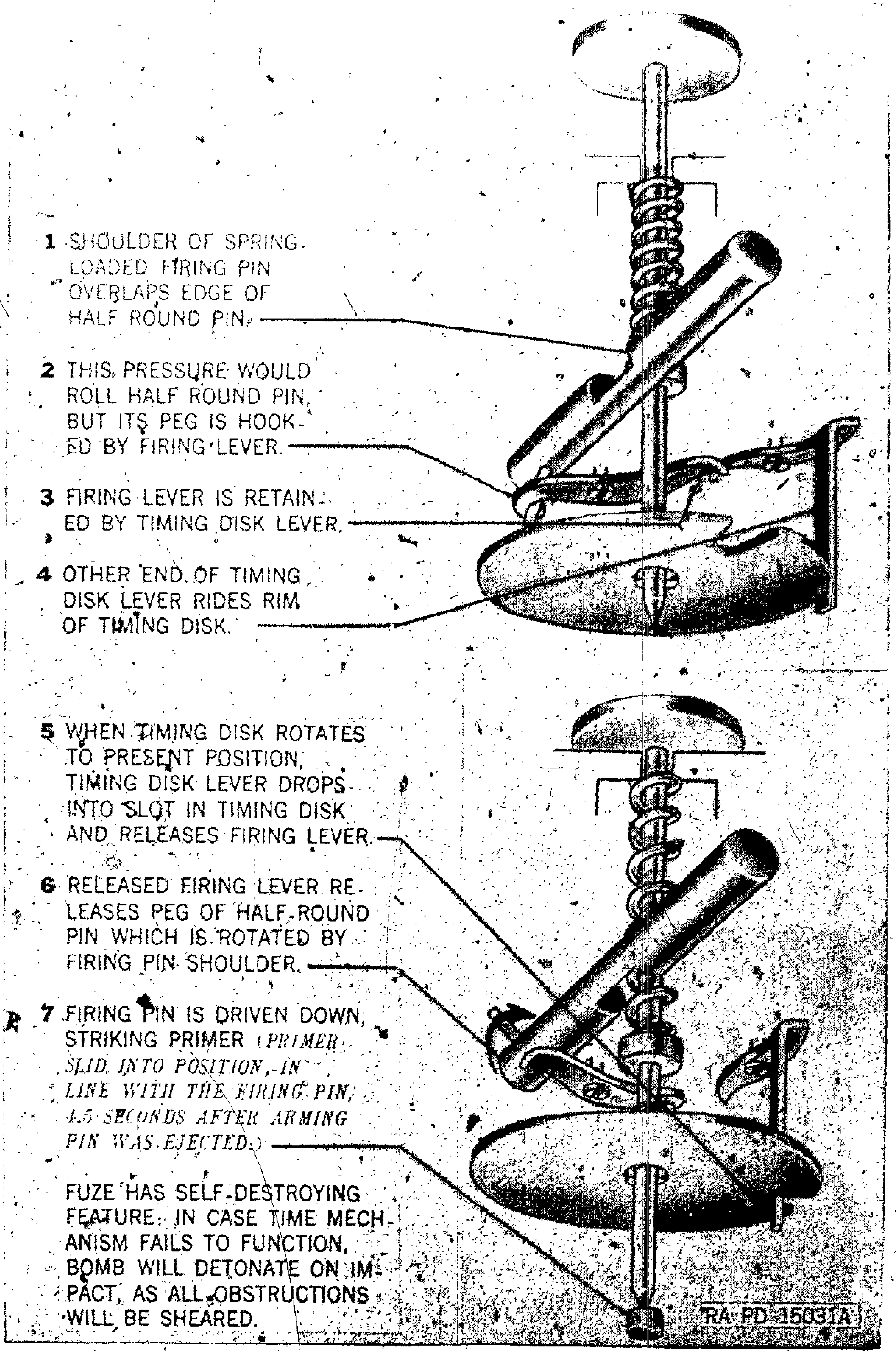

Figure 61. Mechanical time fuze—principles of functioning.

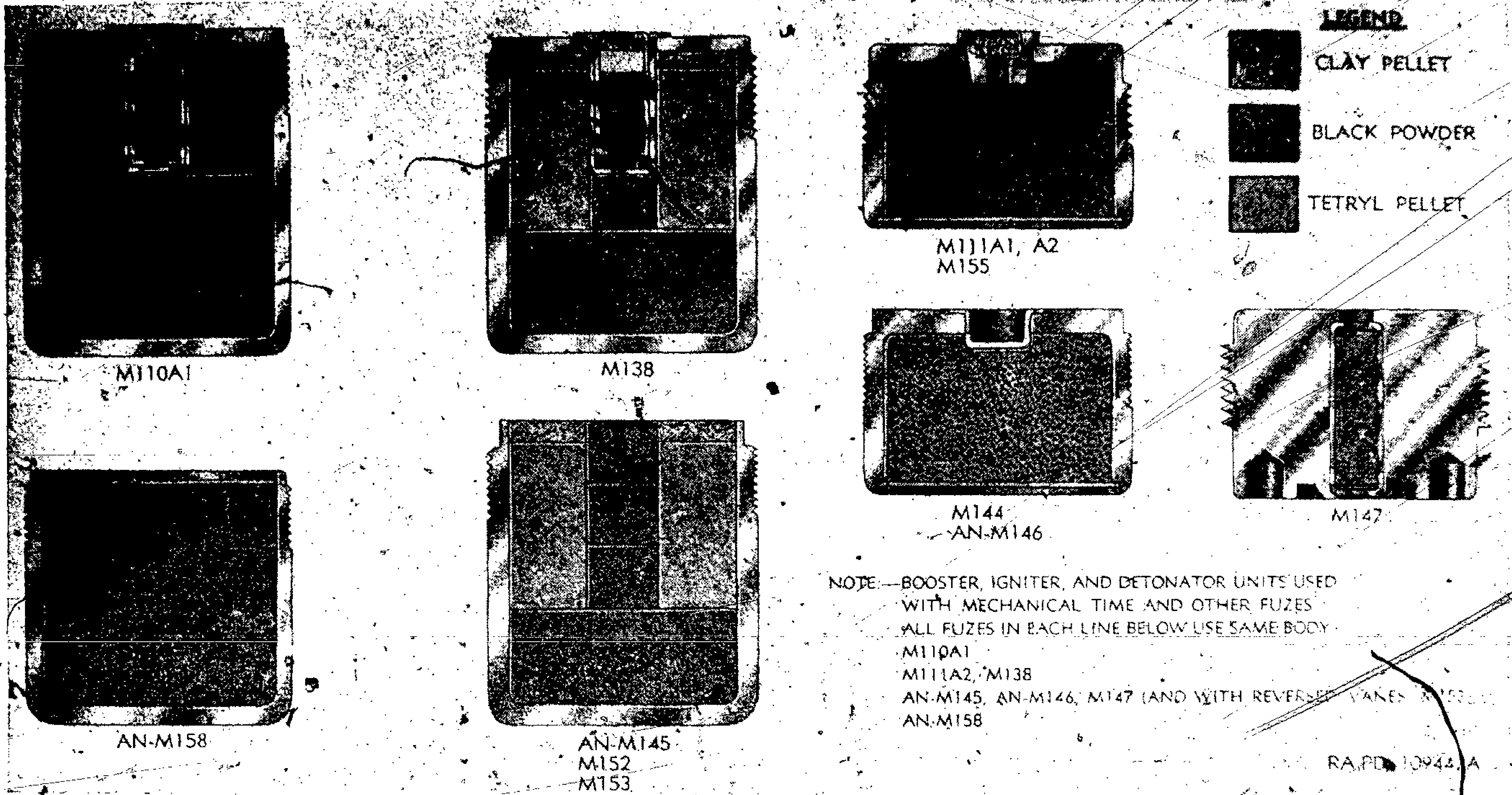

Figure 62. Booster, igniter, and detonator units used with mechanical time and other fuzes.

with 30-second range are marked to indicate every one-fifth second and numbered to indicate every full second. The minimum setting of 15 seconds characterizes the M111. The short time scale differentiates the M144 from the AN–M145.

(4) *Length of body.* The detonator-safe fuzes are about 1¼ inches longer than the nondetonator-safe models. Detonator-safe fuzes are further distinguished by the slider cover plate screwed to the side of the body.

(5) *Booster element.* Fuzes with full or reduced tetryl boosters have a booster cup extending about ¾ inch beyond the fuze threads. Black powder loaded boosters extend only ¼ inch. Detonator holders also extend ¼ inch but may be differentiated by the wrench holes in the bottom.

(6) *Arming hub bearing.* In the tail fuze M152, the arming hub bearing is modified to provide for the reversed direction of thrust. This feature serves to distinguish the M152 from the M153 which is essentially the nose fuze AN–M145 with the pitch of the vanes reversed.

d. INTERCHANGEABILITY. Provided that requirements of space, detonator safety, time range, and arming time are met, any fuze in (1) below may be substituted for any other fuze of the same group; the M152 may be used interchangeably with the M153 ((3) below).

(1) The M111 and Mods M144, AN–M146, and M155 have boosters containing black powder.

Note.—For munitions of poor stability, a quick arming fuze such as the M144 or M155 should be used to insure fuze arming before expiration of fuze time.

(2) The AN–M145 fuze has a reduced tetryl booster.

(3) The M152 and M153 are tail fuzes fitted with reduced tetryl boosters.

e. SUBSTITUTION FOR IMPACT FUZES. When air burst functioning is desired instead of impact action, and if VT fuzes are not available, the mechanical time fuze AN–M145 with adapter-booster M117 may be substituted for the AN–M103A1 or similar fuze.

71. Functioning

a. FUZE, FLARE, NOSE, MECHANICAL TIME, M111A2. This fuze (fig. 63) is typical of the slow arming, long time range, nondetonator-safe type.

(1) *Mechanical arming.* The mechanical arming is similar to that of the M110A1 fuze (par. 55). The vane turns

the arming hub assembly whose stationary gear drives the pinion (idler gear) which, in turn, drives the movable gear of the arming sleeve assembly. As the movable gear lags one tooth each revolution, it unscrews the sleeve from the hub, withdrawing the sleeve from the safety block. When the sleeve is completely withdrawn, the safety block falls away and the fuze is armed.

(2) *Time arming.* There are no time arming features in this type. The primer (detonator) is in line with the firing pin, and if the fuze body should crush on severe impact, the fuze will fire.

(3) *Time functioning.* When the arming pin is ejected, the timing disk starts. It turns at a uniform rate until the notch reaches the timing disk lever which is set at the proper distance from the notch when the calibrated time ring is rotated to the desired time setting. The timing disk lever drops into the notch and releases the firing lever which, in turn, releases the half-round pin and the spring-loaded firing pin.

(4) *Impact functioning.* If impact occurs before the set time expires, the firing pin is driven in, shearing the trigger mechanism and firing the detonator.

Caution: This fuze is nondetonator-safe and may not be assembled to a heavy bomb or flare until after the bomb or flare is securely locked in the bomb rack.

b. FUZE, BOMB, NOSE, MECHANICAL TIME, M144. This fuze (fig. 64) is typical of the detonator-safe rapid arming, short time range type. Except as noted below, this fuze is similar to the AN–M145 (*c* below).

(1) *Mechanical arming.* This type fuze is of the direct arming type. The arming hub is rotated by the vane. The arming sleeve assembly, instead of a gear, carries a forked assembly which rides on a pin within the fuze. The sleeve is held stationary by the fork and is directly unscrewed by the rotation of the hub. Six to nine turns suffice to withdraw the arming sleeve and release the safety block.

(2) *Time arming.* The timing disk of this fuze turns three times as fast as that in the AN–M145, hence the timing disk lever is released in 1.5 ± 0.5 seconds.

c. FUZE, BOMB, NOSE, MECHANICAL TIME, AN–M145. This fuze (fig. 65) is representative of the detonator-safe, long-arming, long-timing range type.

(1) *Mechanical arming.* The mechanical arming system is the same as that described for the M111A2 (*a* above).

Table XIV. Characteristics of Mechanical Time Fuzes

Model	Type fuze seat[1]	Time range (sec)	ARMING		Booster element	Use	Classification
			Vane rev.	Primer detonator[2]			
M111	Nose Flare	15 to 92		In line	Black Powder	Flare M26, Bomb, photoflash, AN-M46, Cluster M28 and M29.	Limited standard
M111A1	Nose Flare	5 to 92		do	do	Leaflet bombs	Do.
M111A2	Nose Flare	do	260	do	do	Flare M26, Bomb, photoflash, AN-M46, Clusters M28 and M29.	Do.
M144	Nose Flare	1.6 to 30.6	6 to 9	Safe; arms in 1.5 sec.	do	Cluster M26, 250-lb TI bombs	Do.
AN-M145 (M145)	Nose Frag	5 to 92	260 to 350	Safe; arms in 4.5 sec.	Reduced Tetryl pellet and clay pellet.	Aimable clusters of chemical bombs and as substitute for impact fuzes (par. 70e).	Standard.
AN-M146 (M146)	Nose Flare	do	do	do	Black Powder	Flare M26, Bomb, photoflash, AN-M46, Clusters M28 and M29 Leaflet bombs.	Do.
M147 (AN-M147)	Nose Flare	do	do	do	(Detonator only)	TI bomb M84 and M84A1, Chemical bombs M47 series.	Limited standard.
M152	Tail	do	do	do	Reduced Tetryl pellet and clay pellet.	Aimable clusters of chemical bombs.	Standard.
M153	Tail	do	do	do	Reduced Tetryl pellet and clay pellet.	do	Do.
M155	Nose Flare	do	6 to 9	In line	Black Powder	Fragmentation bomb clusters and Flare M26A1.	Do.

[1] See par. 15.
[2] Detonator-safe fuzes may be installed before loading if necessary; detonator-in-line fuzes may *not* be installed in bombs or clusters before loading in the plane.

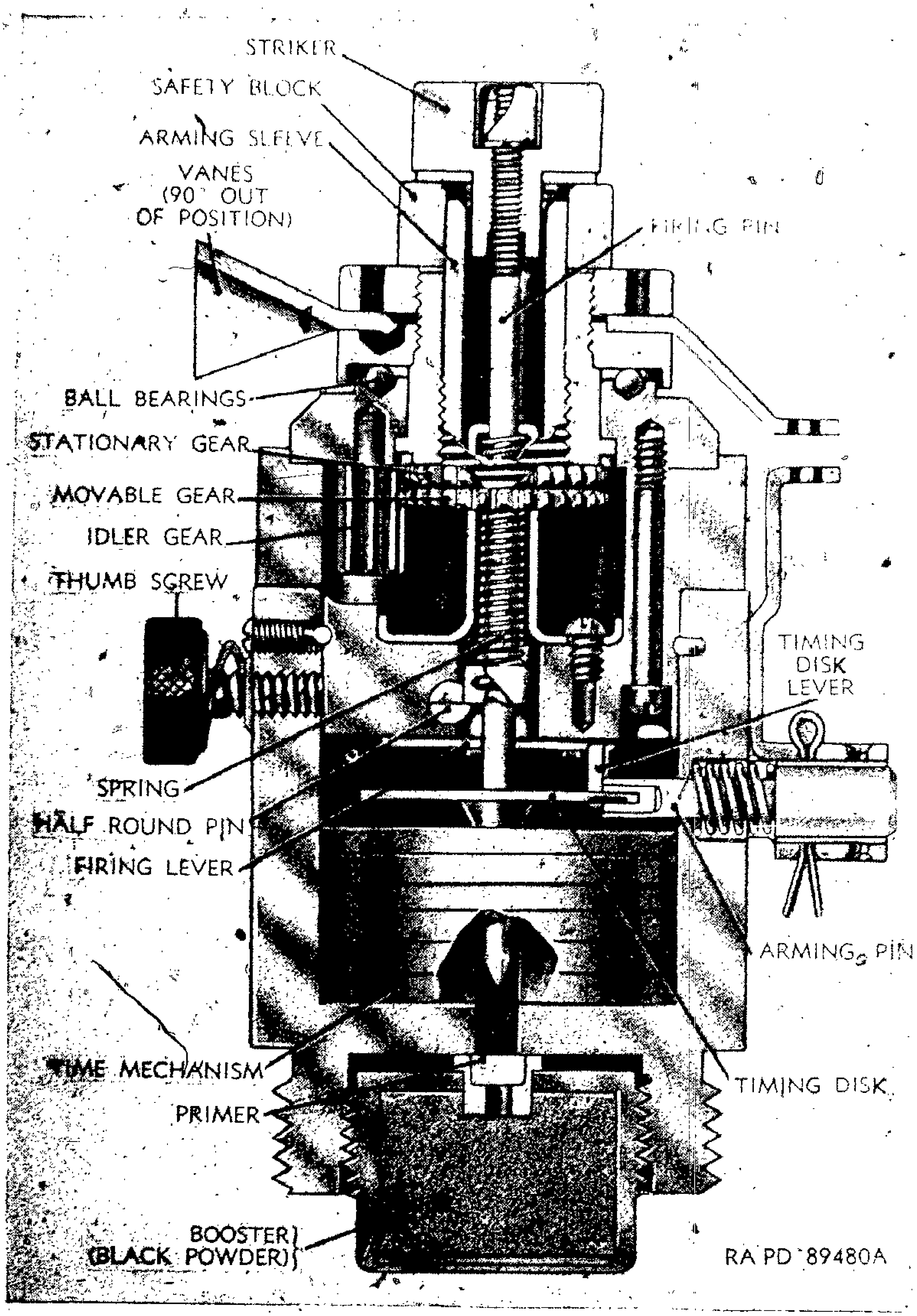

Figure 63. Mechanical time flare fuze M111A2.

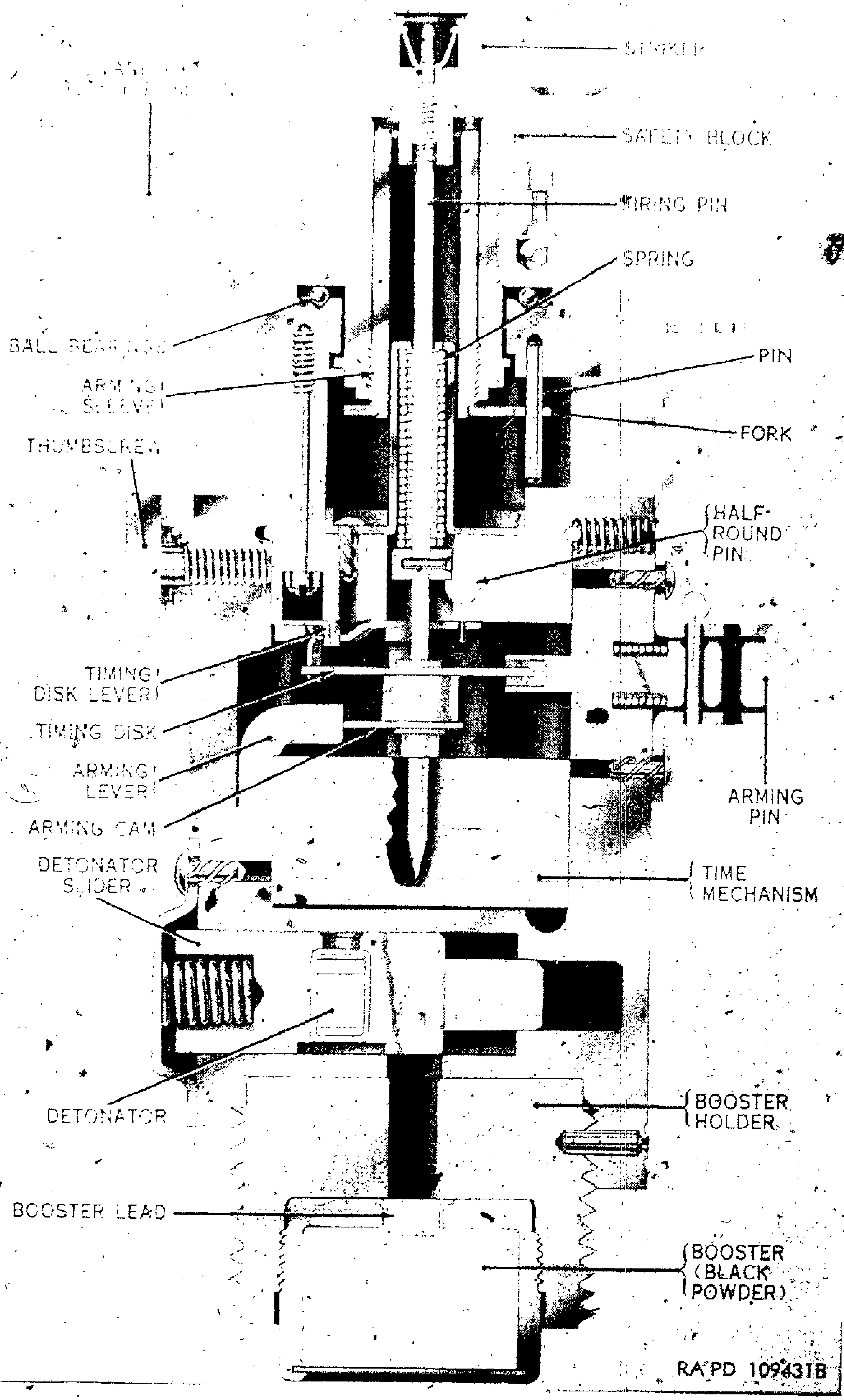

Figure 64. Fuze, bomb, nose, mechanical time, M144.

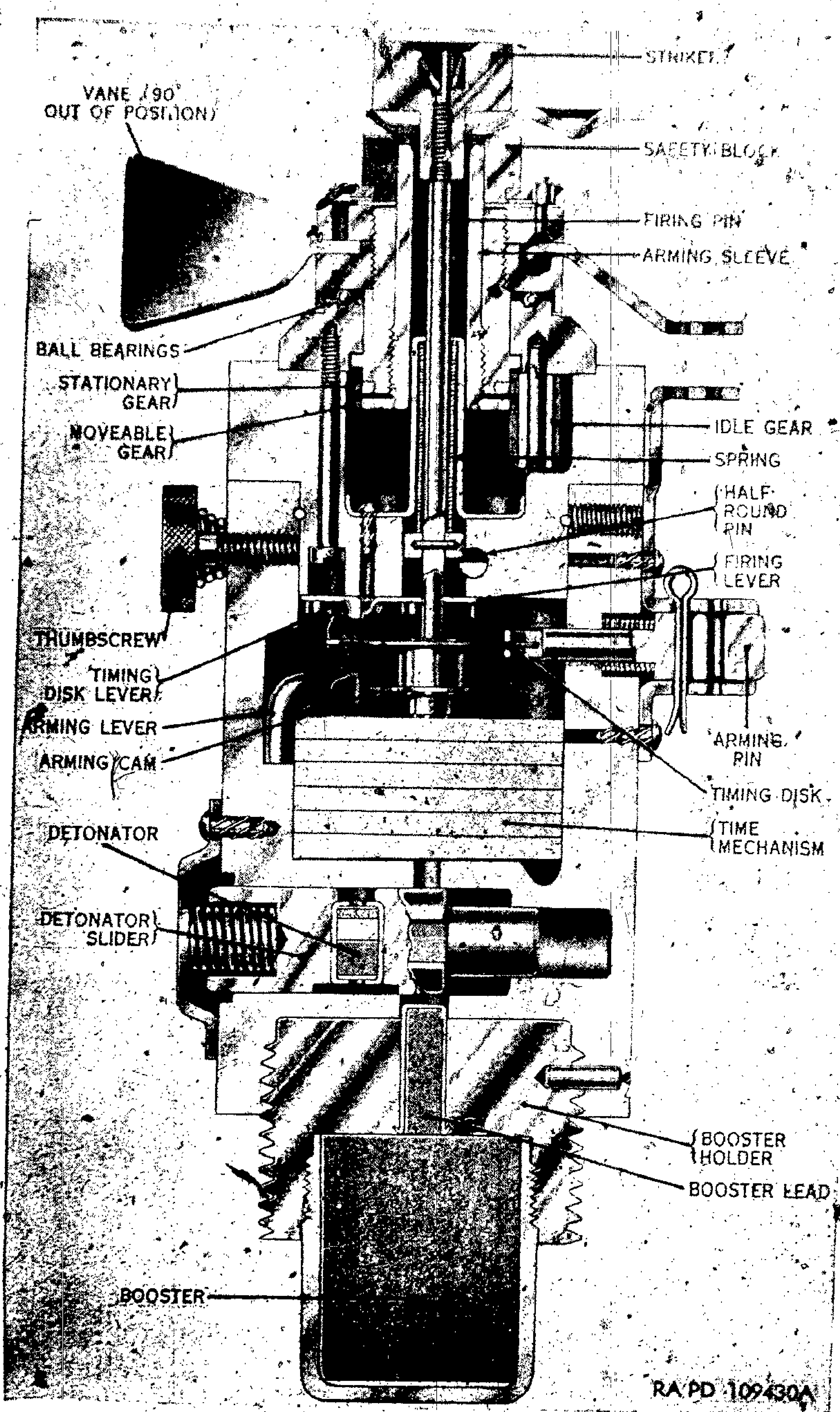

Figure 65. Fuze, bomb, nose, mechanical time, AN–M145.

(2) *Time arming.* When the arming wire is withdrawn, the arming pin is ejected by its spring, and the time mechanism rotates the timing disk and the arming cam. After 4.5 ± 1.5 seconds, the cam releases the arming lever which turns and releases the detonator slider. The slider is moved into position by spring action and locked in place by a spring detent, with the detonator in line with the firing pin and booster lead.

(3) *Functioning.* Time and impact functioning are the same as described in *a* (3) and (4) above.

(4) *Safety features.* When the safety block is in place, it prevents the striker from moving inward on all ordinary impacts. However, if the fuze is assembled to a heavy bomb or cluster, the fuze body may crush on impact. In this case, if the detonator-slider has not armed, the detonator is out of line with the firing pin and booster lead so that, even if the detonator should fire due to the crushing, it will not fire the booster.

d. FUZE, BOMB, NOSE, MECHANICAL TIME, AN–M146. This fuze is essentially the same as the AN–M145 (*c* above) but in place of the tetryl pellet and clay pellet booster, the AN–M146 is fitted with a black powder charge of the type used with the M111A2 (fig. 63).

e. FUZE, BOMB, NOSE, MECHANICAL TIME, M147. This fuze is essentially the same as the AN–M145, but with the booster of the AN–M145 being replaced by a booster lead (fig. 65).

f. FUZE, BOMB, TAIL, MECHANICAL TIME, M152. This fuze is essentially the AN–M145 (*c* above) with the fuze body reinforced, the arming hub bearings modified to accommodate the reversed direction of thrust, the pitch of the vanes reversed, and the vanes painted red. On armed impact, the inertia of the striker will usually develop enough force to shear the trigger and fire the fuze.

g. FUZE, BOMB, TAIL, MECHANICAL TIME, M153. This fuze is essentially the AN–M145 (*c* above) with the pitch of the vanes reversed and the vanes painted red.

h. FUZE, BOMB, NOSE, MECHANICAL TIME, M155. This fuze is essentially the M111A2 (*a* above) fitted with the rapid arming features of the M144 (*b* above).

72. Precautions

In addition to the precautions prescribed for handling fuzes in general (par. 33*b*) the following will be observed with respect to mechanical time bomb fuzes:

a. SAFETY FAHNESTOCK CLIP. No safety clip will be used on the arming wire for mechanical time bomb fuzes. The pressure of the arming pin is sufficient to hold the wire in place and the safety clip is liable to fou the vane assembly.

b. USE WITH HEAVY ITEMS. Nondetonator-safe fuzes may not be assembled to heavy bombs or clusters, that is, to items weighing more than 200 pounds, before the item is securely locked in the rack, because the fuze is of necessarily light construction and will crush and fire on the heavy impact that would be received if such an item should drop on its nose in loading. Detonator-safe fuzes may be assembled to bombs or clusters before installation of the item in the rack, but it is preferred that all fuzing be done after the item is installed in the rack.

c. STRIKER. The striker head must be protected from all heavy blows. The striker release mechanism is necessarily of light construction in all time fuzes, and a heavy blow will shear the trigger mechanism. When this occurs, the striker head will snap down tight against the safety block when the striker stop is removed, and the fuze will fire as soon as the safety block is ejected. If the trigger mechanism is intact, there will be a noticeable air gap between the striker and the safety block. This is the basis for the requirement that the striker stop be removed for a moment when inspecting fuzes for serviceability.

d. ARMING PIN. The arming pin should be kept in place at all times. The arming wire or another cotter pin must be in place in the outer hole in the arming pin before any attempt is made to remove the safety cotter pin. The cotter pin must be replaced before the arming wire is removed. If the arming pin is allowed to move outward as much as $1/_{10}$ of an inch, the time mechanism will start. Once started, it cannot be stopped until the firing pin is released. While the safety block may prevent the fuze from firing, the fuze cannot be reset and must be destroyed. If the safety cotter pin is found located in the outer holes of the arming pin bracket, the cotter pin should be examined to see that it is through the outer hole in the arming pin as well because, when the inner hole of the arming pin is opposite the outer holes in the bracket, the timing disk has been released.

e. TIME MECHANISM. The time mechanism escapement runs very rapidly, consequently, when the fuze is operating, *it does not tick;* it gives a hum or buzz. The time mechanism is spring operated and is wound when manufactured. No attempt will be made to alter the time mechanism in the field.

f. CORROSION. Special attention should be given to examination for evidence of corrosion. A small amount of external corrosion may indicate sufficient internal corrosion to freeze the time mechanism or detonator-slider and cause a dud or, conversely, it may indicate primer corrosion or weakening of light parts which would render the fuze unsafe to handle.

73. Fuzing and Defuzing

The procedure for assembly of mechanical time bomb fuzes is essentially the same for all models.

a. INSPECTION. Remove the fuze from its packing and inspect to insure that safety block is in place, arming pin is in its proper position, fuze threads are clean, and that there is no indication of serious corrosion or other evidence of unserviceability. Holding the safety block in place, remove the striker stop and examine for clearance between striker and safety block. Release the safety block and shake the fuze gently to see if the safety block falls out. Replace the striker stop. If the striker snaps down tight against the safety block or if the safety block falls out, the fuze should be destroyed.

b. TIME SETTING. Loosen the time set screw and turn the fuze head until the desired time is indicated by the index mark on the body. Tighten the set screw to lock the setting.

Note. It should be noted that there is a time lag of 0.2 second between release of the bomb and starting of the time mechanism. This is due to the fact that the bomb falls for 0.2 second after release before the arming wire is withdrawn and the arming pin ejected. Due consideration should be given to this time lag in selecting the time setting. Thus if it is desired that the fuze function 21.5 seconds after release, the fuze should be set for 21.3 seconds.

c. FUZING.

(1) Remove the nose plug from the bomb and inspect fuze seat to be sure that it is clean and the threads are not damaged.

(2) Screw the fuze into the cavity handtight.

(3) Attach arming wire loop to shackle. Use only 0.036-inch diameter arming wire. Straighten free end of wire and pass it through, in turn, the front suspension lug, the outer holes in the arming pin bracket and arming pin, and the outer eyelets in the arming wire guide and vane tab. No safety Fahnestock clip is used. Take up slack in the wire by pulling it forward through the arming pin and vane lock. Cut off wire 2 to 3 inches in front of vane tab. Be sure there are no kinks or burs.

(4) Check fuze setting.

(5) Remove striker stop, safety cotter pin, and seal wire. Check again for clearance between striker and safety block. If striker should snap down tight against safety block or if safety block should fall out, tape safety block in place, remove fuze from bomb or cluster, and set aside for destruction.

d. DEFUZING. If the bomb or cluster is not dropped, replace the cotter pin in the fuze arming pin, replace the striker stop between striker and safety block, pass seal wire through eyelets in vane tab and arming wire guide, and fasten the ends of the wire together. Then remove arming wire and unscrew the fuze. Replace closing plug. Return fuze to its original packings and seal with adhesive tape.

74. Accidental Arming

Evidence of arming is given by absence of safety block; by complete or partial ejection of arming pin, and by failure of trigger mechanism to support the striker clear of the safety block. If any of these conditions are present, the safety block should be fastened in place with tape. If the original is missing, a spare or an improvised block should be used. The fuze may then be handled with comparative safety until it can be destroyed. Such fuzes cannot be returned to serviceable condition in the field.

75. Marking

Mechanical time fuzes are marked with the time scale and setting index, with the words "Tighten after setting" arrowed to the time set screw, and with the type, model, lot number, loader's symbol, and date loaded. Mechanical time tail fuzes have vanes painted red.

76. Packing

Mechanical time fuzes are packed in individual, sealed metal cans which, in turn, are packed in quantities of 15, 24, 25, or 50 per wooden boxes dependent upon the model of fuze packed.

Section VI. HYDROSTATIC FUZES

77. General

Hydrostatic fuzes act under the influence of water pressure to explode a bomb at a predetermined depth below the surface. They are used in depth bombs for antisubmarine warfare.

78. Fuze, Bomb, Tail, Hydrostatic, AN–MK 230 Mods 4, 5, and 6

_a._ DATA. The hydrostatic tail fuze AN–Mk 230 Mods 4, 5, and 6 is a vane arming type which arms after 110 revolutions of the vane; the "mods" merely signify different manufacturers; in all other respects Mods 4, 5, and 6 are identical. It operates in response to hydrostatic pressure to detonate the bomb at a depth of 25, 50, 75, 100, or 125 feet as determined by the setting of a

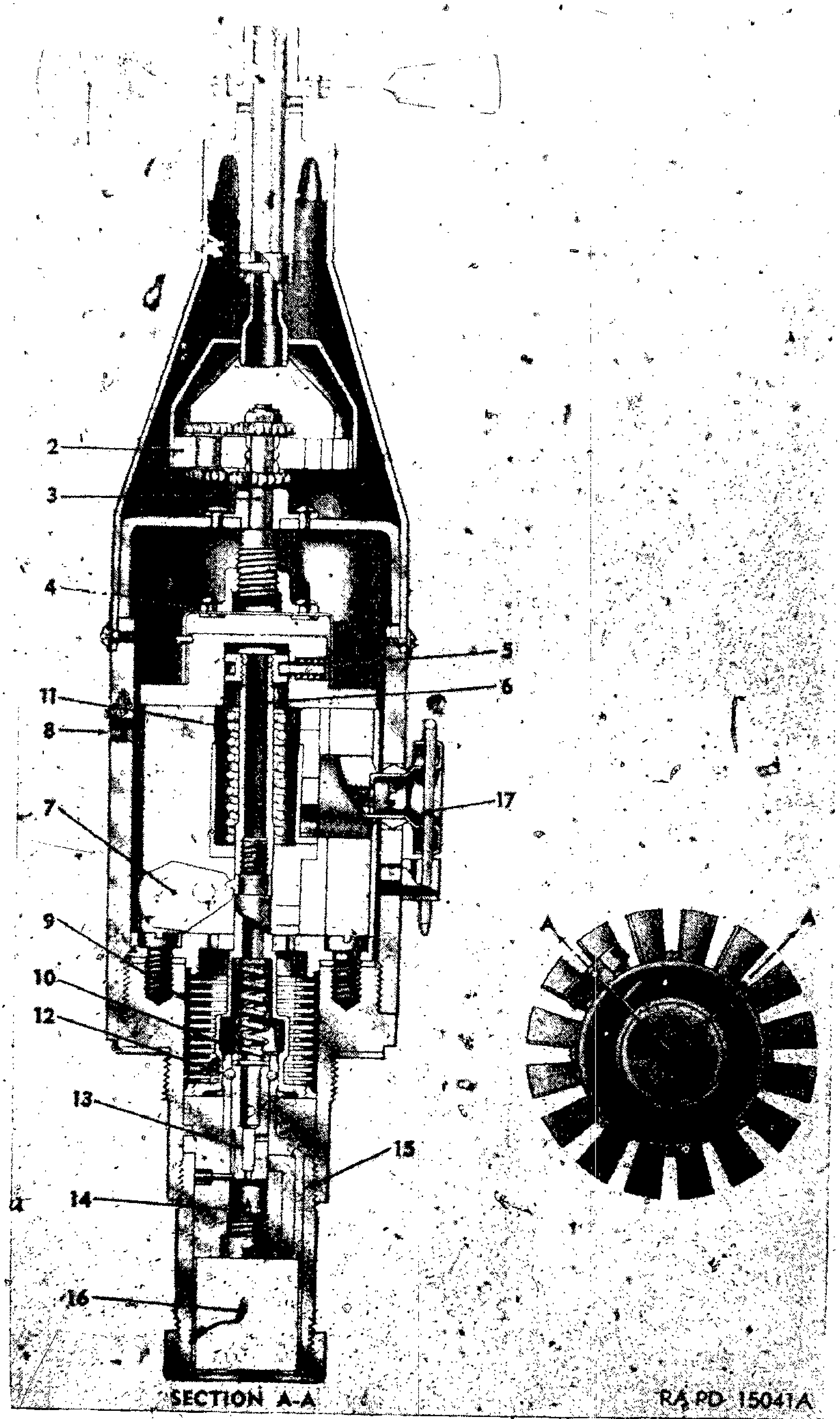

Figure 66.—Fuze, bomb, tail, hydrostatic, AN–MK 230 Mods 4, 5, and 6.

disk on the fuze body. The fuze is 15.4 inches in length and 2.36 inches in diameter; it weighs 15 pounds. This fuze is authorized for use with 500-, 1,000-, and 2,000-pound GP bombs of the "60" series and with the Mk 54 Mod 1 depth bomb. The seat for this fuze should have threads 2.0–12NS–3 and be 2.65 inches deep.

b. DESCRIPTION. This fuze (fig. 18) is shaped like a bottle, with the booster assembled to the base and a 16-blade arming vane assembled to the other end. A vane lock flange is assembled at the neck, and the depth setting disk and lock are assembled to the side. Depth settings in feet are stamped in the disk, the lock serves as the index. As issued, a safety cotter pin, with pull ring and instruction tag, is in place in the vane lock and a safety bar is held in place through the fuze threads by a cotter pin. This bar holds the detonator assembly from moving toward the fixed firing pin.

c. FUNCTIONING. (fig. 66). When the arming wire is withdrawn, the air stream rotates the arming vane (1). The rotation is transmitted through a reduction gear train (2) to the arming shaft (3) which is threaded into the arming spider assembly (4). The arming spider assembly progresses upward and, after 110 revolutions of the vane, clears the safety detents (5) which are ejected by their springs from the groove in the head of the firing spindle (6). Upon impact with the water, the inertia counterbalance weights (7) prevent function by set-forward. As the bomb sinks, the water enters the ports (8) in the body of the fuze and builds up hydrostatic pressure in the bellows (9). When sufficient pressure is built up to compress the firing spring (10) and depth spring (11), the firing spindle is forced downward so that the locking balls (12) fly into a recess and the firing spring forces the detonator (13) against the fixed firing pin (14). The resultant explosion is transmitted through the firing train leads (15) to the booster (16). Variation in depth setting is obtained by varying the compression of the depth spring by means of a cam on the inner end of the depth setting control (17).

d. PREPARATION FOR USE. The fuze is ready for use when removed from its metal container except for removal of safety devices (*e* below) and possible change of depth setting.

e. FUZING. When fuzing GP bombs with this fuze, remove the sleeve from the adapter-booster and proceed as follows:

(1) Remove fuze from its packings and inspect fuze and gasket.

(2) Set to depth desired by removing cotter pin from depth setting rod and withdraw rod. Turn disk so that desired depth is next to the lock. Replace cotter pin in rod and spread ends.

Note. Depth setting should be made before fuze is installed in bomb but it may be changed after fuzing without removing the fuze from the bomb.

(3) Remove cotter pin from safety rod and remove rod from fuze.

(4) Make sure fuze gasket is in place and screw fuze into bomb. Tighten fuze with wrench so as to obtain a watertight seal. Do not use grease or sealing compounds because, if they should seep into the fuze, they are liable to cause a dud.

(5) Thread the arming wire through the rear suspension lug of the bomb and through the nearest pair of holes in the flange and vane. Adjust the wire to protude 4 to 6 inches beyond the vane and place two safety Fahnestock clips on the wire against the face of the vane. Be sure that the wire is neither kinked nor burred.

(6) Remove safety cotter pins from vane and flange.

f. DEFUZING. If the bomb is not dropped, it will be defuzed and the fuze returned to its original condition and packing as follows:

(1) Replace and secure safety cotter pin in vane and flange.

(2) Remove the two safety Fahnestock clips, and the arming wire from the fuze. Repack clips and wire.

(3) Unscrew fuze from bomb and replace the safety rod at the base of the fuze, securing the rod with the cotter pin. If the safety rod can not be reinserted in the fuze, the fuze must be considered as unsafe. Such fuzes should be destroyed.

(4) Reset depth setting to position as issued, making certain that the locking pin is secured with cotter pin.

(5) Return fuze with gasket to its container and reseal container with adhesive tape.

(6) If a GP bomb was fuzed, the sleeve should be replaced in the adapter-booster before returning bomb to storage.

g. ACCIDENTAL ARMING. There is no external means of determining that this fuze is armed. If it is known that this fuze has been armed or has been subjected to such treatment that arming is suspected, it may be restored to the unarmed condition only by authorized and experienced personnel. This may be done by first insuring that the safety rod is in place, then removing the screws in the body, removing the cone from the fuze body, and separating the arming train assembly from the cone. The arming spider assembly is then backed off the arming shaft screw and replaced over the arming pins. The arming shaft is then reengaged in the spider assembly and screwed down until the housing seats firmly

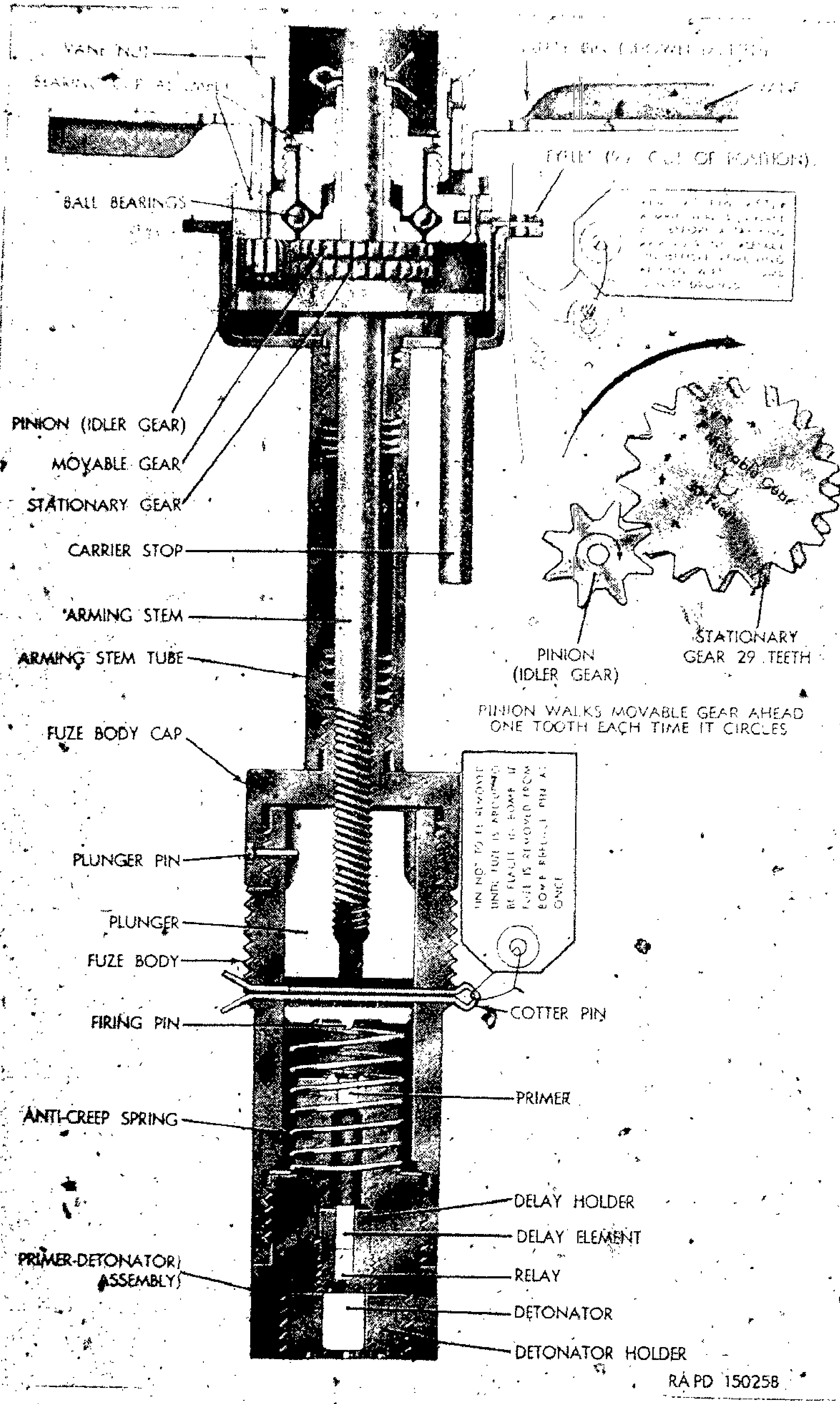

Figure 67. Fuze, bomb, tail, AN–M100A2.

on the fuze body. The vane is inserted into the slot in the reduction gear bracket and the cone reassembled. After the body screws are replaced, the vane is turned backward until it begins to bind and is then turned five revolutions forward. The safety cotter pin is then inserted and the fuze repacked.

h. MARKING. The fuze is marked with type, model, lot number, and inspector's initials. It is also marked to indicate the depth for each position of the depth setting disk.

i. PACKING. One fuze is packed in a sealed metal container, four such containers are packed in a metal crate.

Section VII. IMPACT TAIL FUZES: SHORT AND MEDIUM DELAY

79. General

When a bomb strikes a target, its impact causes these fuzes to function and detonate the bomb immediately or within a short time thereafter, dependent upon the length of delay of the primer-detonator used. All impact tail fuzes are of the arming vane type (fig. 17). The arming vane is separated from the fuze body by a long arming stem. Fuzes of one series (that is, fuzes with the same mechanism and action, but designed for bombs of different sizes) are distinguished among themselves by length of arming stem (fig. 16). The body of the fuze is threaded for an adapter or fuze seat with a nominal diameter of 1.5 inches. The rapid arming impact tail fuzes are distinguished from the slow arming types by the rod which extends from the arming head along the arming stem for approximately 1.5 inches. This rod is present on the slower arming types and absent from the rapid type (fig. 17).

80. Fuze, Bomb, Tail, AN–M100A2, w/Primer-Detonator, M14

a. DATA. The AN–M100A2 is a vane-type tail fuze which arms after 158 revolutions of the arming vane. As issued, this fuze may be fitted with either the PRIMER-DETONATOR, M14, nondelay or the PRIMER-DETONATOR, M14, 0.025-second delay. These may be replaced in the field by the M14 primer-detonator of 0.1-second delay, 0.01-second delay or 0.24-second delay. The fuze is approximately 9 inches long and weighs 2.7 pounds. It is authorized for use in GP and fragmentation bombs of 100 to 300 pounds. Earlier models differ as follows: The fuze, bomb, tail, M100A1 required 675 revolutions of the arming vane to arm the fuze. All earlier models had an 8-bladed vane. The M100A2C tail fuze was designed to provide longer arming time by means of finer threads and a longer-threaded portion on the arming stem. The M100A2C is no longer manufactured.

b. DESCRIPTION. The tail fuze AN-M100A2 consists of body, stem, and arming head (fig. 67).

(1) The cylindrical body is threaded to properly engage the adapter of the bomb. An M14 primer-detonator of desired delay is screwed into the end of the fuze body that enters the adapter; the arming stem is assembled to the opposite end. The body contains an inertia type firing pin and its restraining (anticreep) spring. A cotter pin is placed through the body and plunger for safety during shipment.

(2) The arming stem tube connects the body and arming head cup. The inner end of the arming stem is screwed through the body into the plunger; the arming mechanism is attached to the outer end by means of a cotter pin.

(3) The arming head contains the arming vane assembly and reduction gear train. A stop rod (carrier stop) passes through the cup and extends toward the body, parallel to the stem. The arming vane is of the 4-blade type and is not assembled to the fuze during shipment. A safety pin is sealed into a vane stop eyelet for safety in handling.

(4) In addition to the marking (*h* below), this fuze is distinguished from the M112A1, M115, and M123A1 type fuzes as follows (fig. 1):

(*a*) The AN-M100A2 has a large arming head and the primer-detonator has a single, wide knurled band.

(*b*) The M112A1 type has a small arming head and the primer-detonator has two, narrow knurled bands.

(*c*) The M115 type has a large arming head and the primer-detonator has two, narrow knurled bands.

(*d*) The M123A1 has a small, special type head and the body of the fuze has a groove which contains a steel ball.

c. FUNCTIONING. When the arming wire is withdrawn, the air stream turns the arming vane which turns the bearing cup assembly (fig. 67). A pinion, mounted on the bearing cup, is in mesh with a 29-tooth stationary gear and a 30-tooth movable gear. The stationary gear is prevented from rotating by the carrier stop passing through the stem cup. Each revolution of the pinion forces the movable gear to advance one tooth (1/3 revolution) ahead of the fixed gear. The fixed gear is connected to the arming stem by a cotter pin passing through the gear carrier and the arming stem. As the arming stem rotates, it unscrews from the plunger. After 5.7 revolutions of the arming stem (aprx 158 revolutions of the vane) the stem clears the plunger and the fuze is armed.

Note. The only exterior evidence of fuze arming is the progress of the arming head out of the cup, shortening the amount of stop rod exposed by 0.6 inch.

The vane assembly is still attached to the fuze. After about 200 more revolutions of the vane, the stem unscrews from the fuze body, and the vane arming head and stem are carried clear of the fuze by the air stream. Upon impact, the plunger is driven forward and the firing pin strikes the primer. The flame from the exploding primer ignites the delay charge which burns the required time and ignites the relay charge. This explodes the detonator.

d. PREPARATION FOR USE. When removed from the packing, the fuze is ready for use except for assembly of the arming vane (*e* below), and for possible change of primer-detonator. When necessary to change primer-detonator to provide a different delay, unscrew the undesired primer-detonator from the fuze body. Remove an M14 primer-detonator of the desired delay from its packing, inspect it, and assemble it to fuze body, screwing it in handtight. Seal the primer-detonator removed from the fuze in the packings of the substitute, and mark to indicate the delay. If the plunger spring or spring washer fall out of the fuze when the primer-detonator is removed, they should be replaced before the new primer-detonator is assembled.

Caution: PRIMER-DETONATOR, M14 used in this fuze is not interchangeable with PRIMER-DETONATOR, M16 used in other fuzes. An attempt to assemble a primer-detonator to a fuze for which is is not designed will ruin both fuze and primer-detonator. Primer-detonators may be distinguished by the knurling around the base: the M14 has a single wide band, and the M16 has two narrow bands separated by a groove (fig. 19).

e. FUZING. In fuzing the bomb with FUZE, bomb, tail, AN–M100A2, the following sequence will be observed:

(1) Unseal the can and remove fuze from its packings.

(2) Inspect fuze for serviceability and for presence of primer-detonator of desired delay.

(3) Remove cotter pin which passes through body of fuze.

(4) Screw fuze into adapter-booster handtight.

(5) Thread long branch of arming wire through rear suspension lug of bomb, then through eyelets of vane stop. If nearer eyelets of the vane stop are occupied by the safety pin, place the cotter pin from the fuze body in opposite vane stop, then cut seal wire, remove safety pin, and insert arming wire.

(6) Remove safety or cotter pin.

(7) Thread wire through hole in arming vane and assemble vane to arming head and screw vane nut down handtight. Be sure that slots in vane hub are properly located over studs.

(8) Adjust arming wire to protude 2 to 3 inches. Remove all kinks and burs.

(9) Place two safety clips on the wire and slide them up until the inner one touches the face of the vane.

f. DEFUZING. If the bomb is not dropped, it will be defuzed and the fuze returned to its original condition and packing as follows:

(1) Remove safety clips and arming vane from fuze.

(2) Place safety pin in unoccupied vane stop eyelet. Secure safety pin in place with seal wire.

(3) Remove arming wire. Repack arming wire and safety clips.

(4) Unscrew fuze from bomb and insert cotter pin in fuze body. Spread legs of cotter pin to prevent its slipping out.

(5) Repack fuze in its container and seal container with adhesive tape. Replace containers and arming vanes in packing box.

g. ACCIDENTAL ARMING. Should this fuze become armed accidentally, as shown by the progression of the arming head and shortening of the carrier stop as described above, the fuze will have first the vane assembly and then the primer-detonator removed. The fuze may then be disarmed by authorized and experienced personnel as follows:

(1) Place cotter pin through body of fuze.

(2) Remove the cotter pin at the outer end of the arming stem which holds arming head on stem. Remove arming head.

(3) If there is a register hole through the stem tube and stem, screw the arming stem into the plunger until holes in the stem and stem tube are in register. Place a cotter pin through these holes. If there is no register hole, screw stem down tight then back off one turn.

(4) Replace arming head on stem and replace cotter pin.

(5) If used, remove cotter pin in stem and tube.

(6) Replace primer-detonator.

h. MARKING. The fuze has the type, model, and lot number stamped in the body. The sealing wire of the safety pin carries a tag which reads: "Remove pin after wire is in place but before attaching arming vane. Replace pin before removing arming wire if bomb is not dropped." The primer-detonator is marked (fig. 19) to indicate the amount of delay.

i. PACKING. FUZE, bomb, tail, AN–M100A2 is packed, without vane assembly, one per container, 25 containers and 25 vane assemblies in a wooden box. The vanes are placed on spindles in the packing box.

81. Fuze, Bomb, Tail, AN–M101A2

a. DATA. FUZE, bomb, tail, AN–M101A2 is an arming vane type tail fuze which arms after 158 revolutions of the arming vane and acts to detonate the bomb upon impact with a delay determined by the primer-detonator asesmbled. As issued, either PRIMER-DETONATOR, M14, 0.25-second delay, or nondelay, is assembled to the fuze. These may be replaced in the field by an M14 primer-detonator of 0.1-second delay, 0.01-second delay, or 0.24-second delay. This fuze is 12 inches long and weighs 2.9 pounds. It is authorized for use in GP, SAP, and chemical bombs of 500 to 600 pounds. The fuze M101A2C was designed to provide longer arming time by means of finer threads and greater length of threaded portion on the arming stem. The M101A2C is no longer manufactured.

b. DESCRIPTION. Except for the length of the stem and the corresponding differences in overall length, weight, and bombs authorized, this fuze is identical with FUZE, bomb, tail, AN–M100A2 (par. 80). With the exceptions noted, all statements made above concerning FUZE, bomb, tail, AN–M100A2 apply equally to the AN–M101A2, and all statements concerning the M100A1 apply equally to the M101A1.

82. Fuze, Bomb, Tail, AN–M102A2

a. DATA. FUZE, bomb, tail, AN–M102A2 is an arming vane type fuze which arms with 158 revolutions of the arming vane and acts to detonate the bomb upon impact with a delay determined by the primer-detonator assembled. As issued, either PRIMER-DETONATOR, M14, 0.25-second delay, or nondelay, is assembled to the fuze. These may be replaced in the field by an M14 primer-detonator of 0.1-second delay, 0.01-second delay, or or 0.24-second delay. The fuze is 16 inches long and weighs 3.2 pounds. It is authorized for use with all GP and SAP bombs of 1,000 pounds and larger, with the 4,000-pound LC bomb and with 1,000-pound chemical bombs (nondelay only). The fuze M102A2C was designed to provide longer arming time by means of finer threads and greater length of threaded portion on the arming stem. It is no longer manufactured.

b. DESCRIPTION. Except for the length of the stem and the corresponding differences in overall length, weight, and bombs authorized, this fuze is identical with FUZE, bomb, tail, AN–M100A2 (par. 80). With the exception noted, all statements made above concerning FUZE, bomb, tail, AN–M100A2 apply equally to the AN–M102A2, and all statements concerning the M100A1 apply equally to the M102A1.

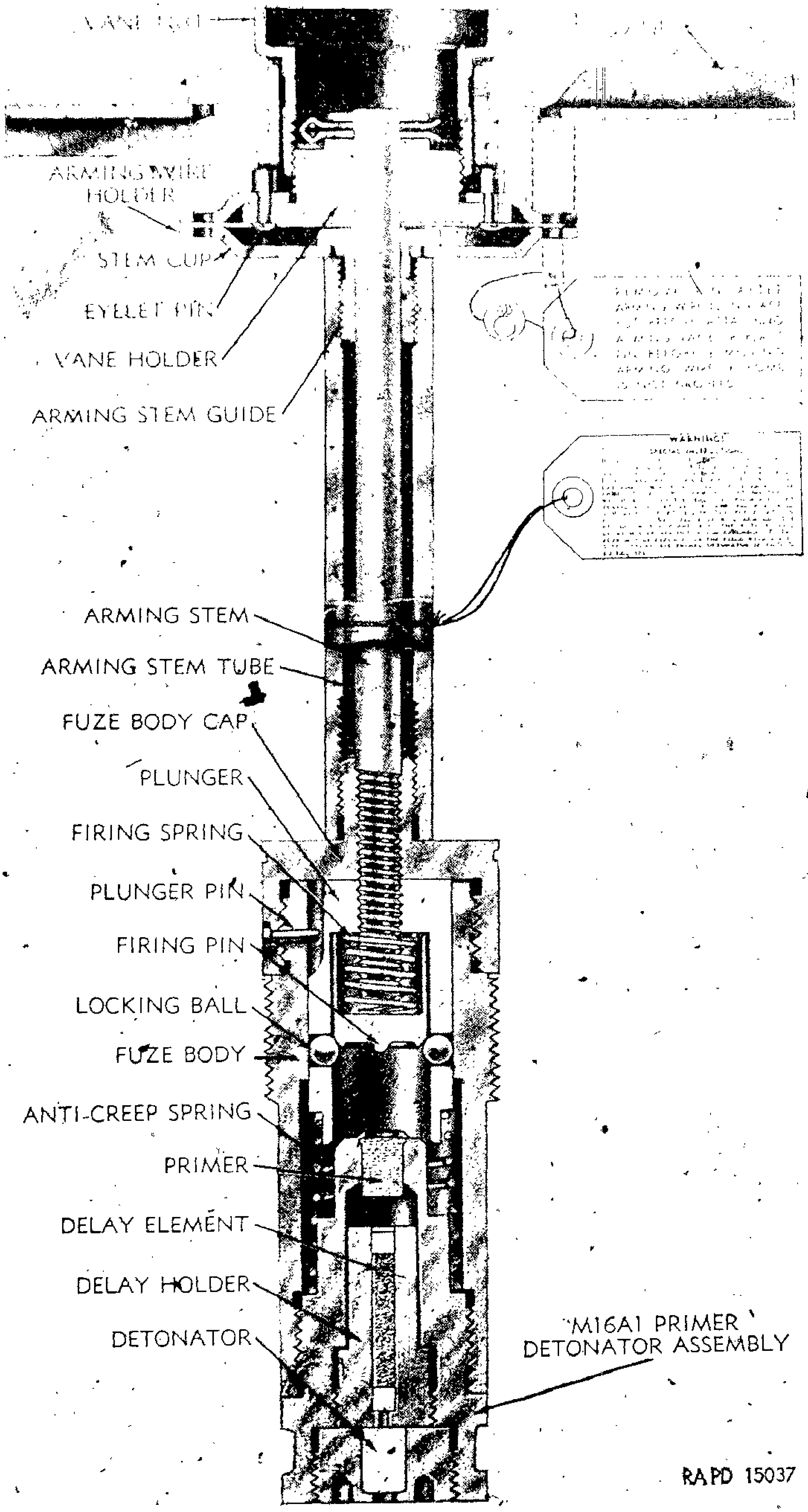

Figure 68. Fuze, bomb, tail, M112A1.

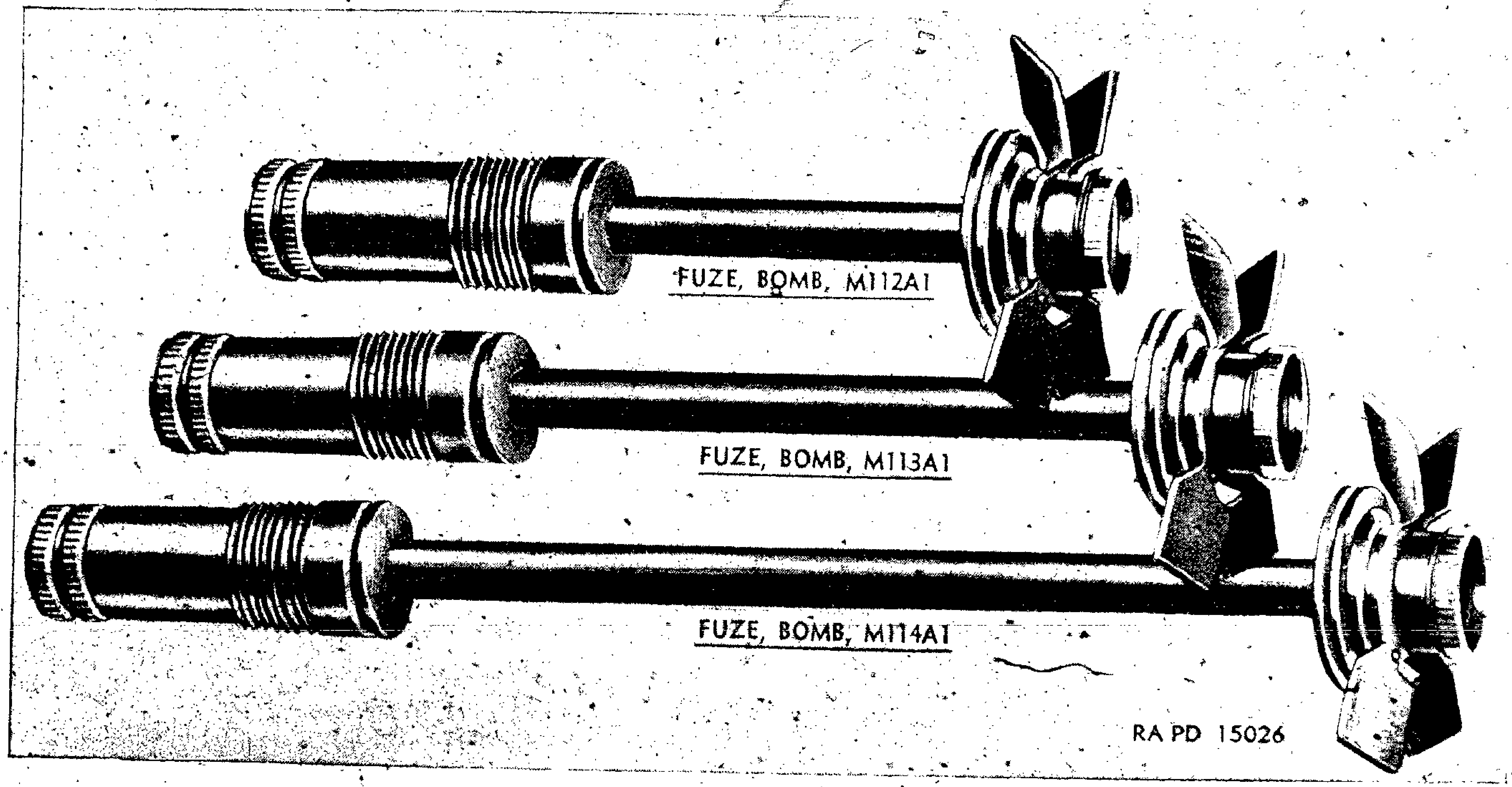

Figure 69. Tail fuze family—M112A1, M113A1, and M114A1.

83. Fuze, Bomb, Tail, M112A1

a. DATA. FUZE, bomb, tail, M112A1 is an arming vane type tail fuze which arms after 18 revolutions of the arming vane. It acts to detonate the bomb 8 to 15 seconds or 4 to 5 seconds after impact, dependent upon the primer-detonator used. The fuze is issued with either the PRIMER-DETONATOR, M16A1, 4- to 5-second delay or 8- to 15-second delay; these primer-detonators are interchangeable. The fuze is equipped with a cocked type firing pin which, once the fuze is armed, is extremely sensitive. FUZE, bomb, tail, M112A1 is authorized for use with GP bombs of 100 to 300 pounds. FUZE, bomb, tail, M112 differs only in that it is issued with PRIMER-DETONATOR, M16 which does not have a shoulder to act as plunger stop. FUZE, bomb, tail, M112 may be substituted when any but the most severe impact is anticipated. The fuze is 9.6 inches long and weighs 2.3 pounds.

b. DESCRIPTION. FUZE, bomb, tail, M112A1 consists of a body which contains the replaceable primer-detonator and a cocked firing pin, the stem, and the vane assembly (fig. 68). PRIMER-DETONATOR, M16, or M16A1 may be used with this fuze (M16 is used with FUZE, bomb, tail, M112). The firing pin is assembled in a cupshaped plunger and is held, with its spring compressed, by two balls assembled in holes in the side of the plunger. The balls are held in place against the firing pin by the wall of the fuze body. When the plunger advances upon impact or other shock, the holes containing the balls are brought opposite a counter bore machined in the body; the balls are forced outward, and the firing pin is released. When the fuze is armed, the plunger is restrained only by a light spring to prevent it creeping forward. The arming stem is threaded at the inner end. When the fuze is in the safe condition, the stem is screwed through the cup of the fuze body and into the plunger. The vane assembly is attached, without reduction gearing, to the outer end of the arming stem. The stem tube forms a housing for the stem and carries on its outer end a shallow cup which, with a similar cup on the vane hub, contains eyelets for insertion of the arming wire. The arming vane is shipped separately.

c. FUNCTIONING. When the arming wire is withdrawn, the air stream rotates the arming vane. The rotation is transmitted directly to the arming stem, unscrewing it from the firing pin plunger and fuze body. After approximately 18 revolutions, the stem is unscrewed from the plunger and the fuze is armed. After 18 more revolutions of the vane, the arming stem unscrews from the fuze body and the vane and stem assembly is carried free of the fuze. Upon impact, even a graze impact, the plunger is carried forward by its inertia, the locking balls are released, and the firing pin is driven by its spring into the primer. The flame from the primer ignites the delay element which burns 8 to 15 seconds (or 4 to 5 sec. dependent upon the primer-detonator assembled to the fuze) before igniting the relay which explodes the detonator. Upon severe impact the plunger is arrested by the shoulder of the primer-detonator so that the blow on the primer has only the force of the firing pin spring, thus avoiding malfunction due to pierced primer.

d. PREPARATION FOR USE. The fuze is ready to be assembled to the bomb when removed from its packings, except when a different delay action is desired. In this case, the 8- to 15-second delay primer-detonator is unscrewed from the fuze and a 4- to 5-second delay primer-detonator is screwed in its place or vice versa. The use of tools is neither necessary nor permitted. If hand force is insufficient, the fuze should be turned in as unserviceable.

e. FUZING. In fuzing a bomb with FUZE, bomb, tail, M112A1, the following sequence will be observed:

(1) Unseal the can and remove the fuze from its packings.
(2) Inspect the fuze for serviceability and for presence of primer-detonator of desired delay.
(3) Screw fuze into adapter-booster handtight.
(4) Thread a long branch of arming wire through rear suspension lug of bomb, then through eyelets of vane stop.
(5) Remove safety pin.
(6) Thread wire through hole in arming vane and assemble vane assembly to hub. Screw vane nut down handtight. Be sure that slots in vane hub are properly located over studs.
(7) Adjust arming wire to protrude 2 to 3 inches.
(8) Place two safety clips on the wire and slide them up until the inner one touches the face of the vane.

f. DEFUZING. If the bomb is not dropped, it will be defuzed and the fuze restored to its original condition and packing as follows:

(1) Remove safety clips and arming vane.
(2) Insert safety pin in unoccupied vane stop eyelet and secure it in place with seal wire.
(3) Remove arming wire from fuze. Repack safety clips and arming wire.
(4) Unscrew fuze from bomb.
(5) Return fuze to its container and seal container with adhesive tape. Repack vanes and sealed containers in original packing box.

g. ACCIDENTAL ARMING. When the arming stem has progressed enough so that the two cups forming the vane stop are separated by 0.5 inch or more, the fuze is armed. If this fuze should become armed accidentally, it should be destroyed. No attempt should be made to reengage the threads of the arming stem in the plunger because, if the threads fail to catch, the plunger will be pushed forward enough to release the firing pin. If the fuze is not fully armed, as indicated by the gap being less than 0.5 inch, it may be restored to original condition as follows—

(1) Remove primer-detonator and vane assembly.

(2) Turn arming stem counterclockwise until the cups meet, then turn clockwise three-quarters to one turn, and insert safety pin.

(3) Replace primer-detonator.

Caution: If this fuze is armed or if there is any reason to believe that it is armed, it must be handled with the utmost care.

h. MARKING. FUZE, bomb, tail, M112A1 has the type, model, and lot number stamped on the body. The amount of delay is stamped on the head of the primer-detonator. This fuze has two tags attached to it. One, attached to the safety pin, reads: "Remove pin after arming wire is in place but before attaching arming vane. Replace pin before removing arming wire if bomb is not dropped." The other tag, tied to the stem tube reads: "Warning. Special instructions. M112A1 fuze may be used in 100-pound M30 demolition, 100-pound AN–M30 GP, 250-pound AN–M57 GP, 300-pound M31 demolition bombs only. This fuze is equipped with cocked firing pin which is extremely sensitive to impact after fuze is armed. The fuze will arm in 100 feet of air travel which means that if released from aircraft traveling 100 fps (68 mph) the fuze will arm about 16 feet below the plane. At 200 fps (136 mph) the fuze will arm about 4 feet below the plane, etc. The 8- to 15-second delay M16A1 primer-detonator assembled to the fuze may be replaced in the field with a 4- to 5-second delay M16A1 primer-detonator if tactics so require."

i. PACKING. FUZE, bomb, tail, M112A1 is packed one per container without vane assembly, 25 containers with 25 vanes on spindles in a wooden box.

84. Fuze, Bomb, Tail, M113A1

a. DATA. FUZE, bomb, tail, M113A1 (fig. 69), is an arming vane type tail fuze which arms after 18 revolutions of the arming vane. Upon impact, it acts to detonate the bomb with a delay of 8 to 15 or 4 to 5 seconds, dependent upon the particular delay of primer-detonator M16A1 used. FUZE, bomb, tail, M113A1 is authorized for use with GP and SAP bombs of 500 to 600 pounds; the warning tag on the arming stem also indicates this. It is 12.6 inches long and weighs 2.5 pounds.

b. DESCRIPTION. Except for the length of the stem and the corresponding differences in length, weight, and bombs authorized, FUZE, bomb, tail, M113A1 is identical with FUZE, bomb, tail, M112A1 (par. 83). With the exception noted, all statements concerning the M112A1 apply equally to the M113A1, and all statements concerning the M112 apply equally to the M113.

85. Fuze, Bomb, Tail, M114A1

a. DATA. FUZE, bomb, tail, M114A1 (fig. 69) is an arming vane type tail fuze which arms after 18 revolutions of the arming vane. Upon impact it acts to detonate the bomb with a delay of 8 to 15 seconds or 4 to 5 seconds, dependent upon which delay of the primer-detonator M16A1 is used. FUZE, bomb, tail, M114A1 is authorized for use with all GP and SAP bombs of 1,000 pounds and over, and in all M-series AP bombs; the warning tag on the arming stem of the fuze also indicates this.

b. DESCRIPTION. Except for the length of the vane stem and the corresponding differences in overall length, weight, and bombs authorized, this fuze is identical with FUZE, bomb, tail, M112A1 (par. 83). With the exceptions noted, all statements concerning FUZE, bomb, tail, M112A1 apply equally to the M114A1, and all statements concerning FUZE, bomb, tail, M112 apply equally to the M114.

86. Fuze, Bomb, Tail, M115

a. DATA. FUZE, bomb, tail, M115 (fig. 17) is an arming vane type fuze which arms after 175 revolutions of the arming vane. It has a cocked firing pin which is extremely sensitive when the fuze is armed. It acts to detonate the bomb 8 to 15 seconds or 4 to 5 seconds after impact dependent upon the primer detonator used. PRIMER-DETONATOR, M16A1, 4- to 5-second delay, is assembled to the fuze as issued. It may be replaced in the field by PRIMER-DETONATOR, M16A1, 8- to 15-second delay. FUZE, bomb, tail, M115 is authorized for use with GP bombs of 100 to 300 pounds. The fuze is 9.5 inches long and weighs 2.7 pounds.

b. DESCRIPTION. FUZE, bomb, tail, M115 is similar to the FUZE, bomb, tail, AN-M100A2 (par. 80) except that the body contains the cocked type firing pin similar to that in the FUZE, bomb, tail, M112A1 (par. 83).

87. Fuze, Bomb, Tail, M116

a. DATA. FUZE, bomb, tail, M116 is an arming vane type tail fuze which arms after 175 revolutions of the arming vane. Upon impact, it acts to detonate the bomb with a delay of 8 to 15 seconds or 4 to 5 seconds, dependent upon the primer-detonator used. PRIMER-DETONATOR, M16A1, 4- to 5-second delay, is assembled to the fuze as issued. This may be replaced in the field by PRIMER-DETONATOR, M16A1, 8- to 15-second delay. The fuze has a cocked firing pin which is extremely sensitive when the fuze is armed. FUZE, bomb, tail, M116 is authorized for use with GP and SAP bombs of 500 to 600 pounds. It is 12.5 inches long and weighs 2.9 pounds.

b. DESCRIPTION. Except for the length of the stem and the resultant differences in overall length, weight, and bombs authorized, this fuze is identical with FUZE, bomb, tail, M115 (par. 86). With the exceptions noted, all statements concerning FUZE, bomb, tail, M115 apply equally to FUZE, bomb, tail, M116.

88. Fuze, Bomb, Tail, M117

a. DATA. FUZE, bomb, tail, M117 is an arming vane type tail fuze which arms after 175 revolutions of the arming vane. Upon impact, it acts to detonate the bomb with a delay of 8 to 15 seconds or 4 to 5 seconds depending upon the primer-detonator used. PRIMER-DETONATOR, M16A1, 4- to 5-second delay, is assembled to the fuze as issued. This may be replaced in the field with PRIMER-DETONATOR, M16A1, 8- to 15-second delay. The fuze has a cocked firing pin which is extremely sensitive when the fuze is armed. FUZE, bomb, tail, M117 is authorized for use with GP and SAP bombs of 1,000 pounds and over. It is 16.5 inches long and weighs 3.2 pounds.

b. DESCRIPTION. Except for the length of the stem and the resultant differences in overall length, weight, and bombs authorized, this fuze is identical with FUZE, bomb, tail, M115 (par. 86). With the exceptions noted, all statements concerning FUZE, bomb, tail, M115 apply equally to FUZE, bomb, tail, M117.

89. Fuze, Bomb, Tail, M151, and Device, Antiricochet, M16 and M17

a. DATA. This fuze (figs. 14, 29, and 70) is a modified arming vane type tail fuze which arms after 26 revolutions of an anemometer wind vane. As issued, this fuze contains the PRIMER-DETONATOR, M16A1, 4- to 5-second delay or 8- to 15-second delay. The fuze is 5.6 inches long and weighs 2.1 pounds. It is authorized for use only with the DEVICE, antiricochet, M16 and M17 which are assemblies of parachute unit, fuze adapter, arming vane (anemometer type), and fuze, used in lieu of fin assembly with 250- and 500-pound GP bombs. Since the M151 is essentially a component of the antiricochet devices, the description of the remaining components of the devices are also described below.

b. DESCRIPTION.

(1) *Fuze.* The M151 fuze consists of the M16A1 primer-detonator, the fuze body, a body cap, and an anemometer wind vane. The body of the M151 is the same type of body as employed in the tail fuze M112A1 (par. 83) except that in the M151, the arming stem is perpendicular to, rather than parallel to, the axis of the body.

(2) *Device, antiricochet, M16.*

(*a*) *General.* This device (figs. 29 and 70) is used with 100- and 250-pound GP bombs when dropped from low flying aircraft to break rapid descent of the bomb. Bombs fitted with this device should not be dropped from aircraft at speeds greater than 350 miles per hour or from altitudes less than 50 feet. The M16 device consists of:

1 PARACHUTE UNIT, M7.
1 ADAPTER, fuze M202 (T3), w/vane assembly.
1 FUZE, bomb, tail, with primer-detonator, M16A1, 4- to 5-sec delay or 8- to 15-sec delay.
1 ARMING WIRE ASSEMBLY.

Except for the arming wire assembly which is packed with the parachute unit, all components as listed above are issued separately..

(*b*) *PARACHUTE UNIT, M7.* This unit, shown in figure 70, consists of a parachute housed in a cylindrical metal container closed at one end by a cover assembly and at the other end by a disk; a threaded collar is assembled to this disk for assembly to the fuze adapter. The cover assembly is held in place during shipment by two diametrically opposite latch assemblies consisting of a spring clasp with guide attached to container body and a metal tongue (over which the clasp guide passes) attached to the cover. The spring clasps are held in a depressed position by cotter pins. Toward the rear of the cover and in line with each latch assembly are two right angled pieces of metal which serve as arming wire guides.

(*c*) *ADAPTER, fuze, M202.* This adapter, shown in figure 70, contains a large internal threaded opening which fits the tail threads of the bomb. The other end contains smaller diameter external threads for assembly to the parachute unit. A sleeve, which projects from the side of the adapter, houses the anemometer

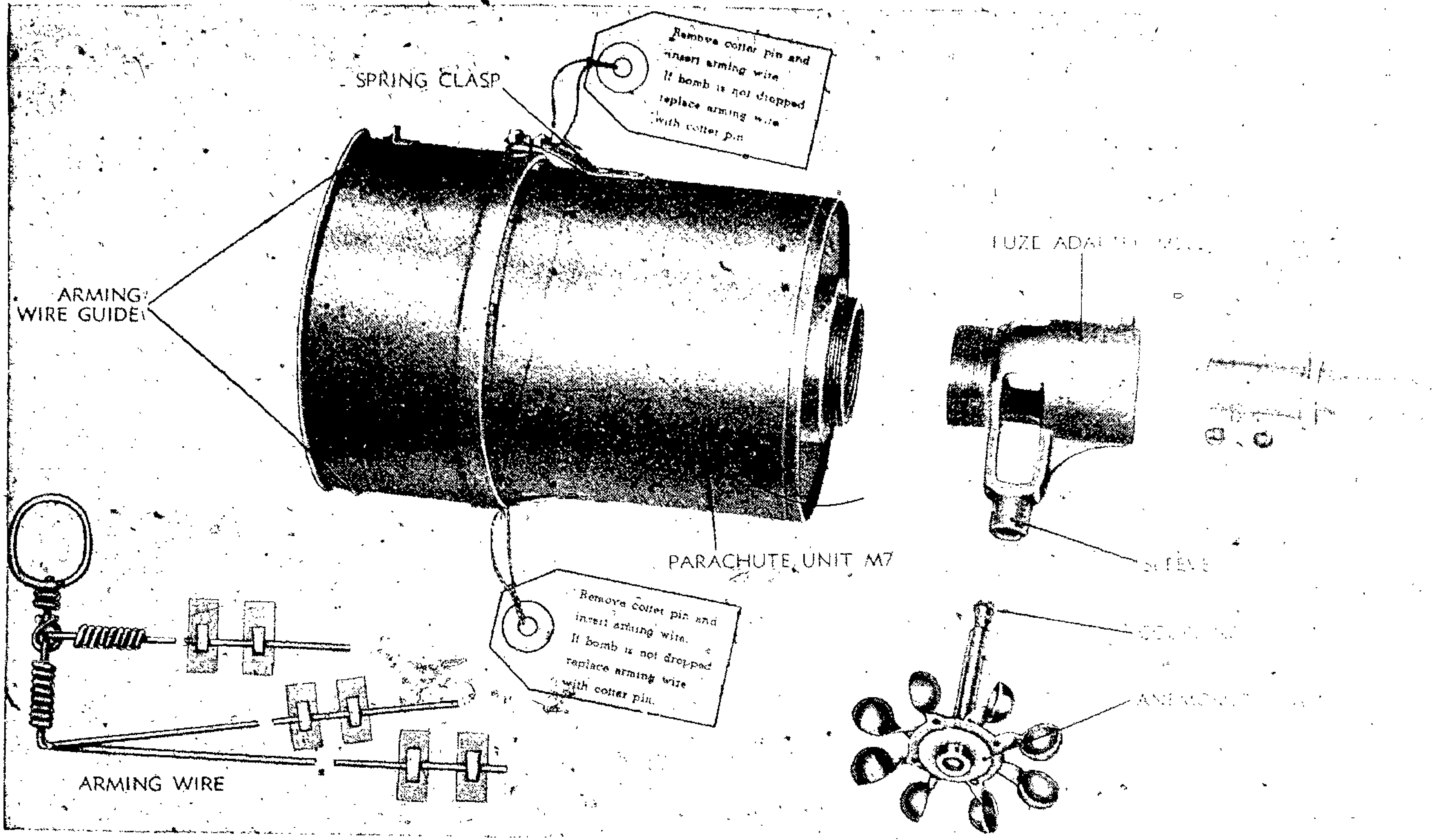

Figure 70. Device, antiricochet, M16—disassembled.

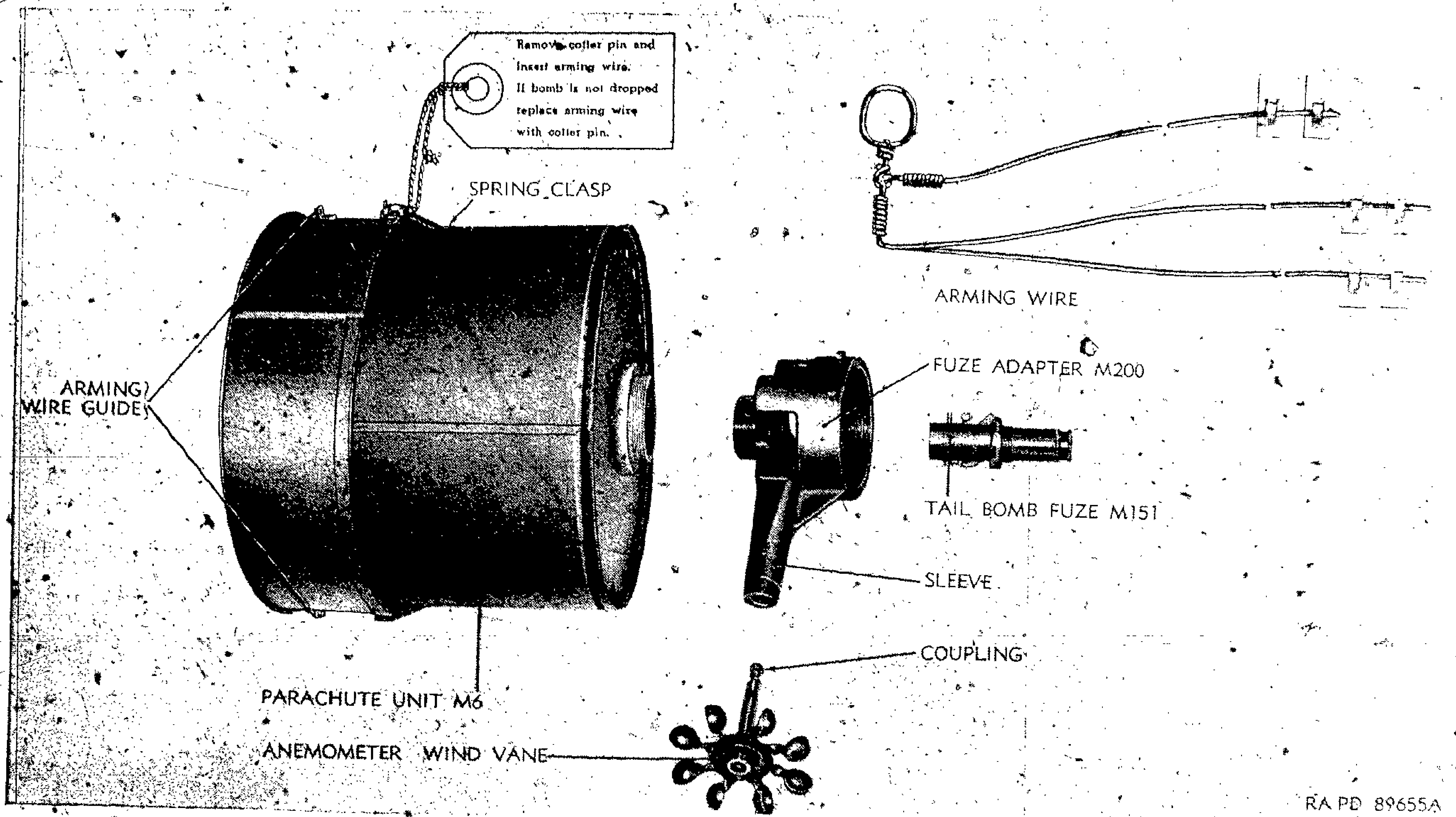

Figure 71. Device, antiricochet, M17—disassembled.

wind vane shaft and acts as a bearing for the shaft. This shaft passes through the sleeve to engage the arming stem in the fuze.

(d) *ARMING WIRE ASSEMBLY.* The arming wire consists of three wires (0.064 in diam), one short and two long wires assembled to one swivel loop.

(3) *DEVICE, antiricochet, M17.* This unit, shown in figure 71, is essentially the same as the M16, except that it is larger and employs the PARACHUTE UNIT, M6 and ADAPTER, fuze, M200. The M17 device is used with 500-pound GP bombs. Otherwise, the description in (2) above applies equally to the M17.

c. FUNCTIONING. When dropped armed, the arming wire is withdrawn from the anemometer wind vane and from the parachute container latch assemblies. The parachute container opens as soon as the bomb is dropped. The air stream turns the anemometer wind vane which turns the safety stem. After 26 revolutions of the anemometer wind vane, the safety stem has cleared the plunger stem and the fuze is armed. Upon impact, the plunger is driven forward, causing the firing pin to strike the primer in the primer-detonator.

d. FUZING. To fuze a bomb with the antiricochet device and M151 fuze, proceed as follows:

(1) Screw the fuze into the tail of the bomb, handtight. Adjust the fuze so that the unthreaded end of the safety stem is 20° to 30° to either side of the single suspension lug. Tighten the fuze lock nut with a wrench.

(2) Cut the sealing wire and remove the retainer pin, leaving the sealing wire and tag attached to the safety stem.

(3) Screw the fuze adapter to the tail of the bomb with the sleeve in line with the unthreaded end of the fuze safety stem. Tighten set screws.

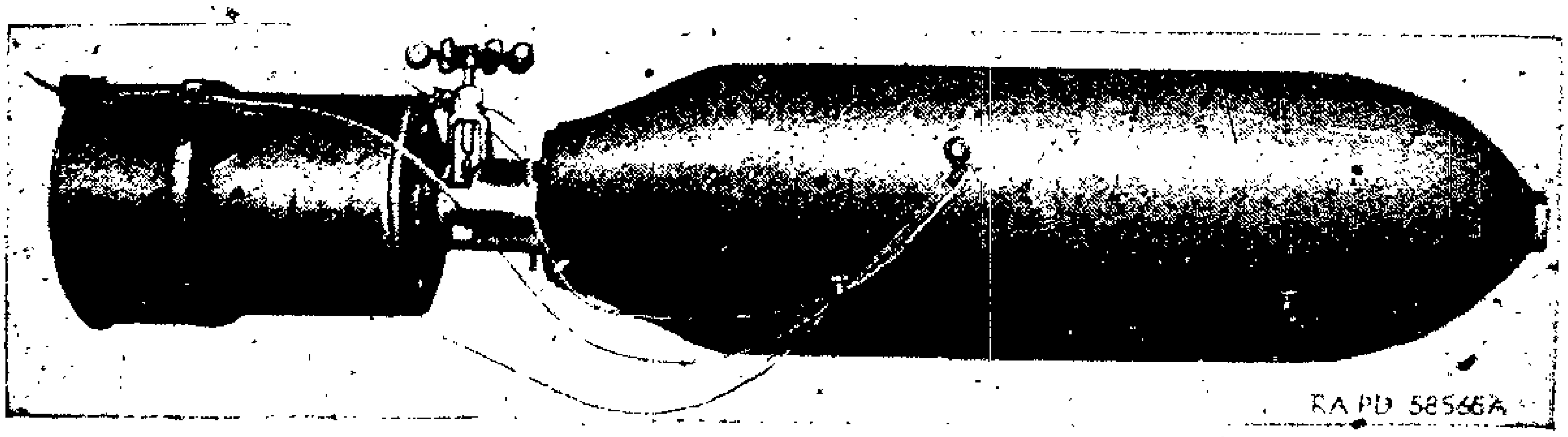

Figure 72. Device, antiricochet, M16 assembled to 250-lb GP bomb.

(4) Remove the spring clip from the anemometer wind vane shaft and insert the shaft in the fuze adapter sleeve. Fasten the shaft to the safety stem with the spring clip.

Check to be sure the vane shaft is in perfect alinement with the fuze safety stem.

(5) Screw the parachute unit to the back of the fuze adapter. The final position of the two parachute container latches should be 90° out of line with the double suspension lugs. Tighten the set screw.

(6) Pass the three strands of arming wire through the rear suspension lug. Pass the short strand through the hole in the adapter sleeve and the hole in the vane shaft. Place two Fahnestock clips over the end of the wire, which should extend 2 to 3 inches beyond the sleeve.

(7) Holding down the spring clasp, remove the cotter pin from one of the parachute container latches, pass one of the wires through the hole in the tongue and then through the arming wire guide, and place two Fahnestock clips over the end of the wire. The wire should extend 2 to 3 inches beyond the end of the parachute-unit cover. Repeat for the other parachute-container latch.

(8) Remove the fuze sealing wire from the fuze safety stem. This should be done after the bomb is fastened in the bomb bay, if practicable.

e. DEFUZING. If the bomb is not dropped, the antiricochet device and fuze will be removed from the bomb and the bomb and all components restored to their original condition and packing as follows:

(1) Replace and secure the sealing wire and attached tag in the hole in the threaded end of the fuze safety stem.

(2) Remove arming wires from parachute container latches and replace cotter pins; do this first at one latch, then the other.

(3) Unscrew the parachute unit from the back of the fuze adapter.

(4) Remove the arming wire from the anemometer wind vane shaft and fuze adapter. Then remove the spring clip from the vane shaft and withdraw the vane from the fuze adapter sleeve.

(5) Unscrew the fuze adapter from the bomb.

(6) Replace the retainer pin in the body of the fuze and secure it with the same sealing wire used to secure the fuze safety stem. Make certain the sealing wire passes through both the fuze safety stem and retainer pin and that the ends are twisted.

(7) Unscrew the fuze from the bomb.

(8) Return all the components to their original packings and seal with adhesive tape.

f. MARKING. The fuze has the model designation, the lot number, and the date loaded stamped in the metal of the body. The sealing wire of the safety stem and retainer pin carries a tag which reads "Remove wire and unthreaded pin when fuze is placed in bomb. If fuze is to be removed from bomb replace at once."

g. PACKING. The FUZE, bomb, tail, M151 is packed, without vane assembly, in a hermetically sealed can, 15 per wooden box. PARACHUTE UNIT, M6 is packed one per metal drum with arming wire assembly. PARACHUTE UNIT, M7 is packed two per metal drum with two arming wire assemblies or one per carton and two cartons with two arming wire assemblies in individual envelopes per wooden box. ADAPTER, fuze, M200 is packed two per carton with two vanes per separate carton all in a wooden box. ADAPTER, fuze M202 is packed two per carton with two vanes per separate carton and in quantities of two cartons of each (four adapters and four vanes) per wooden box.

90. Fuze, Bomb, Tail, M160

a. DATA. This fuze (fig. 17) is a vane type requiring a long air travel to arm which permits bombs to be dropped greater distances from the airplane before arming. This type fuze was provided to decrease the chances of bombs which might bump each other when dropped in salvo, from detonating too close to the airplane. The first of this type slower arming tail fuze was produced as the FUZE, bomb, tail, M100A2C (no longer manufactured), a later development being the M160. As such the M160 corresponds to the FUZE, bomb, tail, AN–M100A2 (par. 80) in all respects except marking, nomenclature, and construction of arming stem or arming screw. The arming stem of the M160 has finer threads and consequently engages the firing pin plunger for a greater length of time, thus requiring greater air travel to arm. For example, the AN–M100A2 assembled to the 250-pound bomb, AN–M57A1 and dropped from an airplane traveling 200 miles per hour will arm after 485 feet of air travel or a vertical drop of 44 feet whereas, under the same conditions, the M160 will arm after 1,950 feet of air travel or a vertical drop of 635 feet. The M160 is authorized for use in GP and fragmentation bombs of 100 to 300 pounds.

b. DESCRIPTION. Except for the marking stamped in the fuze body, the M160 is externally identical to the AN–M100A2. Therefore, a yellow band is painted around the arming stem tube of the M160 to serve as an aid in differentiating between the M160 and the AN–M100A2; the color yellow as employed on bomb fuzes generally indicates slower arming types.

91. Fuze, Bomb, Tail, M161

This fuze is of the same type as the M160 (par. 90) and corresponds to the FUZE, bomb, tail, AN-M101A2 (par. 81) in all respects except marking, nomenclature, and required length of air travel to arm. The M161, as the M160, has a yellow band painted around the arming stem tube. The developmental model of the M161 was the M101A2C (no longer manufactured).

92. Fuze, Bomb, Tail, M162

This fuze is of the same type as the M160 (par. 90) and corresponds to the FUZE, bomb, tail, AN-M102A2 (par. 82) in all respects except marking, nomenclature, and required length of air travel to arm. The developmental model of the M162 was the M102A2C (no longer manufactured). The M162, as the M160, has a yellow band painted around the arming stem tube.

93. Fuze, Bomb, Tail, M167 (T75E2)

a. DATA. This fuze (fig. 14) is a modified arming-vane type tail fuze and uses an arming device fitted with an anemometer wind vane. The fuze body is similar to the fuze body employed in the AN-M100A2 tail fuze (par. 80) and uses the PRIMER-DETONATOR, M14, 0.025-second delay. The fuze body is 4.2 inches long and weighs 1.6 pounds. The arming device assembly is 8.7 inches long and weighs 1.3 pounds. The fuze arms after 1,360 revolutions of the anemometer wind vane. The tail fuze, M167 (T75E2), is for use on 1,000-pound VB-1 (Azon) bombs.

b. DESCRIPTION. The M167 (T75E2) tail fuze (fig. 14) consists of an arming device located at a right angle to the fuze body. The arming device and fuze body are connected by means of a flexible bronze shaft. One end of the fuze safety stem contains two transverse pins to fit in the coupling which joins the flexible shaft and the fuze body. A spacer ring between the fin sleeve and tail unit of the bomb is used to provide the required space and support for the tail fuze.

c. FUNCTIONING. When a bomb equipped with this fuze is released armed, the arming wire is withdrawn from the spring loaded safety pin. The safety pin is ejected from the arming device, leaving the anemometer wind vane free to rotate in the air stream. This rotation is transmitted through a reduction gear train to a flexible shaft which in turn withdraws the safety stem from the firing pin. When the safety stem has cleared the firing pin, the firing pin is free to function upon impact.

d. FUZING.

(1) Assemble the fin sleeve to the bomb in the normal manner for the VB-1 bomb and secure with fin lock nut.

(2) Screw the fuze lock nut towards the back end of its threads. Screw the fuze body into tail cavity of the bomb all the way, then back off until the coupling end of the safety stem points toward the ½ inch dowel in the fin sleeve. Tighten the fuze in this position with the lock nut.

(3) Cut the fuze sealing wire and remove the fuze safety pin. Do not remove the sealing wire from the safety stem.

(4) Place spacer ring over fin sleeve, aline dowel holes over dowels on the fin sleeve. At the same time, slide the coupling through the fuze bracket hole. Attach the coupling to safety stem.

(5) Thread the free end of the arming wire through the arming wire hole in the spring loaded safety pin.

(6) Remove cotter pin from the safety pin and the sealing wire from the fuze safety stem.

(7) The bolts supplied with the fuze to fasten the tail unit to the bomb must pass through holes in the tail unit and the spacer, and must screw into the fin sleeve.

e. DEFUZING. If the bomb is not dropped, the fuze will be removed and returned to its original condition and packing as follows:

(1) Disconnect the tail unit from the spacer ring.

(2) Replace the cotter pin in the safety pin and remove the arming wire.

(3) Replace the safety pin in the fuze body. Secure it and the safety stem with the sealing wire.

(4) Remove spacer ring from fin sleeve.

(5) Unscrew fuze from bomb.

(6) Remove the fin sleeve from the bomb.

(7) Return all the components to their original packings, resealing the fuze packings with adhesive tape.

f. MARKING. The M167 (T75E2) tail fuze body assembly is stamped with the model designation, the lot number, and the date loaded. The arming device is stamped with the type and the fuze model with which it should be used.

g. PACKING. The M167 tail fuze is packed eight per wooden box each fuze being protected by waterproof wrapping.

94. Fuze, Bomb, Tail, M169 (T708)

a. DATA. This fuze (fig. 73) is a simple impact mechanism used in connection with PRIMER-DETONATOR, M40 and ADAPTER-BOOSTER, M118 in the 12,000- and 22,000-pound GP bombs. The fuze is made of brass and is approximately 2 inches in diameter at its widest point and 3.98 inches long.

b. DESCRIPTION. This fuze consists of a cylindrical brass body with a central longitudinal hole and a 1⅝-inch diameter thread on the outside. The cylindrical surface, just below the cap, is knurled. The body houses a cylindrical striker which is held in a

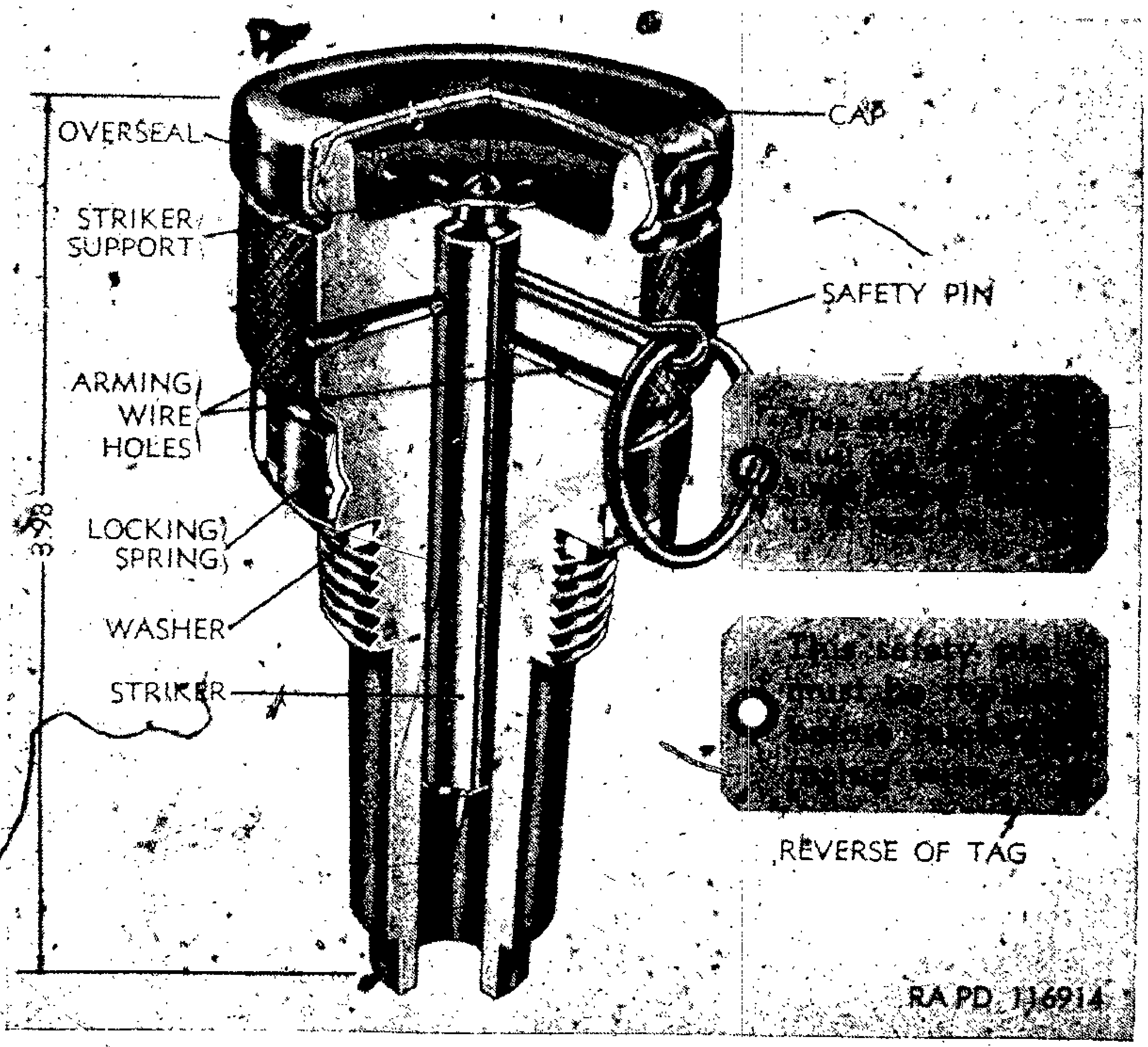

Figure 73. Fuze, bomb, tail, M169 (T708).

safe position by a crosslike striker support pinned to the upper end of the striker; the four tabs of the cross extend outwards over the top of the fuze body. The body and striker have three ¹⁄₁₀-inch holes spaced approximately 0.35 inch apart; the middle hole is at right angles to the other two which are parallel. The uppermost hole is occupied by the safety pin during shipment and the arming wire is placed in the remaining hole which gives the more favorable angle of pull-out. The top of the fuze body is sealed by a metal cap held in place by an overseal.

c. FUNCTIONING. Upon release of the bomb, the arming wire is withdrawn from the fuze. This leaves the striker supported only by the tabs of the striker support. On impact, the inertia of the striker bends the tabs, thus allowing the striker to move forward and pierce the detonator.

Note. Due to the danger of non-functioning when the bomb is dropped from low altitudes, use of bombs fitted with the M169 fuze is restricted to high altitudes.

d. FUZING. Three fuzes M169 and three primer-detonators M40 of desired delay (fig. 19) are required to fuze the 12,000- or 22,000-pound GP bomb. Each fuze and primer-detonator is assembled to the bomb as follows:

(1) Unscrew closing plug and remove it from adapter-booster.

(2) Carefully insert primer-detonator in adapter-booster, narrow end foremost.

(3) Carefully insert fuze into adapter-booster and screw fuze into place handtight.

(4) Insert arming wire into the arming wire hole which will least resist pull-out.

(5) Remove safety pin.

e. DEFUZING. If the bomb is not dropped, the fuzes and primer-detonators will be removed from the bomb and restored to their original condition and packing as follows:

(1) Replace safety pin in each of the three fuzes.

(2) Unscrew and remove one fuze from the bomb.

(3) Carefully extract primer-detonator.

(4) Replace closing plug in adapter-booster.

(5) Repeat (2), (3), and (4) for each of the two remaining fuzes in turn.

(6) Return fuzes and primer-detonators to their individual containers and seal containers with adhesive tape.

f. MARKING.

(1) Nomenclature of the fuze, the lot number, and date loaded (month and year) are marked on the side of the body, just below the threads. The cap is marked with the words "THIS CAP MUST NOT BE REMOVED." A tag attached to the safety pin gives the following instruction: "This safety pin must be replaced before removing fuzing wire."

(2) The primer holder of the primer-detonator is sealed with a shellac-coated green paper disk which is marked in black to give nominal delay, lot number, and date loaded (month and year).

95. Fuze, Bomb, Tail, AN–MK 228

a. DATA. FUZE, bomb, tail, AM-Mk 228, formerly designated Mk 28 or Mk XXVIII, is a detonator-safe, vane-type tail fuze which arms after 150 revolutions of the arming vane. Upon impact, it acts through two independent firing trains with 0.08-second delay to detonate the bomb. The fuze is 16.36 inches long and weighs 10.5 pounds. It is authorized for use in 1,000- and 1,600-pound AP bombs of the AN-Mk series.

b. DESCRIPTION. This fuze (fig. 18) is bottle-shaped with a 16-blade arming vane attached to the outer end and a cylindrical extension containing the booster projecting from the base. The vane assembly is fastened in place on the shaft by a cotter pin. A second cotter pin, to which an instruction tag is attached, passes through the bushing and shaft and prevents rotation of the vane during storage and handling. There is a small round window in the side of the fuze to permit observation of the condition, armed or unarmed, of the fuze mechanism.

c. FUNCTIONING (fig. 74). When the bomb is released "armed," the air stream rotates the arming vane. This rotation is transmitted through a reduction gear train to a central shaft which moves the striker into functioning position. When the striker has moved out (toward the vane) 0.34 inch, the shaft locks and the striker takes up the rotation and lines up firing pins, delay elements, detonators, and booster leads. When the firing elements are in line, they lock in the armed position and ordinarily the vane will stop. However, if the vane is forced to rotate in either direction, pins in the reduction gear assembly will shear and the vane will rotate without effect on the armed fuze mechanism. Upon impact, inertia causes the striker to shear a pin in the shaft and move forward, driving the firing pins into their respective detonators.

d. PREPARATION FOR USE. If there is no arming wire bracket on the fin assembly, it is necessary to attach an arming bracket to the neck of the fuze as follows:

(1) Remove the cotter pin holding the vane to the shaft and remove vane assembly. Do not remove safety cotter pin.
(2) Attach arming bracket loosely to fuze.
(3) Replace vane assembly and cotter pin. Spread ends of cotter pin 180 degrees.

e. FUZING. In fuzing a bomb with FUZE, bomb, tail, AN-Mk 228, the following sequence will be observed:

(1) Unseal the container and remove fuze from packings. Inspect for bent vanes, damaged threads, or corrosion. Use only serviceable fuzes.

(2) Attach arming bracket (d above), if necessary, to aid support of fuze.

(3) Screw fuze into bomb handtight. If necessary, a small spanner wrench may be used.

(4) Place the arming bracket so that it will be in a vertical position when the bomb is placed in the rack and so that it will not interfere with the rotation of the vanes. Tighten in place.

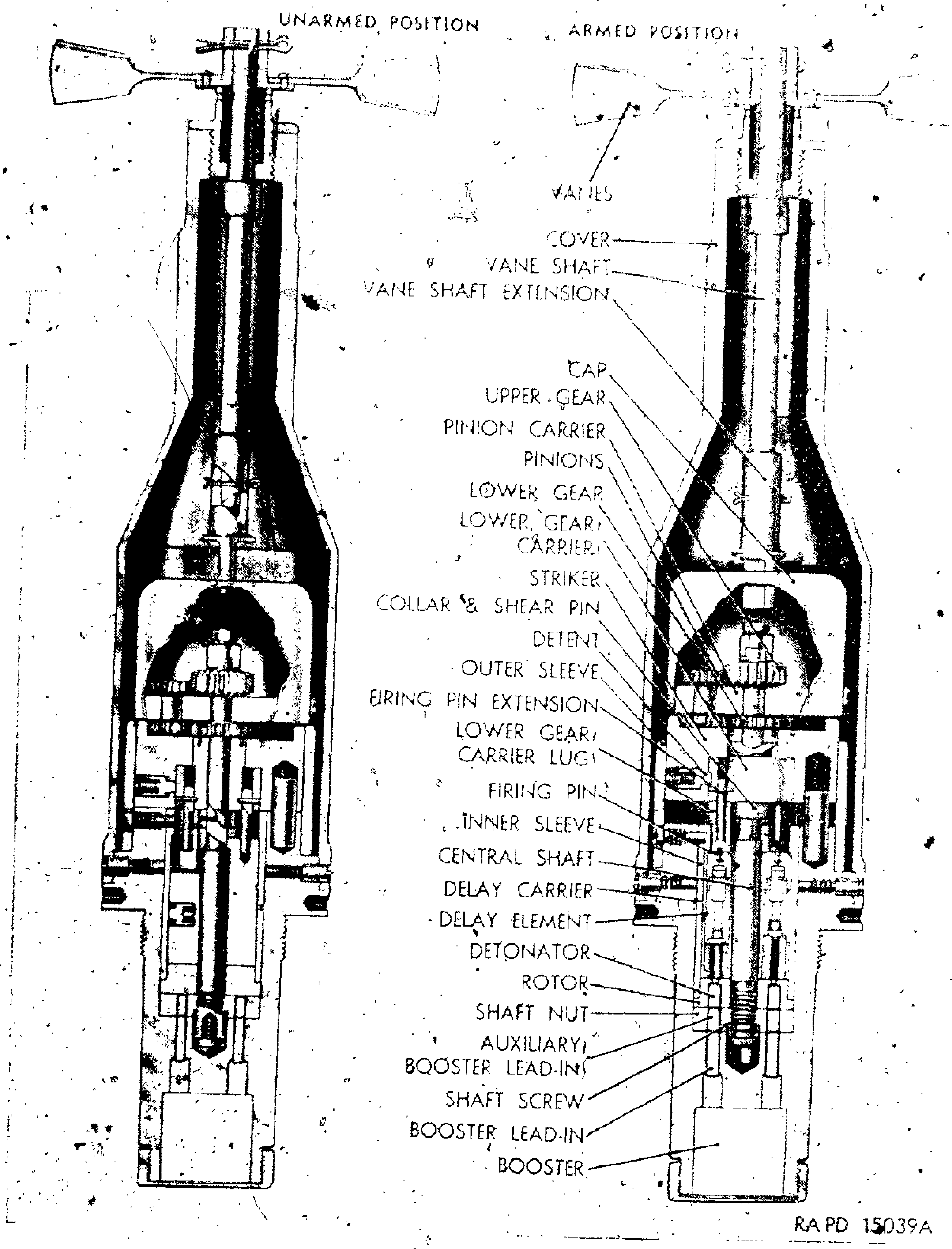

Figure 74. Fuze, bomb, tail, AN–MK 228.

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(5) Thread the arming wire through the rear suspension lug of the bomb and then through the arming bracket. Be sure that the arming wire tube (brass tube furnished with the bracket) covers the arming wire where it passes between the vanes. Adjust the wire to protrude about 6 inches, place two safety clips on the wire and push them up the wire to the bracket.

f. DEFUZING. If the bomb is not dropped, it will be defuzed and the fuze returned to its original condition and packing as follows:

(1) Replace and secure the safety cotter pin in the hole on the shaft, directly behind the arming vane.

(2) Remove the two safety clips and the arming wire from the fuze.

(3) Unscrew the fuze from the bomb.

(4) If an arming bracket was attached in the fuzing operation, remove it.

(5) Return fuze to its packings resealing the container with adhesive tape.

g. ACCIDENTAL ARMING. If this fuze should become armed accidentally, it will be indicated by the position of the striker within the outer sleeve, as observed through the window in the side of the fuze. The outer sleeve occupies the lower half of the window. In the completely unarmed fuze, the top of the striker is about flush with the top of the outer sleeve. If the top of the striker has progressed not more than 3/16 inch above the other sleeve, the fuze is only partially armed and may be returned to the unarmed condition by turning the vane counterclockwise (looking at the vane end of the fuze) until it begins to bind and then turning clockwise three to four turns and locking with the safety cotter pin. If the top of the striker has progressed more than 3/16 inch from the top of the outer sleeve, the fuze will be regarded as armed and will be disposed of as unserviceable ammunition in a dangerous condition.

h. MARKING. The base of the fuze is stamped with the type and model, lot number, manufacturer's and inspector's initials, and date loaded. The arming vane assembly is painted red to distinguish it from vanes for other Navy fuzes which have a different pitch. The safety cotter pin carries a tag which reads: "Remove safety cotter pin after bomb is placed in dropping gear and arming wire clips and propeller are in place."

i. PACKING. FUZE, bomb, tail, AN–Mk 228 is packed one per sealed metal container. Four such containers are packed in a metal crate.

96. Fuze, Bomb, Tail, M123A1, All Delays

a. DATA. This fuze (figs. 17 and 75) is a vane operated tail fuze which must be regarded as armed at all times. It acts to detonate the bomb after a delay of 1 hour to 6 days from the time of release or *immediately, upon any attempt to unscrew the fuze from the bomb.* The M123A1 is designed to provide a specific delay for an individual fuze; the amount of delay—1, 2, 6, 12, 24, 36, 72, or 144 hours—is specified in the nomenclature and is stamped on the fuze body. This type fuze is particularly responsive to heat and cold; high temperatures accelerate its action, low temperatures retard it. See table XV for the effect of temperature on delay times. The amount or delay desired is obtained by choosing a fuze of that particular delay and taking into consideration the effect of temperature upon the delay action. After withdrawal of the arming wire, a short air travel will initiate the delay action. As little as a 1/4 turn in unscrewing the fuze from the bomb causes the fuze body to separate from the fuze extension; this separation causes operation of the antiremoval device and detonation of the bomb. The M123A1 fuze is approximately 9.3 inches long. It is authorized for use in GP and demolition bombs of 100 to 300 pounds.

b. DESCRIPTION.

(1) This fuze consists of an eight-bladed arming vane (fig. 75) which acts directly (not through gear train) to rotate the arming stem and arm the fuze. The M123A1 differs from tail fuzes previously described in that the vane and direct arming head act to screw the arming stem *into* the fuze.

(2) The body assembly (fig. 75) consists of two parts, the fuze body and fuze body extension. The fuze body contains the firing pin and sleeve assembly, a delay wad, and a glass ampoule filled with solvent. The body extension contains the detonator holder assembly which is screwed into the base; the extension also has an eccentric circumferential groove machined into its outer surface—this groove contains a locking ball (extension ball). As shipped (fig. 17), the locking ball is held in place and the body extension is prevented from unscrewing by a wire type safety clip. Some fuzes of this model may be encountered which were fitted with a flat spring safety clip and pull ring assembly in place of the wire type clip. The detonator holder, vane, and fuze are shipped unassembled but contained in the same packing box. The detonator

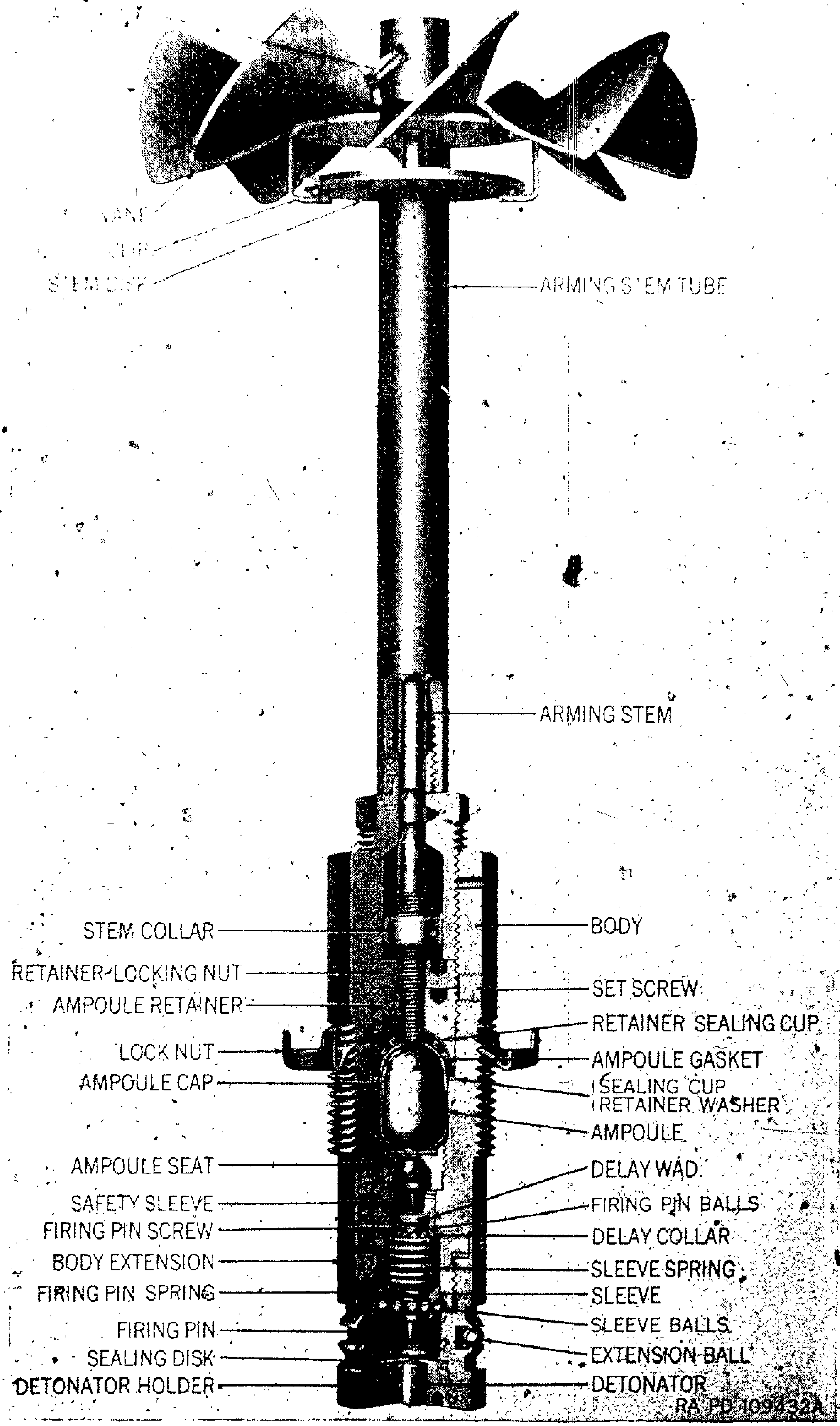

Figure 75. Fuze, bomb, tail, M123A1—section.

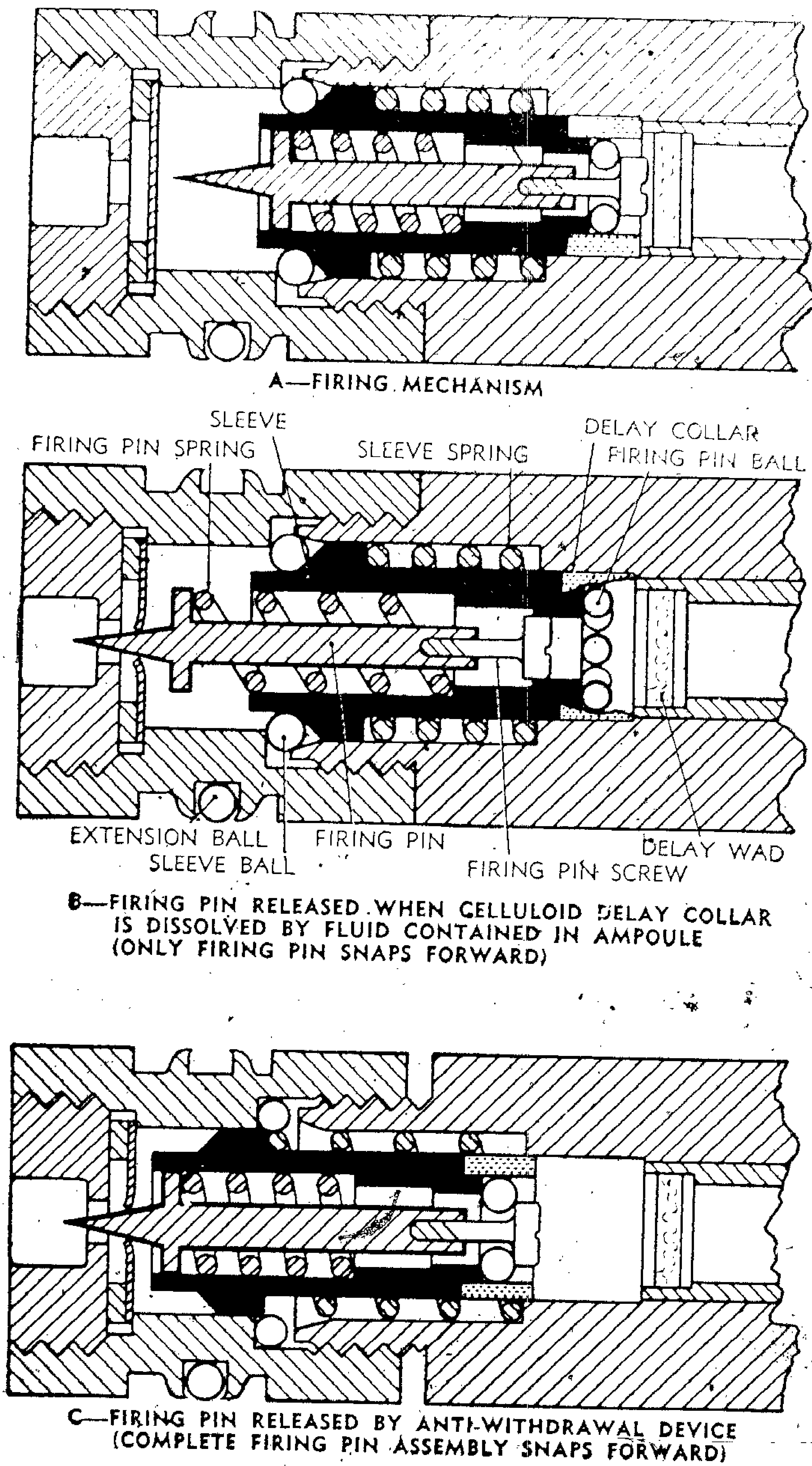

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Figure 76. Fuze, bomb, tail, M123A1—operation.

holder seat in the body extension is closed during shipment by a shipping plug assembly.

(3) The firing pin (fig. 76) is held in place against the action of a compressed firing pin spring by the firing pin balls, which in turn are held in place under the firing pin screw by a celluloid delay collar. This assembly is mounted in a sleeve. The sleeve is held in place, against the action of a compressed sleeve spring, by steel balls (sleeve balls) bearing on the sleeve shoulder and held in place by the lip of the fuze body.

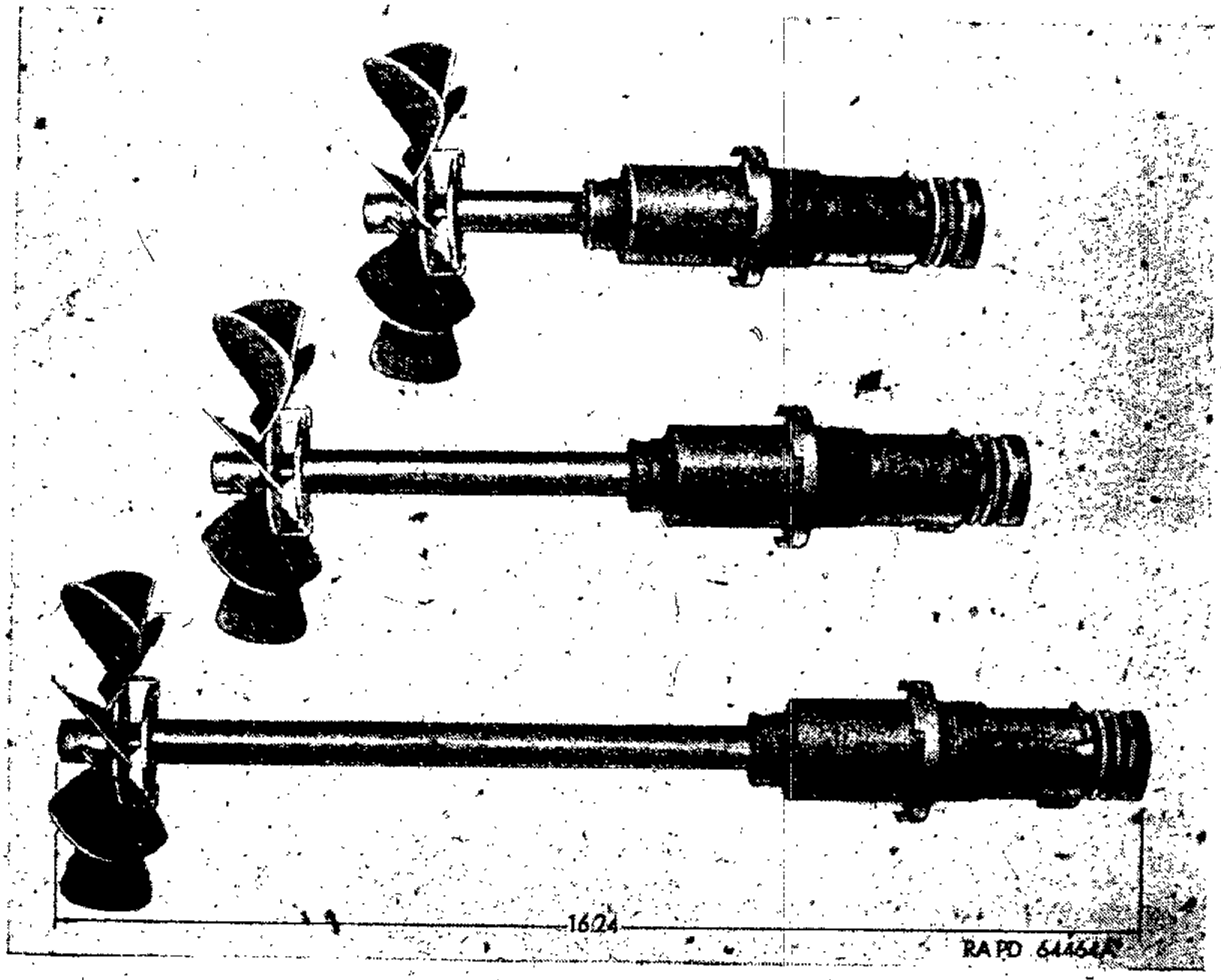

Figure 77. Fuze, bomb, tail, M123A1, M124A1, and M125A1.

c. FUNCTIONING.

(1) *Delay.* When the bomb is released armed, the arming wire is withdrawn and the vane rotates in the air stream. This rotation is transmitted directly to the arming stem, thus causing the stem to screw into the fuze body. After a short air travel, the stem, moving into the body, crushes the ampoule and frees the solvent. After further air travel, the stem progresses far enough to force the stem collar against the retainer locking nut, thus sealing the outer end of the fuze body and preventing escape of solvent or entry of moisture. Meanwhile, the solvent

filters through the delay wad and starts to dissolve the celluloid delay collar. The collar dissolves sufficiently to release the firing pin balls in approximately the specified time. When released, the balls are forced outward and the firing pin spring drives the firing pin into the detonator (fig. 76).

(2) *Antiwithdrawal.* The ball groove on the body extension, being machined eccentrically, forces the locking ball outward when the fuze is turned counterclockwise—this action wedges the ball between adapter-booster wall and fuze body extension, thus locking the extension in place. Any further counterclockwise rotation unscrews the fuze body from the extension (fig. 76). When the body has been separated from the extension by $3/64$ inch, the sleeve balls are released and move outward. The sleeve and firing pin assembly is driven forward by the sleeve spring, causing the firing pin to strike the detonator (fig. 76). As further insurance against withdrawal, the adapter-booster of current design is drilled for the insertion of a metal locking pin supplied with the fuze. When this pin is in place, the adapter-booster is locked to the base plug of the bomb, thus preventing removal of the fuze by unscrewing the adapter-booster.

(3) *Effect of temperature on delay action.* This fuze is responsive to changes in temperature. Temperatures above 50° F. cause the fuze to function earlier than specified; temperatures below 50° F. cause later functioning than specified. Table XV gives average actual delay in hours and minutes at various temperatures.

***Table XV.** Effect of Temperature on Delay Action of M123 and M123A1 Series of Long Delay Tail Fuzes*

Temperature (°F.)	Average actual delay (hr:min) at various temperatures for fuzes having nominal delay of—							
	1 hr	2 hr	6 hr	12 hr	24 hr	36 hr	72 hr	144 hr
115	0:15	0:20	1:00	1:15	------	------	------	------
90	0:20	0:50	1:30	2:30	------	------	------	------
80	------	------	------	------	8:00	15:00	38:00	70:00
75	0:30	1:00	2:00	3:50	------	------	------	------
35	0:45	1:30	3:00	9:00	24:00	37:30	96:00	135:00
25	2:10	3:15	11:20	30:00	------	------	------	------

d. **Inspection Prior to Use.** There are two indicator vials packed in each box of fuzes. Each of these vials contains a powder which melts at a critical temperature. When a box of fuzes is opened, the vials will be inspected and action taken as follows:

(1) If the powder in the green-stoppered vial has solidified, it indicates that the fuzes have been exposed to temperatures higher than 150° F. which cause the powder to melt; it solidifies into a homogeneous mass upon cooling. None of the fuzes in this box will be used for low-altitude bombing.

(2) If the powder in the red-stoppered vial has solidified, it indicates that the fuzes have been exposed to temperatures over 170° F. which cause the powder in this vial to melt; solidification occurs upon cooling. *No attempt will be made to assemble the detonators to the fuzes in this box.* The fuzes will be destroyed.

(3) Should there be any doubt as to whether the powder in either vial is solidified, open the vial and inspect the contents. Personnel handling these fuzes should be able to differentiate between the powdered and solidified condition of the contents of the two vials. This is best learned by removing some powder from each vial, melting it, and allowing it to solidify.

e. PREPARATION FOR USE. The detonator holder with disk and washer must be assembled to the fuze and the safety clip removed before assembling the fuze to the bomb (*f* below). To prepare the M123A1 type fuze for use, proceed as follows:

Note. Hold the fuze by the body extension to prevent separation of extension from body during following operations.

(1) Remove tape and shipping plug from the end of the fuze body extension.

(2) Insert the sealing disk (aluminum or copper) into the end of the fuze. Be sure that the disk rests on the shoulder in the body extension. *If the firing pin interferes with the seating of the disk, the fuze will not be used.*

(3) Insert the lead washer over the disk.

(4) Screw the detonator holder assembly into the body extension and tighten it with the wrench supplied in the box of fuzes. Since the purpose of the disk and washer is to seal the fuze against escape of solvent and entrance of moisture, care will be exercised to seat the detonator holder firmly.

(5) Remove safety clip.

Caution: After the safety clip is removed, particular care must be exercised to prevent the body extension from unscrewing from the fuze body. The fuze will detonate, if the extension is unscrewed more than a quarter turn.

f. FUZING. To fuze a bomb with the M123A1 fuze, proceed as follows:

(1) If the bomb is not fitted with adapter-booster M102A1 or M115A1, then the adapter-booster assembled to the bomb will be staked to the base plug and the base plug staked to the bomb body. *Non-sparking tools will be used for staking operations.*

(2) Gage adapter-booster threads with proper gage or an inert fuze (any standard tail fuze without primer-detonator may be used).

(3) Remove fuze and components from packing and inspect. Back off and replace lock nut to insure fuze threads are clean and undamaged.

(4) If the bomb is fitted with adapter-booster M102A1 or M115A1, insert the lock pin (supplied with fuze) into the hole in the adapter-booster.

(5) Prepare the fuze as described in *e* above.

(6) Be sure lock nut is screwed all the way onto the fuze and then carefully insert and screw the fuze into the adapter as far as possible. Tighten lock nut with the wrench supplied in the box of fuzes.

Warning: Once the fuze is inserted in the adapter, the fuze must not be turned backward (counterclockwise) by any amount however slight. Engage the threads by a "screwing-in" motion only. Do not attempt to unscrew the fuze; a "screwing-out" motion will cause the locking ball to become wedged against the adapter and a quarter turn further will detonate the fuze and bomb.

(7) Remove safety catch from clip hub and assemble vane on the clip hub with the hole in the vane hub in alinement with the hole on the clip hub.

(8) Replace safety catch and secure hook end.

(9) After threading arming wire through rear suspension lug, pass it through holes in clip, stem disk, and vane. Adjust arming wire to protrude 2 to 3 inches beyond vane. Place two safety (Fahnestock) clips on the wire and slide them up the wire until the inner one touches the vane. Be sure arming wire is free of kinks and burs.

(10) Remove safety pin. If it is intended to keep the fuze "safe" until after the plane is airborne, then replace the safety pin with cotter pin and pull ring assembly provided with the fuze. The cotter pin will be removed while the plane is in flight.

(11) Bombs fuzed with the M125A1 type antiwithdrawal fuzes will be used on the mission for which they are fuzed. In the event of incomplete missions, unused bombs will be dropped over enemy territory or deep water. *They will not be returned to the airfield or aircraft carrier.*

Warning: If anything interferes with the completion of the fuzing operation, no attempt will be made to defuze the bomb. The bomb, with fuze in place, will be destroyed by bomb disposal personnel.

g. PRECAUTIONS. In addition to the general precautions prescribed, the following will be observed in the care and handling of this fuze:

(1) Detonator holders will not be assembled to fuzes nor fuzes assembled to bombs in advance or in anticipation of future needs.

(2) Particular care must be exercised to protect this fuze from heat and shock.

(3) The indicator vials will be examined when the fuze packing box is opened. If all of the fuzes in the box are not used, the vials will be left in the box with the remaining fuzes and inspected again when the box is reopened.

(4) The natural tendency in engaging threads of mating parts is to turn one part back and forth until the threads engage. This must not be done when assembling this fuze to a bomb; *use a screwing-in motion only*. The antiwithdrawal device will cause the fuze and bomb to detonate if the fuze is rotated counterclockwise while in the adapter *even before the threads are engaged.*

(5) The warning tag attached to this fuze should not be removed when the fuze is assembled to the bomb.

h. MARKING. Marking on the body of the fuze is located just below the threads and includes nomenclature, nominal delay, lot number, and date loaded. In addition, there are four tags attached to the fuze, one, for the cotter pin and pull ring assembly, is marked "For use if safety pins are to be pulled after the plane is airborne" in black; the second, a warning tag, is marked "DANGER Never remove this tag. This fuze contains a booby trap. NEVER ATTEMPT TO REMOVE THIS FUZE FROM THE BOMB" in red; the third, for the adapter-booster lock pin, is marked "This pin is for use on the adapter-booster of the following bombs: GP 100-lb AN–M30A1 and GP 250-lb AN–M57A1" in black (instructions for assembling this pin to adapter-booster are marked in black on the reverse side of the tag); and fourth, an instruction tag, which contains instructions similar to those in *f* above, marked in black.

i. PACKING. The M123A1 is packed without vane assembly, one per metal container. The detonator holder, washer, and disk are packed in a wooden block in the same container. Twenty-five containers are packed, with 25 vanes on a spindle, in a wooden box. Each packing box also contains two indicator vials, two wrenches, and a thread gage. This fuze is also packed 24 per box with all accessories as above or 25 per box as above but without wrench and gage.

97. Fuze, Bomb, Tail, M123, All Delays

a. DATA. This fuze is an earlier model of the M123A1 (par. 96) and differs principally therefrom in that it employs an arming head with a reduction gear train (similar to the M100 series tail fuses, pars. 80 through 82) which requires from 80 to 100 feet of air travel to arm. The M123 has a 4-bladed arming vane and is 9.61 inches long. Except as noted in *b* and *c* below, all other statements concerning the M123A1 apply equally to the M123.

b. FUZING. Except for (7) through (10) in paragraph 96 *f*, the M123 is assembled to the bomb in the same manner as the M123A1. In lieu of steps (7) through (10), substitute the following instructions for the M123 fuze:

(1) Thread the arming wire through the rear suspension lug of the bomb. Straighten the cotter pin in the fuze, withdraw it, and insert the arming wire in its place passing it through the stem cup eyelet, the arming block, the vane stop eyelet, and the eyelet in the vane. Assemble the vane by screwing the vane nut down tight. Be sure the slots in the vane hub are properly located over the heads of the eyelet pins.

(2) Adjust the arming wire to protrude 2 to 3 inches beyond the vane. Place two safety clips over the wire and push them up the wire until the inner one touches the vane. Be sure the arming wire is free of kinks and burs.

(3) Remove the safety pin.

c. PRECAUTIONS. In addition to the precautions cited for the M123A1 in paragraph 96 *g*, it should be noted that an M123 fuze in which the fuze extension has not been pinned to the fuze body is considered unsafe and will not be used until pinned. Pinning consists of inserting two pins (180° apart and approximately 1½ in. forward of the base of the fuze) through the fuze extension and into the fuze body to connect these components. The pins are required to prevent premature functioning of the fuze due to the fuze body unscrewing from the extension. The pins are held in place by transparent tape. These pins will shear upon any attempt to remove the fuze from the bomb thus permitting the antiwithdrawal feature to operate.

98. Fuze, Bomb, Tail, M124A1, All Delays

Except for differences in length of stem and corresponding differences in length, weight, and bombs authorized, this fuze is identical to the M123A1 (par. 96) and with the exceptions noted, all statements concerning the M123A1 apply equally to the M124A1 (fig. 77). The M124A1 is approximately 12.3 inches in length. It is authorized for use in demolition, GP, and SAP bombs of 500 to 600 pounds.

99. Fuze, Bomb, Tail, M124, All Delays

Except for differences in length of stem and the corresponding differences in length, weight, and bombs authorized, the M124 is identical to the M123 (par. 97), and with the exceptions noted, all statements made concerning the M123 apply equally to the M124. An M124 fuze which is not pinned is considered unsafe and will not be used until pinned (97 *c*). FUZE, bomb, tail, M124 is 12.63 inches in length; it weighs 3.1 pounds; it is authorized for use in demolition, GP, and SAP bombs of 500 to 600 pounds.

100. Fuze, Bomb, Tail, M125A1, All Delays

Except for differences in length of stem and the corresponding differences in length, weight, and bombs authorized, the M125A1 is identical to the M123A1 (par. 96) and, with the exceptions noted, all statements concerning the M123A1 apply equally to the M125A1 (fig. 77). The M125A1 is approximately 16.3 inches in length and is authorized for use in all demolition, GP, and SAP bombs of 1,000 pounds and over. Note that light-case bombs are not included.

101. Fuze, Bomb, Tail, M125, All Delays

Except for differences in length of stem and the corresponding differences in length, weight, and bombs authorized, the M125 is identical to the M123 (par. 97) and, with the exceptions noted, all statements made concerning the M123 apply equally to the M125. An M125 fuze which is not pinned is considered unsafe and will not be used until pinned (97 *c*). FUZE, bomb, tail, M125 is 16.63 inches in length; it weighs 3.4 pounds; it is authorized for use in all demolition, GP, and SAP bombs of 1,000 pounds and over. Note that light-case bombs are not included.

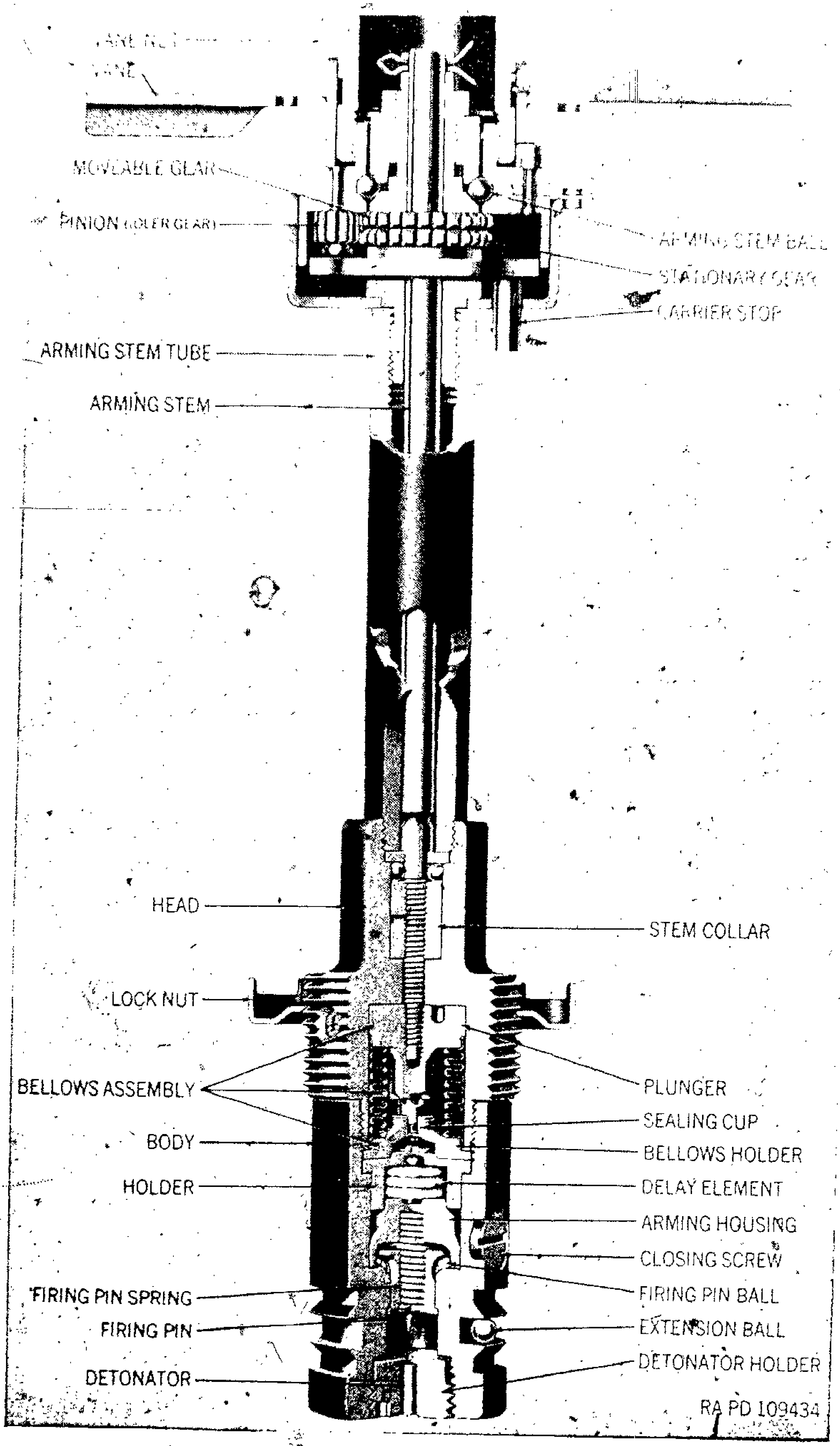

Figure 78. Fuze, bomb, tail, M132.

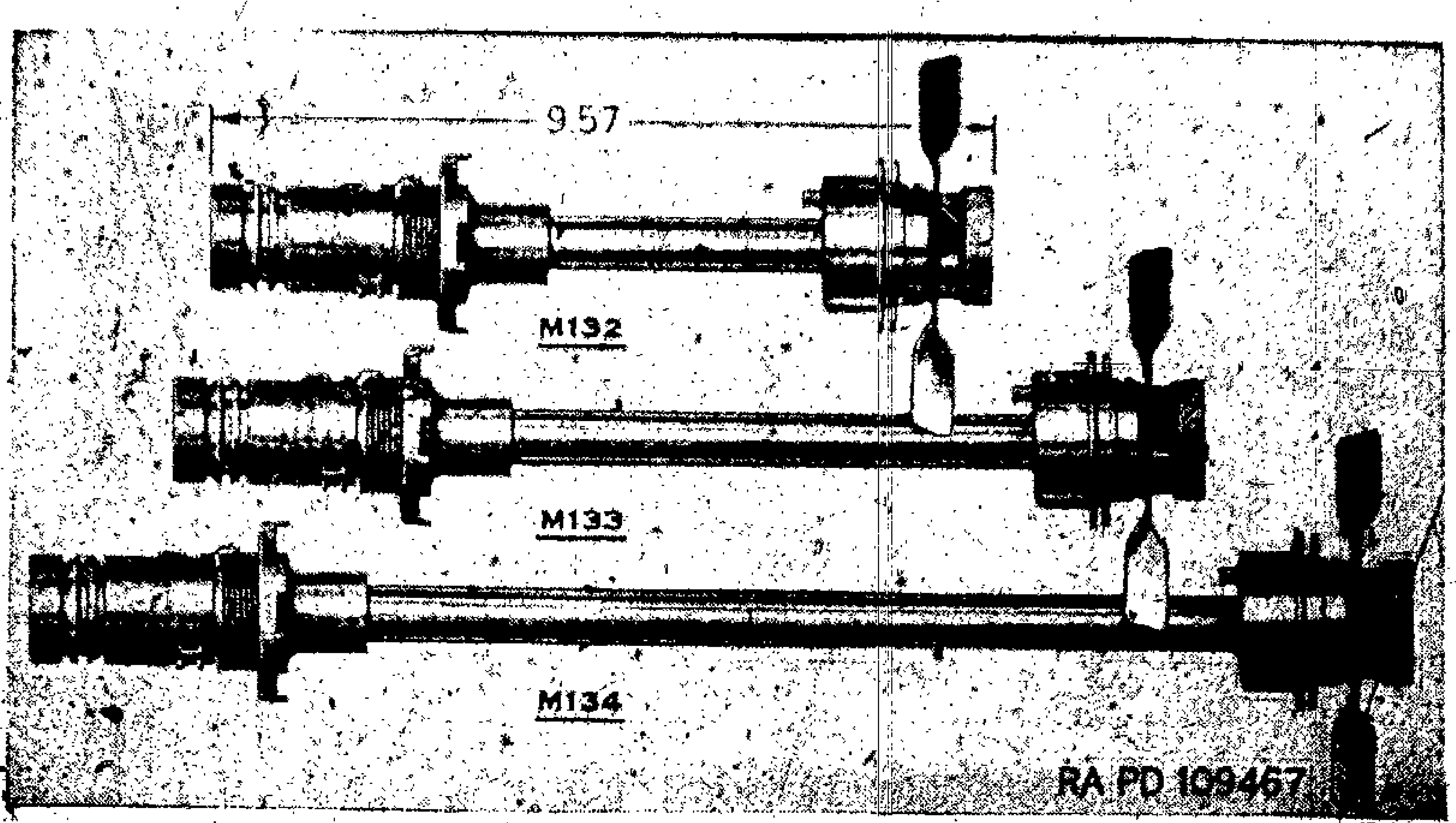

Figure 79. Fuze, bomb, tail, M132, M133, and M134.

102. Fuze, Bomb, Tail, M132

a. DATA. FUZE, bomb, tail, M132 (figs. 17, 78, and 79) is a vane type long delay tail fuze which acts to detonate the bomb with delay depending upon the temperature as indicated below or upon an attempt to remove the fuze from the bomb. The fuze, 9.57 inches long, is authorized for use with 100- to 300-pound demolition and GP bombs.

Fuze temperature (°F.)	*Average delay (min)*
120	6
100	10
80	16
60	26
40	40
20	59
10	80

b. DESCRIPTION.

(1) The vane reduction gears and arming vane of this fuze are the same as tail fuzes M123, M124, and M125, and the general overall appearance is somewhat similar to these fuzes. However, the M132-series fuzes can be readily differentiated from the M123-series fuzes by the reduction of the diameter of the head beyond the lock nut in the M132 series.

(2) The time delay mechanism of these fuzes is somewhat different from that used in the M123 and M123A1 type. This mechanism has a metal bellows (fig. 78) containing a red-colored solvent which is released at the time of

arming the fuze. The solvent acts upon a celluloid cylinder to produce the delay action.

(3) An antiwithdrawal device, which is the same as used in the M123 and M123A1 type, is contained in these fuzes.

Warning: Any attempt to unscrew the fuze from the bomb will result in detonation of the bomb.

(4) When issued, the fuze contains a safety clip containing two studs. One stud engages a hole in the fuze body and the other engages a hole in the fuze head. This clip prevents rotation between the fuze head and the fuze body. A safety screw is also located in the fuze body. This screw must be removed and replaced by the closing screw and the closing screw washer prior to fuzing the bomb.

(5) The detonator holder assembly and holder sealing washer are not assembled to the fuze when issued, but are packed in the fuze container. The detonator holder cavity of the fuze is plugged with absorbent cotton. This cotton wil indicate leakage of the solvent prior to fuzing by being stained red. If the cotton indicates solvent leakage, the fuze will be destroyed.

(6) A lock nut which is located on the bomb mating threads is used to secure the fuze to the bomb firmly.

(7) An adapter-booster lock pin is assembled to the wire holding the lock pin instruction card to the fuze. This pin should be inserted in the hole in the adapter-booster of the bombs listed in (8) below prior to assembly of the fuze to the bomb. The adapter-booster is the threaded part in the tail of the bomb into which the fuze is screwed. The adapter-booster lock pin prevents removal of the adapter-booster after the fuze is inserted in the bomb.

(8) The adapter-booster M102, M102A1, M115, or M115A1 may be found in bombs AN–M64, AN–M64A1, AN–M65, AN–M65A1, AN–M66, AN–M66A1, and AN–M66A2. Fuzes M132, M133, and M134 can only be assembled to bombs fitted with M102-series adapter-boosters and it is therefore necessary to replace the M115 type with the M102 type.

c. FUNCTIONING.

(1) When released armed, the arming wire is withdrawn and the vane is free to rotate. At approximately 100 feet of air travel, the metal bellows is punctured and the solvent forced onto the celluloid cylinder. This initiates a softening action of the celluloid and, after a delay as indicated

in *a* above, the softened celluloid allows the spring-loaded firing pin to move forward, and pierce the detonator, thus detonating the bomb.

(2) When released safe, the arming wire does not allow the arming vane to rotate and the bellows is not punctured. There is no leakage of the solvent onto the celluloid cylinder and no resultant detonation of the bomb. *However, the antiwithdrawal device will detonate the bomb if an attempt is made to remove a fuze even though the bomb is dropped safe.*

d. INSPECTION BEFORE USE.

(1) Before assembling fuze, inspect the glass vials in the shipping box to determine whether the fuzes have been subjected to a temperature which might have damaged the fuze.

(2) If the powder in the green-stoppered vial has melted and solidified, the fuze must not be used for low-altitude bombing (temperature has exceeded 150° F.).

(3) If the powder in the red-stoppered vial has melted and solidified, the fuze must be destroyed (temperature has exceeded 170° F.).

e. PREPARATION FOR USE.

(1) *Preliminary operations (½ hr. prior to fuzing).*

(*a*) *Remove the absorbent cotton from detonator holder cavity and be sure that no solvent has leaked onto the cotton. If the cotton indicates leakage by being stained red, destroy the fuze.*

(*b*) Replace the cotton in the detonator holder cavity.

(*c*) Remove the shipping screw. Shake the fuze several times, but do not strike it.

(*d*) Stand the fuze on the detonator holder end and let it remain in this position for ½ hour.

(*e*) After ½ hour, remove the cotton and inspect it for evidence of leakage. If the cotton has been stained red, destroy the fuze.

(*f*) Replace the shipping screw in its opening in the fuze body. If the screw cannot be replaced, destroy the fuze.

(2) *Preparation of bomb.*

(*a*) If the bomb to be fuzed is fitted with adapter-booster M102A1, remove the adapter-booster lock pin from the fuze and insert the pin into the hole provided inside the wall of the fuze cavity of the adapter-booster. The end of the pin must be flush with or below the inside surface of the adapter-booster before the fuze can be assembled to bomb.

(b) If the bomb to be fuzed is fitted with adapter-booster M102, it is necessary prior to assembling the fuze to the bomb to stake the adapter-booster to the base plug of the bomb and to stake the base plug to the bomb body.

(c) Screw the thread gage, which is furnished with each box of fuzes, into the bomb fuze cavity until it seats. This assures that fuze will assemble without difficulty. Remove the thread gage. Do not use bomb if the bomb fuze cavity contains damaged threads.

f. FUZING.

(1) Remove shipping screw from fuze body and insert the closing screw washer and closing screw in its place. Tighten closing screw.

(2) Insert holder sealing washer (lead) into detonator end of fuze.

(3) Screw detonator holder assembly over washer. In doing this, hold the fuze body (not the extension) to prevent rotation of parts. Tighten detonator holder securely with pin wrench supplied with fuzes.

(4) The extension ball should move freely through a small arc in its groove.

(5) Remove safety clips from fuze body. Do not allow fuze body to rotate about fuze head at any time after removal of safety clip.

(6) Hold fuze by the central tube and turn lock nut so that it passes over all of the threads in order to make sure that the threads are in good condition. Place nut as far as possible toward vane end of fuze. Do not use fuzes with damaged threads.

(7) Screw the fuze into bomb by hand as far as possible, then tighten the lock nut with "L" wrench supplied with fuzes. Tap wrench lightly with small hammer to insure the nut is tight.

Warning: Fuze must not be unscrewed or turned in a screwing-out motion during, or after assembly to bomb, since unscrewing or turning out will cause extension ball to seize and the bomb will explode.

(8) Thread longer end of arming wire assembly through rear suspension of lug of bomb and nearer pair of eyelets on the fuze. Should nearer pair of eyelets be occupied by safety pin and sealing wire, place a second pin

through eyelets diametrically opposite, before removing original safety pin.

(9) Cut sealing wire and remove safety pin, complying with instructions on tag.

(10) Thread end of arming wire through appropriate eyelet in arming vane assembly. At same time, slip vane over end of fuze so that slots in hub fit over heads of the two eyelet pins.

(11) Screw vane nut on threaded end of bearing cup. Tighten nut by hand.

(12) Adjust arming wire to protrude 2 to 3 inches beyond arming vane. If arming wire is too long, cut off excess wire.

(13) Slip two safety clips over end of arming wire and push them up the wire until the inner one touches the vane. Be sure there are no kinks or burs in the wire.

(14) Bombs fuzed with the M132 fuze will be used on the mission for which they are fuzed. In the event of incomplete missions, unused bombs will be dropped over enemy territory or deep water. *They will not be returned to the airfield or aircraft carrier.*

Warning: If anything interferes with the completion of the fuzing operation, no attempt will be made to defuze the bomb. The bomb, with fuze in place, will be destroyed by bomb disposal personnel.

g. PRECAUTIONS. In addition to the general precautions prescribed, the following will be observed in the care and handling of this fuze:

(1) Detonator holders will not be assembled to fuzes nor fuzes assembled to bombs in advance or in anticipation of future needs.

(2) Particular care must be exercised to protect this fuze from heat and shock.

(3) The indicator vials will be examined when the fuze packing box is opened. If all of the fuzes in the box are not used, the vials will be left in the box with the remaining fuzes and inspected again when the box is reopened.

(4) The natural tendency in engaging threads of mating parts is to turn one part back and forth until the threads engage. This must not be done when assembling this fuze to a bomb—*use a screwing-in motion only.* The antiwithdrawal device will cause the fuze and bomb to detonate if the fuze is rotated counterclockwise while in the adapter-booster *even before the threads are engaged.*

(5) The warning tag attached to this fuze should not be removed when the fuze is assembled to the bomb.

h. MARKING. Marking on the body of the fuze is located just below the threads and includes nomenclature, lot number, and date loaded. In addition, there are four tags attached to the fuze—one, for the cotter pin and pull ring assembly, is marked "For use if safety pins are to be pulled after plane is airborne" in black; the second, a warning tag, is marked "DANGER Never remove this tag. This fuze contains a booby trap. NEVER ATTEMPT TO REMOVE THIS FUZE FROM BOMB" in red; the third, for the adapter-booster lock pin, is marked "This pin is for use in the adapter-booster of the following bombs: GP 100-lb AN–M30A1 and GP 250-lb AN–M57A1" in black (instructions for assembling this pin to the adapter-booster are marked in black on the reverse side of the tag); and fourth, an instruction tag attached to the safety pin, is marked "remove this pin after arming wire has been inserted but before arming vane is attached. DO NOT UNSCREW FUZE DURING OR AFTER ASSEMBLY TO BOMB" in black.

i. PACKING.

(1) Fuzes are packed 25 to a wooden packing box. Each fuze, less arming vane, is packed in a metal container. The holder sealing washer, detonator holder assembly, closing screw, and closing screw washer are secured in a wooden block by sealing tape. This block is packed in the fuze container. Twenty-five arming vanes are assembled in a rack which fits in one end of the packing box. Each packing box also contains:

(*a*) Pin wrench for tightening the detonator holder assembly.

(*b*) "L" wrench for tightening the lock nut.

(*c*) The glass vials which indicate whether fuzes have been exposed to dangerous storage temperatures.

(*d*) Thread gage for gaging and cleaning the threads in the bomb fuze cavity prior to fuzing.

(2) Fuzes may also be packed 12 to a wooden packing box in the same manner as above and with the same equipment.

103. Fuze, Bomb, Tail, M133

FUZE, bomb, tail, M133 (fig. 79) is the same as the M132 (par. 102), except that a larger stem makes the overall length of the fuze 12.57 inches. It is authorized for use to 500- to 600-pound bombs.

104. Fuze, Bomb, Tail, M134

FUZE, bomb, tail, M134 (fig. 79) is the same as the M132 (par. 102), except that a larger stem makes the overall length of the fuze 16.57 inches. It is authorized for use in bombs of 1,000 pounds and over.

Section IX. MISCELLANEOUS FUZES

105. Fuze, Bomb, M129

a. DATA. The M129 (figs. 15 and 80) is a body type fuze assembled to the 4-pound fragmentation bomb M83 transversely to the bomb's longitudinal axis (fig. 94). It is designed to give an air or ground (impact) burst dependent upon the setting (only those set for ground burst are used by the Department of the Navy). When the bomb M83 is released from its cluster, the "butterfly" wings snap open and ride to the top of the cable attached to the arming stem of the M129 fuze. The rotation of the wings in this position cause the cable to turn and unscrew the arming stem far enough to initiate the fuze's arming mechanism.

b. DESCRIPTION. The M129 consists of three main assemblies held together by 3 studs:

(1) The cap assembly consists of the cap (marked "air" and "ground") which contains the arming stem, the setting plug, and the setting pin with spring.

(2) The movement assembly consists of the arming mechanism, the firing pin assembly, and primer. The arming mechanism includes the segment gear (regulated by gear train or movement assembly), segment gear stop, segment gear cam shaft, and the safety pellet assembly (includes pellet, shell, and spring).

(3) The booster assembly consists of a tetryl-loaded aluminum cup and a detonator assembly. The cup is screwed into the booster cup retainer which is assembled to the movement assembly.

c. FUNCTIONING. This fuze is designed for air or ground burst and is ordinarily set for ground burst at the time of manufacture. Air burst occurs if the setting plug is turned so that its indicator points to the word "AIR" embossed on the outside of the cap; for ground burst, the indicator points to the word "GROUND."

(1) *Air burst functioning.* If the setting plug is turned to indicate "AIR," the setting pin is forced downward and depresses the safety pellet assembly. This action permits the segment gear stop, when driven by the segment gear, to pass over the top of the safety pellet. When the arming

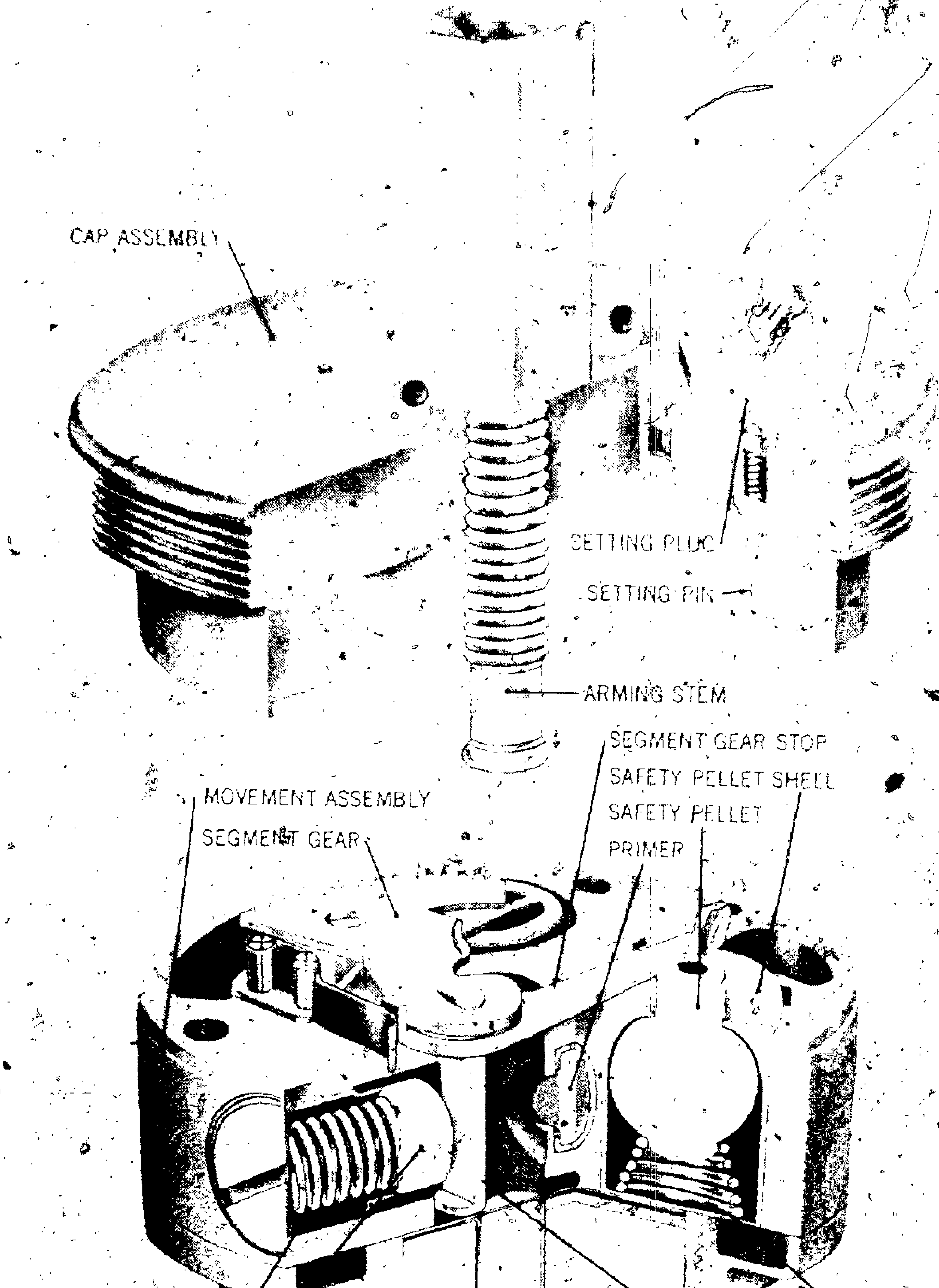

Figure 80. Fuze, bomb, M129—section.

stem is withdrawn, the firing pin is forced by its spring to act against the segment gear cam causing the cam and segment gear to rotate. The rotation of the segment gear is retarded by the movement assembly (consisting of the balance, escape wheel, and first wheel or pinion). When the segment gear has completed its travel toward the gear stop, the cam has rotated until the half round notch cut in the cam has alined with the firing pin which permits the firing pin spring to force the firing pin into the primer, thus detonating the bomb. It requires 2½ to 3 seconds from the time the arming stem is withdrawn until detonation.

(2) *Ground burst functioning.* If the setting plug is turned to indicate "GROUND," the setting pin is retracted into the cap. In this case, the segment gear stop is restrained by the tip on the safety pellet which projects through the safety pellet shell. Upon withdrawal of the arming stem, the segment gear rotates until it contacts the gear stop. In this position the firing pin is still restrained from forward action by the cam. Upon impact with the ground, the complete safety pellet assembly is depressed, due to inertia, and almost simultaneously with that action, the gear stop with segment gear passes over the safety pellet assembly, the cam is further rotated, and the bomb detonated.

d. FUZING. Since the 4-pound fragmentation bombs are always issued fuzed, no fuzing operations or preparations are required in the field.

e. MARKING. The model designation is embossed on the booster cup retainer.

106. Fuze, Bomb, M130 (T48)

a. DATA. The M130 (T48) (fig. 15) is a mechanically operated, delayed action, body type fuze also used with the 4-pound fragmentation bomb M83. It is designed to detonate the bomb at intervals of 10, 20, 30, 40, 50, or 60 minutes dependent upon its setting at time of manufacture. When the arming stem is withdrawn by the action of the "butterfly" wings, the escapement release arm (arming lever) rotates a few degrees, unlocking the escapement wheel and initiating arming action.

b. DESCRIPTION. Externally it is very similar to the M129 (par. 105). The M130 also consists of three main assemblies held together by three studs:

(1) The cap assembly containing arming stem.

(2) The body assembly containing fuze mechanism, striker, and primer.

(3) The booster assembly consisting of a tetryl loaded aluminum cup and a detonator assembly. The cup is screwed into the booster cup retainer which is assembled to the body.

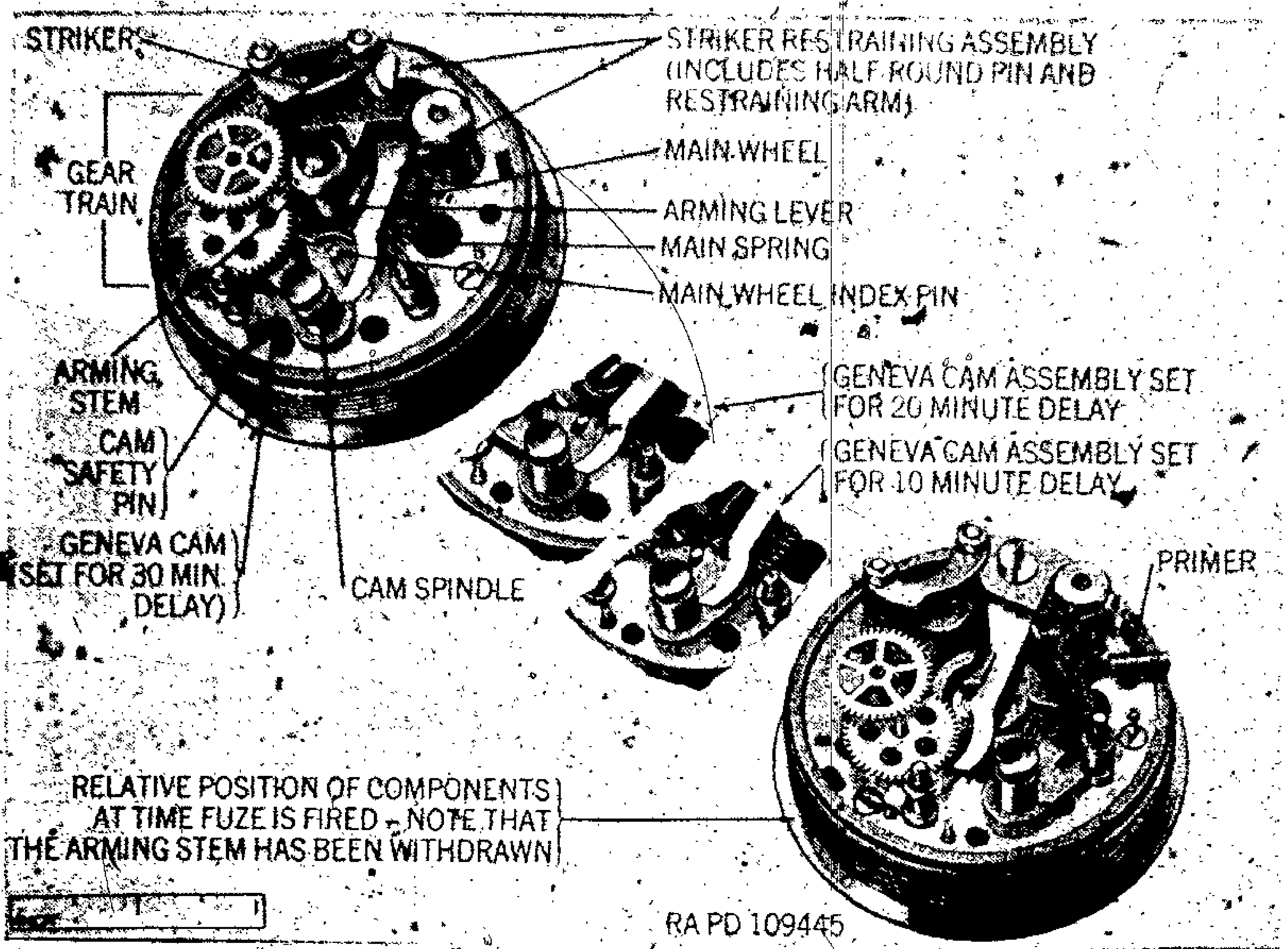

Figure 81. M130 (T48) Bomb fuze—time mechanism.

c. FUNCTIONING. This fuze is designed for delays of 10, 20, 30, 40, 50, or 60 minutes. Its mechanism is similar to that shown in figure 81 which represents the T48 an early development of the M130 designed for delays of 10, 20, or 30 minutes only. This description of functioning pertains to the fuze shown in figure 81 when set for a 30-minute delay but applies basically to the M130, the M130 having additional delays of 40, 50, and 60 minutes. When the arming stem is withdrawn and the escapement released, the main spring unwinds, driving the main wheel in a counterclockwise direction. The speed of the main wheel is regulated by the gear train; the main wheel completes the revolution every ten minutes. The striker is restrained by a half-round pin which engages a notch in the striker. One end of a restraining arm is attached to the restraining spindle and the other end bears on the Geneva cam spindle which prevents the arm from rotating about its own spindle. As the main wheel completes its first revolution, the index pin engages the first notch in the Geneva cam, turning the cam and its spindle about 30 degrees in a clockwise direction. This action also brings a notch in the cam spindle closer to the free end of the restraining arm. This sequence is repeated at the end of the main wheel's second revolution, the index pin engaging the second notch. At the end of the third revolution of the main wheel, the index pin forces the Geneva cam to turn so that the notch in the cam spindle frees the end of the restraining arm. When the restraining arm passes through the notch in the cam spindle, it rotates the restraining spindle and frees the striker. The striker is driven by a spring to rotate about its own axis and to strike the primer, thus detonating the fuze. The operation of functioning is the same for a 20 or 10 minute setting except that the index pin will be set in the first or second notch of the Geneva cam, respectively, at the time of manufacture.

d. FUZING. No fuzing operations or preparations are required, since this fuze is assembled to the fragmentation bomb as issued.

e. MARKING. The model designation is embossed on the booster cup retainer.

107. Fuze, Bomb, M131

a. DATA. The M131 (fig. 15) is a body type fuze also assembled to the 4-pound fragmentation bomb M83. The M131 is a mechanically operated fuze designed to detonate if, after impact, it should in any way be disturbed (such as the movement caused by handling an unexploded bomb). This fuze is therefore known as an antidisturbance fuze. It too depends upon the withdrawal of the arming stem in order to arm.

b. DESCRIPTION. The fuze consists of three parts:

(1) The cap assembly which contains the arming stem.

(2) The body assembly which contains fuze mechanism, firing pin assembly, and primer.

(3) The booster assembly which consists of a tetryl loaded aluminum cup and detonator assembly. In this fuze, the booster is screwed directly to the base of the fuze body.

c. FUNCTIONING. The arming of this fuze requires three steps. The initial arming or first release takes place when the arming stem is withdrawn by the action of the bomb's "butterfly" wings. This permits a clockwork spring to advance a tripping mechanism to a latch device. This latter device jars free when the bomb strikes the ground—this action being known as second release. After the second release, the tripping mechanism advances to the third release device. The advance requires about 2 seconds; this delay is provided to permit the bomb to stop moving or fuze parts to stop vibrating after impact. The third release is the antidisturbance device and is extremely sensitive. Further movement of the bomb on the ground causes the fuze to function and detonate the bomb.

d. **Fuzing.** No fuzing operations or preparations are required since the fuze is assembled to the bomb as issued.

e. **Marking.** The model designation is stamped on the side of the fuze body.

CHAPTER 6
BOMBS

Section I. GENERAL-PURPOSE, DEMOLITION, AND LIGHT-CASE BOMBS

108. General

General-purpose and demolition bombs range in weight from 100 to 44,000 pounds and are used for the majority of bombing situations. The bomb case is cylindrical, has an ogival nose, and tapers conically to the base. The explosive content of GP and demolition bombs represents approximately 50 percent of the total weight. Light-case bombs are designed to carry a maximum charge which represents approximately 70 percent of the total weight. Light-case bombs are not used for penetration since the case is not strong enough to withstand impact; instantaneous fuzes are used with this bomb to provide above ground burst. In all other respects, light-case bombs are similar to the GP bombs. The weights and percentages of explosives given in paragraphs 111 to 119 are based on a tritonal loading, unless otherwise noted. The bombs (GP, demolition, and LC) described in these paragraphs may, however, be loaded with TNT and some may also be encountered in the field loaded with COMP B, or amatol. Tables of data in appendix II provide additional information and characteristics pertaining to bombs, clusters, fuzes, fin assemblies, fin lock nuts, and fuze seats.

109. Assembly

a. COMPONENTS. The components of the complete round are as follows:

(1) Bomb, unfuzed, without fin assembly. This includes:
Bomb body.
Explosive charge of tritonal, TNT, COMP B, or amatol.
One or more auxiliary boosters.
Nose fuze-seat liner with closing plug.
Base plug with fin lock nut.
Tail fuze adapter-booster with closing plug.

(2) Fin assembly or antiricochet device (the antiricochet device is used, when required, in lieu of fin assembly and then only on the 250- and 500-pound GP bombs).

(3) Nose fuze.

(4) Tail fuze.

(5) Arming wire.

b. METHOD OF ASSEMBLY WITH FIN. The complete round may be assembled as follows—

(1) Remove shipping bands from bomb and remove fin assembly from its crate. Remove required number of fuzes and arming wires from packing boxes. Inspect components as specified in paragraph 10. Load all components on bomb service truck and trailer.

(2) Proceed to the assembly point.

(3) At the assembly point, cut the shipping wire and remove fin lock nut and its protector. Remove the protector from the lock nut.

(4) Place fin assembly over tail of the bomb with one fin in line with the suspension lugs (fig. 21). If bombs are intended for external racks, the fin is turned 40 degrees out of alinement with the suspension lugs. Replace fin lock nut and tighten with wrench.

(5) Deliver bomb to plane and install in accordance with instructions pertinent to the type of rack in use subject to provisions of (6) below.

(6) When the bomb is securely locked in the rack, install fuzes and arming wire. If the space in the bomb bay does not permit fuzing, fuzes are assembled to the bomb at the assembly point. Fuzes will be assembled to the bomb in accordance with instructions for the particular fuze in chapter 5.

(7) If bomb is not dropped, it will be unfuzed as outlined for the particular fuze in chapter 5, the nose and tail plugs replaced, and the bomb returned to storage.

Warning: Bombs fuzed with antidisturbance fuzes of the M123, M123A1, and M132 types will not be defuzed. The fuzed bombs will not be returned to storage; they will be destroyed by bomb disposal personnel.

c. METHOD OF ASSEMBLY WITH ANTIRICOCHET DEVICE. The complete round may be assembled as follows—

(1) Remove shipping bands from bomb and other components from their packings. Inspect the bomb body, fuze, primer-detonator, and arming wire assembly as specified in paragraph 10. Remove parachute unit from packing drum and inspect. Remove fuze adapter and vane assembly from box and inspect for serviceability. Load all components on bomb service truck and trailer.

(2) Proceed to the assembly point.

(3) At the assembly point, cut the shipping wire and remove fin lock nut and its protector. Remove the protector from the lock nut.

(4) Assemble fuze and antiricochet device as described in paragraph 89.

(5) Deliver bomb to plane and install in accordance with instructions pertinent to the type of rack in use.

(6) If bomb is not dropped it will be unfuzed and returned to storage as directed under the defuzing operation contained in paragraph 89.

110. Functioning

Light-case bombs are fuzed with instantaneous fuzes for surface blast effect. General purpose or demolition bombs may be fuzed with instantaneous fuzes for blast effect, with short delay (0.1 sec and less) for mining or penetration effect, with fuze delay of 4 to 5 or 8 to 15 seconds for low altitude bombing, or with fuzes of 1 hour to 6 days delay.

111. Limitations

Light-case bombs cannot be used for penetration. The case will fail on any ordinary impact. Delay-fuzed general-purpose bombs released from high altitudes will fail on impact with armor plate or heavy reinforced concrete, but these are proper targets if the fuzing is for instantaneous action or if the bomb is released from medium or low altitudes.

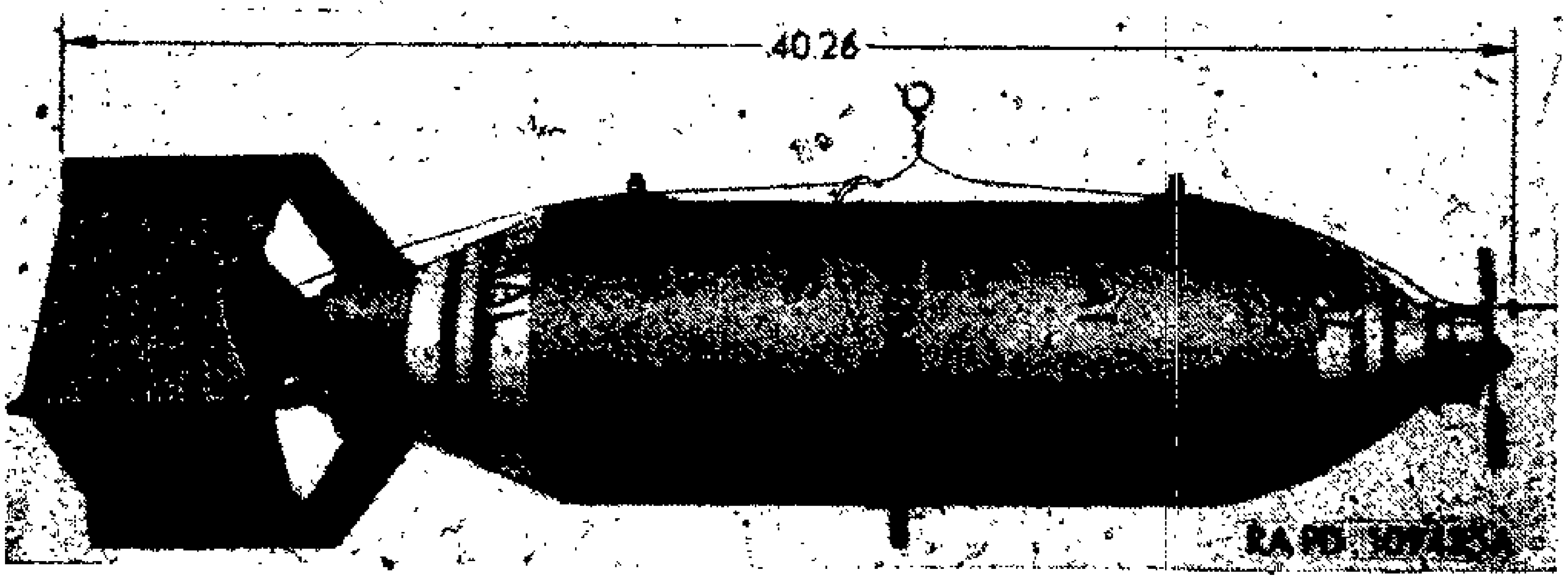

Figure 82. Bomb, GP, tritonal, 100-lb, AN–M30A1.

112. Bomb, GP, 100-lb, AN–M30A1

a. DATA. The AN–M30A1 (fig. 82) is a cylindrical bomb which is 40.26 inches long and weighs 112.3 pounds as released with fin assembly. However, when fitted with the M16 antiricochet device, the AN–M30A1 is 44.8 inches long and weighs 126.1 pounds. The body (without fin and fuze) is 30 inches in length and 8.18 inches in diameter. It weighs 106.7 pounds of which 56.6 pounds (50.4 percent of the complete round) is explosive charge. See appendix II for data pertaining to TNT or amatol loaded 100-pound bombs. The base plate of the AN–M30A1 is securely locked to the bomb body by means of two studs which extend from the plate into the solidified explosive charge. This bomb also provides a means of locking the adapter-booster to the base plate; a locking pin is passed through a hole in the adapter-booster and extends into a groove in the base plate. These modifications were initiated to prevent removal of base plate and adapter-booster to make the antiwithdrawal devices of longer delay fuzes a more effective weapon.

b. FUZE COMBINATIONS. Table XVI lists the combinations of nose and tail fuzes which may be used with all 100-pound and 250-pound GP bombs to make up a complete round. The permissible combinations of nose and tail fuzes are arranged in horizontal lines. For example, any nose fuze in column 1, *line 1*, may only be used with one of the tail fuzes listed in column 3, *line 1*. Those components (columns 2 and 5) without which the fuze cannot be used are labeled "Req'd"—if not labeled "Req'd," the component may be used, or not used, as required by the particular mission. It should also be understood that one of the primer-detonators listed in column 4 is always required for use with the tail fuzes in the preceding column.

c. OTHER MODELS. BOMB, GP, tritonal, 100-lb, AN–M30 differs from the AN–M30A1 in that it is 38.46 inches long and weighs 114.3 pounds as released. The base plate of the AN–M30 can be removed by unscrewing and no locking device is provided for the adapter-booster. The AN–M30 may be loaded with tritonal, TNT, or amatol. BOMB, demolition, 100-lb, M30 is an earlier model of this bomb (AN–M30) which differs in that it does not have a lug for single suspension and uses a base plug having internal threads instead of the present external thread for assembly to the bomb.

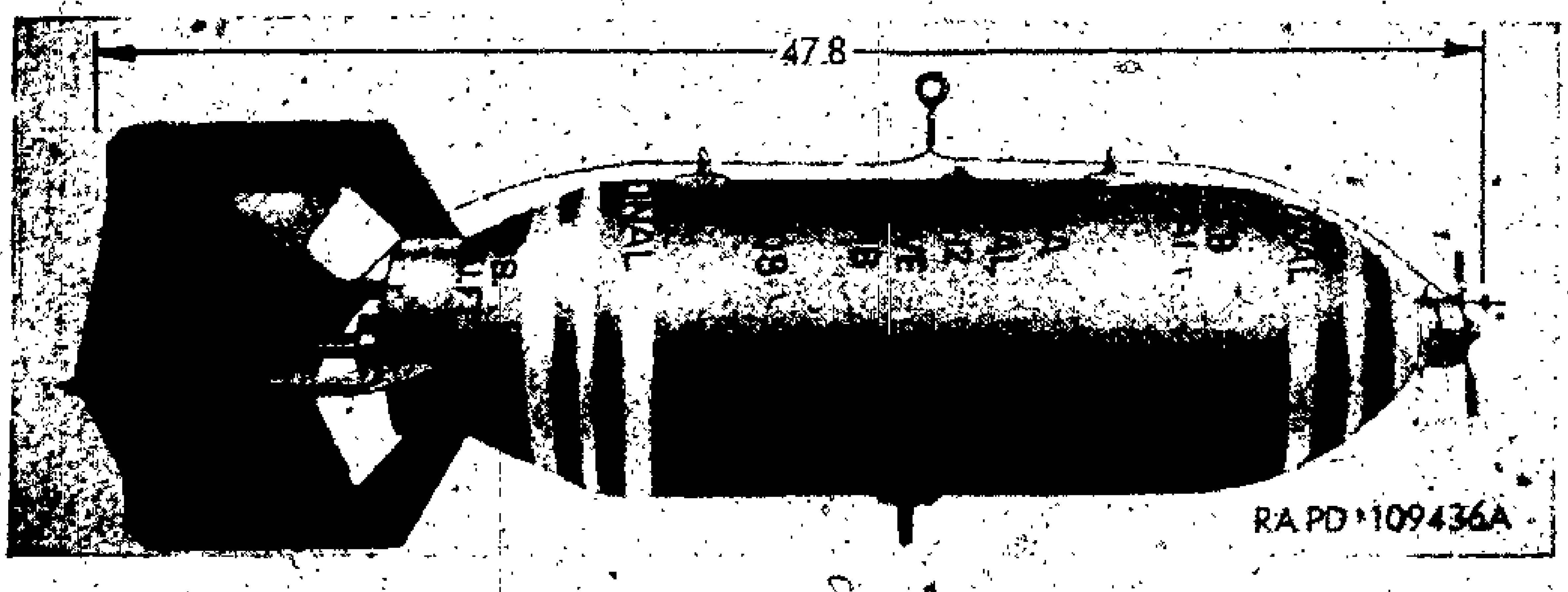

Figure 83. Bomb, GP, tritonal, 250-lb, AN–M57A1.

Table XVI. Fuze Combinations for 100-lb and 250-lb GP Bombs

Line	Nose fuzes		Tail fuzes		
	Model column (1)	Other components column (2)	Model column (3)	Primer-detonator column (4)	Other components column (5)
1	M103 M103 (AN–M103) AN–M103A1 M139 AN–M139A1 M140 AN–M140A1 M163 M164 M165	None.	M100A1 (AN–M100A1) AN–M100A2 M100A2C (AN–M100A2C) M160	M14, nondelay. M14, 0.01-sec delay. M14, 0.02-sec delay. M14, 0.10-sec delay.	None.
2	None.	None.	M112A1 M115	M16A1, 4–5-sec delay. M16A1, 8–15-sec delay.	None.
3	None.	None.	M112	M16, 4–5-sec delay. M16, 8–15-sec delay.	None.
4	AN–M166* AN–M168*	ARMING DELAY, air travel, M1 or M1A1.	Use none or any combination of tail fuze and primer-detonator in line 1, line 2, or line 3.		None.
5	None.	None.	M123, all delays. M123A1, all delays. M132.	M19 supplied with fuzes.	None.
6	None.	None.	M151**	M16A1, 4–5-sec. delay. M16A1, 8–15-sec delay.	ADAPTER, fuze** M202 (Req'd). PARACHUTE-UNIT, assembly, M7** (Req'd).

*AN–M145 may be used as a substitute with ADAPTER-BOOSTER, M117.
**For use with antiricochet device M16.

113. Bomb, GP, 250-lb, AN–M57A1

a. DATA. The AN–M57A1 (fig. 83) is a cylindrical bomb which is 47.8 inches long and weighs 267.4 pounds as released with fin assembly. When the M16 antiricochet device is used instead of a fin, the bomb is 51.7 inches long and weighs 279.6

pounds. The body is 37.5 inches in length and 10.5 inches in diameter. It weighs 253.7 pounds of which 131.1 pounds (49.9 percent of the complete round) is explosive charge. See appendix II for data pertaining to TNT or amatol loaded 250-pound bomb. The base plate of this bomb is securely locked to the bomb body and the adapter-booster may be locked to the base plate as described in paragraph 112*a*.

b. FUZE COMBINATIONS. The fuze combinations employed with the AN–M57A1 are the same as shown in table XVI.

c. OTHER MODELS. BOMB, GP, 250-lb, AN–M57 differs from the AN–M57A1 in that the complete round weighs 262 pounds and the weight of explosive charge is 132.2 pounds or 50.4 percent of complete weight. The base plate of the AN–M57 can be removed and the adapter-booster cannot be locked to the base plate. BOMB, demolition, 300-lb, M31 is an earlier model corresponding to this bomb. The M31, although nominally a 300-pound bomb, actually weighs 274 pounds when loaded with amatol and is 3 inches longer than the AN–M57A1. The M31 also differs from the M57 series by not having the single suspension lug.

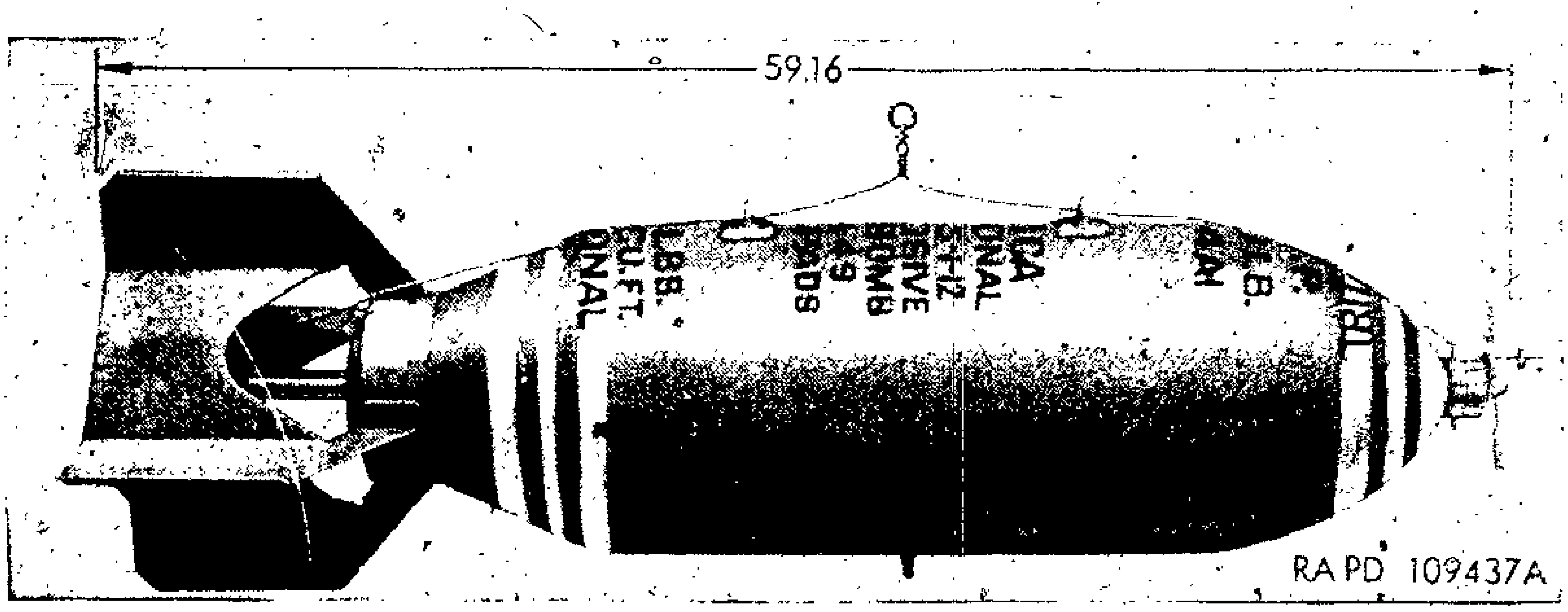

Figure 84. Bomb, GP, tritonal, 500-lb, AN–M64A1.

114. Bomb, GP, 500-lb, AN–M64A1

a. DATA. The AN–M64A1 (fig. 84) is a cylindrical bomb which is 59.16 inches long and weighs 560 pounds as released with fin assembly. If the M17 antiricochet device is used in lieu of a fin assembly, the bomb is 62.6 inches in length and weighs 577 pounds. The body is 47.5 inches in length and 14.2 inches in diameter. It weighs 535 pounds of which 278.3 pounds (49.7 percent of the complete round) is explosive charge. See appendix II for data pertaining to TNT, amatol, and COMP B loaded 500-pound bombs. The base plate of this bomb is securely locked to the bomb body and the adapter-booster may be locked to the base plate as described in paragraph 112 *a*. When the AN–M57A1 is used for dive bombing by the Navy, it must be fitted with the BAND, trunnion, AN–M1A1.

b. FUZE COMBINATIONS. Table XVII lists authorized fuze combinations used with 500-pound GP bombs to create the complete round. Use this table as explained in paragraph 112 *b*.

c. OTHER MODELS. Other models of this size and type bomb, and the details in which they differ are listed below.

(1) *Bomb GP, 500-lb, AN–M64* differs from the AN–M64A1 in that the weight of complete round is 524.1 pounds and weight of explosive charge is 274 pounds or 52.3 percent of the complete weight. The base plate of the AN–M64 is removable and the adapter-booster cannot be locked to the base plate. See appendix II for data pertaining to the AN–M64 when loaded with amatol, COMP B, or TNT.

(2) *Bomb GP, 500-lb, AN–M43* is an earlier model corresponding to the AN–M64 series. It weighs 508 pounds, of which 262 pounds is the explosive charge of amatol. The AN–M43 uses the fin assembly M108 whereas the AN–M64 series employ the M109 or AN–M109A1—consequently the AN–43 requires a smaller fin lock nut. The AN–M43 may use all fuze combinations listed in table XVII, except the tail fuze AN–Mk 230.

(3) *Bomb, GP, 500-lb, M43* is the same as the AN–M43 except that it is not fitted with the single suspension lug.

(4) *Bomb, demolition, 500-lb, M43* is the same as the GP bomb M43 but is fitted with base cap in place of base plate.

115. Bomb, GP, 1,000-lb, AN–M65A1

a. DATA. The AN–M65A1 (fig. 85) is a cylindrical bomb which is 69.5 inches long and weighs 1,080 pounds as released.

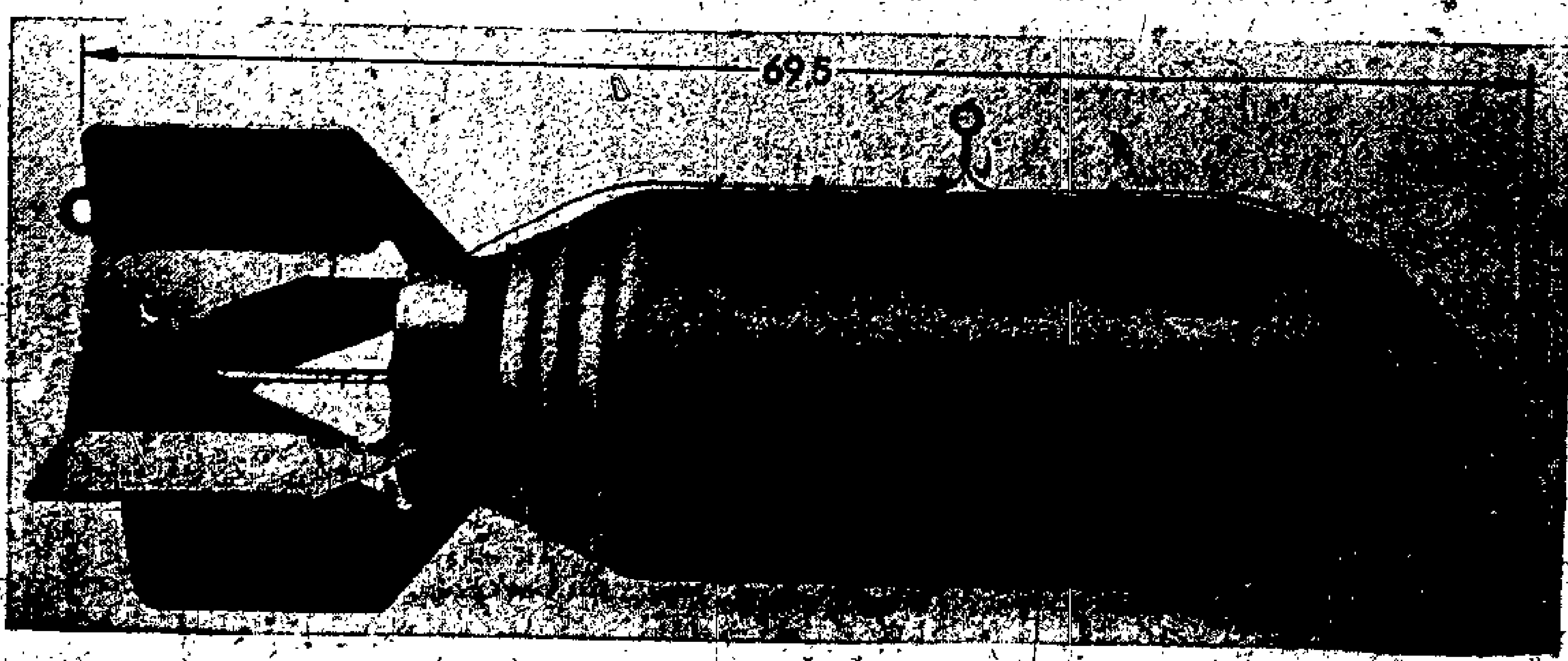

Figure 85. Bomb, GP, tritonal, 1,000-lb, AN–M65A1.

Table XVII. Fuze Combinations for 500-lb GP Bombs§

Line	Nose fuzes: Model column (1)	Nose fuzes: Other components column (2)	Tail fuzes: Model column (3)	Tail fuzes: Primer-detonator column (4)	Tail fuzes: Other components column (5)
1	**M103** **M103 (AN-M103)** **AN-M103** **M139** **AN-M139A1** **M140** **AN-M140A1** **M163** **M164** **M165**	None.	M101A2 AN-M101A2 M101A2C M161	M14, nondelay. M14, 0.01-sec delay. M14, 0.025-sec delay. M14, 0.10-sec delay. M14, 0.24-sec delay.	None.
2	**None.**	None.	M113A1 M116	M16A1, 4–5-sec delay. M16A1, 8–15-sec delay.	None.
3	**None.**	None.	M113	M16, 4–5-sec delay. M16A1, 8–15-sec delay.	None.
4	**AN-M166*** **AN-M168***	ARMING DELAY, air travel, M1 or M1A1.	Use none or any combination of tail fuze and primer-detonator in line 1, line 2, or line 3.		None.
5	**None.**	None.	M124, all delays. M124A1, all delays. M133 AN-Mk 230 Mod 4, 5, or 6.**	M19 supplied with fuzes.	None.
6	**None.**	None.	M151***	M16A1, 4–5-sec delay. M16A1, 8–15-sec delay.	PARACHUTE UNIT,*** assembly M6 (Req'd). ADAPTER, fuze,*** M200 (Req'd).

***AN-M145 may be used as a substitute with ADAPTER-BOOSTER, M117.**
****For use with AN-M64 series only.**
*****For use with antiricochet device M17.**
§For antisubmarine use.

The body is 54.0 inches in length and 18.8 inches in diameter. It weighs 1,042 pounds of which 572.3 pounds (53 percent of the complete round) is explosive charge. The charge may be tritonal, TNT, COMP B, or amatol; see appendix II for data pertaining to the 1,000-pound bombs loaded with these charges. The base plate of this bomb is securely locked to the bomb body and the adapter-booster may be locked to the base plate as described in paragraph 112 *a*. When the AN-M65A1 is used for dive bombing, by the Navy, it must be fitted with BAND, trunnion, AN-M2A1.

b. FUZE COMBINATIONS. Table XVIII lists authorized fuze combinations used with 1,000-pound and 2,000-pound GP bombs to

Table XVIII. Fuze Combinations for 1,000-lb and 2,000-lb GP Bombs

Line	Nose fuzes: Model column (1)	Nose fuzes: Other components column (2)	Tail fuzes: Model column (3)	Tail fuzes: Primer-detonator column (4)	Tail fuzes: Other components column (5)
1	M103 M103 (AN-M103) AN-M103A1 M139 AN-M139A1 M140 AN-M140A1 M1[illegible] M164 M165	None.	M102A1 AN-M102A1 AN-M102A2 M102A2C M162	M14, all delays.***	None.
2	None.	None.	M114A1 M117	M16A1, 4-5-sec delay. M16A1, 8-15-sec delay.	None.
3	None.	None.	M114	M16, 4-5-sec delay. M16, 8-15-sec delay.	None.
4	AN-M166* AN-M168*	ARMING DELAY, air travel, M1 or M1A1.	Use none or any combination of tail fuzes and primer-detonator in line 1, line 2, or line 3.		None.
5	None.	None.	M125 M125A1 M134 AN-Mk 230** Mod 4, 5, or 6.	M19 supplied with fuzes.	None.

*AN-M1[illegible] may be used as substitute with ADAPTER-BOOSTER, M117.
**For use only with AN-M65 and AN-M66 series of GP bombs.
***The 0.[illegible]-second delay is for antisubmarine use.

create the complete round. Use this table as explained in paragraph 112 *b*.

c. OTHER MODELS. Other models of this size and type of bomb, and the details in which they differ from the AN–M65A1, are listed below.

(1) BOMB, *GP, 1,000-lb, AN–M65* differs from the AN–M65A1 in that the weight of complete round is 957 pounds and weight of explosive charge is 530 pounds (amatol) or 53 percent of the complete weight. The base plate of the AN–M65 is removable and the adapter-booster cannot be locked to the base plate.

(2) *Bomb, GP, 1,000-lb, M65* differs in not having the single suspension lug.

(3) *Bomb, GP, 1,000-lb, AN–M44* is an earlier model corresponding to the AN–M65 series. It weighs 967 pounds of which 530 pounds is the explosive charge (amatol). The AN–M44 uses the fin assembly M112 whereas the AN–M65 series employ the M113 or AN–M113A1—consequently the AN–M44 requires a smaller fin lock nut. The AN–M44 may use all fuze combinations listed in table XVIII above except the tail fuze AN–Mk 230.

(4) *Bomb, GP, 1,000-lb, M44* is the same as the AN–M44 except for weight of explosive charge (538 pounds). In addition, the M44 is not fitted with the single suspension lug.

(5) *Bomb, demolition, 1,000-lb, M44* is the same as the GP bomb M44 but is fitted with base cap in place of base plate.

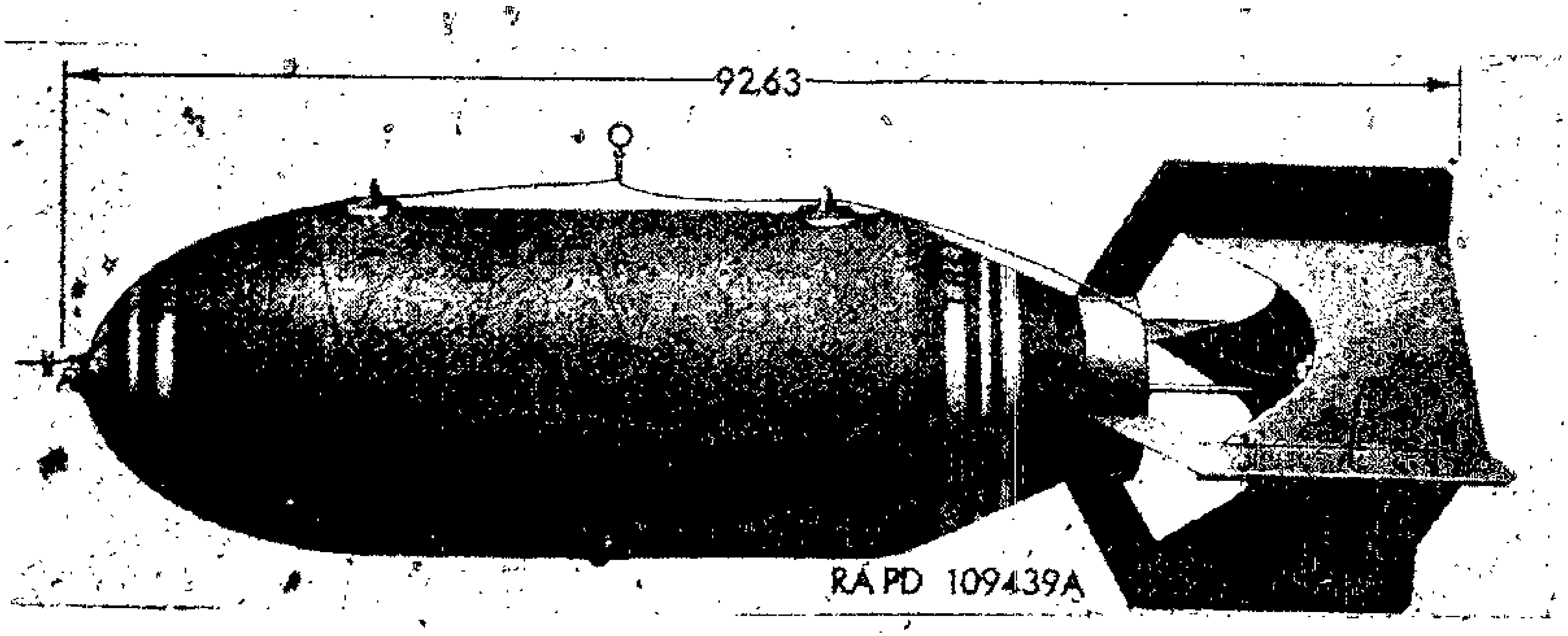

Figure 86. Bomb, GP, tritonal, 2,000-lb, AN–M66A2.

116. Bomb, GP, 2,000-lb, AN–M66A2

a. DATA. The AN–M66A2 (fig. 86) is a cylindrical bomb which is 92.63 inches long and weighs 2,155.5 pounds as released. The body is 71.8 inches in length and 23.3 inches in diameter. It weighs 2,098.5 pounds of which 1,140.3 pounds (52.9 percent of the complete round) is explosive charge. The charge may be tritonal, TNT, COMP B, or amatol; see appendix II for data pertaining to 2,000-pound bombs loaded with these fillers. The base plate of this bomb is securely locked to the body and the adapter-booster may be locked to the base plate as explained in paragraph 112 *a*. When the AN–M66A2 is used for dive bombing, by the Navy, it must be fitted with the BAND, trunnion, AN–M7.

b. FUZE COMBINATIONS. The fuze combinations employed with 2,000-pound GP bombs are the same as shown in table XVIII.

c. OTHER MODELS. Other models of this size and type of bomb and the details in which they differ from the AN–M66A2 are listed below.

(1) *Bomb, GP, 2,000-lb, AN–M66A1* differs from the AN–M66A2 in that it is 92.83 inches long and weighs 2,155 pounds as released. The AN–M66A1 contains 1,156 pounds of explosive (tritonal) or 53.6 percent of the total weight. In addition the nose of the AN–M66A2 is thicker and not as rounded as that of the AN–M66A1—the AN–M66A2 being more similar in shape to smaller GP bombs.

(2) *Bomb, GP, 2,000-lb, AN–M66* is the same as the AN–M66A1 except that its base plate is removable and the adapter-booster cannot be locked in place.

(3) *Bomb, GP, 2,000-lb, AN–M34* is an earlier model corresponding to the AN–M66 series. It weighs 2,049.0 pounds of which 1,060 pounds is explosive charge (amatol). The AN–M34 may use all fuze combinations listed in table XVIII except the AN–Mk 230.

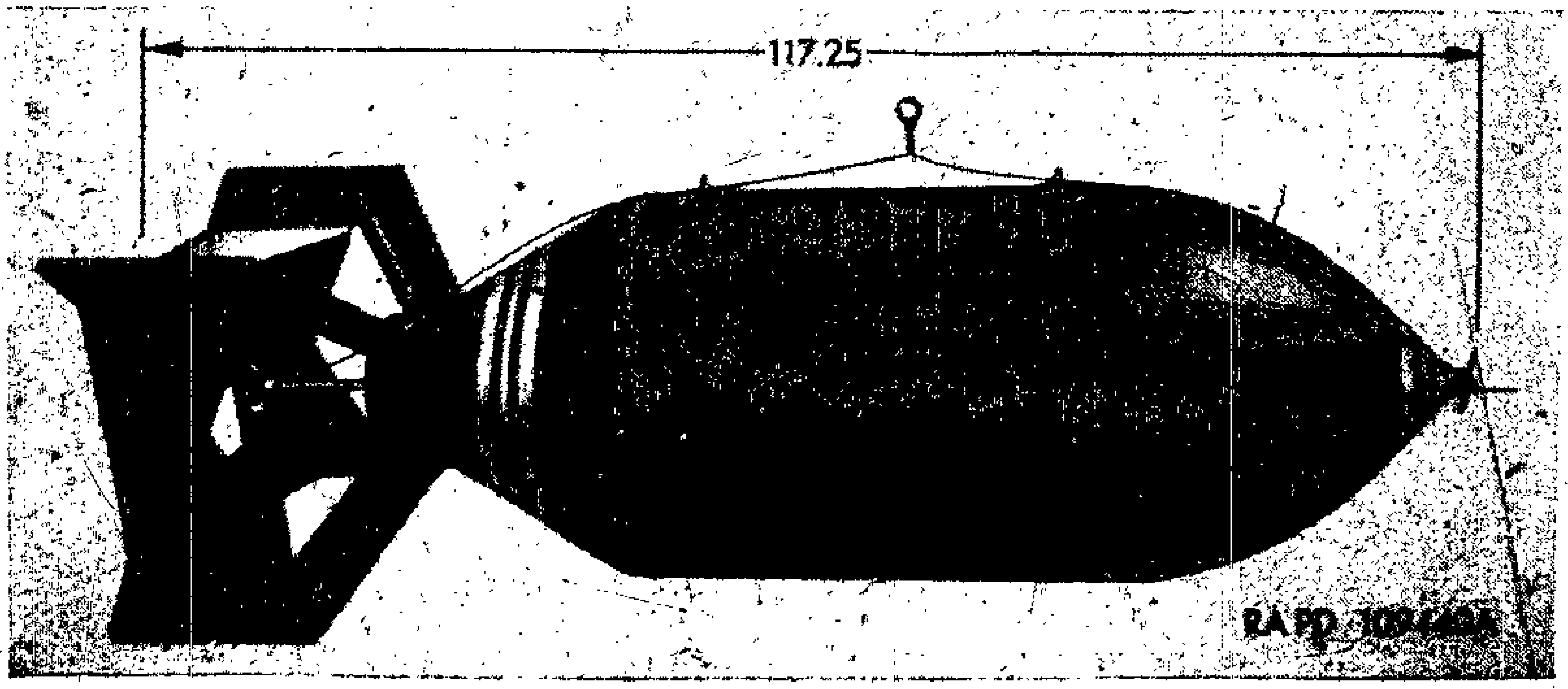

Figure 87. Bomb, light-case, tritonal, 4,000-lb, M56A2—shown with fin assembly, M118A2.

(4) *Bomb, demolition, 2,000-lb, M34* differs from the AN–M34 in that it weighs 1,987 pounds of which 1,076 pounds is explosive charge (amatol). In addition, the M34 does not have the single suspension lug and is fitted with a base cap in place of a base plate.

117. Bomb, Light-case, 4,000-lb, M56A2 (AN–M56A2)

a. DATA. The M56A2 is a cylindrical bomb (fig. 87) which is 117.25 inches in length and weighs 4,535 pounds as released. The body is 95.6 inches long and 34.25 inches in diameter. It weighs 4,397 pounds of which 3,515 pounds (77.9 percent of the complete round weight) is explosive charge. See appendix II for data pertaining to 4,000-pound bombs loaded with other fillers.

b. FUZE COMBINATIONS. Table XIX lists permissible combinations of fuzes for use with the 4,000-pound bombs of the M56 series. Use this table as explained in paragraph 112 *b*.

Table XIX. Fuze Combinations for 4,000-pound GP Bombs

Line	Nose fuzes		Tail fuzes		
	Model column (1)	Other components column (2)	Model column (3)	Primer-detonator column (4)	Other components column (5)
1	M103 M103 (AN–M103) AN–M103A1 M139 AN–M139A1 (M139A1) M140 AN–M140A1 (M140A1) M163 M164 M165	None.	M102A1 (AN–M102A1) AN–M102A2 M102A2C AN–M102A2C M162	M14, nondelay.	None.
2	AN–M166* AN–M168*	ARMING DELAY, air travel, M1 or M1A1.	Use none or any combination of tail fuze and primer-detonator in line 1.		None.

*AN–M145 may be used as a substitute with ADAPTER-BOOSTER, M117.

c. OTHER MODELS. Other models of this series of bombs and the details in which they differ from the M56A2 are listed below.

(1) *Bomb, light-case, tritonal, 4,000-lb, M56A1 (AN–M56A1)* differs from the M56A2 in that it weighs 4,514 pounds of

which 3,519 pounds (78.4 percent of complete round) is explosive charge. The M56A1 is the only bomb of this series (M56, M56A1, and M56A2) which was modified to receive British type hoisting and single suspension lugs. This bomb is fitted with a base cap in place of a base plate.

(2) *Bomb, light-case, 4,000-lb, M56 (AN-M56)* differs from the M56A2 in that it weighs 4,201 pounds of which 3,244 pounds (77.2 percent of complete round) is explosive charge (amatol). The M56 is also fitted with a base cap in place of base plate.

118. BOMB, GP, 12,000-lb, M109 (T10)

a. DATA. The M109 (fig. 2) is a cylindrical bomb which is 252 inches long and weighs 12,622 pounds as released. The body is 124 inches in length and 38 inches in diameter. It weighs 12,448 pounds of which 5,500 pounds is tritonal (43.8 percent of the complete round). Early models of this bomb were loaded with 5,200 pounds of torpex and a 1-inch layer of TNT added to the rear end. This bomb is triple fuzed in the tail and consequently requires three of each of the fuzing components. The fuzes are 120° apart radially, and fuzing is accomplished through three circular holes located in the tail assembly. The M120 tail assembly, attached to the rear of the bomb body with 20 bolts, resembles a cone with the four fins displaced 5° from its axis. This displacement causes the bomb to rotate as it falls. A cylindrical metal cowling, placed between the body and the tail cone, increases the streamlining of the bomb.

b. FUZE COMBINATIONS. Table XX lists authorized fuze combinations used with 12,000-pound and 22,000-pound GP bombs to create the complete round. Use this table as explained in paragraph 112 *b*.

Table XX. Fuze Combinations for 12,000- and 22,000-pound GP Bombs

Line	Nose fuzes		Tail fuzes		
	Model column (1)	Other components column (2)	Model column (3)	Primer-detonator column (4)	Other components column (5)
1	None.	None.	M169 (T708)*	M40, all delays.*	ADAPTER-BOOSTER, M118.*

*Three required.

119. Bomb, GP, 22,000-lb, M110 (T14)

a. DATA. The M110 (fig. 2) is a cylindrical bomb 305 inches in length and weighs 23,037 pounds as released. The bomb body is 150 inches long, 46 inches in diameter, and weighs 22,850 pounds of which 9,600 pounds is tritonal (41.6 percent of the complete round). Early models of the M110 were loaded with 9,200 pounds of torpex and a 1-inch layer of TNT added to the rear end. The 22,000-pound and 12,000-pound GP bombs are similar in construction except that the three fuze seats in the tail of the 22,000-pound bomb are all in a straight line rather than in a circle. The M110 bomb employs the M121 tail assembly, and the section of the tail assembly to the rear of the fins may be removed, when necessary, to fit the complete round in aircraft.

b. FUZING. The fuze combinations employed with the M110 bomb are as shown in table XX.

120. Bomb, GP, 44,000-lb, T12

This bomb is currently under development and is similar to the 22,000-pound, M110. The bomb body is made up of six sections welded together and is 200 inches long and 54 inches in diameter. The tail assembly is attached to the body with 24 bolts which are anchored in the base plate of the body. The complete round is approximately of the size shown in figure 2.

Section II. ARMOR-PIERCING AND SEMI-ARMOR-PIERCING BOMBS

121. General

The armor-piercing bomb is designed to pierce heavy deck armor and consequently has an extremely heavy case with the weight being concentrated in the nose. The bursting charge is explosive D and represents approximately 15 percent of the total weight. Semi-armor-piercing bombs resemble the armor-piercing bombs but have a lighter case and a fuze seat for use of nose fuze (except for the 25,000-lb SAP bomb) which however is rarely used; the nose fuze seat is ordinarily closed by an armor-piercing plug. The standard explosive charge contained in SAP bombs is picratol and represents approximately 30 percent of the total weight; bombs containing TNT or amatol may be encountered.

122. Assembly

a. COMPONENTS. The components of the complete round of each type are as follows:

(1) *SAP.*

(*a*) Bomb, unfuzed, without fin assembly. This includes: Bomb body.

Explosive charge of picratol, TNT, or amatol.
One or more auxiliary boosters.
Fuze seat liner, with closing plug.
Base plug with fin lock nut.
Adapter-booster with closing plug.

(*b*) Fin assembly.

(*c*) Tail fuze.

(*d*) Arming wire.

(*e*) Trunnion band (for dive bombing only).

(2) *AP (AN–Mk series)*.

(*a*) Bomb, unfuzed, without fin assembly. This includes:
Bomb body.
Base plug with fin lock nut.
Adapter and fuze seat liner containing auxiliary booster and fuze hole plug.
Explosive charge of Explosive D.

(*b*) Fin assembly crate includes:
Fin assembly.
Suspension lugs.
Hoisting lug.
Guide stud.
Cap screws.
Safety wire.
Lock washers.
Trunnions.
Arming bracket.

(*c*) Tail fuze.

(*d*) Arming wire assembly.

b. METHOD OF ASSEMBLY. The assembly of the complete round for each type is as follows—

(1) *SAP bombs*. Same as for GP (par. 109 *b*).

(2) *AP bombs (AN–Mk series)*.

(*a*) Remove shipping bands (if present) from bomb and fin assembly from its crate. Remove required fuzes and arming wires from packing boxes. Inspect components as specified in paragraph 10. Load all components on bomb service truck and trailer.

(*b*) Proceed to assembly point.

(*c*) Remove shipping plugs from places for fittings required by type of suspension. Clean out holes.

(*d*) Attach suspension fittings required. For cap screws, use a screw driver of sufficient size to fill the slot and tighten securely. Screws holding suspension lugs should be safety wired in pairs. In attaching trunnions, be sure there is a shakeproof lock washer in place under the base of each trunnion before installing. Tighten the trunnion securely with wrench.

(e) Remove the closing plug or snap-on cover from the fuze cavity. Be sure the auxiliary booster is in place and that there is no foreign matter present in tail fuze seat.

(f) Remove fin lock nut. Place fin assembly over tail with one fin in line with suspension lugs. Replace fin lock nut and tighten. A few taps of a hammer on a wooden drift held against one of the pins on the nut will suffice. Tighten set screws.

(g) Attach arming bracket loosely to the neck of the fuze.

(h) Install fuze by the procedure outlined in paragraph 95.

(i) If bomb is not dropped, reverse the above steps, defuzing as directed in paragraph 95, and return components to packings.

(3) *AP bombs (M-series)*.

(a) Proceed as in (2) (a) and (b) above.

(b) Assemble suspension bands, locating them according to markings on bomb body. Gage lugs for alinement and distance, then tighten securely.

(c) Screw couplings into adapter. If necessary, use a bar through the holes in the side to seat coupling firmly.

(d) Place fin assembly over tail and seat firmly with one fin alined with suspension lugs. Screw fin lock nut on outer end of coupling and tighten with wrench.

(e) Assemble fuze and arming wire as outlined in paragraph 95.

(f) If bomb is not dropped, reverse the above steps, defuzing as directed in paragraph 95, and return components to storage.

123. Functioning

AP and SAP bombs are fuzed for delay action in order to permit penetration of the target before the bomb explodes. SAP bombs are designed for use against reinforced concrete construction and lightly armored shipping. AP bombs are designed to pierce concrete bombproof construction and the heaviest deck armor known to be in use.

124. Limitations

If used on unarmored or lightly armored ships, AP bombs will probably pass entirely through the target before exploding. Because of the limited explosive content, direct hits are required for effect and because of the high impact velocity required they must be released at high altitudes.

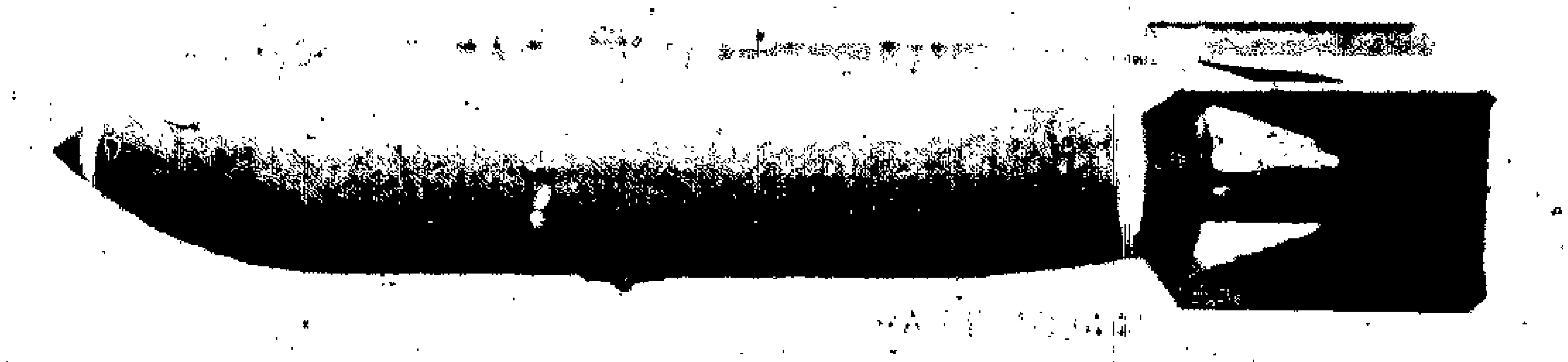

Figure 88. Bomb, AP, 1,000-lb, AN–MK 33.

125. Bomb, AP, 1,000-lb, AN–MK 33

a. DATA. The AN–Mk 33 (fig. 88) is a streamlined bomb which is 73.0 inches long and weighs 1,008.0 pounds as released. The bomb body is 59.8 inches in length and 12 inches in diameter. It weighs 991 pounds of which 140.0 pounds (13.9 percent of complete round weight) is a charge of Explosive D.

b. FUZES AUTHORIZED. The only fuze authorized for use with this bomb is FUZE, bomb, tail, AN–Mk 228.

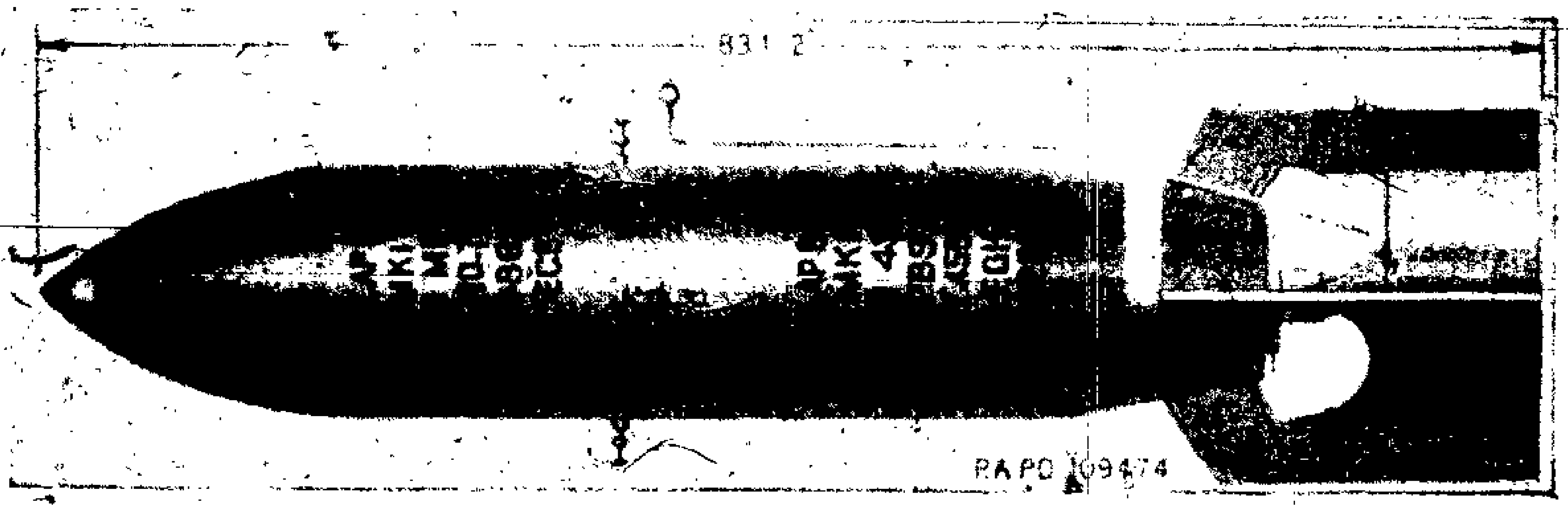

Figure 89. Bomb, AP, 1,600-lb, AN–MK 1.

126. Bomb, AP, 1,600-lb, AN–MK 1

a. DATA. The AN–Mk 1 (fig. 89) is a streamlined bomb which is 83.5 inches long and weighs 1,590.0 pounds as released. The bomb body is 69.8 inches in length and 14.0 inches in diameter. It weighs 1,575 pounds of which 209 pounds (13.1 percent of the complete round) is Explosive D. This bomb is issued unfuzed and without fin assembly or suspension accessories. The fin assembly is packed separately in a metal crate which also contains arming bracket, arming wire assembly, trunnions with lock washers, suspension lugs, guide stud, hoisting lug with cap screws, and safety wires for their attachment. The fuze and arming wire assembly are issued separately.

b. FUZES AUTHORIZED. The only fuze authorized for use with this bomb is FUZE, bomb, tail, AN–Mk 228.

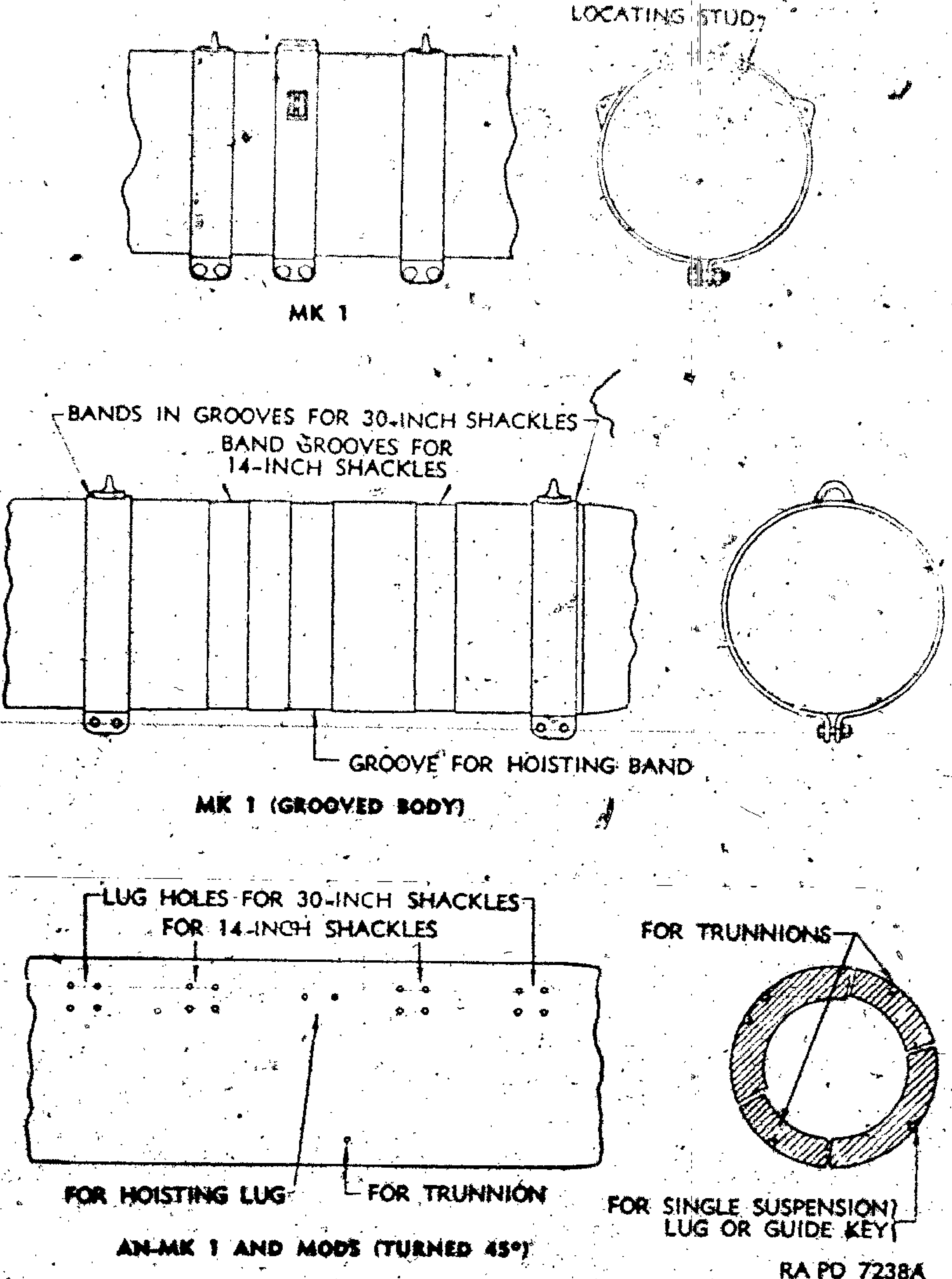

Figure 90. 1,600-lb, AP, Bombs (difference in detail of various models).

c. OTHER MODELS. Other models of this bomb and the details in which they differ (fig. 90) are as follows:

(1) *Bomb, AP, 1,600-lb, Mk 1 (Navy)* differs in that means of suspension are provided by suspension bands bolted around the bomb body. A stud on the band fits into a recess in the bomb body to prevent shifting. The recesses are so located that, when the suspension bands are assembled to the bomb, the lugs (on the bands) are spaced

14 inches apart, center to center. If suspension from 30-inch racks is required, the bands are removed from the bomb, the studs are removed by any available means (as file or hacksaw), one band is installed with the center of the lug 18.5 inches from the nose of the bomb, and the other band is installed with the center of the lug 30 inches aft of the center of the lug on the forward band. Before final tightening, the lugs should be lined up with each other and with one tail fin. Care should be exercised to tighten the bands securely. Radical maneuvers should be avoided when carrying a bomb with this modified suspension. The bomb is shipped with suspension bands assembled and protected by shipping bands. This model also differs in that the arming bracket is attached to the fin assembly.

Caution: The lugs on the suspension bands are too small to take the hook of the D–6 shackle. When using the bomb with this shackle, it is necessary to file about $\frac{1}{4}$ inch of material from the lower face of the shackle hooks. Care should be exercised not to remove more material than necessary, but particular attention should be given to obtaining freedom of the hooks in their fully closed position. The holes of the lugs should never be enlarged because such action would weaken the lug beyond the limits of safety.

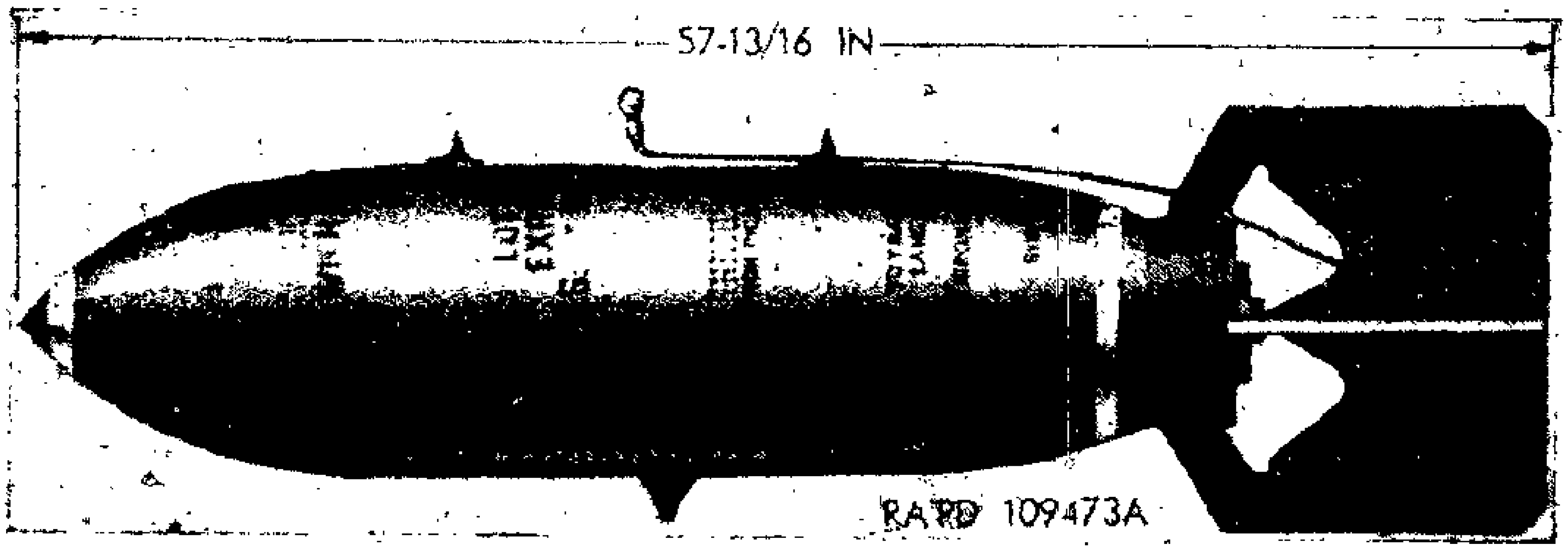

Figure 91. Bomb, SAP, 500-lb, AN–M58A2.

(2) *Bomb, AP, 1,600-lb, Mk 1–Mod 1 (Navy)* is also equipped with suspension bands and a hoisting band. However, the bands are positioned by grooves, 0.30 inch deep, machined in the bomb body. There are five grooves: the outer pair for locating the suspension bands for 30-inch shackles, the next pair for locating the bands for 14-inch shackles, and the center groove for locating the hoisting band. The bomb is issued with the suspension bands, protected by shipping bands, in position for 14-

inch racks. If 30-inch suspension is required, the bands are removed, transferred to the outer set of grooves, alined and tightened.

127. Bomb, SAP, 500-lb, AN–M58A2

a. DATA. The AN–M58A2 (fig. 91) is a cylindrical bomb which is 57.8 inches long and weighs 536.5 pounds as released. The bomb body is 47.7 inches in length and 11.8 inches in diameter. It weighs 522.5 pounds of which 143.1 pounds (26.7 percent of complete round) is picratol. The base plate of this bomb is securely locked in place and the adapter-booster may be locked to the base plate described in paragraph 112 *a*.

b. FUZE COMBINATIONS. The fuze combinations authorized for use with this bomb are the same as shown in table XVII. However, it should be noted that the nose fuzes are not ordinarily required for use with SAP bombs.

c. OTHER MODELS. Other models of this size and type of bomb, and the details in which they differ are listed below.

(1) *Bomb, SAP, 500-lb, AN–M58A1* differs from the AN–M58A2 in that it weighs 499.5 pounds as released. The AN–M58A1 contains 145.1 pounds of explosive tamatol or 29 percent of complete weight. The base plate of the AN–M58A1 is removable and the adapter-booster cannot be locked in place.

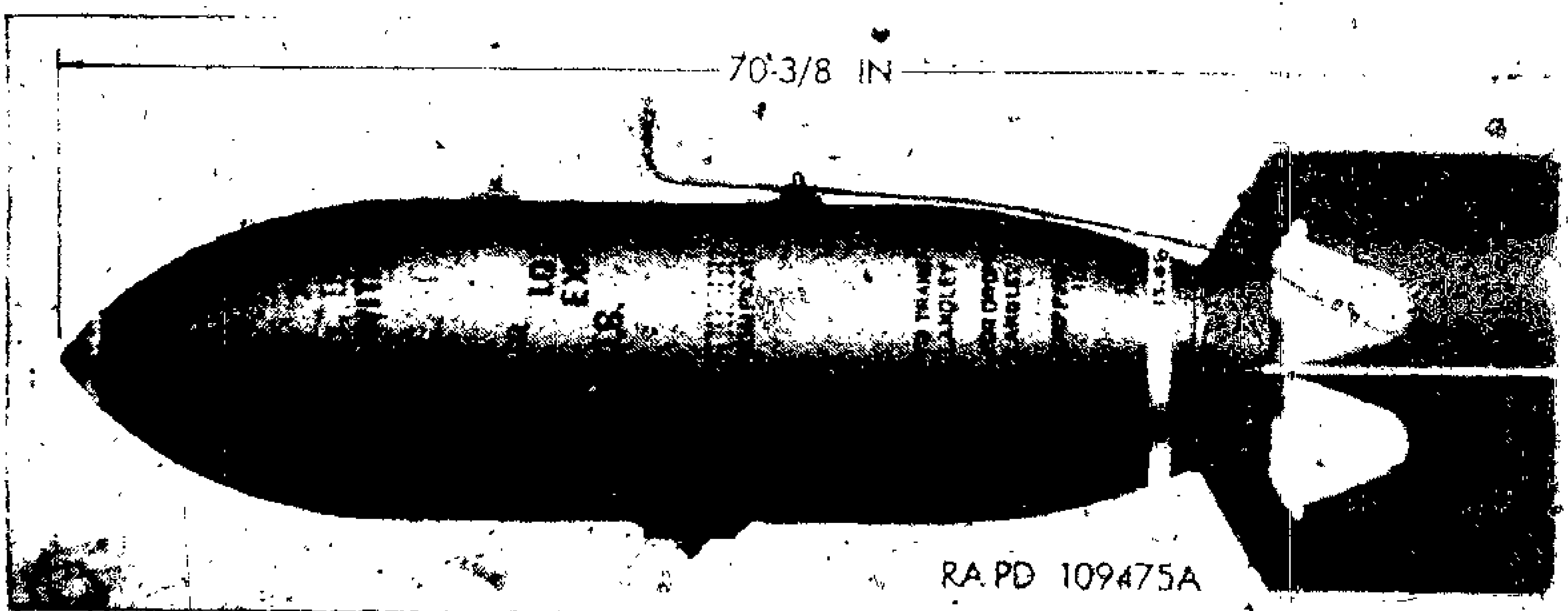

Figure 92. Bomb, SAP, 1,000-lb, AN–M59A1.

(2) *Bomb, SAP, 500-lb, AN–M58* is an earlier model which differs principally from the AN–M58A1 in that its body was of lighter design. The complete round weighs 480 pounds of which 154.6 pounds (32.2 percent of complete weight) is explosive charge.

128. Bomb, SAP, 1,000-lb, AN–M59A1

a. DATA. The AN–M59A1 (fig. 92) is a cylindrical bomb which is 70.375 inches long and weighs 1,033.9 pounds as released. The bomb body is 57.3 inches in length and 15.1 inches in diameter. It weighs 1,013.8 pounds of which 312.6 pounds (30.2 percent of the complete round) is explosive charge (picratol). The base plate of this bomb is securely locked in place and the adapter-booster may be locked to the base plate.

b. FUZE COMBINATIONS. The fuze combinations authorized for use with this bomb are the same as shown in table XVIII. However, it should be noted that the nose fuzes are not ordinarily required for use with SAP bombs.

c. OTHER MODELS. BOMB, SAP, 1,000-lb. AN–M59 is the only other model of this series. It differs from the AN–M59A1 in that its complete weight is 990 pounds of which 315 pounds (31.8 percent) is explosive charge. The base plate of the AN–M59 is removable and the adapter-booster cannot be locked to the base plate.

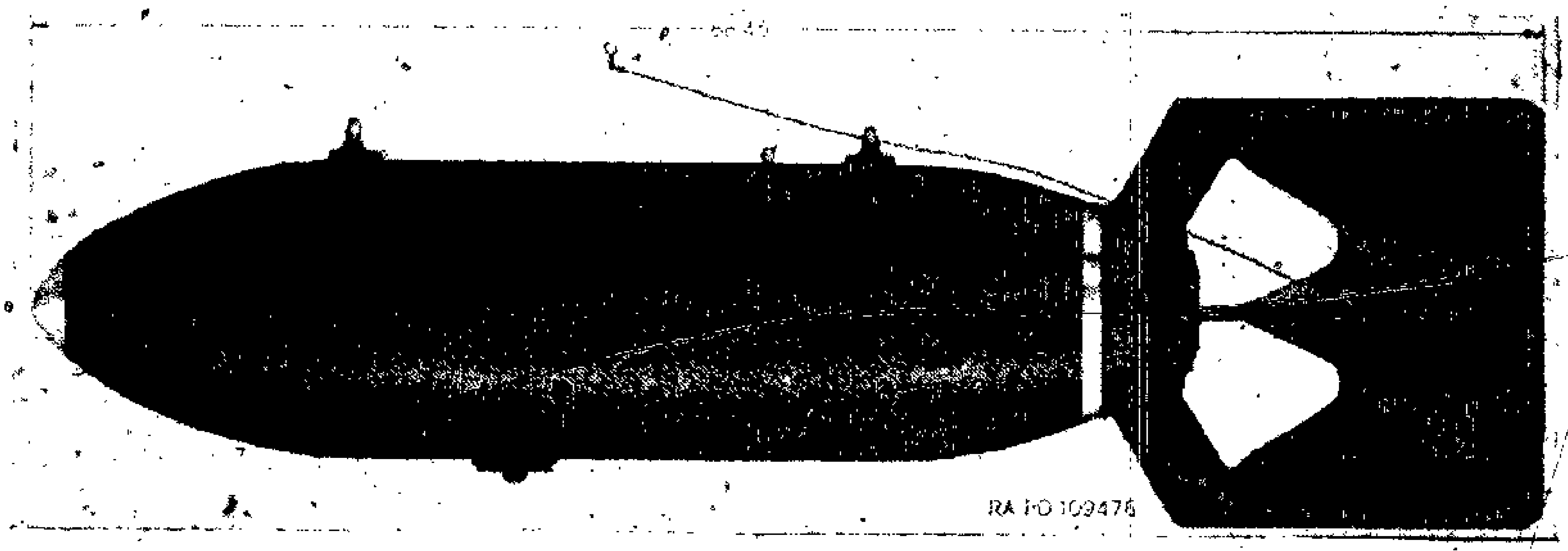

Figure 93. Bomb, SAP, picratol, 2,000-lb, M103.

129. Bomb, SAP, Picratol, 2,000-lb, M103

a. DATA. The M103 (fig. 93) is a cylindrical bomb which is 88.45 inches long and weighs 2,039.4 pounds as released. The bomb body is 68.55 inches in length and 18.8 inches in diameter. It weighs 1,983.3 pounds of which 556.5 pounds (27.3 percent of complete round) is explosive charge.

b. FUZE COMBINATIONS. The fuze combinations for use with this bomb are the same as shown in table XVIII. However, it should be noted that nose fuzes are not ordinarily used with SAP bombs.

130. Bomb, SAP, 25,000-lb, T28E4

This bomb is currently under development. The bomb body is 199.5 inches in length and has a diameter of 32 inches. The tail assembly is attached to the bomb body with 16 bolts which are anchored in the base plate of the body. The T28E4, unlike other SAP bombs, has no nose plug, the nose being a solid piece.

Section III. DEPTH BOMBS

131. General

The depth bomb is similar to a light-case bomb that is designed for use against underwater targets, submarines in particular. The bomb case contains a bursting charge of HBX, HBX–1, or TNT which represents approximately 70 percent of the total weight. The cylindrical case has a flat nose which prevents ricochet upon impact. The bomb functions at a predetermined depth dependent upon the setting on the hydrostatic fuze assembled to the bomb. Generally, depth bombs are only tail fuzed but provision is also made for nose fuzing in the event that blast effect may be desired under certain tactical conditions.

132. Assembly

a. COMPONENTS. The components of the complete round are—

(1) Bomb, unfuzed, without fin assembly. This includes—
- Bomb body with single and double suspension lugs attached.
- Explosive charge of HBX, HBX–1, or TNT.
- Nose fuze seat liner with one auxiliary booster and fuze hole plug.
- Tail fuze seat liner with one auxiliary booster and fuze hole plug.
- Cap screws for attachment of fin assembly.

(2) Fin assembly crate includes—
- Fin assembly.
- Hoisting lugs.
- Trunnions.
- Bolts for tail.
- Lockwashers for tail bolts.
- Lockwashers for trunnions.
- Arming vane (30° pitch) for AN–M103A1 fuze.

(3) Nose fuze. (Used for blast effect. Nose and hydrostatic fuzes used simultaneously only when selective arming is available.)

(4) Hydrostatic tail fuze.

(5) Arming wire assemblies.

b. METHOD OF ASSEMBLY. The complete round may be assembled as follows:

(1) Remove bomb, fin assembly, fuzes, and arming wires from their packings. Inspect all components as specified in paragraph 10. Load all components on bomb service truck and trailer.

(2) Proceed to assembly point.

(3) Attach trunnions or hoisting lugs if required.

(4) Attach fin assembly to bomb so that one fin alines with the suspension lugs.

(5) Assemble fuze or fuzes desired in accordance with instructions for the particular fuze or fuzes as contained in chapter 5.

(6) If bomb is not dropped and if it is to be returned to storage, reverse the above steps by defuzing the bomb as directed under the particular fuze in chapter 5 and coating the fuze cavities with COMPOUND, rust-preventive, light. Return all components to their original packings and reseal those which were originally sealed.

*133. Functioning

Depth bombs are intended for attack on submarines and, as a consequence, must be equipped with hydrostatic fuzes. However, in order that advantage may be taken of the discovery of a surface target, they are also adapted for impact fuzes. Since the submarine is its primary target, the depth bomb will only be fitted with a hydrostatic fuze unless selective arming is available so that the bomb may be dropped with the impact fuze set safe and the hydrostatic fuze armed. The blast effect of an *impact* fuzed depth bomb is slightly greater than that of a GP bomb. The radius of underwater effectiveness, that is, the distance from the explosion at which a submarine will probably be fatally damaged, is approximately 45 feet for 350-pound bombs.

134. Limitations

Depth bombs cannot be used for penetration of solid materials. They cannot be dropped from high altitudes because the hydrostatic fuzes will function at depths greater than those for which they are set. In addition, if the bomb has been dropped from high altitude, its impact with water may so distort the bomb body and fuze cavities that the fuzes cannot function. Depth settings must be made in advance of the mission since they are difficult if not impossible to change while the plane is in flight.

135. Bomb, Depth, 350-lb, AN–MK 54 MOD 1

a. DATA. The BOMB, depth, 350-lb, AN–Mk 54 Mod 1 (fig. 34) is a flat-nose, light-case type bomb which is 52.5 inches long and weighs 346 pounds as released. It contains 248 pounds of HBX or HBX–1, 71.7 percent of complete weight. Alternative loading is 225.5 pounds of TNT, 70.0 percent of the complete weight which is 324 pounds.

b. FUZE COMBINATIONS. The fuzes authorized for use with this bomb are the FUZE, bomb, nose, AN–M103A1 (with the flat or 30-deg. pitch vane shown in fig. 10) or the FUZE, bomb, nose, AN–Mk 219 Mod 3 or Mod 4 (these require a fuze adapter and an extra auxiliary booster) and FUZE, bomb, tail, hydrostatic, Mk 230 or AN–Mk 230 Mod 4, 5, or 6.

Note. When equipped with the flat vane, the AN–M103A1 will arm in 1,800 feet of air travel whereas the Mk 219 type requires 2,500 feet.

c. OTHER MODELS. An earlier modification of this bomb is the BOMB, depth, 350-lb, AN–Mk 54 Mod 0. It differs from the AN–Mk 54 Mod 1 in that all attachments (including the two suspension lugs normally welded to the Mod 1 case) are contained in the fin assembly crate for assembly in the field. This bomb (Mod 0) is not provided with shipping band or crate.

Section IV. FRAGMENTATION BOMBS

136. General

With the exception of the 4-pound bomb M83 (par. 140), the body of a fragmentation bomb consists of a thin steel tubular sleeve closed at each end by a heavy metal cap. A body of heavy steel bar stock, spirally wound, is assembled to the outside of the steel sleeve and provides the principal source of fragments when the bomb is detonated. The nose is threaded to receive an impact fuze and the tail cap is threaded to provide attachment of the fin assembly or parachute unit assembly. Fragmentation bombs 220 pounds and larger are adapted for both nose and tail fuzes.

137. Assembly

a. COMPONENTS. The components of complete fragmentation bombs, with the exception of the 4-pound M83, are as follows:

(1) *Fin type.*

(*a*) Bomb, unfuzed, includes—
Bomb body, including case, nose, and base.
Explosive charge, TNT, or COMP B.
Fin assembly.

(*b*) Vane type nose fuze.

(*c*) Vane type tail fuze (large bombs only).

Note. No arming wire is necessary for bombs assembled in clusters, since the vane stop of the cluster adapter keeps the fuze from arming until the bomb is released from the cluster.

(2) *Parachute type.*

(*a*) Bomb, unfuzed, includes—

Bomb body, including case, nose, and base.

Explosive charge, TNT, or COMP B.

Parachute unit assembly including parachute assembly, parachute case assembly, and arming wire assembly.

(*b*) Pin type nose fuze with delayed arming.

(3) *Fins.* The stabilizer assembly of small bombs consists of an axial member to which four radial fins are attached. One end is threaded for attachment to the bomb and the other end is formed into a lug for vertical suspension of the bomb. Large fragmentation bombs have a box type fin.

(4) *Parachute unit assembly.* The parachute unit assembly consists of a cylindrical parachute case which is attached to the bomb body and contains the parachute and shrouds, arming cord, parachute top cord assembly; and, in the case of individually suspended bombs, a pull-out wire and pull-out wire container. In the latter, the pull-out wire container serves to close the case; however, for handling, a shipping cover is added and sealed in place. The case is closed, in the cluster bomb, by a loose cap held in place by the cluster adapter.

b. METHOD OF ASSEMBLY.

(1) Bombs issued in clusters are completely assembled. For cluster adapters and assembly and installation of the cluster see chapters 7 and 8.

(2) Large fragmentation bombs are assembled in accordance with directions for GP bombs as outlined in paragraph 109.

(3) Small bombs for individual suspension are assembled and installed as follows:

(*a*) Remove the bomb and fuze from their packings. Inspect components as specified in paragraph 10. Load components on bomb service truck and trailer.

(*b*) Proceed to assembly point.

(*c*) Remove the tape holding the arming wire to the case and disengage the arming cord from the case coupling.

(*d*) Assemble fuze to bomb in accordance with instructions for the particular fuze as contained in chapter 5.

(*e*) Remove sealing strip and shipping cover from the parachute case. Uncoil the pull-out wire from the case, taking care not to loosen its container or to kink or knot the pull-out wire.

(*f*) Suspend the bomb in the rack by the "S" hook on the suspension cable and remove the safety cotter pin from the fuze. Attach the loop on the pull-out wire to the arming pawl.

(*g*) If the bomb is not dropped, the above steps will be reversed by defuzing the bomb as directed for the particular fuze in chapter 5, and the components returned to their original condition and packing.

138. Functioning

The functioning of bombs in clusters is described in chapter 8. Fragmentation bombs suspended individually function as follows:

a. DROPPED ARMED. The suspension hook releases the bomb; the arming hook retains the pull-out wire, pulling out the container. The pilot disk of the top cord assembly is caught by the air stream and pulls the parachute from the case. The arming cord is attached to the parachute shrouds and, as the parachute opens and the shroud lines straighten, the arming cord pulls the arming wire from the fuze and allows the fuze to arm. Meanwhile, the bomb, retarded by the parachute, falls with a terminal velocity of approximately 20 mph. Upon impact, the bomb explodes and projects fragments over an effective radius of 10 to 25 yards.

b. DROPPED "SAFE." When dropped "Safe," the pull-out cord is released with the bomb. The container remains in place keeping the parachute in the case. Since the parachute does not open, the arming wire is not withdrawn from the fuze and the fuze does not function on impact.

139. Limitations

Because of their small size, direct hits or near misses are required for this type bomb to damage armored targets. Plane loads are limited by the number of bombs and not by their full weight-carrying capacity.

140. Bomb, Fragmentation, 4-lb, M83

This bomb (fig. 94) is a small cylindrical bomb used only in clusters. The fuze (M129, M130, or M131) is set into the bomb body and has a cable extension on which the bomb case assembly (butterfly wings) is mounted. When the bomb is released from the cluster, the wings are opened by spring action and are forced, by the air stream, to the top of the cable extension. In this position, the butterfly wings retard the fall of the bomb and begin to rotate. This rotation turns the cable and withdraws the arming stem, thus arming the fuze. The bomb is issued in CLUSTER,

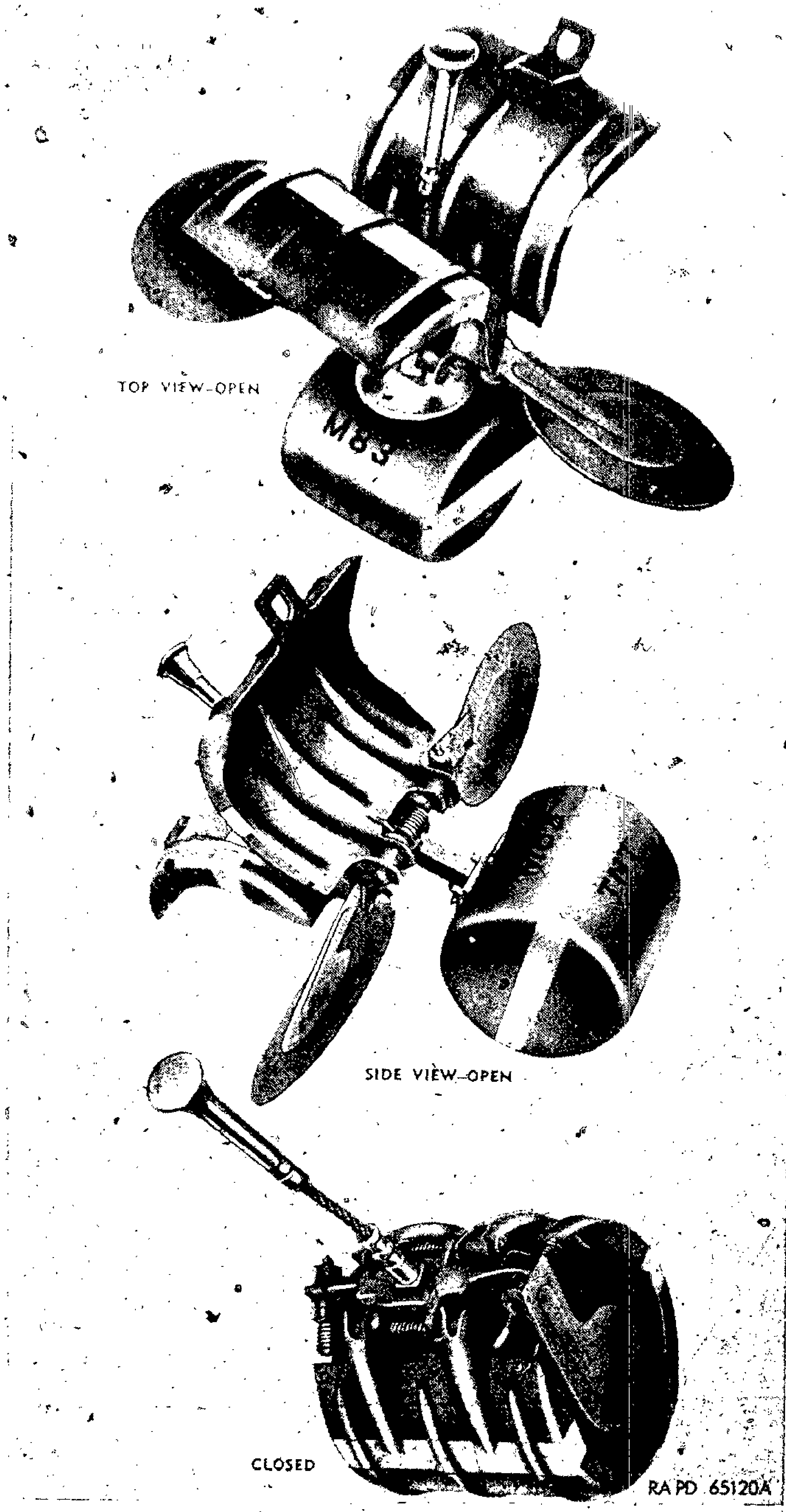

Figure 94. Bomb, fragmentation, 4-lb, M83—steps in operation.

fragmentation bomb, M28, M28A1 or M28A2 (100-lb size containing 24 bombs) or in the form of a 10-bomb wafer for use in assembling the CLUSTER, fragmentation bomb, M29 or M29A1 in the field. The M29 or M29A1 cluster (fig. 131) is a 500-pound size containing 9 wafers (10 bombs per wafer) or a total of 90 bombs M83. The action of the fuze (pars. 105, 106, and 107) is specified in the marking of the cluster and may be airburst or, impact, mechanical time, or antidisturbance.

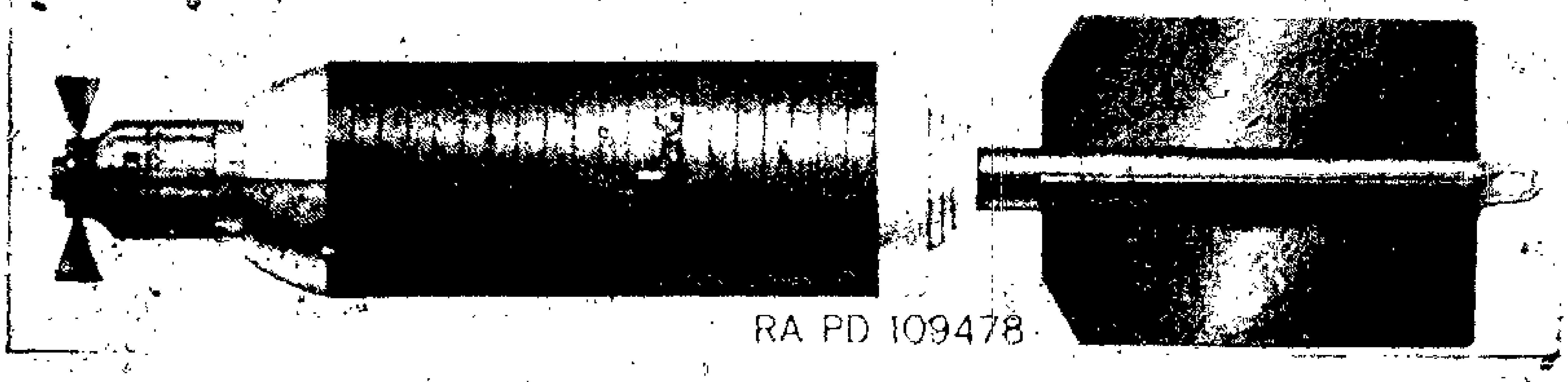

Figure 95. Bomb, fragmentation, 20-lb, AN–M41A1.

141. Bomb, Fragmentation, TNT, 20-lb, AN–M41A1

a. DATA. The AN–M41A1 (fig. 95) is a fin-stabilized type. The fuzed bomb is 22.35 inches long, 3.64 inches in diameter, weighs 19.8 pounds, and contains 2.7 pounds of TNT. It is issued in fragmentation bomb cluster, AN–M1A2 and the M26 series of fragmentation bomb clusters (ch. 8).

b. AUTHORIZED FUZES. The AN–M41A1 may be fitted with the nose fuzes, AN–M110A1, M110 (renovated), or AN–M158.

c. OTHER MODELS. The BOMB, fragmentation, TNT, 20-lb, AN–M41 is ½ inch shorter than the AN–M41A1 due to a change in design which added a shoulder to the nose of the bomb; this change in design constitutes the "A1" modification. The AN–M41 is only issued in cluster form but may be found in the fragmentation bomb cluster M1A1 as well as the M1A2.

142. Bomb, Fragmentation, TNT, 23-lb, M40A1 (AN–M40A1) (w/parachute unit).

a. DATA. The M40A1 (fig. 96) is a parachute type fragmentation bomb designed for assembly in clusters but is also authorized for single suspension use. The fuzed bomb is 30.15 inches long, 4.37 inches in diameter, and weighs 24.6 pounds. This bomb is used in fragmentation bomb clusters M4A1 and M4A2 (pars. 182 and 183).

b. AUTHORIZED FUZES. The M40A1 may be fitted with the nose fuzes M170, M120A1 (AN–M120A1), or M120.

b. OTHER MODELS. The BOMB, frag., TNT, 23-lb, M40 is [illegible] shorter than the M40A1 due to a change in design which gives a shoulder to the nose of the bomb; this change in design constitutes the "A1" modification. The M40 is used in forming the M4 cluster as well as the M4A1 and M4A2.

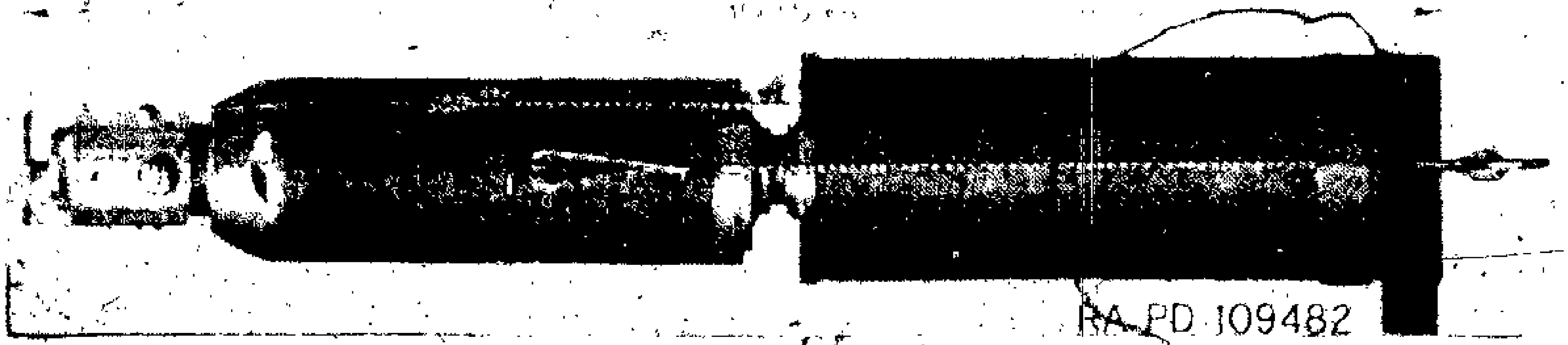

Figure 96. Bomb, fragmentation, TNT, 23-lb, M40A1 (AN–M40A1) (w/parachute unit).

143. Bomb, Fragmentation, TNT, 23-lb, M72A1 (w/parachute unit).

a. DATA. This bomb is a parachute type fragmentation bomb designed for single suspension. It is 30.15 inches long (not including vertical suspension lug and cable), weighs 24.5 pounds, and contains 2.7 pounds of TNT.

b. AUTHORIZED FUZES. The M72A1 may be fitted with the nose fuzes M170, M120A1 (AN–M120A1), or M120.

c. OTHER MODELS. BOMB, fragmentation, 23-lb, M72 does not have the shoulder design type of nose and is consequently only 29.75 inches long (not including vertical suspension lug and cable). The vertical suspension lug of the M72 is "S" shaped whereas that of the M72A1 is a flat piece of metal with a drilled hole used for suspension purposes.

144. Conversion of the AN–M41 Type Bomb to the M40 or M72 Type.

a. GENERAL. It is required at times that the 20-pound fragmentation bombs of the AN–M41 type be converted to the parachute type for single suspension or for use in the M4 series of clusters described in chapter 8. A conversion kit is issued for the purpose of making these changes. The kits are made up in combinations of the following components:

3 Nose fuzes M120, M120A1 (AN–M120A1), or M170.
3 Parachute units M4.
1 Cluster adapter M3, M3 (AN–M3), or M3A1 (AN–M3A1).
2 "D" bolts with nuts and lock washers.
2 Steel straps with clamps.
3 Parachute case covers with sleeves ½, 2 and 4 inches.
1 Arming wire assembly.

Cotter pins for suspension lugs and release mechanisms. Specifically, the kits are used to convert 20-pound fragmentation bombs of AN–M41 series, or clusters composed of AN–M41 series bombs (M1 series of clusters), to—

(1) *Individual 23-pound fragmentation bomb M72.*

Note: Bombs in cluster T4E4 cannot be converted to 23-pound fragmentation bomb M72, since bombs in this cluster do not have suspension lugs welded to bomb body.

(2) *Fragmentation bomb clusters of the M4 series (pars. 182 through 184) (composed of three bombs previously AN–M41 which have been converted to M40 (AN–40)) (c below).* Conversion of parachute unit M4 to parachute unit M3, as outlined in this paragraph, is necessary in this use.

b. CONVERSION OF 20-POUND AN-M41 TYPE TO 23-POUND M72 TYPE.

(1) If bomb is fuzed, observe safety precautions (*e* below) and remove nose fuze M110A1.

(2) Loosen set screw in base plug and remove fin assembly from bomb body.

(3) Screw parachute unit tightly into base closing plug of bomb body.

(4) Loosen band holding suspension assembly, and fasten snap to bomb lug.

(5) Aline suspension assembly and tighten set screw in base of bomb.

(6) Pull suspension assembly taut, removing all slack. Position band approximately 1/4 inch from cover and tighten band screw.

Caution: Tighten band sufficiently to prevent band from slipping, but do not tighten enough to deform case or bind pull-out wire container.

(7) Prior to loading bomb into aircraft:

(*a*) Check fuze cavity of bomb for obstructions.

(*b*) Remove nose fuze M120 or M120A1 (AN–M120A1) from container, inspect fuze, and assemble fuze to bomb. It may be necessary to shim fuze so that arming pin will be in position for assembly of arming wire.

(*c*) Thread arming wire through lower hole in arming pin of fuze.

Warning: Do not remove cotter pin from fuze until bomb has been placed in bomb rack.

(*d*) Remove cover from parachute unit to expose pull-out wire container assembly. Bomb is now ready for assembly into bomb rack as a fragmentation bomb M72 or

M72A1, dependent upon whether an AN-M41 or AN-M41A1, respectively, was converted.

c. CONVERSION OF 20-POUND AN-M41 TYPE, TO 23-POUND M40 TYPE FOR ASSEMBLY IN M4 SERIES TYPE CLUSTERS.

(1) Modify parachute unit M4 as follows:

(*a*) Remove band assembly and suspension assembly from parachute case.

(*b*) Remove parachute case cover and remove excess adhesive from case.

(*c*) Remove sealing wire and pull-out wire container assembly.

Caution: Parachute is packed under pressure. Do not permit parachute to spring out of case.

(*d*) Assemble loose covers provided with cluster adapter.

(2) Convert AN-M41 type bomb to M40, as follows:

(*a*) Observing all safety precautions (*e* below), remove fuze M110A1 from the bomb, if bomb is fuzed.

(*b*) Screw parachute unit assembly (as modified above) tightly into base closing plug of bomb body and tighten set screw. Bomb is now prepared for assembly into M4 type cluster.

d. ASSEMBLY OF THE M4 TYPE CLUSTERS. Assemble cluster M4A2 as outlined below (the cluster adapter is shown in fig. 111). The pallet shown in figure 97 may be fabricated locally to help in assembly of cluster but is not required.

(1) Assemble bombs which have been converted as outlined in *c* above into position shown in figure 123. Note that bomb with the ½-inch cover is on the bottom. Be sure bombs are positioned so that arming wire will not be fouled by cluster straps.

(2) Arrange front discharge springs as shown in figure 98.

(3) Bring loose end of front strap (short strap) around bombs and hold strap clamp in position as shown in figure 99.

(4) Tighten strap by turning bolt from right to left as shown in figure 99. Note that the strap should be rolled over the top of the "D" bolt. A tight strap is indicated when a light tap on the strap with a metal object produces a high-pitched sound. When strap is sufficiently tight, tighten nut (note that lock washer is assembled under the nut) until side plates of release mechanism are compressed against sides of loop of strap.

Caution: Bolt must be turned from right to left only, as indicated in figure 99. If bolt is turned in wrong direction, discard strap and assemble a new one.

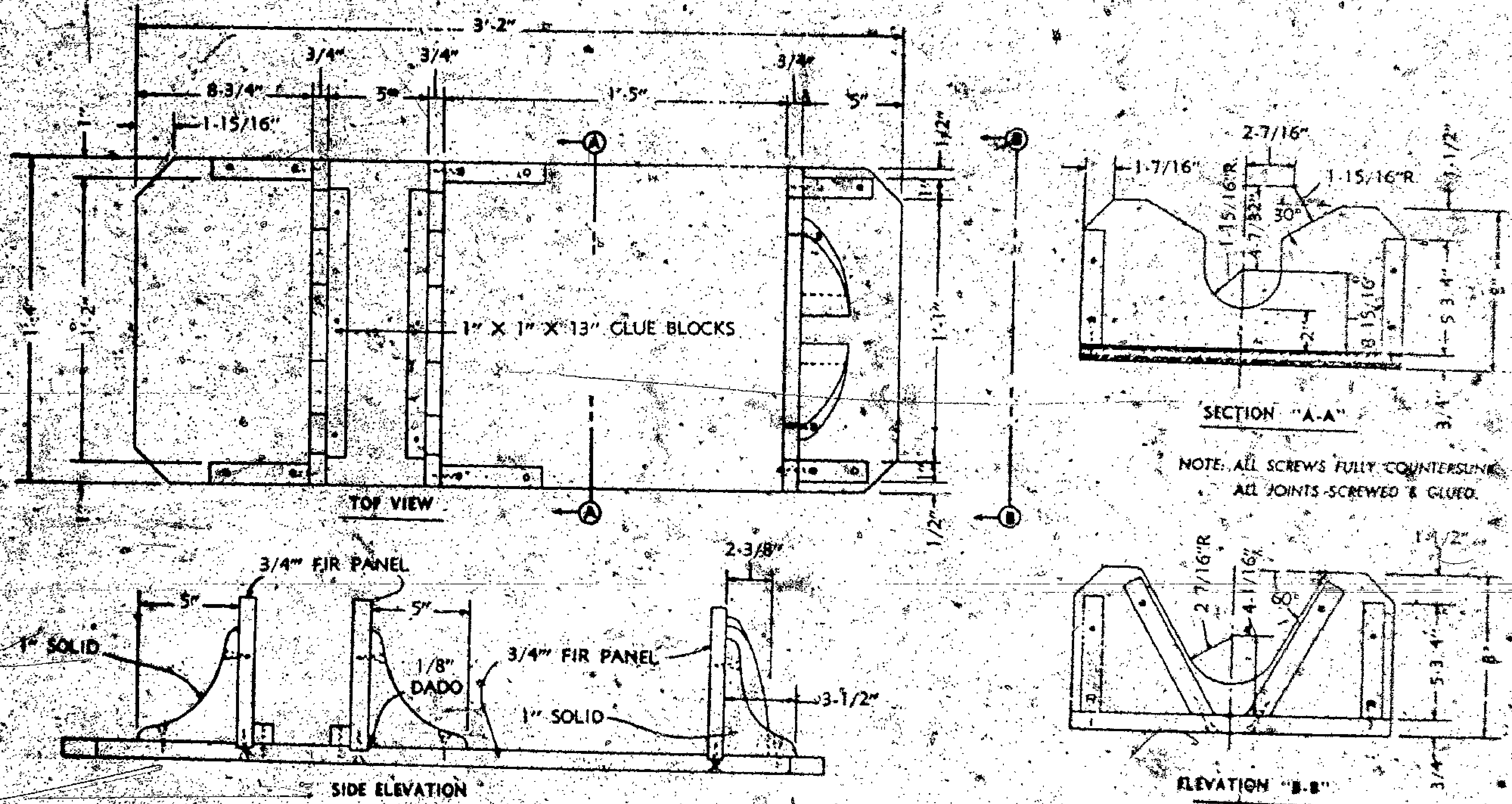

Figure 97. Pallet for clustering converted bomb into AN-M41A1 cluster.

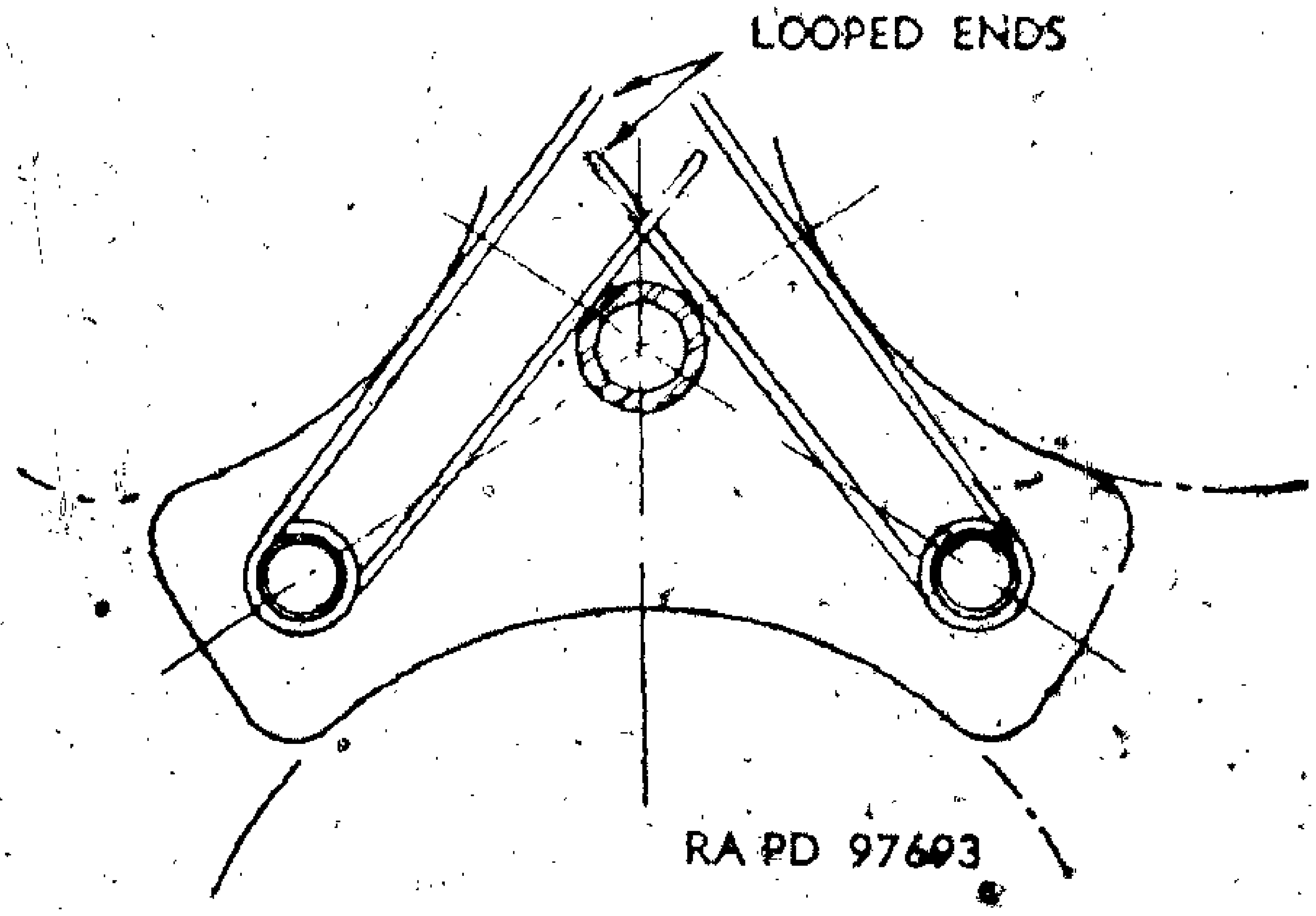

Figure 98. Front discharge springs.

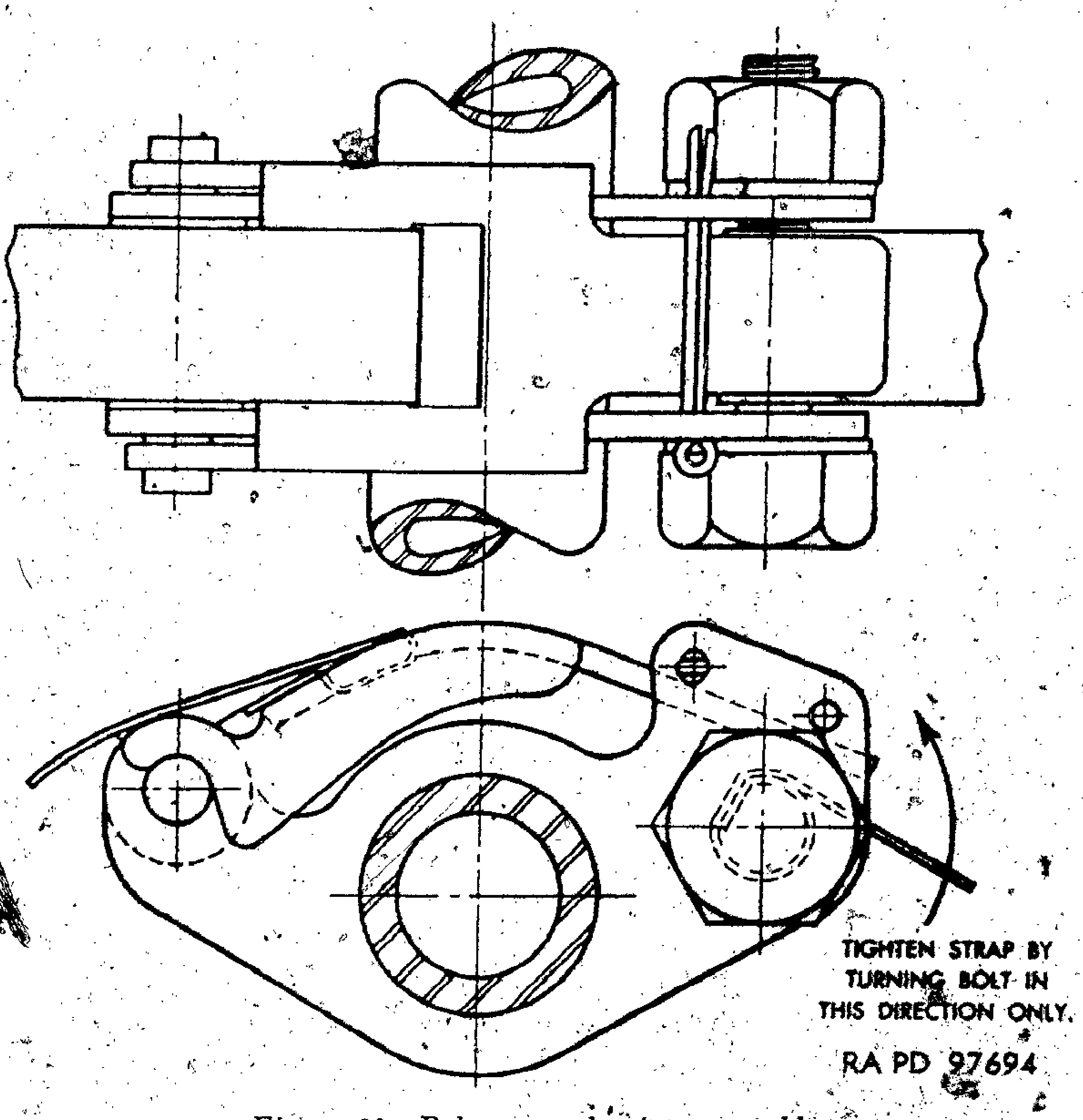

Figure 99. Release mechanism assembly.

(5) Bring loose end of rear strap (long strap) around parachute containers and repeat step outlined in (4) above, except that care should be taken not to deform parachute containers in tightening the strap.

(6) Assemble arming wire through outer set of holes in release mechanisms.

(7) Prior to assembling cluster into aircraft bomb racks, remove fuzes M170, M120A1 (AN–M120A1), or M120 from containers and screw fuzes into bombs. It may be necessary to shim fuzes so that arming pin will be in position to permit proper insertion of arming wire.

(8) After assembling fuzes to bombs, thread arming wire through lower hole in arming pin of fuze.

Warning: Do not remove cotter pin from fuzes until cluster is assembled into bomb rack.

(9) Observe all instructions and precautions on tags.

e. PRECAUTIONS.

(1) In defuzing operations, only one cluster at a time should be open and worked on at one location. Several locations may be established but should be separated from each other by adequate distances and/or barricades.

(2) Before disassembling cluster, be sure all fuze safety blocks are in place. If fuze seal wires are not in place, they should be improvised.

(3) If any unusual resistance is encountered in unscrewing a fuze, the operator should be protected by a barricade. If such equipment is not available, the bomb should be rejected as unsuitable for conversion.

(4) Fuzes recovered in conversion operations should be adequately packed.

(5) Completed bombs and clusters and recovered fuzes should not be allowed to accumulate at operation locations.

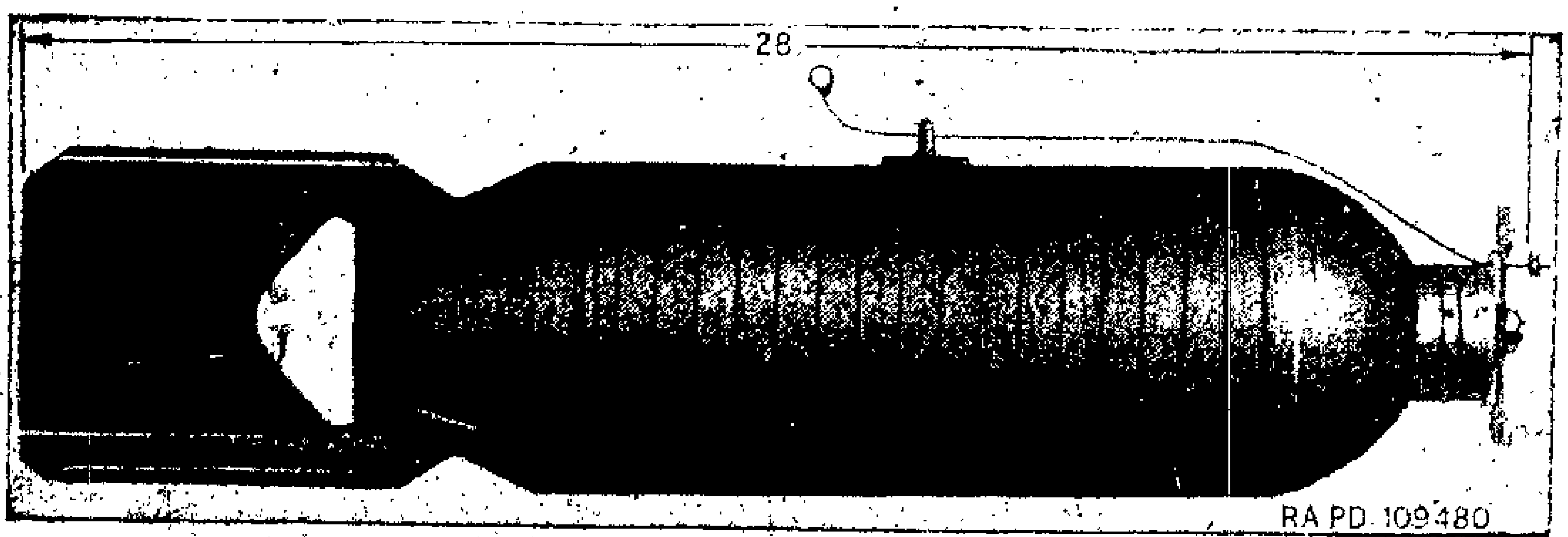

Figure 100. Bomb, fragmentation, 90-lb, M82.

145. Bomb, Fragmentation, 90-lb, M82

a. DATA. The M82 (fig. 100) is designed for use in clusters and has only one suspension lug. Consequently it is not directly adaptable to standard bomb racks for individual suspension. The complete round is 28.0 inches long and weighs 88.5 pounds. The body, issued unfuzed and without fin, is 20.5 inches long and 6.06 inches in diameter. It contains 12.3 pounds (13.9 percent of complete weight) of COMP B. Some of these bombs were TNT loaded. This bomb is used in forming the M27 type cluster described in chapter 8.

b. AUTHORIZED FUZES. When used in clusters, this bomb is fuzed with the instantaneous nose fuze AN–M103A1 fitted with the short vane shown in figure 10. When adapted for use in single suspension, the M82 may be fitted with the nose fuzes M103, M103 (AN–M103), and AN–M103A1 (all instantaneous), or the VT fuzes AN–M166 or AN–M168. The addition of ADAPTER-BOOSTER, M117 permits use of mechanical time fuze AN–M145 as an emergency substitute.

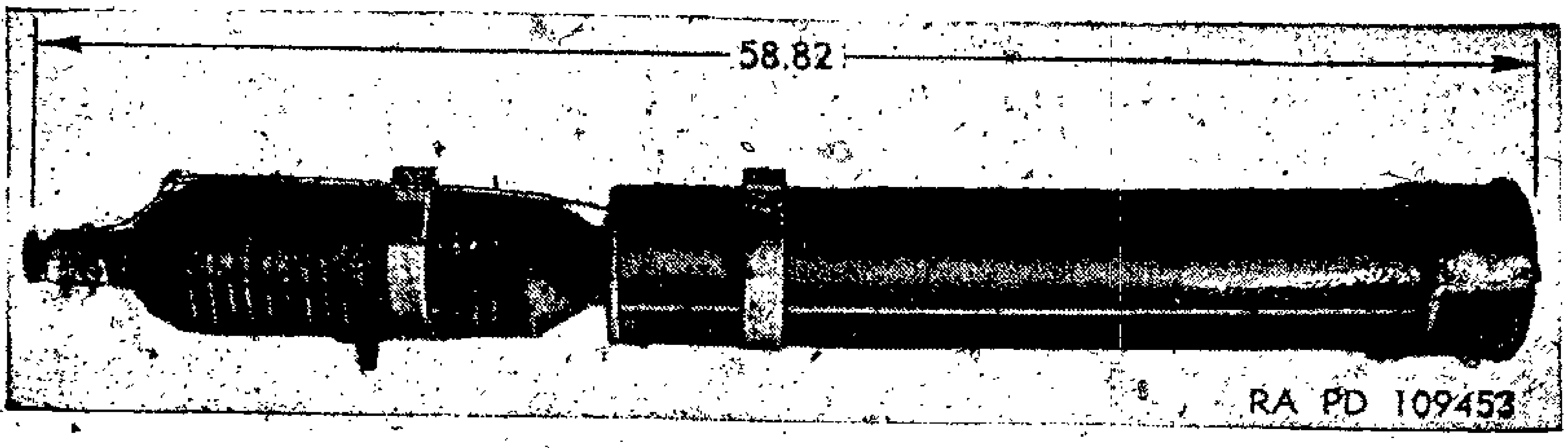

Figure 101. Bomb, fragmentation, 120-lb, M86.

146. Bomb, Fragmentation, 120-lb, M86

a. DATA. The M86 (fig. 101) consists of the same bomb body as the 90-pound M82 (par. 145) and the PARACHUTE-UNIT M5. The complete round is 58.82 inches long and weighs 118.2 pounds.

b. ASSEMBLY OF PARACHUTE UNIT.

(1) Unscrew fin lock nut with protector.

(2) Inspect threads on rear of bomb body and front of parachute-unit to be sure they are clean and not damaged.

(3) Screw parachute-unit onto bomb body as far as possible.

(4) Adjust rear suspension lug so that the eye of the lug is in line with the cover latch.

(5) Lock the parachute-unit to bomb body by tightening set screw.

c. PREPARATION OF BOMB FOR SINGLE SUSPENSION. After complete round is assembled proceed as follows:

(1) Pa[illegible]
[illegible]
guide of the [illegible]
passing wire through [illegible].

(2) Fasten the swivel loop to the [illegible] manner and draw wire taut to [illegible] wire back, leaving about ½ inch of slack [illegible] wire flush with parachute-unit cover.

(3) The bomb is now ready to be suspended in the bomb bay after which the safety pin in the fuze must be removed.

d. AUTHORIZED FUZES. The M86 must be fitted with the ADAPTER-BOOSTER, M117 before assembling any of the authorized fuzes which are the nose fuzes M170, M120A1 (AN–M120A1), or M120.

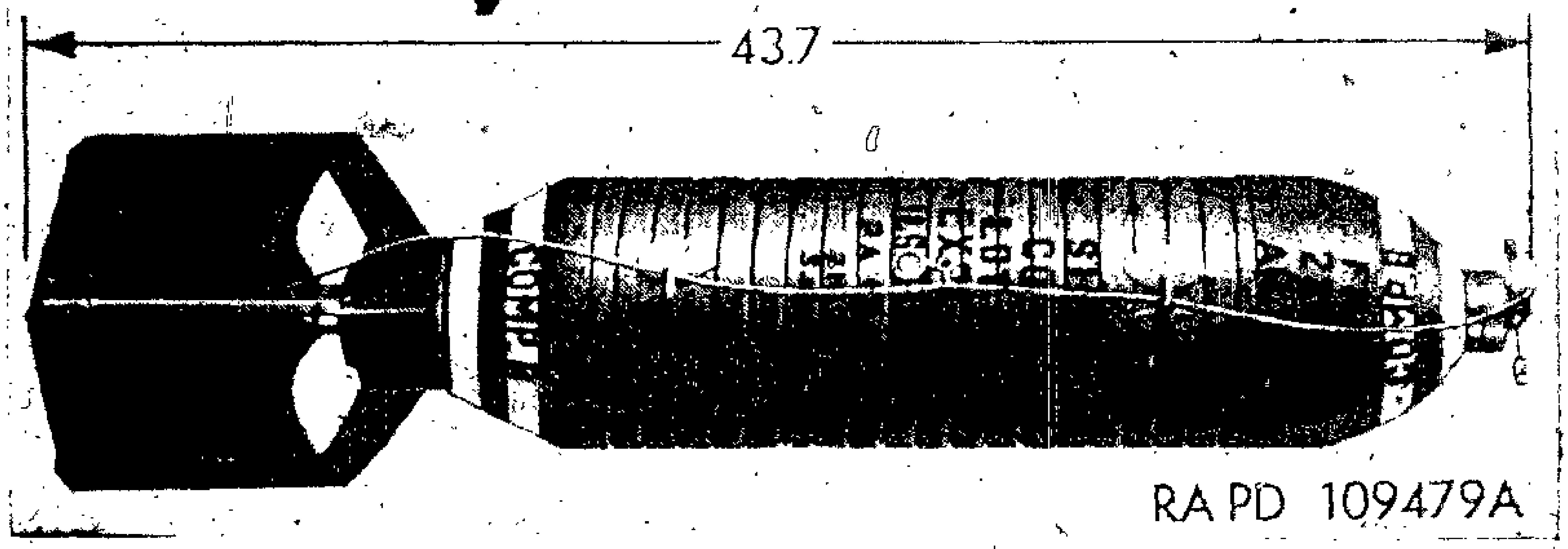

Figure 102. Bomb, fragmentation, COMP B, 220-lb, AN–M88.

147. Bomb, Fragmentation, Comp B, 220-lb, AN–M88

a. DATA. The AN–M88 (fig. 102) is designed for single suspension. The complete round is 43.7 inches long and weighs 217.9 pounds. The bomb body is 34.1 inches in length, 8.1 inches in diameter, and weighs 208.4 pounds of which 41.4 pounds represents the explosive charge of COMP B and the nose and tail surrounds. Alternative explosive fillers for this bomb are Ednatol (1st alternative) or TNT (2d). The assembly of the bomb is the same as that described for GP bombs in paragraph 109.

b. AUTHORIZED FUZES. Table XXI gives authorized fuze combinations used with the fragmentation bomb AN–M88.

c. OTHER MODELS. An earlier modification of the AN–M88 is the BOMB, fragmentation, 260-lb, AN–M81. It differs from the AN–M88 in that the complete round weighs 263 pounds, the increased weight being due to the larger size of spiral wrapping. The AN–M81 bomb body weighs 253.5 pounds of which 36.0 pounds is COMP B.

Table XXI. Fuze Combinations for 220-lb Fragmentation Bomb AN-M88

Line	Nose fuzes		Tail fuzes		
	Model column (1)	Other components column (2)	Model column (3)	Primer-detonator column (4)	Other components column (5)
1	M103* M103 (AN-M103)* AN-M103A1* M163	None.	M100A1 (AN-M100A1) AN-M100A2 M160	M14 nondelay.	None.
2	AN-M166 AN-M168	ARMING DELAY, air travel, M1.	Use none or any combination of tail fuze and primer-detonator in line 1.		None.
3	AN-M145	ADAPTER-BOOSTER, M117 (Req'd).	Use none or any combination of tail fuze and primer-detonator in line 1.		None.

*All M103 series fuzes used with this bomb are instantaneous only.

Section V. MISCELLANEOUS SERVICE BOMBS

148. General

Certain flares, photoflash bombs, and target identification bombs are pyrotechnic items which are described in detail in TM 9-1981. However, since photoflash bombs may properly be called bombs because of their explosive qualities, and since some flares and target identification bombs are fuzed and prepared for use in the same manner as bombs, a brief description of each of these items is given below. Leaflet bombs are described herein in detail.

149. Flare, Aircraft, Parachute, M26A1 (AN-M26)

a. DATA. The M26A1 (fig. 103) is a flare which is discharged from its case and ignited when the fuze functions. It is parachute supported and burns for 3 to 3.5 minutes with a yellowish light of 800,000 candle power. The complete round is 50 inches long, 8 inches in diameter, and weighs 52.5 pounds of which 14 pounds is flare charge.

b. AUTHORIZED FUZES. The FUZE, flare, mechanical time, M111 series is authorized for use with the M26A1 flare.

c. ASSEMBLY. To assemble the complete round proceed as follows:

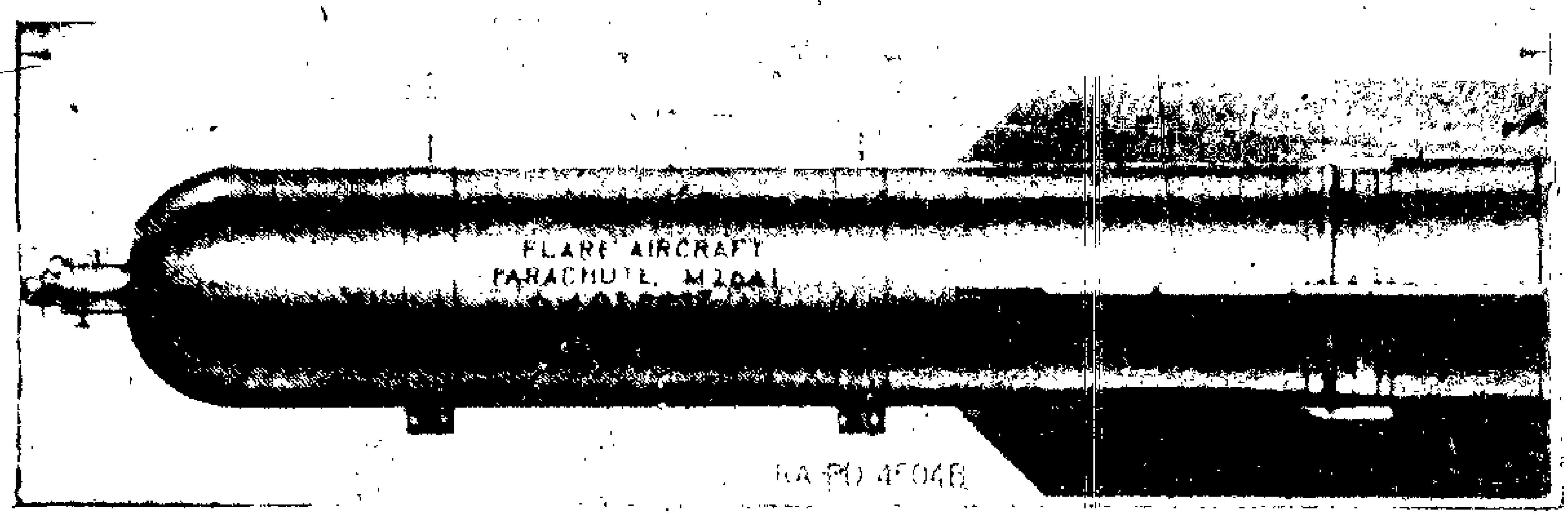

Figure 103. Flare, aircraft, parachute, M26A1 (AN–M26).

(1) Remove the flare and fuze from the packings and inspect for serviceability.
(2) Unseal and remove the shipping cover from the base of the flare case.
(3) Uncoil the hangwire-arming wire assembly from the container, pass it around the case and thread the wire through the forward suspension lug. Be careful not to pull on the hangwire so strongly as to pull out the hangwire container.
(4) Set and assemble the fuze as described in paragraph 73.
(5) If the flare is not used, reverse the above steps and return flare and fuze to their original condition and packing.

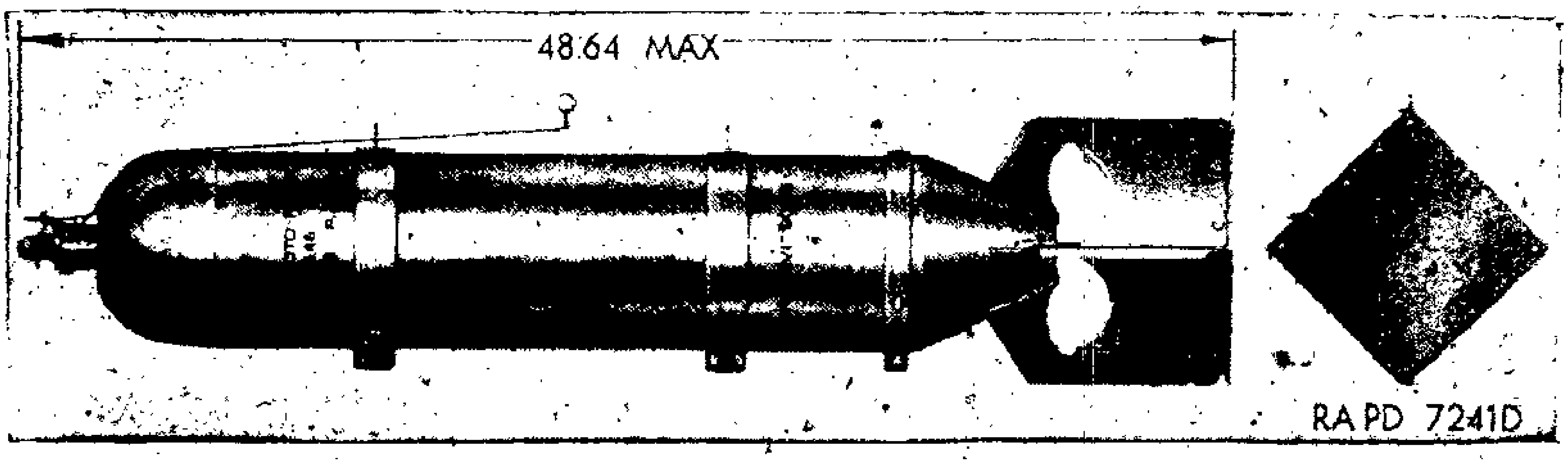

Figure 104. Bomb, photoflash, 100-lb, AN–M46.

150. Bomb, Photoflash, 100-lb, AN–M46

a. DATA. The AN–M46 (fig. 104) employs a cylindrical type bomb case with round nose. The complete round is 48.6 inches long and 7.8 inches in diameter. It weighs 51.9 pounds and contains a charge of 25 pounds of photoflash powder in a fiber container. When the fuze functions, the charge explodes, producing a light of 500,000,000 candlepower, maximum, burning for 0.20 second.

b. AUTHORIZED FUZES. The FUZE, bomb, nose, mechanical time, AN–M146 is authorized for use with the AN–M46 photoflash bomb. In the absence of the AN–M146, the M111A2 may be used.

c. ASSEMBLY. To assemble the complete round proceed as follows:

(1) Remove the bomb from its packing and inspect bomb body and fuze well for any damage or obstruction. *If there is any evidence of photoflash powder leakage either in the shipping box or in the fuze cavity, the bomb will be carefully placed in a tight container and carefully transported to a disposal area and destroyed in accordance with instructions contained in TM 9–1981.*

(2) Set and assemble the fuze (par. 73).

(3) If the bomb is not used, reverse the above steps by defuzing the bomb as indicated in paragraph 73, and return bomb and fuze to their original condition and packing.

d. PRECAUTIONS. Photoflash bombs may not be stored with any other type of explosives and ammunition. They must be handled with extreme care as the photoflash powder filler is more sensitive than black powder. If any powder should be spilled, all work in the vicinity must be stopped until the powder is taken up, the source of the spillage located, and the spilled powder and broken container carefully placed in a tight container and removed. The spilled powder should be covered with an inert, nonabrasive powder such as talc and brushed up with a soft brush. Any residue should be taken up by dabbing with a damp cloth.

151. Bomb, TI, Smoke, Red, 100-lb, M84A1

a. GENERAL. The M84A1 (fig. 105) differs from the target identification bombs described generally in paragraph 29 in that it does not contain pyrotechnic candles. It is used to indicate a bomb release point when bombing operations are carried out above an overcast and the ground targets are not discernible. The bomb is usually set for an air burst. When the bomb bursts, a large cloud of red smoke is produced. This cloud hangs in the air for a considerable time.

b. DATA. This bomb consists of a round-nose, cylindrical sheet steel body fitted with a box fin. The complete round, containing 72 pounds of red iron oxide (hematite) filler, weighs 103 pounds, is 53.1 inches long, and 8.1 inches in diameter. The BURSTER, AN-M4 is employed with this bomb to rupture the case and expel the filler.

c. AUTHORIZED FUZES. The FUZE, bomb, nose, mechanical time, M147 (AN–M147) is authorized for use with the target identification smoke bomb M84A1.

d. OTHER MODELS. An earlier modification, the BOMB, TI, smoke, red, 100-lb., M84 is the same as the M84A1 except that it is fitted with a shorter fin assembly hence its complete round length is only 50.1 inches.

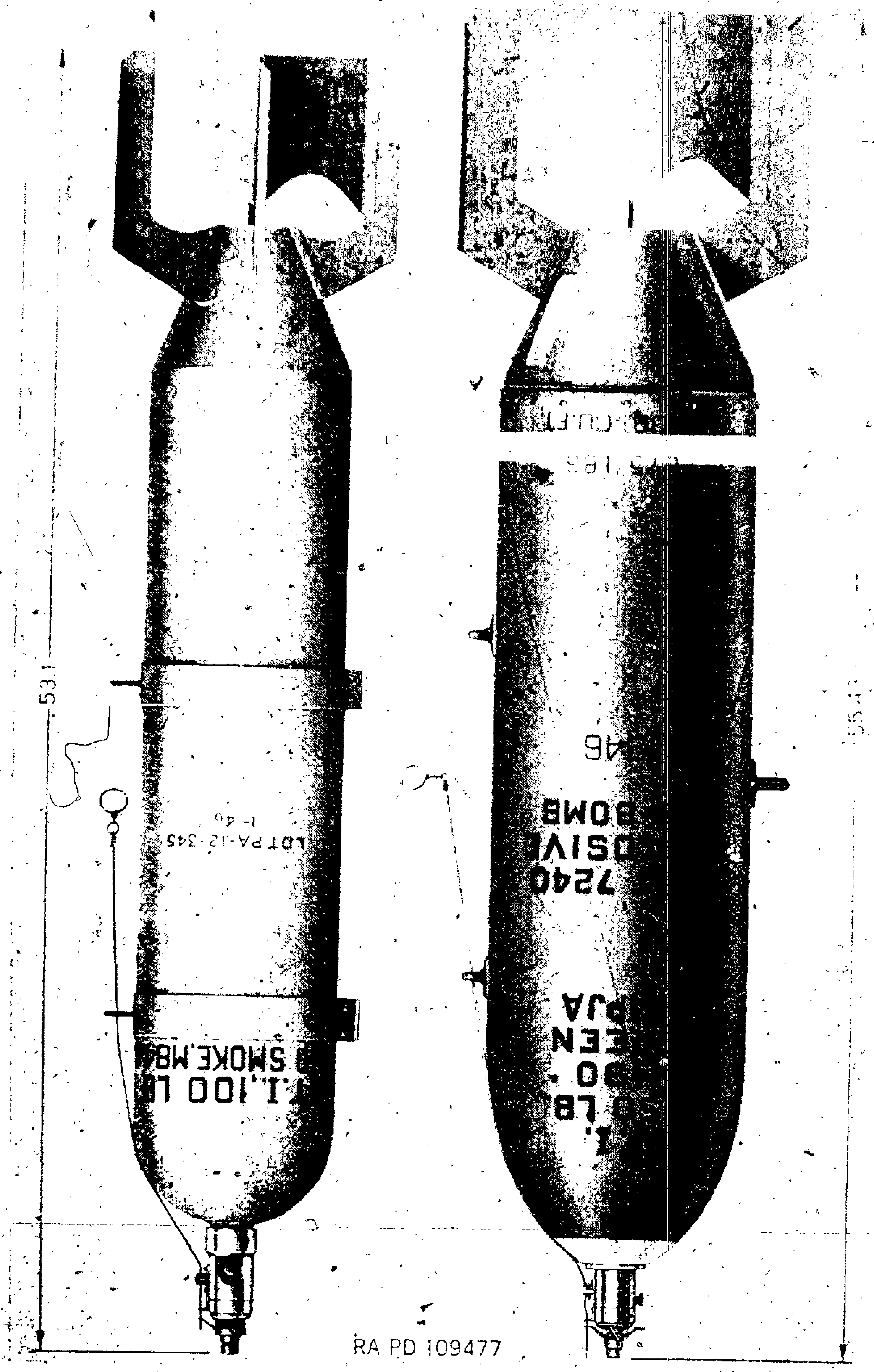

Figure 105. Target identification bombs—100- and 250-lb. sizes.

912342O—50—16

152. Bomb, TI, 250-lb, All Models

a. GENERAL. All of the 250-pound target identification bombs (fig. 105) contain a filler of 61 pyrotechnic candles. There are various designs of candle employed, red, green, yellow, or explosive. Model designations have been assigned to these bombs on the basis of the various combinations of candles contained in the bomb. The following list indicates the model designations and the combinations of candles employed therein. For further details and description of candles and TI bombs, see TM 9–1981; see table XXVIII for fin assembly.

TI bomb model designations	*No. and model of candles contained in bomb*
M89 (green, red, or yellow)	61—M103 candles, nondelay.
M90 (green, red, or yellow)	57—M103 candles, nondelay. 4—M105 candles, exploding.
M91 (green, red, or yellow)	16—M103 candles, nondelay. 15—M104 candles, 2¾-min, delay. 15—M104 candles, 4-min, delay. 15—M104 candles, 5¼-min, delay.
M98 (green, red, or yellow)	31—M103 candles, nondelay. 30—M105 candles, exploding.
M100 (red-green, red-yellow, or yellow-green)	61—M107 candles, combination 3-minute burning time.

b. DATA. The 250-pound TI bombs M89, M90, M91, M98, and M100 all consist of a modified 250-pound GP bomb body which when fuzed is 56.8 inches long and 10.84 inches in diameter. The complete round weight varies (dependent upon combinations of candles contained) and ranges from 241 pounds to 265 pounds.

c. AUTHORIZED FUZES. The FUZE, bomb, nose, mechanical time, AN–M146 is authorized for use with all 250-pound TI bombs. The M144 or M155 mechanical time fuzes may also be used.

153. Bomb, Leaflet, (Empty), 100-lb, M104 and 500-lb, M105

a. GENERAL. The 100-pound leaflet bomb M104 and the 500-pound leaflet bomb M105 are essentially the same as the 100-pound fragmentation bomb cluster adapter M15A2 (fig. 113) and the 500-pound fragmentation bomb cluster adapter M16A1 (fig. 118) respectively. The leaflet bombs are issued empty and unfuzed. The leaflets are placed in the bomb and the [illegible] complete round. The mechanical time [illegible] for [illegible] tioning in order to get proper dispersal of the leaflets.

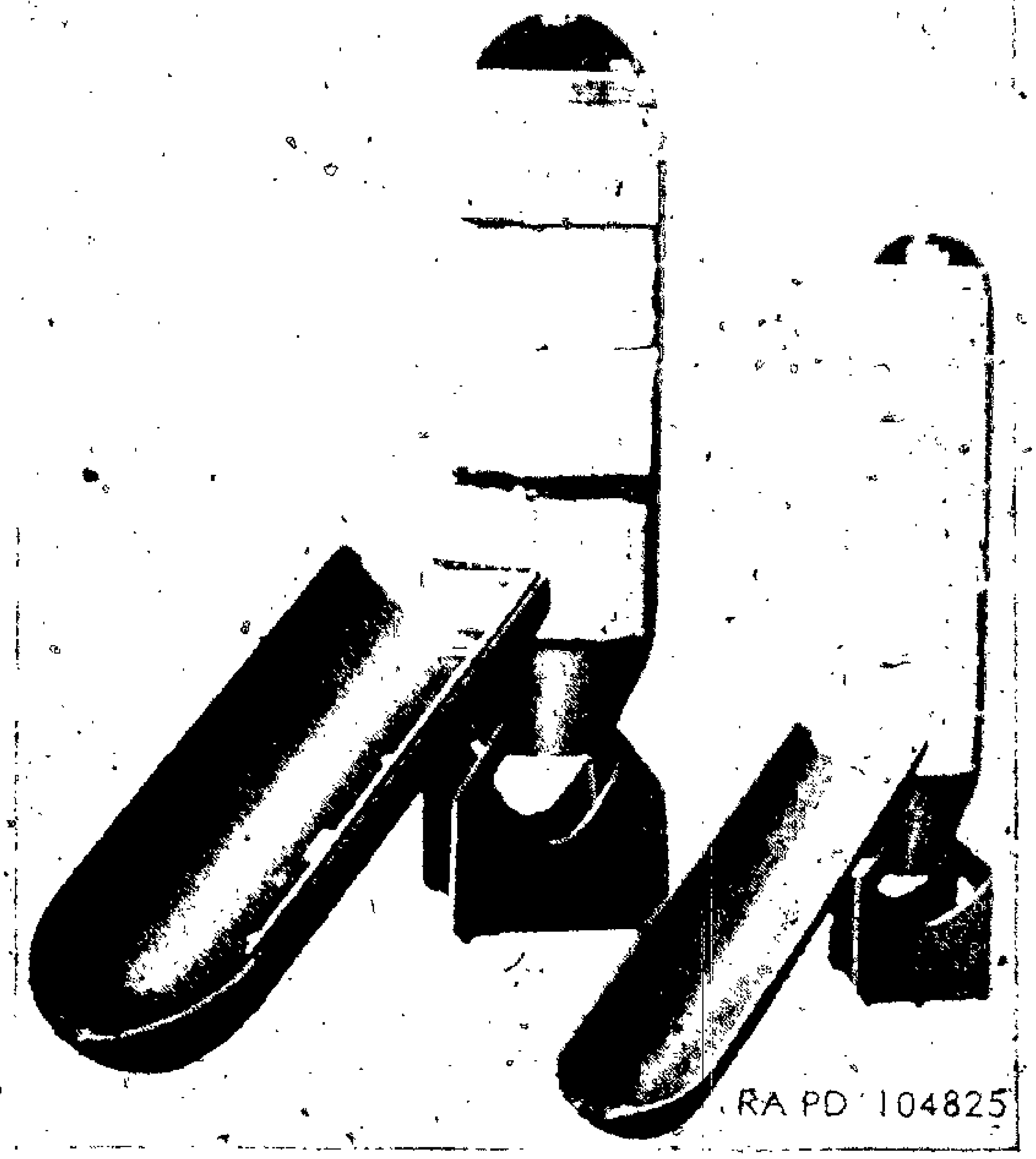

Figure 106. 100- and 500-pound leaflet bombs—open.

b. DESCRIPTION. These bombs are cylindrical sheet metal cases to which a fin assembly, fuze adapter, and nose locking cup are attached. One-half of the cylindrical portion may be opened to permit assembly of the leaflets (fig. 106). Three circular metal plates are assembled at intervals inside the bomb body to provide four compartments for rolls of leaflets. The nose locking cup (figs. 114 to 117) serves to lock the bomb case closed during shipment and after loading and fuzing. The cup is fastened to the lower section of the bomb by two screws, 1.5 inches long, passing through the angles on the cup. Once closed, the case is locked when the cup is screwed up tight against the inside of the bomb nose, thus straddling the fuze adapter on the lower section of the bomb and a mating flange on the bomb cover. The angles through which the screws pass are secured in place by soft copper rivets which are sheared when fuze detonates to allow the bomb to open.

c. DATA. Table XXII lists characteristics of the 100- and 500-pound leaflet bombs.

Tab. XXII. Characteristics of 100- and 500-lb Leaflet Bombs

Model	Complete round				Metal parts		Authorized fuzes
	Length (in)	Weight (lb)	Leaflets Quantity	Leaflets Weight (lb)	Weight (lb)	Diam of body (in)	
100-lb M104	47.35	51.61	7,250	26	24.50	8.00	FUZE, bomb, nose, mechanical time, M155*.
500-lb M105	59.37	173.12	30,000	100	72.00	13.89	FUZE, bomb, nose, mechanical time, M155.*

*In the absence of the M155, use the AN-M146.

d. PREPARATION OF LEAFLETS FOR LOADING BOMB.

(1) *General.* The leaflets must be loaded into the bomb in the form of roll-like bundles (fig. 107). Each roll must be tied tightly and have a sliding fit in the bomb case. It is important that the bomb case be fully loaded. If there are not sufficient leaflets to load the bomb, then use some other filling material but leave the nose compartment empty (except for locking cup). Rolls of leaflets must be 7½ inches outside diameter for the M104 and 13½ inches outside diameter for the M105.

(2) *Preparation of roll.*

Note. The method described below applies to 5- by 8-inch leaflets. However, this same method can be used for leaflets of any other size, provided they are folded so as to make up rolls of a correct size, i.e., 5⅛ (height) x 7½ (diam) inches for the M104 and 5⅛ (height) x 13½ (diam) inches for the M105.

(*a*) Prepare template rings (fig. 107) made of sheet metal or cardboard. Each ring should be approximately two-thirds of leaflet height, with an inside diameter of 7½ inches for the M104 and 13½ inches for the M105.

(*b*) Prepare a quantity of cardboard disks (spacers) 7 inches in diameter for the M104 and from 12 to 18 inches in diameter for the M105.

(*c*) Fill each template ring carefully and tightly with leaflets.

(*d*) Tie a string tightly around one end of the roll of leaflets. Slide the template towards the string just tied and tie another around the other end of the roll.

(*e*) Place a cardboard disk on top of the roll upside down, remove the template ring, and store until ready for use.

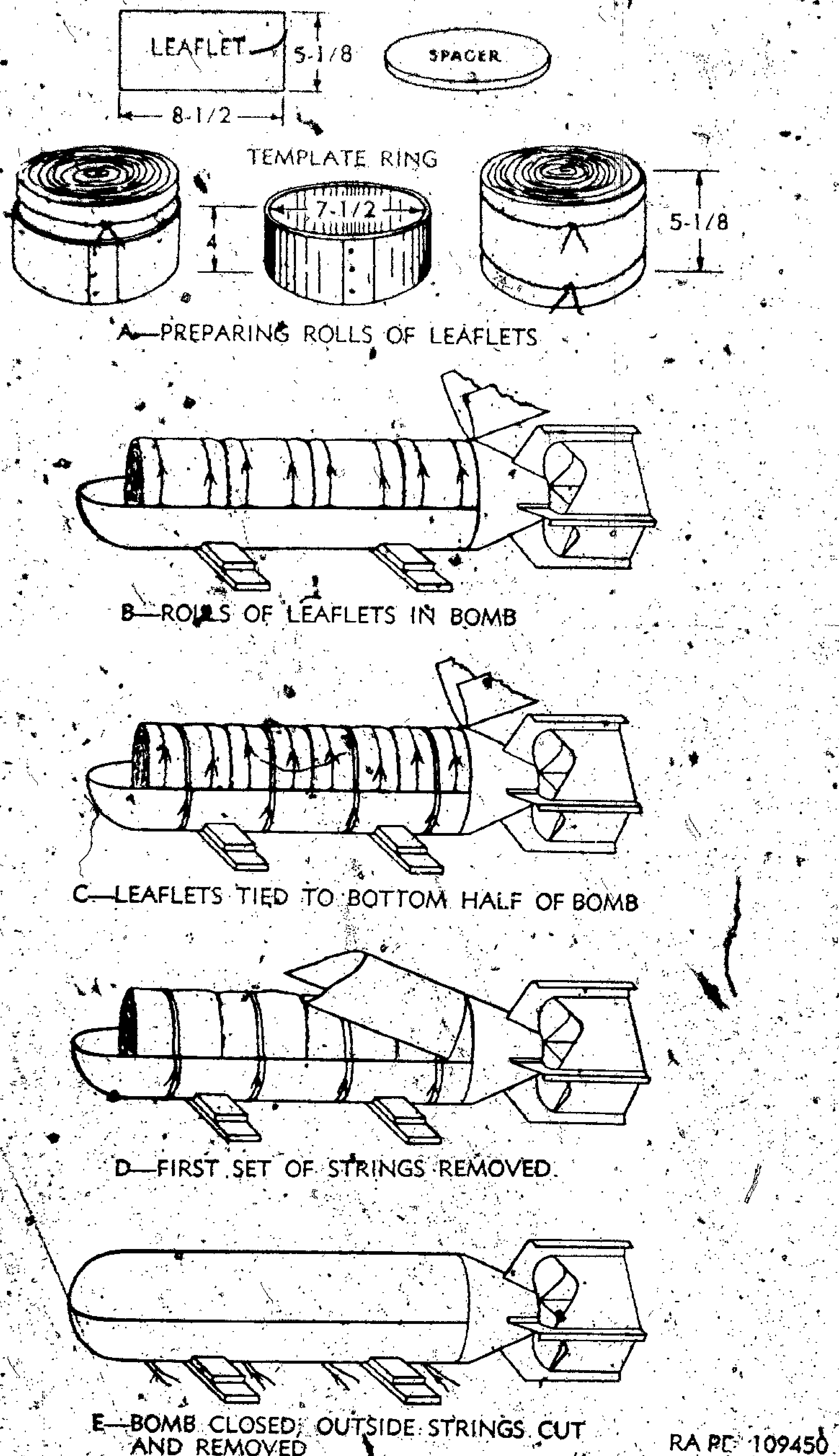

Figure 107. Leaflet bomb, M104—details of loading.

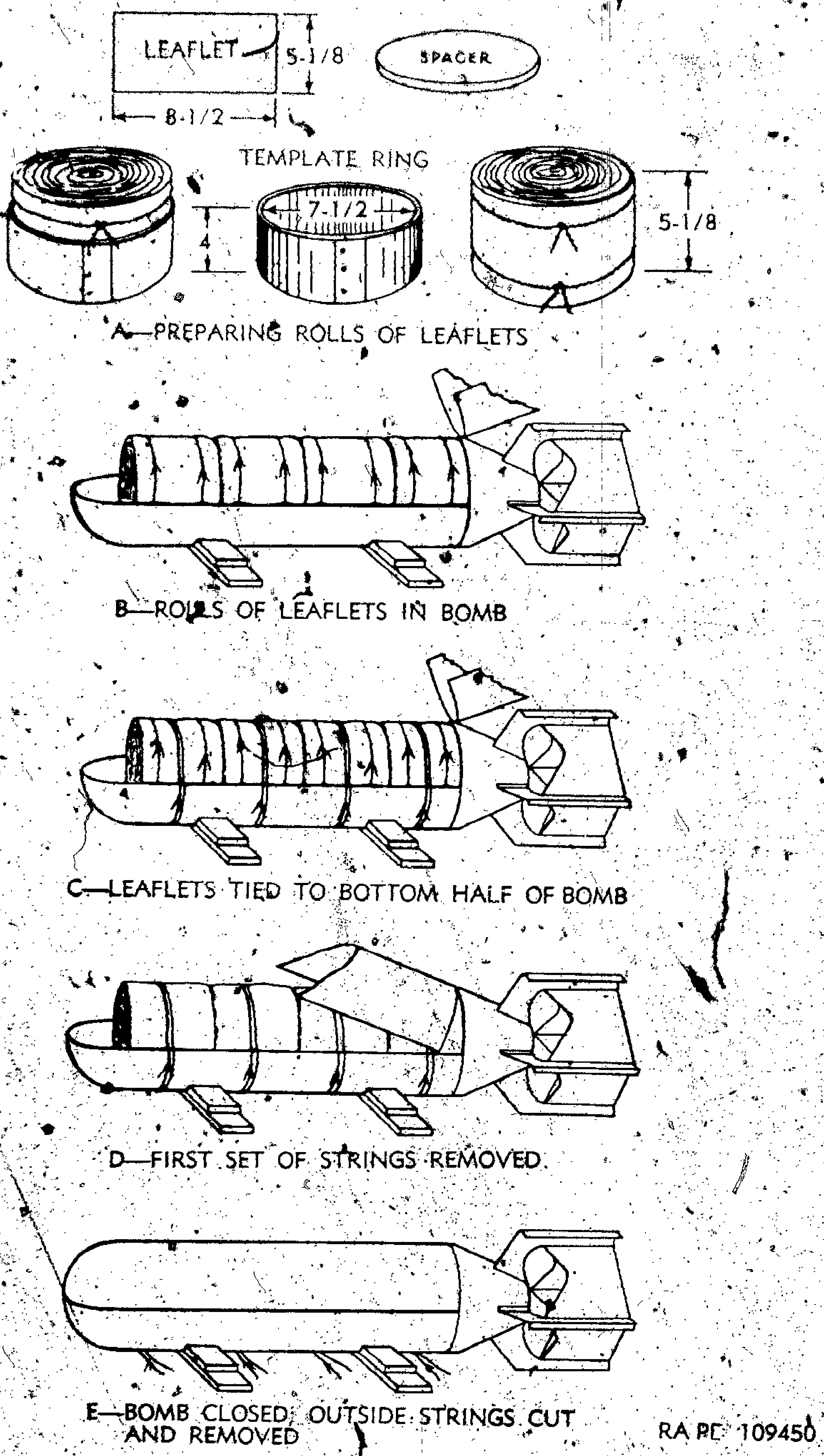

Figure 107. Leaflet bomb, M104—details of loading.

e. LOADING BOMB WITH LEAFLETS.

(1) Place the bomb on skids (fig. 107) and place blocks on skids under each side of the bomb to prevent rocking.

(2) Cut the wire which protrudes through the locking cup guard on the bomb nose and remove wire and guard. Then loosen the screws but do not disengage them from the locking cup. The locking cup is forced, by the turning of the screws, to recede into the bomb, thus clearing the fuze adapter. When the locking cup clears the adapter, the cover of the bomb can be lifted.

(3) Open the cover of the bomb and insert the prepared leaflet rolls in the compartments, placing a cardboard disk on each side of each roll. Make sure that the leaflet rolls fit loosely in their compartments and do not bind at the ends (fig. 107).

(4) Tie a string around the center of each roll and the bottom half of the bomb (fig. 107).

(5) Cut the strings with which the rolls were originally tied, leaving the second set of strings tied around the bomb (fig. 107).

(6) Close the cover of the bomb and securely lock the cover in place by drawing the locking cup into position with a string or wire hook. Tighten the locking cup screws, turning them alternately so that the locking cup moves forward evenly.

Note. If one screw is turned too far ahead of the other, the locking cup may cock over on one side and not fully engage the upper and lower positions of the bomb.

(7) Cut the strings on both sides of the bomb near the closing edges (fig. 107). This frees all the leaflets so that, when the bomb opens, the leaflets are readily dispersed.

Note. Do not open the cover of the bomb after the strings have been cut unless it becomes necessary to change the leaflets.

f. FUNCTIONING.

(1) *Assembly.* After being loaded, the bomb is closed and locked. A time fuze is installed and set for air functioning and an arming wire assembled. The bomb is then ready to be dropped.

(2) *Functioning.* When the bomb is dropped armed, the arming wire is withdrawn from the fuze, and, after the proper time has elapsed, the fuze functions. This causes the locking cup to be blown into the nose compartment. Once unlocked, the cluster opens and the leaflets are dispersed.

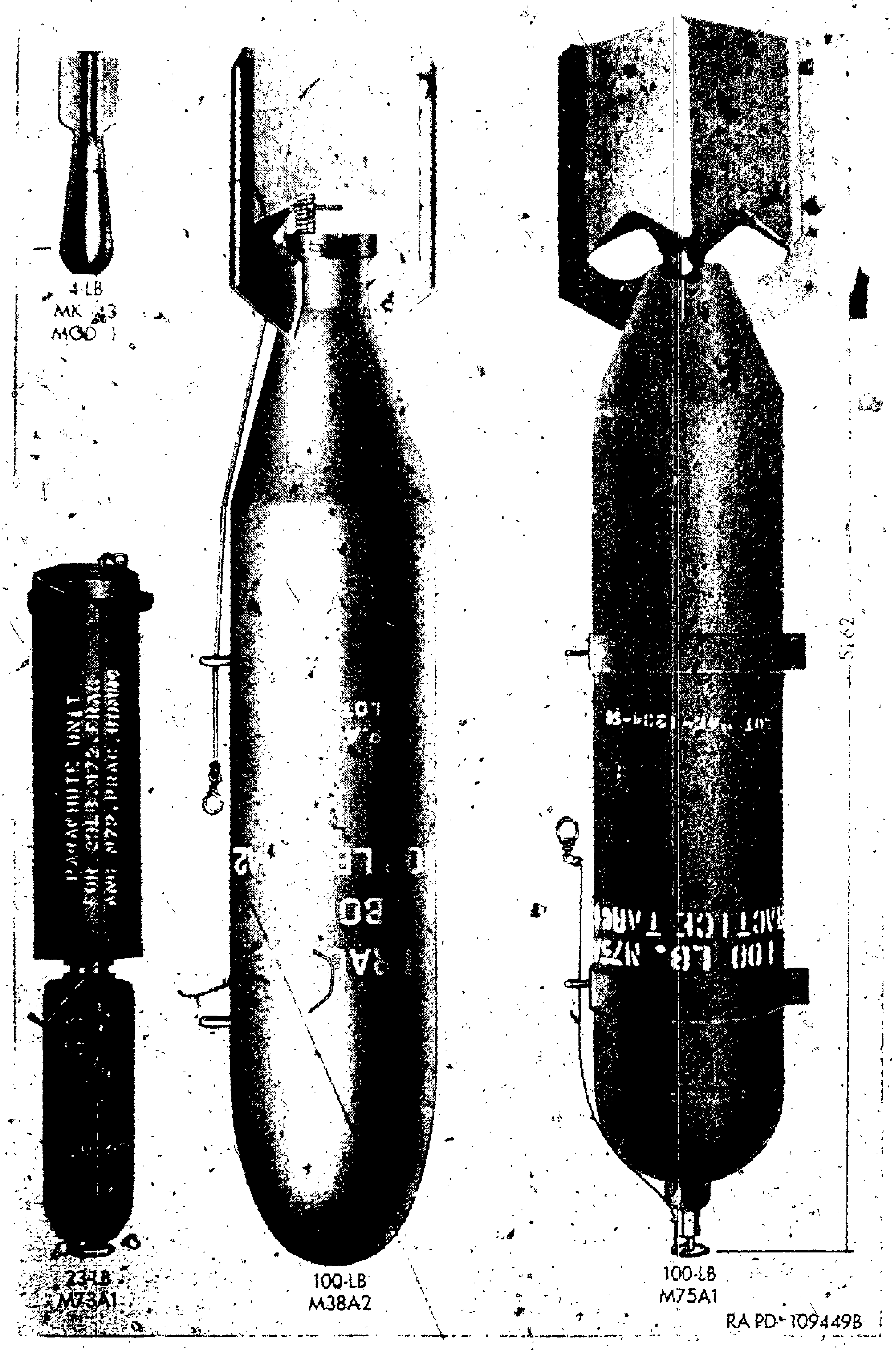

Figure 108. 4-lb, 23-lb, and 100-lb practice bombs and 100-lb practice target bomb.

Section VI. PRACTICE BOMBS

154. General

Practice bombs are provided for target practice and are available in various sizes and weights to simulate service bombs. Some practice bombs have a fuze and spotting charge, others are completely inert, and one bomb (par. 158) is used to provide a colored target on snow covered ranges.

155. Bomb, Practice, Miniature, 3-lb, MK 23 MOD 1 (AN–MK 23 Mod 1)

a. DATA. The Mk 23 Mod 1 is a streamlined miniature practice bomb 8.25 inches long and 2.18 inches in diameter. It is made of cast iron. Its weight without signal but with firing pin assembly is approximately 2 pounds, 14 ounces; with signal, 3 pounds. The authorized spotting charge is SIGNAL, bomb, practice, miniature, Mk 4 or Mk 5 (fluorescein dye) over water.

b. OTHER MODELS. The BOMB, practice, miniature, 4.5-pound, Mk 43 Mod 1 (fig. 108) is the same as the Mk 23 type except that it is made of lead and consequently weighs approximately 4.5 pounds. The BOMB, practice, miniature, 3-pound, Mk 23 Mod 0 and 4.5-pound, Mk 43 Mod 0 are the same as the Mk 23 Mod 1 except that they lack the sheet metal stabilizing shrouds across the tail vanes.

c. ASSEMBLY. In order to assemble the spotting charge, it is only necessary to remove the cotter pin in the nose of the bomb, remove the firing pin, insert the signal, and replace the firing pin and cotter pin.

156. Bombs, Practice, 23-lb Size

a. GENERAL. These bombs (fig. 108) represent parachute type fragmentation bombs for assembly in clusters or for individual suspension dependent upon the model. There are four models of 23-pound practice bombs: M71, M71A1, M73, and M73A1. They consist of an empty fragmentation bomb body fitted with either the M3 or M4 parachute unit. These bombs do not require fuze or spotting charge since the parachute is ample for spotting purposes. Both the M71A1 and M73A1 differ from their respective basic models by the addition of a cylindrical shoulder, ½ inch long, to the nose of the bomb body.

b. DATA. Table XXIII lists the characteristics of the four models of 23-pound practice bombs.

Table XXIII. Characteristics of Practice Bombs M71, M71A1, M73, and M73A1

Nomenclature	Complete round		Parachute unit employed	Use	
	Length (in)	Weight (lb)		In clusters	Individually
BOMB, practice, 23-lb, M71	26.7	21.1	M3	✓	
BOMB, practice, 23-lb, M71A1	27.24	21.1	M3	✓	
BOMB, practice, 23-lb, M73	26.77	21.0	M4*		✓
BOMB, practice, 23-lb, M73A1	27.24	21.0	M4*		✓

*The M4 parachute unit may be converted to the equivalent of an M3 parachute unit by removing suspension assembly, band assembly, and pull wire container assembly.

157. Bomb, Practice 100-lb, M38A2

a. DATA. The M38A2 is a round-nosed cylindrical bomb (fig. 108) designed to simulate GP bombs. It is 47.5 inches long and 8.12 inches in diameter. As issued, the fin is assembled to the bomb body which is empty. This assembly (fin and body) weighs 15.8 pounds. At the point of use, 80 pounds of sand are poured into the bomb case, and the spotting charge added to create the complete round which weighs 100 pounds. The spotting charge is assembled in a sleeve at the base of the bomb.

b. SPOTTING CHARGE. The authorized spotting charge is the CHARGE, spotting, assembly, M1A1, for practice bomb, 100-lb M38A2 (black powder). However, the spotting charge assemblies, M3 and M4 may also be used. These assemblies consist of a 3-pound charge and an integral fuze consisting of an inertia type firing pin and a blank, loaded shotgun shell as the primer. The M3 produces a large cloud of black smoke and is authorized over snow covered ranges. The M4 is authorized for use on ranges equipped with sonic spotting devices. The M1A1 is used for all other purposes.

c. ASSEMBLY. The complete round is assembled as follows:

(1) *Inspection.* All lots of M38 series practice bombs manufactured prior to 13 September 1943 will be inspected at time of use for defective spot welds, particularly at the joint of the fin cone and body. If the welding is unsatisfactory and the bomb is otherwise serviceable, the bomb may be repaired by a continuous or interrupted seam weld in order to obtain a joint with sufficient strength.

(2) *Load with sand to weight.* Remove the bomb from the carton and inspect for serviceability. Remove the closing cover from its place in the sleeve. Place the bomb upright and fill completely with a uniform sand mixture. Shake the load down well so that there will be no room for shifting. If a lighter loading is desired, mix dry sawdust

or dry sifted ashes with the sand. The bomb must be filled and the loading material uniform. Press the closing cap into place.

(3) *Assembly of the spotting charge.* Insert spotting charge assembly and seat firmly with arming pin pointing away from bomb suspension lugs. Pass arming wire through rear suspension lug and then through the eyelet in the arming pin. Adjust the arming wire to extend 2 to 3 inches beyond the arming pin.

158. Bomb, Target, Practice, 100-lb, M75A1

a. DATA. The M75A1 (fig. 108) is designed to provide a target reference for practice bombing over snow covered ranges. The bomb resembles the 100-pound TI red smoke bomb M84A1 and consists of a light sheet metal case, a charge of red iron oxide (hematite), a burster, and a fuze. The bomb is 51.62 inches long and 8.125 inches in diameter. It weighs 101.22 pounds of which 72 pounds is hematite. Upon impact, the burster distributes the charge over an area 35 feet in diameter.

b. COMPLETE ROUND. The following components are necessary to assemble the complete round:

1 Bomb body.
1 FUZE, bomb, nose, M108—with pressure plate.
1 arming wire assembly.
1 BURSTER, AN-M4.

c. ASSEMBLY. To assemble the complete round, proceed in the following manner:

(1) Remove components from packing and inspect for serviceability.

(2) Remove the fuze seat and adapter sleeve from the adapter.

(3) Insert the burster in the burster well; push it in until the shoulder of the burster seats against the shoulder of the burster well. Use no force.

(4) Replace the adapter sleeve and screw firmly against the burster.

(5) Assemble the pressure plate to the striker of the fuze bending the lugs on the plate to hold it securely.

(6) Push the fuze into the fuze seat until both ball latches engage the groove in the seat.

(7) Screw the fuze seat, with fuze, into the bomb handtight. Arrange the arming pin so that the safety cotter pin is perpendicular to the length of the fuze.

(8) Thread the arming wire through the forward suspension lug of the bomb then, pressing the head of the arm-

ing pin to expose the lower hole, thread the arming wire through the inner eyelet in the arming pin.

(9) When the bomb is installed in the rack, remove the safety cotter pin in the fuze.

(10) If the bomb is not dropped, disassemble and return the components to their original condition and packing by first defuzing the bomb as directed in paragraph 54 and then removing the burster.

d. OTHER MODELS. The BOMB, target, practice, 100-lb, M75 is an earlier design of the M75A1. The fin assembly of the M75 is 3 inches shorter than that assembled to the M75A1 and consequently the complete round length of the M75 is only 48.62 inches. The suspension lugs of the M75A1 are designed for greater strength than those assembled to the M75. In all other respects the M75 is the same as the M75A1 including components and method of assembly.

159. Bomb, Practice, 100-lb, M85 (Concrete)

The M85 is a round-nosed cylindrical type bomb constructed completely (except for fin assembly and spotting charge) of reinforced concrete. It simulates the M38A2 in general shape and employs the same spotting charges as the M38A2 (par. 157 *b*). It is issued without fin and spotting charge. Four studs are cast into the rear of the bomb body to which the fin assembly is bolted when the complete round is assembled. The M85 (complete) is 38.25 inches long and weighs 103.5 pounds.

Section VII. DRILL BOMBS

160. General

Drill bombs are provided for training of ground crews in assembling, fuzing, unfuzing, and other handling of bombs. Drill bombs and their components are completely inert and are usually constructed from the metal parts of service bombs. They differ from inert practice bombs in that practice bombs are expendable; drill bombs are not.

161. Assembly

a. COMPONENTS. The components of a drill bomb are the inert metal parts of the service bomb which they are intended to simulate.

b. METHOD OF ASSEMBLY. Drill bombs are assembled in accordance with the service bombs they simulate.

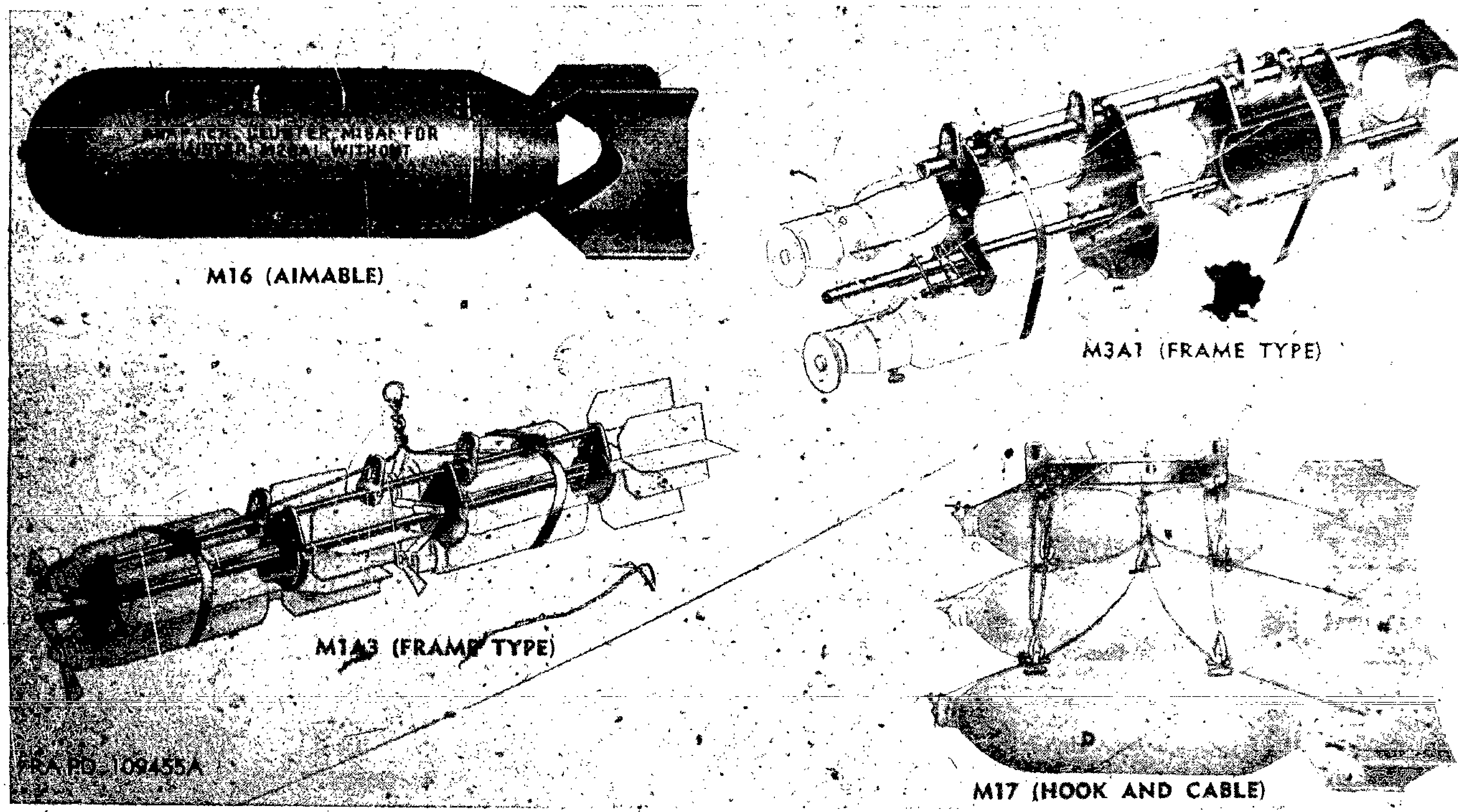

Figure 109. Adapter types.

162. Models

Each service bomb is represented by a corresponding drill bomb which bears the same model designation. When necessary to avoid confusion, the type represented may be indicated in the nomenclature, for example: CLUSTER, drill (fragmentation bomb) and CLUSTER, drill (practice bomb).

163. Complete Rounds

The complete round for a drill bomb corresponds exactly to the complete round of the service bomb it represents except that the components are inert. Directions and precautions laid down for the assembly and disassembly of complete rounds of the corresponding service bomb will be observed.

CHAPTER 7

CLUSTER ADAPTERS

Section I. INTRODUCTION

164. General

The adapters described within this chapter are the quick-opening (frame), aimable, and hook and cable types (fig. 109) outlined in paragraph 20.

165. Types

a. QUICK-OPENING (FRAME) ADAPTERS. This type consists of a frame to which several bombs are attached by means of straps, thus forming an assembly which may be suspended and released as a unit. The straps are fastened with clamps which may be released by withdrawing the arming wire or by the action of a time fuze. The frame is also equipped with a fuze lock which prevents arming of the bomb fuzes until after they are released from the cluster.

b. AIMABLE ADAPTERS. This type consists essentially of a streamlined metal body to contain the clustered bombs, a fin assembly or other such means of stabilization, and a time fuze to open the body and release the individual bombs at the time desired.

c. HOOK AND CABLE ADAPTERS. This type consists of a set of hook and cable assemblies, by means of which several bombs or clusters may be suspended from the same station, and a hanger and yoke assembly by which the arming wires of the individual bomb or clusters may be withdrawn or released "safe" as desired.

Section II. QUICK-OPENING (FRAME) ADAPTERS

166. Adapter, Cluster, AN-M1A3

a. DESCRIPTION. The AN-M1A3 is a frame type adapter (fig. 110) constructed of two longitudinal members of tubular steel which are passed through four sheet metal supports. The upper member is fitted with three flat sheet steel suspension lugs for single and double suspension and the side plates of the two strap clamp assemblies. The lower member is fitted with two wavy strip springs along that portion of the member against which the bomb bodies rest when the cluster is assembled. In front of each of the strip springs is a ferrule which holds the curved ends of the fuze lock springs. There are six fuze lock springs; three are passed through the front support and three through the third support. The fuze lock springs are narrow sheet steel strips which project at an angle from the supports and prevent the rotation of the fuze arming vanes while the bombs are still in the cluster. Two metal straps are provided to hold the bombs in place against the adapter. The free ends of the straps are locked in place by a toggle type strap clamp. The clamps are kept in locked position by an arming wire. When the cluster is released armed, the arming wire is withdrawn, the strap clamp flies open and frees the strap which action, in turn, frees the bombs from the adapter. The strip springs act as an aid in forcing the bombs away from the adapter.

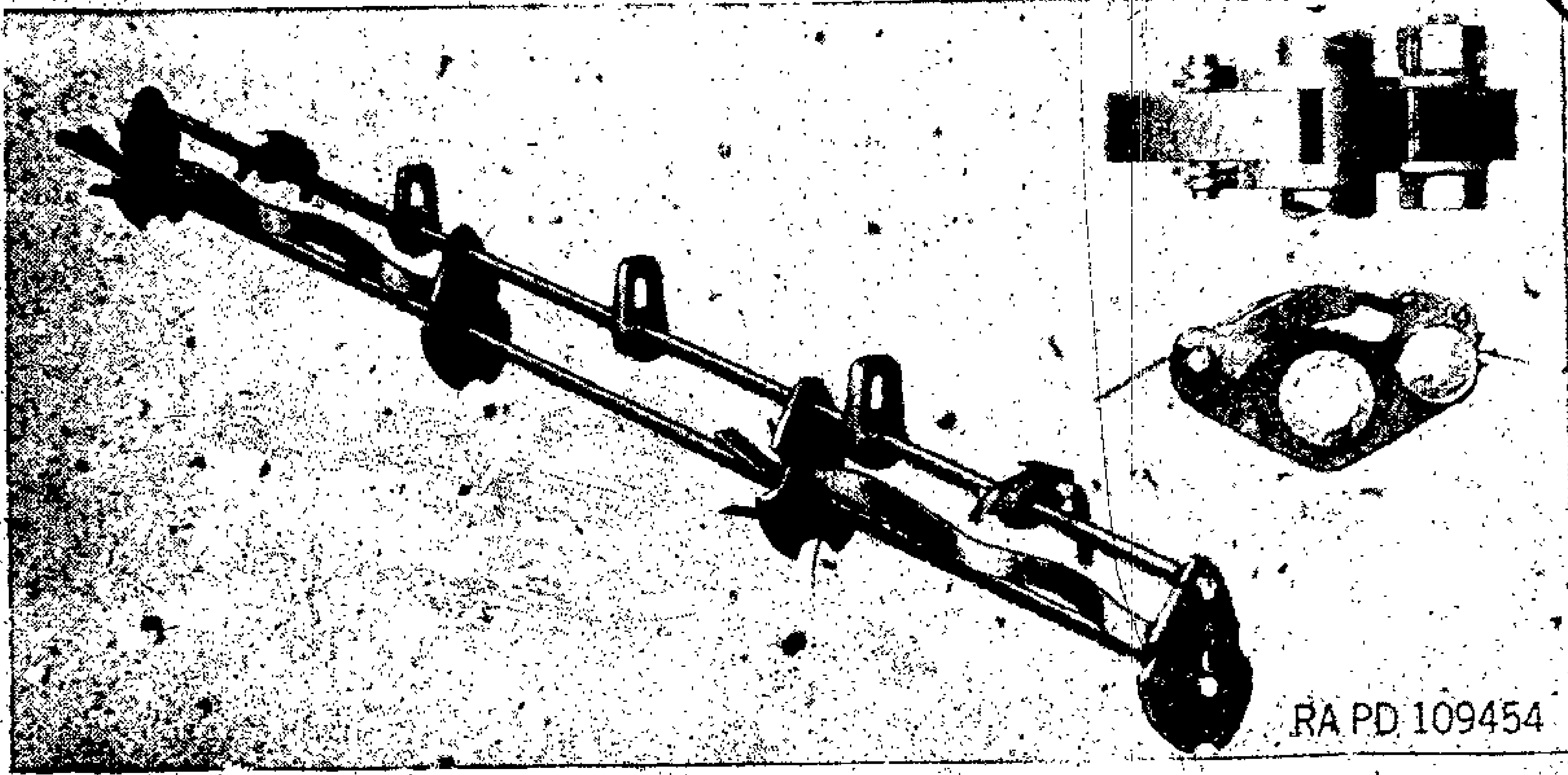

Figure 110. Adapter, cluster, AN–M1A3.

b. USE. The AN–M1A3 adapter is used to assemble six fin-type fragmentation bombs AN–M41A1 to form the CLUSTER, fragmentation bomb, AN–M1A2 (100-lb size) (par. 180). The AN–M1A2 cluster is the only one of the M1 series which is issued unfuzed; the AN–M1A3 adapter was designed to permit such issue.

c. OTHER MODELS.

(1) The ADAPTER, cluster, M1A2 differs from the AN–M1A3 in that it does not permit fuzing operations in the field (any clusters using this adapter are always shipped fuzed). In place of the fuze lock springs, the M1A2 is fitted with two fuze lock plates which are three bladed assemblies passed over the lower member and situated in front of the first and third supports. The suspension lugs of the M1A2 are U shaped.

(2) The ADAPTER, cluster, M1A1 is the same as the M1A2 except that its suspension lugs are narrower than those assembled to the M1A2.

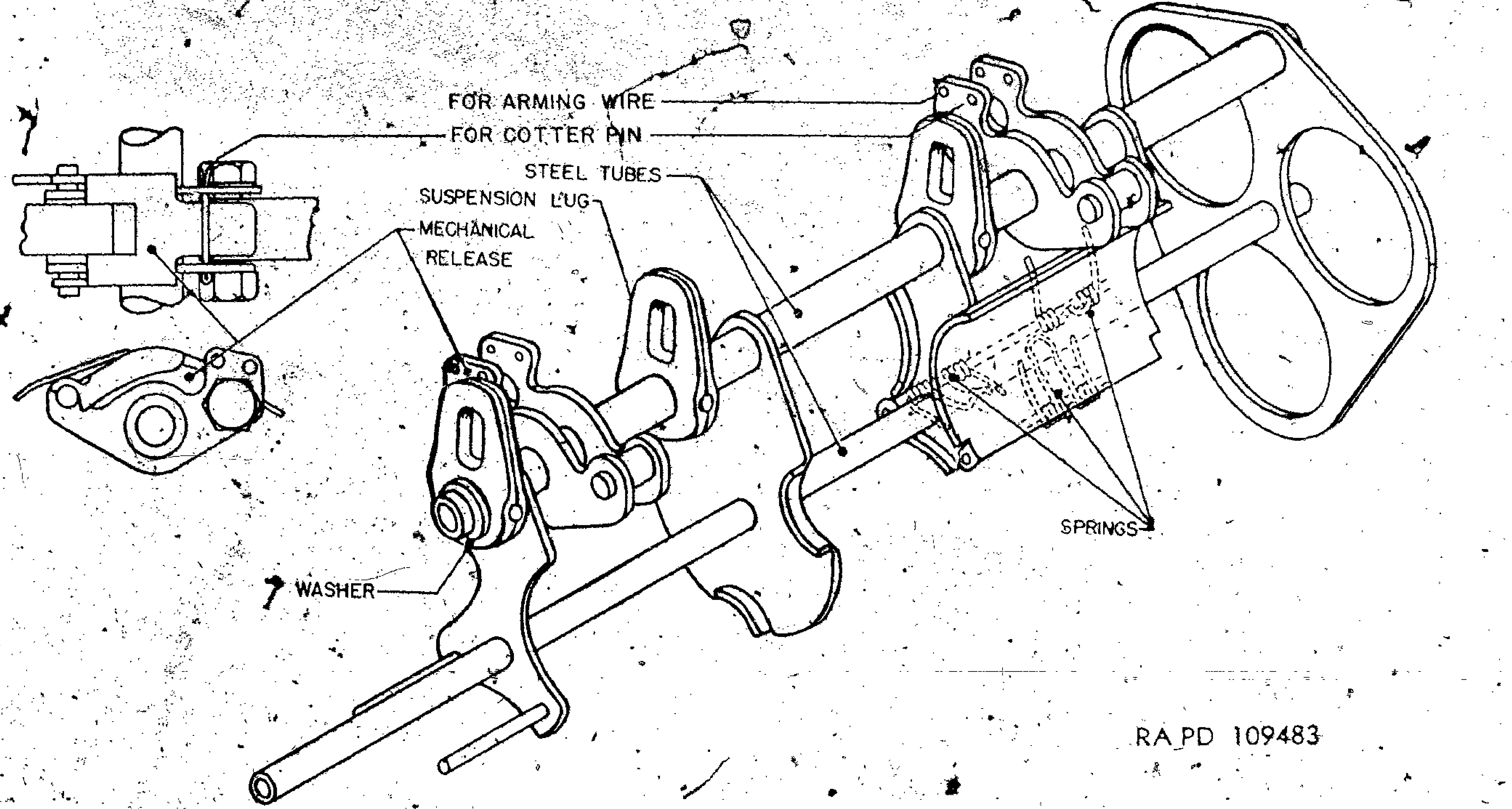

Figure 111. Adapter, cluster, M3A1 (AN-M3A1).

167. Adapter, Cluster, M3A1 (AN-M3A1)

a. DESCRIPTION. The M3A1 is a frame type adapter (fig. 111) which consists of two longitudinal members and three supports. The upper member carries two mechanical release mechanism (toggle type strap clamp) and three lugs for single and double suspension. The lower member carries five springs which aid in separating the bombs when they are released from the cluster.

b. USE. The M3A1 adapter is used to assemble three parachute type fragmentation bombs M40A1 or parachute type practice bombs M71 or M71A1 to form CLUSTER, fragmentation bomb, M4A2 (100-lb size) or CLUSTER, practice bomb, M5, respectively.

c. OTHER MODELS. The ADAPTER, cluster, M3 differs from the M3A1 in that the M3 employs the U type suspension lugs and that it may be used with the M40 fragmentation bombs to form the M4 cluster or with the M40A1 modification to form the M4A1 cluster. It may be used in place of the M3A1 adapter when assembling the practice cluster M5.

168. Adapter, Cluster, M13A2

a. DESCRIPTION. The M13A2 (shown assembled to form the cluster M26A2 in fig. 124) is a frame type adapter which consists of a longitudinal tube to which are fastened two suspension lugs, one hoisting lug, two strap clamps, two sets of side (positioning) plates, and three sway brace plates. One suspension lug for single suspension is also provided and is assembled to the longitudinal tube when required.

(1) The two outside lugs are used for double suspension. The central lug is used for hoisting purposes only. If single suspension is required, the hoisting lug must be removed and replaced by the single suspension lug.

(2) Each of the two strap clamps secures a steel strap which encircles ten 20-pound fragmentation bombs and holds the bombs (total of 20) to the adapter. When the cluster is issued, each clamp is secured by a safety cotter pin and by a shear wire (fig. 130) which has a loop on the under side of the longitudinal tube and a sleeve covering where it extends beyond the clamps.

(3) Ten separator assemblies, located between the bombs of each bank, are used to push the bombs out of the cluster when it opens. These assemblies consist of a triangular end plate supported on each end of a rod. Three bowed spring steel straps pass between these end plates and force the bombs against the cluster straps. Two of the

separator assembly rods in each bank are elongated and extend to the front of each bank of bombs. The elongations on these rods support the fuze vane locks (fig. 126).

(4) Two fuze vane locks, on the front of each bank of bombs, prevent the fuze vanes from turning prior to the release of the bombs. These locks are readily removable for installation of the fuzes.

(5) A steel slug is wired in the forward end of the longitudinal tube. This slug, which provides for delay opening of the cluster, is propelled rearward by the mechanical time fuze and severs the shear wires which secure the strap clamps in the closed position.

Note. The slug wire must not be removed. Proper functioning of this slug requires that it be supported by the wire at moment of operation of the time fuze.

b. Arming Wire. An arming wire is issued coiled up and fastened to the cluster. This arming wire contains two front strands and one rear strand. The rear strand (0.064 in diam) must be passed through the rear suspension lug and the rear strap clamp. One front strand (0.064 in diam) must be passed through the forward suspension lug and the forward clamp. The other front strand (0.036 in diam) is for use with the mechanical time fuze.

c. Preparation for Use. The complete cluster is issued ready for use, except for installation of the fuzes AN–M158 or M110A1 and the arming wire. If immediate opening is required, the mechanical time fuze is not used, the longest strand of the arming wire (0.036 in diam) must be cut off close to the swivel loop, and the two shear wires must be cut off and removed.

d. Other Models. Previous models of this adapter carry the designations M13 and M13A1. They differ only in design details of the suspension lugs and strap clamps.

169. Adapter, Cluster, M14 and M14A1

a. Description. The M14 type adapter (fig. 112) is similar to the M13, being of frame construction designed for either immediate or delayed opening. The adapter consists of two longitudinal steel tubes to which are welded four sheet steel plates which form nose and tail supports for two banks of three bombs each. The lower member serves as backbone for the cluster and carries a fuze vane stop for each bank of bombs. The upper member carries a pair of suspension lugs, a hoisting lug, two buckles for holding and releasing steel straps holding the bombs in the cluster, and adapters for nose and tail fuzes. The M14A1 adapter is the same as the M14 except that the M14A1 has wider fuze vane lock plates, reinforced sway brace plates, a leaf spring for the bottom bomb, and a $1\frac{1}{8}$ inch wide release strap.

b. LUGS. The suspension and hoisting lugs consist of "U" shaped shackles with bolts held in place by a cotter pin. The shackles are located by washers welded to the upper member. A long cotter pin passes through each lug to hold it in position. When suspension from singlehook racks is desired, the hoistings

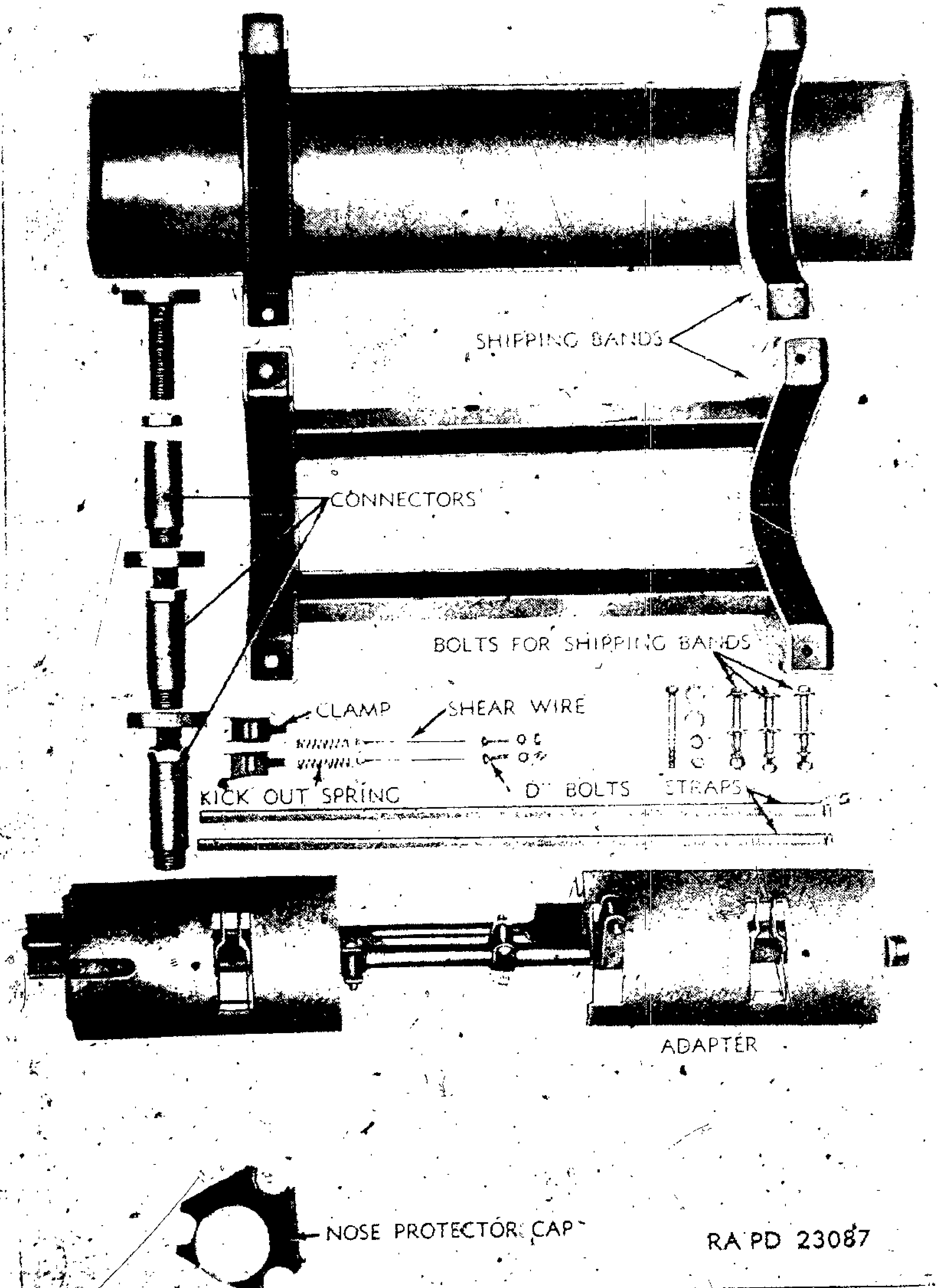

Figure 112. Adapter, cluster, M14 type.

lug is removed and replaced by one of the suspension lugs.

c. RELEASE MECHANISM. The release mechanism consists of a toggle-type buckle which is held closed as follows:

(1) *For storage and handling,* by a cotter pin which is removed only after the arming wire is installed.

(2) *For carrying in the plane,* by a branch of the arming wire which is withdrawn when the cluster is released from the plane armed or, if the cluster is not dropped, by the cotter pin which has been replaced.

(3) *For delayed opening of the cluster,* by a sheer wire which passes through the tongue of the clamp and the upper member of the cluster. When it is desired that the cluster discharge the individual bombs immediately upon release from the plane, the shear wire is cut off after the arming wire is installed. When delayed action is desired, the shear wire is left in place. At the time set, the fuze functions to drive a steel slug through the upper member, shearing the wire and allowing the buckle to open.

d. FUZE ADAPTERS. A fuze adapter is assembled to the forward end of the upper member. This provides a seat for the mechanical time fuze used for delayed opening; the use of mechanical time fuze M155 is preferred for this purpose. A set screw and lock nut, for holding the fuze in place, are shipped in an envelope inside the fuze adapter. A steel slug for cutting the shear wires of the release mechanism is wired in place in the upper member just inside the fuze adapter. A fuze adapter for the rear end of the member is supplied separately with the cluster adapter.

e. ARMING WIRE. The arming wire assembly for the cluster consists of a swivel loop assembly and four branches of wire, of which two are fine (0.036-in diam) and two are heavy (0.064-in diam). The fine branches are for the cluster time fuzes and, if either or both fuzes are omitted, the corresponding length of wire is cut off. The heavy branches are for the release mechanism.

f. SHIPPING BANDS. The shipping band (fig. 112) for the cluster consists of an upper and a lower member. Each consists of two semicircular channels joined by sheet metal troughs. The upper member has, in addition, extensions to protect the nose and tail of the cluster. When the cluster is placed in shipping bands, a nose protector cap and three connectors are installed. The nose protector cap is a flanged cup which fits over the forward vane stop of the adapter and is held in place by the fuze-hole plugs of the forward bank of bombs. The connectors are small screw jacks which are screwed into the fuze adapter of each of the bombs in the rear bank and butt against the cones of the corresponding bombs in the forward bank.

g. PACKING. The ADAPTER, M14 is packed one, complete, per box with shipping bands for the assembled cluster.

Note. The upper and lower wooden cradles used to pack the adapter and shipping bands may be conveniently used to build an assembly cradle (par. 186).

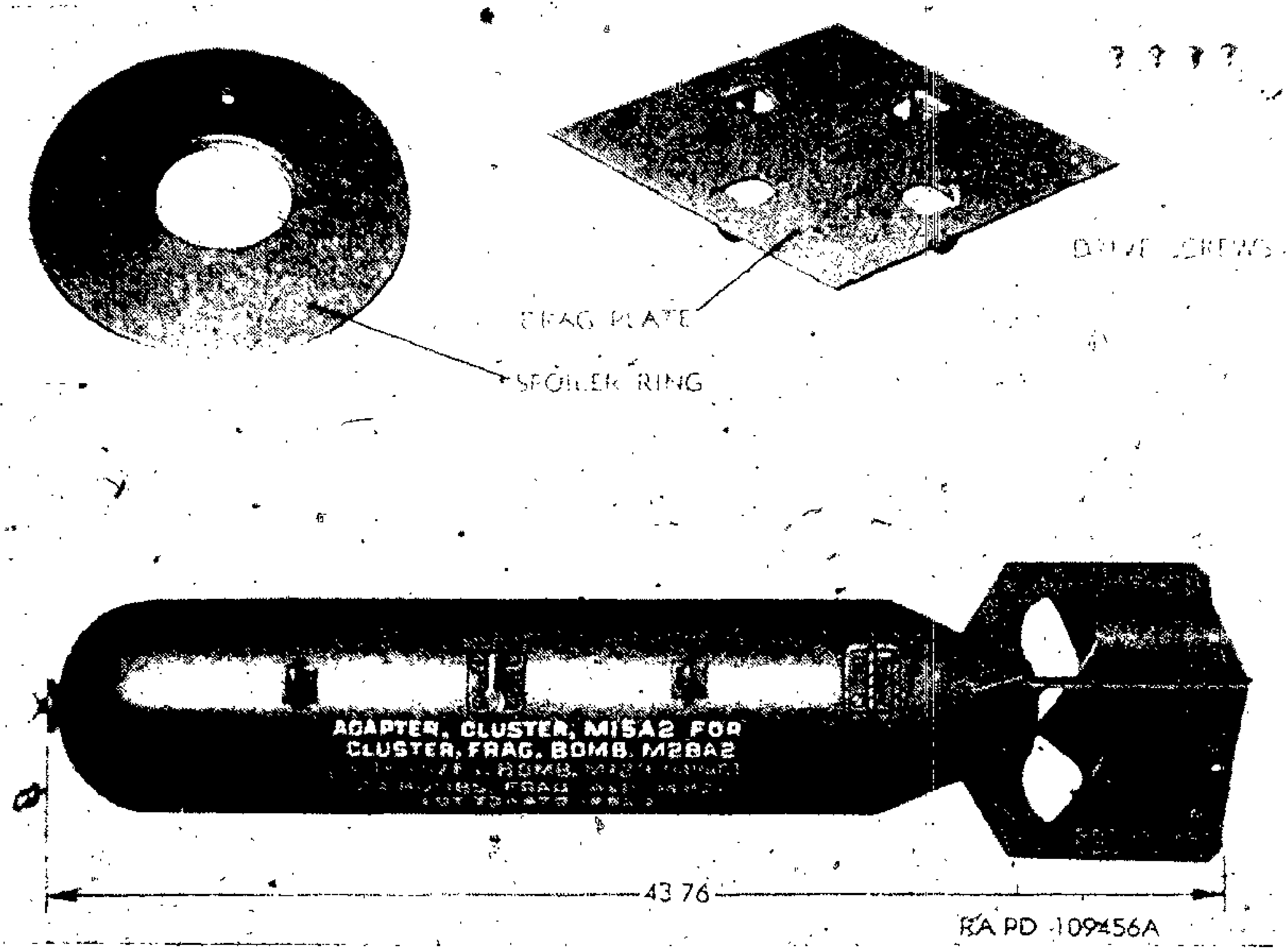

Figure 113. Adapter, cluster, M15A2.

Section III. AIMABLE ADAPTERS

170. Adapter, Cluster, M15, M15A1, and M15A2

a. DESCRIPTION. These adapters (fig. 113) use the same bomb body and box fin. It is cylindrical and constructed of steel parts consisting of upper and lower halves which, being hinged at the rear, may be opened longitudinally. Double suspension lugs are attached to bulkheads and pass through the top half (or cover) of the case. For single suspension, an extra lug is provided which may be attached to the adapter with screws. The nose of the models M15 and M15A1 is held closed by a nose cup. The nose of the M15A2 is held closed by a nose locking cup. The M15A1 and M15A2 differ from the M15 by the addition of a spoiler ring held in place against the nose of the adapter by the nose fuze and the addition of a drag plate fastened to the back of the fin assembly (figs. 113 and 133).

b. DRAG PLATE. The drag plate is an 8-inch square piece of sheet metal with four protruding tabs, each containing a tapped hole to accommodate a screw. When the drag plate is placed over the rear end of the fin assembly, each tab lies against one side of the fin box and the hole in the tab alines with a hole in the fin box. The fin assembly of the M15 adapter does not have these holes. Using the holes in the drag plate tabs as a guide, drill four holes with a No. 30 drill (0.128 in diam).

c. SPOILER RING. The spoiler ring is a circular piece of sheet metal (7.875 in diam) containing one central hole large enough to pass only the threaded end of a nose fuze. A small hole is also provided through which the arming wire is passed.

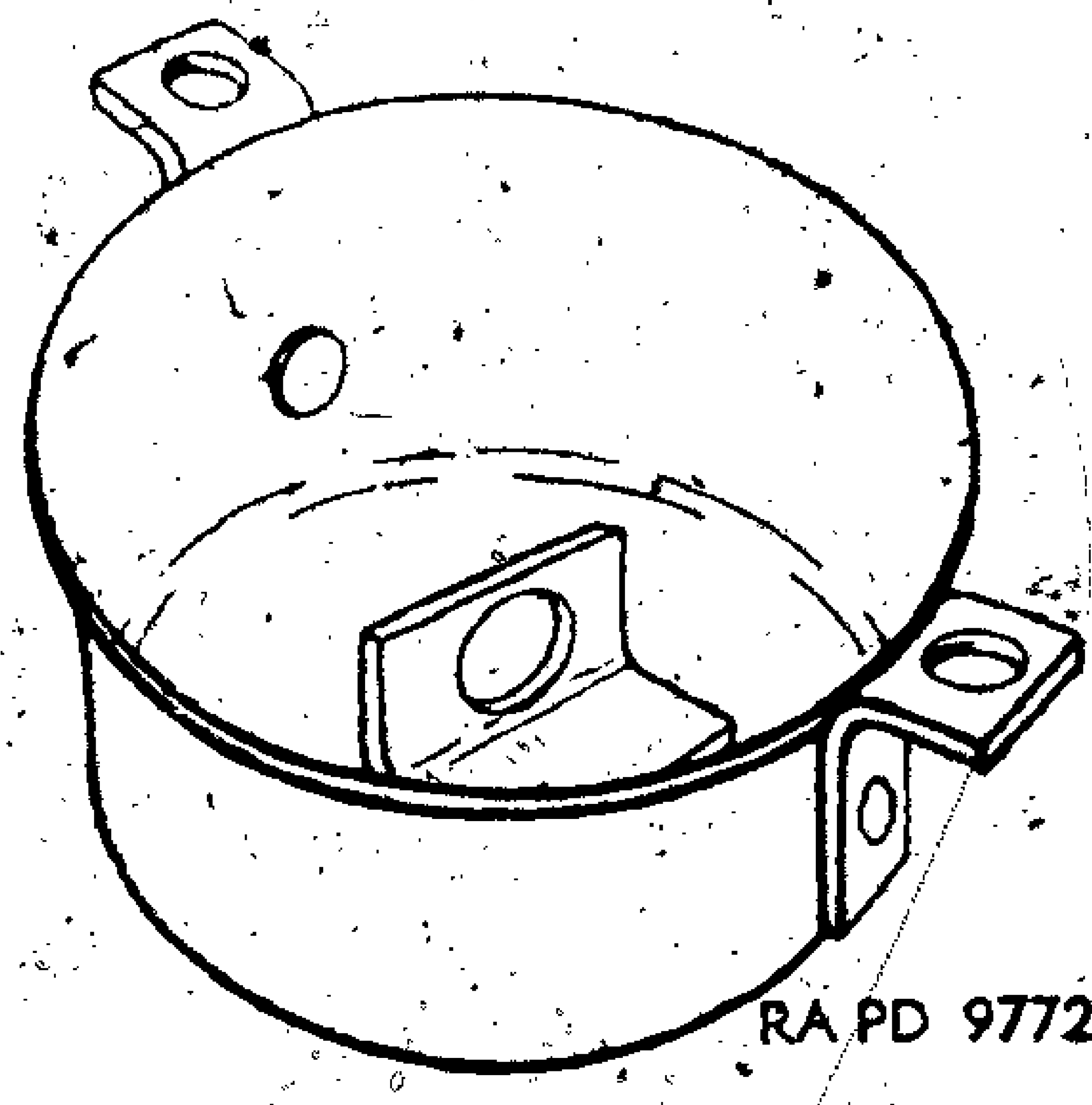

Figure 114. Nose locking cup.

d. NOSE LOCKING CUP.

(1) *Description.* The new locking cup (fig. 114), which constitutes the "A2" modification, is fastened to the lower half of the adapter nose by means of two screws (fig. 115 for positioning of holes in adapter case), a locking cup guard, and wire. The angles, attached to the side of the locking cup by copper rivets, are provided to receive No. 10 (190)–24NC x 1.5-inch slotted head, type I, thread cutting shakeproof screws.

(2) *Functioning.* The locking cup holds the adapter closed in the same manner as in the M15 or M15A1, but instead of being retained in place by friction, the locking cup is now securely fastened in place by means of two screws. Turning the screws in a counterclockwise direction forces the locking cup toward the rear of the adapter (opened position, fig. 116). Clockwise rotation of the screws draws the locking cup against the nose of the bomb (closed position, fig. 117). Upon functioning of the time

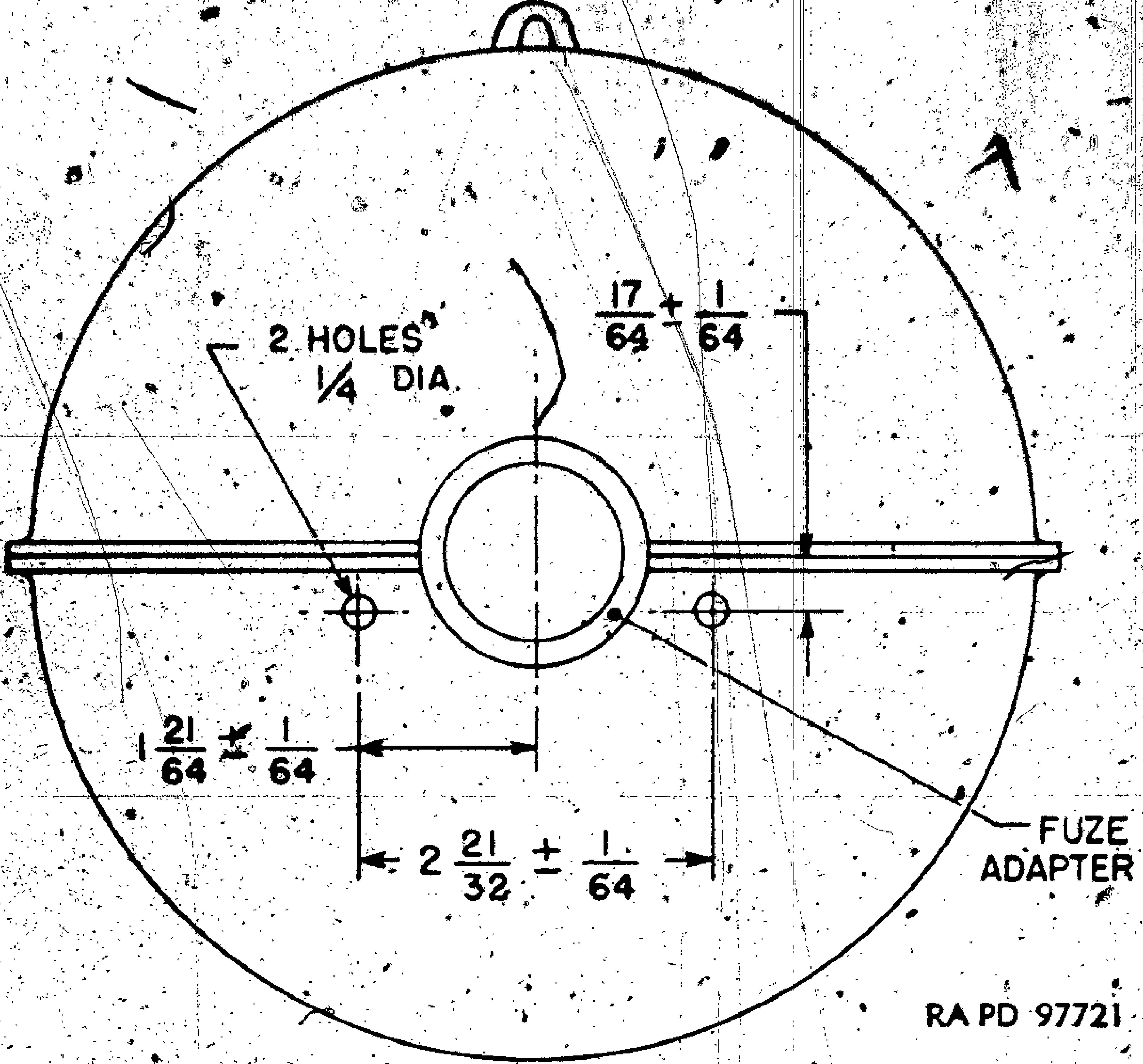

Figure 115. Locating holes for locking cup screws.

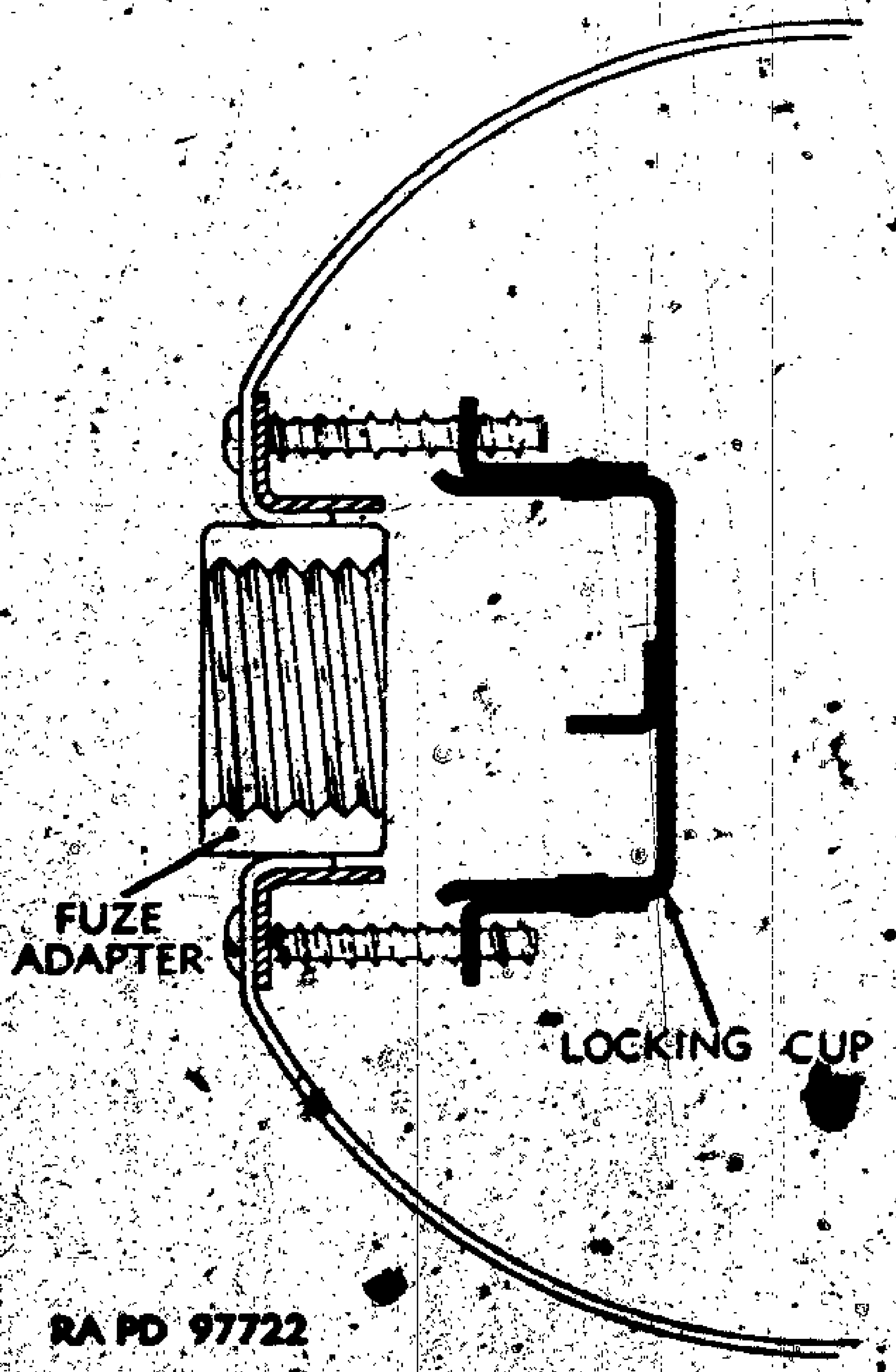

Figure 116. Locking cup—open position.

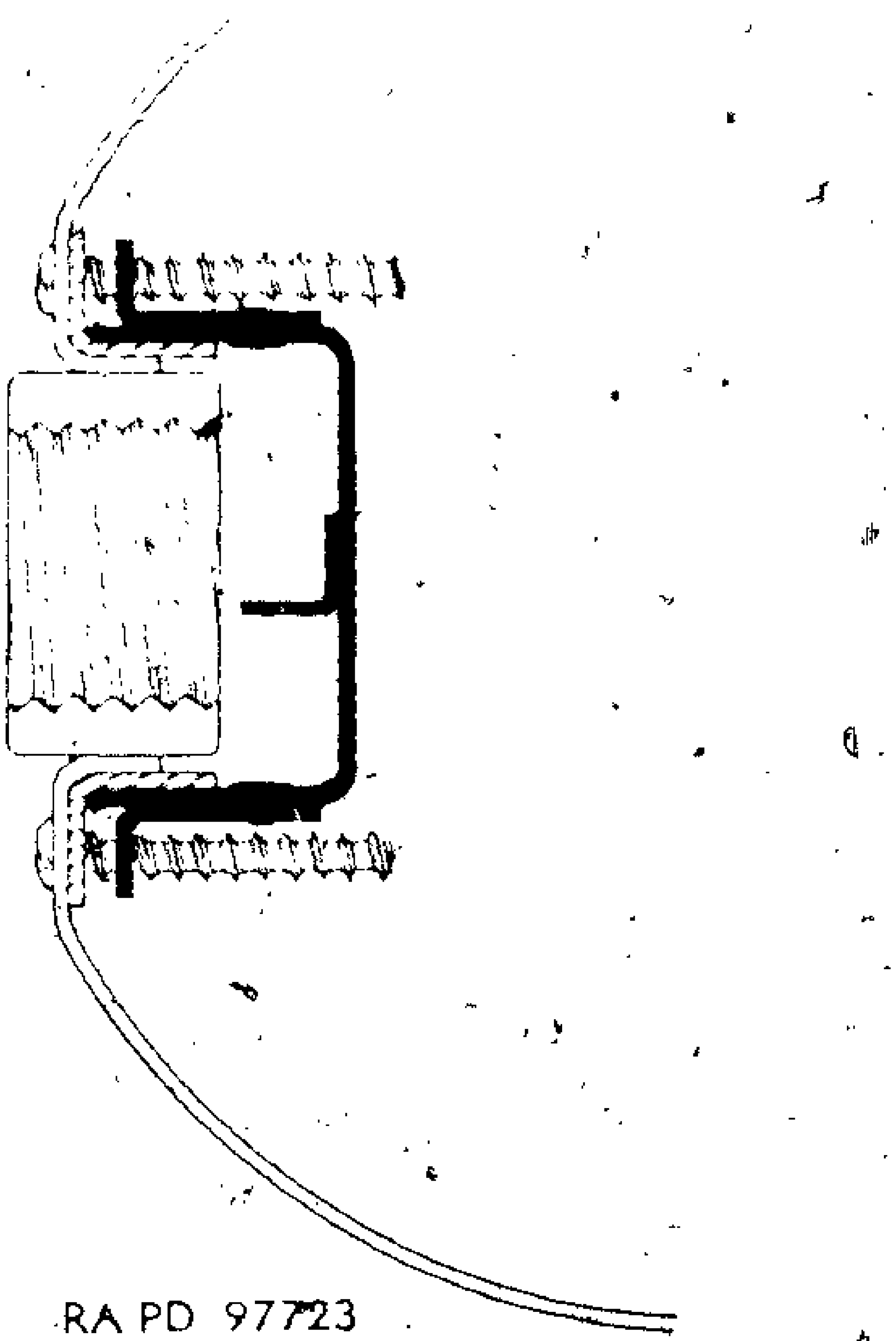

Figure 117. Locking cup—closed position.

fuze, the locking cup is blown into the cluster, shearing the two copper rivets which fasten it to the angles. The angles and screws remain fastened to the adapter. As soon as the cup clears the fuze adapter, the cluster is free to open for dispersion of the bombs.

e. USE. This series of adapters is used to assemble twenty-four 4-pound fragmentation bombs M83 when forming the M28 series of clusters described in paragraph 188. The M15 adapter forms the M28 cluster; the M15A1 forms the M28A1, and the M15A2 forms the M28A2.

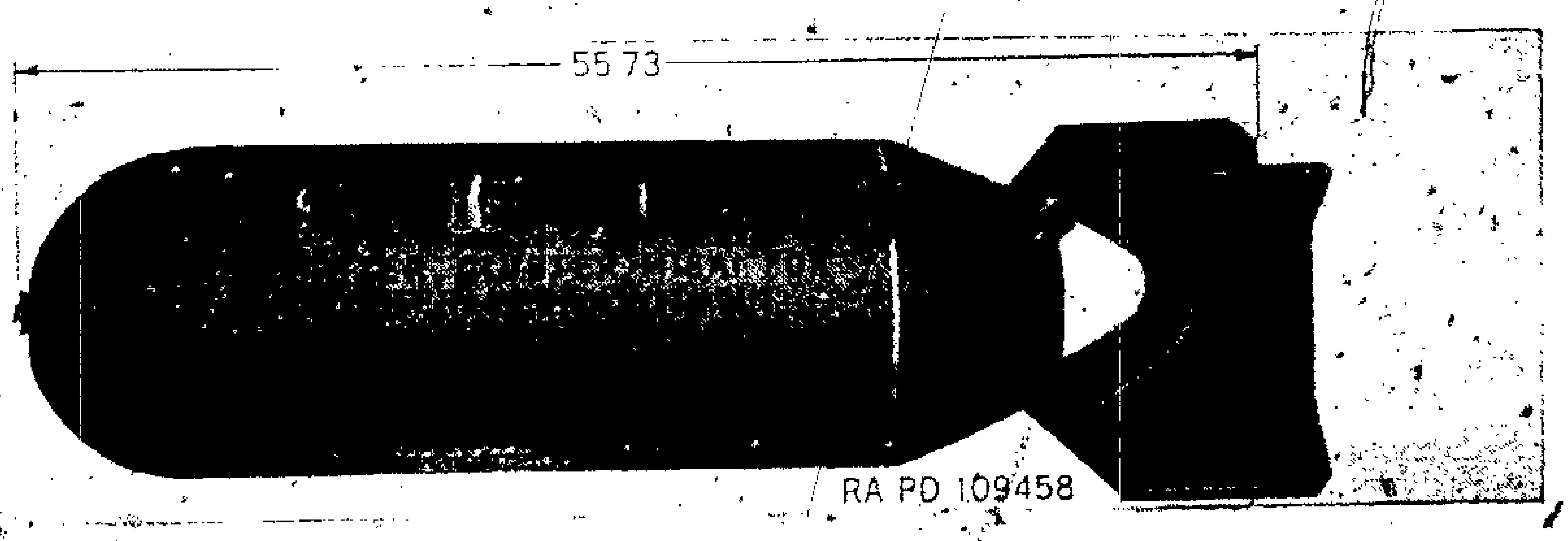

Figure 118. Adapter, cluster, M16A1.

171. Adapter, Cluster, M16 and M16A1

These adapters (fig. 118) are the same, except for size, as the M15 series (par. 170). The M16 series adapters are used to assemble ninety 4-pound fragmentation bombs M83 to form the clusters M29 and M29A1, the M16 being used for the M29 and the M16A1 for the M29A1. The addition of a new nose locking cup to the M16 adapter forms the M16A1. This locking cup is of the same design as described in paragraph 170 *d*.

Section IV. HOOK AND CABLE ADAPTERS

172. General

The hook and cable adapters (fig. 109) differ from the quick-opening (frame) and aimable types in that they serve only as a means of hanging more than one bomb or more than one cluster of bombs to a shackle. Once the hook and cable clusters are released from the plane, all the items (bombs or clusters of bombs) in the cluster fall freely, that is, there is no means of keeping the items clustered while they are dropping. A hook and cable assembly consists of a loop of wire-stranded cable to which a harness-type snap hook is attached. The bombs dropped in these clusters (100-lb or 250-lb sizes) are assembled and fuzed in the same manner as for single suspension. However, with the exception of the hook and cable assembly M12, the swivel loops of the arming wires are not placed in the shackle but are placed over a stirrup shaped wire hanger which is connected to the shackle by means of a flat steel link.

173. Functioning

When the cable type cluster is dropped "armed," the stirrup (hanger) is not released by the shackle and in turn the hanger holds the arming wires which are withdrawn from the fuzes thus permitting the fuzes to arm. When dropped "safe" the complete assembly of bombs, arming wires, and hanger are released from the shackle. The hanger falls away from the arming wire swivel loops, thus permitting the arming wires to remain in place and render each bomb safe by preventing arming of the fuzes.

174. Adapter, Cluster, M12

a. GENERAL. This adapter (similar to the M17 shown in fig. 109) consists of two hook and cable assemblies. Each assembly consists of a hook with a 4.5-inch loop of steel cable attached. The adapter is used to suspend two 100-pound size bombs or clusters from a single station.

b. METHOD OF ASSEMBLY. Before the first bomb is installed, the loop of wire is placed over each suspension lug before the shackle is attached. The hook of each cable is then snapped to a suspension lug of the second bomb or cluster. The arming wire swivel loops from both bombs or clusters are attached to the arming hook of the shackle. Care should be taken to see that the arming wire of the second bomb or cluster is long enough so that it will not pull out of the fuzes when the loop is attached to the shackle.

175. Adapter, Cluster, M17 (T15)

a. GENERAL. This adapter (fig. 109) consists of four hook and cable assemblies and an arming wire assembly consisting of a hanger assembly and three arming wires. Two of the hook and cable assemblies form a loop of 4.37 inches when extended; the other two assemblies form a loop of 12.18 inches when extended. This adapter is used to suspend three 100-pound size bombs or clusters from a single station.

b. METHOD OF ASSEMBLY. The bombs are fuzed as for single suspension and the bomb to be placed in the shackle is fitted with the shortest arming wire assembly, the second bomb with the next longest arming wire, and the last bomb with the longest arming wire. Before the first bomb is installed, one short and one long hook cable assembly are looped over its forward suspension lug and the remaining pair (one short and one long) is looped over the rear suspension lug before the shackle is attached. The hooks of the short cables are then snapped to the suspension lugs of the second bomb or cluster. After the second bomb has been installed, the hooks of the long cables are then snapped to the suspension lugs of the third bomb or cluster. Then the link end of the stirrup shaped hanger is passed through the swivel loops of the three arming wires and is fastened to the shackle by the link. Care should be exercised in assembling the hanger; be sure that the arming wires of the second and third bombs are long enough so that they will not pull out of the fuzes.

176. Adapter, Cluster, M18 (T16)

a. GENERAL. This adapter consists of two hook and cable assemblies. Each assembly consists of a hook with a loop of wire-stranded cable which is 7 inches long when extended. The adapter is used to suspend two 250-pound size bombs or clusters from a single station.

b. METHOD OF ASSEMBLY. Before the first bomb is installed, a hook and cable assembly is looped over each of the suspension lugs.

The hook of each assembly is then snapped to a suspension lug of the second bomb or cluster. A stirrup shaped wire hanger is then passed through the swivel loops of the arming wires and attached to the shackle by the link attached to the hanger. Care should be taken to see that the arming wires are long enough so that they will not pull out of the fuzes when the loop is attached to the shackle.

177. Adapter, Cluster, M24A1 (T19)

a. GENERAL. This adapter consists of two sets of five separate hook and cable assemblies and one hanger assembly with six arming wires. The hook and cable assemblies and arming wires are color coded as indicated in figures 119 and 120. This adapter is used to suspend six 100-pound nose-fuzed bombs or clusters from a single station (fig. 121).

b. METHOD OF ASSEMBLY. Figure 119 illustrates the numbering system used to identify each of the six bombs in the cluster and the manner in which the hooks and cables are fastened to the bombs. The numbers assigned to the bombs indicate the order of assembly. Figure 121 illustrates the manner in which arming wire assemblies are fitted to the six bombs. Using figures 119 and 121 as reference, assemble the cluster as follows:

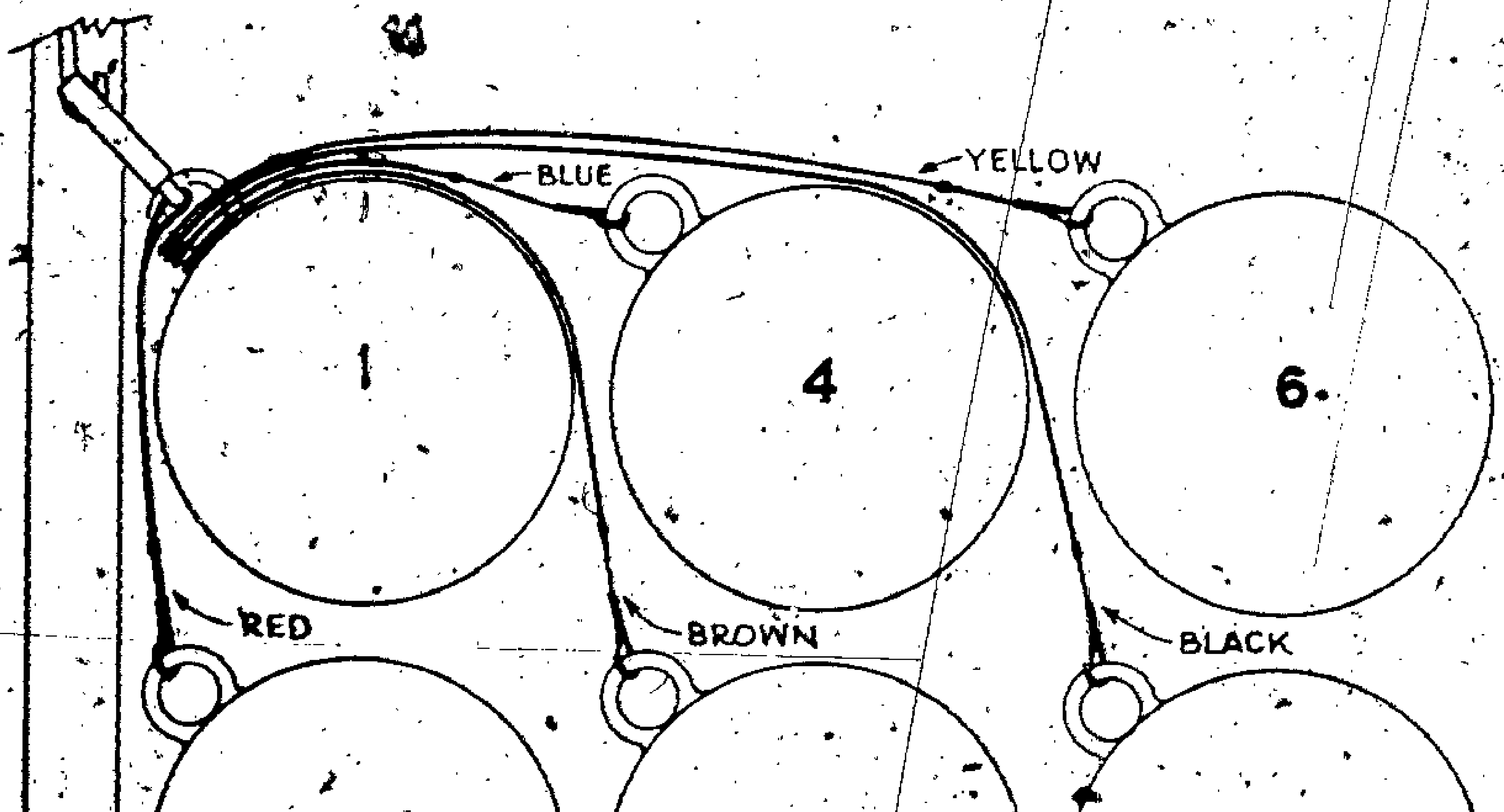

Figure 119. Set of hook and cable assemblies for adapter, cluster, M24A1—two sets required.

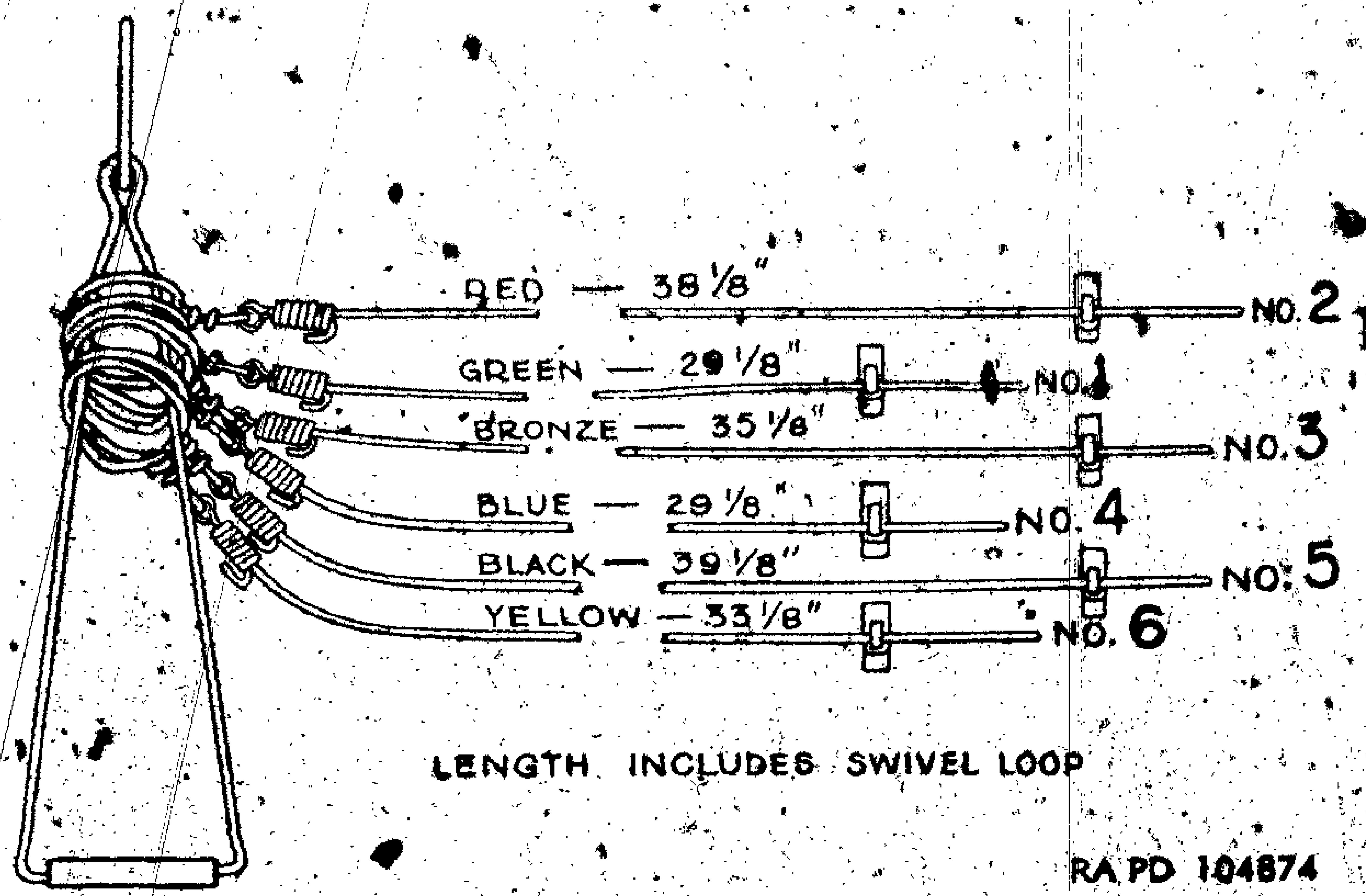

Figure 120. Hanger and arming wire assemblies for adapter, cluster, M24A1.

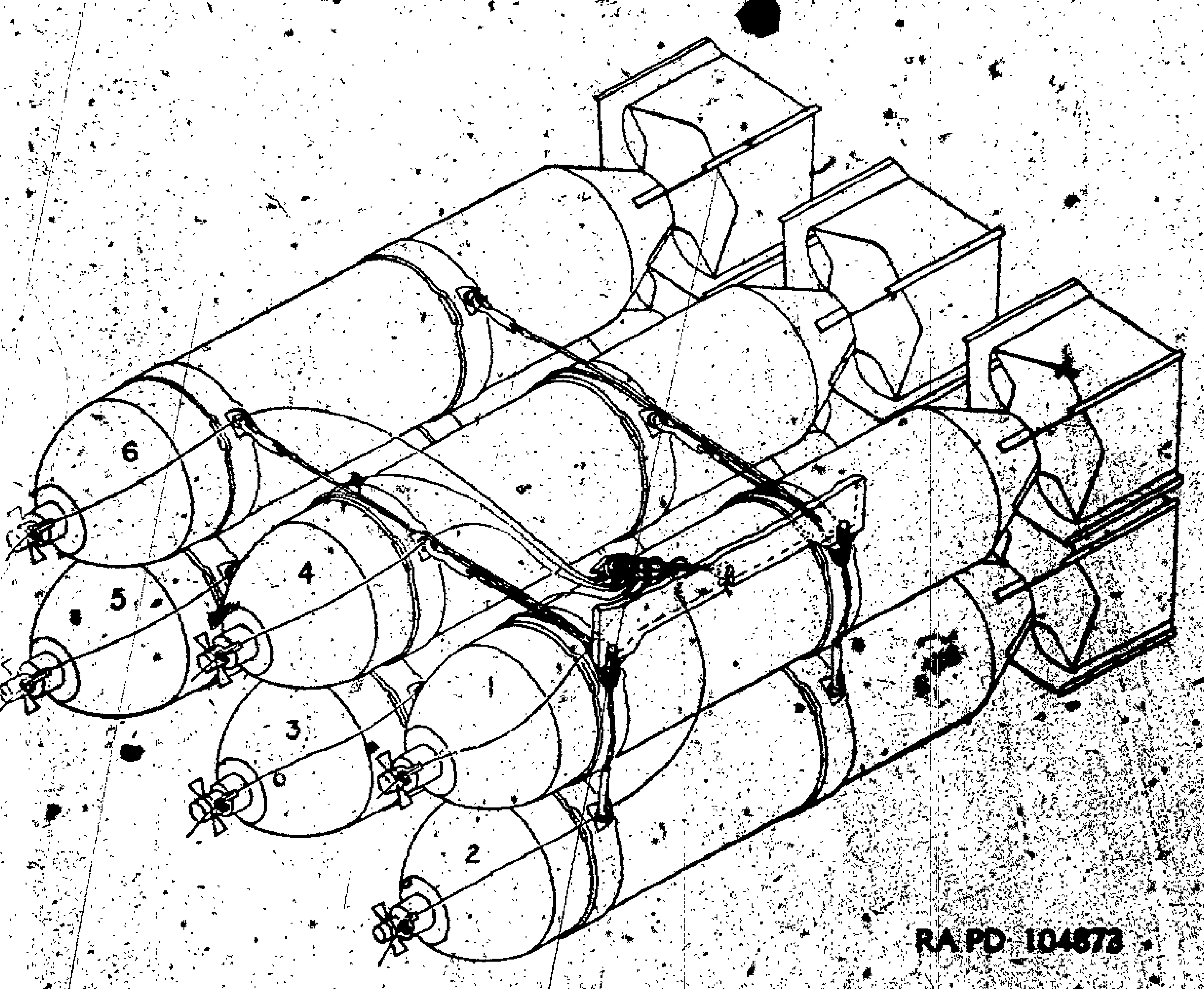

Figure 121. Bombs assembled in adapter, cluster, M24A1.

(1) Prepare each bomb as for single suspension. Do not remove sealing wires from fuzes.

(2) Position the No. 1 bomb so that its suspension lugs are on top of the bomb.

(3) Assemble one set of hooks and cables to each suspension lug as follows:

(*a*) Set aside the red assembly for use in (4) below.

(*b*) Pass the *loops* of the brown, blue black, and yellow assemblies over the suspension lugs, in the sequence enumerated.

(*c*) The assemblies should all hang over the side of the bomb which will be away from the bomb rack.

(4) Prepare shackle for fastening to bomb and then place the *loop* of a red assembly over each bomb hook on the shackle so that the assembly will hang over the side of the bomb nearest the shackle.

(5) Fasten the shackle to the No. 1 bomb. Make sure that the loops of the hook and cable assemblies are secure around the suspension lugs and that the assemblies extend to their full lengths.

(6) Lift the bomb and attach shackle to bomb rack.

(7) Place the ring of the arming wire hanger into the arming hook of the shackle. The order of arming wires, from the large end (copper sleeve) of the hanger, should be yellow, black, blue, bronze, green, and red.

(8) Suspend the No. 2 bomb below No. 1 bomb by snapping hooks of the *red* hook and cable assemblies into the suspension lugs of the No. 2 bomb.

(9) Pass the *red* arming wire between the shackle and bomb No. 1 and through the forward lug of No. 2 bomb to the fuze. Assemble wire to fuze and install safety clips if required. (See instructions in ch. 5 pertaining to the particular fuze.)

(10) Pass the *green* arming wire over the cables directly to No. 1 bomb fuze. This wire *does not* pass through the suspension lug. Assemble wire to fuze as for No. 2 bomb ((9) above).

(11) Suspend No. 3 bomb by means of hooks on the *bronze* hook and cable assembly.

(12) Pass the *bronze* arming wire over the No. 1 bomb and through the forward suspension lug to the No. 3 bomb fuze. Assemble wire to fuze as for the No. 2 bomb ((9) above).

(13) Suspend No. 4 bomb by means of hooks on the *blue* hook and cable assemblies.

(14) Pass the *blue* arming wire over the No. 1 bomb and through the forward suspension lug to the No. 4 bomb fuze. Assemble the wire to fuze as for the No. 2 bomb ((9) above).

(15) Suspend No. 5 bomb by means of hooks on *black* hook and cable assembly.

(16) Pass the *black* arming wire over bombs Nos. 1 and 4 and through the forward suspension lug of No. 5 bomb to the fuze. Assemble wire to fuze as for No. 2 bomb ((9) above).

(17) Suspend the No. 6 bomb by means of hooks on the *yellow* hook and cable assembly.

(18) Pass the *yellow* arming wire across the top of bombs Nos. 1 and 4 and through the forward suspension lug on No. 6 bomb to the fuze. Assemble wire to fuze as for No. 2 bomb ((9) above).

(19) Remove all kinks and burs from arming wires. Leave enough slack in the wires so that the hanger ring is not placing any pressure on the shackle arming hook; if this is not done, the shackle may fail to release the cluster. Make sure that arming wires and cables are not tangled.

(20) If necessary, adjust positions of bombs to properly mesh the bomb fins and to be certain that each cable carries its share of the load.

(21) Remove sealing wires from all fuzes.

CHAPTER 8

CLUSTERS OF EXPLOSIVE AND PRACTICE BOMBS*

Section I. INTRODUCTION

178. Precautions

a. Since clusters of bombs represent the only instance in which it is permitted to store and ship fuzed bombs, they present a unique problem in care and handling and involve exceptional precautions. Clusters are shipped one in a wooden box as assembled complete rounds. They need only be unpacked and have the arming wire installed and the various safety devices removed (par. 179) to be ready for use.

b. Boxed clusters should be handled carefully. They should be carried and set down in place horizontally. They should not be slid, tumbled, or struck. Boxes should not be "walked" on the corners.

c. Upon opening a box, the cluster should be inspected to insure that fuze safety devices are in place. For pin type fuzes, the fuze arming wire and safety cotter pin should both be in place. For vane type fuzes, the safety block should be taped in place. If pin type fuzes show evidence of having armed, the cluster will not be removed from the box but will be taken with the utmost care to a safe place and there destroyed with explosive by authorized and experienced personnel in accordance with regulations prescribed in SR 385–310–1—AFR 50–13. If the safety blocks of vane type fuzes have fallen out, they will be replaced and taped in place, the cluster broken down, and such fuzes removed from the bomb and destroyed. Binding wires or straps which hold the bombs in place should be tight and unbroken. Broken wires or straps may be replaced and the cluster used.

179. Preparation for Use

After inspection as specified in paragraph 178 *c*, the cluster is prepared for use as follows:

a. Assemble arming wire by threading the long branch through the forward suspension lug and through the holes in the front release mechanism. Thread the short branch through the rear lug and the rear release mechanism. Adjust the wires to protrude

* For chemical-bomb clusters see pertinent publications listed in SR 310–20–4.

[illegible]. Place a Fahnestock clip on each end. Remove all kinks and [illegible].

b. Pull up the desired suspension lugs and fasten with cotter pins supplied.

c. Remove adhesive tape from safety blocks of vane type fuzes. If safety block falls out, replace and retape. Reject the cluster until the fuze can be replaced. Or, remove adhesive tape from arming wire of pin type fuzes and remove safety cotter pin from fuze.

d. Install cluster and remove cotter pins from release mechanism.

e. If the cluster is not dropped, replace all pins and taping before repacking cluster for return to storage.

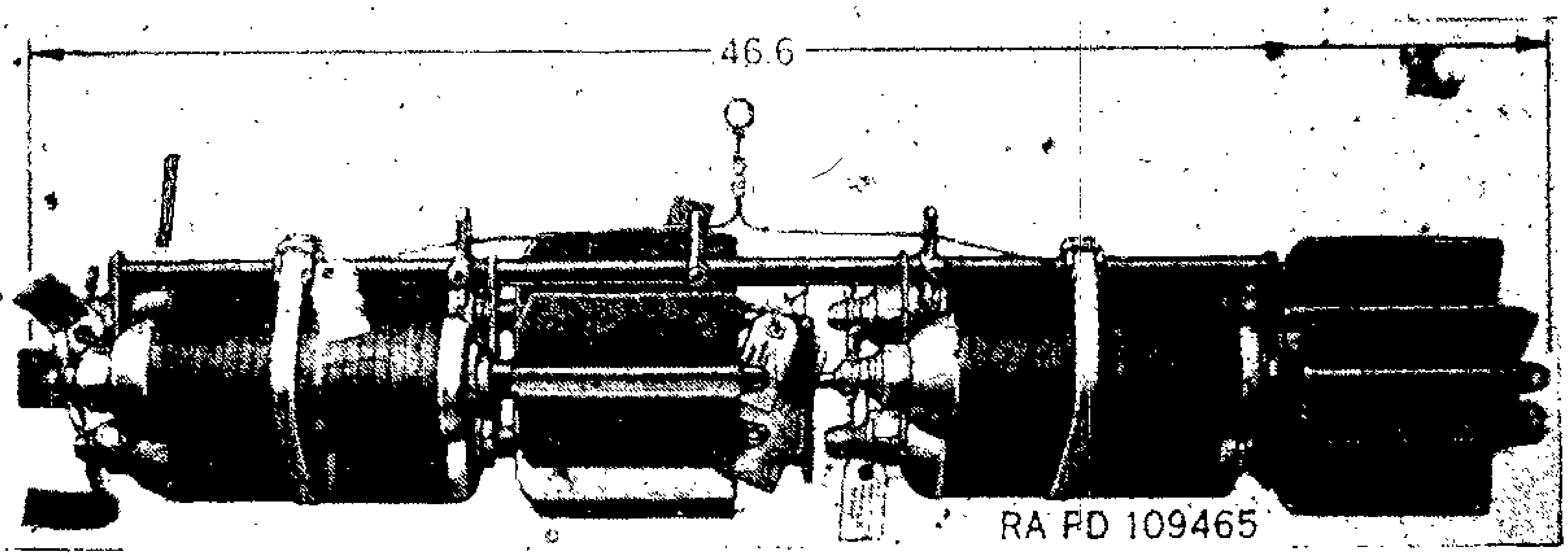

Figure 122. Cluster, fragmentation bomb, AN–M1A2.

Section II. QUICK OPENING (FRAME) CLUSTERS

180. Cluster, Fragmentation Bomb, AN–M1A2

CLUSTER, fragmentation bomb, AN–M1A2 (100-lb size) (6 BOMB, fragmentation, 20-lb, AN–M41A1, unfuzed) (fig. 122) is assembled by means of ADAPTER, cluster, M1A3 which is of the mechanical release type (fig. 110). The fuzed cluster is 46.6 inches long and weighs 128 pounds. It is provided with flat steel lugs for single or double suspension. The AN–M1A2 cluster is issued unfuzed. The FUZE, bomb, nose, AN–M158 is authorized for use with this cluster. The FUZE, bomb, nose, M110A1 (AN–M110A1) may be used as an alternative.

181. Cluster, Fragmentation Bomb, M1A1

CLUSTER, fragmentation bomb, M1A1 (100-lb size) (6 BOMB, fragmentation, 20-lb, M41, AN–M41, or AN–M41A1, w/fuze, bomb, nose, M110A1) is the same as the AN–M1A2 except that it is assembled by means of the ADAPTER, cluster M1A2 or M1A1 which has U type suspension lugs and weighs 125 pounds. This cluster is issued fuzed.

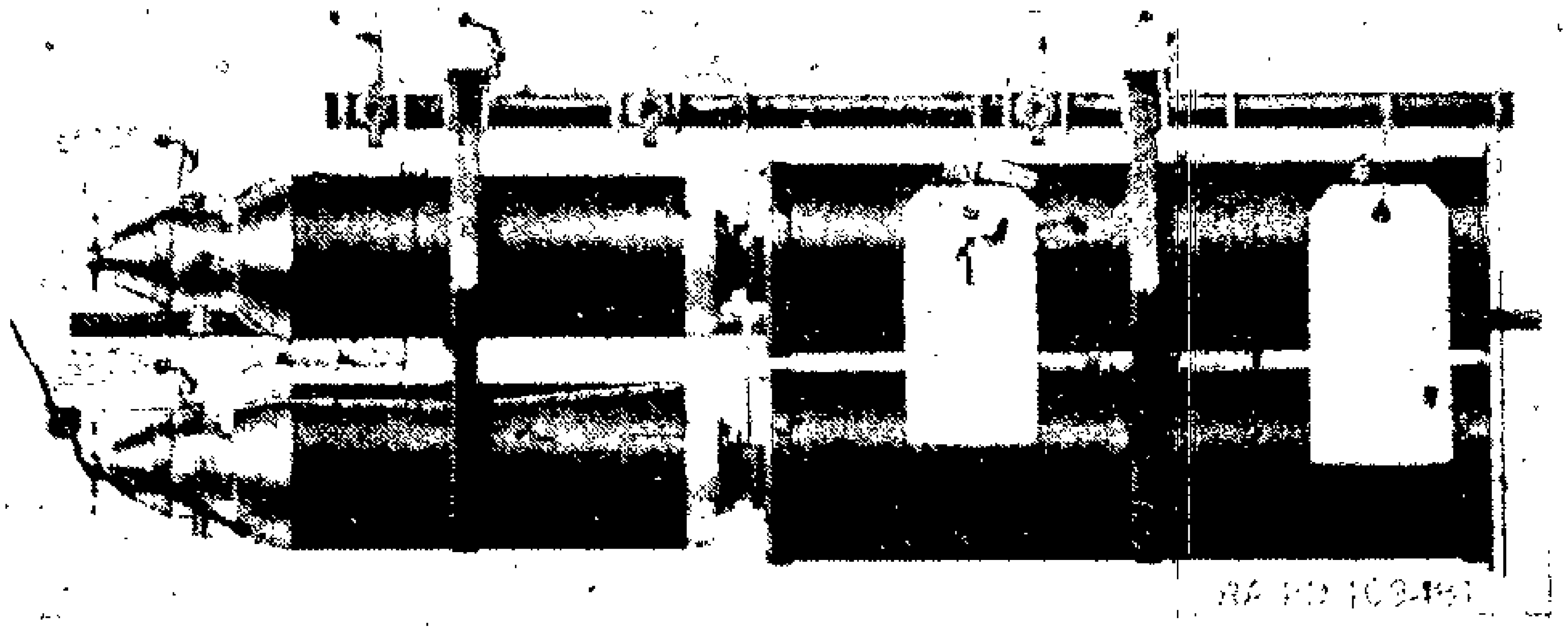

Figure 123. Cluster, fragmentation bomb, M4A2.

182. Cluster, Fragmentation Bomb, M4A2

CLUSTER, fragmentation bomb, M4A2 (100-lb size) (3 BOMB, fragmentation, 23-lb, M40A1, unfuzed) (fig. 123) is assembled by means of ADAPTER, cluster, M3A1 which is of the mechanical release type (fig. 111). The fuzed cluster is 31 inches long and weighs 87.2 pounds. It is provided with flat steel suspension lugs for single or double suspension. The FUZE, bomb, nose, M170 is authorized for use with the bombs in this cluster. The FUZE, bomb, nose, M120 or M120A1 (AN–M120A1) may also be used in lieu of the M170.

Note. This cluster is installed in the plane with parachute case forward. Unsatisfactory dispersion may result if the bombs are installed nose forward.

183. Cluster, Fragmentation Bomb, M4A1

CLUSTER, fragmentation bomb, M4A1 (100-lb size) (3 BOMB, fragmentation, 23-lb, M40 or M40A1, unfuzed) is the same as the M4A2 (par. 182) except that it employs the ADAPTER, cluster, M3.

184. Cluster, Fragmentation Bomb, M4

CLUSTER, fragmentation bomb, M4 (100-lb size) (3 BOMB, fragmentation, 23-lb, M40, w/fuze, bomb, nose, M120, M120A1, or M170) is the same as the M4A2 (par. 182) except that the M4 uses the bomb, M40 and the cluster adapter M3. Also, the M4 is issued fuzed.

185. Cluster, Fragmentation Bomb, M26 Series

a. GENERAL. This series of clusters consists of the models M26, M26A1, and M26A2 (figs. 124 and 125) and all contain twenty 20-pound fragmentation bombs. The clusters M26 and M26A1 contain the AN–M41 fragmentation bomb and are shipped fuzed;

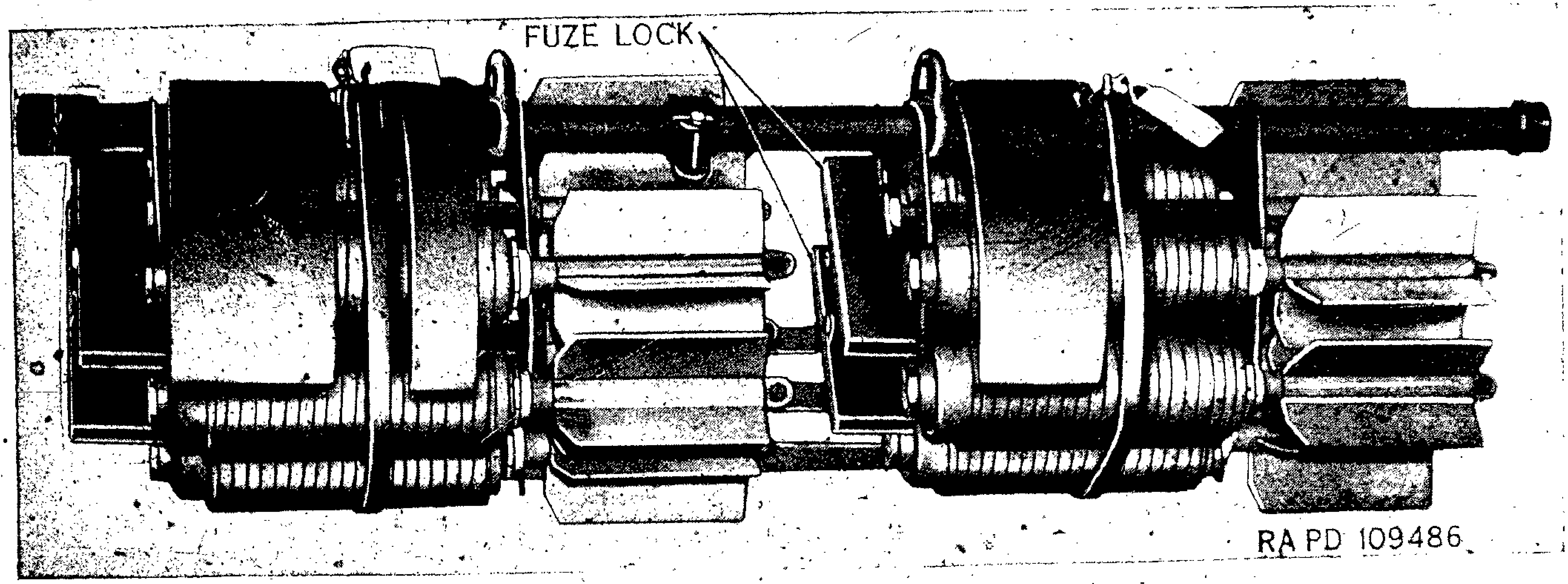

Figure 124. Cluster, fragmentation bomb, M26A2, unfuzed.

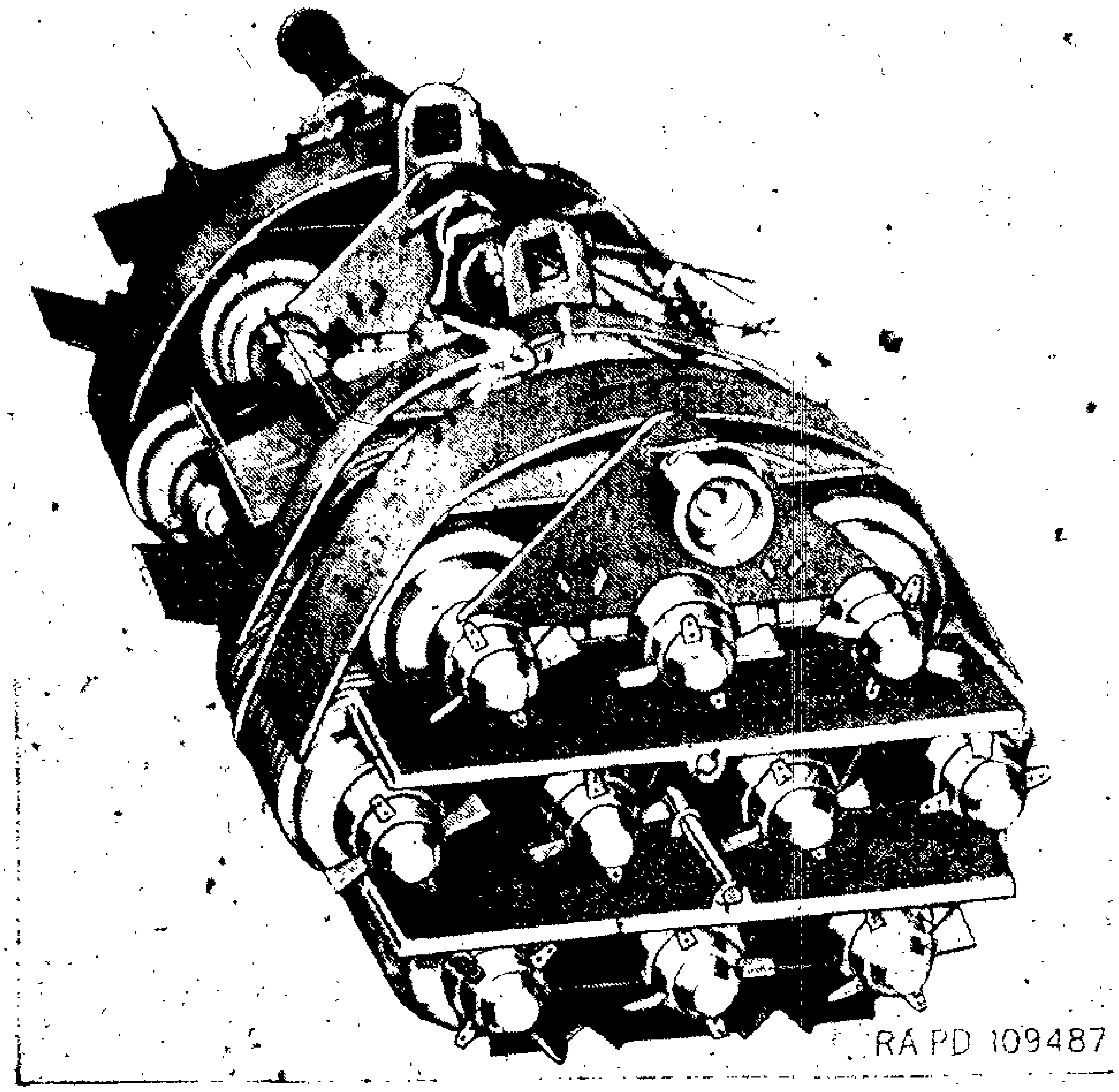

Figure 125. Cluster, fragmentation bomb, M26A2, fuzed.

the M26A2 contains the AN–M41A1 fragmentation bomb and is shipped unfuzed. The FUZE bomb, nose, AN–M158 is authorized for use in the bombs and FUZE, bomb, nose, M110A1 (AN–M110A1) may be used in lieu of the AN–M158. This type cluster may be dropped for immediate opening or for delay opening. If delay opening is required, the cluster adapter must be fuzed with the mechanical time fuze M155. The cluster, which fits a 500-pound bomb station, is 52.56 inches long and weighs 416 pounds. The three models differ as follows:

(1) The M26 consists of 20 fuzed fragmentation bombs AN–M41 assembled by means of the cluster adapter M13.

(2) The M26A1 consists of 20 fuzed fragmentation bombs AN–M41 assembled by means of the cluster adapter M13A1.

(3) The M26A2 consists of 20 unfuzed fragmentation bombs AN–M41A1 assembled by means of the cluster adapter M13A2.

b. FUNCTIONING.

(1) *Delay opening.* When released armed, the arming wire remains attached to the bomb shackle and is pulled out of the strap clamps and mechanical time fuze. No Fahnestock clips are used on the arming wire with mechanical

time fuzes. The clamps remain closed because of the shear wires. At the expiration of the time set on the fuze, the fuze functions and drives the steel slug through the longitudinal member tube. This slug severs the shear wires which hold the clamps closed. The clamps then open and allow the bombs to be pushed out of the cluster adapter by the separator assemblies. Air stream arms the fuzes and the individual bombs detonate upon impact

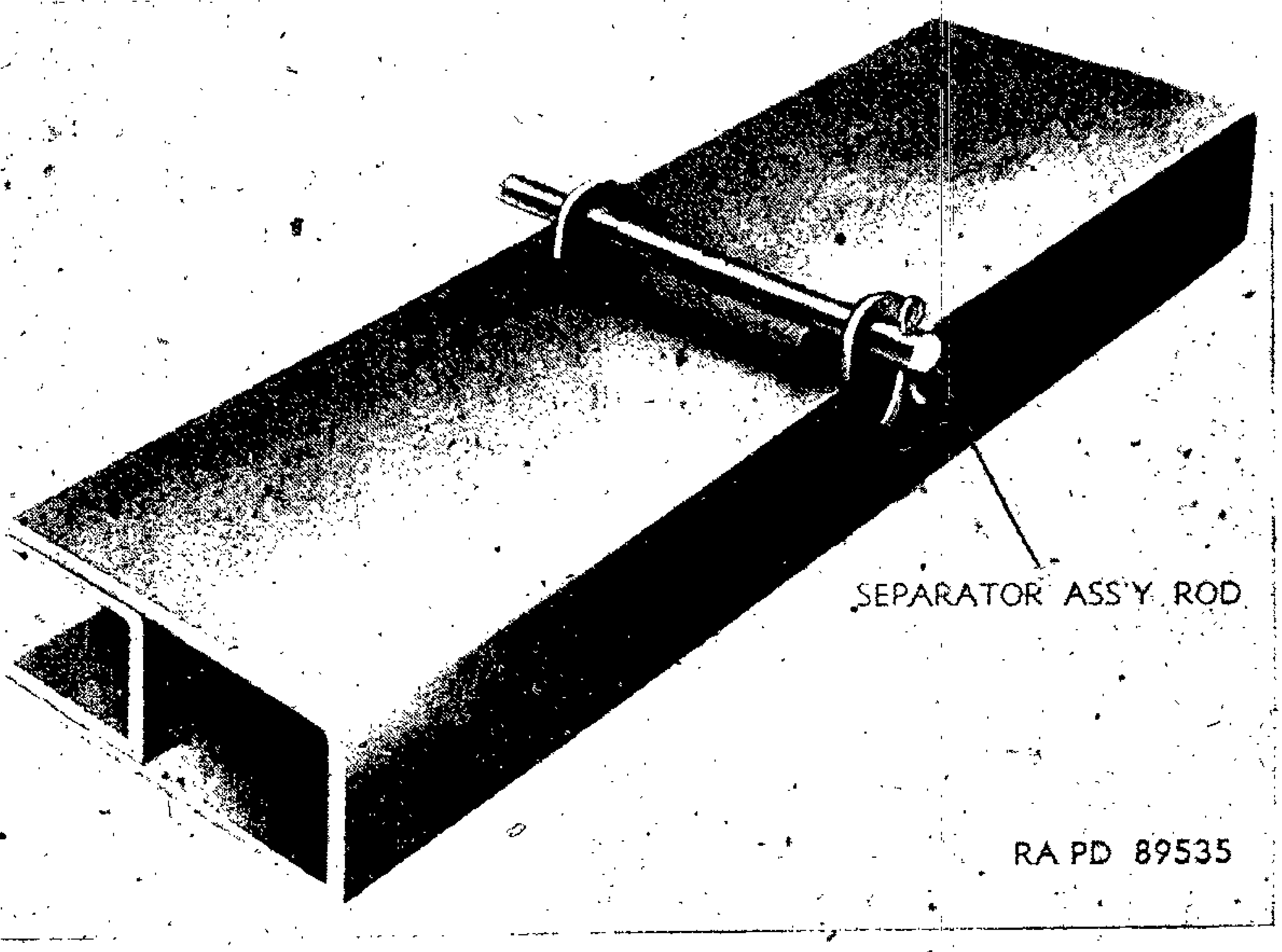

Figure 126. Cluster, fragmentation bomb, M26A2—details of fuze vane lock.

(2) *Immediate opening.* The mechanical time fuze is not used for immediate opening and the shear wires must be cut. When released armed, the arming wire is withdrawn from the clamps. They open and allow the individual bombs to be pushed out of the cluster adapter by the separator assemblies. Air stream then arms the fuzes and the bombs detonate upon impact.

(3) *Released safe.* If the cluster is released safe, the arming wire is dropped with the cluster and thereby prevents the clamps from opening and also prevents the mechanical time fuze, if on the cluster, from becoming armed. The individual bomb fuzes will not arm because they remain fixed to the cluster. However, the bombs may function on impact.

c. PREPARATION FOR USE.

(1) *To unpack cluster.* Unpack cluster and remove all packing accessories such as extra strapping, lug rods and thrust plates. Inspect for general serviceability. Be sure that cotter pins and shear wire are present in strap clamps and that straps hold bombs securely. Place desired suspension lugs in position and fasten with pins provided.

(2) *To fuze bombs.*

(*a*) Cut and remove wire holding removable fuze vane locks on long separator assembly rods of cluster. Retain two cotter pins threaded on wire.

(*b*) Remove fuze vane locks (fig. 126). Remove shipping plugs from bombs and inspect fuze seats.

(*c*) Unpack and inspect fuzes.

(*d*) Cut, but do not remove, fuze seal wires. Hold them in place by such means as a loose twist or sharp bend.

(*e*) Assemble fuzes to lower layer of rear bank of bombs. If the arming wire guide on the fuze body is between eleven o'clock and one o'clock, it will interfere with the assembly of the fuze vane lock. In such a case, unscrew the fuze and add improvised shims so that, when the fuze is handtight, the arming wire guide will not be in position to interfere with the vane lock.

(*f*) Assemble fuzes to middle layer of bombs in accordance with (*e*) above to avoid interference with both lower and upper fuze vane locks.

(*g*) Replace lower fuze vane lock on rod, insert cotter pin, and spread at least 90 degrees.

(*h*) Assemble fuzes to upper layer of bombs and replace upper fuze vane lock, insert cotter pin, and spread at least 90 degrees.

(*i*) Assemble fuzes and fuze vane locks to front bank of bombs in the same manner as described for rear banks in (*e*), (*f*), (*g*), and (*h*) above.

(*j*) Insure that vane locks are securely assembled; then remove fuze sealing wires.

(3) *To prepare cluster for immediate opening.*

(*a*) Cut off fine branch of arming wire.

(*b*) Pass one branch of arming wire through forward suspension lug and outer holes in forward strap clamp. Pass other branch through rear lug and rear strap clamp.

(c) At each strap clamp, cut shear wire (fig. 130) between clamp and sleeve and pull wire out from under side of tube.

(d) Remove cotter pins from strap clamps.

(e) Install cluster in plane.

Note. If cluster is not used, return it to its original condition in accordance with *d* below.

(4) *To prepare cluster for delay opening.*

(a) Inspect fuze well in longitudinal member tube to make sure that it is serviceable and free of any obstruction or foreign material and examine for presence of steel slug and its holding wire.

(b) Install cluster securely in bomb rack of plane.

(c) Inspect the mechanical time fuze M155.

(d) Set fuze for time desired by loosening set screw, turning fuze head until time desired is indicated by index line on fuze body, and retightening set screw.

(e) Screw fuze handtight into longitudinal member tube.

(f) Pass fine branch of arming wire through front suspension lug and both holes in the mechanical time fuze arming pin bracket and vane so that it extends 2 to 3 inches. Be sure the wire is not kinked or burred. No Fahnestock clip is necessary. Pass heavy branches of arming wire through suspension lugs and strap clamps. *Do not cut shear wire of each strap clamp.*

(g) Remove cotter pins from strap clamps. Remove sealing wire, cotter pin, and striker stop from mechanical time fuze.

d. TO RETURN TO STORAGE. If the cluster is not used, replace sealing wire, cotter pin, and striker stop in the time fuze; replace cotter pins in cluster strap clamps. Remove arming wire from time fuze and remove time fuze for separate storage. Remove cluster from the rack. For temporary storage (alerted ammunition), the cluster may be stored without unfuzing the individual bombs. In the case of the cluster M26A2 and for other than temporary storage, the individual bombs will be unfuzed as follows:

(1) Replace and secure seal wires in fuzes in top layer of bombs.

(2) Remove upper fuze vane lock.

(3) Replace and secure seal wires in fuzes in middle layer of bombs.

(4) Remove fuzes from top layer of bombs.

(5) Replace and secure seal wires in fuzes in lowest layer of bombs.

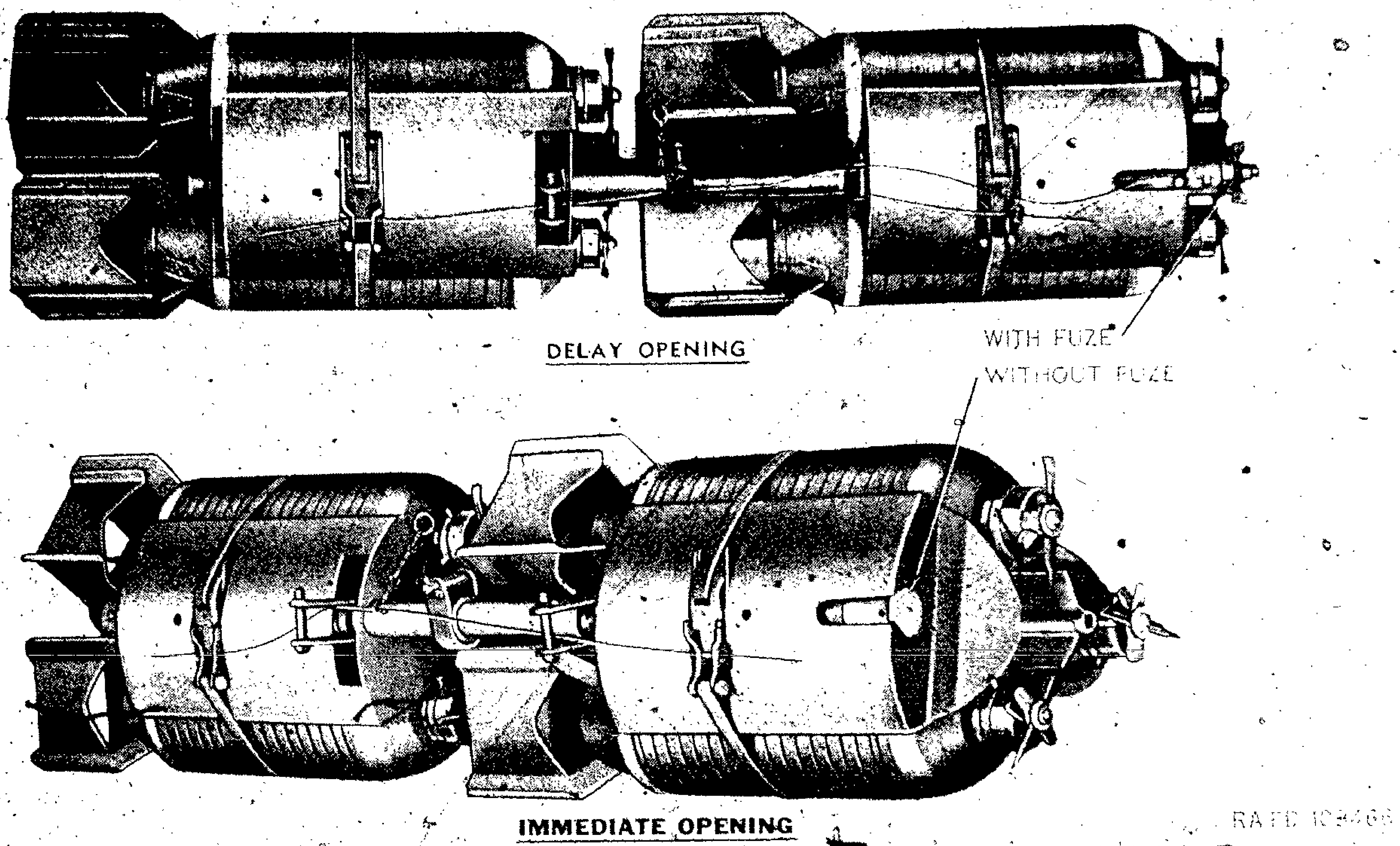

Figure 127. Cluster, fragmentation bomb, M27 type—showing cluster set for delay opening and immediate opening.

(6) Remove lower fuze vane lock.

(7) Remove fuzes from middle and lower layers of bombs.

(8) Repack and reseal fuzes in containers.

(9) Replace fuze hole plugs and replace cluster in original packing.

Note. If the cluster was prepared for immediate opening, new shear wires must be installed before cluster can be used for delay opening. WIRE, arming, low brass, 0.064-inch diameter, cut to proper length, may be used as a replacement shear wire; loops formed at both ends (similar to those on the original shear wire) will hold it in place.

186. Cluster, Fragmentation Bomb, M27 Series

a. GENERAL. The only difference between these clusters is that the M27 employs the ADAPTER, cluster, M14 and the M27A1 uses the ADAPTER, cluster, M14A1 (par. 169). In all other respects the information in this paragraph pertains to both the M27 and M27A1. This cluster (figs. 127 and 132) is of the 500-pound size and contains six 90-pound fragmentation bombs M82. The cluster may be adjusted to discharge the individual bombs immediately or, by the action of one or two mechanical time fuzes, to discharge the bombs 5 to 92 seconds after release from the plane. This cluster is assembled in the field and its components may be supplied unassembled or partially assembled. The assembled cluster is 59 inches long and weighs 585 pounds.

b. ASSEMBLY OF CLUSTER FOR STORAGE AND SHIPMENT.

(1) *Cluster.* The preliminary assembly of the cluster is carried out as follows (fig. 129):

(*a*) Place four bombs, pointing in the same direction, on

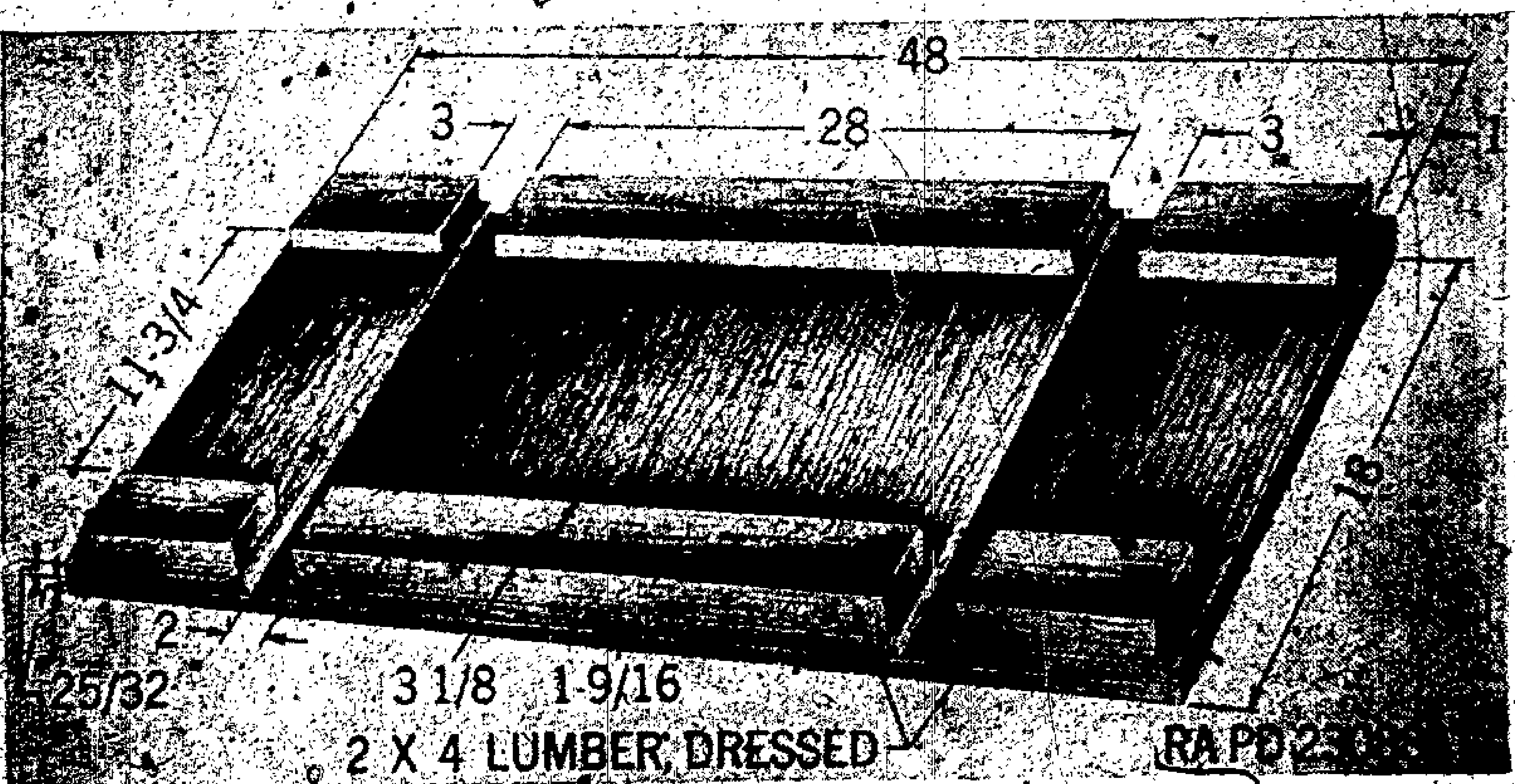

Figure 128. Assembly cradle for M27 clusters.

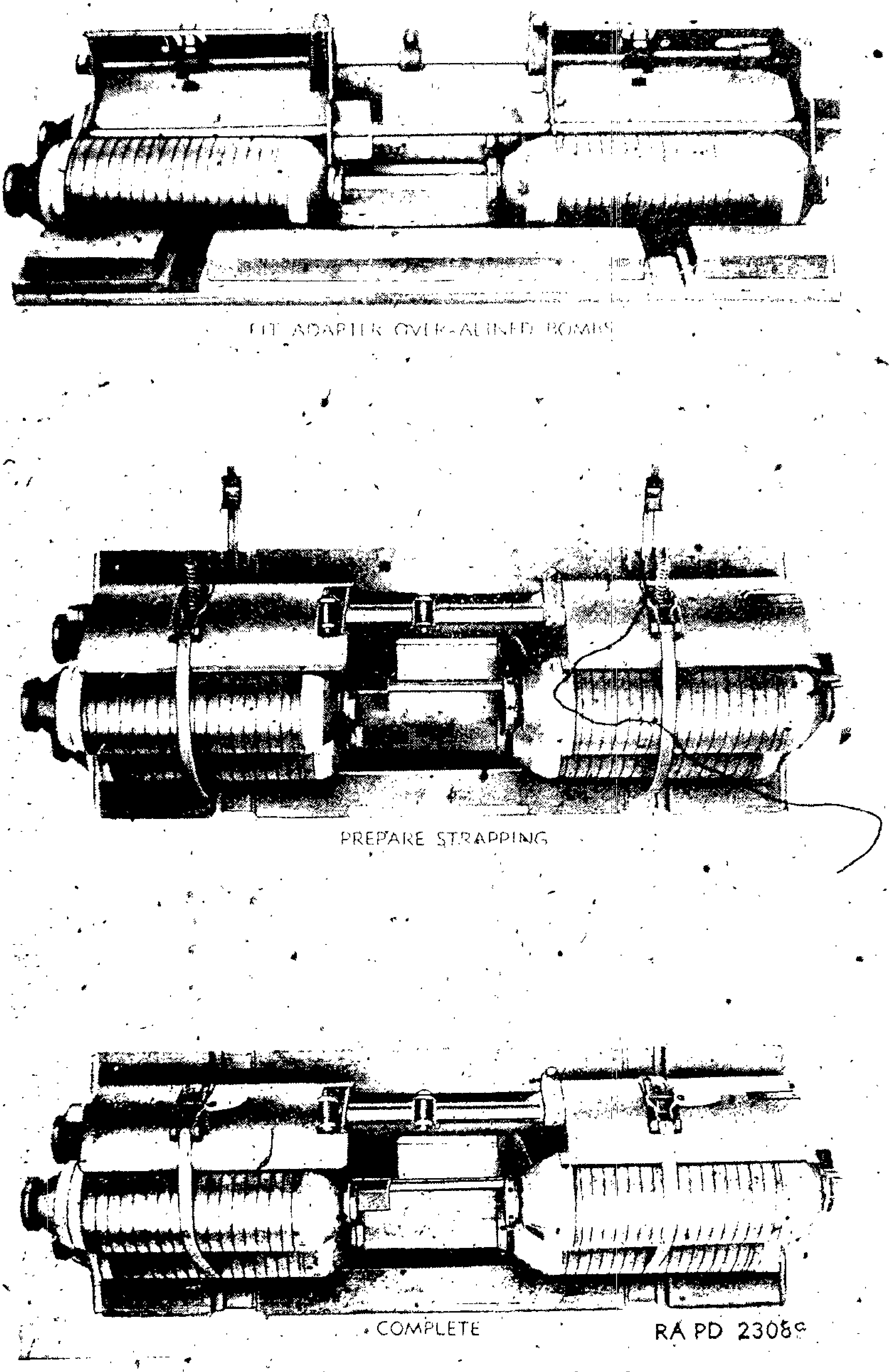

Figure 129. Steps in assembling M27 clusters.

an assembly cradle (par. 169) such as that illustrated in figure 128.

(b) Fit adapter over bombs and aline bombs to fit the nose and tail supports.

(c) Thread a shear wire through each of the two holes in the upper member between the side plates of the release mechanisms.

(d) Assemble remaining two bombs to adapter.

(e) Attach formed end of straps to release mechanisms with "D" bolts, assembling lock washer and nut loosely.

(f) Pass straight ends of straps around bombs and attach clamp to strap.

Note. To attach clamp to strap, pass straight end of strap through the wide slot in the clamp from the top. Place the clamp in approximate position in release mechanism and mark place for bending. Let the clamp slide down the strap and form a hairpin bend at the point marked. Bring the clamp back up the strap and pass the free end of the strap through the narrow slot. Pull up the clamp and, if necessary, seat it by tapping with a wooden block.

(g) Place kick-out spring over each shear wire.

(h) Place strap clamp on release mechanism, threading shear wire through clamps. Fasten clamp in position with cotter pin and tag, and spread ends of cotter pin.

(i) Tighten strapping around bombs by rolling strapping on "D" bolts with open-end wrench. When proper tension is obtained, tighten nut.

Note. The strap should be tight enough so that all slack is taken up, and tapping the strap with a wrench will cause it to rebound. However, it should not be so tight that the strap clamp cannot be depressed by thumb pressure.

(j) Form a loop in each shear wire, similar to the preformed loop at the other end (fig. 130).

Note. If available, Nicopress sleeve may be used to fasten shear wire, by crimping two sleeves to the shear wire first with crimping pliers, then with special crimping tool. Another piece of wire is placed in the empty channel of the sleeve to insure tight crimp.

(2) *Connectors.* Connectors are assembled as follows (fig. 129):

(a) Remove nose plugs of bombs in rear bank and replace with tubular connector assembly.

(b) Screw extension out until the cup is against the cone of the bomb in the forward band, wrenchtight.

(c) Holding the extension, tighten lock nut.

(3) *Nose protector cap.* Nose protector cap is assembled as follows:

(a) Remove nose plug from the forward bank of bombs.

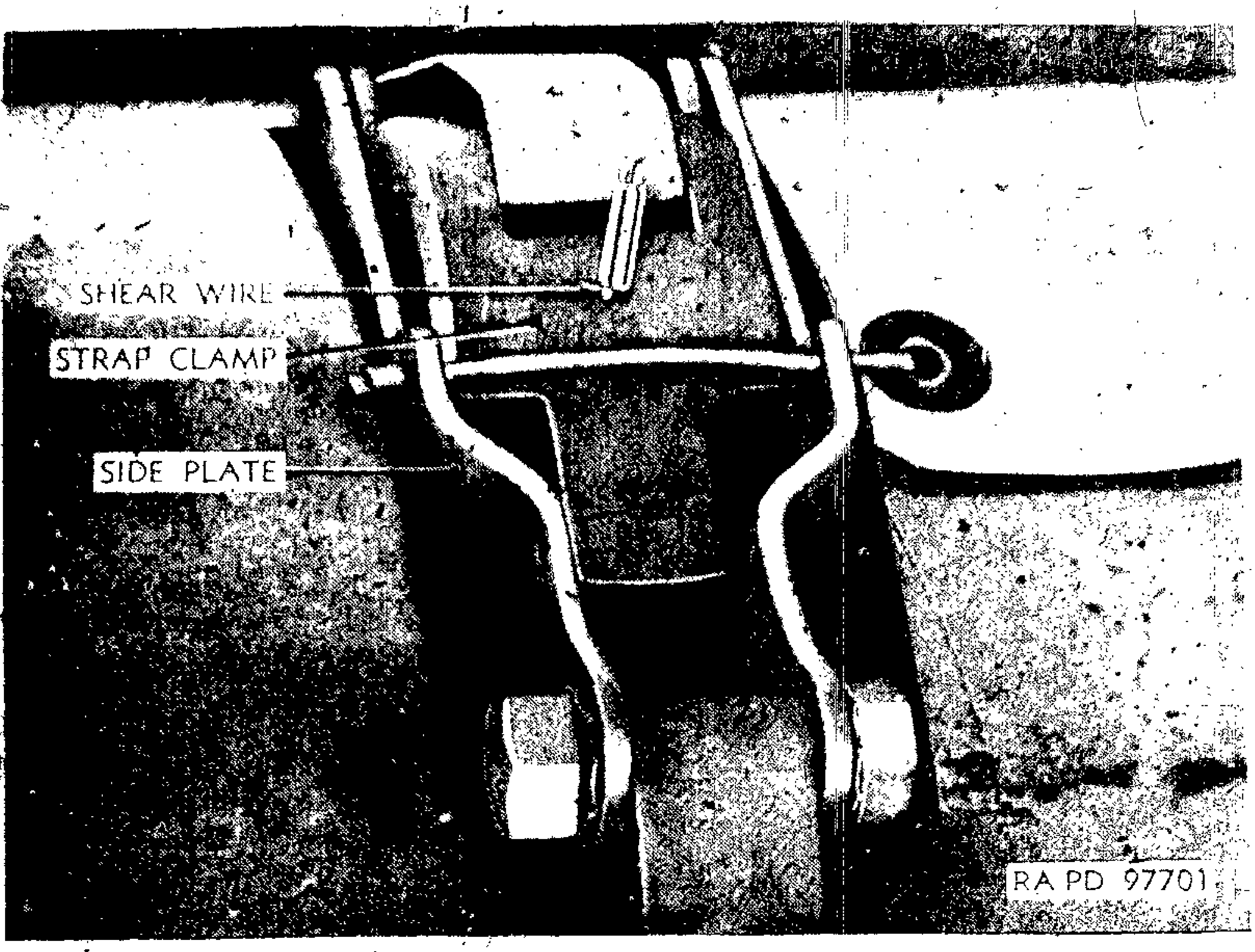

Figure 130. Shear wire assembly.

(*b*) Place nose protector cap in position and fasten in place by replacing nose plugs.

(4) *Shipping bands.* Shipping bands are assembled as follows:

(*a*) Brace the lower half of the shipping band assembly to prevent it from moving.

(*b*) Place the cluster into shipping band so that strapping is alined properly within the bands.

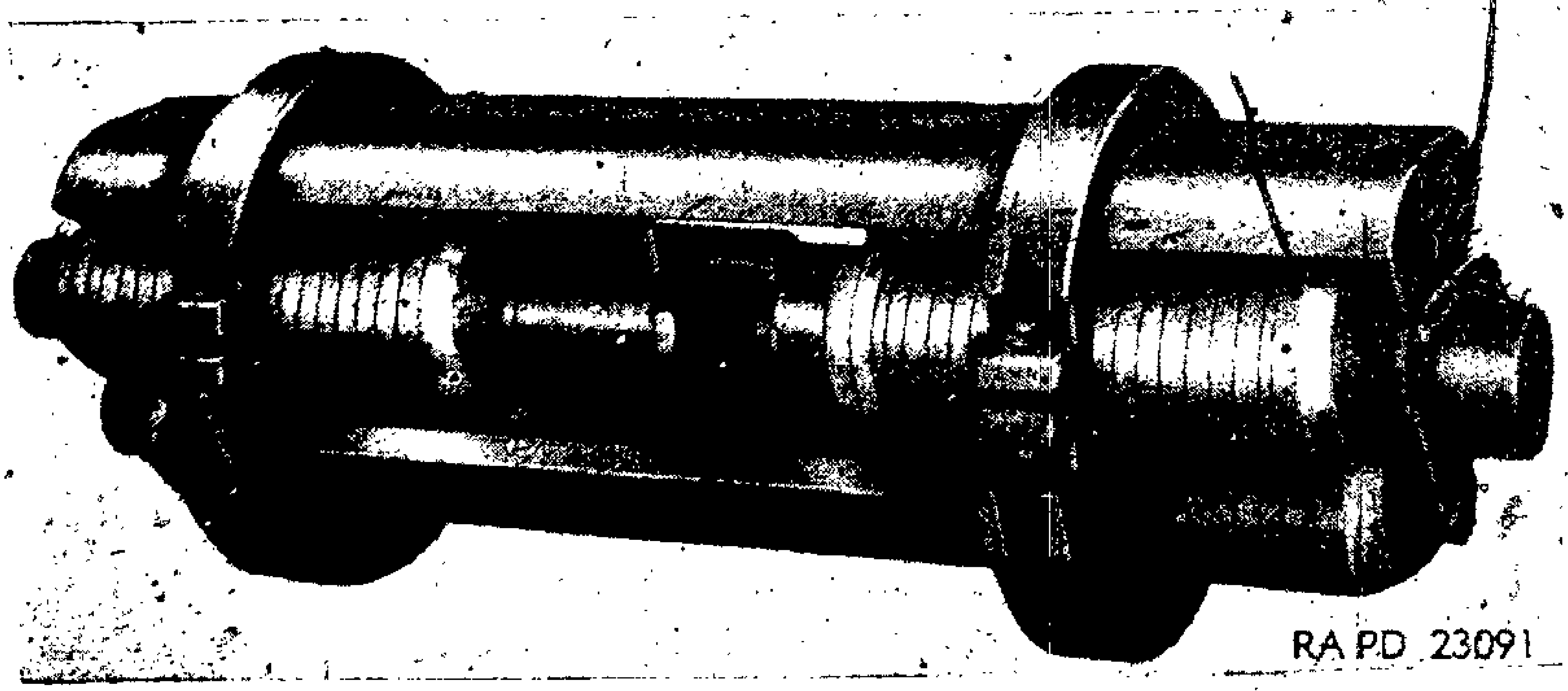

Figure 131. M27 cluster in shipping bands.

(c) Place upper half of shipping band assembly over cluster and assemble bolts, washers, and lock washers.

(d) Examine assembly to see that bands bear properly against the bomb bodies.

c. PREPARATION FOR USE.

(1) *General.* The cluster, partially assembled as described above, is prepared for use by assembling the fins and fuzes to the individual bombs and adjusting the adapter for immediate or delayed opening on release.

(2) *Assembly of bombs.*

(a) Remove cluster from shipping bands.

(b) Remove nose plugs and nose protector cap.

(c) Release lock nuts and remove connectors.

(d) Remove fin lock nuts from all bombs.

(e) Inspect fuze cavities and threads.

(f) Assemble fins to bombs. Be careful that fins are located so that they will not interfere with each other and will not be damaged when the cluster is installed in the plane (fig. 132).

(g) Unpack six FUZE, bomb, AN–M103A1. Inspect for serviceability. Discard the vane assembly supplied with the fuze.

(h) Set each fuze for superquick action by pulling out the setting pin and turning it so that the locating pin seats in the shallow slot.

(i) Screw a fuze into the nose of each bomb, handtight. If necessary, transfer the safety cotter pin so that it will be accessible from the outside of the cluster.

(j) Cut and remove the fuze seal wire. Assemble the short (4.6 in) vane supplied with the fin assembly.

(k) Remove the safety cotter pin and turn the vane each way to be sure that the adapter vane stop will prevent the fuze vane from rotating.

(3) *Preparation for delayed opening.* To prepare the cluster for delayed opening after release, prepare bombs as described in (2) above, then,

(a) Remove plug from nose end of upper member (fuze adapter) and remove envelope containing set screw. Inspect to see that the cavity is clear.

(b) Unpack FUZE, bomb, nose, mechanical time, M155, and inspect for serviceability. Remove and replace the striker stop to be sure that the safety block will not fall out.

(c) Set the time desired on the fuze. Loosen the thumbscrew in the side of the fuze body, turn the head of the

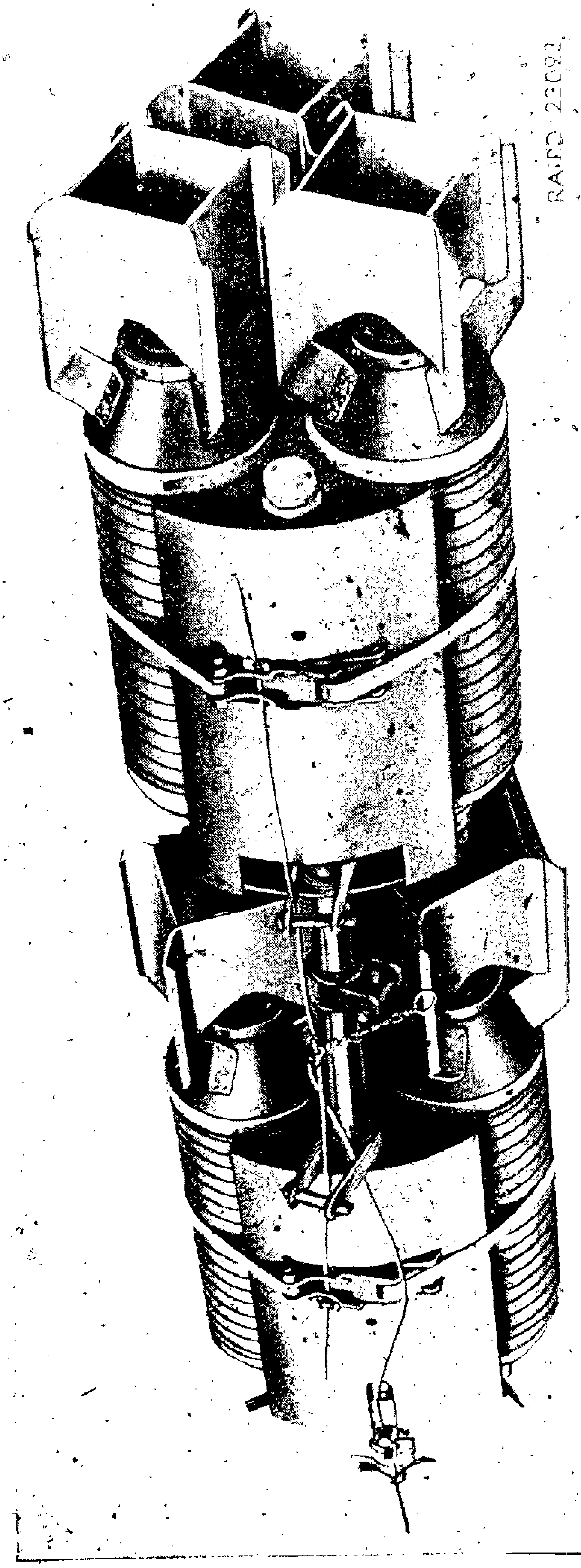

Figure 132. M27 cluster—rear view.

fuze until the index line is opposite the number of seconds desired, and tighten thumbscrew.

(d) Screw the fuze handtight into the fuze adapter. Assemble set screw and lock nut loosely. Back off the fuze until the arming pin points up, that is, away from the lower member. Tighten the set screw and lock nut.

(e) Thread a heavy and a fine branch of the arming wire through the forward suspension lug. Thread the heavy branch through the vacant holes in the release mechanism. Thread the fine branch through the inner holes of the fuze arming pin, arming wire guide, and vane tab so that about 2.5 inches protrudes beyond the vane tab. Place a safety clip (Fahnestock) on the branch of the heavy wire.

(f) Thread the remaining branch of heavy wire through the rear suspension lug and through the holes in the rear release mechanism. Place a safety clip (Fahnestock) on the wire. Cut off the unused branch of fine wire close to the swivel loop attachment.

(g) Cut and remove fuze sealing wire, safety cotter pin, and striker stop.

(h) Install cluster in plane.

(i) Remove safety cotter pins from both cluster release mechanisms and from all six bomb fuzes.

(j) If cluster is not dropped, disassemble and return components to storage by reversing the above steps.

(4) *Preparation for immediate opening.* To prepare cluster for opening immediately on release, prepare bombs as described in (2) above, then,

(a) Thread a heavy branch of the arming wire through each suspension lug and through the holes in the corresponding release mechanism. Place a safety clip (Fahnestock) on each branch.

(b) Cut off both branches of fine wire close to the swivel loop attachment.

(c) Cut the shear wire in each release mechanism close to the clamp.

(d) Install the cluster in the plane.

(e) Remove safety cotter pins from both release mechanisms and from all six bomb fuzes.

(f) If the cluster is not dropped, replace all cotter pins and shear wire (185 *d* above) or tie a conspicuous tag to the release mechanism to indicate that the shear wire has been cut and that the cluster is for immediate opening only.

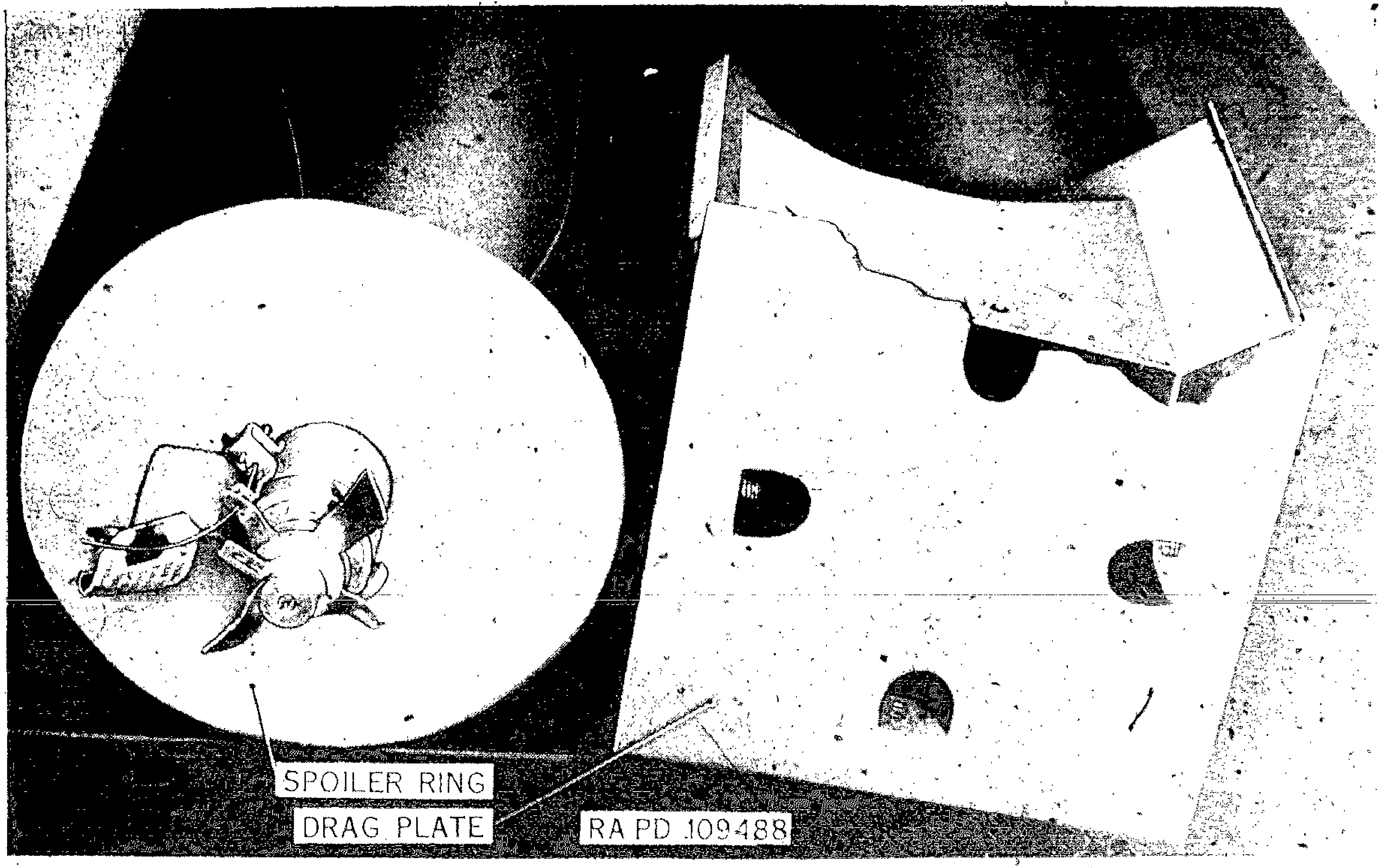

Figure 133. Cluster, fragmentation bomb, M28A2 — assembly

d. PRECAUTIONS.

(1) The general precautions for handling bombs, clusters, and fuzes will be observed.

(2) The time fuze will crush and function if cluster is dropped on it.

(3) If immediate opening is desired, shear wire must be cut or cluster will not open.

(4) If delay opening is desired, shear wire must be left intact and fuze installed and set.

(5) Cluster must open at altitude of 1,000 feet minimum to provide enough time for the bomb fuze to arm.

(6) Immediate opening of the cluster produces the most favorable impact pattern. At openings greater than 10 to 12 seconds, (aprx 2,000 ft of fall), range errors increase appreciably.

187. Cluster, Practice Bomb, M5

CLUSTER, practice bomb, M5 (100-lb size) (3 BOMB, practice, 23-lb, M71 or M71A1) is assembled in the field from the following components:

ADAPTER, cluster, M3 or M3A1, complete.
BODY, bomb, for 23-pound, practice bomb, M71, or M71A1.
PARACHUTE, unit, assembly, M3, or M4 (modified).

The bomb body and parachute unit are assembled and the parachute unit assembly is modified, if the M4 is used, by removing the suspension cable and removing the shipping cover and pull wire container and replacing them by the loose fitting cover supplied as part of the adapter assembly. Three bombs are bound in the cluster by the two steel straps which are fastened in place by cotter pins in the outer eyelets in the buckles. The arming wire is then inserted with one branch through the inner eyelets of each buckle and a safety clip placed on each end. The assembled cluster is 31 inches long and weighs 84 pounds.

Section VI. AIMABLE CLUSTERS

188. Cluster, Fragmentation Bomb, M28 Series

a. DESCRIPTION. This series of clusters consists of the models M28, M28A1, and M28A2. The M28 uses the ADAPTER cluster, M15; the M28A1 uses the adapter M15A1 (with spoiler ring and drag plate); and the M28A2 uses the adapter M15A2 (which contains a new nose locking cup in addition to spoiler ring and drag plate) (par. 170). In all other respects the clusters in this series are identical, and the information in this paragraph pertains to the three models unless otherwise noted. The 100-pound M28 type bomb cluster consists of an M15 type cluster adapter containing twenty-four 4-pound fragmentation bombs M83 arranged in eight banks of three bombs each (similar to method shown in fig. 134, for M29 type clusters). The fragmentation bombs are equipped with an M129, M130, or M131 fuze (pars. 105 to 107). The FUZE, bomb, nose, mechanical time, M155 is authorized for use with these clusters. However, in the absence of the M155, the AN-M146 may be used.

b. FUNCTIONING. When the cluster is released armed, the arming wire is withdrawn from the time fuze, allowing the fuze to arm. When the time set on the fuze has elapsed, the fuze functions and blows the nose cup into the adapter, permitting the cluster to open and disperse the bombs. The individual bombs function as described in par. 140.

c. PREPARATION FOR USE.

(1) Assemble drag plate (*d* below).

(2) Unscrew the bolts and remove the L shaped protectors from the suspension lugs. If single hook suspension is desired, push the double lugs down into the cases and attach the single lug with the screws provided.

(3) Cut wire on nose cup retainer and remove wire and retainer. When carrying out this operation on the M28 or M28A1 cluster, be careful not to push the cup off its seat. When carrying out this operation on the M28A2, make certain that the locking cup screws are tight.

(4) Assemble spoiler ring and fuze (*e* below).

(5) If the cluster is not used, restore components to original condition and packings.

d. TO ASSEMBLE THE DRAG PLATE. Using figures 113 and 133 as a reference, proceed as follows:

(1) Rest the cluster in a horizontal position on a support so that the tail fin is several inches above the ground.

(2) Fit the drag plate over the tail fin so that one ear rests against the outside of each side of the tail fin.

(3) If holes are not drilled in the tail fin to accommodate the drag plate, drill holes with a No. 30 drill (0.128-in diam), using the holes in the drag plate ears as guides.

(4) Screw the drag plate to the fin, using the special self-tapping screws issued with the drag plate. Make sure the drag plate is secure.

e. TO ASSEMBLE SPOILER RING. Using figures 113 and 133 as a reference, proceed as follows:

(1) Place the spoiler ring over the fuze cavity of the cluster

so that the flange of the spoiler ring hole fit inside the cavity.

(2) While holding the spoiler ring in this position, screw the fuze into the fuze cavity. Tighten it by hand; adjust, at the same time, the final position of the spoiler ring so that the small hole in the ring is in line with the arming pin of the fuze.

(3) When installing the arming wire, pass the wire through the hole in the spoiler ring.

f. PRECAUTIONS. In addition to the general precautions for handling bombs, clusters, and fuzes, the following will also be observed:

(1) Protect unpacked clusters, not intended for immediate use, from atmospheric moisture.

(2) Under no circumstances will the using arm attempt to disassemble the cluster or any of its bomb components.

(3) Because of great dispersion and drift, best results are obtained when the cluster is released at altitudes of 2,000 to 5,000 feet with fuze setting of 5 to 8 seconds.

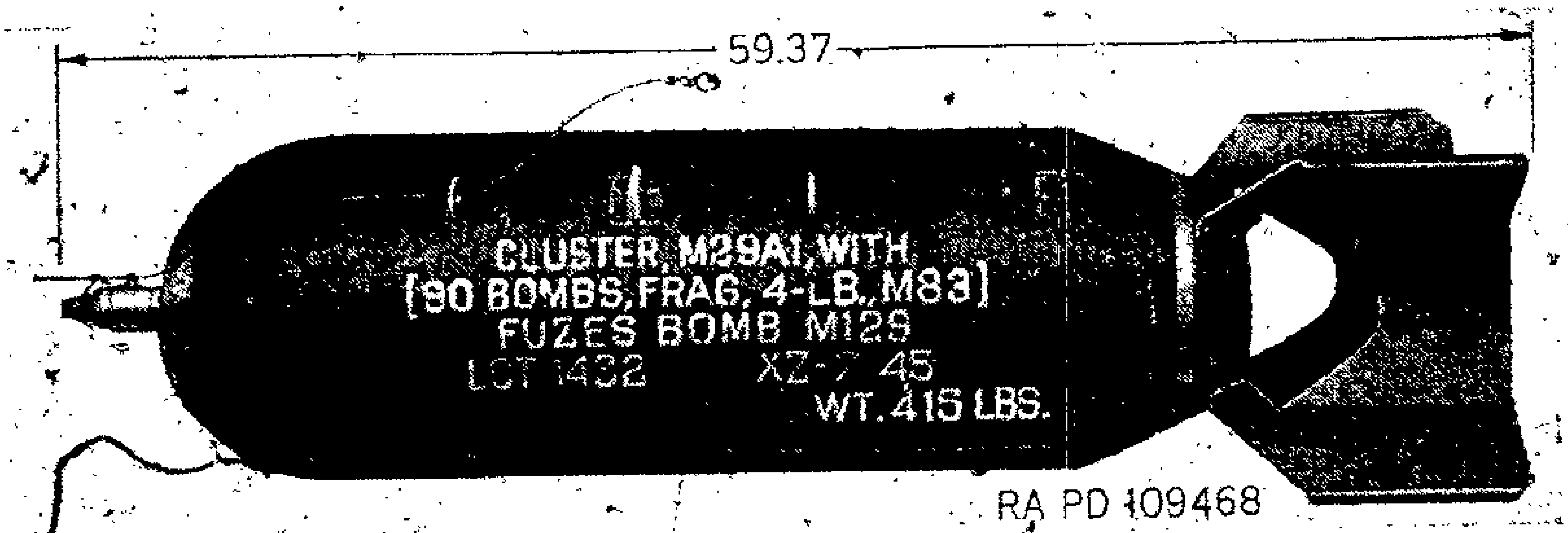

Figure 134. Cluster, fragmentation bomb, M29A1—complete.

189. Cluster, Fragmentation Bomb, M29 Series

a. GENERAL. These clusters are identical except that the M29 employs the ADAPTER, cluster, M16 (par. 171) and the M29A1 uses the M16A1 which differs from the M16 by the addition of a new nose locking cup (par. 170 *d*). Except for that difference, the information in this paragraph pertains equally to the M29 and M29A1. The M29 type cluster (fig. 134) is of the 500-pound size and is assembled in the field. It consists of ninety 4-pound fragmentation bombs M83 assembled in the M16 type cluster adapter. The FUZE, bomb, nose, mechanical time, M155, is authorized for use with these clusters. However, in the absence of the M155, the AN–M146 may be used. The cluster fits any 500-pound bomb station.

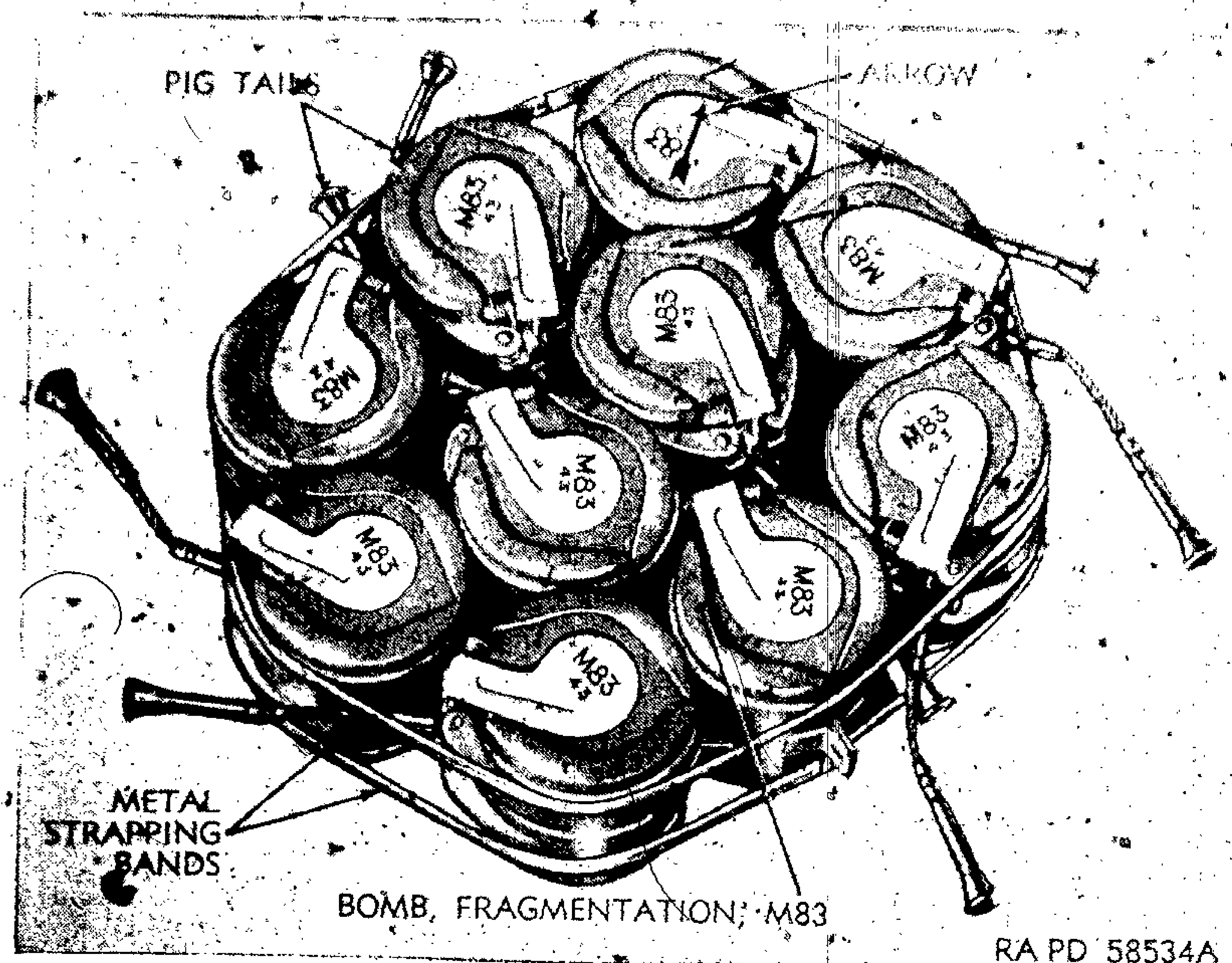

Figure 135. Wafer assembly.

b. COMPONENTS. The M29 type cluster consists of the following components:

(1) An ADAPTER, cluster, of the M16 type. This is a bomb-shaped metal adapter with hinged top cover and with partitions inside the body for inserting wafers of M83 bombs (figs. 135 and 136).

(2) Ninety BOMB, fragmentation, 4-pound, M83, in wafer form (135). Ten bombs are assembled in each wafer and nine wafers are placed inside the adapter.

(3) FUZE, bomb, nose, mechanical time, M155, for insertion in the nose of the adapter.

(4) Arming wire assembly for bomb cluster M29 or M29A1.

c. PREPARATION FOR USE. The cluster components are shipped separately and must be assembled in the field. The steps listed below should be followed carefully:

(1) *Preparing the adapter.*

(*a*) Unpack cluster adapter M16 or M16A1 from wooden shipping box, and place it on suitable horizontal supports so that no weight will be on the tail fins.

(*b*) Unscrew and remove the suspension lug guards.

(*c*) Cut wire on cup container located in the nose of adapter. Remove cup retainer and wire.

(d) In the case of the M16 adapter, drive back the locking cup by inserting a wooden stick or similar object into the nose fuze well and tapping inward to dislodge the cup. In the case of the M16A1 adapter, turn the screws of the locking cup in a counterclockwise direction forcing the locking cup inward. The cover of the adapter may now be opened by prying with a screw driver along the seam a short distance back of the nose.

(e) Thread a cord through the hole in the pull piece of the locking cup, passing the free end through the nose fuze well opening so that the locking cup can be pulled into place when the lid is closed.

(2) *Loading bombs in cluster.*

(a) Open individually packed wafer boxes by tearing open the metal liner and removing the strapping which secures the wafers to plywood inserts. Remove the twine which is packed with the wafer and lay it aside for later use.

(b) Lift wafers by cable assemblies (pigtails) and place four wafers in two center bays of the bottom half of the adapter (fig. 136).

Caution: Always handle wafers by cable assemblies or by the flat surface of the wafer. Do not handle by the strapping.

(c) If the cluster is to be suspended from a single suspension lug, remove the metal brace, single suspension lug, and screws from the inside of the wooden case in which the adapter cluster is packed and proceed as follows:

1. Remove the two regular suspension lugs of the adapter and fasten the metal brace in place between the partitions, using screws taken from the two regular suspension lugs.

2. Fasten the single suspension lug in place on the metal brace with the machine screws in the two sets of holes nearest the tail end of the cluster adapter. (There are three sets of holes on the brace; the first (forward) set is not used.)

(d) If the navy hoisting lug is used, fasten it over the center partition of the cluster adapter with the small portion of the lug forward (toward the nose of the adapter). The two regular suspension lugs remain in place.

(e) Place three wafers in the rear bay and two wafers in the front bay.

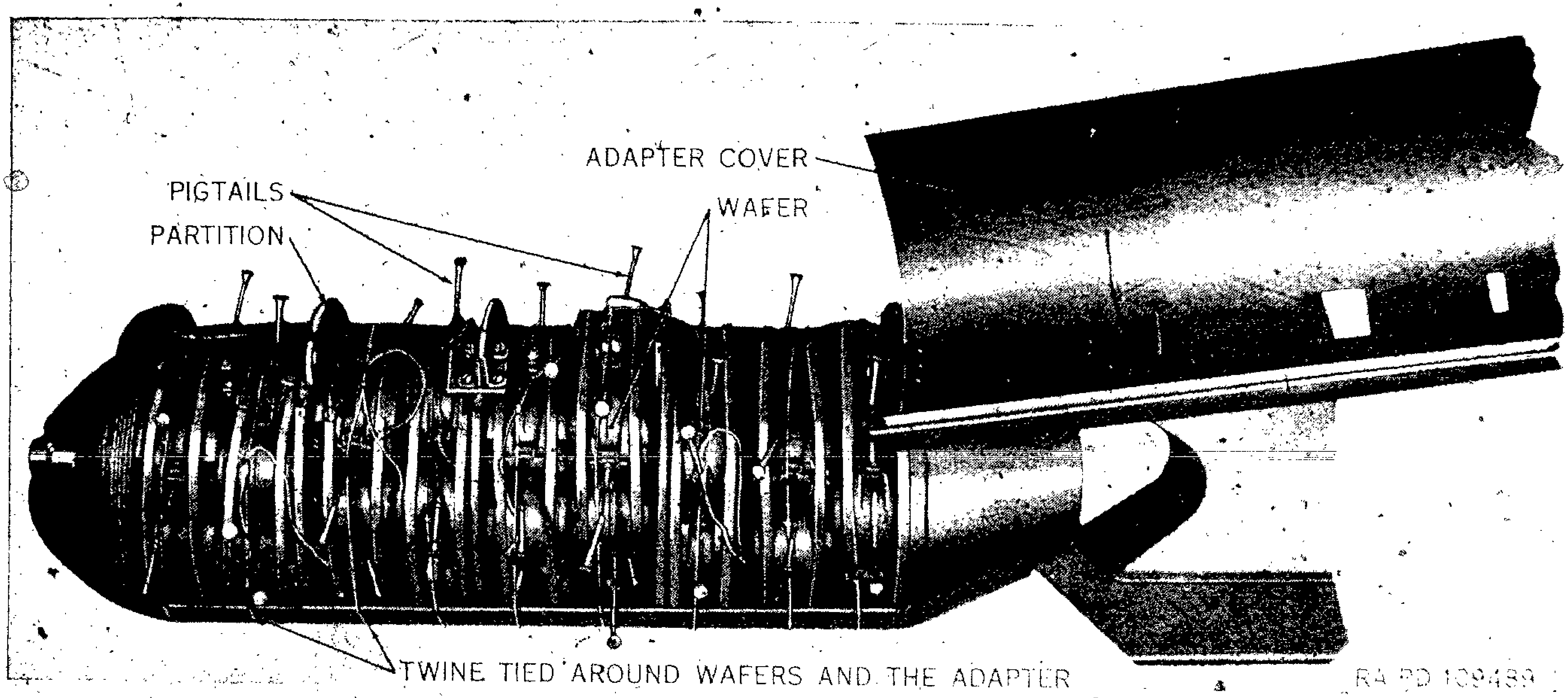

Figure 136. Cluster, fragmentation bomb, M29A1— step in assembly.

(3) *Arranging bombs in cluster.*

(*a*) Tie all wafers down separately and firmly with the twine provided, passing the twine over the bombs and outside of the bottom half of the adapter (fig. 136).

(*b*) Cut and remove metal strapping from the bombs, and settle the bombs in place by careful shifting of the wafers so that no rigid part of any bomb will interfere with closing the cluster cover.

Caution: The following operations should be performed slowly and carefully. Failure to follow these directions may permit the bomb to spring out of the cluster, and the case assemblies (butterfly wings) to open. Before cutting any strings, be certain that the adapter cover is closed.

(4) *Closing the cluster.*

(*a*) Close the adapter by lowering the cover slowly; at the same time, adjust the cable assemblies (pigtails) of the bombs so that they do not rest across either of the partitions and do not get in the way of the cover. When closing cover of cluster, be certain that the back corners of the cover are seated *under* the rear flange of the bottom half of the adapter, and that the strips reinforcing the edge of the cover are *inside* the bottom half. If the flange does not seat properly, it can be seated by tapping lightly with a hammer along the edge of the flange.

Note. When the adapter is being closed, its cover will probably cut some of the strings with which the wafers are tied. If this occurs, the cover must not be allowed to open or the untied bombs will spring out.

(*b*) When using the M16 cluster adapter (M29 cluster), pull the locking cup into position with the string previously attached to it. Use the hook and prying tool provided for this purpose. When using the M16A1 cluster adapter (M29A1 cluster), pull the locking cup into position and turn the locking screws in a clockwise direction which will draw and hold the locking cup against the nose of the bomb.

Caution: Do not exert sufficient force on the locking cup to distort it. (The hook and prying tool is part of a kit which is issued separately to all oversea commands performing this work. The kit also contains pliers, tinsnips, and a measuring gage).

(*c*) Insert the special measuring gage into the fuze well of either the M16 or M16A1 adapter against the bottom surface of the locking cup. (This gage has a measurement of 1.375 in. on one end and 0.8437 in. on the other.) The distance between the bottom surface of the locking cup and the nose of the cluster adapter should be a maximum of 1.375 inches.

(*d*) Turn the gage around and insert it in the fuze well of the M16 adapter, against the pull piece of the locking cup. The distance between the pull pieces and the nose of the adapter should be a minimum of 0.8437 inch.

Note. If the adapters do not gage properly ((*c*) and (*d*) above) and cannot be adjusted to gage properly, they will not be used.

(*e*) With the cover securely in place and held by the locking cap, cut and remove the twine with which the wafers are tied and which was not cut when the cover was closed. If the twine does not pull out easily, the pieces may be cut on both sides of the adapter at the seam and the upper portion left in the adapter.

(*f*) Remove the mechanical time fuze, M155 from its packing and inspect.

(*g*) Set the time fuze to the desired time and install in the fuze adapter.

(*h*) Install bomb securely in rack of plane.

(*i*) Pass one branch of the arming wire through the forward suspension lug, arming pin bracket and vane of the fuze. Remove the fuze cotter pin and sealing wire. The arming wire should extend 2 to 3 inches beyond the vane.

(*j*) If not dropped, arming wire and time fuze will be removed in accordance with instructions contained in chapter 5. Store the loaded cluster off the ground and under a paulin. Store for as short a period as possible since this matériel, particularly the fuzes, is susceptible to damage by atmospheric moisture.

d. PRECAUTIONS. In addition to the general precautions for handling bombs, clusters, and fuzes, the following will also be observed:

(1) Under no circumstances will the using arm attempt to disassemble the cluster or any of its bomb components. When once loaded, the cluster adapter will not be reopened.

(2) Because of the great dispersion and drift of the butterfly bombs when released from a high altitude, best results are obtained when the cluster is dropped from an alti-

tude of from 2,000 to 5,000 feet, with a time setting on the M155 time fuze ranging from approximately 5 to 8 seconds.

(3) Care should be taken to make certain that the locking cup is in the fully locked position before the time fuze is inserted.

Section IV. HOOK AND CABLE CLUSTERS

190. General

Bombs clustered by means of hook and cable adapters exist only when assembled in place in the bomb rack; hence, model designations have not been assigned to the assembled clusters.

191. Bombs Clustered With Hook and Cable Adapters

For hook and cable clusters, the first of the fuzed bombs which will comprise the cluster is installed in the bomb rack, additional bombs being attached thereto by means of the appropriate hook and cable adapter as indicated in table XXIV and described in detail in the paragraphs devoted to the particular model of hook and cable adapter (pars. 172 through 177).

Table XXIV. Hook and Cable Cluster Data

Bomb or cluster		Adapter	
Number of bombs authorized	Weight (lb)	Model	Par. No.
2	100	M12	174
3	100	M17	175
2	250	M18	176
6	*100	M24A1	177

* W/nose fuze only.

CHAPTER 9

DESTRUCTION OF BOMBS AND COMPONENTS TO PREVENT ENEMY USE

192. General

a. Destruction of bombs and bomb components described herein, when subject to capture or abandonment, will be undertaken by the using arm only when, in the judgment of the unit commander, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. The conditions under which destruction will be effected are command decisions and may vary in each case dependent upon a number of factors such as the tactical situation, security classification of the bombs and components (AR 380–5 and AFR 205–1), quantity and location of bombs and components, facilities for accomplishing destruction, and time. In general, destruction of ammunition can be accomplished most effectively by burning or detonation, or a combination of these. Selection of the particular method of destruction requires imagination and resourcefulness in utilization of the facilities at hand under the existing circumstances. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, bombs and their components must be so badly damaged that they cannot be restored to usable condition in the combat zone. Equally important, the same essential bomb components must be destroyed so that the enemy cannot assemble complete rounds from undamaged components.

d. If destruction of bombs and bomb components is directed, due consideration should be given to:

(1) Accomplishment of the destruction in such a manner as to cause the greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments.

(2) Observance of appropriate safety precautions.

193. Methods

The following methods, in order of preference, are considered the most satisfactory for destruction. The danger area for both methods is the same since detonation of the stock piles of bombs is also to be expected as a result of fire. The following representative data indicate the distances at which no major structural damage is expected to result from the detonation of stock piles of bombs; the data are based on the explosive content of the bombs. However, occasional erratic missiles may be expected at greater ranges.

Weight of explosive (lb)	*Radius of danger area (ft)*
10,000 to 15,000	1,780
25,000 to 30,000	2,260
50,000 to 55,000	2,920
75,000 to 80,000	3,390
100,000 to 125,000	3,670
200,000 to 225,000	4,190
225,000 to 250,000	4,310

a. METHOD No. 1—BURNING. Explosive-containing bomb components such as fuzes, adapter-boosters and primer-detonators can be destroyed most readily by burning. Piles of these items (as packed) may be burned in place by surrounding and covering the pile with all available inflammable material such as wood, rags, and brush; pouring oil over the pile; and igniting the pile from cover. Bombs may also be destroyed in a like manner and, if time permits, boxes of explosive-containing components may be placed around the stock pile of bombs before placing the inflammable materials. The danger area is as indicated above.

b. METHOD No. 2—DETONATION. Stock piles of bombs may be destroyed in place by first removing the nose or tail plugs of bombs (at regular intervals in the pile) and inserting either charges of plastic explosives or cut-down ½-pound blocks of TNT in the empty fuze cavities. The charges should be primed for simultaneous detonation and provision should be made for dual ignition by fitting at least two charges with blasting caps and sufficient lengths of safety fuze to permit all men to take cover in accordance with the missile distances indicated above. Explosive-containing bomb components may be detonated without being unpacked by placing ½ pound or 1 pound blocks of TNT in packing boxes at the amount of 1 pound of TNT for each 100 pounds (gross wt) of components—the charges should be distributed throughout the pile and primed for simultaneous detonation and dual ignition as described for bombs. If charges are primed with safety fuze, light fuze and take cover. If arranged for electrical ignition, take cover and then fire. The placing and priming of charges will be done in accordance with FM 5–25.

Note. **When practicable, and prior to detonation, the stacks of ammunition should be covered with earth, or other material, in order to reduce the effective range of missiles and assure high-order detonation.**

APPENDIX I
REFERENCES

1. Publication Indexes

The following publication indexes and lists of current issue should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this manual:

a. Index of administrative publications	SR 310-20-5
b. Index of Army motion pictures and film strips.	SR 110-1-1
c. Index of Army training publications	SR 310-20-3
d. Index of blank forms and army personnel classification tests.	SR 310-20-6
e. Index of ordnance publications (Navy)	OP 0
f. Index of technical manuals, technical regulations, technical bulletins, supply bulletins, lubrication orders, modification work orders, tables of organization and equipment, reduction tables, tables of allowances, tables of organization, tables of equipment, and tables of basic allowances.	SR 310-20-4
g. Index to bombing tables	BT-I-4
h. Introduction and index (supply catalogs)	ORD 1
i. Military training aids	FM 21-8
j. Ordnance major items and combinations, and pertinent publications.	SB 9-1

2. Supply Catalogs

The following catalogs of the Department of the Army Supply Catalog pertain to this ammunition:

a. Ammunition instruction material for aircraft bombs, grenades, pyrotechnics, and rockets.	ORD 11 SNL S-6
b. Ammunition surveillance, testing, and inspection equipment and supplies.	ORD 6 SNL N-10
c. Bombs, aircraft, all types	ORD 3 SNL S-1
d. Cleaners, preservatives, lubricants, recoil fluids, special oils, and related maintenance materials.	ORD 3 SNL K-1
e. Fin assemblies and miscellaneous inert components for aircraft bombs.	ORD 11 SNL S-3

f. Fuzes and miscellaneous explosive components for aircraft bombs.	ORD 11 SNL S–2
g. General tools and supplies for ammunition company.	ORD 10 SNL N–17
h. Material for renovating and packaging of Group S ammunition and miscellaneous items.	ORD 11 SNL S–11
i. Special ammunition surveillance, testing, inspection, and renovation tools and supplies.	ORD 5 SNL P–11

3. Explanatory Publications

The following explanatory publications contain information pertinent to this ammunition and associated equipment:

a. AMMUNITION.

Aircraft bombs (Navy)	OP 1280*
Ammunition condition report	OO Form No 517
Ammunition: General	SB 9–AMM 1
Ammunition, general	TM 9–1900
Ammunition inspection guide	TM 9–1904
Ammunition, net prices	ORD 5–3–6
Ammunition renovation	TM 9–1905
Ammunition: Restricted or suspended	TB 9–AMM 2
Ammunition supply	FM 9–6 AFR 67–28
Ballistic data	TM 9–1907
Bomb fuze data (Navy)	OP 1548
Carrying fire bombs and other ammunition on tactical aircraft.	AFR 55–25
Complete Round Charts	No 5981
Disposal by dumping at sea	AFR 68–3
Explosives and demolitions	FM 5–25
Guides for areas required for bombing gunnery and rocket ranges.	AFR 87–16
Issue of supplies and equipment	SR 725–10–2
Military explosives	TM 9–2900
Military pyrotechnics	TM 9–1981
Ordnance safety manual	OO Form No 7224
Qualifications in arms and ammunition training allowances.	AR 775–10
Regulations for firing ammunition for training, target-practice, and combat.	SR 385–310–1 AFR 50–13
Supply bulletins	SB 9–series SB 9–AMM–series

* Requisition Navy publications from the Bureau of Ordnance, Department of the Navy, Washington 25, D. C.

b. GENERAL.

Army marking directive	TM 38–414
Cleaning, preserving, sealing, lubricating, and related materials issued for ordnance matériel.	TM 9–850
Decontamination	TM 3–220
Defense against chemical attack	FM 21–40
Dictionary of US Army terms	SR 320–5–1
Instruction guide—Ordnance packaging and shipping (posts, camps, and stations).	TM 9–2854
Military chemistry and chemical agents	TM 3–215
Ordnance service in the field	FM 9–5
Protection of ordnance matériel in open storage.	SB 9–47
Reports	SB 9–AMM 8
Safety:	
Ammunition and explosives matériel surveillance and safety.	AFR 136–6
Armed services explosives safety board	AFR 14–12
Reports of (accidents, fires, and explosives).	SR 385–10–40 series
Report of hazardous conditions involving military explosives or ammunition.	SR 385–15–1
Selection of bombs and fuzes for destruction of various targets.	FM 1–110
Unexploded bombs, organization and operation for disposal.	FM 9–40

c. MATÉRIEL AND HANDLING EQUIPMENT.

Bomb racks, tow target equipment, and flare racks.	TM 1–500
Bomb service truck, M6 (Chevrolet)	TM 9–765
Bomb trailer M5	TM 9–760
Lift truck M22	TM 9–762
Truck, bomb service, M27	TM 9–766

APPENDIX II
TABLES OF DATA

1. General

This appendix includes reference tables which provide data pertaining to arming wires, fuzes (type, action, and dimensions), bombs and clusters (kind and weight of explosive and dimensions of complete round and bomb as shipped), fin assemblies and fin lock nuts (dimensions and bombs used with), fuze seats (dimensions). For the authorized combinations of bomb and fuze, or cluster and fuze, see chapters 6 and 8 respectively. For packing and shipping data see Department of the Army Supply Catalogs ORD 11 SNL's of the S group; SNL S–1 also includes complete round data. For selection of bombs and fuzes for destruction of various targets see FM 1–110.

2. Arming Wire Data

In addition to the arming wire data given in table XXV, it should be noted that two Fahnestock clips are required for each branch of an arming wire used with all fuzes except those, such as mechanical time fuzes and certain impact fuzes, which are provided with spring-loaded arming pins; the arming pin acts to prevent the arming wire from slipping out accidentally, hence, no Fahnestock clips are required.

3. Fuze Data

See table XXVI.

4. Bomb and Cluster Data

See table XXVII.

5. Fin Assembly and Fin Lock Nut Data

See table XXVIII and figure 137.

6. Fuze Seat Dimensions

See table XXIX.

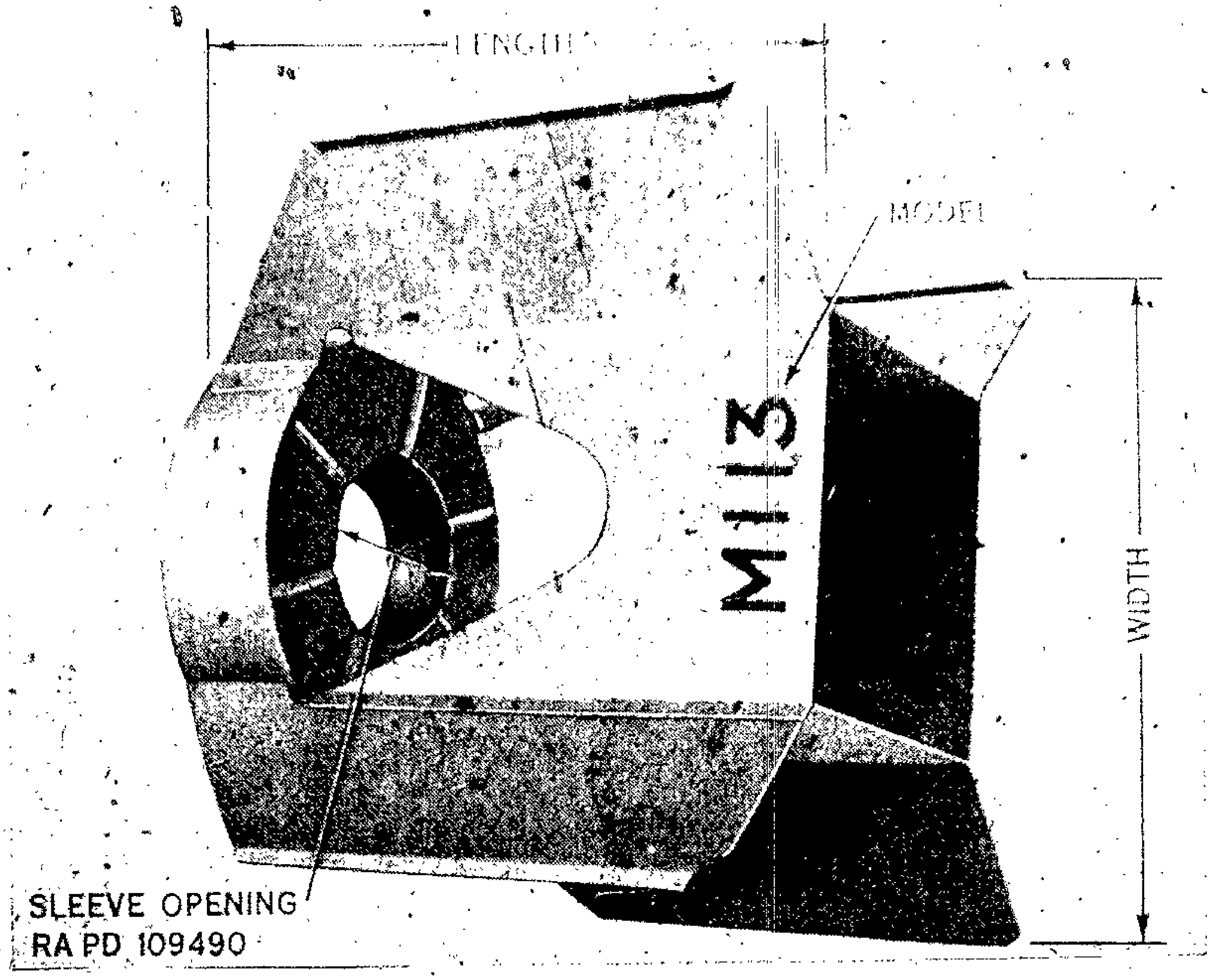

Figure 137. Fin assembly.

Table XXV. Arming Wire Data

Model of arming wire and/or bombs used with—	Pc mk	Assembled length of branches (in)	Length and diameter of unassembled wire (in)
M1—for 100-lb GP and demolition.	82-3-234XA	22, 30	54.0 x 0.064
	82-3-234WA	24, 33	59.0 x 0.064
	82-3-234BA [1]	24, 36	62.0 x 0.064
	82-3-234U [1]	22, 30	54.0 x 0.064
M1A1—for 100-, 250-, and 300-lb GP and demolition or 220- or 260-lb frag.	82-3-234FB	27, 33	62.0 x 0.064
	82-3-234YA [2]	30, 36	68.0 x 0.064
	82-3-234GA [1]	34, 39	75.0 x 0.064
	82-3-234EB [1]	28, 34	64.0 x 0.064
M3—for 100-lb TI, M84 and M84A1 or 100-lb practice target, M75 or M75A1.	82-3-234S	26	26.25 x 0.064
	82-3-277C	26	26.25 x 0.064
	82-3-312B	26	26.25 x 0.064
	82-3-405D	26	26.25 x 0.064
	82-3-409C	26	26.25 x 0.064
M4—for 250-lb TI	82-3-234RA	40	40.25 x 0.036
M5—for 500-lb GP, demolition, chemical, incendiary and SAP or 600-lb demolition.	82-3-234HB	33, 42	77.0 x 0.064
	82-3-234YA [3]	33, 42	77.0 x 0.064
	82-3-234NB		
	82-3-234FA	33, 42	77.0 x 0.064

See footnotes at end of table.

Table XXV. Arming Wire Data—Continued

Model of arming wire and/or bombs used with—	Pc mk	Assembled length of branches (in)	Length and diameter of unassembled wire (in)
M6—for 500-lb SAP	82-3-234BB	41	41.25 x 0.064
M6A1—for 500-lb and 1,000-lb SAP.	82-3-234VA [1]	46	46.25 x 0.064
	82-3-234VA	48	48.25 x 0.064
M7—for 1,000-lb GP, demolition, and chemical.	82-3-234ZA [2]	34, 45	81.5 x 0.064
	82-3-234ZA	36.5, 45	83.5 x 0.064
	82-3-234KA [1]	36, 50	88.0 x 0.064
M8—for 2,000-lb GP and demolition, or 1,100-lb demolition.	82-3-234AB	49, 60	111.0 x 0.064
	82-3-234SA	49, 60	111.0 x 0.064
	82-3-234NA [1]	49, 60	111.0 x 0.064
M9—for 2,000-lb SAP	82-3-234ZC	54	54.25 x 0.064
M10—for 4,000-lb LC	82-3-234UA	62, 68	132.0 x 0.064
For 20-lb parachute frag	82-3-207G	6	6.75 x 0.064
For cluster, M28, M28A1, or M28A2.	82-3-234CB	28	28.25 x 0.064
	82-3-439K	26	26.25 x 0.036
For 90-lb frag or 100-lb practice M38A2.	82-3-234W [1]	34	34.25 x 0.064
	82-3-213D	34	34.25 x 0.064
For cluster M29 or M29A1	82-3-446H	34	34.25 x 0.036
AP bombs	82-3-234ZB	54	54.25 x 0.064
100-lb parachute frag clusters	82-3-378F	7, 11	20.0 x 0.064
100-lb frag clusters	82-3-234DB [1]	14, 18	34.0 x 0.064
	82-3-350H	14, 18	34.0 x 0.064
AN-Mk—bombs	150931 Navy	55, 55	108.0 x 0.064
Parachute, M5	82-3-520F [4]	6	6.25 x 0.064
	82-3-520C	42	42.25 x 0.064
Parachute, M6, M7	82-3-592	1-56, 2-68	138.0 x 0.064
			57.25 x 0.064
500-lb frag cluster	82-3-477A	35, 16, 20	38.0 x 0.064
			36.25 x 0.036
Cable adapter M17 (T15)	82-3-626	2-27, 22	2- 52.125 x 0.064
		1-31, 26	1- 60.125 x 0.064
Cable adapter M18 (T16)	82-3-627	4-28	59.125 x 0.064
Cable adapter M24A1 (T19)	82-3-629 [5]	27.75	29.125 x 0.064
		36.75	38.125 x 0.064
		33.75	35.125 x 0.064
		27.75	29.125 x 0.064
		37.75	39.125 x 0.064
		31.75	33.125 x 0.064

[1] One additional clip must be added to assemblies of this pc mk to equal 82-3-350H.
[2] Revision date of 5-26-42.
[3] Revision date of 12-14-42.
[4] Assembled to arming cord as issued.
[5] Hanger and link assembly 82-3-599A, required to complete assembly.

Table XXVI. Fuze Data

Model	Type			Arming			Dimensions		
M No. (T No.)	Position	Action	Delay or time range	Type	Delay (rev and/or sec)	Air Travel [1] (ft)	Length (in)	Weight (lb)	Thread [2]
BODY FUZES									
M129	Body	Airburst or impact.	Inst or non-delay	Vane	6 rev and 3 sec		3.01	0.39	1.75-24NS-1LH
M130	do	Mech time	10, 20, 30, 40, 50, or 60 minute delay.	do	6 rev		3.16		1.75-24NS-1LH
M131	do	Antidisturbance.	Inst	Vane and impact.	6 rev and 2 sec after impact.		3.16		1.75-24NS-1LH
NOSE FUZES, LARGE									
M103	Nose	Impact	0.1 sec or Inst	Vane	409 rev D 692 rev SQ	1,140 1,710	7.0	3.7	2.-12NS-1
M103 (AN-M103)	do	do	0.1 sec or Inst	do	180 rev D 302 rev Inst	510 765	7.0	3.7	2.-12NS-1
AN-M103A1	do	do	0.1 sec or Inst	do	180 rev D 302 rev Inst	510 765	7.0	3.7	2.-12NS-1
M139 (T66)	do	do	0.01 sec or Inst	do	180 rev D 302 rev Inst	510 765	7.0	3.7	2.-12NS-1
AN-M139A1 (M139A1)	do	do	0.01 sec or Inst	do	180 rev D 302 rev Inst	510 765	7.0	3.7	2.-12NS-1
M140 (T67)	do	do	0.025 sec or Inst	do	180 rev D 302 rev Inst	510 765	7.0	3.7	2.-12NS-1

See footnotes at end of table.

912242°—50—20

Table XXVI. Fuze Data—Continued

Model	Type			Arming			Dimensions		
M No. (T No.)	Position	Action	Delay or time range	Type	Delay (rev and/or sec)	Air travel (ft)	Length (in)	Weight (lb)	Thread
				NOSE FUZES, LARGE—Continued					
AN–M140A1 (M140A1)	Nose	Impact	0.025 sec or Inst	Vane	180 rev D 302 rev Inst	510 765	7.0	3.7	2–12NS–1
M163	do	do	0.1 sec or Inst	do	409 rev D 692 rev Inst	1,140 1,710	7.1	3.7	2–12NS–1
M164	do	do	0.01 sec or Inst	do	409 rev D 692 rev Inst	1,140 1,710	7.1	3.7	2–12NS–1
M165	do	do	0.025 sec or Inst	do	409 rev D 692 rev Inst	1,140 1,710	7.1	3.7	2–12NS–1
AN–M166 (T51E1)	do	VT	VT bar type	do		3,600	10.5		2–12NS–1
AN–M168 (T91E1)	do	VT	VT ring type	do		2,000	10.0		2–12NS–1
M171 (T85)	do	Impact	0.025 sec	Anem Vane	875 rev		6.7	3.5	2–12NS–1
				NOSE FUZES, SMALL					
M110	Nose	Impact	Inst	Vane	455 rev	2,200	3.58	1.1	1.5–12NF–1
M110A1 (AN–M110A1)	do	do	Inst	do	325 rev	725	3.7	1.1	1.5–12NF–1
M120 (AN–M120)	do	do	Inst	Pin	2.5 sec		4.58	1.1	1.5–12NF–1
M120A1 (AN–M120A1)	do	do	Inst	do	1.9 sec		4.58		1.5–12NF–1
AN–M158 (T70)	do	do	Inst	Vane	300–500 rev		3.69	1.02	1.5–12NF–1
M170	do	do	Inst	Pin	1.5 sec		4.58	1.12	1.5–12NF–1
AN–M145 (T55E1)	do	Time-impact	5–92 sec	Pin Vane	4.5 sec 260 rev	1,000	6.27	1.6	1.5–12NF–1
				NOSE FUZES, MISCELLANEOUS					
M108	Nose	Impact	Inst	Pin	0	0	2.66	0.54	
M126 (AN–M126)	do	do	Inst	Vane	455 rev	725	3.12	1.0	1.5–12NF–1
M126A1 (AN–M126A1)	do	do	Inst	do	325 rev	725	3.24	1.0	1.5–12NF–1
AN–M159 (T70E1)	do	do	Inst	do	300–500 rev		3.21	1.13	1.5–12NF–1
M144 (T64)	do	Time [2]	1.6–30.6 sec	do	6–9 rev		5.69	1.6	1.5–12NF–1
AN–M146 (T55E2)	do	do [2]	5–92 sec	do	260 rev		5.69	1.6	1.5–12NF–1
M147 (T55E3)	do	do [2]	5–92 sec	do	260 rev		5.74	1.6	1.5–12NF–1
M155 (T71)	do	do [2]	5–92 sec	do	6–9 rev		4.47	.97	1.5–12NF–1
M111 flare	do	do [2]	5–92 sec or Inst	do			4.17	.89	1.5–12NF–1
M111A1 flare	do	do [2]	5–92 sec or Inst	do			4.17	.89	1.5–12NF–1
M111A2 flare	do	do [2]	5–92 sec or Inst	do	260 rev		4.48	1.4	1.5–12NF–1
AN–Mk 219 Mods 3 and 4	do	Impact	Inst	do	175 rev	1,000	5.5	4.1	1.75–14NS–1
				TAIL FUZES, SHORT DELAY					
M100A1 (AN–M100A1)	Tail	Impact	0.025 sec or non-delay	Vane	675 rev	2,000	9.26	2.7	1.5–12NF–1
AN–M100A2	do	do	0.025 sec or non-delay	do	158 rev	445–485	9.26	2.7	1.5–12NF–1
M101A1 (AN–M101A1)	do	do	0.025 sec or non-delay	do	675 rev	2,000	12.26	2.9	1.5–12NF–1

See footnotes at end of table.

Table XXVI. Fuze Data—Continued

Model	Type			Arming			Dimensions		
M No. (T No.)	Position	Action	Delay or time range	Type	Delay (rev and/or sec)	Air Travel (ft)	Length (in)	Weight (lb)	Thread
TAIL FUZES, SHORT DELAY—Continued									
AN-M101A2	Tail	Impact	0.025 sec or non-delay.	Vane	158 rev	555	12.26	2.9	1.5-12NF-1
M102A1 (AN-M102A1)	do	do	0.025 sec or non-delay.	do	675 rev	2,000	15.8	3.2	1.5-12NF-1
AN-M102A2	do	do	0.025 sec or non-delay.	do	158 rev	465-665	16.26	3.2	1.5-12NF-1
M160	do	do	0.025 sec or non-delay.	do	657 rev	1,710-2,680	9.26	2.7	1.5-12NF-1
M161	do	do	0.025 sec or non-delay.	do	657 rev	1,710-2,680	12.26	2.9	1.5-12NF-1
M162	do	do	0.025 sec or non-delay.	do	657 rev	1,710-2,680	16.26	3.2	1.5-12NF-1
M169 (T708)	do	do	See footnote 3				4.0		1.375-14TWS-1
AN-Mk 228	do	do	0.08 sec	Vane	155 rev	800-1,100	16.4	10.5	2-12NS-3
TAIL FUZES, MEDIUM DELAY									
M112	Tail	Impact	4-5 sec, 8-15 sec.[5]	Vane	18 rev	73	9.6	2.3	1.5-12NF-1
M112A1	do	do	4-5 sec, 8-15 sec	do	18 rev	73	9.6	2.3	1.5-12NF-1
M113	do	do	4-5 sec, 8-15 sec[5]	do	18 rev	73	12.6	2.5	1.5-12NF-1
M113A1	do	do	4-5 sec, 8-15 sec	do	18 rev	73	12.6	2.5	1.5-12NF-1
M114	do	do	4-5 sec, 8-15 sec[5]	do	18 rev	73	16.6	2.8	1.5-12NF-1
M114A1	do	do	4-5 sec, 8-15 sec	do	18 rev	73	16.6	2.8	1.5-12NF-1
M115	do	do	4-5 sec	do	175 rev	400-650	9.54	2.7	1.5-12NF-1
M116	do	do	4-5 sec	do	175 rev	400-650	12.54	2.9	1.5-12NF-1
M117	do	do	4-5 sec	do	175 rev	400-650	16.54	3.2	1.5-12NF-1
TAIL FUZES, LONG DELAY									
M123	Tail	Time	See footnote 4	Arming wire.	0	80-100	9.6	2.9	1.5-12NF-1
M123A1	do	do	See footnote 4		0		9.24		1.5-12NF-1
M124	do	do	See footnote 4	Arming wire.	0	80-100	12.63	3.1	1.5-12NF-1
M124A1	do	do	See footnote 4		0		12.24		1.5-12NF-1
M125	do	do	See footnote 4	Arming wire.	0	80-100	16.63	3.4	1.5-12NF-1
M125A1	do	do	See footnote 4		0		16.24		1.5-12NF-1
M132	do	Time and antiwithdrawal.	10 min	Vane	0	0	9.57		1.5-12NF-1
M133	do	Time and antiwithdrawal.	10 min	do	0	0	12.57		1.5-12NF-1
M134	do	Time and antiwithdrawal.	10 min	do	0	0	16.57		1.5-12NF-1
TAIL FUZES, MISCELLANEOUS									
M151 (T79E1)	Tail	Impact	4-5 sec 8-15 sec	Anem. Vane	15-30 rev		5.55	2.1	1.5-12NF-1
M152 (T53E1)	do	Time	5-92 sec	Pin Vane	4-5 sec 260 rev		6.24		1.5-12NF-1

See footnotes at end of table.

Table XXVI. Fuze Data—Continued

Model	Type			Arming			
M No. (T No.)	Position	Action	Delay or time range	Type	Delay (rev[2] and or sec)	Air travel[1] (ft)	[illegible]
			NOSE FUZES, MISCELLANEOUS—Continued				
M153 (T73)	Tail	Time	5–92 sec	Pin Vane	4.5 sec 260 rev		6.2
M167 (T75E2)	do	Impact	0.025 sec	Anem Vane			4.2
Mk 230 (AN–Mk 230)	do	Hydrostatic	25 ft–125 ft	Vane	110 rev	400–500	15.4
AN–Mk 230 Mods 4, 5, 6	do	do	25 ft–125 ft	do		300–400	15.4

rev—revolution. sec—second. Inst.—instantaneous.

[1] Air travel to arm varies with size of bomb, speed, and angle of release.

[2] Function on impact if armed and impact occurs before set time (or in event of failure of time mechanism).

[3] Primer-detonator, M40, all delays.

[4] 1, 2, 6, 12, 24, 36, 72, 144 hours delay. Instantaneous on withdrawal.

[5] Some fuzes may be encountered fitted with primer-detonator, M14, 8 to 11-second delay.

Table XXVII. Bomb and Cluster Data

Kind	Charge: Weight (lb)	Charge: Percent of complete round weight	Complete Round: Length (in)	Complete Round: Weight (lb)	Body: Length (in)	Body: Diameter (in)	Body: Weight (lb)
BOMB, AP, 1,000-LB, AN-MK 33 AND MODS							
Exp D	140.0	13.9	73.0	1,008.0	59.8	12.0	991.0
BOMB, AP, 1,600-LB, AN-MK 1 AND MODS							
Exp D	209.0	13.1	83.5	1,590.0	69.8	14.0	1,575.0
BOMB, AP, 1,600-LB, MK 1 (NAVY) AND MODS							
Exp D	216.0	13.5	83.5	1,601.0	67.9	14.0	1,385.0
BOMB, DEMOLITION, 100-LB, M30							
AM 50-50	53.9	50.6	38.5	106.6	30.0	8.2	98.0
BOMB, GP, 100-LB, AN-M30							
AM 50-50	53.3	49.4	38.5	107.8	30.0	8.2	99.0
TNT	56.8	51.0	38.5	111.3	30.0	8.2	102.5
Tritonal	59.8	52.3	38.5	114.3	30.0	8.2	105.5
BOMB, GP, 100-LB, AN-M30A1							
TNT	53.7	49.0	40.3	109.5	30	8.2	103.9
Tritonal	56.6	50.4	40.3	112.3	30	8.2	106.7
BOMB, GP, 250-LB, AN-M57							
AM 50-50	122.0	48.4	47.8	252.0	37.5	10.9	240.7
TNT	126.0	49.2	47.8	256.0	37.5	10.9	244.7
Tritonal	132.2	50.4	47.8	262.2	37.5	10.9	250.9
BOMB, GP, 250-LB, AN-M57A1							
AM 50-50	119.7	46.6	47.8	256.7	37.5	10.9	243.0
TNT	124.6	47.8	47.8	260.9	37.5	10.9	247.2
Tritonal	131.1	49.0	47.8	267.4	37.5	10.9	253.7
BOMB, DEMOLITION, 300-LB, M31							
AM 50-50	136.6	49.9	51.0	274.0	40.2	10.9	263.0
TNT	144.1	51.3	51.0	281.0	40.2	10.9	270.0
BOMB, DEMOLITION, 500-LB, M43							
AM 50-50	265.6	53.5	59.2	496.0	46.9	14.2	478.0
TNT	280.1	54.9	59.2	510.5	46.9	14.2	492.5

Table XXVII. Bomb and Cluster Data—Continued

Kind	Charge		Complete Round		Body		
	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
BOMB, GP, 500-LB, AN-M43							
AM 50-50	261.5	51.5	59.2	508.0	46.9	14.2	490.0
TNT	267.1	52.1	59.2	513.0	46.9	14.2	495.0
BOMB, GP, 500-LB, AN-M64							
AM 50-50	261.7	51.1	59.2	512.0	47.5	14.2	493.8
COMP B	273.2	52.2	59.2	523.5	47.5	14.2	505.3
TNT	261.7	51.1	59.2	511.8	47.5	14.2	493.8
Tritonal	274.0	52.3	59.2	524.1	47.5	14.2	506.1
BOMB, GP, 500-LB, AN-M64A1							
AM 50-50	258.5	47.8	59.2	540.6	47.5	14.2	516.3
COMP B	272.7	49.0	59.2	554.1	47.5	14.2	529.8
TNT	266.0	48.6	59.2	547.4	47.5	14.2	523.1
Tritonal	278.3	49.7	59.2	559.7	47.5	14.2	535.4
BOMB, DEMOLITION, 600-LB, M32							
AM 50-50	319.4	52.9	61.9	604.3	49.7	15.2	586.8
AM 80-20	304.4	51.7	61.9	589.3	49.7	15.2	571.8
TNT	336.1	54.1	61.9	621.0	49.7	15.2	603.5
BOMB, DEMOLITION, 1,000-LB, M44 AND BOMB, GP, 1,000-LB, M44							
AM 50-50	537.7	55.7	69.5	966.0	53.1	18.8	939.0
TNT	566.1	57.0	69.5	993.7	53.1	18.8	966.7
BOMB, GP, 1,000-LB, AN-M44							
AM 50-50	529.7	53.3	69.5	994.0	53.1	18.8	966.7
TNT	558.4	54.7	69.5	1,020.0	53.1	18.8	994.7
BOMB, GP, 1,000-LB, AN-M65							
AM 50-50	529.8	53.1	69.5	997.0	53.3	18.8	970.0
COMP B	572.7	55.1	69.5	1,040.0	53.3	18.8	1,013.0
TNT	548.4	54.0	69.5	1,015.4	53.3	18.8	988.4
Tritonal	575.7	55.2	69.5	1,042.7	53.3	18.8	1,015.7
BOMB, GP, 1,000-LB, AN-M65A1							
AM 50-50	525.8	50.8	69.5	1,034.1	54.0	18.8	996.2
COMP B	560.3	52.5	69.5	1,067.9	54.0	18.8	1,030.0
TNT	545.2	51.8	69.5	1,052.8	54.0	18.8	1,014.9
Tritonal	572.3	53.0	69.5	1,079.9	54.0	18.8	1,042.0

Table XXVII. Bomb and Cluster Data—Continued

Kind	Charge		Complete Round		Body		
	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
BOMB, DEMOLITION, 1,100-LB, M33							
AM 50–50	588.1	53.0	71.1	1,110.0	54.7	19.8	1,082.4
AM 80–20	559.1	51.7	71.1	1,082.0	54.7	19.8	1,054.4
TNT	618.1	54.2	71.1	1,141.0	54.7	19.8	1,113.4
BOMB, DEMOLITION, 2,000-LB, M34							
AM 50–50	1,076.1	54.2	92.8	1,987	71.0	23.3	1,943
TNT	1,133.1	55.4	92.8	2,044	71.0	23.3	2,000
BOMB, GP, 2,000-LB, AN–M34							
AM 50–50	1,060.3	51.7	92.6	2,049	71.0	23.3	2,005
TNT	1,117.1	53.1	92.6	2,105	71.0	23.3	2,061
BOMB, GP, 2,000-LB, AN–M66							
AM 50–50	1,060.5	51.7	92.8	2,052	71.8	23.3	2,011.4
COMP B	1,145.8	53.6	92.8	2,135.9	71.8	23.3	2,096.4
TNT	1,097.2	52.5	92.8	2,088.3	71.8	23.3	2,047.7
Tritonal	1,155.7	53.6	92.8	2,154.5	71.8	23.3	2,113.9
BOMB, GP, 2,000-LB, AN–M66A1							
AM 50–50	1,060.5	51.7	92.8	2,052	71.8	23.3	2,011.4
COMP B	1,144.8	53.6	92.8	2,135.9	71.8	23.3	2,095.3
TNT	1,097.2	52.5	92.8	2,088.3	71.8	23.3	2,047.7
Tritonal	1,155.7	53.6	92.8	2,154.5	71.8	23.3	2,113.9
BOMB, GP, 2,000-LB, AN–M66A2							
AM 50–50	1,045.2	50.7	92.6	2,061.1	71.8	23.3	2,004.1
COMP B	1,150.3	53.1	92.6	2,165.5	71.8	23.3	2,108.5
TNT	1,082.6	51.6	92.6	2,097.8	71.8	23.3	2,040.8
Tritonal	1,140.3	52.9	92.6	2,155.5	71.8	23.3	2,098.5
BOMB, LC, 4,000-LB, M56 (AN–M56)							
AM 50–50	3,244.1	77.2	117.3	4,201.0	94.9	34.3	4,087.0
TNT	3,360.5	77.8	117.3	4,317.0	94.9	34.3	4,203.0
Tritonal	3,526.3	78.7	117.3	4,482.8	94.9	34.3	4,368.8
BOMB, LC, 4,000-LB, M56A1 (AN–M56A1)							
AM 50–50	3,237.1	76.5	117.3	4,232.0	95.6	34.3	4,121.4
HBX	3,720.8	78.5	117.3	4,741.7	95.6	34.3	4,595.7
TNT	3,353.5	77.1	117.3	4,348.4	95.6	34.3	4,238.4
Tritonal	3,518.9	78.4	117.3	4,513.8	95.6	34.3	4,403.2

Kind	Charge		Complete Round		Body		
	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
BOMB, LC, 4,000-LB, M56A2 (AN–M56A2)							
AM 50–50	3,239.6	76.2	117.3	4,250.4	95.6	34.3	4,112.9
TNT	3,348.7	76.6	117.3	4,369.5	95.6	34.3	4,232
Tritonal	3,514.7	77.9	117.3	4,534.5	95.6	34.3	4,397
BOMB, GP, 12,000-LB, M109 (T10)							
Torpex	5,200	44.5	252	11,885	120	38	11,710
Tritonal	5,500	43.8	252	12,622	124	38	12,448
BOMB, GP, 22,000-LB, M110 (T14)							
Torpex	9,200	41.0	305	22,400	150	46	22,113
Tritonal	9,600	41.6	305	23,037	150	46	22,850
BOMB, GP, 44,000-LB, T12							
Tritonal	---------	---------	---------	---------	200	54	---------
BOMB, DEPTH, 350-LB, AN–MK 54 MOD 1							
HBX	248.0	71.7	52.5	346.3	33.3	13.5	80.0
HBX-1	248.0	71.7	52.5	346.3	33.3	13.5	80.0
TNT	225.5	70.0	52.5	323.8	33.3	13.5	80.0
BOMB, FRAGMENTATION, 4-LB, M83							
COMP-B	0.49	12.8	---------	3.82	2.82	3.125	2.31
Ednatol	.48	12.6	---------	3.81	2.82	3.125	2.30
TNT	.47	12.4	---------	3.80	2.82	3.125	2.29
BOMB, FRAGMENTATION, 20-LB, AN–M41							
AM 50–50	2.57	13.0	21.8	19.7	11.8	3.6	17.8
TNT	2.7	13.6	21.8	19.8	11.8	3.6	17.9
BOMB, FRAGMENTATION, 20-LB, AN–M41A1							
AM 50–50	2.57	13.0	22.2	19.7	11.8	3.6	17.8
TNT	2.7	13.6	22.2	19.8	11.8	3.6	17.9
BOMB, FRAGMENTATION, 23-LB, M40							
AM 50–50	2.57	10.5	29.8	24.5	11.3	3.6	17.8
TNT	2.7	11.0	29.8	24.6	11.3	3.6	17.9
BOMB, FRAGMENTATION, 23-LB, M40A1							
AM 50–50	2.57	10.5	30.2	24.5	11.8	3.6	17.8
TNT	2.7	11.0	30.2	24.6	11.8	3.6	17.9

Kind	Charge		Complete round		Body		
	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
	BOMB, FRAGMENTATION, 23-LB, M72						
AM 50-50	2.57	10.5	29.8	24.4	11.3	3.6	17.8
TNT	2.7	11.0	29.8	24.5	11.3	3.6	17.9
	BOMB, FRAGMENTATION, 23-LB, M72A1						
AM 50-50	2.57	10.5	30.2	24.4	11.5	3.6	17.8
TNT	2.7	11.0	30.2	24.5	11.5	3.6	17.9
	BOMB, FRAGMENTATION, 90-LB, M82						
COMP B	12.3	13.9	28.0	88.5	20.5	6.1	83.4
TNT	11.4	13.0	28.0	87.4	20.5	6.1	82.5
	BOMB, FRAGMENTATION, 120-LB, M86						
COMP B	12.3	10.4	58.8	118.2	20.5	6.1	83.4
TNT	11.4	9.7	58.8	117.3	20.5	6.1	82.5
	BOMB, FRAGMENTATION, 220-LB, AN-M88 (M88)						
COMP B	41.4	19.0	43.7	217.9	34.1	8.1	208.4
Ednatol	41.2	18.9	43.7	217.7	34.1	8.1	208.2
TNT	41.2	18.9	43.7	217.7	34.1	8.1	208.2
	BOMB, FRAGMENTATION, 260-LB, AN-M81						
COMP B	36.0	13.7	43.7	263.0	34.1	8.1	253.5
Ednatol	34.5	13.2	43.7	261.5	34.1	8.1	252.0
TNT	34.5	13.2	43.7	261.5	34.1	8.1	252.0
	BOMB, PHOTOFLASH, 100-LB, AN-M46 (M46)						
PF	25.0	48.2	48.6	51.9	32.9	7.8	43.9
	BOMB, LEAFLET (EMPTY), 100-LB, M104 (T2)						
See paragraph 153			47.4	25.6	43.7	8.0	24.5
	BOMB, LEAFLET (EMPTY), 500-LB, M105 (T3)						
See paragraph 153			59.4	73.1	55.7	13.9	72.0
	BOMB, PRACTICE, MINIATURE, 3-LB, MK 23 MOD 1 (AN-MK 23 MOD 1)						
See footnote 1			8.3	3.0	8.3	2.2	2.8

[1] Uses SIGNAL, bomb, practice, miniature, Mk 4 (AN-Mk 4) as spotting charge.

Table XXVII. Bomb and Cluster Data—Continued

Charge			Complete round		Body		
Kind	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
BOMB, PRACTICE, MINIATURE, 4.5-LB, MK 43 MOD 1 (AN–MK 43 MOD 1)							
See footnote 1			8.3	4.4	8.3	2.2	4.3
BOMB, PRACTICE, 23-LB, M71 OR M73							
None			26.7	21.0	11.4	3.6	15.2
BOMB, PRACTICE, 23-LB, M71A1 OR M73A1							
None			27.2	21.1	11.5	3.6	15.2
BOMB, PRACTICE, 100-LB, M38A2							
Sand	80.0	80.0	47.5	100.0	47.5	8.1	15.8
BOMB, PRACTICE, 100-LB, M85 (CONCRETE)							
Concrete	95.0	91.8	38.3	103.5	28.5	8.1	95.2
BOMB, TARGET, PRACTICE, 100-LB, M75							
Hematite	72.0	71.1	48.6	101.2	46.7	8.1	98.3
BOMB, TARGET, PRACTICE, 100-LB, M75A1							
Hematite	72.0	71.1	51.6	101.2	49.7	8.1	98.3
BOMB, SAP, 500-LB, AN–M58							
AM 50–50	154.6	32.2	57.8	480.0	47.2	11.8	466.5
TNT	160.1	33.0	57.8	485.2	47.2	11.8	471.7
BOMB, SAP, 500-LB, AN–M58A1							
AM 50–50	145.1	29.0	57.8	499.5	47.7	11.8	486.0
Picratol	152.6	30.1	57.8	507.0	47.7	11.8	493.5
TNT	151.0	29.9	57.8	505.4	47.7	11.8	491.9
BOMB, SAP, 500-LB, AN–M58A2							
AM 50–50	135.2	25.6	57.8	528.6	47.7	11.8	514.6
Picratol	143.1	26.7	57.8	536.5	47.7	11.8	522.5
TNT	141.5	26.5	57.8	534.6	47.7	11.8	520.6
BOMB, SAP, 1,000-LB, AN–M59							
AM 50–50	312.6	31.7	70.4	987.5	57.3	15.1	977.4
Picratol	314.7	31.8	70.4	990.0	57.3	15.1	979.9
TNT	312.2	31.6	70.4	987.2	57.3	15.1	977.1

[1] Uses SIGNAL, bomb, practice, miniature, Mk 4 (AN–Mk 4) as spotting charge.

Charge			Complete round		Body		
Kind	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
BOMB, SAP, 1,000-LB, AN-M59A1							
AM 50-50	302.4	29.5	70.4	1,023.6	57.3	15.1	1,003.5
Picratol	312.6	30.2	70.4	1,033.9	57.3	15.1	1,013.8
TNT	310.1	30.1	70.4	1,031.1	57.3	15.1	1,011.0
BOMB, SAP, 2,000-LB, M103							
Picratol	556.5	27.3	88.5	2,039.4	68.6	18.8	1,983.3
TNT	552.6	26.4	88.5	2,095.5	68.6	18.8	1,979.4
BOMB, SAP, 25,000-LB, T28E4							
Picratol	3,900				199.5	32.0	25,020.0
BOMB, TI, SMOKE, RED, 100-LB, M84							
Hematite	72.0	70.6	50.1	102.0	46.7	8.1	98.3
BOMB, TI, SMOKE, RED, 100-LB, M84A1							
Hematite	72.0	69.9	53.1	103.0	49.7	8.1	99.3
BOMB, TI, 250-LB, M89							
Pyrotechnic, green.	74.3	28.5	56.8	261.0	39.6	10.8	253.0
Pyrotechnic, red.	65.6	27.1	56.8	242.0	39.6	10.8	234.0
Pyrotechnic, yellow.	58.9	24.0	56.8	245.0	39.6	10.8	237.0
BOMB, TI, 250-LB, M90 (T2)							
Pyrotechnic, green.	71.9 [1]	27.4	56.8	262.0	39.6	10.8	254.0
Pyrotechnic, red.	63.6 [1]	25.9	56.8	246.0	39.6	10.8	238.0
Pyrotechnic, yellow.	57.3 [1]	23.2	56.8	247.0	39.6	10.8	239.0
BOMB, TI, 250-LB, M91 (T9)							
Pyrotechnic, green.	45.8	18.5	56.8	248.0	39.6	10.8	240.0
Pyrotechnic, red.	43.3	18.0	56.8	241.0	39.6	10.8	233.0
Pyrotechnic, yellow.	37.3	15.4	56.8	242.0	39.6	10.8	234.0

[1] Gross weight of pyrotechnic and explosive.

Table XXVII. Bomb and Cluster Data—Continued

Kind	Charge: Weight (lb)	Charge: Percent of complete round weight	Complete round: Length (in)	Complete round: Weight (lb)	Body: Length (in)	Body: Diameter (in)	Body: Weight (lb)
BOMB, TI, 250-LB, M98 (T17)							
Pyrotechnic, green.	58.5[2]	22.1	56.8	265.0	39.6	10.8	257.0
Pyrotechnic, red.	51.2[2]	20.5	56.8	256.0	39.6	10.8	248.0
Pyrotechnic, yellow.	46.7[2]	20.4	56.8	255.0	39.6	10.8	247.0
BOMB, TI, 250-LB, M100 (T19)							
Pyrotechnic, red-green.	71.5	27.0	56.8	265.0	39.6	10.8	257.0
Pyrotechnic, red-yellow.	60.2	25.3	56.8	258.0	39.6	10.8	250.0
Pyrotechnic, yellow-green.	67.5	25.5	56.8	265.0	39.6	10.8	257.0
CLUSTER, FRAGMENTATION BOMB, M1A1 (AN–M1A1)							
TNT-------	16.2	13.0	46.6	125.0	46.6	--------	121.3
CLUSTER, FRAGMENTATION BOMB, AN–M1A2							
TNT-------	16.2	12.7	46.6	128.0	46.6	--------	124.3
CLUSTER, FRAGMENTATION BOMB, M4 (AN–M4)							
TNT-------	8.1	9.3	31.0	87.2	31.0	--------	83.7
CLUSTER, FRAGMENTATION BOMB, M4A1 (AN–M4A1)							
TNT-------	8.1	9.3	31.0	87.2	31.0	--------	83.7
CLUSTER, FRAGMENTATION BOMB, M4A2 (AN–M4A2)							
TNT-------	8.1	9.3	31.0	87.2	31.0	--------	83.7
CLUSTER, FRAGMENTATION BOMB, M26							
TNT-------	54.0	13.4	52.6	404	48.5	--------	383
CLUSTER, FRAGMENTATION BOMB, M26A1							
TNT-------	54.0	13.4	52.6	404	48.5	--------	383

[2] Gross weight of pyrotechnic and explosive.

Charge			Complete round		Body		
Kind	Weight (lb)	Percent of complete round weight	Length (in)	Weight (lb)	Length (in)	Diameter (in)	Weight (lb)
CLUSTER, FRAGMENTATION BOMB, M26A2							
TNT	54.0	13.0	52.6	416	48.5	------	305
CLUSTER, FRAGMENTATION BOMB, M27							
TNT	68.4	11.7	59.0	584.6	55.6	------	561.4
CLUSTER, FRAGMENTATION BOMB, M27A1							
TNT	68.4	11.7	59.0	584.6	55.8	------	561.4
CLUSTER, FRAGMENTATION BOMB, M28							
TNT	11.3	9.7	47.4	116.8	43.7	8.00	115.7
CLUSTER, FRAGMENTATION BOMB, M28A1							
TNT	11.3	9.5	47.5	118.7	43.7	8.00	115.7
CLUSTER, FRAGMENTATION BOMB, M28A2							
TNT	11.3	9.5	47.5	118.7	43.7	8.00	115.7
CLUSTER, FRAGMENTATION BOMB, M29, M29A1, M29A2							
TNT	42.3	10.2	59.4	415.1	55.7	13.9	72.0
CLUSTER, PRACTICE BOMB, M5							
None	------	------	31.0	84.0	31.0	------	84.0

Table XXVIII. Fin Assembly and Fin Lock Nut Data

Bomb	Fin Assembly				Fin lock nut	
	Model	Sleeve opening (in)	Length (in)	Width (in)	Model	Thread specification
ARMOR-PIERCING						
AP, 1,000-lb, AN-Mk 33 and mods.	----------	5.50	17	11½	----------	5.0-12NS-1
AP, 1,600-lb, AN-Mk 1 and mods.	----------	5.50	21.0	14½	----------	5.0-12NS-1
AP, 1,600-lb, Mk 1 and mods.	----------	5.50	21.0	14½	----------	5.0-12NS-1
GENERAL PURPOSE						
Demolition, 100-lb, M30. GP, 100-lb, AN-M30. GP, 100-lb, AN-M30A1.	Fin assembly, M102 (100-lb size) or Fin assembly, M102A1 (100-lb size) or Fin assembly, AN-M103A1 (100-lb size).	3	9½	8	M1 [1] ----------	2.625-12NS-1
GP, 250-lb, AN-M57. GP, 250-lb, AN-M57A1. Demolition, 300-lb, M31.	Fin assembly, M106 (250-lb size) or Fin assembly, AN-M106A1 (250-lb size).	3	12⅛	10⅞	M1 [1] ----------	2.625-12NS-1
TI, 250-lb, all models.	Fin assembly, M107 (250-lb size) or Fin assembly, M107A1 (250-lb size).	None	15.70	10.76	Lock nut not required.	
Demolition, 500-lb, M43. GP, 500-lb, AN-M43. GP, 500-lb, AN-M64. GP, 500-lb, AN-M64A1.	Fin assembly, M108 (500-lb size).	4.03	14	13¾	See footnote 1.	3.5-12NS-1
	Fin assembly, M109 (500-lb size) or Fin assembly, AN-M109A1 (500-lb size) or Fin assembly, M123 (500-lb size).[2]	5.23	14	13¾	M2 [1] ----------	4.7-12NS-1
Demolition, 600-lb, M32.	Fin assembly, M111 (500-lb size).	4.03	14	14¾	See footnote 1.	3.5-12NS-1
Demolition, 1,000-lb, M44. GP, 1,000-lb, M44. GP, 1,000-lb, AN-M44. GP, 1,000-lb, M65. GP, 1,000-lb, AN-M65. GP, 1,000-lb, AN-M65A1.	Fin assembly, M112 (1,000-lb size).	4.03	18½	18¼	See footnote 1.	3.5-12NS-1
	Fin assembly, M113 (1,000-lb size) or Fin assembly, AN-M113A1 (1,000-lb size) or Fin assembly, M124 (1,000-lb size).[2]	5.23	18½	18¼	M2 [1] ----------	4.7-12NS-1
Demolition, 1,100-lb, M33.	Fin assembly, M115 (1,000-lb size).	4.03	18½	19½	See footnote 1.	3.5-12NS-1
Demolition, 2,000-lb, M34. GP, 2,000-lb, AN-M34. GP, 2,000-lb, AN-M66. GP, 2,000-lb, AN-M66A1. GP, 2,000-lb, AN-M66A2.	Fin assembly, M116 (2,000-lb size) or Fin assembly, AN-M116A1 (2,000-lb size).	6.53	25	22¾	M3 [1] ----------	6.-12NS-1

See footnotes at end of table.

Table XXVIII. Fin Assembly and Fin Lock Nut Data—Continued

Bomb	Fin assembly				Fin lock nut	
	Model	Sleeve opening (in)	Length (in)	Width (in)	Model	Thread specification
GENERAL PURPOSE—Continued						
LC, 4,000-lb, M56. LC, 4,000-lb, M56 (AN-M56). LC, 4,000-lb, M56A1 (AN-M56A1). LC, 4,000-lb, M56A2 (AN-M56A2).	Fin assembly, M118 (4,000-lb size) or Fin assembly, M118A1 (4,000-lb size) or Fin assembly, M118A2 (4,000-lb size).	6.53	28	34	M3 [1]	6-12NS-1
GP, 12,000-lb, M109 (T10).	Fin assembly, M120 (12,000-lb size).		132⅛	44½	See footnote 3.	
GP, 22,000-lb, M110 (T14).	Fin assembly, M121 (22,000-lb size).		160	53⅛	See footnote 3.	
GP, 44,000-lb, T12.					See footnote 3.	
FRAGMENTATION						
Fragmentation, 20-lb, M41. Fragmentation, 20-lb, AN-M41. Fragmentation, 20-lb, AN-M41A1.	Fin assembly, AN-M100 (clustered).		9	3¾	Fin is screwed directly to bomb body.	
Fragmentation, 90-lb, M82.	Fin assembly, M101 (clustered).	3	9¼	6	See footnote 1.	2.625-12NS-1
Fragmentation, 220-lb, AN-M88 (M88).	Fin assembly, M103 (100-lb size) or	3	11½	8	See footnote 1.	2.625-12NS-1
Fragmentation, 260-lb, AN-M81.	Fin assembly, AN-M103A1 (100-lb size).				See footnote 1.	
PRACTICE						
Practice, 100-lb, M85.	Fin assembly, M105 (100-lb size).		11½	8	See footnote 4.	
SEMI-ARMOR PIERCING						
SAP, 500-lb, AN-M58. SAP, 500-lb, AN-M58A1. SAP, 500-lb, AN-M58A2.	Fin assembly, M110 (500-lb size) or Fin assembly, AN-M110A1 (500-lb size).	4.03	15⅛	11¾	See footnote 1.	3.5-12NS-1
SAP, 1,000-lb, AN-M59. SAP, 1,000-lb, AN-M59A1.	Fin assembly, M114 (1,000-lb size) or Fin assembly, AN-M114A1 (1,000-lb size).	4.03	16⅞	15	See footnote 1.	3.5-12NS-1
SAP, 2,000-lb, M103.	Fin assembly, M117 (2,000-lb size) or Fin assembly, M117A1 (2,000-lb size).	5.23	25¾	18⅝	See footnote 1.	4.7-12NS-1
SAP, 25,000-lb, T28E4.					See footnote 3.	

*See footnotes at end of table.

Table XXVIII. Fin Assembly and Fin Lock Nut Data—Continued

Bomb	Fin Assembly				Fin lock nut	
	Model	Sleeve opening (in)	Length (in)	Width (in)	Model	Thread specification
TARGET IDENTIFICATION						
TI, 250-lb, (all colors and all mods).	Fin assembly, M107 (250-lb size). or Fin assembly, M107A1 (250-lb size).	----------	15¾	10¾	See footnote 5.	

[1] Fin lock nuts of older design (without set screw) which were not assigned "M" designations are also available.
[2] For externally carried bombs on high speed aircraft.
[3] Fin assembly is attached to bomb body by bolts.
[4] The fin assembly is passed over four stud bolts extending from the body and is held in place by hexagonal nuts.
[5] The fin assembly is held in place by spring latches.

Table XXIX. Fuze Seat Dimensions (fig. 27)

Type	Threads	Depth (in)	Bombs
GP type nose	2.-12NS-1	5	GP, SAP, demolition and LC, all. Fragmentation 90-lb and larger. Depth. Chemical 500-lb and larger.
Fragmentation type nose	1.5-12NF-1	1.3	Fragmentation 20–23 lb. Aimable clusters (cml C). Adapter Booster M117. Chemical 115-lb.
Flare type nose	1.5-12NF-1	0.84	Aircraft flares. Aimable clusters (Ord Dept.). Fragmentation and practice clusters. Photoflash bombs. Chemical bombs 100-lb.
GP type tail (M102)	1.5-12NF-1	2.86	GP 100-250 lb, GP 500-2,000 lb. Demolition 300-1, 100 lb, SAP 500-1,000 lb. Light case, 4,000 lb.
GP type tail (M115)	2.-12NS-3 1.5-12NF-1	2.68 2.87	GP 500-2,000 lb (M64, M65, M66). Incendiary 500-lb, Chemical 500-1,000 lb.
Navy type tail		4.0	AP 1,000-1,600 lb. Depth.
GP type tail (M169)	1.375-14TWS-1	2.45	GP 12,000-22,000 lb (M109, M110).

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