TM 5-3820-239-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL
SUPPORT, AND DEPOT MAINTENANCE MANUAL

DRILL, PNEUMATIC, DRIFTER: BOOM-TYPE; CRAWLER-MOUNTED; SELF-PROPELLED (INGERSOLL-RAND MODEL CM150A/D475A) FSN 3820-854-4149

HEADQUARTERS, DEPARTMENT OF THE ARMY

25 JANUARY 1968

SAFETY PRECAUTIONS

BEFORE OPERATION

Make sure the drill is raised to clear a11 obstacles before towing or trimming (moving under compressor power).

DURING OPERATION

Make sure the drill guide is raised to clear all obstacles before towing or tramming (moving under compressor power).

Wear safety glasses while drilling, to prevent damage to the eyes.

Use extreme caution when walking alongside the unit while tramming. The propelling motors are fast-acting during starting and turning.

AFTER OPERATION

When the hydraulic system is not in use, turn off pump to prevent pressure build-up.

Be sure compressor is shut off and pressure in lines released before disconnecting hoses.

GPO 812-695-1

Changes in force: C 2, C 3, and C 5

TM 5-3820-239-15
***C5**

CHANGE

No. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., *11 May 1992*

Operator's, Organizational, Direct Support, and General Support Maintenance Manual

DRILL, PNEUMATIC, DRIFTER: BOOM-TYPE; CRAWLER-MOUNTED; SELF-PROPELLED (INGERSOLL-RAND MODELS CM150A/D475A AND CM225/D475A) NSN 3820-00-854-4149 AND NSN 3820-00-410-5549

Note: The equipment/system described herein is non-metric and does not require metric common or special tools: therefore, metric units are not supplied. For clarity, operator and maintenance instructions will also remain non-metric.

PURPOSE

The purpose of this change is to incorporate operation and maintenance data for the 220-lb class crawler-mounted drifter drill retrofit kit.

HOW TO USE THIS CHANGE

To determine if your crawler-mounted drill is equipped with the retrofit kit, check the part number stamped on the gearbox mounting plate. If the part number is "20010", your unit is equipped with the retrofit kit. Follow the instructions included in this change package for operation, preventive maintenance, and maintenance of the feed-shell assembly and drifter drill.

TM 5-3820-239-1525 January 1968, is changed as follows:

Inside front cover. Add the following warning:

***Warning:* Wear hearing protection during drilling to prevent ear damage due to excessive noise.**

Page ii.

Add the following to the Table of Contents, immediately before Appendix A:

CHAPTER 7. MAINTENANCE INSTRUCTIONS FOR UNITS EQUIPPED WITH RETROFIT KIT

Section I. Organizational Maintenance Instructions, paragraphs 7-l-7-16

Section II. Direct Support Maintenance Instructions, paragraphs 7-17-7-23

Add the following to the Table of Contents, immediately after Appendix C:

APPENDIX D. ILLUSTRATED LIST OF MANUFACTURED ITEMS

Page 1-1.

Paragraph *1-1d is* superseded as follows:

d. You can help improve this manual. If you find any mistakes or know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Rec*ommended Changes to Publications and Blank Forms)* direct to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

Paragraph *1-2b* is superseded as follows:

b. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, *The Army Maintenance Management System (TAMMS).*

***This change supersedes Change 4, 16 April 1990.**

Page 1-5. Add the following data to the paragraph indicated:

Paragraph *1-4b(2).*

Manufacturer. . . . . .Cannon Industries, Inc.
Model. CVR-250
Bit size. . . . . .1 1/2 to 3 1/2 in.

Paragraph *1-4b(7).*

Manufacturer. . . . . .Jimco Supply Co., Inc.
Model. ACB38

Paragraph *1-4b(13).*

Manufacturer . . . . . .Gast Manufacturing Corporation
Model. 16AM-F3RV-13

Page 1-11. Figure 1-4.1 is added.

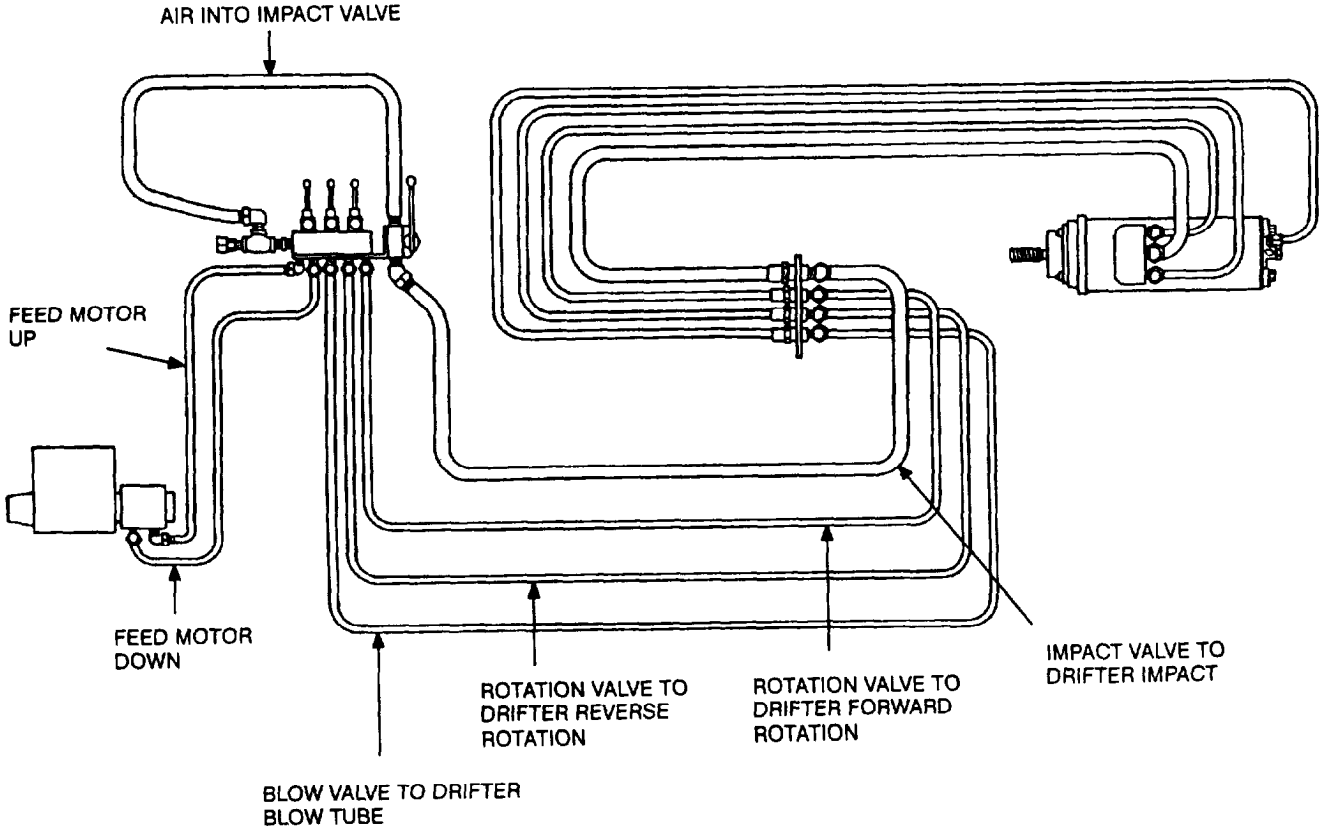


Figure 1-4.1. Drill control air piping diagram (for units equipped with retrofit kit).

Page 2-6. Figure 2-3(2.1) is added after Figure 2-3(2) as follows:

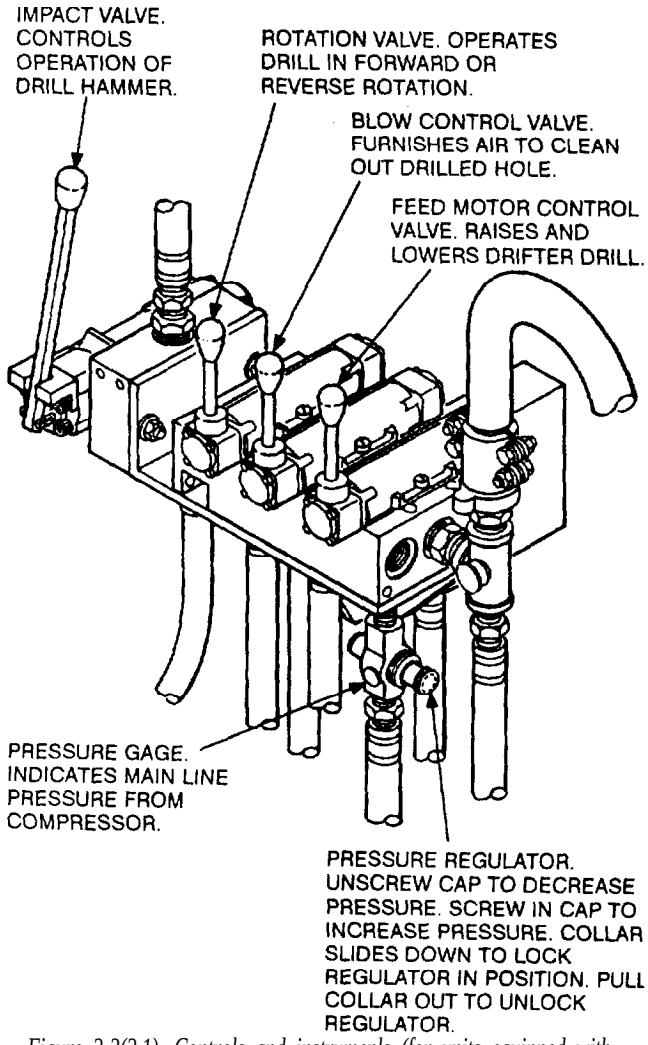


Figure 2-3(2.1). Controls and instrumenls (for units equipped with retrofit kit).

Page 2-10, paragraph *2-13b.* The warning is superseded as follows:

Warning: **Wear a respiratory mask at all times during drilling to prevent rock drill dust from entering the lungs. Wear safety glasses while drilling to prevent eye damage from flying particles. Wear hearing protection while drilling to prevent ear damage due to excessive noise.**

Page 3-3. Chapter 3, Section III is superseded as follows:

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-5. Introduction.

a. General. Tables 3-l and 3-2 (PMCS Table) have been provided so you can keep your equipment in good operating condition and ready for its primary mission.

b. Warnings and Cautions. Always observe the WARNINGS and CAUTIONS appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe these WARNINGS and CAUTIONS to prevent serious injury to yourself and others or to prevent your equipment from being damaged.

3-6. Explanation of Table Entries.

a. Item Number Column. Numbers in this column are for reference. When completing DA Form 2404 *(Equipment Maintenance and Inspection Work-sheet),* include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services.

b. Interval Column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or

use the equipment. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment. WEEKLY procedures must be done once each week. QUARTERLY procedures must be done every three months or after 250 hours of operation, whichever comes first.

c. Location, Item to Check/Service Column. This column provides the location and the item to be checked or serviced. The item location is underlined.

d. Procedure Column. This column gives the procedures you must do to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the interval column.

e. Not Fully Mission Capable If: Column. Information in this column tells you what faults will keep your equipment from being able to perform its primary mission. If you make check and service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

f: Other Table Entries. Be sure to observe all special information and notes that appear in you table.

3-7. Leakage Definitions.

The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment.

CLASSIFICATION	DEFINITION
Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops but not enough to cause drops to drip from the item being inspected.
Class III	Leakage of fluid great enough to cause drops to drip from the item being inspected.

Note: Fluid levels of items with Class I and Class II leaks must be checked often so proper levels can be kept.

Class III leaks must be reported to supervisors or to Organizational Level Maintenance for corrective action.

Table 3-1. Operator Preventive Maintenance Checks and Services for Crawler-mounted Rock Drill

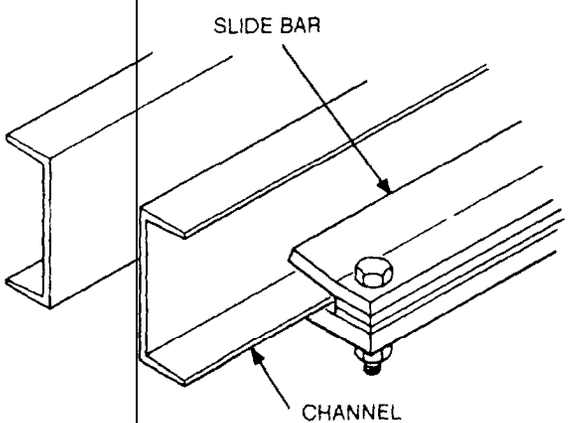
Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
		Crawler		
1	Before	Hydraulic Hoses and Fittings	Check hoses and fittings for good condition. Ensure that fittings are tight. Look for signs of leakage around hydraulic hoses.	Signs of Class III leakage.
2	Before	Lubricating Oil Reservoir	Check oil level. Notify organizational maintenance if level is low.	
3	Before	Traction Drive Planet Gear Housing	Check oil level. Notify organizational maintenance if level is low.	
4	Before	Propelling Air Motors	Check oil level. Notify organizational maintenance if level is low.	
5	During	Hydraulic Control Valves	Check hydraulic control valves for leaks.	Class III leaks are found.
6	During	Lubricator Metering Valve	Adjust flow to drill (see paragraph 3-10).	
7	Weekly	Hydraulic Reservoir	Check oil level. Oil level should be 5 in, below top of reservoir. Notify organizational maintenance if level is low.	

Table 3-1. Operator Preventive Maintenance Checks and Services for Crawler-mounted Rock Drill

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
		Feed Mechanism		
8	Before	Drill Steel	Clean, inspect, and lubricate.	
9	Before	Striker Bar	Check striker bar for damage and excessive wear. Both ends of striking bar must be flat and square, not chipped. Replace if necessary.	Striker bar is excessively worn or damaged.
10	Before	Drifter Drill	Check front cap for tightness. Do not run drill with a loose front cap.	Front cap is loose.
11	Before	Feed Chain	Visually check feed chain for breaks or damage.	Feed chain broken or damaged.
12	Before	Feed Chain Sprockets	Visually check sprocket alinement. If sprockets are not aligned, notify organizational maintenance.	
13	Before	Feedshell	Visually check feedshell for damage. Visually check for wear that would interfere with operation.	
14	Before	Sprockets, Feed Chain and Centralizer	Visually check for excessive accumulation of dust and debris that will interfere with operation.	
15	Before	Mounting Hardware	Check for loose or missing nuts or bolts. Notify organizational maintenance if any nuts or bolts are loose or missing.	Mounting hardware loose or missing.
16	During	Sprockets, Feed Chain and Centralizer	Visually check for excessive accumulation of dust and debris that will interfere with operation.	
17	During	Air Hoses	Inspect air hoses for leaks, damage, or frays.	Leakage causes poor performance.
18	Weekly	Feed Motor Gearbox	Check oil level in gearbox. Notify organization maintenance if level is low.	

Table 3-2. Organizational Preventive Maintenance Checks and Services for Crawler-mounted Rock Drill

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			Note: Checks 1 through 4 are for units equipped with retrofit kit.	
1	Weekly	Feedshell	Check all bolts and nuts on feedshell for tightness. Pay particular attention to drifter drill mounting bolts and feedshell slide mounting bolts.	Any bolts loose or missing.
2	Weekly	Feed Chain	Check chain deflection weekly. Ensure that chain is not so tight that no deflection occurs not so loose that is sags. Adjust if necessary (see paragraph 3-25 or 7-13).	Chain cannot be adjusted.
3	Weekly	Air Hose Connections	Check all air hose connections and tighten if necessary.	
4	Monthly	Slide Bar Shims	Measure clearance between slide bar and feedshell channel. If clearance is greater tha: 1/8 in., remove slide bar and adjust shims until clearance is less than 1/8 in. (see paragraph 7-12). Repeat for all four slide bars.	
5	Monthly	Centralizer	Close centralizer and measure inside diameter of bore. Replace centralizer blocks when inside diameter is greater than 2 in. (see paragraph 7-9).	
6	Monthly	Drifter Drill	Check torque on side rod mounting nuts. Gradually tighten to 150 lb-ft.	
7	Quarterly	Brakes	Adjust brakes (see paragraph 3-38).	
8	Quarterly	Final Drive Sprockets	Check and tighten sprocket stud nuts if required (see paragraph *3-36b).*	
9	Quarterly	Tracks	(Check and adjust tracks if requircd (see paragraph *3-36b).*	



Page 5-1.

Paragraph 5-4. Add the following references where indicated:

Following the possible remedy for "Valve chest clogged" add reference to paragraph 7-19.

Following the possible remedy for "Damaged or worn parts" add reference to paragraph 7-19.

Paragraph 5-5. Add the following references where indicated:

Following the possible remedy for "Dirt clogging drill" add reference to paragraph 7-19.

Following the possible remedy for "Blower tube broken" add reference to paragraph 7-19.

Page 5-2.

Paragraph 5-6. Following the possible remedy for "Rifle bar, pawls, rifle nut, or chuck nut damaged or worn" add reference to paragraph 7-19.

Paragraph 5-7. Following the possible remedy for "Worn bearings" add reference to paragraph 7-22.

Page A-1. Chapter 7 is added before Appendix A as follows:

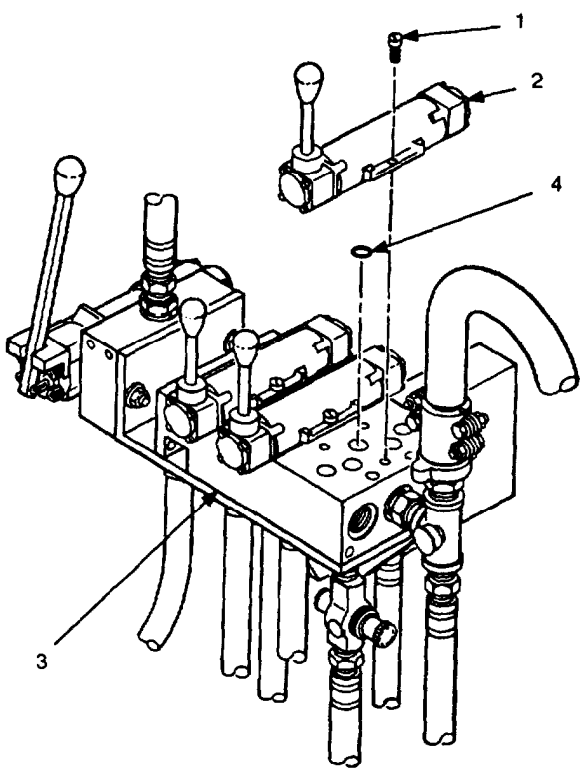
CHAPTER 7

MAINTENANCE INSTRUCTIONS FOR UNITS EQUIPPED WITH RETROFIT KIT

Section I. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

7-1. Control Valves and Manifold Replacement

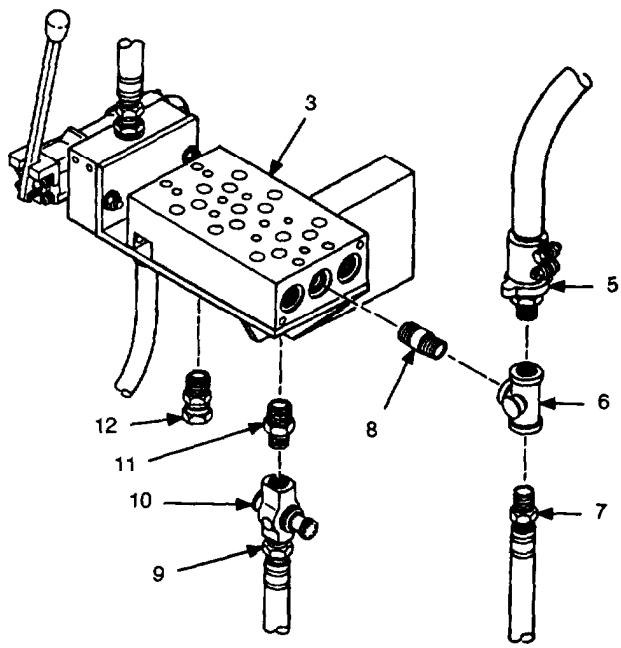
a. Removal.



(1) Remove three screws (1). Remove valve (2) from manifold (3).

(2) Remove five O-rings (4) from valve (2) or manifold (3). Discard O-rings.

(3) Repeat steps (1) and (2) for remaining valves.

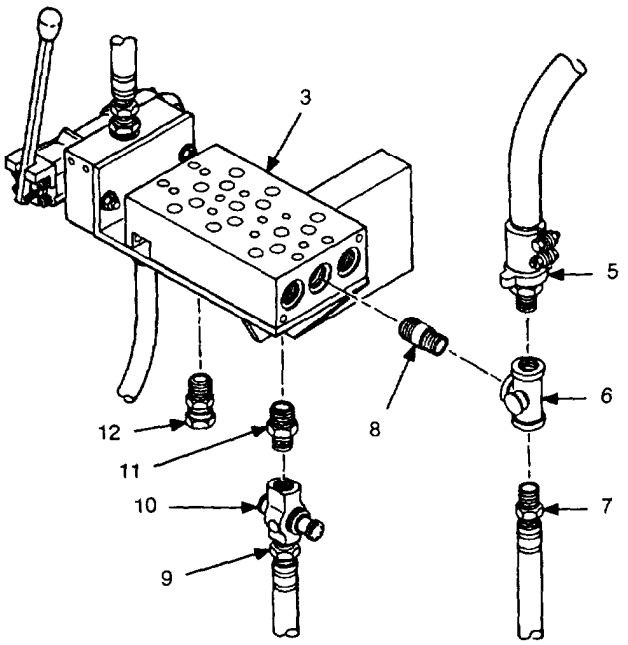


(4) Disconnect crawler air hose (5) from tee (6).

(5) Disconnect impact valve air hose (7) from tee (6).

(6) Remove tee (6) and nipple (8) from manifold (3).

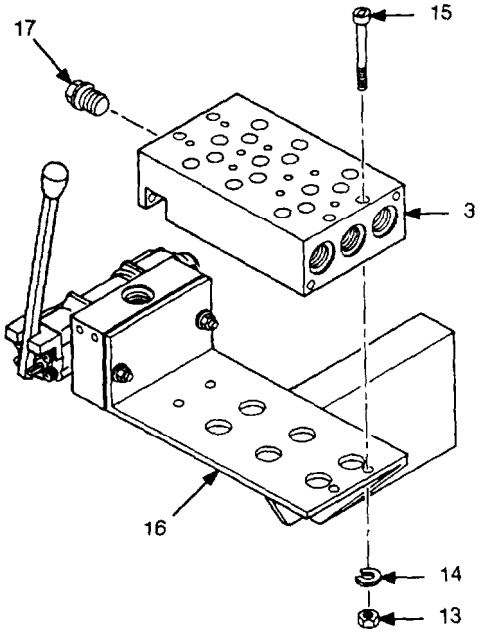
(7) Tag and disconnect five hoses (9).



Note: Use a thin-walled wrench (NSN 5120-00-288-8714) to remove swivels from valve manifold.

(8) Remove pressure regulator (10) and swivel (11) from manifold (3).

(9) Remove remaining four swivels (12) from manifold (3).



(10) Remove four nuts (13), lockwashers (14), and bolts (15). Remove manifold (3) from bracket (16). Discard lockwashers.

(11) Remove seven pipe plugs (17) from manifold (3).

b. Installation.

(1) Wrap pipe plug threads with antiseize tape. Install seven pipe plugs (17) in manifold (3).

(2) Install manifold (3) on bracket (16) using four bolts (15), new lockwashers (14), and nuts (13).

Note: Use a thin-walled wrench (NSN 5120-00-288-8714) to install swivels in valve manifold.

(3) Wrap male threads on four swivels (12) with antiseize tape. Install four swivels in manifold (3).

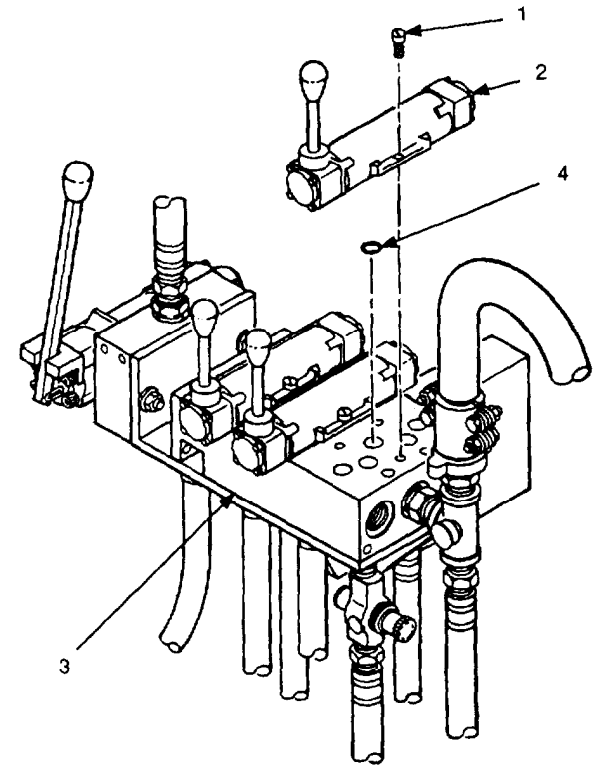
(4) Wrap threads on swivel (11) with antiseize tape. Install swivel in manifold (3). then install pressure regulator (10) on swivel.

(5) Connect five hoses (9) to swivels (12 and 11). Remove tags.

(6) Wrap threads on nipple (8) with antiseize tape. Install nipple in manifold (3), then install tee (6) on nipple.

(7) Connect impact valve air hose (7) to tee (6).

(8) Connect crawler air hose (5) to tee (6).

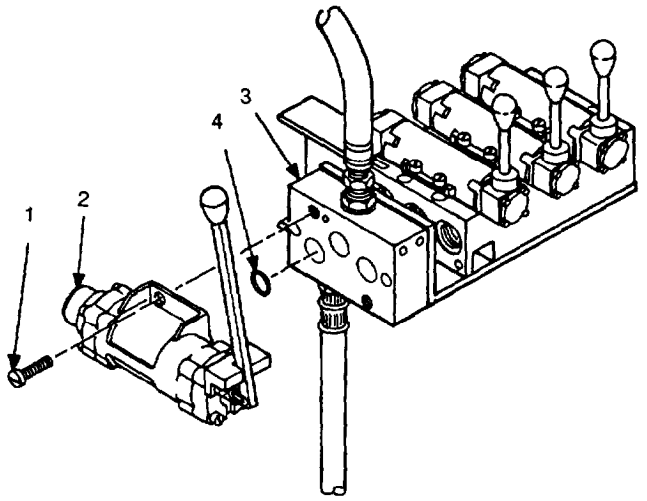


(9) Install five new O-rings (4) in valve (2).

(10) Install valve (2) on manifold (3) using three screws (1).

(11) Repeat steps (9) and (10) for remaining valves.

7-2. Impact Valve and Manifold Replacement



a. Removal.

(1) Remove two screws (1). Remove impact valve (2) from manifold (3).

(2) Remove two O-rings (4) from impact valve (2) or manifold (3). Discard O-rings.

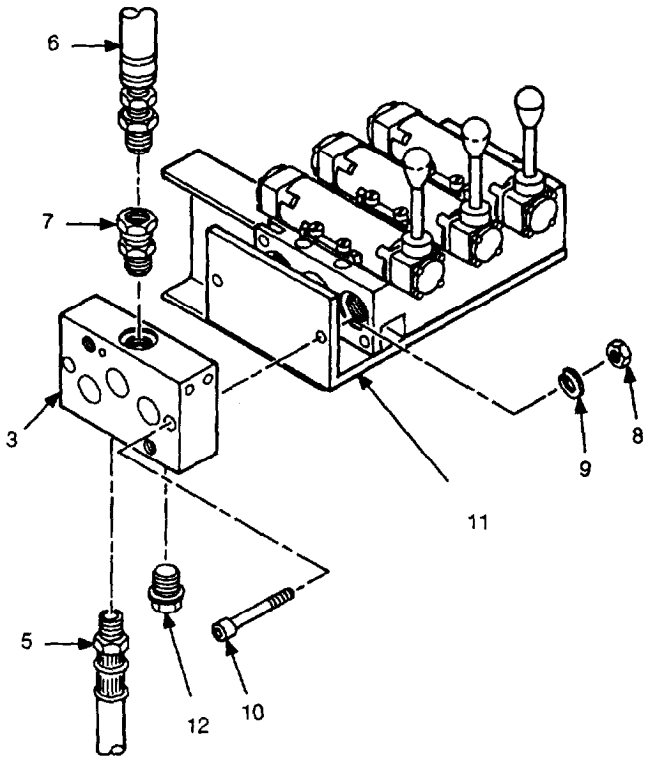
(3) Tag and disconnect hose (5) from manifold (3).

(4) Tag and disconnect hose (6) from swivel (7).

(5) Remove swivel (7) from manifold (3).

(6) Remove two nuts (8), lockwashers(9), and bolts (10). Remove manifold (3) from bracket (11). Discard lockwashers.

(7) Remove plug (12) from manifold (3).



b. Installation.

(1) Wrap threads on plug (12) with antiseize tape. Install plug in manifold (3).

(2) Install manifold (3) on bracket (11) using two bolts (10), new lockwashers (9), and nuts (8).

(3) Wrap male threads on swivel (7) with antiseize tape. Install swivel in manifold (3).

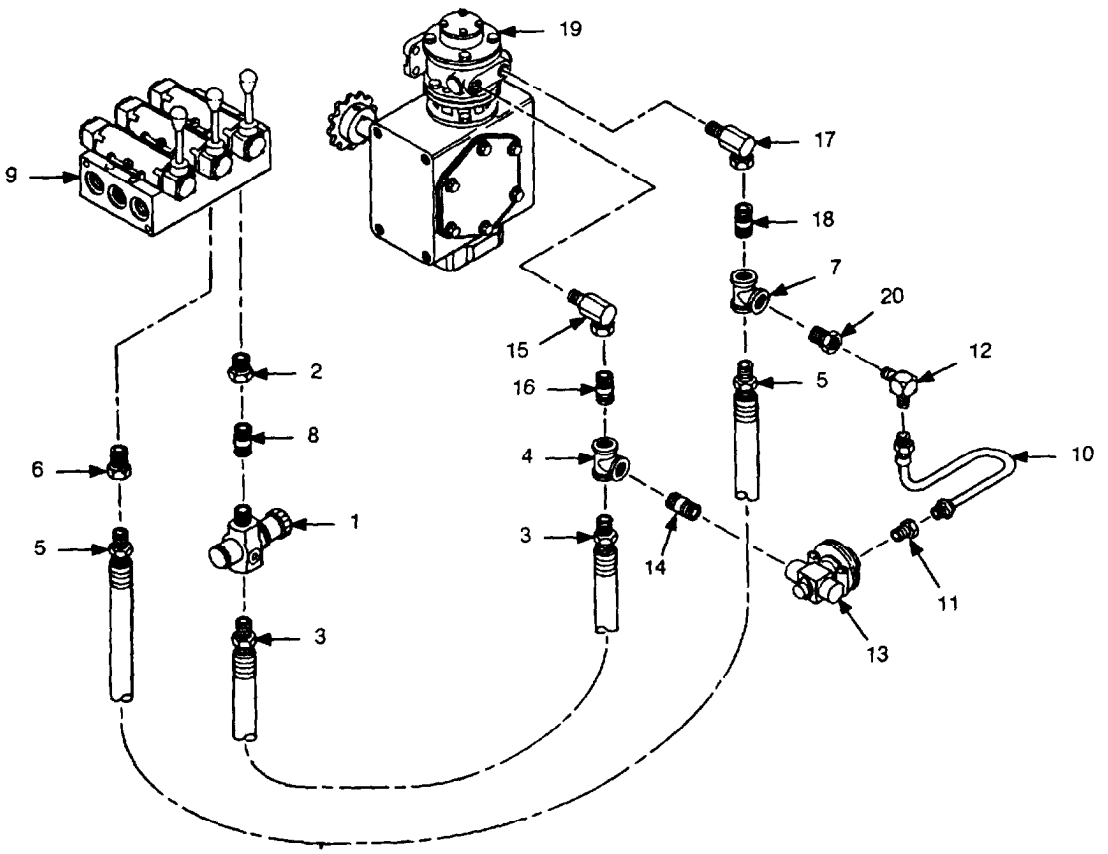
(4) Connect hose (6) to swivel (7). Remove tag.

(5) Connect hose (5) to manifold (3). Remove tag.

(6) Install two new O-rings (4) in impact valve (2).

(7) Install impact valve (2) on manifold (3) using two screws (1).

7-3. Feed Motor Hoses and Fittings Replacement



a. Removal.

(1) Disconnect pressure regulator (1) from swivel (2). Remove hose (3) from pressure regulator and tee (4).

(2) Disconnect hose (5) from swivel (6) and tee (7). Remove hose.

(3) Remove nipple (8) from pressure regulator (1) or swivel (2).

Note: Use a thin-walled wrench (NSN 5120-00-288-8714) to remove swivels from valve manifold.

(4) Remove two swivels (2 and 6) from valve manifold (9).

(5) Remove hose (10) from straight fitting (11) and 90 degree fitting (12).

(6) Remove quick-exhaust valve (13) from nipple (14).

(7) Remove tee (4) from elbow (15). Remove nipple (16) from tee.

(8) Remove tee (7) from elbow (17). Remove nipple (18) from tee.

(9) Remove nipple (14) from tee (4) or quick-exhaust valve (13).

(10) Remove two elbows (15 and 17) from feed motor (19).

(11) Remove straight fitting (11) from quick-exhaust valve (13).

(12) Remove 90 degree fitting (12) from bushing (20), then remove bushing from tee (7).

b. Installation.

(1) Wrap male threads on elbows (15 and 17) with antiseize tape. Install two elbows in feed motor (19). Elbows must face down.

(2) Wrap two nipples (14 and 16) with antiseize tape. Install two nipples in tee (4).

(3) Install quick-exhaust valve (13) on nipple (14).

(4) Install straight fitting (11) in quick-exhaust valve (13).

(5) Connect assembled quick-exhaust valve (13) and tee (4) to elbow (15) on control valve side of feed motor (19).

(6) Wrap threads on nipple (18) with antiseize tape. Install nipple in tee (7).

(7) Wrap male threads on bushing (20) with antiseize tape. Install bushing in tee (7).

(8) Install 90 degree fitting (12) in bushing (20).

(9) Install tee (7) on elbow (17).

(10) Connect hose (10) to straight fitting (11) and 90 degree fitting (12).

Note: Use a thin-walled wrench (NSN 5120-00-288-8714) to install swivels in valve manifold.

(11) Install two swivels (2 and 6) in valve manifold (9).

(12) Wrap threads on one end of hose (5) with antiseize tape. Connect that end to tee (7).

(13) Connect other end of hose (5) to swivel (6).

(14) Wrap threads on one end of hose (3) with antiseize tape. Connect that end to pressure regulator (1).

(15) Connect other end of hose (3) to tee (4).

(16) Wrap nipple (8) with antiseize tape. Install nipple in pressure regulator (1).

(17) Connect nipple (8) to swivel (2).

7-4. Rotation and Blow Hoses and Fittings Replacement

a. Removal.

(1) Tag and disconnect hose (1) from swivel (2) at valve manifold (3) and elbow (4) at hose bulkhead (5). Remove hose.

Note: Use a thin-walled wrench (NSN 5120-00-288-8714) to remove swivels from valve manifold.

(2) Remove swivel (2) from valve manifold (3).

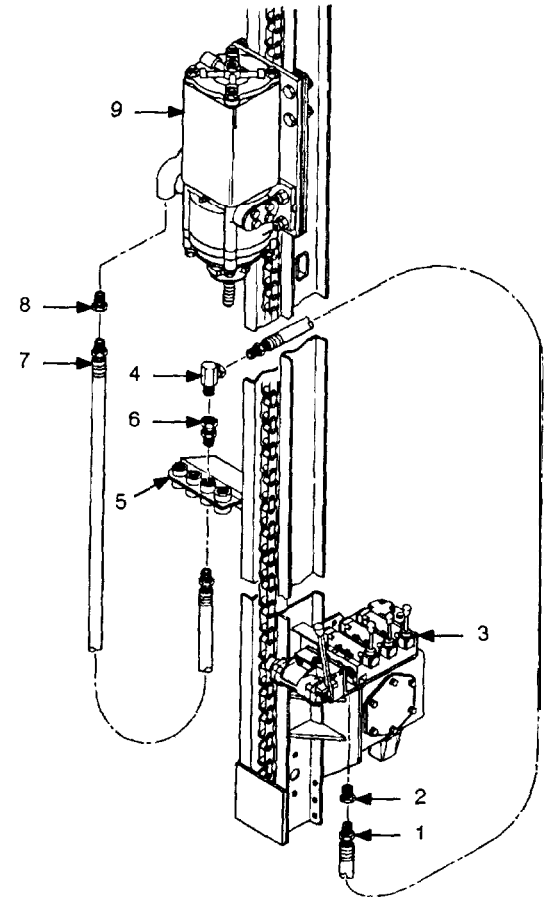
Note: First and third hoses in bulkhead have elbow and swivel. Second and fourth hoses only have elbows.

(3) Remove elbow (4) and swivel (6) from hose bulkhead (5).

Note: Blow hose at rear of drifter connects to elbow. All other hoses connect to swivels.

(4) Tag and disconnect hose (7) from swivel (8) in drifter (9) and hose bulkhead (5).

(5) Remove swivel (8) from drifter (9).



b. Installation

(1) Wrap male threads on swivel (8) with antiseize tape. Install swivel in drifter (9). If installing elbow for blow hose, ensure that elbow points toward striker bar end of drifter.

(2) Connect hose (7) to hose bulkhead (5) and swivel (8) in drifter (9). Remove tag.

(3) Wrap male threads on swivel (6) and elbow (4) with antiseize tape. Install swivel and elbow in hose bulkhead (5).

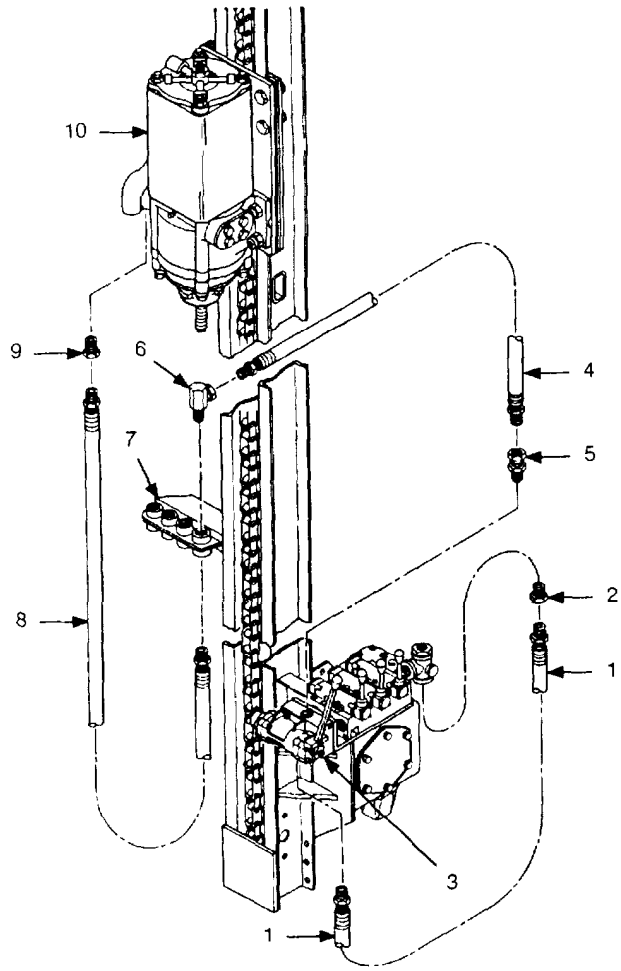
Note: Use a thin-walled wrench (NSN 5120-00-288-8714) to install swivels in valve manifold.

(4) Wrap male threads on swivel (2) with antiseize tape. Install swivel in valve manifold (3).

Note: Route all hoses behind feedshell so that they will not interfere with drifter movement. Ensure that hoses are not twisted or kinked after installation.

(5) Connect hose (1) to elbow (4) in bulkhead (5) and swivel (2) in valve manifold (3). Remove tag.

7-5. Impact Valve Hoses and Fittings Replacement



a. Removal.

(1) Disconnect hose (1) from swivel (2) and impact valve manifold (3). Remove hose.

(2) Disconnect hose (4) from swivel (5) on impact valve manifold (3) and elbow (6) on hose bulkhead (7). Remove hose.

(3) Remove swivel (5) from impact valve manifold (3).

(4) Removc elbow (6) from hose bulkhead (7).

(5) Disconnect hose (8) from swivel (9) on drifter (10) and hose bulkhead (7). Remove hose.

(6) Remove swivel (9) from drifter (10).

b. Installation.

(1) Wrap male threads of swivel (9) with antiseize tape. Install switch in drifter (10).

Note: Ensure that hose is not twisted or kinked after installation.

(2) Wrap threads on hose (8) (where it connects to hose bulkhead) with antiseize tape. Connect hose to hose bulkhead (7) and swivel (9) on drifter (10).

(3) Wrap male threads of elbow (6) with antiseize tape. Install elbow in hose bulkhead (7).

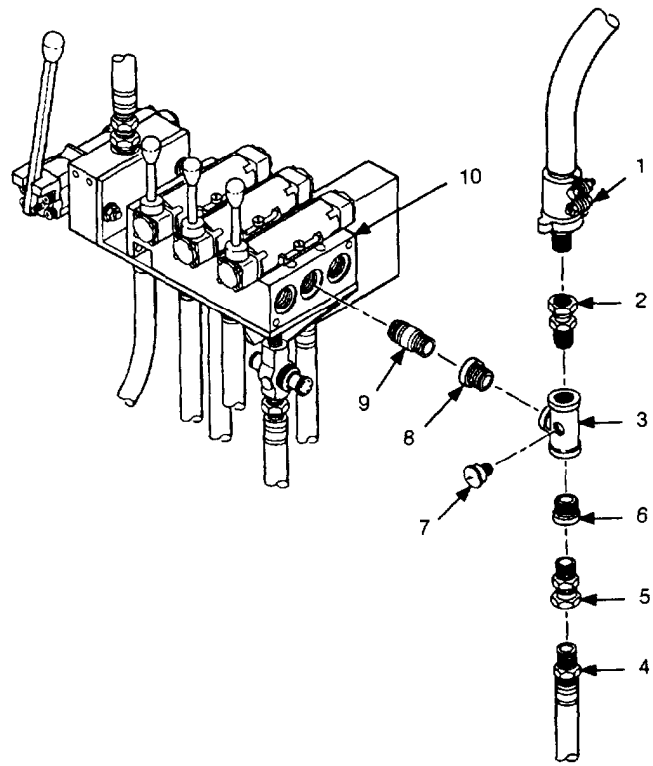
(4) Wrap male threads of swivel (5) with antiseize tape. Install swivel in impact valve manifold (3).

Note: Route hose behind feedshell so that it will not interfere with drifter movement. Ensure that hose is not twisted or kinked after installation.

(5) Connect hose (4) to swivel (5) on impact valve manifold (3) and elbow (6) on hose bulkhead (7).

(6) Connect hose (1) to impact valve manifold (3) and swivel (2).

7-6. Air Inlet Tee and Fittings Replacement



a. Removal.

(1) Disconnect crawler air hose (1) from swivel (2).

(2) Remove swivel (2) from tee (3).

(3) Disconnect impact valve hose (4) from swivel (5).

(4) Remove swivel (5) and bushing (6) from tee (3).

(5) Unscrew and remove gage (7) from tee (3).

(6) Remove tee (3) from bushing (8).

(7) Remove bushing (8) from nipple (9).

(8) Remove nipple (9) from valve manifold (10).

b. Installation.

(1) Wrap threads on nipple (9) with antiseize tape. Install nipple in valve manifold (10).

(2) Wrap male threads on bushing (8) with antiseize tape. Install bushing on nipple (9).

(3) Install tee (3) on bushing (8). Ensure that mounting hole for gage (7) faces out.

(4) Wrap male threads on bushing (6) with antiseize tape. Install bushing in tee (3).

(5) Wrap male threads on swivel (5) with antiseize tape. Install swivel in bushing (6).

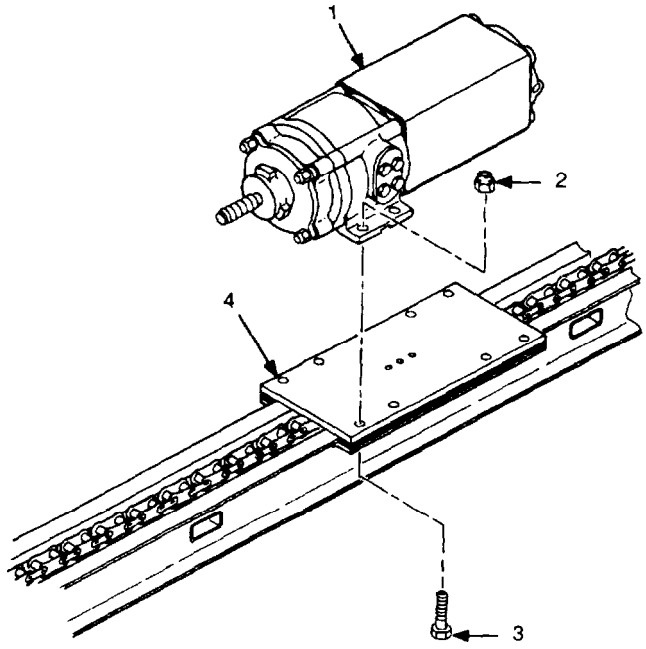
(6) Connect impact valve hose (4) to swivel (5).

(7) Wrap male threads on swivel (2) with antiseize tape. Install swivel in tee (3).

(8) Connect crawler air hose (1) to swivel (2).

(9) Wrap threads on gage (7) with antiseize tape. Screw gage into tee (3).

7-7. Drifter Drill Replacement



a. Removal.

(1) Tag and disconnect air hoses from drifter drill (1).

Warning: **Drifter drill is heavy (approx 288 lb). Use an overhead hoist to remove drifter drill. Secure drifter drill to overhead hoist before removing mounting hardware. Failure to follow this warning could result in personnel injury and equipment damage.**

(2) Remove four locknuts (2) and bolts (3). Remove drifter drill from slabback (4). Discard locknuts.

b. Installation.

(1) Install drifter drill (1) on slabback (4) using four bolts (3) and new locknuts (2).

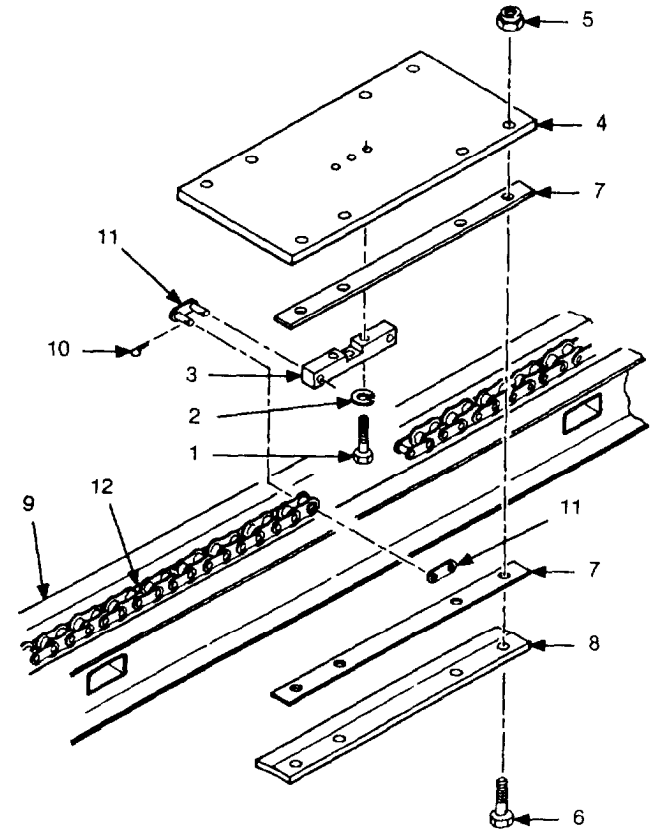
(2) Connect air hoses to drifter drill (1) and remove tags.

7-8. Slabback Replacement

a. Removal.

(1) Remove drifter drill (see paragraph 7-7).

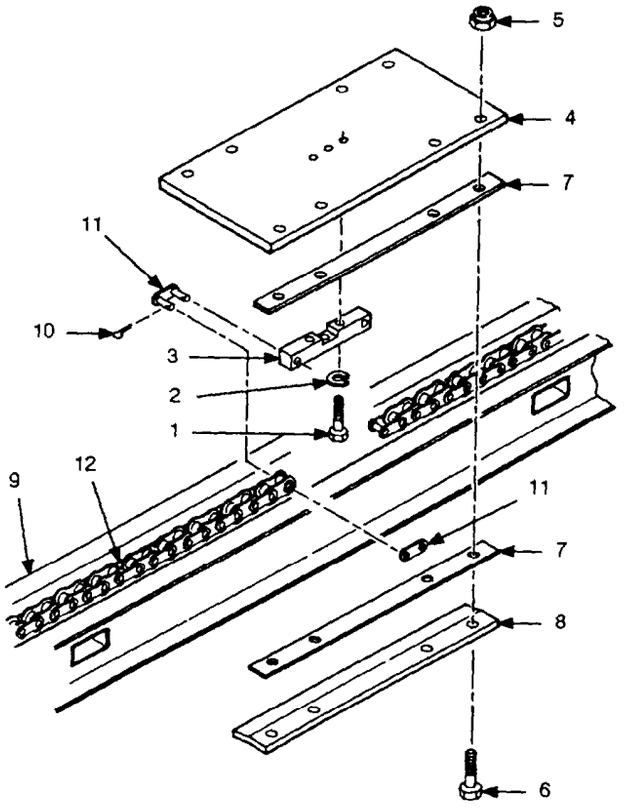
(2) Fully loosen chain (see paragraph 7-13).



(3) Remove three screws (1) and lockwashers (2). Remove chain mounting block (3) from slabback (4). Discard lockwashers.

(4) Remove four locknuts (5) and bolts (6) securing slabback (4), four shims (7), and two side rails (8) to feedshell (9). Remove slabback. shims, and side rails. Discard locknuts.

(5) Remove two cotter pins (10) from each master link (11). Separate master links and remove from chain mounting block (3). Discard cotter pins.



b. Installation.

(1) Connect two master links (11) on feed chain (12) to chain mounting block (3). Secure using four new cotter pins (10).

(2) Install slabback (4), four shims (7) and two side rails (8) on feedshell (9) using four bolts (6) and new locknuts (5).

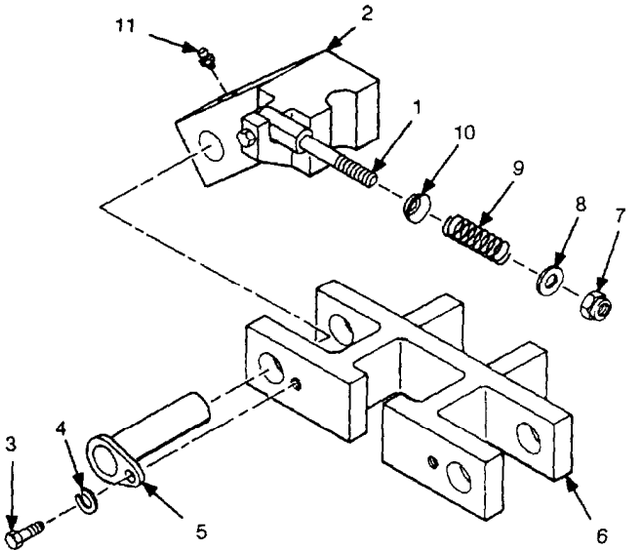
(3) Measure clearance between side rails (8) and flange on feedshell (9). If clearance is greater than l/8 in., remove thinner shim and remeasure. Adjust shims until clearance is l/8 in. or less.

(4) Install chain mounting block (3) on slabback (4) using three bolts (1) and new lockwashers (2).

(5) Install drifter drill (see paragraph 7-7).

(6) Adjust chain (see paragraph 7-13).

7-9. Centralizer Replacement and Repair



a. Removal.

(1) Release latch bolt (1) from two centralizer blocks (2).

(2) Remove bolt (3), lockwasher (4), and pin (5) securing each centralizer block (2) to mount (6). Remove two blocks from mount. Discard lockwashers.

b. Disassembly.

(1) Remove locknut (7) flatwasher (8), spring (9) and beveled washer (10) from latch bolt (1). Discard locknut.

(2) Remove lubrication fitting (11) from each centralizer block (2).

c. Assembly.

(1) Install lubrication fitting (11) in each centralizer block (2).

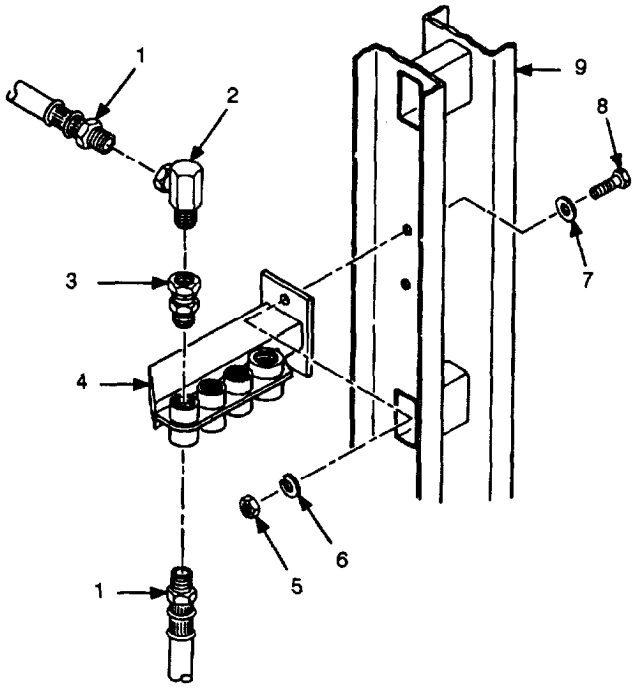
(2) Install beveled washer (10), spring (9) and flatwasher (8) on latch bolt (1). Secure with new locknut (7). Do not fully tighten locknut.

d. Installation.

(1) Install each block (2) on mount (6) using pin (5) new lockwasher (4) and bolt (3).

(2) Lubricate centralizer (LO 5-3820-241-12).

7-10. Hose Bulkhead Replacement



a. Removal.

(1) Tag and disconnect hoses (1).

(2) Remove elbows (2) and swivels (3) from hose bulkhead (4).

(3) Remove two nuts (5), lockwashers (6), flatwashers (7), and bolts (8) securing hose bulkhead (4) to feedshell (9). Remove hose bulkhead. Discard lockwashers.

b. Installation.

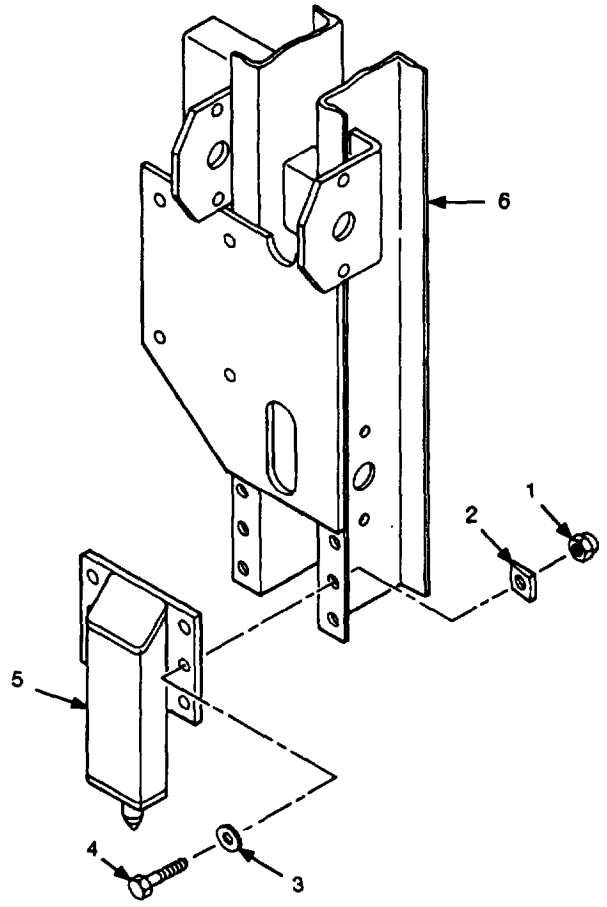
(1) Install hose bulkhead (4) on feedshell (9) using two bolts (8), flatwashers (7), new lockwashers (6), and two nuts (5).

Note: First and third hoses have swivels and elbows. Second and fourth hoses have elbows only.

(2) Wrap male threads on swivels (3) and elbows (2) with antiseize tape. Install swivels and elbows in hose bulkhead (4).

(3) Connect hoses (1) and remove tags.

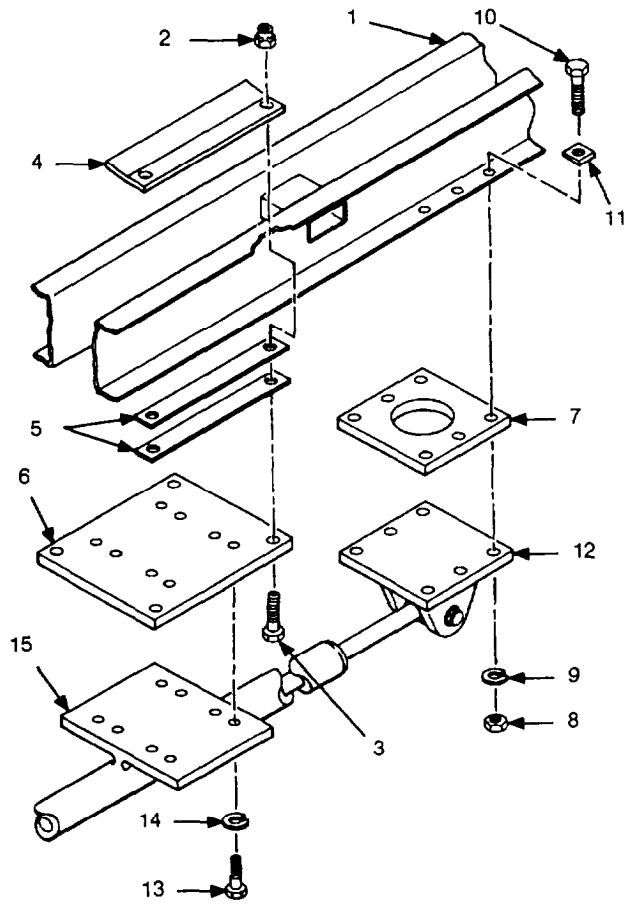
7-11. Foot Replacement



a. Removal. Remove six locknuts (1), bevel washers (2), flatwashers (3). and bolts (4) securing foot (5) to feedshell (6). Remove foot. Discard locknuts.

b. Installation. Install foot (5) on feedshell (6) using six bolts (4), flatwashers (3), bevel washers (2), and new locknuts (1).

7-12. Feedshell Slide Bars and Adapters Replacement



a. Removal.

Note: Replace slide bars one at a time so that feedshell is never completely disconnected.

The following procedure is the same for all four slide bars.

(1) Position feedshell (1) horizontally.

(2) Remove two locknuts (2) and bolts (3) securing slide bar (4) and two shims (5) to adapter plate (6). Remove slide bar and shims. Discard locknuts.

(3) If adapter plates (6 and 7) require replacement, do the following:

Warning: **Feedshell will be unsupported when attaching hardware is removed. Secure feedshell to prevent it from falling. Failure to follow this warning could result in personnel injury and equipment damage.**

(a) Support feedshell (1) with hoist or winch.

(b) Remove four slide bars (4). See step (2) above.

(c) Remove six nuts (8), lockwashers (9) bolts (10), and square washers (11) securing feedshell (1) and adapter plate (7) to cylinder mount (12). Discard lockwashers.

(d) Remove four bolts (13) and lockwashers (14) securing each of the adapter plates (6) to guide plates (15). Discard lockwashers.

(e) Raise feedshell (1) using hoist and remove adapter plates (6 and 7).

b. Installation.

(1) If adapter plates were removed, do the following:

(a) Install each adapter plate (6) on guide plate (15) using four bolts (13) and new lockwashers (14).

(b) Raise feedshell (1) using hoist and position for installation. Before lowering feedshell onto adapter plates (6) position cylinder adapter plate (7) on cylinder mount (12).

(c) Install four slide bars (4). See step (2) below.

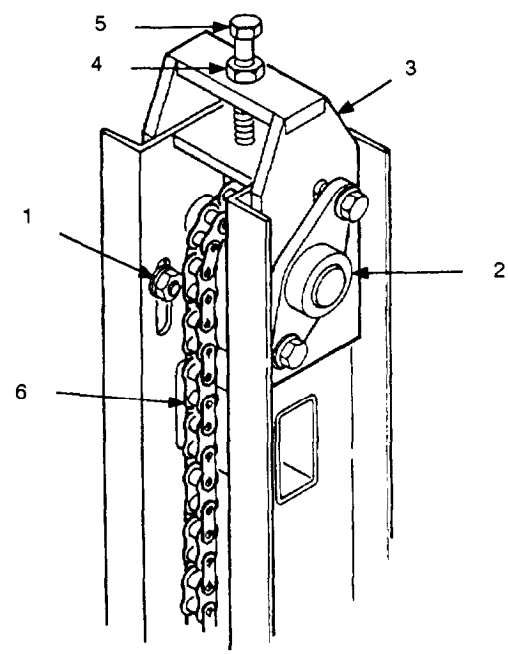
(d) Secure feedshell (1) and adapter plate (7) to cylinder mount (12) using six bolts (10), square washers (11) nuts (8), and new lockwashers (9).

(e) Remove hoist from feedshell (1).

(2) Install slide bar (4) and two shims (5) on adapter plate (6) using two bolts (3) and new locknuts (2).

(3) Measure clearance between slide bar (4) and flange on feedshell (1). If clearance is greater than l/8 in., remove thinner shim and remeasure. Adjust shims until clearance is l/8 in. or less.

7-13. Feed Chain Adjustment



a. Loosen four locknuts (1) securing flange bearings (2) to chain adjuster (3).

b. Loosen jam nut (4).

c. Tighten bolt (5) to tighten chain (6) or loosen bolt to loosen chain.

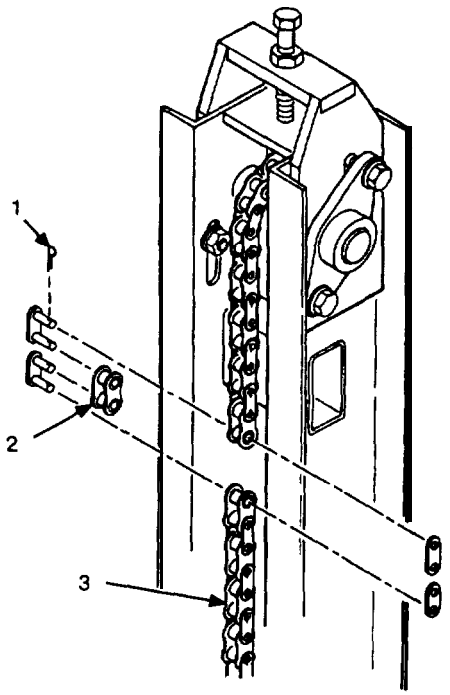
d. When chain (6) is properly adjusted, tighten jam nut (4) against top of chain adjuster (3).

e. Tighten four locknuts (1).

7-14. Chain Adjuster and Upper Sprocket, Shaft, and Bearings Replacement

a. Removal.

(1) Fully loosen chain (see paragraph 7-13).



(2) Remove four cotter pins (1) from one of the master links (2) on feed chain (3). Remove master link. Discard cotter pins.

(3) Remove two locknuts (4), flatwashers (5), and bolts (6) securing each bearing (7) to chain adjuster (8) and feedshell (9). Discard locknuts.

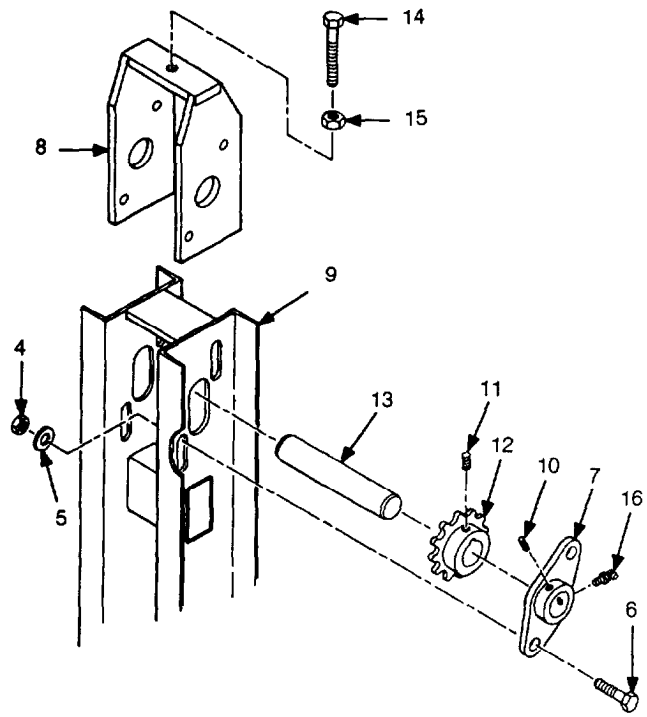
(4) Loosen two setscrews (10) in each bearing (7).

(5) Loosen setscrew (11) in sprocket (12).

(6) Drive out shaft (13) and remove sprocket (12), chain adjuster (8), and two bearings (7).

(7) Remove bolt (14) and jam nut (15) from chain adjuster (8).

(8) Remove lubrication fitting (16) from each bearing (7).



b. Installation.

(1) Install lubrication fitting (16) in each bearing (7).

(2) Screw jam nut (15) onto bolt (14) and install bolt in chain adjuster (8). Do not tighten jam nut against chain adjuster.

Note: Ensure that chain adjuster is installed correctly. Chain adjuster should be installed so that holes for shaft are closer to front (drifter side) of feedshell.

(3) Slide chain adjuster (8) over top of feedshell (9).

(4) Position sprocket (12) in feedshell (9) and install shaft (13) through chain adjuster (8), feedshell, and sprocket. Ensure that sprocket is centered on shaft.

(5) Tighten setscrew (11) in sprocket (12).

Note: Bearing on control valve side of feedshell must be installed with) lubrication fitting to rear.

(6) Install bearing (7) on each end of shaft (13).

(7) Secure each bearing (7) to chain adjuster (8) and feedshell (9) using two bolts (6), flatwashers (5) and new locknuts (4). Do not fully tighten locknuts.

(8) Tighten two setscrews (10) in each bearing (7).

(9) Ensure that drive chain (3) properly engages all sprockets. Install master link (2) and secure with four new cotter pins (1).

(10) Lubricate bearings (LO 5-3820-241-12).

(11) Adjust chain (see paragraph 7-13).

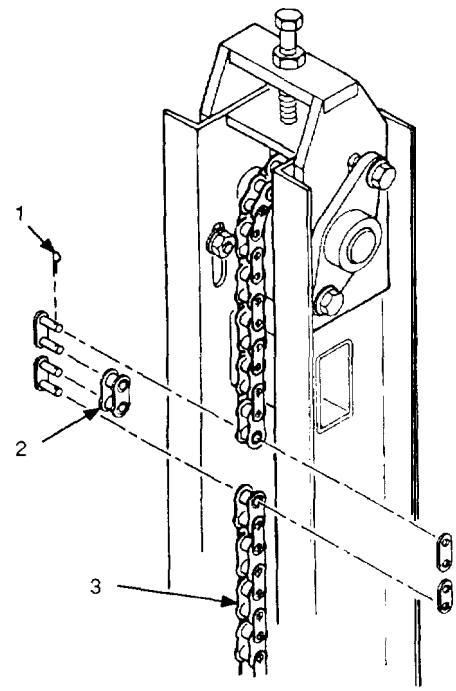
7-15. Feed Chain Sprockets, Bearings, and Shafts Replacement

Note: This procedure is for the lower and middle sprockets, bearings, and shafts. If the upper sprocket, bearings, or shafts require replacement, see paragraph 7-14.

Middle sprocket is illustrated. Procedure is identical for lower sprocket.

a. Removal.

(1) Fully loosen chain (see paragraph 7-13).



(2) Remove four cotter pins (1) from one of the master links (2) on drive chain (3). Remove master link. Discard cotter pins.

(3) Remove two nuts (4), lockwashers (5), flatwashers (6) (lower sprocket only), and bolts (7) securing each bearing (8) to feedshell (9). Discard lockwashers.

(4) Loosen two setscrews (10) in each bearing (8).

(5) Loosen setscrew (11) in sprocket (12).

(6) Drive out shaft (13) and remove sprocket (17) and two bearings (8).

(7) Remove lubrication fitting (14) from each bearing (8).

b. Installation.

(1) Install lubrication fitting (14) in each bearing (8).

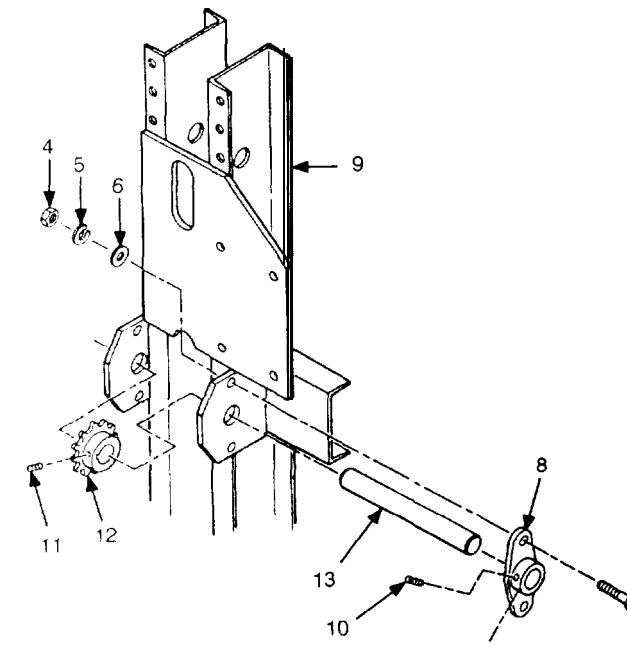
(2) Position sprocket (12) in feedshell (9) and install shaft (13). Ensure that sprocket is centered on shaft.

(3) Tighten setscrew (11) in sprocket (12).

(4) Install bearing (8) on each end of shaft (13).

(5) Secure each bearing (8) to feedshell (9) using two bolts (7), flatwashers (6), new lockwashers (5), and nuts (4).

(6) Tighten two setscrews (10) in each bearing (8).



(7) Ensure that drive chain (3) properly engages all sprockets. Install master link (2) and secure with four new cotter pins (1).

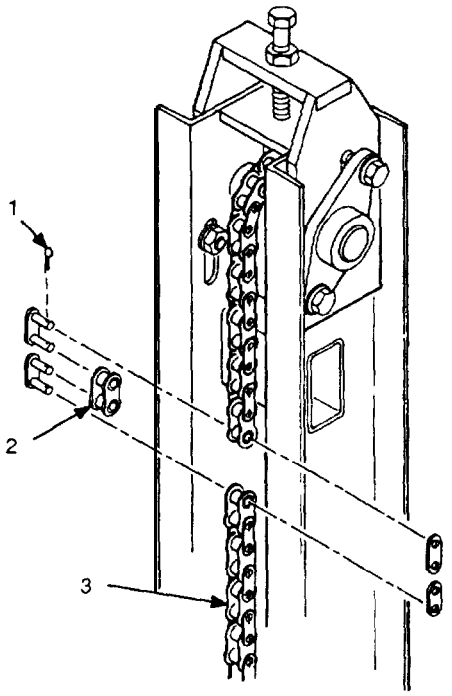
(8) Lubricate bearings (LO 5-3820-241-12).

(9) Adjust chain (see paragraph 7-13).

7-16. Feed Motor and Gearbox Assembly Replacement

a. Removal.

(1) Fully loosen chain (see paragraph 7-13).



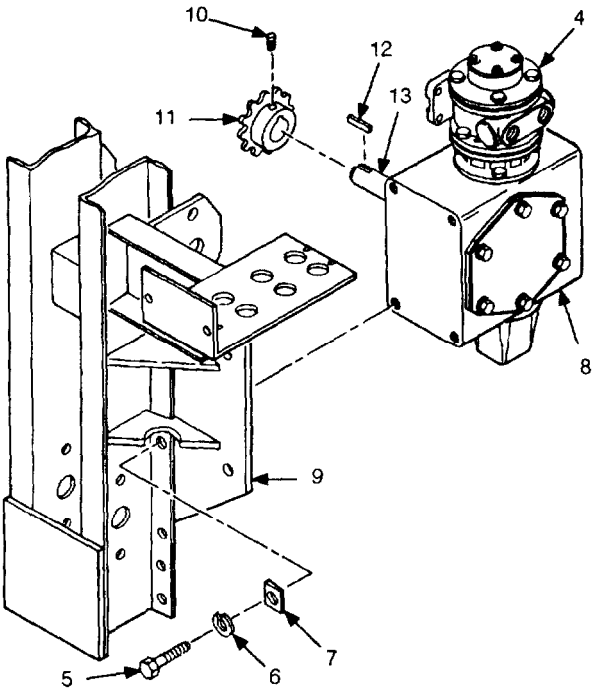
(2) Remove four cotter pins (1) from one of the master links (2) on drive chain (3). Remove master link. Discard cotter pins.

(3) Remove air hoses and fittings from feed motor (4) (see paragraph 7-3).

Warning: **Feed motor and gearbox assembly is heavy. Use an overhead hoist to remove assembly. Secure assembly to overhead hoist before removing mounting hardware. Failure to follow this warning could result in personnel injury and equipment damage.**

(4) Remove four bolts (5), lockwashers (6), and two square washers (7) securing gearbox (8) to mount (9). Remove feed motor (4) and gearbox. Discard lockwashers.

(5) Loosen setscrew (10) and remove sprocket (11) and key (12) from gearbox shaft (13).



b. Installation.

(1) Install key (12) and sprocket (11) on gearbox shaft (13). Tighten setscrew (10).

Note: Square washers are used on inner mounting bolts only.

(2) Install feed motor (4) and gearbox (8) on mount (9) using four bolts (5), new lockwashers (6), and two square washers (7).

(3) Ensure that sprocket (11) is aligned with other sprockets. Adjust position if necessary.

(4) Install air hoses and fittings on feed motor (4) (see paragraph 7-3).

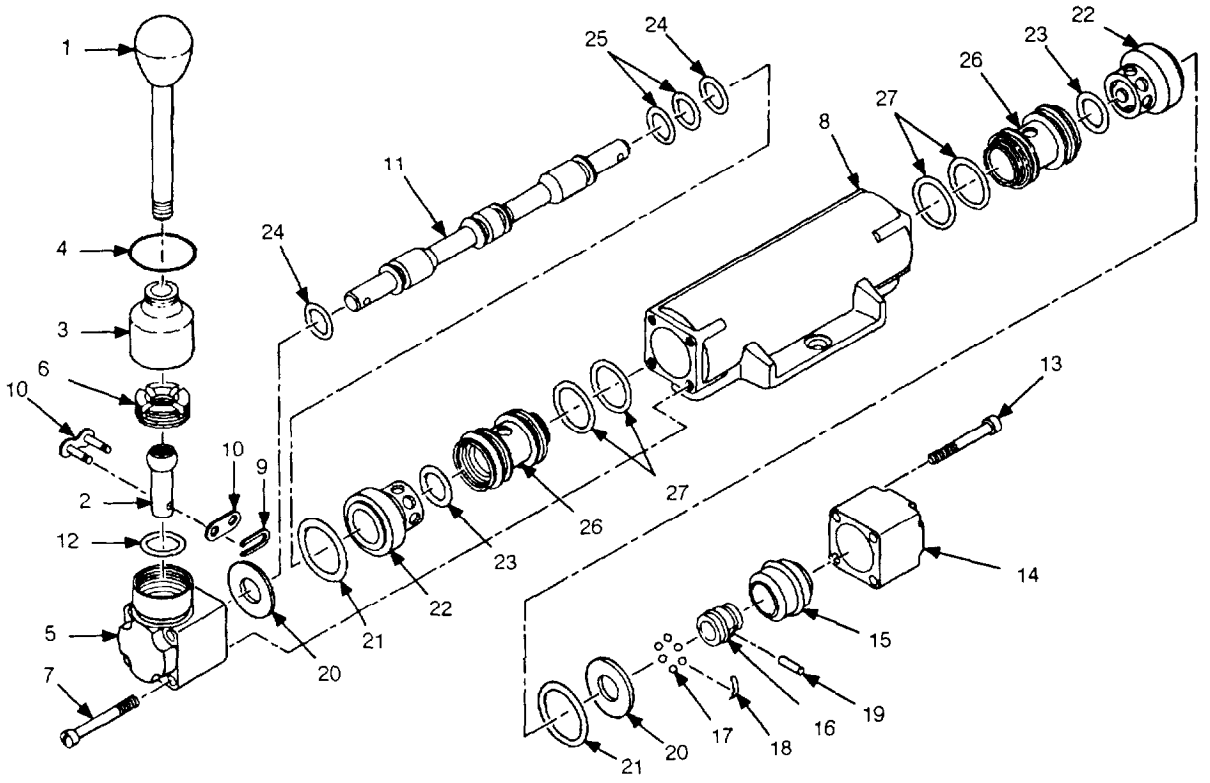
(5) Ensure that drive chain (3) properly engages all sprockets. Install master link (2) and secure with four new cotter pins (1).

(6) Service gearbox (LO 5-3820-241-12).

(7) Adjust chain (see paragraph 7-13).

Section II. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

7-17. Remote Control Valve Repair



a. Disassembly.

(1) Remove valve (see paragraph 7-1).

(2) Unscrew and remove lever (1) from knuckle (2).

(3) Remove boot (3) and clip (4) from lever cap (5).

(4) Remove screw (6) from lever cap (5).

(5) Remove four screws (7) securing lever cap (5) to body (8).

(6) Partially remove lever cap (5) from body (8), then remove clip (9) from link assembly (10). Separate link assembly from plunger (11), then fully remove lever cap.

(7) Remove knuckle (2) and link assembly (10) from lever cap (5).

(8) Remove O-ring (12) from screw (6). Discard O-ring.

(9) Remove four screws (13) securing spring cap (14) to body (8). Remove spring cap.

(10) Remove cage (15) from detent (16) or spring cap (14), being careful not to lose six balls (17). Balls are packed in grease and should stay inside cage.

(11) Remove spring clip (18) from detent (16).

(12) Remove pin (19) securing detent (16) to plunger (11). Remove detent from plunger.

(13) Remove washer (20) and O-ring (21) from each end of body (8). Discard O-rings.

(14) Remove retainer (22) and O-ring (23) from each end of body (8). Discard O-rings.

(15) Remove plunger (11) from body (8).

(16) Remove O-ring (24) from each end of plunger (11). Discard O-rings.

(17) Remove two O-rings (25) from middle of plunger (11). Discard O-rings.

(18) Remove two bushings (26) from body (8).

(19) Remove two O-rings (27) from each bushing (26). Discard O-rings.

b. Inspection.

Warning: **Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective gloves and use in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 100-138 degrees F (38-50 degrees C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.**

(1) Clean all parts with dry cleaning solvent and dry thoroughly.

(2) Check all parts for cracks, damage, and excessive wear. Replace all cracked, damaged, and worn parts.

(3) Inspect two bushings in accordance with TM 9-214. Replace if necessary.

c. Assembly.

(1) Install two new O-rings (27) in each bushing (26).

(2) Install two bushings (26) in body (8).

(3) Install two new O-rings (25) in middle of plunger (11).

(4) Install new O-ring (24) on each end of plunger (11).

(5) Lightly coat plunger (11) with GAA, then install in body (8).

(6) Install new O-ring (23) and retainer (22) in each end of body (8).

(7) Install new O-ring (21) and flatwasher (20) in each end of body (8).

(8) Slide detent (16) over plunger (11) and install pin (19). Secure pm in place with spring clip (18).

(9) Install cage (15) in spring cap (14).

(10) Lightly coat inside of cage (15) with GAA, then press balls (17) into place.

Note: Spring cap has an air hole drilled in it. Install spring cap on valve body with air hole facing port side of valve body.

(11) Install spring cap (14) over detent (16). Secure spring cap to body (8) using four screws (13).

(12) Install new O-ring (12) in lever cap (5).

(13) Install knuckle (2) in lever cap (5), then install screw (6). Leave screw loose.

(14) Position lever cap (5) for installation on body (8). Connect link assembly (10) to knuckle (2) and plunger (11) and secure with clip (9).

(15) Secure lever cap (5) to body (8) using four screws (7).

(16) Tighten screw (6).

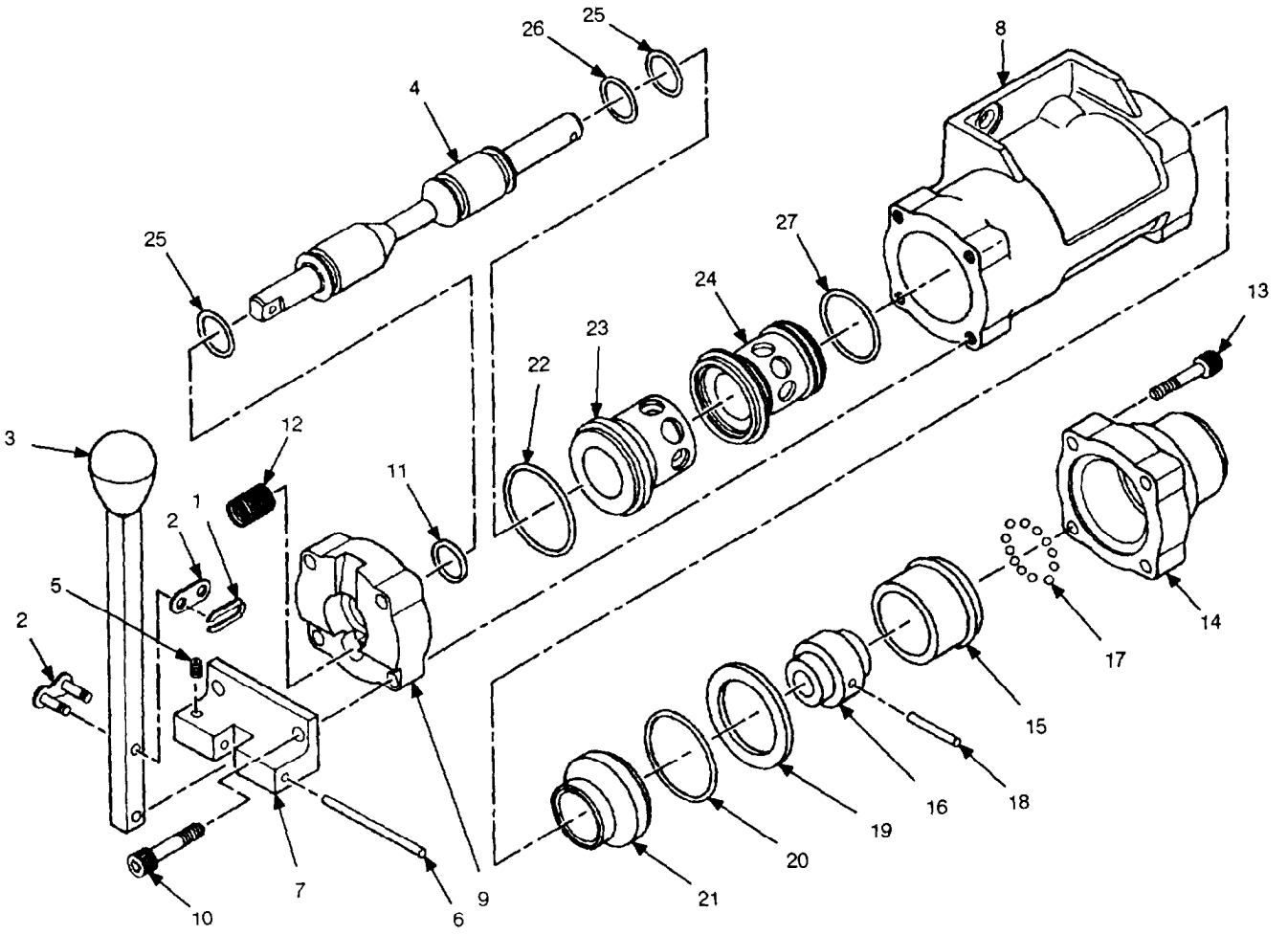
(17) Slide clip (4) and boot (3) over lever (1).

(18) Screw lever (1) into knuckle (2).

(19) Slide boot (3) over lever cap (5) and secure in place with clip (4).

(20) Install valve (see paragraph 7-1).

7-18. Impact Valve Repair



a. Disassembly.

(1) Remove impact valve (see paragraph 7-2).

(2) Remove clip (1) from link assembly (2). Remove link assembly from lever (3) and plunger (4).

(3) Loosen setscrew (5). Remove pin (6), then remove lever (3) from bracket (7).

(4) Scribe line on body (8) and lever cap (9) so that cap can be installed properly.

(5) Remove four screws (10) securing bracket (7) and lever cap (9) to body (8). Remove bracket and lever cap from body.

(6) Remove O-ring (11) and filter (12) from lever cap (9). Discard O-ring and filter.

(7) Remove four screws (13) securing spring cap (14) to body (8). Remove spring cap.

(8) Remove cage (15) from detent (16) being careful not to lose 12 balls (17). Balls are packed in grease and should remain inside cage.

(9) Remove pin (18) securing detent (16) to plunger (4). Remove detent.

(10) Remove washer (19), O-ring (20), and bearing (21) from body (8). Discard O-ring.

(11) Remove O-ring (22) and retainer (23) from body (8). Discard O-ring.

(12) Remove plunger (4) and bushing (24) from body (8).

(13) Remove O-ring (25) from each end of plunger (4). Discard O-rings.

(14) Remove O-ring (26) from middle of plunger (4). Discard O-ring.

(15) Remove O-ring (27) from bushing (24). Discard O-ring.

b. Inspection.

Warning: **Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective gloves and use in a well ventilated area. Avoid contact with shin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 100-138 degrees F (38-50 degrees C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.**

(1) Clean all parts with dry cleaning solvent and dry thoroughly.

(2) Check all parts for cracks, damage, and excessive wear. Replace all cracked, damaged, and worn parts.

(3) Inspect bushing and bearing in accordance with TM 9-214. Replace if necessary.

c. Assembly.

Note: Bushing has only one O-ring.

(1) Install new O-ring (27) on smaller diameter end of bushing (24).

(2) Install bushing (24) in body (8). Install O-ring end first through front of body.

(3) Install new O-ring (26) on middle of plunger (4). Middle O-ring (26) is harder than the other two O-rings (25).

(4) Install new O-ring (25) on each end of plunger (4).

(5) Install plunger (4) in body (8). Install end with two O-rings first through front of body.

(6) Install retainer (23) and new O-ring (22) in body (8).

(7) Install bearing (21) in body (8).

(8) Install detent (16) over plunger (4) and secure with pin (18).

(9) Install new O-ring (20) and flatwasher (19) in body (8).

(10) Lightly coat inside of cage (15) with GAA and press 12 balls (17) into place. Install cage over detent (16).

Note: Spring cap has a notch cut into it. Install spring cap with notch facing port side of valve body.

(11) Install spring cap (14) on body (8) using four screws (13).

(12) Install new filter (12) and O-ring (11) in lever cap (9).

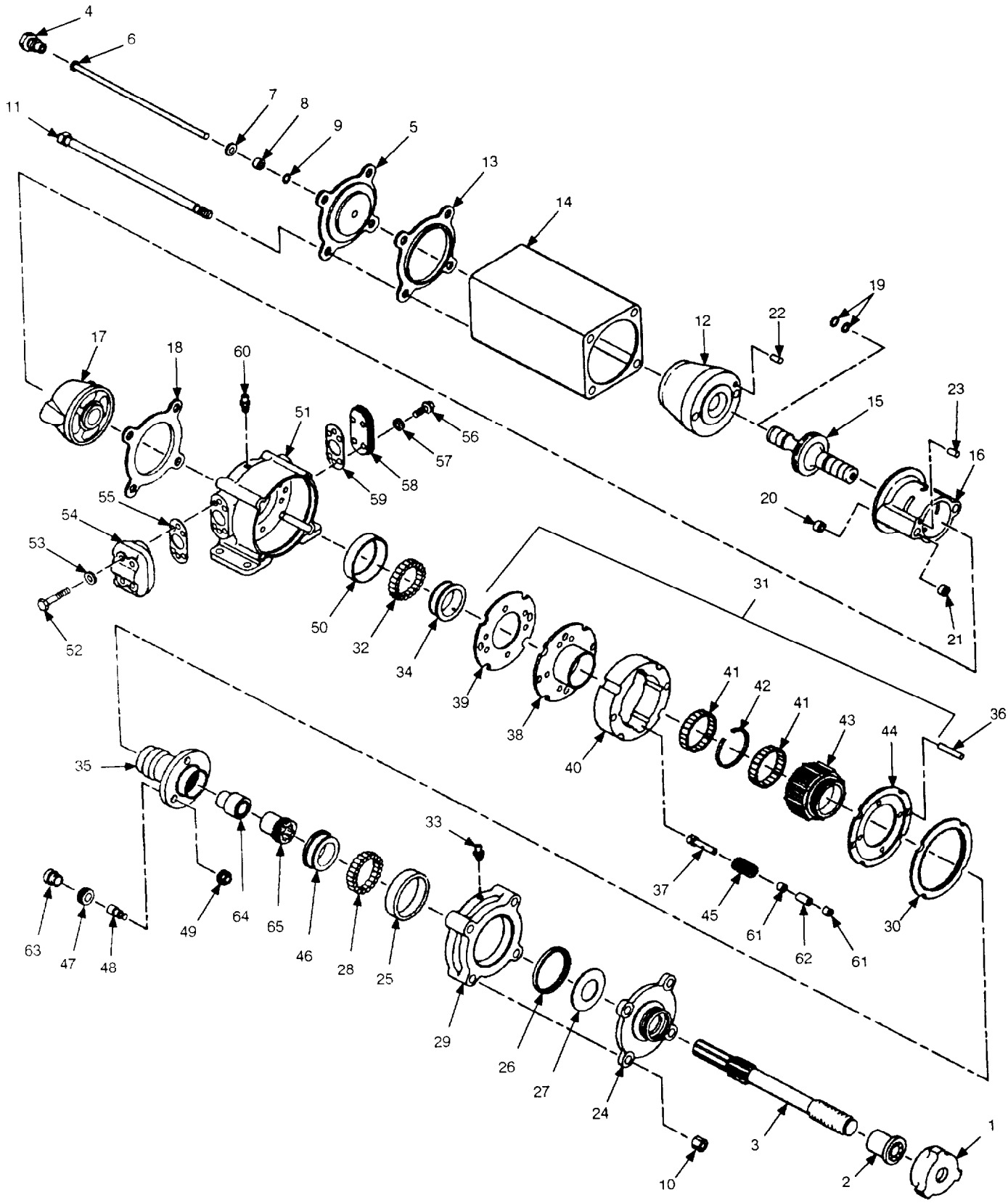
(13) Install lever cap (9) and bracket (7) on body (8) using four screws (10).

(14) Position lever (3) on bracket (7) and install pin (6).

(15) Install setscrew (5) in bracket (7).

(16) Connect link assembly (2) to lever (3) and plunger (4), then secure with clip (1).

(17) Install valve (see paragraph 7-2).


4
6
11
7
8
9
5
13
14
19
22
12
17
18
60
51
56
57
58
59
15
23
16
20
55
54
53
52
50
32
34
39
38
40
31
21
41
42
41
43
44
36
35
33
37
45
61
62
61
30
63
47
48
49
64
65
46
28
25
29
26
27
24
10
3
2
1

7-19. Drifter Drill Repair

a. Disassembly.

(1) Remove drifter drill (see paragraph 7-7).

Warning: **Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective gloves and use in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 100-138 degrees F (38-50 degrees C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.**

Note: Clean exterior of (drifter drill before disassembly.

Use a babbitt hammer 10 drive off the heavier exterior parts.

Handle parts carefully. Hardened parts might chip or break if dropped on a hard surface. Other parts may be damaged by improper handling.

Clean disassembled parts in a solvent. Probe ports to loosen and remove foreign matter.

(2) Unscrew front cap (1) and remove bushing (2) and striker bar (3).

(3) Remove gland plug (4) from backhead (5).

(4) Remove air tube (6). washer (7). packing (8), and O-ring (9). Discard packing and O-ring.

(5) Remove four nuts (10) and side rods (11).

(6) Lift off backhead (5) evenly and straight, being careful not to disturb upper distributor (12).

(7) Remove seal (13) and muffler (14). Discard seal.

(8) Remove and separate upper distributor (12), piston (15), cylinder (16), lower distributor (17), and lower muffler seal (18). Discard seal.

(9) Remove and discard two O-rings (19) from piston (15).

(10) Remove and discard two upper (20) and two lower (21) packings from cylinder (16).

(11) If damaged, remove spring pin (22) from upper distributor (12) and remove spring pin (23) from cylinder (16).

(12) Turn drifter drill so that front cover (24) faces up.

(13) Remove front cover (24).

(14) Remove bearing cup (25), retainer (26). and spring washer (27) from front cover (24).

(15) Remove bearings (28).

(16) Remove spacer cover (29), gear (30), air motor assembly (31), and roller bearings (32). If air motor assembly is stuck, lay the drifter drill on its side and gently tap out the air motor assembly with striker bar (3).

(17) Remove grease fitting (33) from spacer cover (29).

(18) Remove bearing cone (34) from carrier (35).

(19) Remove two dowel pins (36), then remove carrier (35).

(20) Press two shafts (37) out of flange (38). Separate upper plate (39), flange (38), motor housing (40), two bearings (41) and spacer (42), air motor gear (43), lower plate (44), and two gears (45).

(21) Remove bearing cone (46) from carrier (35).

(22) Remove three gears (47) from shafts (48).

(23) Remove nut (49) from each shaft (48) and press shafts out of carrier (35).

(24) Remove bearing cup (SO) from main housing (51).

(25) Remove four screws (52) and lockwashers (53) securing manifold (54) to main housing (51). Remove manifold and gasket (55). Discard gasket and lockwashers.

(26) Remove four screws (56) and lockwashers (57) securing cover (58) to main housing (51). Remove cover and gasket (59). Discard gasket and lockwashers.

(27) Remove grease fitting (60) from main housing (51).

b. Inspection and Repair.

(1) Inspect all bushings, bearings, cups, and cones in accordance with TM 9-214.

(2) If replacement is required, press two bearings (61) and bushing (62) out of each gear (45) and replace.

(3) If replacement is required, press bushing (03) out of each gear (47) and replace.

(4) Check striking face of piston (15). If wear is greater than 0.030 in., grind striking fact square. If wear is greater than 0.050 in., replace piston.

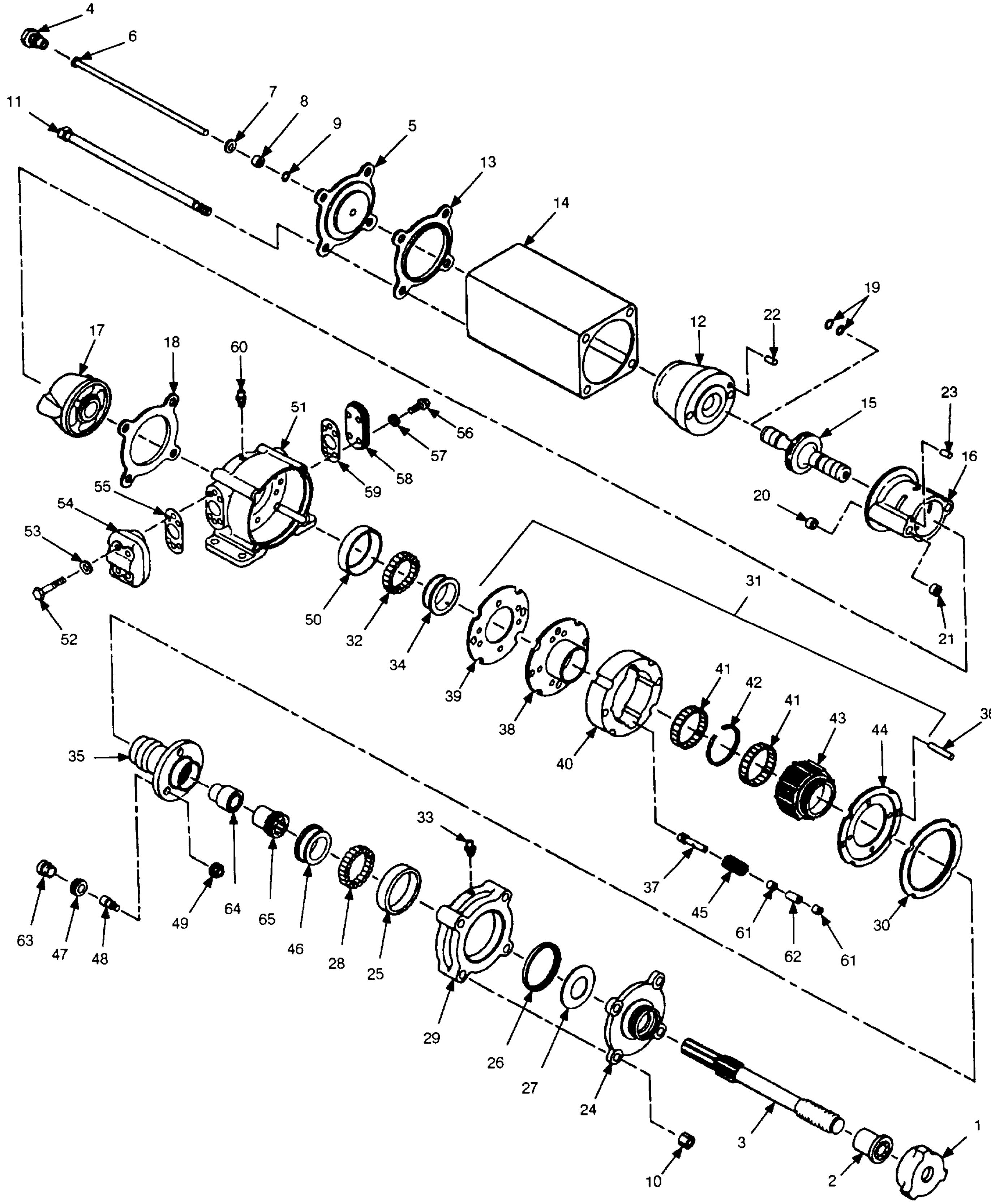
(5) Check clearance between piston head and cylinder (16). If total clearance is greater than 0.015 in., replace piston, cylinder, or both.

(6) Check clearance betwccn piston stems and upper and lower distributors (12 and 17). If total clearance is greater than 0.006 in., replace piston, distributors, or all three parts.

(7) Check for gaulding and burning in the upper and lower distributors (12 and 17) and the cylinder (16). Hone to clean or replace.

(8) Carefully check air tube (6) for splits, cracks. scoring, or excessive wear. particularly in the first 4 in. where air tube contacts striker bar. Replace cracked, split, scored, or worn air tube.

(9) Inspect plates (39 and 44) for sharp edges and wear. Remove all sharp edges and hone to clean.


4
6
11
7
8
9
5
13
14
19
22
12
17
18
60
51
56
57
58
59
15
23
16
20
55
54
53
52
50
32
34
39
38
31
21
40
41
42
41
43
44
36
35
64
65
46
28
25
33
29
37
45
61
62
61
30
63
47
48
49
26
27
24
3
10
2
1

(10) Check inside diameter of front bushing (2). If inside diameter is greater than 1.285 in., replace front bushing. If front bushing can no longer be kept tight because of excessive wear on inside face of front cap (1) replace cap.

(11) Check for wear on retainer (26) and both sides of spring washer (27). Replace if worn.

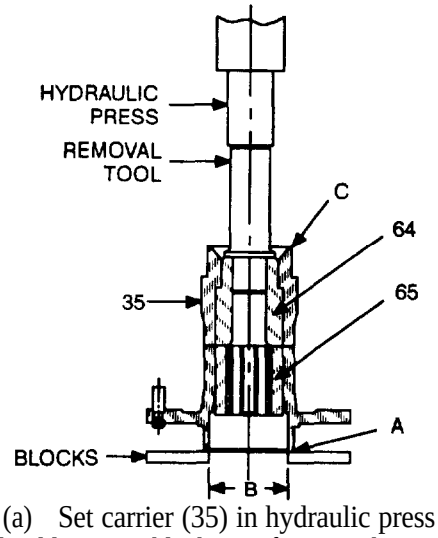
(12) Inspect gland plug (4) for damage and wear. Replace if damaged or worn.

(13) Inspect chuck bushing (64) inside carrier (35). If striking bar imprint is 0.050 in. or greater, replace chuck bushing (see step (16) below).

(14) Check inside diameter of chuck bushing (64). If inside diameter is greater than 1.405 in., replace chuck bushing (see step (16) below).

(15) Check splines on chuck driver (65). If splines are worn half through, replace chuck driver (see step (16) below).

(16) To remove chuck bushing (64) or chuck driver (65):



(a) Set carrier (35) in hydraulic press as shown. End A should rest on blocks set far enough apart and deep enough to allow clearance for the chuck bushing (64) and driver (65) to be pressed through B. Do not attempt to press out parts with carrier resting on face C.

(b) Insert fabricated removal tool (see Appendix D) between press and chuck bushing (64) as shown.

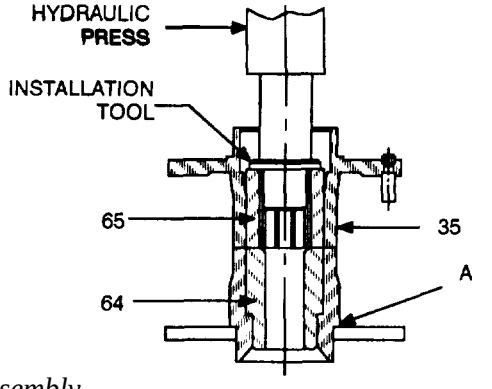
(c) Press chuck driver (65) and bushing (64) out of carrier (35).

(17) To install chuck bushing (64) and driver (65):

(a) Set carrier (35) in hydraulic press as shown. Rest face A on blocks.

(b) Using fabricated installation tool (see Appendix D), press chuck bushing (64) beveled face up, into carrier (35) until seated.

(c) Using fabricated installation tool, press chuck driver (65) into carrier (35), using the minor diameter of the spline marks as a guide.



c. Assembly.

(1) Tap bearing cup (50) into main housing (51).

(2) Install new gasket (59) and cover (58) on main housing (51) using four screws (56) and new lockwashers (57).

(3) Install new gasket (55) and manifold (54) on main housing (51) using four screws (52) and new lockwashers (53).

(4) Install grease fitting (60) in main housing (51).

(5) Press two shafts (37) into flange (38). Carefully orient ends of shafts so that they will properly key into slots in plate (39) when installed.

(6) Install gear (45) on each shaft (37).

(7) Place two bearings (41) and spacer (42) in between gears (45). Ensure that ends of bearings are slightly lower than surface of gears.

(8) Seat motor housing (40) on flange (38). Aline two dowel pin holes and tap in two dowel pins (36).

(9) Install air motor gear (43) on flange (38).

(10) Install front plate (44) on dowel pins (36) and shafts (37) and gently tap in place.

(11) Press three shafts (48) into carrier (35). Install three nuts (49) and secure with thread-locking compound.

(12) Press bearing cone (46) onto carrier (35).

(13) Slide gear (47) onto each shaft (48).

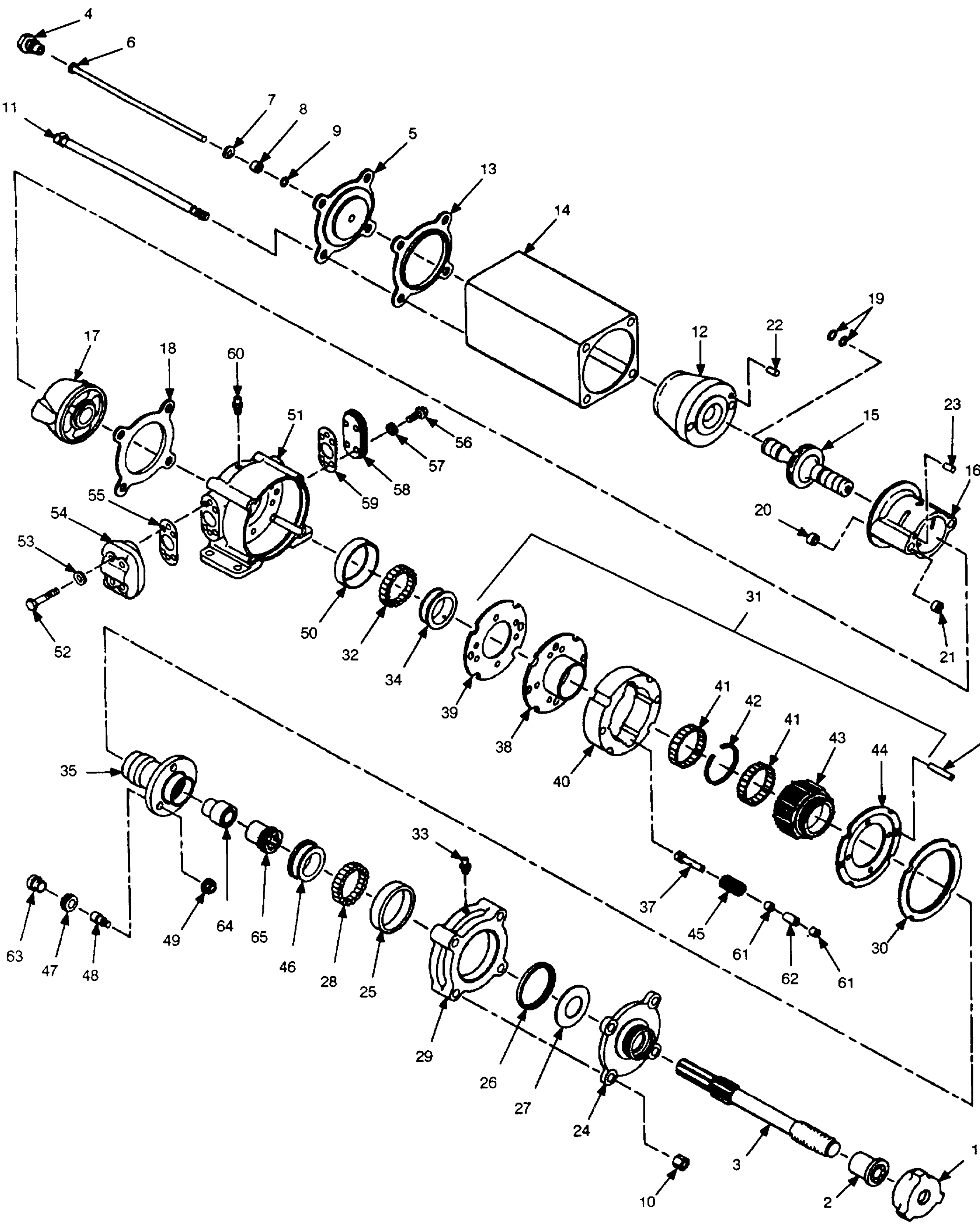
(14) Set carrier (35) face down and slide air motor assembly (31) onto carrier. Ensure gears mesh properly.

(15) Press bearing cone (34) onto carrier (35).

(16) Install plate (39), outer edge bevel facing up, on back of air motor assembly (31). Shafts (37) fit into slots on plate.

(17) Pack roller bearing (32) in accordance with TM 9-214 and install (small end up) on bearing cone (34).

(18) Install main housing (51) over air motor assembly (31). Ensure that shafts (37) are positioned correctly and aline with relief holes in main housing.


4
6
11
7
8
9
5
13
14
19
22
12
17
18
60
51
56
57
58
59
23
15
16
55
54
53
20
52
50
32
34
31
21
39
38
40
41
42
41
43
44
36
35
33
37
45
61
62
61
30
63
47
48
49
64
65
46
28
25
29
26
27
24
3
1
10
2

(19) Carefully turn main housing (51) over, keeping entire assembly tight to keep gears properly aligned.

(20) Install gear (30), ensuring that notches in gear aline with side rod holes.

(21) Pack roller bearing (28) in accordance with TM 9-214 and install (small end up) on bearing cone (46).

(22) Install grease fitting (33) in spacer cover (29).

(23) Install spacer cover (29) on main housing (51).

(24) Install cup (25) over roller bearing (28).

(25) Install retainer (26) and spring washer (27) on cup (25). Ensure that dished face of spring washer faces retainer.

(26) Install cover (24) on spacer cover (29).

(27) Lay drifter drill on its side and install two of the side rods (11). Align internal parts then remove side rods. Stand drill on front face.

(28) Install new seal (18) on main housing (51).

(29) Insert lower distributor (17) through seal (18) and into main housing (51).

(30) If removed, install spring pin (23) in cylinder (16).

(31) Install two new packings (21) in lower face of cylinder (16).

(32) Install cylinder (16) on lower distributor (17).

(33) Install two new packings (20) in upper face of cylinder (16).

(34) Install two new O-rings (19) in piston (15).

(35) Install piston (15) in cylinder (16), ensuring that striking face is down.

(36) If removed, install spring pin (22) in upper distributor (12).

(37) Install upper distributor (12) over piston (15) and into cylinder (16).

(38) Install muffler (14) and new seal (13). Install muffler so that exhaust port will face slabback when drifter is installed.

(39) Install backhead (5) into upper distributor (12). Install backhead so that port for blow hose elbow is on same side as manifold (54).

(40) Install four side rods (11).

(41) Lay drifter drill on its side and install four nuts (10). Tighten until snug.

(42) Install striker bar (3), bushing (2), and cap (1).

Caution: **Side rod nuts must have the proper, equal torque to pretension side rods and prevent the nuts from working loose during use. Failure to apply proper torque equally on all nuts could cause equipment damage.**

(43) Tighten side rod nuts (10) to 50-75 lb-ft.

Note: When drifter drill has been correctly assembled, all parts will operate freely. To check assembly, turn striker bar slowly by hand. It should revolve uniformly. With proper preload on bearings, striker bar can be rotated by hand, but with some difficulty.

(44) Rotate striker bar (3) and ensure that all parts turn freely, then tighten side rod nuts (10) to 100 lb-ft.

(45) Rotate striker bar (3) and ensure that all parts turn freely, then tighten side rod nuts (10) to 150 lb-ft.

(46) Install flatwasher (7), new packing (8), and new O-ring (9) on air tube (6).

(47) Install air tube (6) in drifter drill.

(48) Install gland plug (4).

(49) Install drifter drill (see paragraph 7-7).

(50) Lubricate drifter drill (LO 5-3820-239-12).

7-20. Feedshell Maintenance

a. Removal.

(1) Remove the following components in the order listed:

(a) Drifter drill (see paragraph 7-7).

(b) Slabback (see paragraph 7-8).

(c) Feed chain (see paragraph 7-23).

(d) Chain adjuster (see paragraph 7-14).

(e) Feed chain sprockets, bearings, and shafts (see paragraph 7-15).

(f) Feed motor and gearbox assembly (see paragraph 7-16).

(g) Centralizer (see paragraph 7-9).

(h) Foot (see paragraph 7-11).

(i) Hose bulkhead (see paragraph 7-10).

(j) Control valves and manifold (see paragraph 7-1).

(k) Impact valve and manifold (see paragraph 7-2).

(2) Remove feedshell slide bars, adapters, and cylinder mount (see paragraph 7-12). Once the slide bars, adapters, and cylinder mount have been removed, the feedshell can be removed from the crawler.

b. Repair. Refer to TM 9-237 for instructions on welding repair.

c. Installation.

(1) Install feedshell along with slide bars, adapters, and cylinder mount (see paragraph 7-12).

(2) Install the following components in the order listed:

(a) Impact valve and manifold (see paragraph 7-2).

(b) Control valves and manifold (see paragraph 7-1).

(c) Hose bulkhead (see paragraph 7-10).

(d) Foot (see paragraph 7-11).

(c) Centralizer (see paragraph 7-9).

(f) Feed motor and gearbox assembly (see paragraph 7-16).

(g) Feed chain sprockets, bearings, and shafts (see paragraph 7-15).

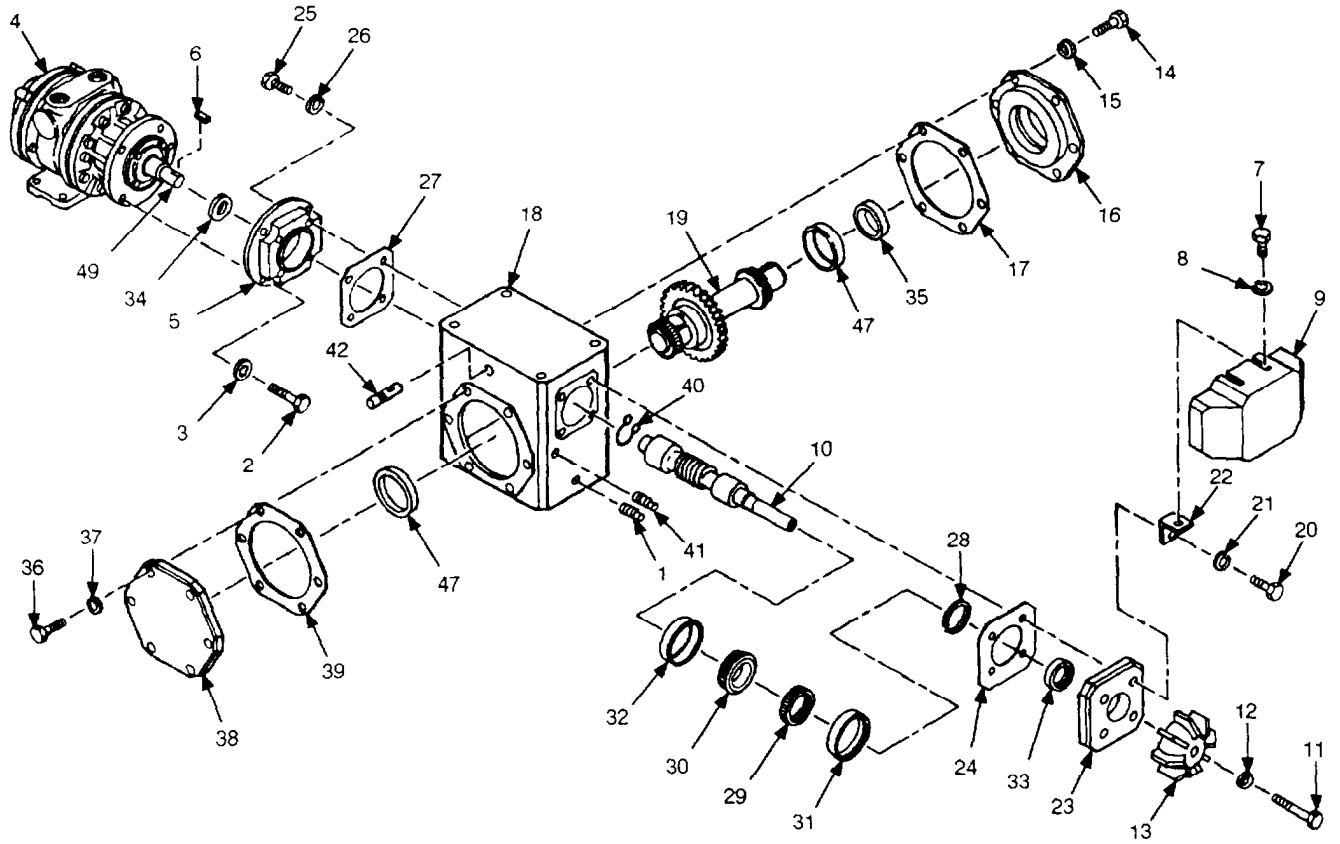
(h) Chain adjuster (see paragraph 7-14).

(i) Feed chain (see paragraph 7-23).

(j) Slabback (set paragraph 7-8).

(k) Drifter drill (see paragraph 7-7).

(3) Adjust chain tension (see paragraph 7-13).



7-21. Gearbox Repair

a. Disassembly.

(1) Remove feed motor and gearbox assembly (see paragraph 7-16).

(2) Remove drain plug (1) and allow oil to drain. Reinstall drain plug.

Note: Scribe feed motor and quill motor flange to ensure proper reassembly.

(3) Remove four screws (2) and lockwashers (3) securing feed motor (4) to quill motor flange (5). Remove feed motor and key (6). Discard lockwashers.

(4) Remove four screws (7) and flatwashers (8). Remove fan cover (9).

(5) Hold quill shaft (10) in place and remove screw (11) and lockwasher (12) securing fan (13) to quill shaft. Remove fan. Discard lockwasher.

Note: Gaskets on gearbox covers are laminated. Record thickness of gaskets after removing. Use the same thickness when installing gearbox covers.

(6) Remove six screws (14) and lockwashers (15). Remove cover (16) and gasket (17) from housing (18). Discard lockwashers and gasket.

(7) Remove shaft (19) from housing (18).

Note: Gaskets on gearbox covers are laminated. Record thickness of gaskets after removing. Use the same thickness when installing gearbox covers.

(8) Remove four screws (20) and lockwashers (21). Remove fan brackets (22), cover (23) and gasket (24) from gear housing (18). Discard lockwashers and gasket.

(9) Remove four screws (25) and lockwashers (26). Remove quill motor flange (5) and gasket (27) from gear housing (18). Discard lockwashers and gasket.

(10) Block gear housing (18) with fan end facing up.

(11) Remove retaining ring (28) from quill shaft (10).

(12) Press out quill shaft (10), removing two bearings (29 and 30) and two cups (31 and 32) when shaft is free.

(13) Remove and discard oil seal (33) from cover (23).

(14) Remove and discard oil seal (34) from quill motor flange (5).

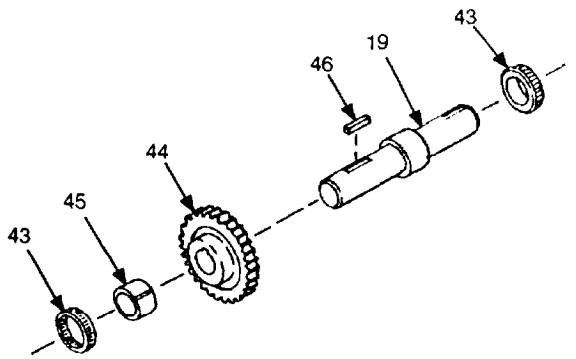
(15) Remove and discard oil seal (35) from cover (16).

Note: Gaskets on gearbox covers are Iaminated. Record thickness of gaskets after removing. Use the same thickness when installing gearbox covers.

(16) Remove six screws (36) and lockwashers (37). Remove cover (38) and gasket (39) from housing (18). Dis card lockwashers and gasket.

(17) Remove retaining ring (40) from housing (IX).

(18) Remove drain plug (1). pipe plug (41), and vent plug (42) from housing (18).



b. Inspection.

Warning: **Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective gloves and use in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 100-138 degrees F (38-50 degrees C). If you become dizzy while using cleaning sol. vent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.**

(1) Clean and inspect bearings (43) on shaft (10) in accordance with TM 9-214. If replacement is required, press out shaft or remove bearings using bearing puller. Press new bearings onto shaft.

(2) Inspect worm gear (44) for cracked, chipped, or broken teeth. If replacement is required. press out shaft (19) and remove bearings (43), spacer (45), worm gear. and key (46). Install key, new worm gear. and spacer on shaft. then press on two new bearings.

(3) Inspect quill shaft (10) for stripped or damaged threads. Replace if damaged.

(4) Clean and inspect bearing cups (47) in covers (16 and 38) in accordance with TM 9-214. Remove and install new bearing cups if required.

(5) Inspect all parts for cracks, breaks, and other signs of damage. Replace all damaged parts.

c. *Assembly.*

(1) Install vent plug (42), pipe plug (41), and drain plug (1) in gearbox housing (18).

(2) Install retaining ring (40) in gear housing (18).

(3) Install cover (38) and new gasket (39) on housing (18) using six screws (36) and new lockwashers (37).

(4) Insert quill shaft (10) from air motor side of gear housing (18).

(5) Turn gear housing (18) so that fan side is up.

(6) Install bearing cup (32), bearing (30). bearing (29), and bearing cup (31) on quill shaft (10).

(7) Install retaining ring (28).

(8) Install new oil seal (33) in cover (23).

(9) Install cover (23), new gasket (24), and fan brackets (22) on gear housing (18) using four screws (20) and new lockwashers (21).

(10) Install new oil seal (34) in quill motor flange (5).

(11) Install quill motor flange (5) and new gasket (27) on gear motor housing (18) using four screws (25) and new lockwashers (26).

(12) Install shaft (19) in gear housing (18).

(13) Install new oil seal (35) in cover (16).

(14) Install cover (16) and new gasket (17) on gear housing (18) using six screws (14) and new lockwashers (15). Snug two of the screws and then check end play on shaft (19). Adjust thickness of shim (17) until there is no perceptible end play, then install and fully tighten screws and lockwashers.

(15) Install fan (13) on quill shaft (10) using screw (11) and new lockwasher (12).

(16) Install fan cover (9) on fan brackets (22) using four screws (7) and flatwashers (8).

(17) Position gear housing (18) upright.

(18) Install key (6) in feed motor output shaft (49).

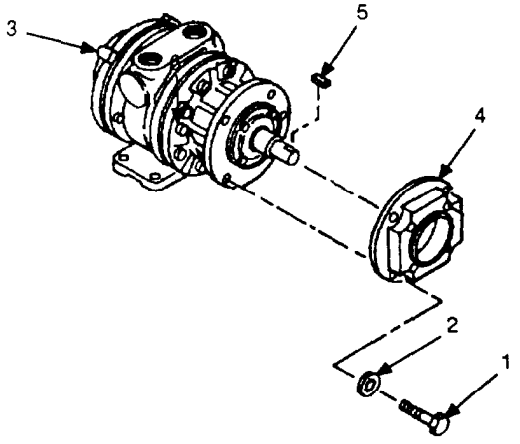
(19) Carefully position feed motor (4) for installation. Ensure (that key (6) on feed motor output shaft (49) properly engages keyway in quill shaft (10).

(20) Secure feed motor (4) to quill motor flange (5) using four screws (2) and new lockwashers (3).

(21) Install feed motor and gearbox assembly (set paragraph 7-16).

(12) Service gearbox (set LO 5-3820-239-12).

7-22. Feed Motor Repair

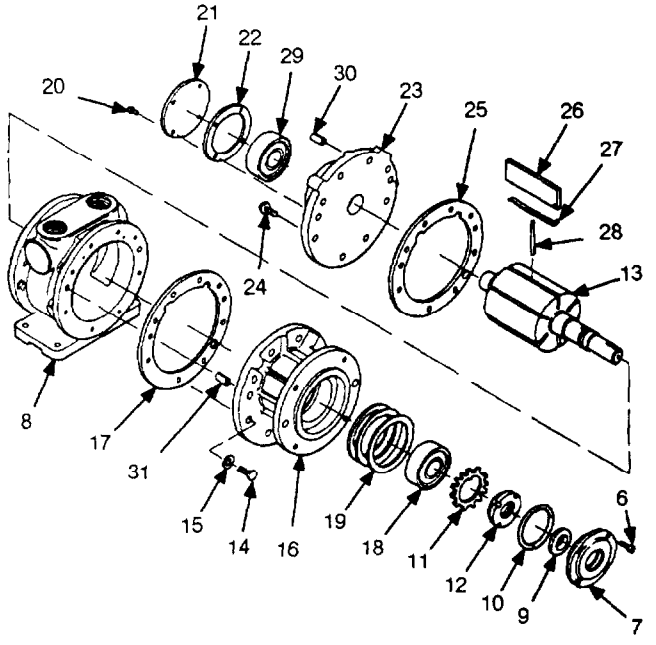


a. Disassembly.

(1) Remove air hoses and fittings from feed motor (see paragraph 7-3).

Note: Scribe feed motor and quill motor flange to ensure proper reassembly.

(2) Remove four screws (1) and lockwashers (2) securing feed motor (3) to quill motor flange (4). Remove feed motor and key (5). Discard lockwashers.



(3) Remove four screws (6). Remove drive end cap (7) from body (8).

(4) Remove and discard seal (9) and O-ring (10).

(5) Open tabs on lockwasher (11). Remove locknut (12) and lockwasher from rotor (13).

(6) Remove eight screws (14) and lockwashers (15). Remove drive end plate (16) and gasket (17) from body (8). Discard lockwashers and gasket.

(7) Remove bearing (18) and spacers (19) from inside drive end plate (16).

(8) Remove four screws (20). Remove dead end cap (21) and gasket (22) from dead end plate (23). Discard gasket.

(9) Remove eight screws (24). Remove dead end plate (23), gasket (25). and rotor (13) from body (8). Vanes (26) and springs (27) will come off as rotor is removed. Discard gasket.

(10) Remove three push pins (28) from rotor (13).

(11) Press bearing (29) and rotor (13) out of dead end plate (23).

(12) If damaged, remove two dowel pins (30) from dead end plate (23).

(13) If damaged, remove two dowel pins (31) from drive end plate (16).

b. Inspection.

(1) Clean and inspect bearings in accordance with TM 9-214.

(2) Inspect all parts for cracks, damage, and excessive wear. Replace all damaged and worn parts.

c. Assembly.

(1) If removed, install two dowel pins (31) in drive end plate (16).

(2) If removed, install two dowel pins (30) in dead end plate (23).

(3) Install rotor (13) in drive end plate (16).

(4) Install spacers (19) and bearing (18) over rotor (13).

(5) Install lockwasher (11) and locknut (12) over rotor. Ensure that tab on lockwasher engages rotor shaft.

Caution: **Do not fully tighten locknut. Rotor must turn freely.**

(6) Tighten locknut (12), then bend tabs on lockwasher (11) over locknut.

(7) Install new seal (9) in drive end cap (7).

(8) Install drive end cap (7) and new O-ring (10) on drive end plate (16) using four screws (6).

(9) Install three push pins (28) in rotor (13).

(10) Install six springs (27) and vanes (26) in rotor (13). Install vanes with notches to front of feed motor.

(11) Compress springs (27) and vanes (26) and slide new gasket (17) and body (8) over rotor (13).

(12) Install eight screws (14) and new lockwashers (15) to secure drive end plate (16) to body (8).

(13) Install dead end plate (23) and new gasket (25) on body (8) using eight screws (24).

(14) Tap bearing (29) into place in dead end plate (23).

(15) Install dead end cap (21) and new gasket (22) on dead end plate (23) using four screws (20).

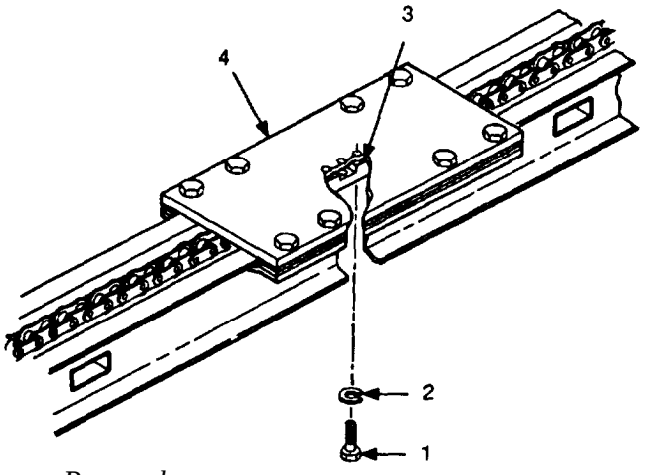
(16) Install key (5) in feed motor shaft.

(17) Carefully position feed motor (3) for installation. Ensure that key (5) on feed motor shaft properly engages keyway in gearbox shaft.

(18) Secure feed motor (3) to quill motor flange (4) using four screws (1) and new lockwashers (2).

(19) Install feed motor and gearbox assembly (see paragraph 7-16).

7-23. Chain Replacement

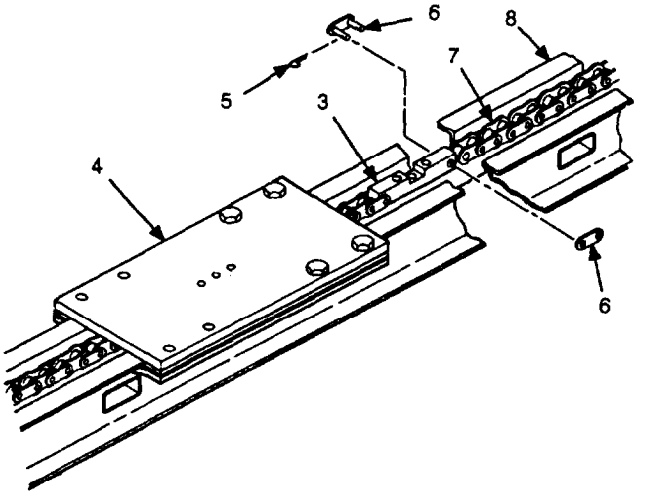


a. Removal.

Warning: **If feedshell is in operating position, fully lower drifter before removing chain. Failure to follow this warning could cause injury to personnel and damage to equipment.**

(1) Fully loosen chain (see paragraph 7-13).

(2) Remove three screws (1) and lockwashers (2). Remove chain mounting block (3) from slabback (4). Discard lockwashers.



(3) Move slabback (4) or chain mounting block (3) out of the way so that master links on chain are accessible.

(4) Remove two cotter pins (5) from each master link (6). Separate master links and remove from chain mounting block (3). Discard cotter pins.

(5) Remove chain (7) from feedshell (8).

b. Installation.

Caution: **Do not grease chain.**

(1) Wrap chain (7) around sprockets. Ensure that chain properly engages all sprockets.

(2) Connect two master links (6) to chain (7) and chain mounting block (3). Secure using four new cotter pins (5).

(3) Install chain mounting block (3) on slabback (4) using three screws (1) and new lockwashers (2).

(4) Adjust chain (see paragraph 7-13).

Page C-1. Appendix C is superseded as follows:

APPENDIX C

MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

C-1. The Army Maintenance System MAC

a. This introduction (Section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be

consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in Column (4) as:

Unit-includes two subcolumns, C (operator/crew) and O (unit) maintenance.
Direct Support-includes an F subcolumn.
General Support-includes an H subcolumn.
Depot-includes a D subcolumn.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

C-2. Maintenance Functions. Maintenance functions are limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services including fault location/troubleshooting, removal/installation, and disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurement (e.g., hours/miles) considered in classifying Army equipment/components.

C-3. Explanation of Columns in the MAC, Section II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph C-2.)

d. Column 4, Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in Column 3, by indicating a work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time re-

quired to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or crew maintenance
O	Organizational maintenance
F	Direct support maintenance
L	Specialized Repair Activity (SRA)
H	General support maintenance
D	Depot maintenance

e. Column 5, Tools and Test Equipment Reference Code. Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section III.

f. Column 6, Remarks. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

C-4. Explanation of Columns in Tool and Test Equipment Requirements, Section III

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National Stock Number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number, model number, or type number.

C-5. Explanation of columns in Remarks, Section IV

a. Column I, Remarks Code. The code recorded in Column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART FOR CM150A/D475A AND CM225/D475A

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot	Tools and Equipment	
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Ref Code	Remarks Code
13	WHEELS AND TRACKS								
1302	TRACK SUPPORT ROLLERS AND BRACKETS	SERVICE		0.3					
		REPLACE			3.0				
		REPAIR			3.0				
1303	TRACK IDLER AND BRACKETS	SERVICE		0.5					
		ADJUST		1 .0					
		REPLACE			3.0				
		REPAIR			3.0				
1304	TRACK DRIVE SPROCKETS	SERVICE		0.3					
		INSPECT	0.5						
		REPLACE			3.0				
1305	TRACK ASSEMBLY	INSPECT		0.5					
		ADJUST		1.0					
		REPLACE			16.0				
		REPAIR			16.0				
15	FRAME, TOWING ATTACHMENTS AND DRAWBARS								
1501	FRAME ASSEMBLY	SERVICE		0.5					
		REPLACE			24.0				
		REPAIR			10.5				
1503	PINTLES AND TOWING ATTACHMENTS								
	TOW HITCH	SERVICE		0.1					
		REPLACE		1.5					
		REPAIR		1.5					
18	BODY, CAB, HOOD AN HULL								
1808	STOWAGE BOXES	REPLACE		1 .0					
		REPAIR		1 .0					
22	BODY CHASSIS AND ACCESSORY ITEMS								
	DATA PLATES	REPLACE			0.5				

Section II. MAINTENANCE ALLOCATION CHART FOR CM150A/D475A AND CM 225/D475A

Group Number	Component/Assembly	Maintenance Function	(4) Maintenance Level					Tools and Equipment Ref Code	Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
24	HYDRAULIC AND FLUID SYSTEMS								
2401	HYDRAULIC PUMP AND PNEUMATIC DRIVE MOTOR ASSEMBLY	SERVICE REPLACE REPAIR		0.3 3.0	 5.0				
2403	HYDRAULIC CONTROL VALVES	REPLACE REPAIR		2.0	 3.0				
2406	HYDRAULIC FILTERS, STRAINERS, LINES AND FITTINGS	SERVICE INSPECT REPLACE REPAIR		0.3 0.3 0.5 1.0					
2407	HYDRAULIC CYLINDERS	REPLACE REPAIR		1.0	 4.0				
2408	LIQUID TANKS AND RESERVOIRS	INSPECT SERVICE	.02 .03						
50	PNEUMATIC EQUIPMENT								
5006	LUBRICATION SYSTEM								
	MANIFOLD LUBRICATOR	REPLACE REPAIR		1.5	 1.5				
	HOSES	INSPECT REPLACE REPAIR	.05		 1.0 1.0				
5008	AIR INTAKES								
	VALVE, MAIN AIR INLET	REPLACE REPAIR			.05	 .05			
5015	AIR DISCHARGE SYSTEM								
	REMOTE CONTROL MANIFOLD AND THROTTLE VALVES	INSPECT REPLACE REPAIR		 1.0		.05 3.0			
	AIR LINES AND FITTINGS	INSPECT REPLACE	0.3	0.5 0.5				1,2	A

Section II. MAINTENANCE ALLOCATION CHART FOR CM150A/D475A AND CM 225/D475A

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment Ref Code	Remarks Code
5019	PNEUMATIC MOTOR ASSEMBLIES								
	TRACTION DRIVE PROPELLING MOTORS	SERVICE		.05					
		REPLACE			4.0				
		REPAIR			5.0				
	PROPELLING MOTOR CONTROL ASSEMBLY	REPLACE		2.0					
		REPAIR							
	PNEUMATIC DRIFTER DRILL MOTOR	SERVICE		0.5					
		INSPECT	0.3	0.5					
		REPLACE		2.5					
		REPAIR			4.5				
74	CRANES, SHOVELS AND EARTH MOVING EQUIPMENT								
7473	LIFT AND SWING MECHANISM								
	BOOM FRAME AND DRILL GUIDE ASSEMBLY	SERVICE	0.5	0.3					
		INSPECT	0.2	0.5					
		REPLACE			3.0				
		REPAIR		2.0	4.0				
	DRILL MOUNTING CENTRALIZER	SERVICE		0.3					
		INSPECT	0.2	0.2					
		REPLACE		1.0					
		REPAIR		1.0					
7476	FEED AND LEVELING MECHANISM								
	CHAIN AND GUIDE ASSEMBLY	SERVICE		0.3					
		INSPECT	0.3						
		ADJUST		0.5					
		REPLACE			3.0				
		REPAIR			3.0				
	FEED MOTOR GEARBOX ASSEMBLY	SERVICE		0.5					
		REPLACE		1.0					
		REPAIR			2.0				
	FEED MOTOR	INSPECT		0.5					
		REPLACE		1.0					
		REPAIR			1.0				

Section III. TOOLS AND TEST EQUIPMENT FOR CM150A/D475A AND CM225/D475A

(1) Tool or Test Equipment Reference Code	(2) Maintenance Level	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
1	0	TOOL KIT, GENERAL MECHANIC'S AUTOMOTIVE	5180-00-177-7033	SC 5180-90-CL-N26
2	0	SHOP EQUIPMENT, AUTOMOTIVE MAINTENANCE AND REPAIR, ORGANIZATIONAL MAINTENANCE, COMMON NO.2	491-00-754-0650	SC 491O-95-CL-A72

Section IV. REMARKS FOR CM150A/D475A AND CM225/D475A

Remarks Code	Remarks
A	TOOL REQUIREMENT IS FOR RETROFIT KIT ONLY
B	FOR REPAIR, REFER TO TM 9-237

Page I-1. Appendix D is added before the index as follows:

APPENDIX D

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

D-1. Scope

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at direct support maintenance.

A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure that covers fabrication criteria.

All bulk material needed for manufacture or an item are listed by part number or specification number in a tabular list on the illustration.

D-2. Manufactured Items Part Number Index

Part Number	Description	Figure No.
	Chuck bushing and driver removal tool	D-l
	Chuck bushing and driver installation tool	D-2

Section II. MANUFACTURED ITEMS ILLUSTRATIONS

NOTES:
1. ALL DIMENSIONS ARE IN INCHES
2. DULL ALL SHARP EDGES
3. MAKE FROM MILD STEEL

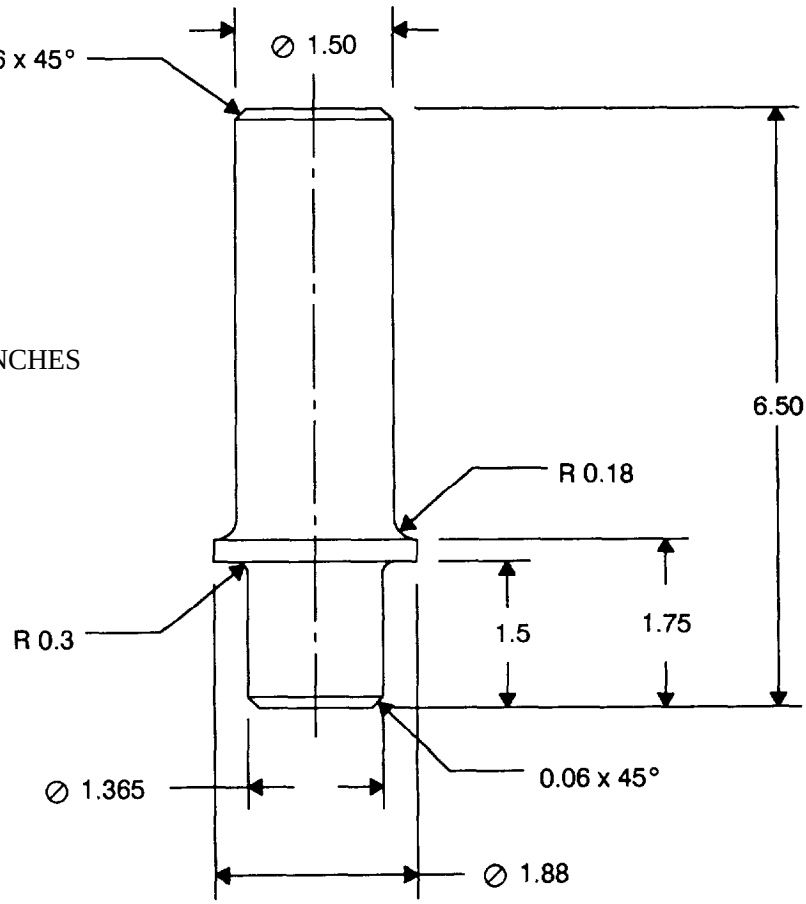


Figure D-I. Chuck bushing and driver removal tool.

NOTES:
1. ALL DIMENSIONS ARE IN INCHES
2. DULL ALL SHARP EDGES
3. MAKE FROM MILD STEEL

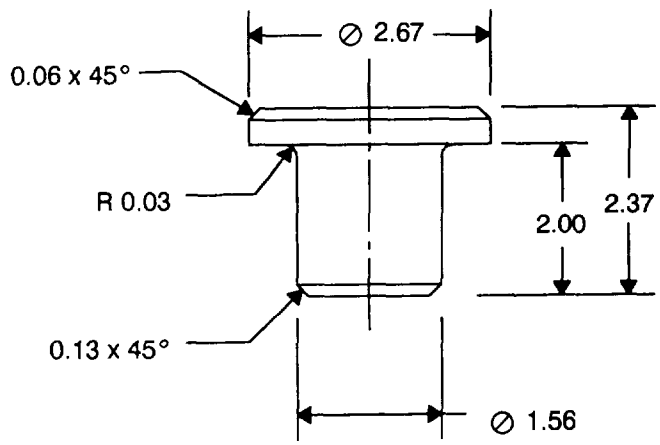


Figure D-2. Chuck bushing and driver installation tool.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of ***Staff***

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
01885

Distribution:
To be distributed in accordance with DA Form 12-25-E (Block 0691) Operator,Unit, Direct and General Support maintenance requirements for TM5-3820-239-15.

☆U.S. GOVERNMENT PRINTING OFFICE: 1992 643-016/60130

Changes in force: C 2 and C 3

***TM 5-3820-239-15**
C 3

Change No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 31 August 1973

Operator's, Organizational, Direct Support and General Support Maintenance Manual
DRILL, PNEUMATIC, DRIFTER:
BOOM TYPE; CRAWLER-MOUNTED; SELF-PROPELLED
(INGERSOLL-RAND MODELS CM150A/D475A AND CM225/D475A)
FSN 3820-854-4149
AND
FSN 3820-410-5549

TM 5-3820-239-15, 25 January 1968. is changed as follows:

The title is changed as shown above.

Cover. Inside the front cover, the following is added to the BEFORE OPERATION SAFETY PRECAUTIONS: "Drill should not be operated without striker bars."

Page ii. In the table of contents, Appendix B is rescinded.

Page 2-1. Paragraph 2-2.1. is added after paragraph 2-2.

2-2.1. Maintenance and Operating Supplies

Refer to table 2-1 for a complete list of maintenance and operating suppiies required for initial operation of the drill.

*This change superseder C1, 7 February 1969.

Table 2-1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for 8 hrs operation	(6) Notes
1103 FINAL DRIVE (1)		LUBRICATING OIL GEAR: 5 gal drum as follows:			(1) Includes quantity of gear oil for both units.
	9150-577-5844 (2)	GO-90	3 qt	(3)	(2) See C9100-IL for additional data and requesting procedure.
	9150-257-5440 (2)	GOS	3 qt	(3)	(3) See current LO For grade application and replenishment intervals.
4308 HYDRAULIC RESERVOIR.	9150-265-9428 (2)	OIL, LUBRICATING: 5 gal pail as follows:			
	9150-242-7603	OEHD	40 qt (4)	(3)	(4) Reservoir capacity
5006 MANIFOLD LUBRICATOR LUBRICATOR	9150-265-9435 (2)	OIL, LUBRICATING: 8 gal pail as follows:			(5) Average oil consumption is 1 qt per hour of operation.
	9150-205-942 (2)	OE-30	8 qt (4)		
		OE-10	8 qt (4)	(5)	
	9150-242-7603 (2)	OES	8 qt (4)	(5)	
5019 AIR FEED MOTOR. (1)	9150-577-5844 (2)	LUBRICATING OIL GEAR: 5 gal drum as follows:		(5)	
		GO-90		(3)	
	9150-257-5440 (2)	GOS		(3)	
5019 PROPELLING AIR MOTOR. (1)		OIL LUBRICATING 5 gal drum as follows:			
	9150-265-9435 (2)	OE-30	2 qt	(3)	
	9150-265-9428 (2)	OE-10	2 qt	(3)	
DRILL STEEL BITS	9150-223-4004 (2)	GREASE, MOLYBDENUM DISULFIDE: 5 lb can, GMD.		(3)	
GREASE POINTS	9150-190-0955 (2)	GREASE, AUTOMOTIVE AND ARTILLARY: 5 lb can, GAA.		(3)	

Page 2-4. Subparagraph 2-11*a*(3) is added after subparagraph 2-11*a*(2).

(3) Break in period: The drill should be operated in the FORWARD/COUNTERCLOCKWISE position of drilling for a period of 5 minutes to properly set the adjustment of the RIFLE NUT.

Page 2-7. Subparagraph 2-11c.1 is added after subparagraph 2-11*c*(2) *(f).*

c1. Installing the shank piece (striker bar).

(1) Loosen the chuck jaw retainer bolts and remove the chuck jaw retainer.

(2) Insert the shank end of the striker bar in the drill chuck.

(3) Slide the chuck jaw retainer over the end of the striker bar and bolt it to the front head of the drill.

CAUTION

Operation of the drifter drill without the striker bar should not be attempted.

Page 2-9. immediately after subparagraph 2-11*d* (2) *(d),* the following is added.

CAUTION

A break in operation of a new or overhauled drifter drill is required to seat the rifle bar nut and other internal parts of the drill. Break in the drifter drill by operating it in only the forward (counterclockwise) direction for a minimum period of 5 minutes.

Page. 3-5. Subparagraph 3-9c is superseded as follows:

c. Fill with rock drill oil. MIL-L2104B. as often as necessary.

Page 3-9. In figure 3-7(2), TRACK ROLLER OIL FITTINGS is changed to read "TRACK ROLLER GREASE FITTINGS."

Page A-1. In paragraph A6:

TB 740-93-2 is changed to read "TB 740-97-2."

TP 740-93-3 is changed to read "TM 740-90-1."

Page B-1. Appendix B is rescinded.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General. United States Amy
The *Adjutant General*

Distribution:
To be distributed in accordance with DA Form 12-25B (qty rqr block No. 385) Operator Maintenance Requirements for Earth Drilling Machine.

U.S. GOVERMENT PRINTING OFFICE: 1973-768109/216
868-260

TM 5-3820-239-15
C 2

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *1 December 1971*

Operator, Organizational, Direct and General Support, and Depot Maintenance Manual

DRILL, PNEUMATIC, DRIFTER: BOOM-TYPE; CRAWLER-MOUNTED; SELF-PROPELLED (INGERSOLL-RAND MODELS CM150A/D475A AND CM225/D475A)

FSN 3820-854-4149 AND FSN 3820-410-5549

TM 5-3820-239-15, 25 January 1968, is changed as follows:

The title is changed as shown above.

Page 1-1. Paragraph 1-1, CM225/D475A is added after CM150A/D475A.

Paragraph 1-3a. Delete Ingersoll-Rand Model CM150A/D475A.

Page 1-2. Paragraph 1-4a, the following is added: MODEL CM225/D475A, CONTRACT NO.-DSA700-69-C-H056, FSN 3820-410-5549, DATE MFD–1969.

Paragraph 1-4b(l), the following is added:
Model.....CM225/D475A
Serial No.....CL23190 and CL23301 through 23349

Page 1-5. The following data is added to paragraphs indicated:

Paragraph 1-4b(5):
Manufacturer.....Ingersoll Rand
Mode.....1040CMP (CM225/0475A)

Paragraph.....1-4b(14):
Model.....C-2763-SK-2 (CM225/D475A)

Paragraph 1-4b(15):
Model.....1CYL640AA (CM225/D475A)

Paragraph 1-4b(16):
Model.....1CY640AE (CM225/D475A)

Paragraph 1-4b(17):
Model.....1CYL640AR (CM255/D475A)

Paragraph 1-4b(1B):
Model.....1CYL640AF (CM225/D475A)

Paragraph 1-4b(19):
Model.....1CYL640AC (CM225/D475A)

Page 1-6. Paragraph 1-5 is superseded as follows:

1-5. Difference in Models.

This manual covers the Ingersoll-Rand Models CM150A/D475A and CM225/D475A pneumatic drills. There are differences between the two models in the hydraulic pump coupling, extension cylinder, dump cylinder, swing cylinder, boom lift cylinder and boom swing cylinder. These differences are noted, where applicable, throughout manual.

Page 1-9. Figure 1-3.1 is added.

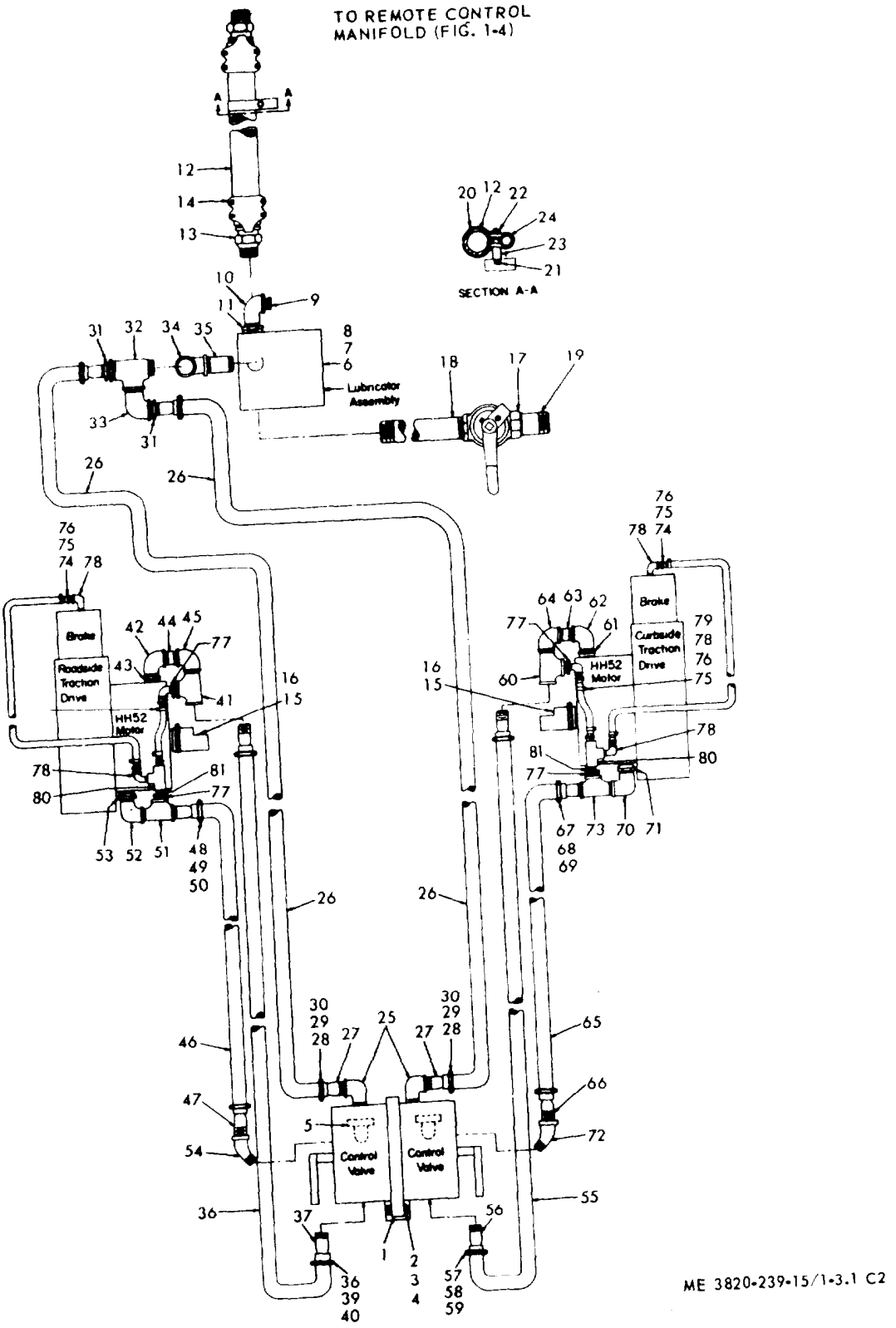


Figure 1-3.1. Propelling air piping diagram (CM225/D475A)

1 Bracket. propelling control panel
2 Bolt, 1/2 in. x 2 1/2 in. lg (2)
3 Nut, 1/2 in. (2)
4 Lockwasher, 1/2 in. (2)
5 Street elbow. 1 in. NPT x 45º (2)
6 Lubricator assembly
7 Bolt, 5/8 in. x 1 1/2 in. lg (4)
8 Nut, 5/8 in. (4)
9 Reducing bushing, 1 in x 1/2 in NPT.
10 Street elbow, in. NPT x 90º
11 Redging bushing, 1 in. x 144 in. NPT
12 AX hose, 2 in. x 17 ft 6 in. lg
13 Hose stem (2)
14 Hose clamp (2)
15 Hose, deflector (2)
16 Hose clamp (2)
17 Main air valve
18 Nipple, 2 in. NPT x 6 in. lg
19 Nipple, 2 in. NPT x 2 1/2 in. lg
20 Hose clamp, half (2)
21 Stud, 1/2 in. x 4 in. lg
22 Nut, 1/2 in.
23 Pipe, 1/2 in, NPT x 1 1/4 in lg
24 Coupling, 3/4 in. NPT x 1 5/8 in. lg
25 Street elbow, 1 in. NPT x 90º (2)
26 Air hose, 1 in. x 32 in. lg (2)
27 Hose stem (4)
28 Hose clamp, half (8)
29 Bolt, 3/8 in. x 2 1/4 in. lg (8)
30 Nut, 3/8 in. (8)
31 Reducing bushing, 1 1/2 in. x 1 in. NPT (2)
32 Street tee, 1 1/2 in. NPT
33 Street elbow, 1 1/2 in. NPT x 90º
34 Elbow, 1 1/2 in. NPT x 90º
35 Nipple. 1 1/2 in. NPT x 3 in. lg
36 Air hose, 1 in. x 72 in. lg
37 Hose stem (2)
38 Hose clamp, half (4)
39 Bolt, 3/8 in. x 2 1/4 in. lg (4)
40 Nut. 3/8 in. (4)
41 Street tee, 1 in. NPT
42 Street elbow, 1 in. NPT x 90º
43 Reducing bushing, 1 1/4 **in** x 1 in. NPT
44 Nipple, 1 in. NPT x 1 1/2 in. lg
45 Elbow, 1 in. NPT x 90º
46 Air hose, 1 in. x 32 in. lg
47 Hose stem (2)
48 Hose clamp, half (4)
49 Bolt, 3/8 in. x 2 1/4 in. lg (4)
50 Nut. 3/8 in. (4)
51 Street tee, 1 in. NPT
52 Street elbow, 1 in. NPT x 90º
53 Reducing bushing. 1 1/4 in. x 1 in. NPT
54 Street elbow, 1 in NPT x 45º
55 Air hose, 1 in. x 93 in. lg
56 Hose stem (2)
57 Hose clamp, half (4)
58 Bolt, 3/8 in x 2 1/4 in. lg (4)
59 Nut, 3/8 in. (4)
60 Street tee, 1 in. NPT
61 Reducing bushing. 1 1/4 in x 1 in NPT
62 Street elbow, 1 in. NPT x 90º
63 Nipple. 1 in. NPT x 1 1/2 in. lg
64 Elbow. 1 in. NPT x 90º
65 Air hose. 1 in. x 32 in. lg
66 Hose stem (2)
67 Hose clamp, half (4)
68 Bolt. 3/8 in. x 2 1/4 in. lg (4)
69 Nut, 3/8 in. (4)
70 Street elbows, 1 in NPT x 90º
71 Reducing bushing. 1 1/4 in x 1 in NPT
72 Street elbow, 1 in. NPT x 45º
73 Street tee, 1 in. NPT
74 Air hose, 1/4 in. x 22 in. lg (2)
75 Hose nipple (8)
76 Hose clamp (8)
77 Reducing Bushing, 1/4 in. x 1 in. NPT (4)
78 Street elbow. 1/4 in. NPT x 90º (6)
79 Air hose, 1/4 in. x 12 in. lg (2)
80 Shuttle valve, 1/4 in. NPT (2)
81 Nipple, 1/4 in. NPT x 7/8 IN. lg (2)

Page 1-13. Figure 1-5.1 is added.

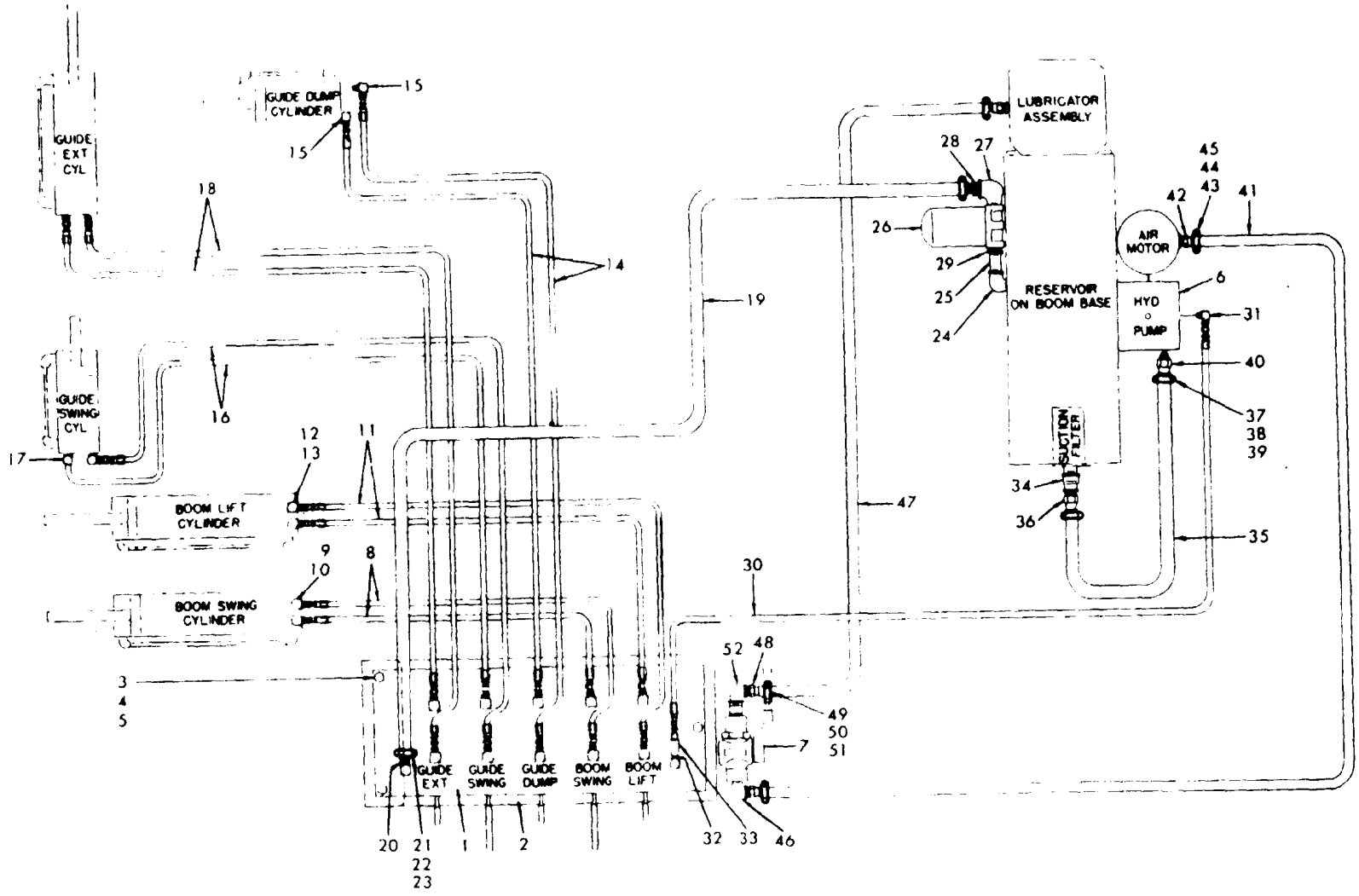


Figure 1-5.1. Hydraulic piping diagram (CM225/D475A)

ME 3820-239-15/1-5.1 C2

1 Hydraulic valve assembly
2 Mounting plate, hydraulic valve
3 Bolt, 3/8 in. x 3 in. lg (3)
4 Nut, 3/8 in. (3)
5 Lockwasher, 3/8 in. (3)
6 Hydraulic pump complete
7 Throttle valve complete
8 Hydraulic hose assembly (2)
9 Reducing bushing, 1/2 in x 3/8 in. NPT (2)
10 Elbow (2)
11 Hydraulic hose assembly (2)
12 Reducing bushing, 1/2 in. x 3/8 in. NPT (2)
13 Elbow (2)
14 Hydraulic hose assembly (2)
15 Elbow (2)
16 Hydraulic hose assembly (2)
17 Elbow (2)
18 Hydraulic hose assembly (2)
19 Hydraulic hose
20 Hose stem (2)
21 Hose clamp, half (4)
22 Bolt, 3/8 in. x 1 3/4 in. lg (4)
23 Nut, 3/8 in. (4)
24 Street elbow, 3/4 in. NPT x 90°
25 Nipple, 3/4 in. NPT x 2 1/2 in. lg
26 Oil filter
27 Street elbow, 1 in. NPT x 90°
28 Reducing bushing, 1 in. x 1/2 in. NPT
29 Reducing bushing, 1 in. x 3/4 in. NPT
30 Hydraulic hose assembly
31 Elbow
32 Nipple, 3/8 in. NPT x 1 in. lg
33 Flow control valve, 3/8 in. NPT
34 Reducing coupling, 1 in. x 3/4 in. NPT
35 Hydraulic hose
36 Hose stem
37 Hose clamp, half (4)
38 Bolt, 3/8 in. x 1 3/4 in. lg (4)
39 Nut, 3/8 in. (4)
40 Hose stem
41 Hydraulic hose
42 Hose stem (2)
43 Hose clamp, half (4)
44 Bolt, 3/8 in. x 1 3/4 in. lg (4)
45 Nut, 3/8 in. (4)
46 Street elbow, 1/2 in. x 90°
47 Hydraulic hose
48 Hose stem (2)
49 Hose clamp, half (4)
50 Bolt, 3/8 in. x 1 3/4 in. lg (4)
51 Nut, 3/8 in. (4)
52 Elbow, 1/2 in. NPT x 90°

Page 3-7. Paragraph *3-13a,* "oil fittings" is changed to read "lubrication fittings";
In Note, "oil the fittings" is changed to read "lubricate the fittings".

Paragraph 3-13b is superseded:

b. Using a grease gun, fill each fitting until grease is forced out through the seals.

Page 6-43. Paragraph 6-52.1 is added.

6-52.1. Disassembly (Model CM225/D475A)

a. Power Dump and Swing Assembly. Refer to paragraph *6-52a.*

b. Hydraulic Cylinders.

NOTE

The hydraulic cylinders are similar in construction. For maintenance purposes, a typical cylinder will be covered. Differences in the check valve parts do not affect the instructions appreciably.

(1) Remove capscrews (1, fig. 6-20.1) lock washers (2).

(2) Using a suitable spanner wrench, unscrew retainer ring.

NOTE

The retainer ring cannot be completely removed when unscrewed, since it may not fit over the fitting of the piston rod assembly.

(3) Slide piston rod assembly (19), with all parts attached, out of barrel assembly (29).

(4) Drive out lock pin (3) and remove all parts from the pin end of the piston rod assembly.

NOTE

Discard O-rings, U-cups, V-packings, lock pin, backup ring, and rod wiper repairing the hydraulic cylinder. These parts are not available separately, but are furnished in a service kit. Refer to TM 5-3820-239-35P

Paragraph 6-55.1 is added

6-55.1. Reassembly (Model CM225/D475A)

a. Hydraulic Cylinders.

NOTE

Coat all parts with clean hydraulic oil to aid in reassembly.

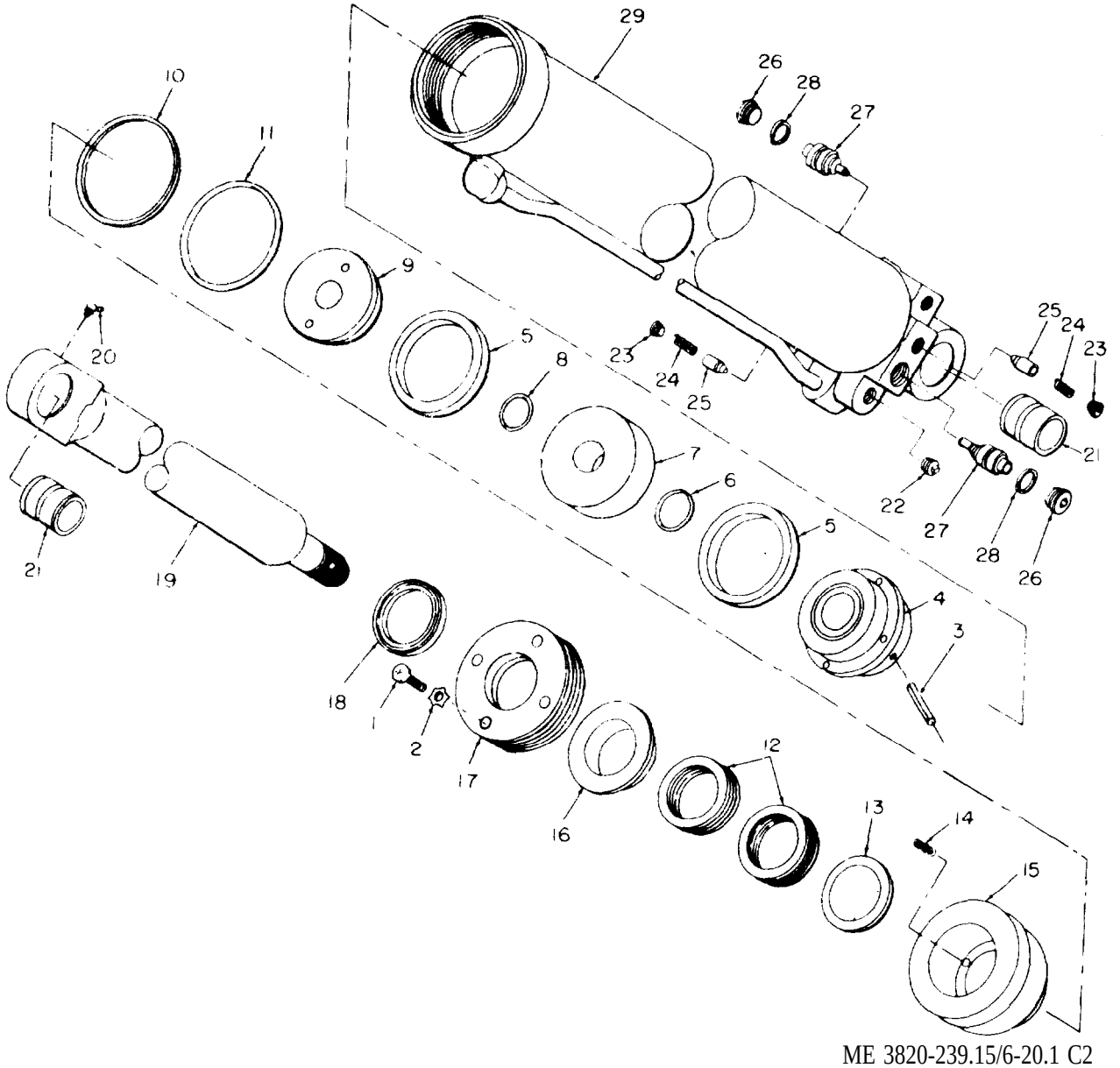
(1) Install all check valve parts as shown in figure 6-20.1.

(2) Slide rod wiper (18), retainer ring (17), and gland nut (16) onto piston rod assembly (19).

(3) Install springs (14), male adapter (13), and V-packing (12) into cylinder head (15). Mount O-ring (11) and backup ring (10) on the cylinder head, and slide the asembled parts onto piston rod assembly (19). Install lockpin (3) to retain the parts.

b. Power Dump and Swing Assembly. refer to paragraph 6-55c.

Page G-47. **Figure 6-20.1 is added.**



ME 3820-239.15/6-20.1 C2

1 Capscrew
2 Lockwasher
3 Lock pin
4 Rear backing plate
5 U-cup
6 O-ring
7 Piston
8 0-ring
9 Front backing plate
10 Backup ring
11 O-ring
12 V-packing
13 Male adapter
14 Spring
15 Cylinder head
16 Gland nut
17 Retainer ring
18 Rod wiper
19 Piston rod assembly
20 Lubrication fitting
21 Bushing
22 Pipe plug
23 Pipe plug
24 Spring
25 Poppet
26 Pipe plug
27 Pilot check piston
28 Piston ring
29 Barrel assembly

Figure 6-20.1. Typical hydraulic cylinder, exploded view.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States *Army,*
Chief *of Staff.*

Official:

VERNE L. BOWERS,
Major General, United States *Army,*
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25B (qty rqr Block No. 385), Operator requirements for Earth Drilling Machine.

U.S. GOVERNMENT PRINTING OFFICE: 1975-[illegible]

GPO 869 411

TECHNICAL MANUAL
No. 5-3820-239-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *25 January 1968*

Operator, Organizational, Direct and General Support, and Depot Mainenance Manual

DRILL, PNEUMATIC, DRIFTER: BOOM-TYPE; CRAWLER-MOUNTED; SELF-PROPELLED (INGERSOLL-RAND MODEL CM15OA/D475A)

FSN 3820-854-4149

CHAPTER 1

INTRODUCTION

Section 1. GENERAL

1-1. Scope

a. These instructions are published for use by personnel to whom the Ingersoll-Rand Model CM150A/D475A pneumatic drills are issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapters 4 through 6 provide information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized the operator of this equipment, and the list of maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart. Organizational, direct and general support, and depot maintenance repair parts and special tools are listed in TM 5-3820-239-20P and 35P.

c. Numbers in parenthesis following nomenclature callouts on illusrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submittedon DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to the Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis Mo. 63120

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organizational maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government motor vehicle identification card) which is carried by the operator, shall he kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND TABULATED DATA

1-3. Description

a. General. The Ingersoll-Rand Model CM 150A/D475A pneumatic drill (fig. 1-1 and 1-2) is a self-propelled, compressed air operated, crawler-mounted, boom-type drifter drill that is used for drilling holes in rocklike formations. The unit is designed to drill both vertical and angular primary blasting holes, within the range of boom travel. The drill as furnished does not include its own air supply. A portable compressor capable of supplying 600 cfm (cubic feet per minute) of air at 90 psi (pounds per square inch), and a 2-inch bull hose are required to supply all operating air needed for drilling and tramming (propelling).

b. Tramming. The pneumatic drill traction unit (fig. 1-1) is equipped with two 5-roller tank-type tracks which are driven by propelling air motors through clutches and automatic air brakes (all part of the traction drive, fig.

1-2). This arrangement, used for tramming, allows the operator to stand on the operator's platform (fig. 1-2) or walk either alongside or behind the unit while operating the propelling controls (fig. 1-2). Refer to paragraph *d* below.

c. Towing the Pneumatic Drill. The traction drive allows the propelling air motors to be declutched and the brake deactivated for towing. In this way, the tracks turn freely when the pneumatic drill is being towed to a new location. The tow hitch (fig. 1-2) provides a convenient connection point for towing purposes.

d. Propelling Controls. The propelling controls (fig. 1-2) are mounted on a propelling control arm which can be mounted in one of three locations for operator convenience. If the operator desires to stand on the operator's platform while tramming, the controls are mounted on a fixed bracket on top of the boom base (fig. 1-2). If the operator desires to walk either alongside or behind the pneumatic drill, the propelling controls are attached to a propelling control arm which can be swiveled to the side or to the rear of the unit. The propelling controls consist of two identical control valves, each of which controls one track independently of the other. The valves can be moved either forward or back, and are spring-returned to the center (off) position for safety. The independent action of each valve permits turning in a smaller radius than would normally be possible in a unit of this size.

e. Drifter Drill Positioning. The hydraulic boom assembly (fig. 1-1) consists of several hydraulically-operated (boom lift and boom swing) cylinders which position the entire drill guide and power dump and swing assembly as required for drilling operations. The complete range of boom travel is 100° in a horizontal direction and 82° in a vertical direction. The power dump and swing assembly (fig. l-l) consists of a dump cylinder and swing cylinder which hydraulically position the drill guide at the desired drilling angle. The power dump and solving assembly permits a full 180° vertical travel of the drill guide. All positioning is controlled by the hydraulic valve (fig. 1-2), and no manual repositioning or connections are required.

f. Drilling. The drifter drill (fig. 1-1) is mounted on the drill guide and is positioned by a chain drive. The power guide extension mounting contains a drill guide extension cylinder which is hydraulically controlled from the hydraulic valve (fig. 1-2) to lower the drill guide in order to place the foot piece (fig. 1-1) against the ground for added stability. The drill itself is operated from the remote control manifold, which has five valves, four of which are used. A rotation selector valve drives the drifter drill in the desired direction of rotation. A drill feed control valve moves the drill up and down. A drill throttle control valve selects the speed of drilling. A blow line valve allows air to clean out the hole.

1-4. Identification and Tabulated Data

a. Identification The Ingersoll-Rand Model CM150A/D475A pneumatic drill has one major identification plate. The information contained on the plate is listed below.

U.S. Army
Drill, pneumatic, drifter
MODEL—CMl50A/D475A
CONTR NO.—DAAK01-67-C-D096
SER
CAPACITY
REG NO.
FSN 3820-854-4149
GVW 8,600 LB
LG—192 IN.
HGT—72 IN.
W—84 IN.
SHIP WT—8,600 LB
CUBE—700 FT
DATE MFD—1967
ENG SER
WARRANTY
DATE SHIPPED
DATE INSP
INSP STAMP
MFD BY—Ingersoll-Rand

b. Tabulated Data.

(1) *Pneumatic drill.*

Manufacturer	Ingersoll-Rand
Model	CM150A/D475A
Type	Self-propelled
Specification	MIL-D-52335 (MO)

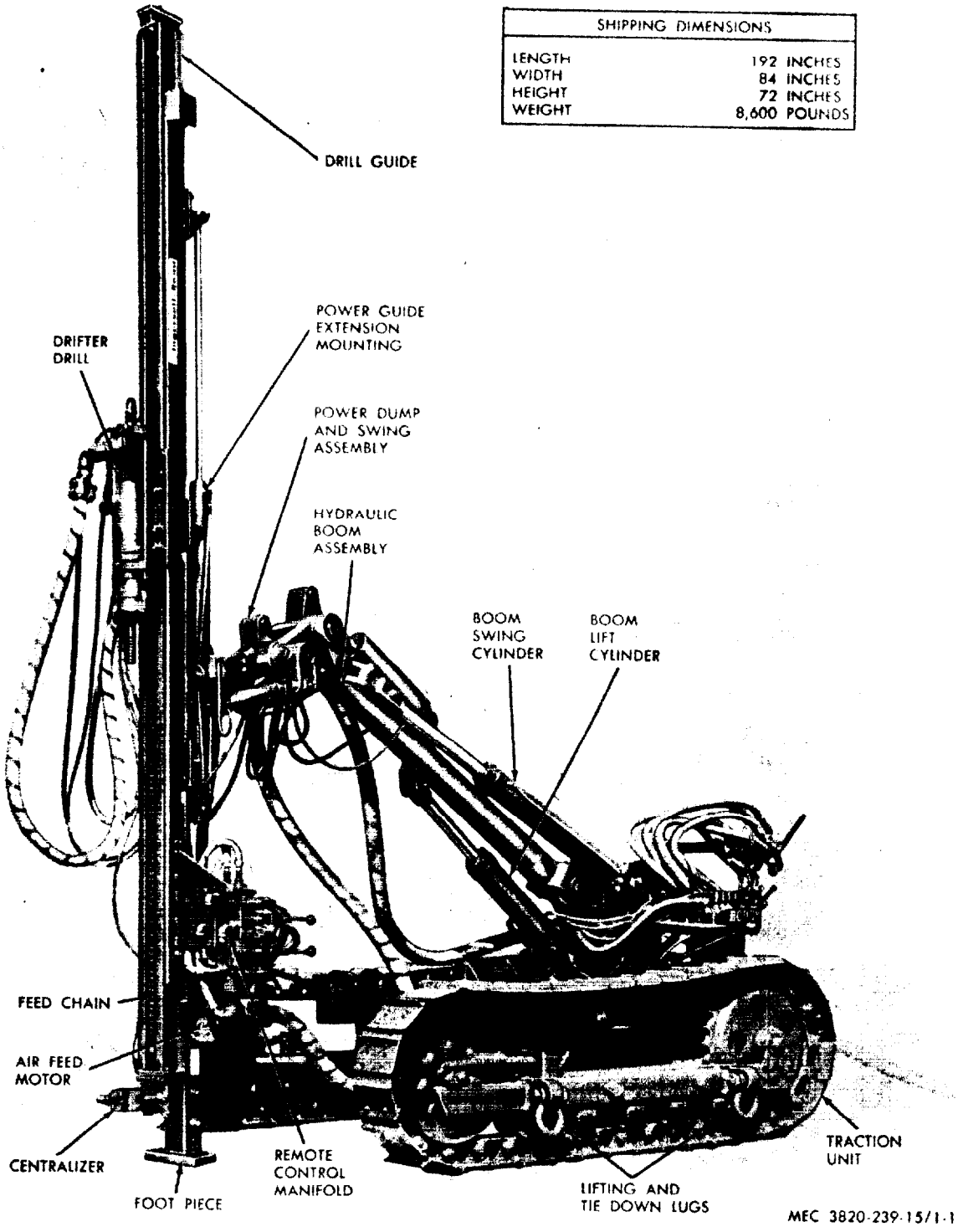


Figure 1-1. Pneumatic drill, left-front, three quarter view with shipping dimensions.

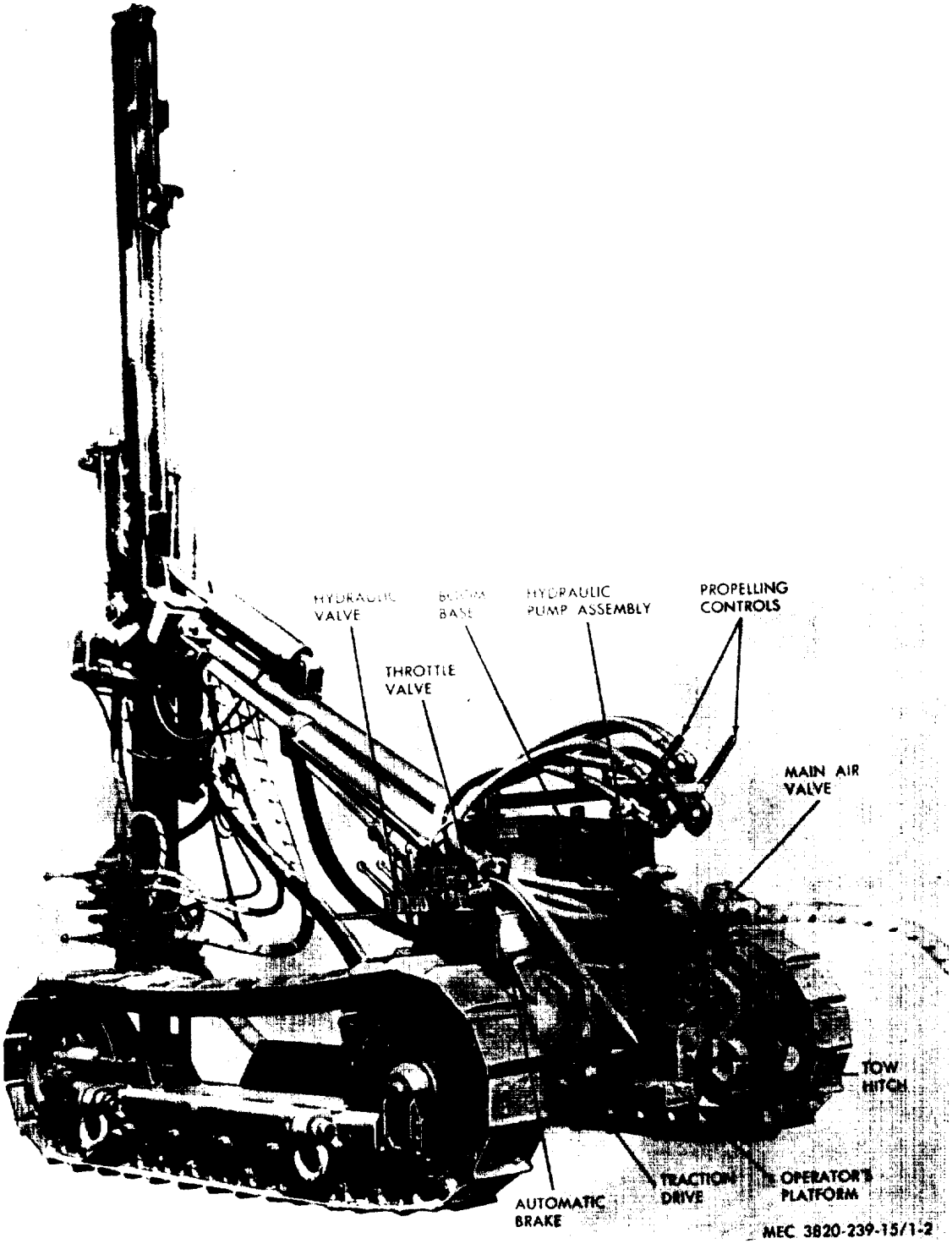


Figure 1-2. Pneumatic drill left-rear, three-quarter view.

(2) *Drifter drill.*

Manufacturer - - - - - - - - Ingersoll-Rand
Model - - - - - - - - - - - - - D475A
Bit size - - - - - - - - - - - 2 1/2 to 4 in.

(3) *Tow hitch.*

Manufacturer - - - - - - - - - - - - Holland-Hitch Co
Model - - - - - - - - - - - - - - - 760-1

(4) *Hydraulic pump.*

Manufacturer - - - - - - - - - - - Vickers, Inc.
Model - - - - - - - - - - - - - - - - - V110-15-1A-10-LHS85
Type - - - - - - - - - - - - - - - - - - Vane

(5) *Hydraulic pump coupling.*

Manufacturer - - - - - - - - - Link Belt Co
Model- - - - - - - - - - - - - - RC-5010
Type - - - - - - - - - - - - - - - - - - Flexible

(6) *Propelling air motors.*

Manufacturer - - - - - - - - - - - - Ingersoll-Rand
Model - - - - - - - - - - - - - - - - - HH52

(7) *Drill steel centralizer.*

Manufacturer - - - - - - - - - - Ingersoll-Rand
Model - - - - - - - - - - - - - - - - A45CM150A

(8) *Drill feed chain.*

Manufacturer - - - - - - - - - - - Link-Belt Co
Model - - - - - - - - - - - - - - - - RC80SU
Type - - - - - - - - - - - - - - - - - - Roller

(9) *Throttle valve.*

Manufacturer - - - - - - - - - - - - - Hose Accessories Co
Model- - - - - - - - - - - - - - - - - LE-HI VF-50
Size- - - - - - - - - - - - - - - - - - 1/2 in. NPT

(10) *Return line oil filter.*

Manufacturer - - - - - - - - - - - Vickers, Inc
Model - - - - - - - - - - - - - - - - OFM-101
Size- - - - - - - - - - - - - - - - - - 1 in. NPT

(11) *Main air valve.*

Manufacturer - - - - - - - - - - - - - Homestead Valve Mfg Co
Model- - - - - - - - - - - - - - - - - - 1112
Size- 2 in.

(12) *Drain plugs.*

Manufacturer- - - - - - - - - - - Lisle Corp
Type - - - - - - - - - - - - - - - - - Magnetic

(13) *Air feed motor assembly.*

Manufacturer - - - - - - - - - - - - - Ingersoll-Rand
Model - 128CM150A

(14) *Propelling motor control valve.*

Manufacturer - - - - - - - - - - Galland-Henning Nopak Div
Model - C-2538-SK-1
Size - - - - - - - - - - - - - - - - - - 1 in.
Type- - - - - - - - - - - - - - - - - - 4-way hand valve (spring-centered).

(15) *Drill guide extension cylinder.*

Manufacturer - - - - - - - - - - - - Benton Harbor Engineering Works Inc
Model - - - - - - - - - - - - - - - - - 1CYL640H
Type - - - - - - - - - - - - - - - - - - Hydraulic with thermal relief poppet

(16) *Dump cylinder.*

Manufacturer - - - - - - - - - - - - - Benton Harbor Engineering works Inc
Model - - - - - - - - - - - - - - - - 1CYL640K
Type - - - - - - - - - - - - - - - - - - - Hydraulic with thermal relief poppet

(17) *Swing cylinder.*

Manufacturer - - - - - - - - - - Benton Harbor Engineering Works Inc
Model - - - - - - - - - - - - - - - - - 1CYL640J
Type - - - - - - - - - - - - - - - - - - - Hydraulic with thermal relief poppet

(18) *Boom lift cylinder.*

Manufacturer - - - - - - - - - - - - Benton Harbor Engineering Works Inc
Model - - - - - - - - - - - - - - - - - 1CYL640G
Type - - - - - - - - - - - - - - - - - - Hydraulic with thermal relief poppet

(19) *Boom swing cylinder.*

Manufacturer - - - - - - - - - - Benton Harbor Engineering Works Inc
Model - - - - - - - - - - - - - - - - - 1CYL640F
Type - - - - - - - - - - - - - - - - - - - Hydraulic with thermal relief poppet

(20) *Nut and bolt torque data.*

Return line oil filter mounting bolt.	12 to 15 ft-lb (foot-pounds)
Traction unit sprocket stud nuts.	150 ft-lb
Pipe plugs	
1/8 in.	15 to 20 ft-lb
1/4 in.	40 to 50 ft-lb
3/8 in.	90 to 100 ft-lb
1/2 in.	140 to 150 ft-lb
5/8 in.	180 to 200 ft-lb
3/4 in.	240 to 250 ft-lb
1 in.	340 to 350 ft-lb
Bolts and nuts (thread size).	
No. 2	2 in.-lb (inch-pounds)
No. 3	3 in-lb
No. 4	4 in.-lb
No. 6	8 in.-lb
No. 8	16 in.-lb
No. 10	25 in.-lb
1/4 in.	4 to 5 ft-lb
5/16 in.	8 to 10 ft-lb
3/8 in.	12 to 15 ft-lb

7/16 in.	25 to 30 ft-lb
1/2in.	30 to 40 ft-lb
9/l6 in.	50 to 60 ft-lb
5/8 in.	70 to 80 ft-lb
3/4 in	90 to 100 ft-lb
7/8 in.	140 to 150 ft-lb
1 in.	200 to 210 ft-lb
1 1/8 in.	280 to 300 ft-lb
1 1/4 in.	380 to 400 ft-lb
1 3/8 in.	430 to 470 ft-lb
1 1/2 in.	500 to 550 ft-lb

(21) *Dimensions and weight (fig. 1-1).*

Overall height (guide vertical).	16 ft (feet)
Overall length (less boom and guide).	8 ft, 10 in.
Track width	7 ft
Track length	8 ft, 3 in.
Volume	700 cu ft (cubic feet)
Weight	8,600 lb (pounds)

(22) *Air piping diagram.* See figure 1-3 for propelling piping diagram. See figure 1-4 for drill control piping diagram.

(23) *Hydraulic piping diagram.* See figure 1-5.

1-5. Difference in Models

This manual covers only the Ingersoll-Rand Model CM150A/D475A pneumatic drill. No known unit differences exist for the model covered by this manual.

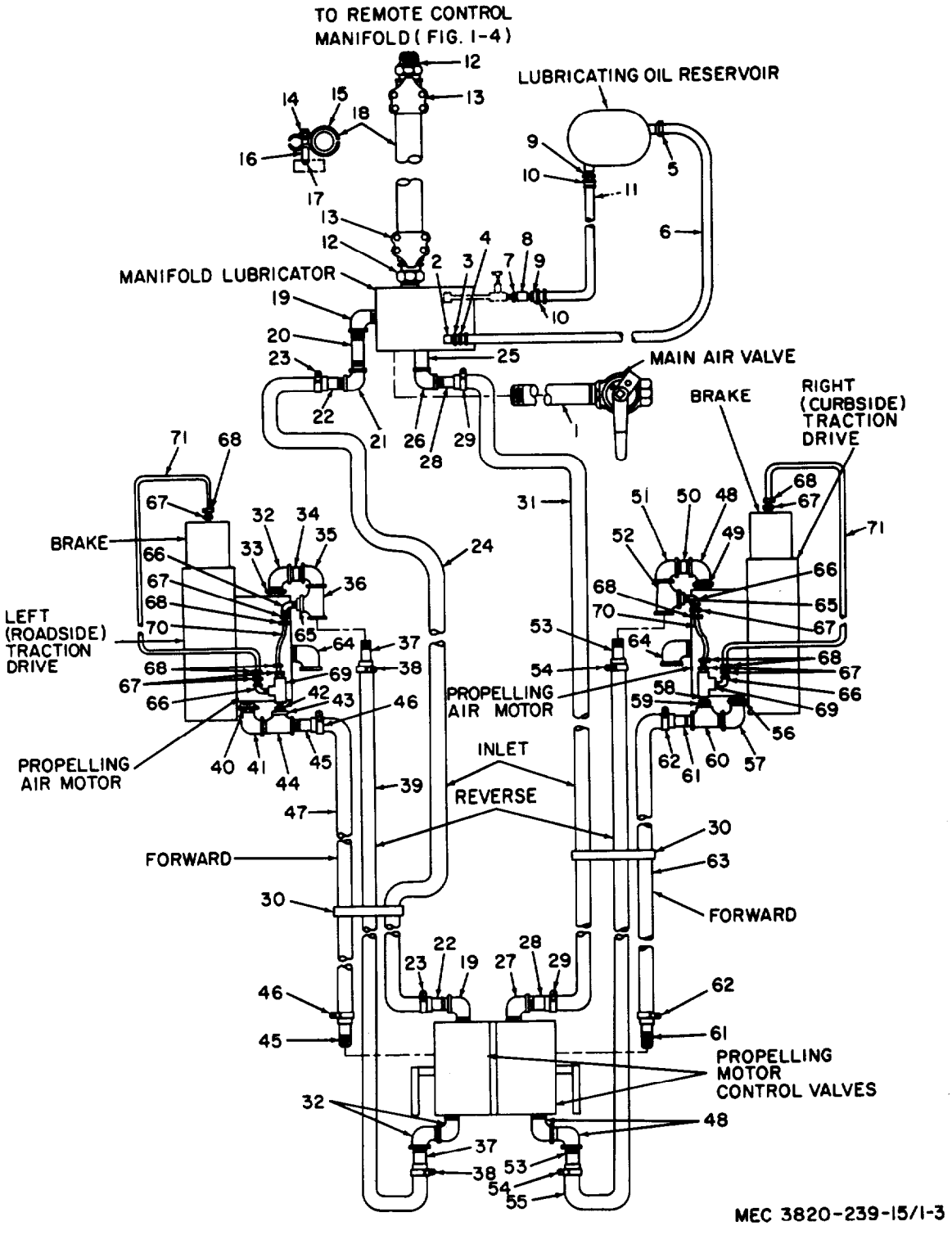


Figure 1-3. Propelling air piping diagram.

1 Long nipple, 2 x 9 in.
2 Elbow
3 Adapter
4 Universal swivel
5 Male pipe hose fitting
6 Hose, 21 in.
7 Reducing bushing, 3/8 to 1/4 in.
8 Coupling, 3/8 x 1 3/16 in.
9 Adapter (2)
10 Universal swivel (2)
11 Hose, 21 in.
12 Hose stem (2)
13 Hose clamp (2)
14 Stop nut, 1/2 in.
15 Hose clamp half (2)
16 Pipe, 1/2 x 1 1/4 in.
17 Stud, 1/2 x 4 in.
18 Air hose, 2 in. x 17 1/2 ft
19 Street elbow, 90° x 1 in. (2)
20 Nipple, 1 x 5 in.
21 Elbow, 90° x 1 in.
22 Hose stem (2)
23 Hose clamp (2)
24 Airhose, 1 in. x 7 1/2 ft
25 Nipple, 1 x 2 in.
26 Elbow, 90° x 1 in.
27 Street elbow, 90° x 1 in.
28 Hose stem (2)
29 Hose clamp (2)
30 Hose clamp, 2 1/8 ID x 2 1/2 OD x 3/4 in. thk (6)
31 Air hose, 1 in. x 7 1/2 ft.
32 Street elbow, 90° x 1 in. (3)
33 Reducing bushing, 1 1/4 to 1 in.
34 Nipple, 1 x 1 1/2 in.
35 Elbow, 90° x 1 in.
36 Street tee, 1 in.
37 Hose stem (2)
38 Hose clamp (2)
39 Air hose, 1 x 82 in.
40 Reducing bushing, 1 1/4 to 1 in.
41 Street elbow, 90° x 1 in.
42 Close nipple, 1/4 x 7/8 in
43 Reducing bushing, 1 to 1/4 in.
44 Street tee, 1 in.
45 Hose stem (2)
46 Hose clamp (2)
47 Air hose, 1 in. x 6 ft
48 Street elbow, 90° x 1 in. (3)
49 Reducing bushing, 1 1/4 to 1 in.
50 Nipple, 1 x 1 1/2in.
51 Elbow, 90° x 1 in.
52 Street tee, 1 in.
53 Hose stem (2)
54 Hose clamp (2)
55 Air hose, 1 x 103 in.
56 Reducing bushing, 1 1/4 to 1 in.
57 Street elbow, 90° x 1 in.
58 Close nipple, 1/4 x 7/8 in.
59 Reducing bushing, 1 to 1/4 in.
60 Street tee, 1 in.
61 Hose stem (2)
62 Hose clamp (2)
63 Air hose, 1 x 93 in.
64 Street elbow, 90° x 1 1/4 in. (2)
65 Reducing bushing, 1 to 1/4 in. (2)
66 Street elbow, 90° x 1/4 in. (4)
67 Hose nipple, 1/4 in. (8)
68 Hose clamp, 1/4 in. (8)
69 Shuttle valve (2)
70 Air hose, 1/4 x 12 in. (2)
71 Air hose, 1/4 x 22 in.

Figure 1-3—Continued.

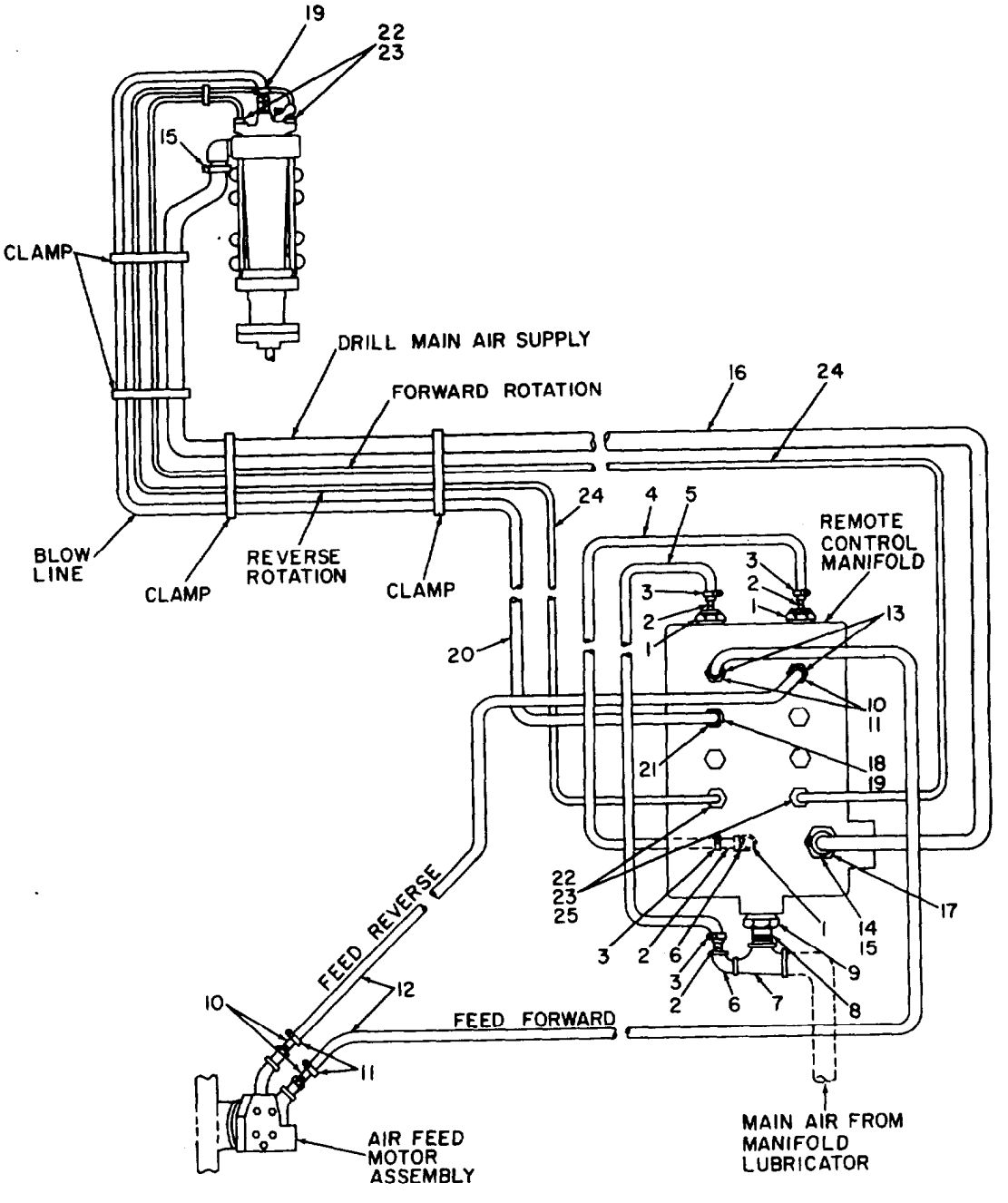


Figure 1-4. Drill control air piping diagram.

1 Reducing bushing, 1 to 3/4 in. (3)
2 Hose stem, 3/4 in. (4)
3 Hose clamp (4)
4 Air hose, 3/4 x 32 in.
5 Air hose 2/4 x 37 in
6 Street elbow, 3/4 in. (2)
7 Reducing tee, 2 x 2 x 3/4 in
8 Nipple, 2 x 2 in.
9 Reducing bushing, 2 1/2 to 2 in.
10 Hose stem 3/4 in. (4)
11 Hose clamp (4)
12 Air hose, 3/4 x 30 in. (2)
13 Reducing bushing, 1 to 3/4 in. (2)
14 Hose stem, 1 1/2 in.
15 Hose clamp (2)
16 Air hose, 1 1/2 in. x 17 ft
17 Reducing bushing, 2 to 1 1/2 in.
18 Hose stem, 3/4 in.
19 Hose clamp (2)
20 Air hose, 3/4 in. x 17 ft
21 Reducing bushing, 1 to 3/4 in.
22 Adapter (4)
23 Swivel (4)
24 Air hose, 3/8 in. x 18 ft (2)
25 Reducing bushing, 3/4 to 3/8 in. (2)

Figure 1-4—Continued.

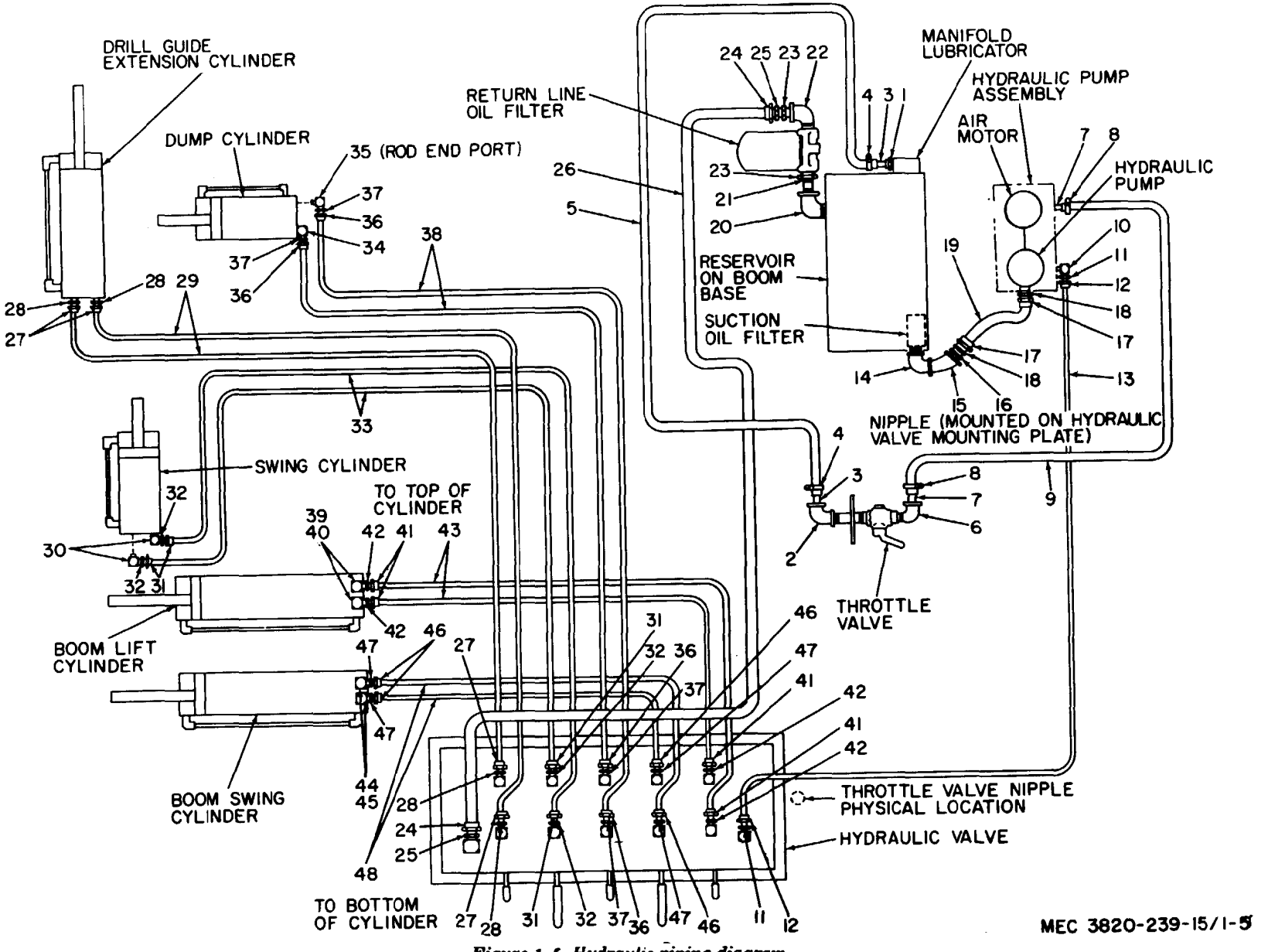


Figure 1-5. Hydraulic piping diagram.

1 Reducing bushing, 1 to 1/2 in.
2 Elbow, 1/2 in. x 90°
3 Hose stem, 1/2 in. (2)
4 Hose clamp (2)
5 Air hose, 1/2 x 66 in.
6 Street elbow, 1/2 in. x 90°
7 Hose stem, 1/2 in. (2)
8 Hose clamp (2)
9 Air hose, 1/2 x 51 in.
10 Elbow, 5/64 in. dia restriction orifice x 90°
11 Hose fitting (2)
12 Adapter (2)
13 Hose, 33 in. long
14 Elbow, 1 in. x 90°
15 Street elbow, 1 in. x 45°
16 Reducing bushing, 1 to 3/4 in.
17 Hose fitting (2)
18 Adapter (2)
19 Hose, 3/4 x 9 in.
20 Street elgow, 3/4 in. x 90°
21 Nipple, 3/4 x 2 1/2 in.
22 Street elbow, 1 in. x 90°
23 Reducing bushing, 1 to 3/4 in. (2)
24 Hose fitting (2)
25 Adapter (2)
26 Hose, 3/4 x 56 in.
27 Hose fitting (4)
28 Adapter (4)
29 Hose, 181 in. long (2)
30 Elbow, with 3/64 in. dia restriction orifice (2)
31 Hose fitting (4)
32 Adapter (4)
33 Hose, 151 in. long (2)
34 Elbow
35 Elbow, with 3/64 in. dia restriction orifice
36 Hose fitting (4)
37 Adapter (4)
38 Hose, 151 in. long (2)
39 Reducing bushing, 1/2 to 3/8 in. (2)
40 Elbow (2)
41 Hose fitting (4)
42 Adapter (4)
43 Hose, 45 in. long (2)
44 Reducing bushing, 1/2 to 3/8 in. (2)
45 Elbow (2)
46 Hose fitting (4)
47 Adapter (4)
48 Hose, 33 in. long (2)

Figure 1-5—Continued.

GPO 812-695-2

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unloading Equipment

The pneumatic drill is equipped with two lifting and tie down lugs (fig. l-l) on each side of the track frame for crane handling. When unloading the unit from the flatcar or trailer bed, use a spreader bar located over the center of gravity (fig. 2-1).

Warning: **Do not attempt to lift the pneumatic drill unless the drill guide is positioned as shown. If this procedure is not followed, unbalancing of the load may occur which can cause damage to the equipment and severe injury to personnel in the area.**

2-2. Unpacking Equipment

The pneumatic drill is shipped completely assembled and is not packed in any exterior containers or crates.

2-3. Inspecting and Servicing Equipment

a. Refer to the basic issue items list (app. B) to check for the presence of all required materials. Check all parts for insecure mounting. Tighten all loose mounting screws. and caps.

b. Refer. to paragraph 3-6 for daily preventive maintenance services to be performed.

c. Visually check the pneumatic drill for missing parts and for damage that may have occurred during shipment. Carefully check all hoses and fittings for abrasion and tightness.

2-4. Installation of Separately Packed Components

Since the pneumatic drill is shipped completely assembled, no installation is required.

2-5. Installation or Setting up Instructions

a. Location.

(1) *Towing.*

(a) If the pneumatic drill is to be towed to the desired worksite, disengage the clutch on each propelling air motor by pulling the clutch lock pin handle (fig. 2-2) out to the retracted position, and turning the handle to lock it in this position.

Caution: **If the clutches are not disengaged before towing, damage to the internal parts of the motor will occur.**

(b) Release the automatic brakes on the propelling air motors by turning in (clockwise) the setscrew (fig. 2-2) on each brake cylinder. Tighten the locknut to retain the setting.

Caution: **Do not tow the pneumatic drill at speeds greater than 4 mph (miles per hour). Be sure that the drill guide is raised enough to clear obstacles.**

(2) *Tramming.*

(a) Engage the clutch on each propelling air motor by releasing the clutch lock pin handle (fig. 2-2). Turn the handle either right or left until it releases and pulls in. If the lock pin does not snap into position, it may be necessary to operate the propelling air motor very slowly until the ring gear is

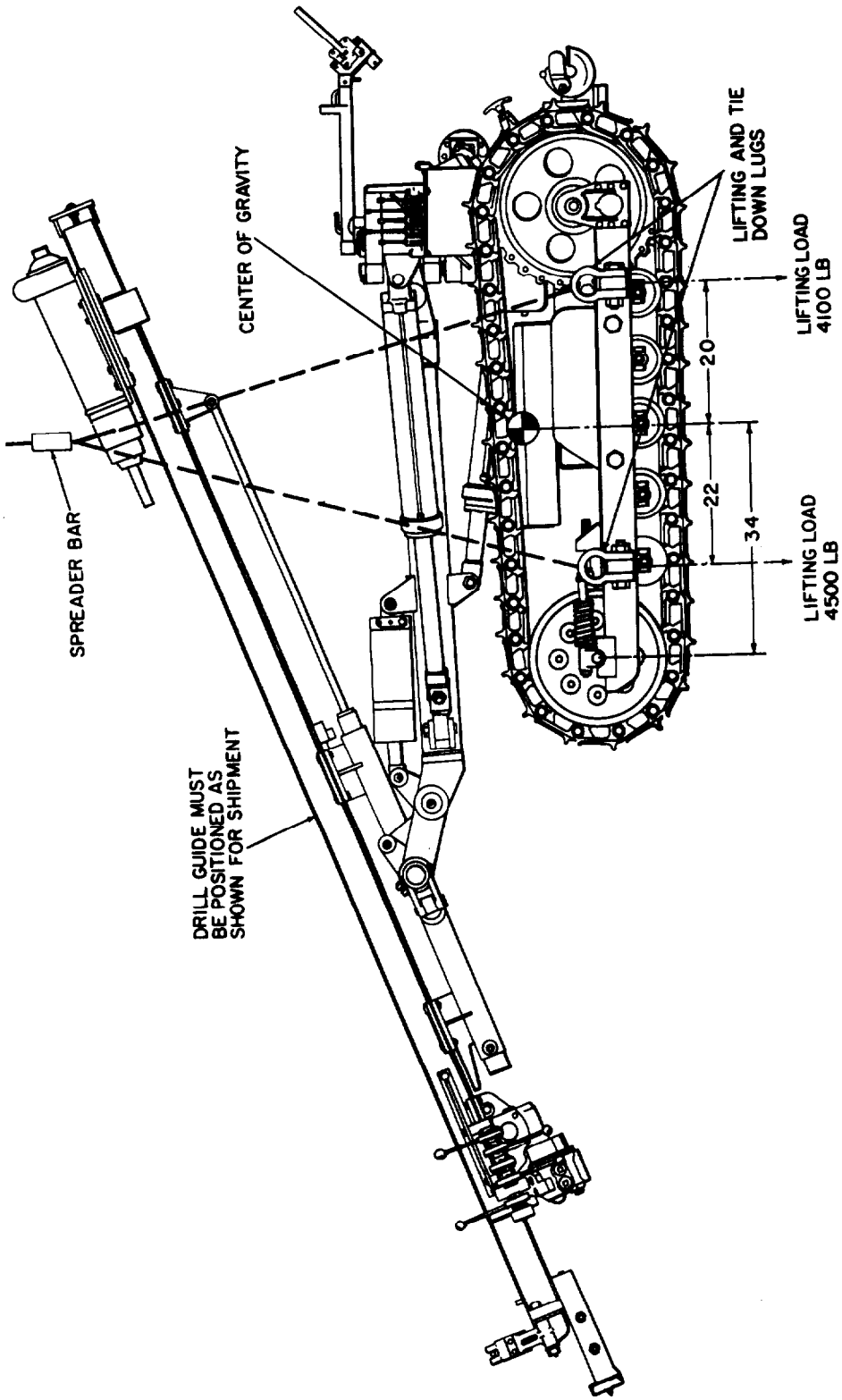


Figure 2-1. Pneumatic drill lifting points.

aligned with the pin. Refer to paragraph *2-5b* for connections required.

Warning: **If the clutch lock pin handle is engaged when air is directed to the propelling air motors, the unit will** move **forward quickly. Under no circumstances attempt to** pull **the propelling motor control handle back to cause reverse tramming while standing near the clutch.**

(b) Set the propelling motor automatic brakes by unscrewing (counterclockwise) the setscrew (fig. 2-2) on each brake cylinder. When the setscrew is free of piston drag, tighten the locknut to retain the setting.

Caution: **Be sure that the drill guide is raised high enough to clear obstacles.**

b. Connections.

(1) Blow out the main air hose from the compressor, to assure that all foreign material is removed from the line. If the hose is new, coat the inside sur-

Figure 2-2. Location of propelling air motor clutch handle and automatic brake setscrew.

faces by pouring one pint of the prescribed oil directly into the hose.

Note. **Use as short a length of hose as possible, in order to minimize excessive air pressure loss.**

(2) Disconnect the 1 1/2 inch main hose at the drifter drill and blow out the line for several minutes to remove trapped moisture and dirt.

Caution: If the air hose is new, allow the compressor to run with the hose disconnected from the drifter drill until oil vapor is visible at the hose outlet. It will require approximately 12 to 15 minutes for the 1 1/2 inch diameter hose to become completely coated with oil (lubricator must be open).

(3) Connect the hoses and check all fittings for tightness.

c. Lubrication. Before attempting operation, make sure that the pneumatic drill is properly lubricated. Refer to paragraph 3-6 for daily preventive maintenance services.

Section II. MOVEMENT TO NEW WORKSITE

2-6. Dismantling for Movement

a. If the pneumatic drill is to be moved a short distance by tramming, no dismantling is required. Follow the procedures of paragraph *2-5a(2).*

b. If the pneumatic drill is to be moved by towing, disconnect the compressor hose, and use the tow hitch located at the rear of the unit (fig. 1-2). Follow the procedure of paragraph *2-5a* (1). For longer distances when necessary to transport by rail or trailer, make sure to position the drill guide as shown in fig. 2-1 before lifting.

2-7. Reinstallation After Movement

Refer to paragraph 2-5 for reinstallation procedures.

Section III. CONTROLS AND INSTRUMENTS

2-8. General

This section describes, locates, illustrates and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for proper operation of the pneumatic drill.

2-9. Controls and Instruments

The purpose of controls and instruments and their normal settings are illustrated in figure 2-3.

Section IV. OPERATION OF EQUIPMENT

2-10. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the pneumatic drill.

b. The operator must know how to perform every operation of which the pneumatic drill is capable. This section gives instructions on starting and stopping the pneumatic drill, basic motions of the pneumatic drill, and on coordinating basic motions to perform specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedure to fit the individual job.

2-11. Starting

a. General.

(1) Perform necessary daily preventive maintenance services (para 3-6).

(2) Turn on main air valve (fig. 2-3).

b. Tramming.

(1) Mount propelling controls in the desired location (para *1-3d).*

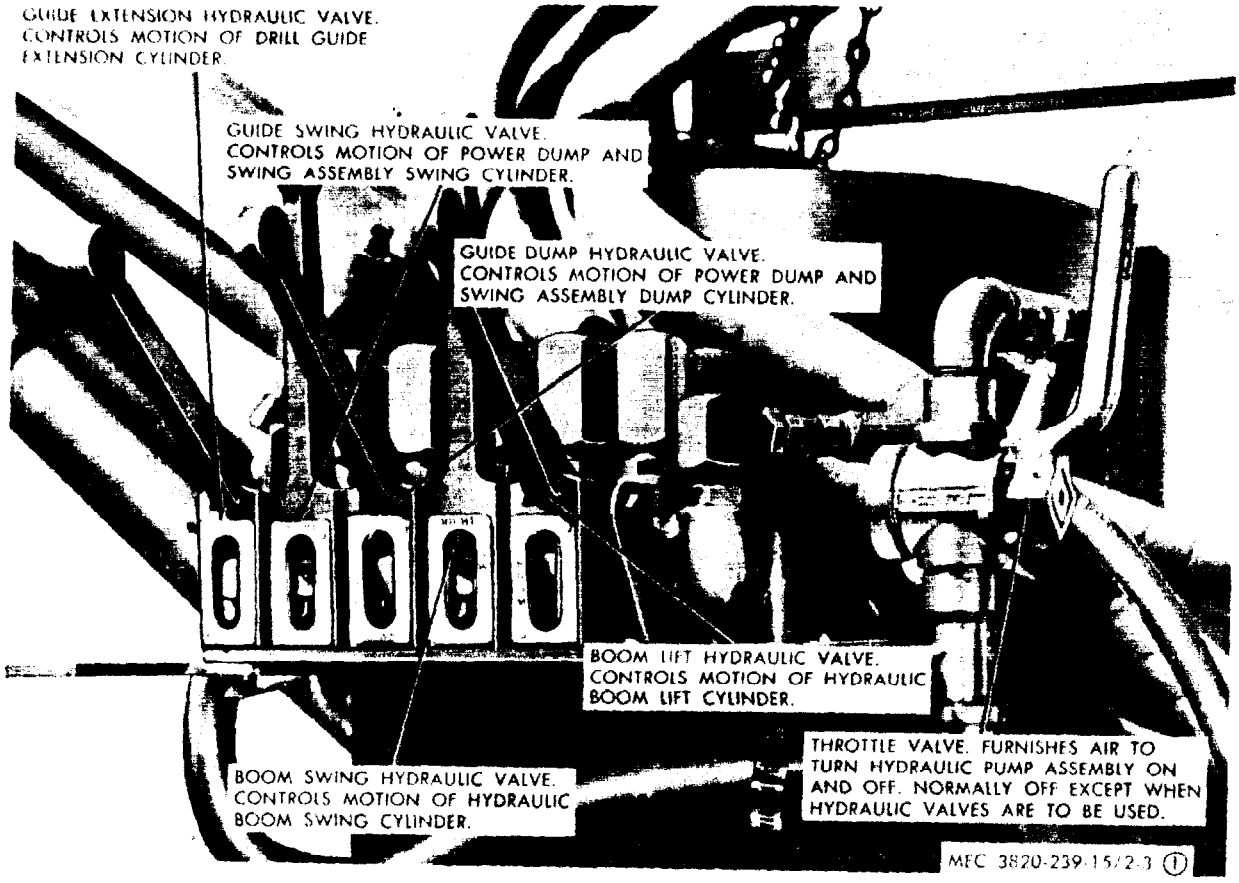


Figure 2-3(1). Controls and instruments.

(2) Follow the propelling procedure as follows:

(a) To propel straight forward-push both control handles forward at the same time.

(b) To propel in reverse-pull both control handles toward operator at the same time.

(c) To make a sharp left turn—-push the right hand control handle forward and pull the left hand control toward the operator at the same time.

(d) To make a sharp right turn-push the left hand control handle forward and pull the right hand control handle toward operator at the same time.

(e) To make a gradual right turn—push the left hand control handle forward, allow the right hand control handle to remain in neutral.

(f) To make a gradual left turn-push the right hand control handle forward, allow the left hand control handle to remain in neutral.

(g) Care should be exercised as the propelling motors are fast acting especially in starting and turning.

c. Positioning the Drill Guide.

(1) Turn on the hydraulic pump by positioning the throttle valve (fig. 2-3)

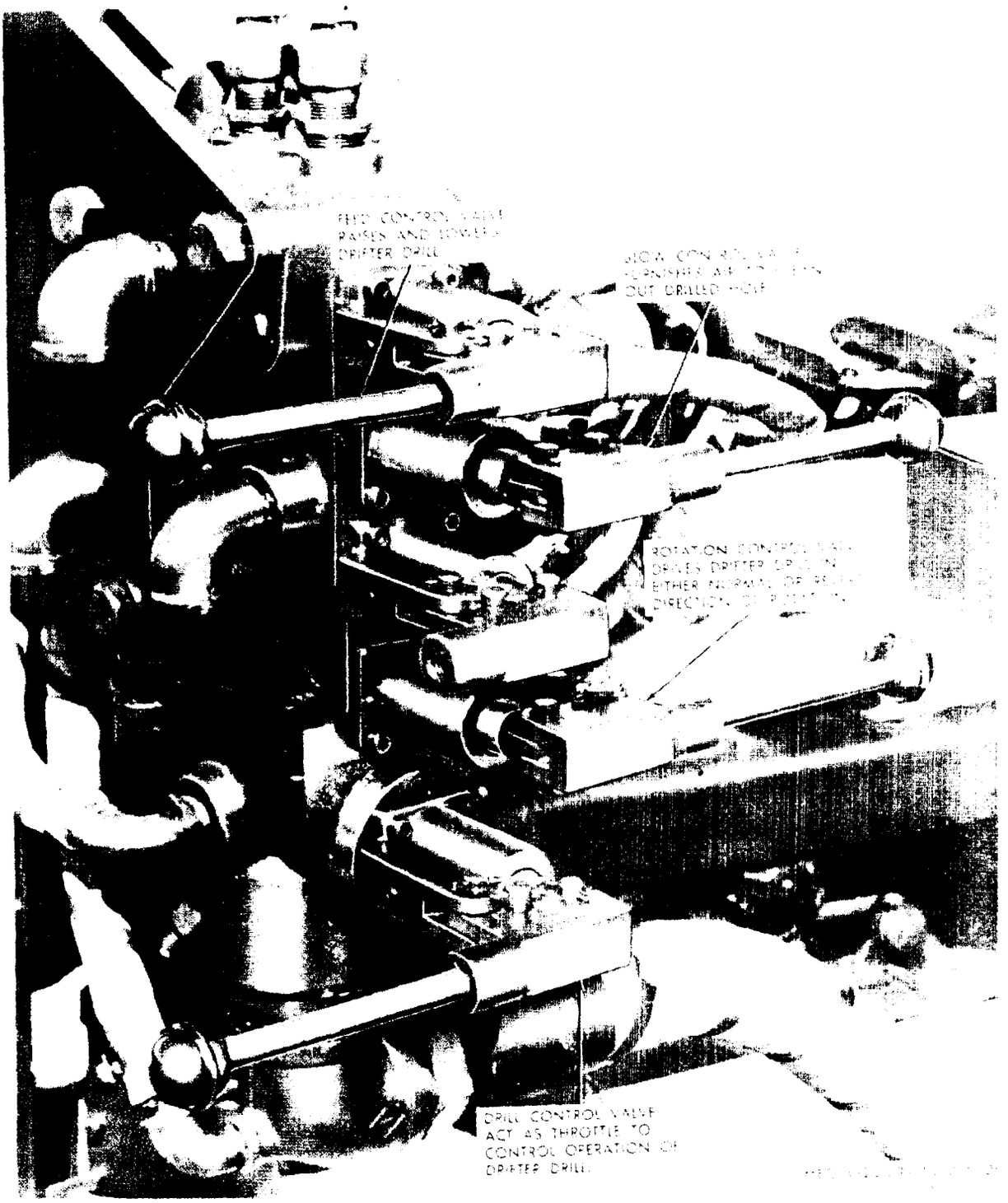


Figure 2-3(2)—Continued

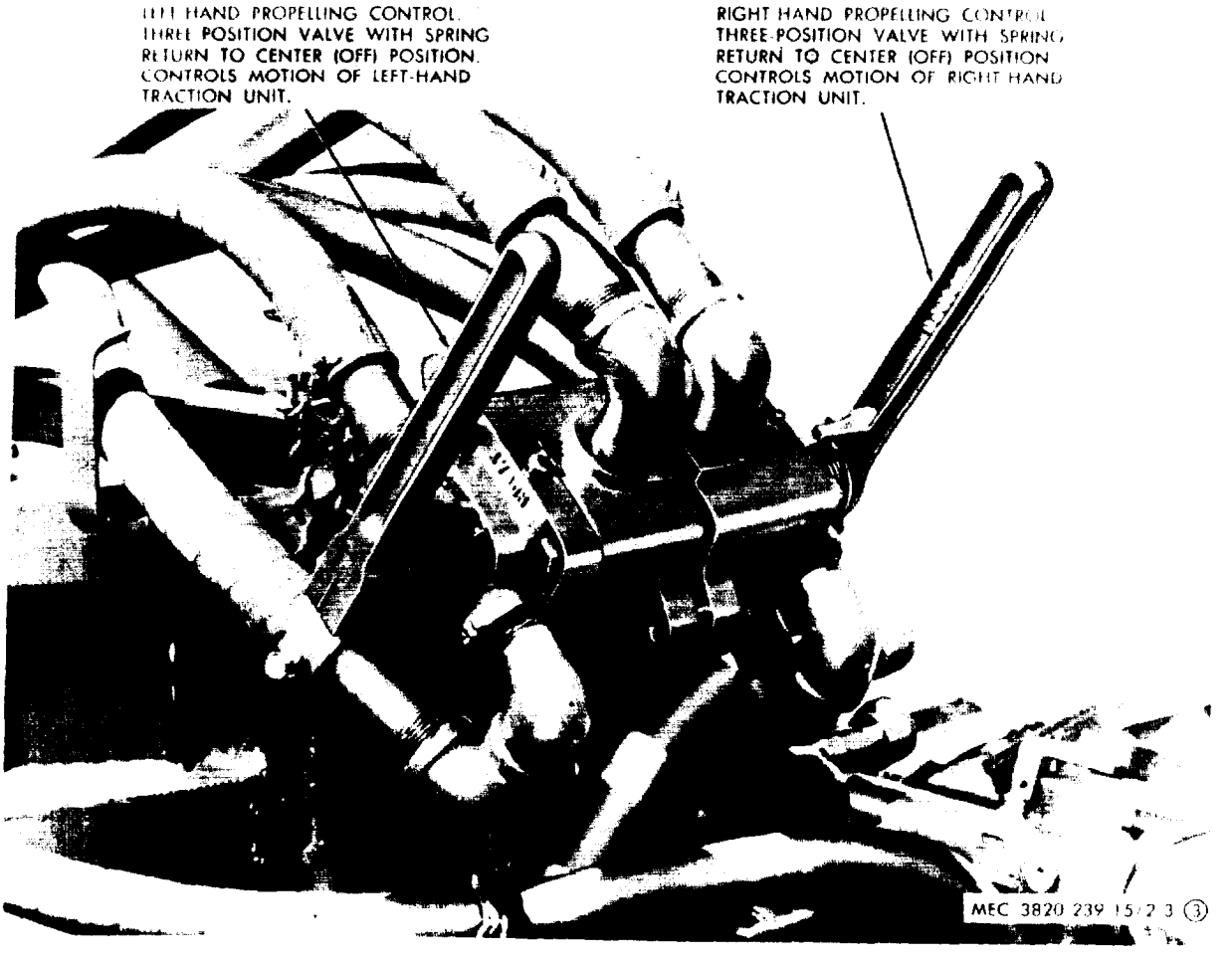


Figure 2-3(3)—Contiued

so that the handle is in the same direction as the piping.

(2) Position the drill guide as required by following the procedure:

(a) To raise the boom—move the boom lift lever to the "UP" position. To lower the boom—move the boom lift lever to the "DOWN" position.

(b) To move the boom to the right-move the boom swing lever to the "RIGHT" position. To move the boom to the left-move the boom swing lever to the "LEFT" position.

(cl To tilt the drill guide up-move 'the guide dump lever to the "UP" position. To tilt the drill guide down—move the guide dump lever to the "DOWN" position.

(d) To swing the drill guide to the right—move the guide swing lever to the "RIGHT POSITION". To swing the drill guide to the left—move the guide swing lever to the "LEFT POSITION".

(e) To raise the drill guide-move the guide extension lever to the "IN" position. To lower the drill guide—move the guide extension lever to the "OUT" position.

(f) Turn off pump when not using hydraulic controls by positioning the throttle valve so that the handle is perpendicular to the piping.

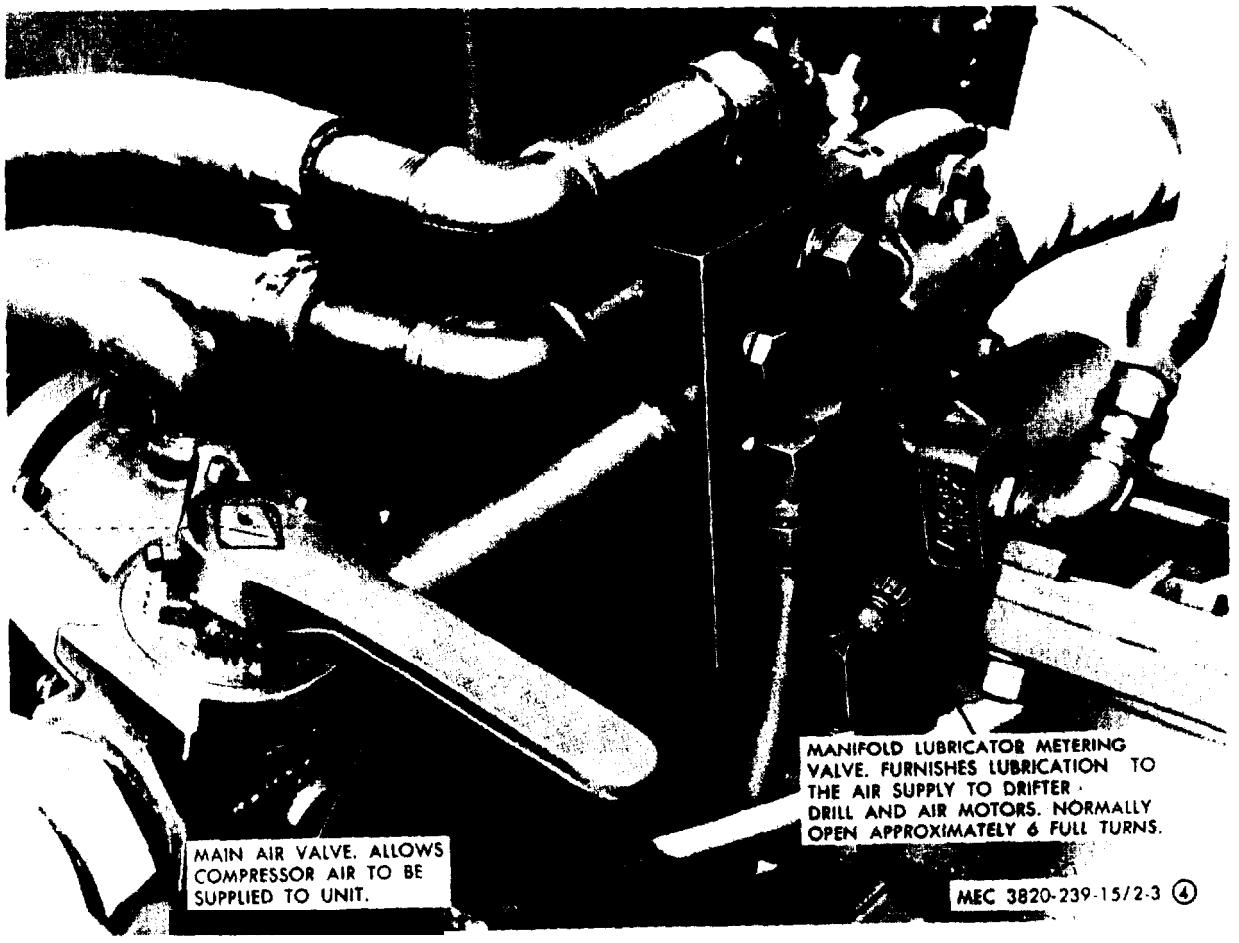


Figure2-3(4)—Continued.

d. Drilling.

(1) Open the valve on the manifold lubricator (fig. 2-3) by following the procedure:

(a) Turn the valve handwheel in a clockwise direction until the valve is completely closed.

(b) Open the valve six complete turns by turning the handwheel in a counterclockwise direction.

(c) Start the drill. After a few minutes check to see if the following condition exist:

1. Oil droplets are visible on the drill shank piece.

2. A bluish oil mist or haze is seen in the drill exhaust

If the above conditions do not exist, the needle valve may require additional adjusting.

(d) To increase the flow of oil, turn the needle valve handwheel counterclockwise.

(e) To decrease the flow of oil, turn the needle valve handwheel clockwise.

(f) Never allow the rig to operate without lubricating oil in the reservoir, Lack of lubrication will ruin the air operated motors and drill.

(2) Operate the drill from the remote control manifold (fig. 2-8) by following the procedure:

(a) Blow out main air line hose, check lubricator for oil, and connect main air line. If drill is new, remove air hose at drill and turn on air supply when oil vapor emerges from hose. Reconnect hose to drill.

(b) Install drill steel & bit in drill and close centralizer arms above bit.

(c) Position drill guide to the desired drilling location. Extend the power guide extension cylinder until the foot piece is firmly against the drilling face.

(d) Turn drill blow control on, use the feed motor control to move drill until bit is just above rock. Put rotation control in forward. Turn on drill control to rotate bit slowly. Feed bit down into rock and collar hole.

(e) After collaring hole, turn drill control on full and adjust feed to allow steel to rotate freely.

(f) After hole is bottomed, shut off drill. Use the drill blow control to clean out hole. After hole is cleaned, shut off all air blow, and retract drill steel from hole.

(g) If needed, add another drill steel to deepen hole or move drill to next position for new hole as required and repeat cycle.

e. Adding Extension Rods.

(1) Shut off the drill control at the remote control manifold.

(2) Use the feed control to retract the drill to free the bit from the bottom of the hole.

(3) Place the ROTATION control in the neutral position to stop rotation.

Caution: **The drill power can be used to loosen couplings but this procedure must be done with no rotation. Do not use reverse rotation to loosen couplings.**

(4) Use the FEED control to lower the drill, and hold the bit at the bottom of the hole under normal feed pressure.

(6) Move the DRILL control on and off in short bursts until the coupling is loose on the shank piece.

(6) Shut off the DRILL control.

(7) Place the ROTATION selector in the reverse position.

(8) Use the FEED control to raise the drill, allowing the shank piece to drop clear of piston action. Keep the shank piece clear of hammer range when using reverse rotation to unscrew threads. Threads can be damaged by the hammer blows when *not* in full contact.

(9) Operate the DRILL control at part throttle to unscrew the shank piece ‘from the coupling.

(10) Shut off the DRILL control.

(11) Retract the drill to the top of the drill guide.

(12) Lubricate the threads at both ends of the coupling.

(13) Screw a coupling on one end of the extension rod by hand.

(14) Align the extension rod and coupling with the shank piece and screw the other end into the coupling resting on the centralizer.

(15) Screw the coupling to the shank piece by hand, as tightly as possible.

(16) Place the ROTATION selector in the conventional (left-hand) rotation position, and operate the DRILL control at part throttle to tighten up the extension rod at both ends.

Caution: **Do not use the hammer control to tighten parts since damage to threads on the shank piece end extension rod may occur if the shank piece is struck before the threads are in full contact.**

(17) Repeat the entire procedure for each extension rod added.

2-12. Stopping

a. Shut off the DRILL control at the remote control manifold.

b. Use the FEED control to retract the drill steel from the hole.

c. Place the ROTATION control in the neutral position to stop rotation.

d. Use the FEED control to lower the drill, and hold the bit at the bottom of the hold under normal feed pressure.

e. Move the DRILL control on and off in short bursts until the coupling is loose on the shank piece.

f. Shut off the DRILL control.

g. Place the ROTATION selector in the reverse position.

h. Open the centralizer arms and feed the drill up the drill guide.

i. Stop the drill feed when the coupling clears the top of the centralizer.

j. Close the centralizer arms and feed the drill down until the coupling rests on top of the centralizer.

k. Operate the DRILL control at part throttle to unscrew the drill steel from the coupling resting on the centralizer, and the coupling on the shank piece.

l. Stop rotation and feed the drill down the drill guide until the shank piece engages the coupling resting on the centralizer.

m. Place the ROTATION selector in the conventional (left-hand) rotation position and screw the shank piece into the coupling. Do not screw the joint tight.

n. Repeat the procedure to remove successive sections of drill steel.

o. Shut off the main air valve and disconnect the bull hose if operation is complete. Shut off the compressor.

p. Perform the necessary daily preventive maintenance services (para 3-6).

2-13. Operation Under Usual Conditions

a. Start the pneumatic drill as described in paragraph *2-11e.*

b. Operate the pneumatic drill as described in paragraph 2-11b through 2-11e.

Warning: **Wear a respiratory mask at all times during drilling operations, to prevent rock drill dust from entering the lungs. Wear safety glasses while drilling to prevent eye damage from flying particles.**

c. Stop the pneumatic drill as described in paragraph 2-12.

2-14. Operation in Extreme Cold (Below -10°F)

a. Keep lubricating oil reservior and hydraulic reservoir full at all times to prevent moisture condensation in the oils.

b. Use grade OES lubricating oil for improved performance in cold weather.

c. Be sure the compressor is thoroughly warmed up before drilling.

d. Avoid sharp bends in hoses and handle them with care. They may become brittle at extreme temperatures.

e. Check all exhaust ports frequently for frost formation. Defrost as necessary.

Warning: **Do not touch unpainted metal surfaces with bare hands. The skin may stick to the metal surfaces at extreme temperatures.**

2-15. Operation in Extreme Heat

a. Where possible, take advantage of natural barriers to keep the unit from direct rays of the sun.

b. Inspect hoses frequently for signs of deterioration due to excessive heat.

2-16. Operation in Dusty or Sandy Areas

a. Shield the unit from dust. Take advantage of natural barriers which offer protection from blowing sand or dust.

b. Strain lubricating oil and hydraulic oil before adding to the manifold lubricator and hydraulic reservoir, respectively. Make sure pouring vessels are clean, and take precautions to avoid dust or grit getting into the reservoirs during refilling process.

c. Blow all air hoses out before attaching them to the pneumatic drill.

d. Take extra care to make sure that oil vapor is emerging from the drill before attempting drilling operations.

e. Between operating periods, cover, the entire unit if possible or seal all openings with cloth or tape.

2-17. Operation Under Rainy or Humid Conditions

a. Keep the pneumatic drill in a sheltered area if possible, or keep the unit covered when not in use.

b. Coat exposed ferrous metal surfaces with standard issue rustproofing material if available, or cover parts with a light film of grease.

2-18. Operation in Salt Water Areas

a. Avoid contact with salt water as much as possible since it is highly corrosive. Wash with fresh water to remove salt.

b. Exercise extreme care to prevent salt water or salt particles from entering lubricant containers, as salt retards the rust preventive effect and increases the corrosive effect of lubricants.

c. Paint exposed metallic surfaces if paint has been chipped off or otherwise removed. Coat exposed ferrous metal surfaces with standard issue rustproofing material if available, or cover parts with a light film of grease.

d. When the unit is not in use, cover or plug all openings to prevent salt air seepage into internal parts.

2-19. Operation at High Altitudes

Since air pressure decreases with increasing altitude, the following air consumption multipliers are provided for various altitudes in order that the compressor output can be readjusted. The following are based on a multiplier of 1.000 at sea level (0 feet).

a. 1,000 ft; multiplier 1.032
b. 2,000 ft; multiplier 1.065
c. 5,000 ft; multiplier 1.174
d. 10,000 ft; multiplier 1.391

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

No special tools or equipment are required by operator or organizational maintenance personnel for maintenance of the pneumatic drill.

3-2. Basic Issue Tools and Equipment

Repair parts issued with or authorized for use with the pneumatic drill are listed in the basic issue items list, Appendix B of this manual.

Section II. LUBRICATION

3-3. General lubrication Information

For the current lubrication order, LO 5-3820-239-12, refer to DA Pamphlet 310-4 (Military Publications).

3-4. Detailed lubrication Information

a. General. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Do not allow any dust, dirt, or other foreign matter to come in contact with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts that do not require lubrication free of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Points of Lubrication. Service the lubrication points at proper intervals as indicated on LO 5-3820-239-12.

d. OES Oil.

(1) When using grade OES oil (under conditions of extreme cold), check the oil level frequently, as oil consumption may increase.

(2) This oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

e. Oil Filter Service. Refer to figure 3-2 and service the return line oil filter. Refer to figure 3-3 and service the suction oil filter.

Note. **This service is performed only when draining and flushing the hydraulic reservoir. Refer to section VI.**

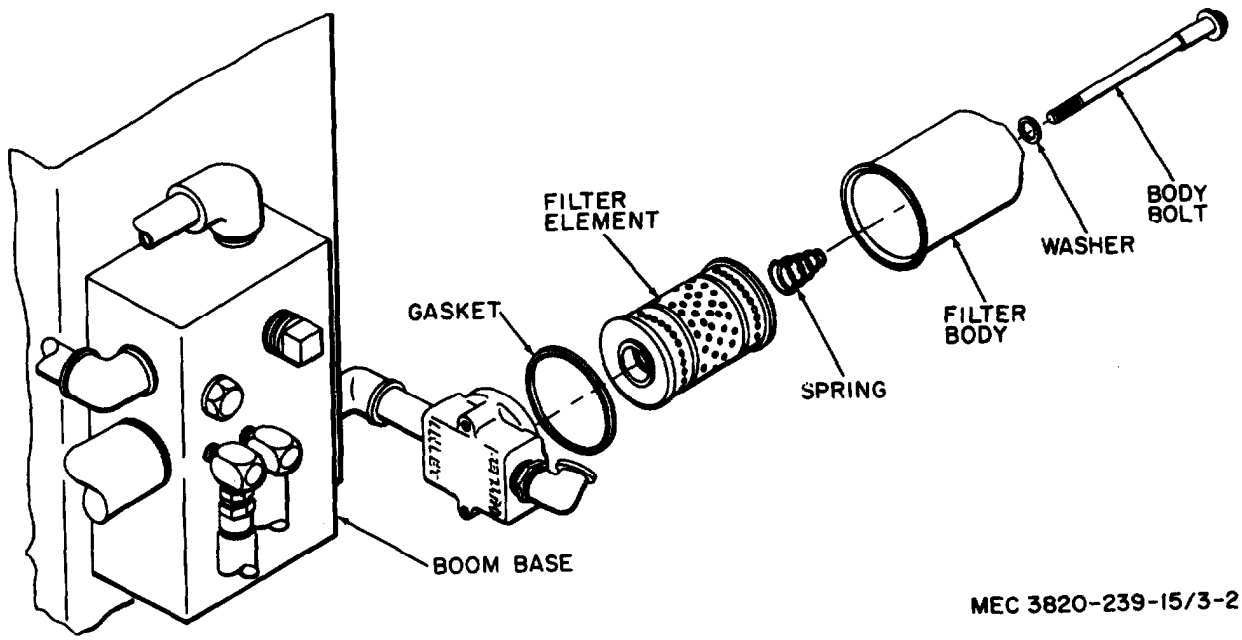


Figure 3-2. Return line oil filter service.

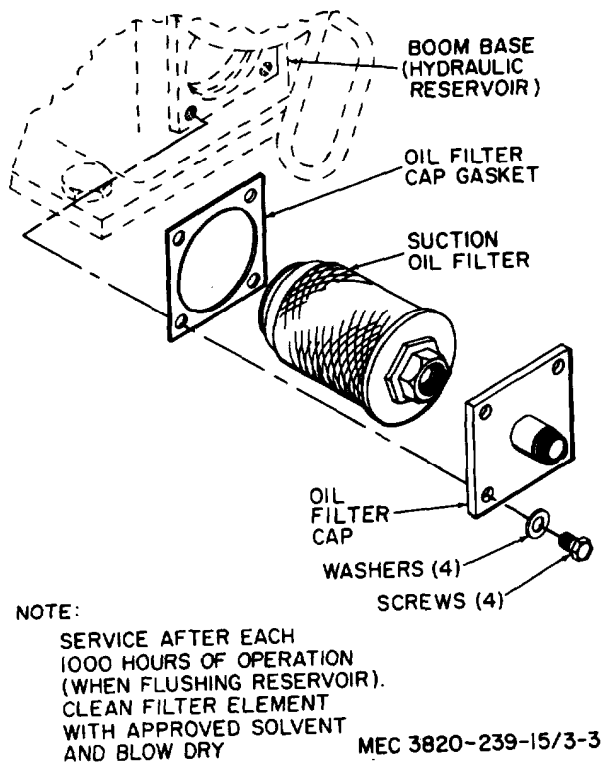


Figure 3-3. Suction oil filter service.

Section III. PREVENTIVE MAINTENANCE SERVICE

3-5. General

To insure that the pneumatic drill is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-6 and 3-7. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

3-6. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator or organizational maintenance personnel. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-4 for the daily preventive maintenance services.

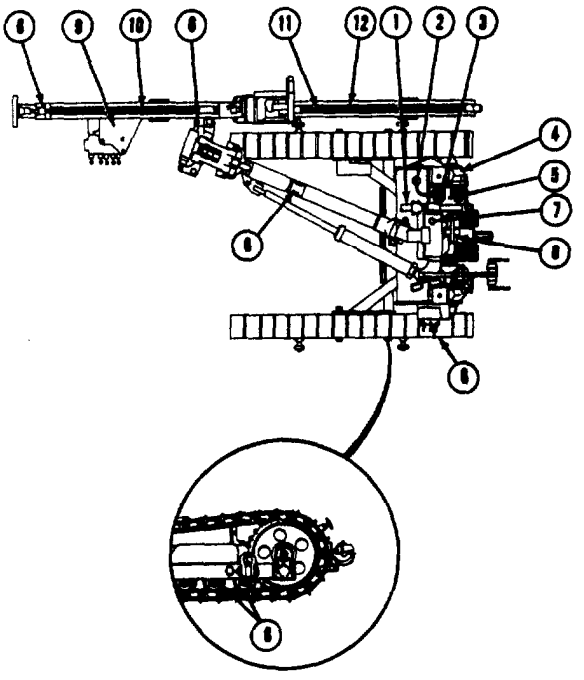
3-7. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-5 for the quarterly preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES
DAILY

TM 5-3820-239-15 | INGERSOLL-RAND MODEL CM150A/D475A | PNEUMATIC DRILL



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR.REF
1	HOSES AND FITTINGS. CHECK HOSES FOR CONDITION. MAKE SURE CONNECTIONS ARE TIGHT.	
2	LUBRICATING OIL RESERVOIR. CHECK OIL LEVEL.	3-9
3	LUBRICATOR METERING VALVE. ADJUST FLOW TO DRILL.	3-10
4	TRACTION DRIVE PLANET GEAR HOUSING. CHECK OIL LEVEL.	3-11
5	PROPELLING AIR MOTORS. CHECK OIL LEVEL.	3-11
6	LUBRICATION FITTINGS. ADD GREASE TO FITTINGS(ON BOOM, HYDRAULIC CYLINDERS, MAIN FRAME, DRILL GUIDE, POWER DUMP AND SWING ASSEMBLY, AIR FEED MOTOR, CENTRALIZER, POWER GUIDE EXTENSION MOUNTING, PROPELLING CONTROLS, AND TRACK IDLERS). ADD GREASE TO FITTINGS ON HYDRAULIC PUMP (WEEKLY).	
7	HYDRAULIC RESERVOIR. CHECK AND MAINTAIN OIL LEVEL 5 INCHES BELOW TOP OF RESERVOIR (WEEKLY).	3-12
8	TRACTION UNIT. LUBRICATE ROLLERS AND FITTINGS. CHECK OIL LEVEL IN FINAL DRIVE HOUSING.	3-13
9	AIR FEED MOTOR. CHECK OIL LEVEL IN WORM HOUSING. ADD GREASE TO CYLINDER CASE (WEEKLY).	3-14
10	DRILL STEEL. CLEAN, INSPECT, AND LUBRICATE.	
11	FEED CHAIN. INSPECT. CHECK FEED CHAIN TENSION(WEEKLY). CLEAN AND LUBRICATE(MONTHLY).	3-25
12	DRILL GUIDE. GREASE DRILL GUIDE CHANNELS.	

MEC 3820-239-15/3-4

Figure 3-4. Daily preventive maintenance services.

GPO 812-695-3

Section IV. OPERATOR'S MAINTENANCE

3-8. General

Instructions in this section are published for the information and guidance of the operator to maintain the pneumatic drill.

3-9. lubricating Oil Reservolr

a. Disconnect the manifold lubricator air line at the pipe plug on top of the manifold lubricator. Remove the pipe plug.

b. Insert a clean dipstick and check the level of oil in the lubricating oil reservoir.

c. Fill with the prescribed oil as often as necessary.

Caution: **Do not allow the unit to run without oil in the reservoir. This oil furnishes the lubrication to the drifter drill and air motors, and lack of lubrication will cause these parts to wear prematurely.**

Note. Normally, if the reservoir is filled at the beginning *of* the day, the drill should operate for 8 hours without refilling.

3-10. Lubricator Metering Valve Setting

a. Turn the metering valve handle (fig. 2-3) clockwise until completely closed.

b. Open the valve (counterclockwise rotation) six complete revolutions.

c. Start the drill. After several minutes, check to see that the following conditions exist:

(1) Oil droplets are visible on the drill shank piece.

(2) A bluish oil mist or haze is apparent in the exhaust.

d. If the above conditions do not exist, or too much oil is flowing, readjust the valve as required (counterclockwise rotation allows more oil to flow; clockwise rotation decreases the flow of oil).

Caution: **Do not operate the drill with the lubricator valve closed. The oil furnishes the lubrication to the drifter drill and the air motors, and lack of lubrication will cause these parts to wear prematurely.**

3-11 Lubrication of Traction Drive and Propelling Air Motors

The traction drive receives its lubrication from the propelling air motor through lubrication holes in the motor case cover, Thus, although there is no direct check of the oil level in the traction drive planetary gear housing, the level must be the same as that in the propelling air motor. Proceed as follows.

a. To check the oil level in the propelling air motors, remove the pipe plug located 1/3 of the way up from the bottom of the motor case (fig. 3-6). If oil flows from this port, the level is sufficient for both the propelling air motors and the traction drive.

b. If it is necessary to add oil, leave the pipe plug off and remove the vent cap at the top of the case. Add the prescribed lubricating oil through the vent cap port until it flows from the pipe plug port. Install the pipe plug and the vent cap.

c. When necessary to drain the oil from the traction drive planetary gear housing and propelling air motor, remove the magnetic plug and pipe plugs at the bottom of each housing and allow all of the oil to drain off. Clean and install the plugs and refill through the vent cap port (b above).

3-12. Checking Oil level in Hydraulic Reservoir

a. Remove the vent cap from the hydraulic reservoir.

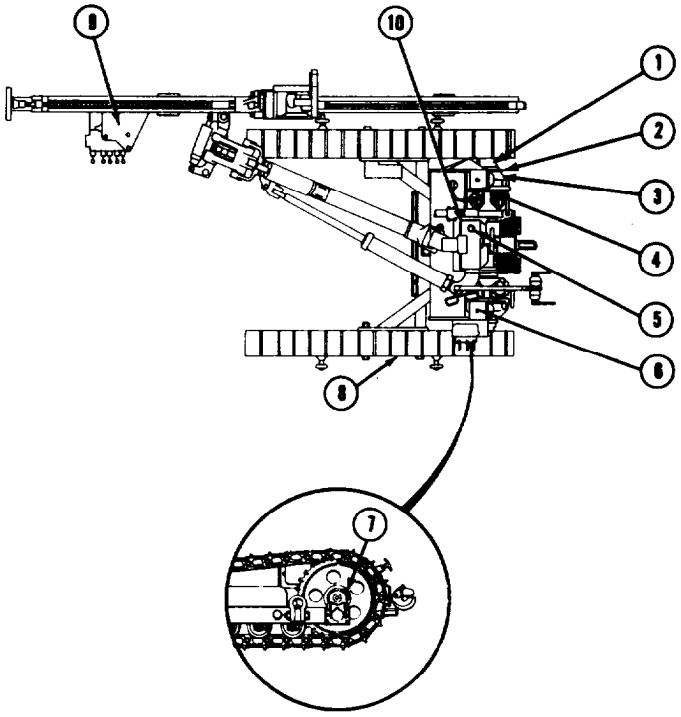
b. Insert a clean dipstick into the reservoir and check the level of oil, The level should be 5 inches below the top, This allows room for oil return during operation.

Note. If the unit is new or the system was drained, make sure oil is distributed throughout the closed system by turning on the hydraulic pump and operating the boom cylinder through use of the hydraulic valve. Recheck the oil level after operation, and refill if necessary.

c. Add the prescribed oil if necessary through the vent cap port, until the level is 5 inches below the top. Install the vent cap.

PREVENTIVE MAINTENANCE SERVICES
QUARTERLY

TM 5-3820-239-15 | INGERSOLL-RAND MODEL CM150A/D475A | PNEUMATIC DRILL



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR. REF
1	FINAL DRIVE. DRAIN OIL AND REFILL (500 HOURS).	3-13
2	MAGNETIC PLUGS. CLEAN AND INSPECT (1000 HOURS).	
3	TRACTION DRIVE. DRAIN OIL AND REFILL PLANET GEAR HOUSING (500 HOURS).	3-11
4	PROPELLING AIR MOTORS. DRAIN OIL AND REFILL (500 HOURS).	3-11
5	HYDRAULIC RESERVOIR. REMOVE AND CLEAN SUCTION OIL FILTER. DRAIN, FLUSH, AND REFILL RESERVOIR (1000 HOURS).	3-23
6	BRAKES. ADJUST BRAKES	3-38
7	FINAL DRIVE SPROCKETS. CHECK AND TIGHTEN SPROCKET STUD NUTS IF REQUIRED.	3-36b
8	TRACKS. CHECK AND ADJUST TRACK IF REQUIRED.	3-36a
9	AIR FEED MOTOR. DRAIN TRANSMISSION OIL IN WORM HOUSING. REFILL (500 HOURS).	3-14
10	RETURN LINE OIL FILTER. REPLACE FILTER CARTRIDGE (1000 HOURS).	

MEC 3820-239-15/3-5

Figure 3-5. Quarterly preventive maintenance services.

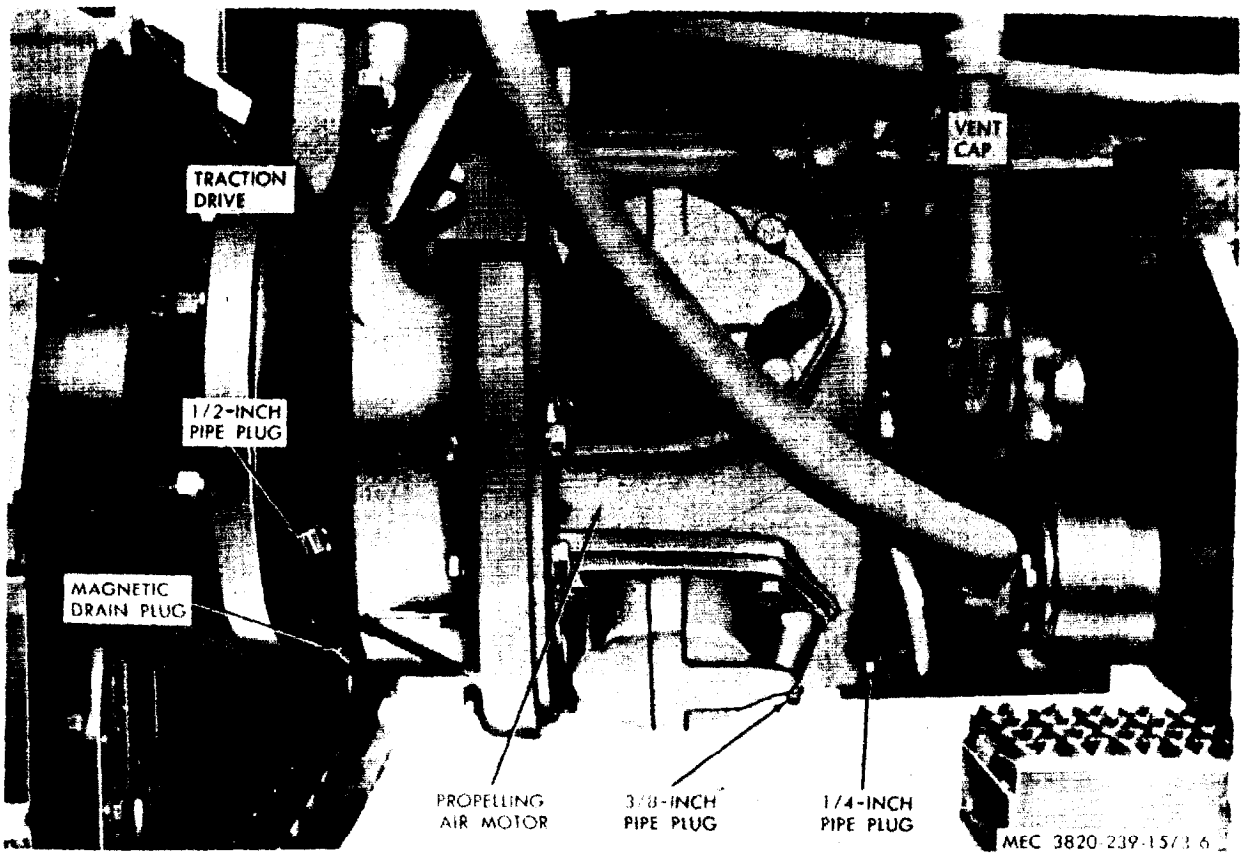


Figure 3-6. Lubrication of traction drive and propelling air motors.

Note. Since the hydraulic system is a closed system, there should never be need to add a significant amount of oil. Should frequent refilling be required, inspect carefully for leaks or defective seals and components. See figure 1-5 for a complete hydraulic piping diagram.

3-13. Lubricating Traction Unit

a. Clean the oil fittings on the track rollers, rear sprocket shaft, and front wheel support of each traction unit (fig. 3-7).

Note. If the pneumatic drill is standing or operating in mud or water, clean and oil the fittings every 1 hours instead of every 8 hours.

b. Using an oil gun, fill each fitting until oil is forced out through the seals.

c. To check the oil level in the final drive housing, remove the oil level plug near the bottom of each drive (on the inner side of the rear sprocket) (fig. 3-8).

d. If it is necessary to add oil, remove the filler plug at the top of the final drive housing (fig. 3-8). Add the prescribed oil until it flows from the oil level plug port. Install the oil level plug and the fill plug.

e. When necessary to drain the oil from the final drive housing, remove the magnetic drain plug from the bottom of each housing (fig. 3-3) and allow all of the oil to drain off. Clean and install the drain and level plugs and refill through the fill plug port (d above). When refilling, note that the capacity of each drive housing is 1 1/2 pints of oil.

3-14. Lubricating Air Feed Motor

a. Remove the worm housing plug from the top of the air feed motor (fig. 3-9) and add

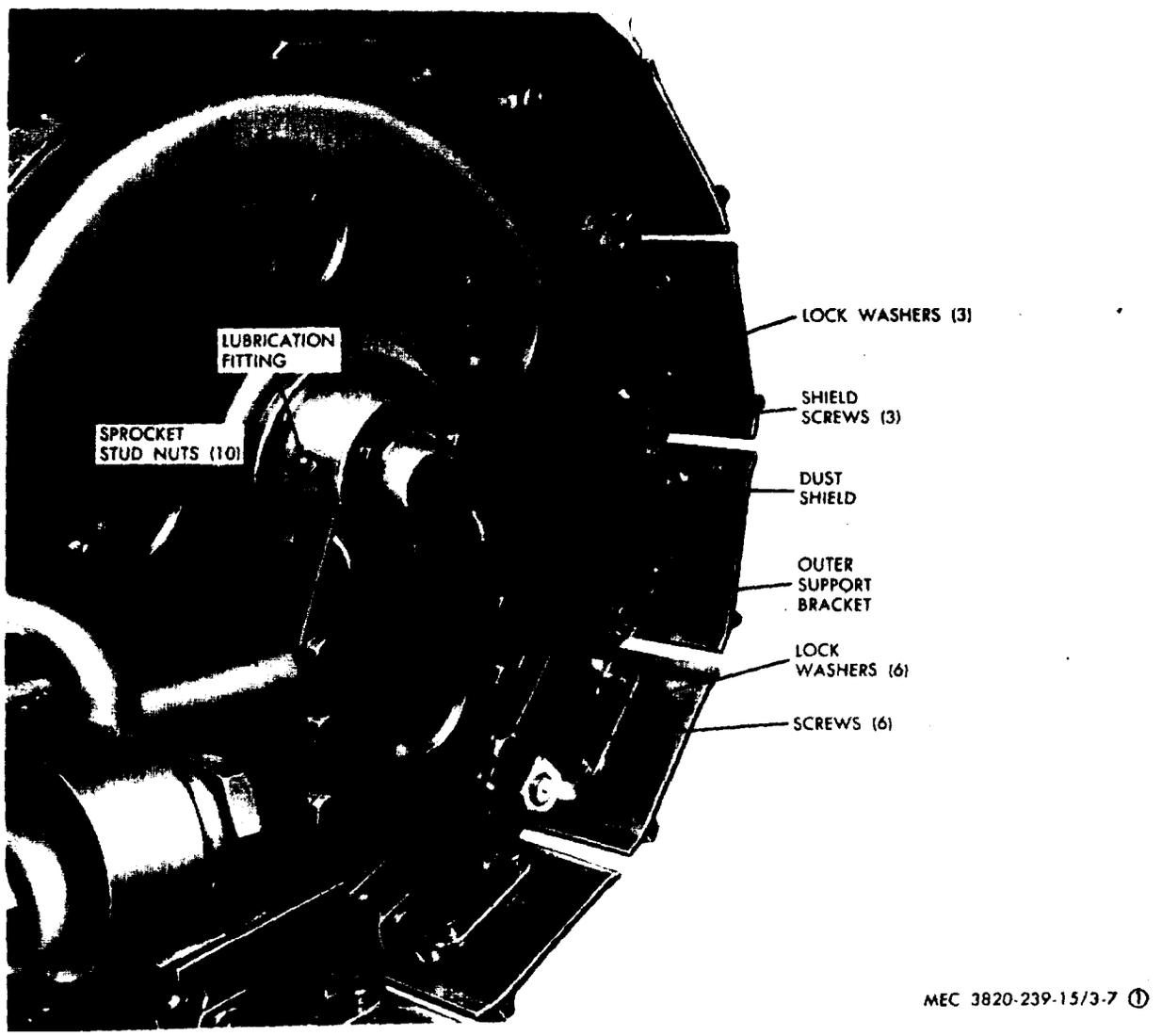


Figure 3-7(1). Lubrication of traction unit.

the prescribed lubricating oil to replenish the supply.

b. Remove the grease plug from the side of the air feed motor cylinder case and add 2 to 3 ounces of the prescribed grease.

c. When necessary to drain the oil from the air feed motor worm housing, position the drill guide so that the air feed motor is upside down, and remove the worm housing plug and the two pipe plugs from the housing, and allow all of the oil to drain off. Install the plugs, position the drill guide in an upright position, and refill through the worm housing plug port *(a* above).

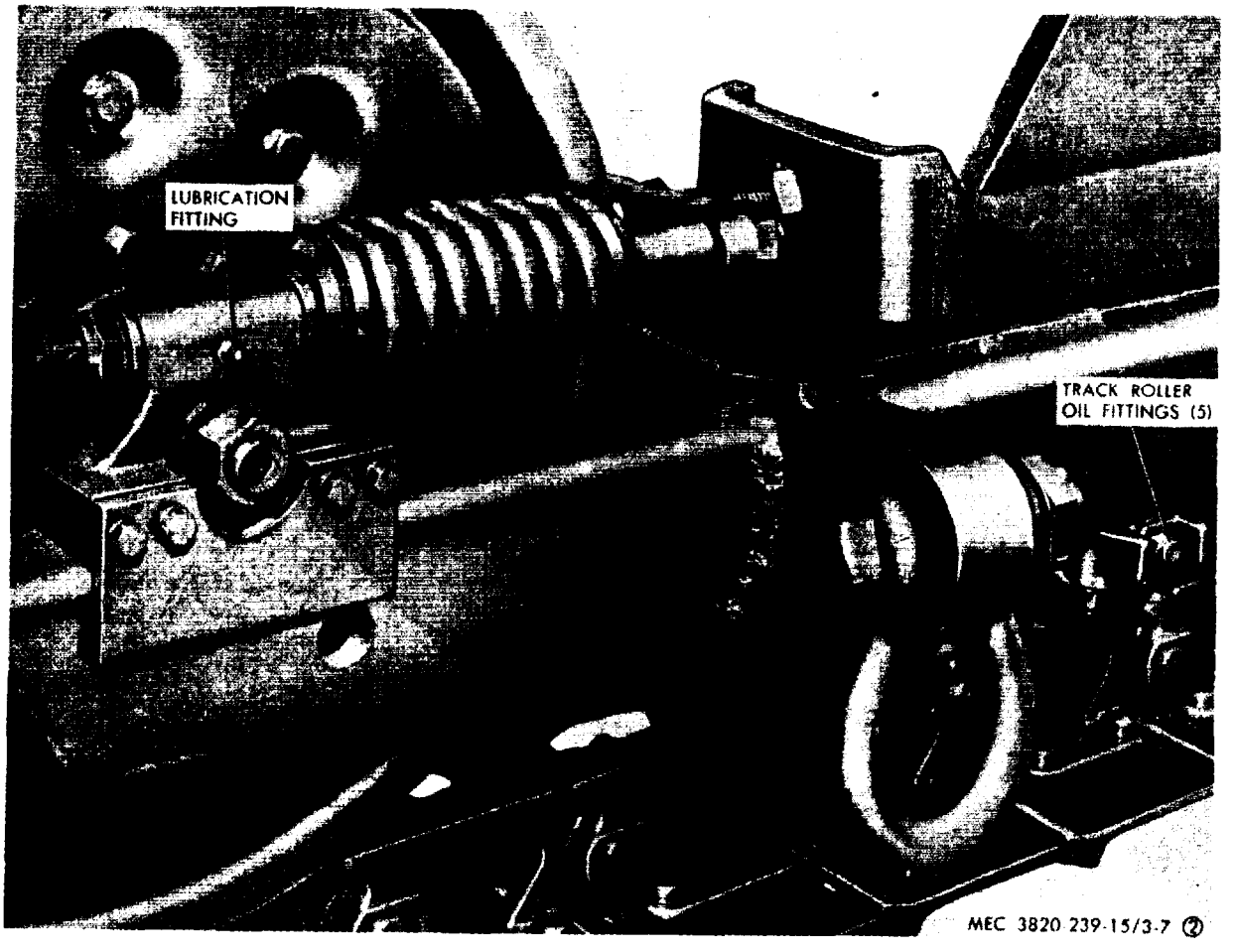


Figure 3-7(2)—Continued.

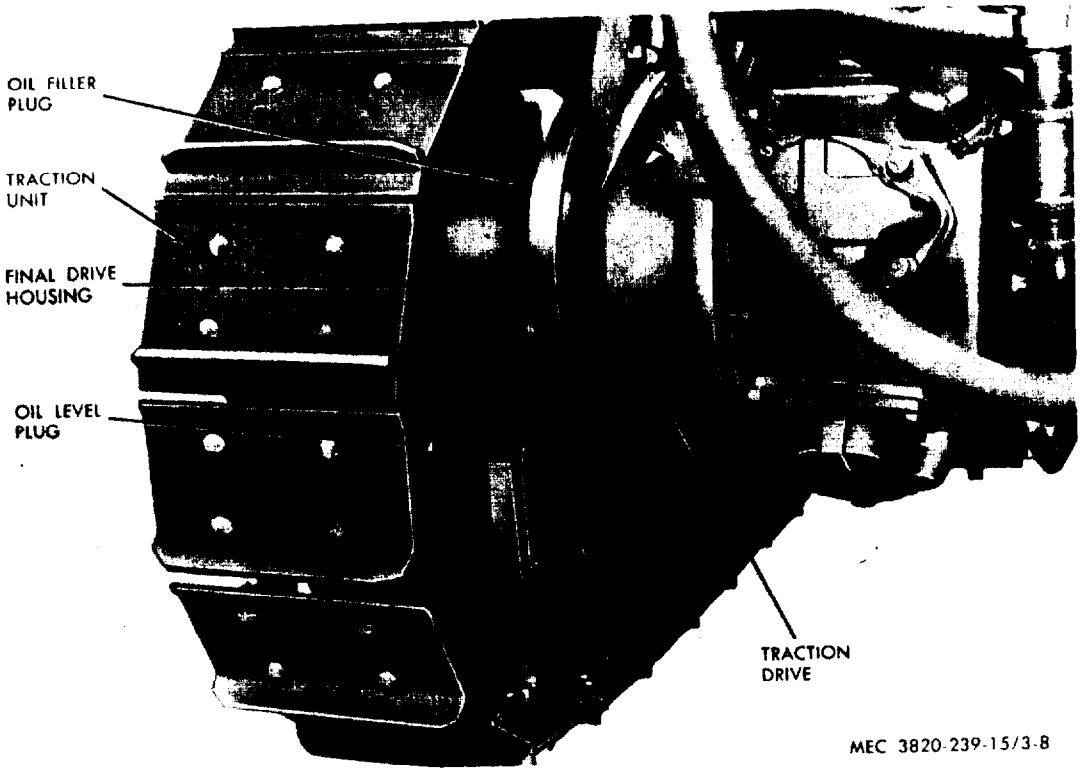


Figure 3-8. Lubrication of traction unit find drive house.

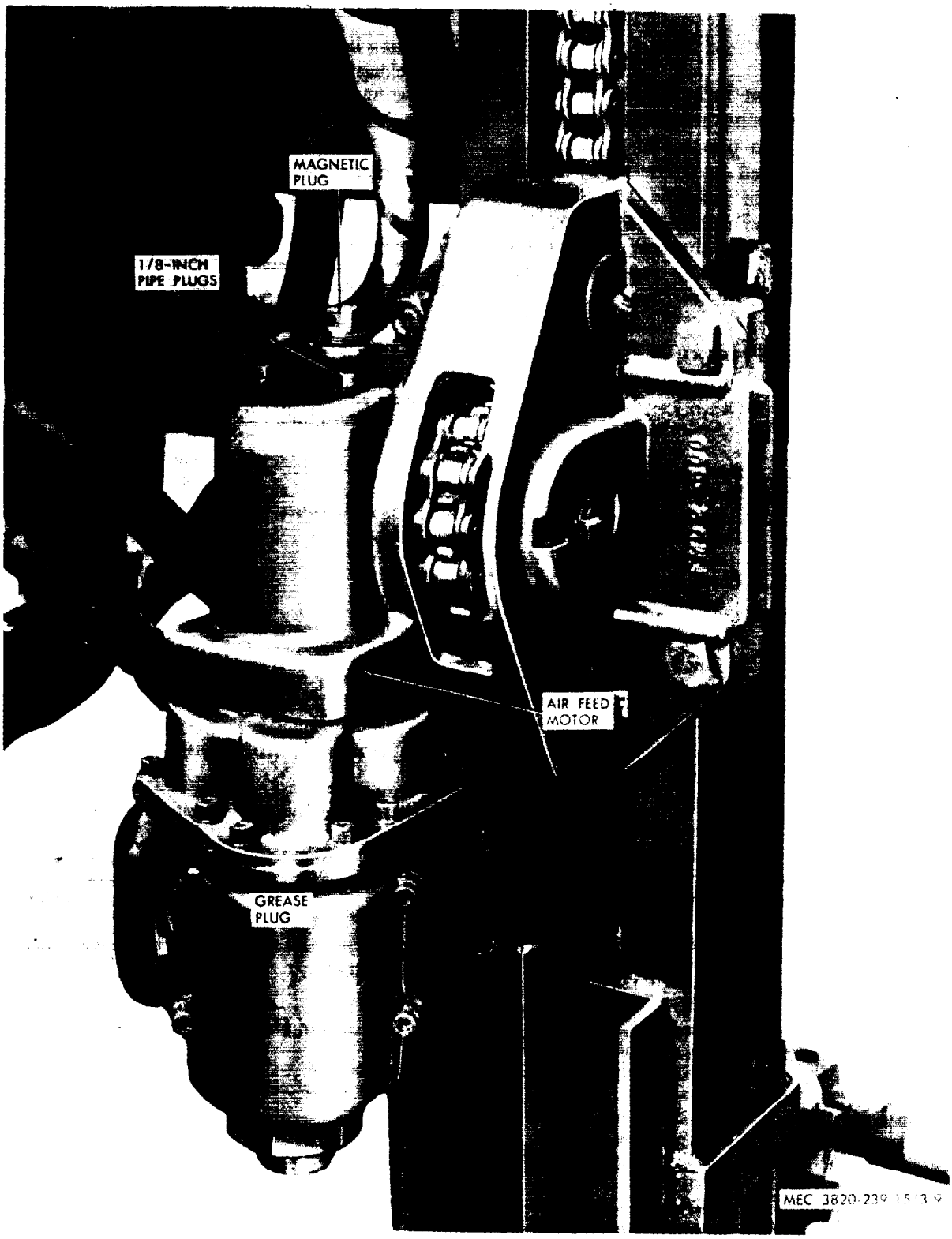


Figure 3-9. Lubrication of air feed motor.

Section V. TBOUBLESHOOTING

3-15. General

This Section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the pneumatic drill. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3-16. No Hydraulic Pressure in System

Probable cause	Possible remedy
Insufficient air supply to hydraulic pump air motor.	Check hoses and fittings for leakage.
Throttle valve closed	Open throttle valve.
Hydraulic pump coupling loose or damaged.	Inspect and tighten or replace.
Hydraulic pump or air motor damaged.	Replace pump or air motor (para. 3-43).
Hydraulic lines clogged	Check suction filter and hydraulic reservoir for dirt and sludge. Drain, flush and refill if necessary (para. 3-23).
Hydraulic oil level low	Check hydraulic reservoir (para. 3-12) and fill if necessary. Inspect for leaks.

3-17. Drifter Drill Inoperative

Probable cause	Possible remedy
Air feed motor connections loose or damaged.	Check hoses and fittings for leakage.
Air feed motor not being properly lubricated.	Check level in lubricating oil reservoir. Refill if required (para. 3-9).
Feed chain broken or damaged.	Inspect, clean, and lubricate feed chain (para. 3-27).
Air feed motor damaged	Disassemble and inspect (report this condition to direct support maintenance).
Remote control manifold damaged.	Disassemble and inspec (report this condition to direct support maintenance).
Drifter drill binding or damaged.	Disassemble and inspect (report this condition to direct support maintenance).
Drill sticking when moving up and down drill guide.	Grease channels on drill guide.

3-18. Hydraulic Valve Operating Improperly

Probable cause	Possible remedy
Excessive leakage around boss fittings.	Tighten hoses. Disassemble and inspect for damaged O-rings (report this condition to direct support maintenance).
Fluttering action due to plugged return line.	Inspect return line filter. Replace cartridge if necessary. Drain and flush hydraulic reservoir if necessary.
Levers do not operately smoothly.	Disassemble and inspect spools, springs and handles (report this condition to direct support maintenance).
Erratic system pressure	Clean relief valve in hydraulic valve (report this condition to direct support maintenance).

3-19. Boom Operates Improperly

Probable Cause	Possible remedy
Oil leakage in hydraulic cylinders.	Replace cylinder (para 3-46).
Excessive clearance between cylinder head and rod.	Replace rod Packing (report this condition to direct support maintenance).
Boom drifts due to cylinder leakage.	Replace cylinder (para. 3-46).

3-20. Traction Unit Brakes Improperly

Probable cause	Possible remedy
Brakes need adjustment	Adjust brakes (para. 3-38).
Air hoses to brakes improperly connected or damaged.	Inspect hoses for condition and proper connection (fig. 1-3).
Brakes damaged	Disassemble and inspect (report this condition to direct support maintenance).

Probable cause	Possible remedy
Propelling controls do not release brakes.	Check propelling controls and piping (fig. 1-8)

3-21. Traction Unit Operates Improperly

Probable cause	Possible Remedy
Track rollers do not rotate.	Check for wedged objects and lubricate rollers (para. 3-13).
Track adjustment required.	Adjust track (para. 3-36).
Air leakage	Check hoses and fittings
Improper lubrication	Check oil level in propelling air motors and lubricating oil reservoir. Lubricate fittings (para. 3-13).

Section VI. HYDRAULIC RESERVOIR

3-22. General

The hydraulic reservoir stores and provides the hydraulic oil to operate the boom and guide cylinders, as a result of operation of the hydraulic valve. The reservoir is an integral part of the boom base assembly.

3-23. Servicing Procedure

a. Remove the vent cap from the top of the reservoir.

b. Remove the magnetic plug from the bottom of the boom base assembly.

c. Allow the oil to drain off.

Note. The reservoir holds 10 gallons of oil. Provide a rubble container to collect the runoff.

d. Remove the suction oil filter (fig. 3-3), clean With an approved solvent, and blow dry with compressed air.

e. Install the suction oil filter with a new oil filter cap gasket.

f. Clean the magnetic plug and install on the drain adapter at the bottom of the hydraulic reservoir.

g. Remove and discard the return line oil filter cartridge (fig. 3-2). Clean the body and other parts with an approved solvent and install a new filter cartridge.

h. Add the prescribed oil until the level is within 5 inches of the top of the reservoir. Install the vent cap.

i. Operate the booms with the hydraulic valve to make sure oil is flowing throughout the system.

j. Remove the vent cap and recheck the oil level with a clean dipstick. Add oil if necessary to bring the level up to within 5 inches of the top.

Caution: Do not overfill. The reservoir must allow for return of oil during operation.

Section VII FEED CHAIN

3-24. General

The feed chain passes over sprockets at each end of the drill guide, and over idler wheels and driving sprockets in the air feed motor, The feed chain transmits power from the air feed motor worm gear to the drifter drill for movement up and down the drill guide.

3-25. Adjustment

Check the adjustment of the feed chain by pressing against the rollers at a point approximately midway up the drill guide (fig. 3-10). If the adjustment is proper, the chain will deflect slightly. No specific measurement can be given, but make sure that the chain is neither so tight that no deflection occurs, nor so loose that it sags. If the tension is improper, adjust as follows:

Note. A new feed chain has a tendency to stretch and should be checked frequently.

a. Back off the nut on the bottom of the drill guide (fig. 3-10) until the spring is loose.

b. Tighten the bottom nut until the spring (fig. 3-10) just begins to compress (approximately 1/8 inch).

c. Loosen the jam nut on the top of the drill guide (fig. 3-10) and adjust the locknut until the feed chain tension is correct. Tighten the jam nut.

3-26. Removal

a. Loosen the nuts at the top and bottom of the drill guide (fig. 3-10) to provide slack in the feed chain.

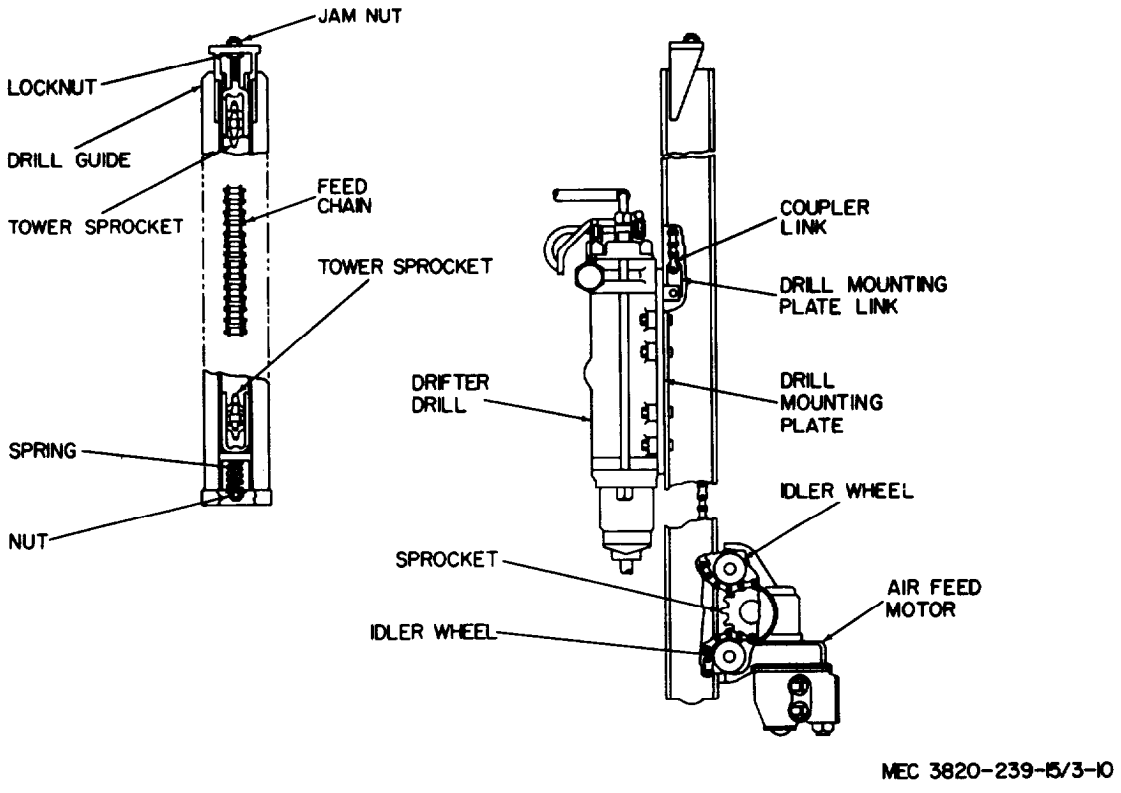


Figure 3-10. Adjustment and removal of feed chain.

b. Disconnect the feed chain coupler links (fig. 3-10) from the drill mounting plate links by removing the cotter pins and the link side plates.

c. Lift the feed chain off the tower sprockets and carefully remove it from the air feed motor sprocket and the drill guide.

3-27. Cleaning and Inspection

a. Clean the feed chain with approved solvent. Dry thoroughly.

b. Inspect the feed chain carefully for broken links. Repair or replace as necessary.

c. Coat the feed chain with oil to prevent corrosion and insure smooth operation.

3-28. Installation

a. Loop the feed chain around the top tower sprocket (fig. 3-10) on the drill guide.

b. Carefully thread the chain under the top idler wheel, around the sprocket, and over the bottom idler wheel in the air feed motor (fig. 3-10).

Caution: **Make sure the feed chain engages properly with the sprocket to avoid binding.**

c. Thread the feed chain around the lower tower sprocket (fig. 3-10) and connect the coupler links to the drill mounting plate links. Install the cotter pins in the coupler links and bend the ends over to secure the side ‘plates.

d. Adjust feed chain tension (para 3-25).

Section VIII. CENTRALIZER

3-29. General

The centralizer is mounted in a bracket at the lower end of the drill guide. It maintains the drill steel position when the arms are closed. The arms can be manually opened by use of a swing bolt and they will remain in

the set position. Bushings are used to take the wear of the drill steel.

3-30. Removal

a. Straighten the ends of the cotter pins (fig. 3-11) and remove the pins.

b. Remove the two nuts and centralizer arm bolts and remove the centralizer.

3-31. Installation

See figure 3-11 and install the centralizer.

Section IX. DRIFTER DRILL

3-32. General

The drifter drill is an air-operated drill lubricated by rock drill oil which is injected into the air stream from the lubricating oil reservoir.

3-33. Removal

a. Disconnect the air hoses from the drifter drill.

b. Loosen the drill mounting plate clamp bolts and nuts (fig. 3-12) and remove the drifter drill from the drill guide.

3-34. Installation

See figure 3-12 and install the drifter drill on the drill mounting plate.

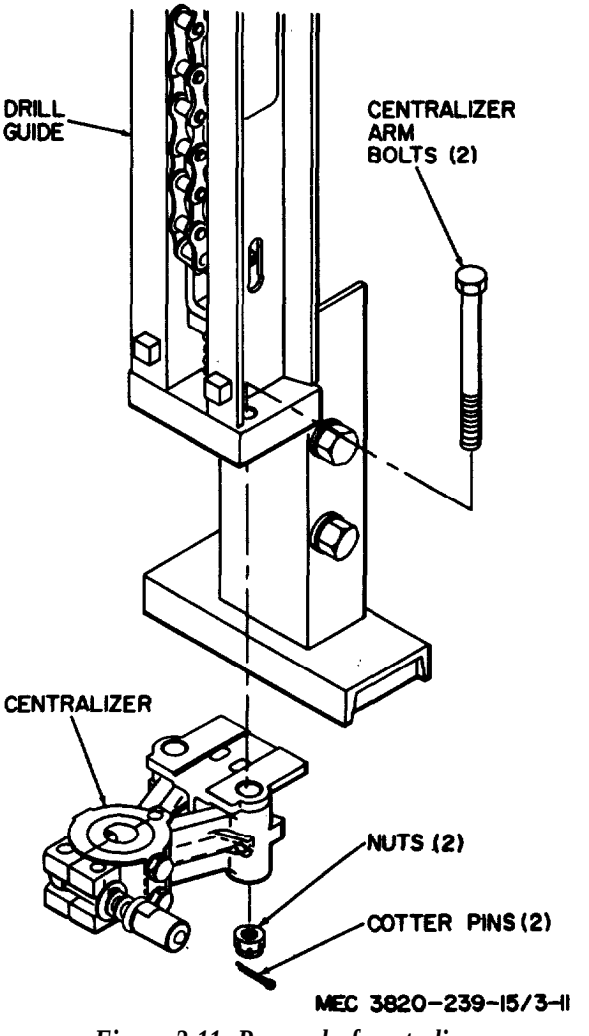


Figure 3-11. Removal of centralizer.

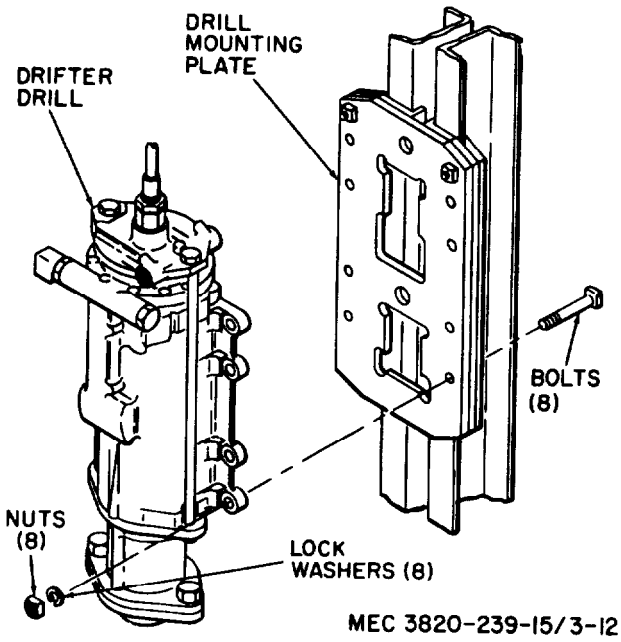


Figure 3-12. Removal of drifter drill.

Section X. TRACTION UNIT

3-35. General

The traction unit provides the propelling motion for the unit. The only work authorized at organizational level is the checking and adjustment of the tracks, and tightening sprocket stud nuts if required.

3-36. Servicing

a. Track Adjustment.

(1) Propel the pneumatic drill until the center of a grouser is directly over the centerline of the rear wheel sprocket (fig. 3-13).

(2) Lay a straightedge across the track so that it rests on the grousers over both the front and rear wheels.

(3) Check the dip at the midpoint between wheels (fig. 3-13). The correct adjustment is 2 inches from the bottom of the straightedge to the top of the grouser.

(4) If the adjustment is not correct, or if the unit drifts to one side or the other while tramming, adjust the track by loosening one of the adjusting screw locknuts and tightening the other, using the track adjusting wrench. When the adjustment is correct, tighten the locknut.

b. Sprocket Stud Nuts.

Note. When the unit is new, it is extemely important that the sprocket stud nuts be checked for tightness after approximately 100 hours of operation After the initial check, annual rechecking is sufficient.

(1) Remove the dust shield and outer support bracket (fig. 3-7) from each traction unit rear sprocket.

(2) Using a torque wrench, tighten the 10 sprocket stud nuts to a torque of 150 feet-pound.

(3) Install the outer support brackets and dust shields.

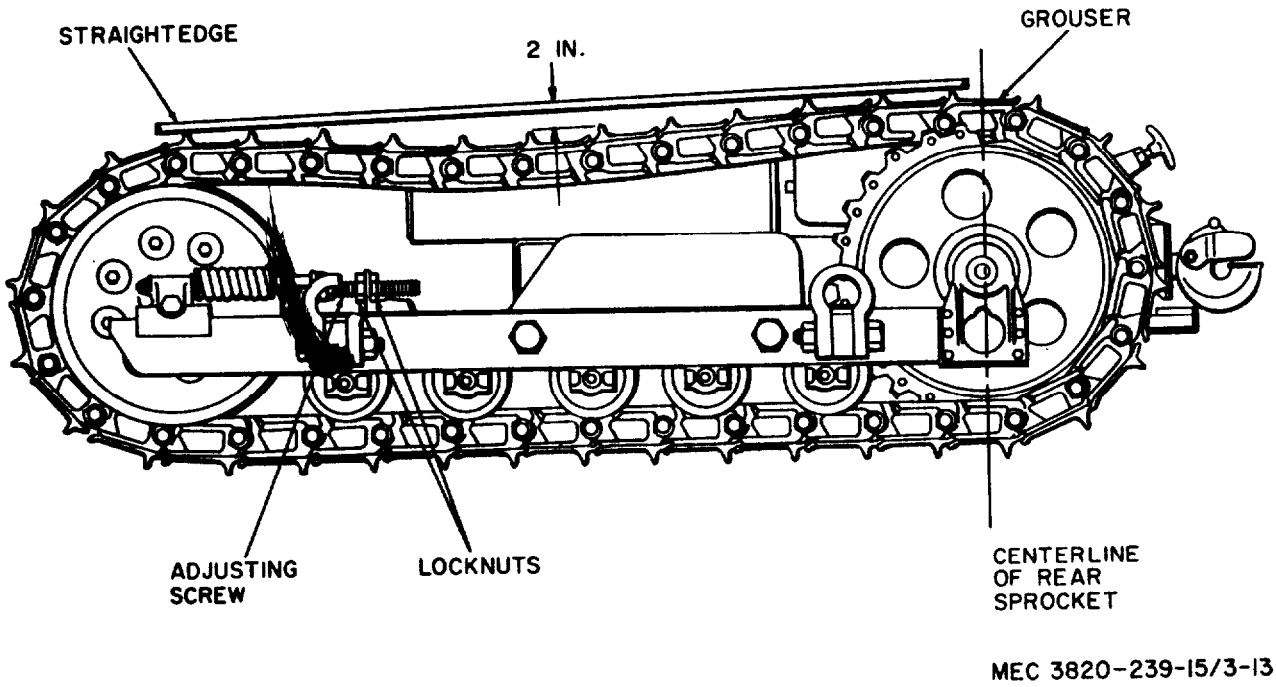


Figure 3-13. Track adjustment.

Section XI. AUTOMATIC BRAKES

3-37. General

The automatic brakes used on the pneumatic drill operate independently of each other. Each brake is designed to be normally on, thus preventing accidental movement. When the propelling controls are used, some of the air to the propelling air motors is directed to the brake (fig. 1-3), thus releasing it. During towing, the brake can be manually released by turning in (clockwise) the setscrew at the top of each brake housing.

3-38. Brake Admustment

There is no method of checking the brake adjustment without actually making the adjustment. Unless a trouble is encountered during operation which pinpoints the brakes as the trouble source, perform the adjustment only when specified during preventive maintenance services.

a. Remove the screws, nuts, and lock washers holding the brake cylinder cover (fig. 3-14).

b. Lift off the brake cylinder cover and brake cylinder gasket.

c. Screw two 5/8-inch coarse thread bolts into the holes in the top of the brake piston, and remove the piston from the cylinder.

Caution: **Be careful not to damage the brake piston O-ring.**

d. Using a 1 1/4-inch socket wrench, adjust the brake bolt until the working length of the brake spring (measured from the bottom of the cylinder to the top of the brake spring) is 3 1/2 inches (fig. 3-14).

e. See figure 3-14 and install the parts.

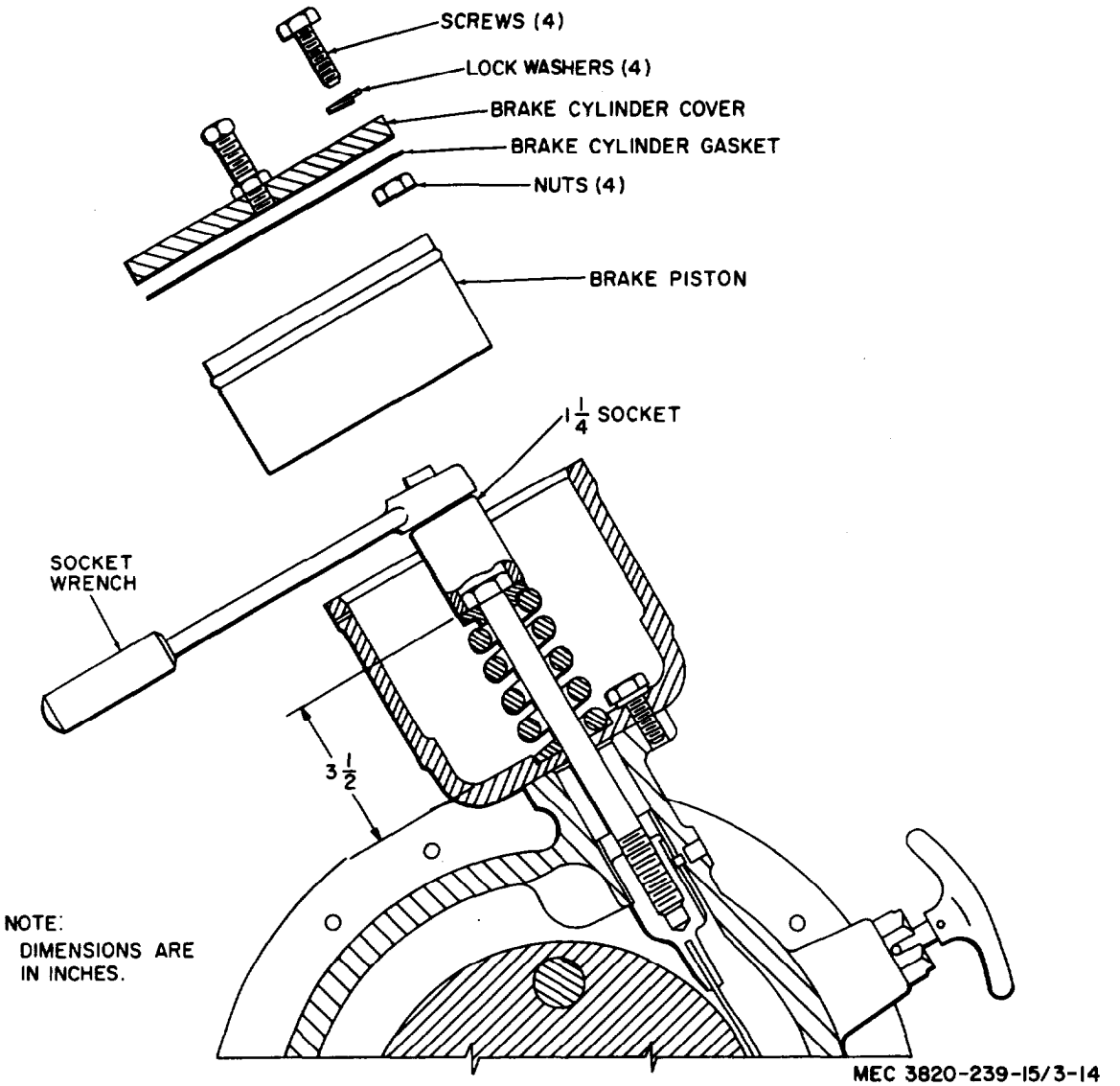


Figure 3-14. Brake adjustment.

Section XII. TOW HITCH

3-39. General

The tow hitch is a swivel-type hitch mounted at the rear of the frame (fig. 1-2). It may be used to couple the compressor to the unit, or to connect to a truck or tractor when towing.

3-40. Removal

a. Straighten the ends of the cotter pin (fig. 3-15) and remove the pin.

b. Remove the nut and washer and slide out the tow hitch.

3-41. Installation

See figure 3-15 and install the tow hitch.

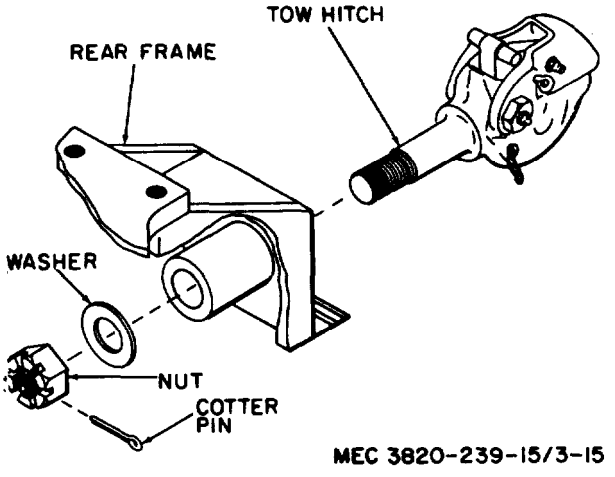


Figure 3-15. Removal of tow hitch.

Section XIII. HYDRAULIC PUMP ASSEMBLY

3-42. General

The complete hydraulic pump assembly consists of a hydraulic pump air motor, a flexible coupling, and a hydraulic pump. The air motor drives the pump and furnishes all hydraulic power to the hydraulic valve for operation of the hydraulic cylinders (fig. 1-5).

3-43. Removal

a. Disconnect all hoses and fittings.

b. Remove the four nuts, lock washers, and studs (fig. 3-16) and separate the complete hydraulic pump assembly from the boom base.

Note. If necessary to replace only the air motor, flexible coupling, or hydraulic pump, follow the required procedure given below.

c. Loosen the setscrew on either side of the flexible coupling, depending on which unit is to be removed.

d. Remove the two nuts, lock washers, and bolts securing the hydraulic pump to the pump housing (fig. 3-16), and remove the hydraulic pump with or without the flexible coupling.

e. Remove the eight bolts and lock washers securing the hydraulic pump air motor to the pump housing (fig. 3-16), and remove the air motor.

f. Loosen the remaining setscrew on the flexible coupling and separate the flexible coupling from the shaft.

3-44. Installation

a. See figure 3-16 and install the hydraulic pump parts.

b. See figure 1-5 and connect the hoses and fittings.

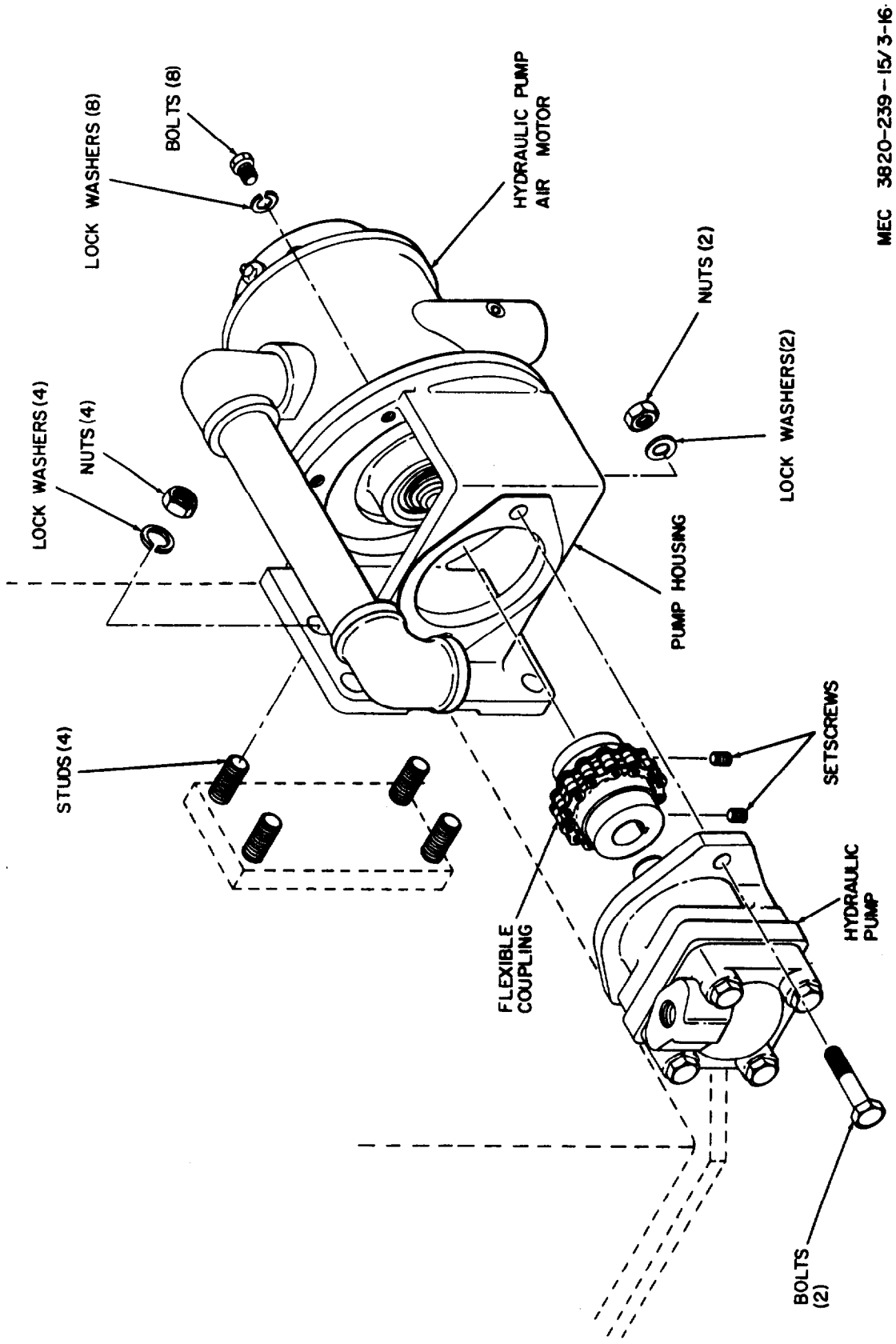


Figure 3-16. Removal of hydraulic pump assembly.

Section-XIV. HYDRAULIC CYLINDERS

3-45. General

The hydraulic cylinders used on the pneumatic drill are all essentially identical in operation and design. The two cylinders used on the hydraulic boom assembly (boom swing and boom lift) (fig. 1-1) control the boom position both horizontally and vertically. The two cylinders used on the power dump and swing assembly (swing and dump) (fig. 1-1) control the position of the drill guide. The remaining cylinder is a part of the power guide extension mounting (fig. 1-1) The extension cylinder moves the drill guide up and down within the clamps of the extension mounting.

3-46. Removal

a. General. See figure 1-5 and disconnect hoses and fittings from the cylinders to be removed.

b. Hydraulic Boom Cylinders. See figure 3-17 and remove the boom swing cylinder and the boom lift cylinder.

c. Power Dump and Swing Cylinders. See figure 3-18 and remove the dump cylinder and the swing cylinder from the power dump and swing assembly.

d. Drill Guide Extension Cylinder. See figure 3-19 and remove the drill guide extension cylinder.

3-47. Installation

a. See figures 3-17 through 3-19 and install the hydraulic cylinders.

b. See figure 1-5 and connect the hoses and fittings,

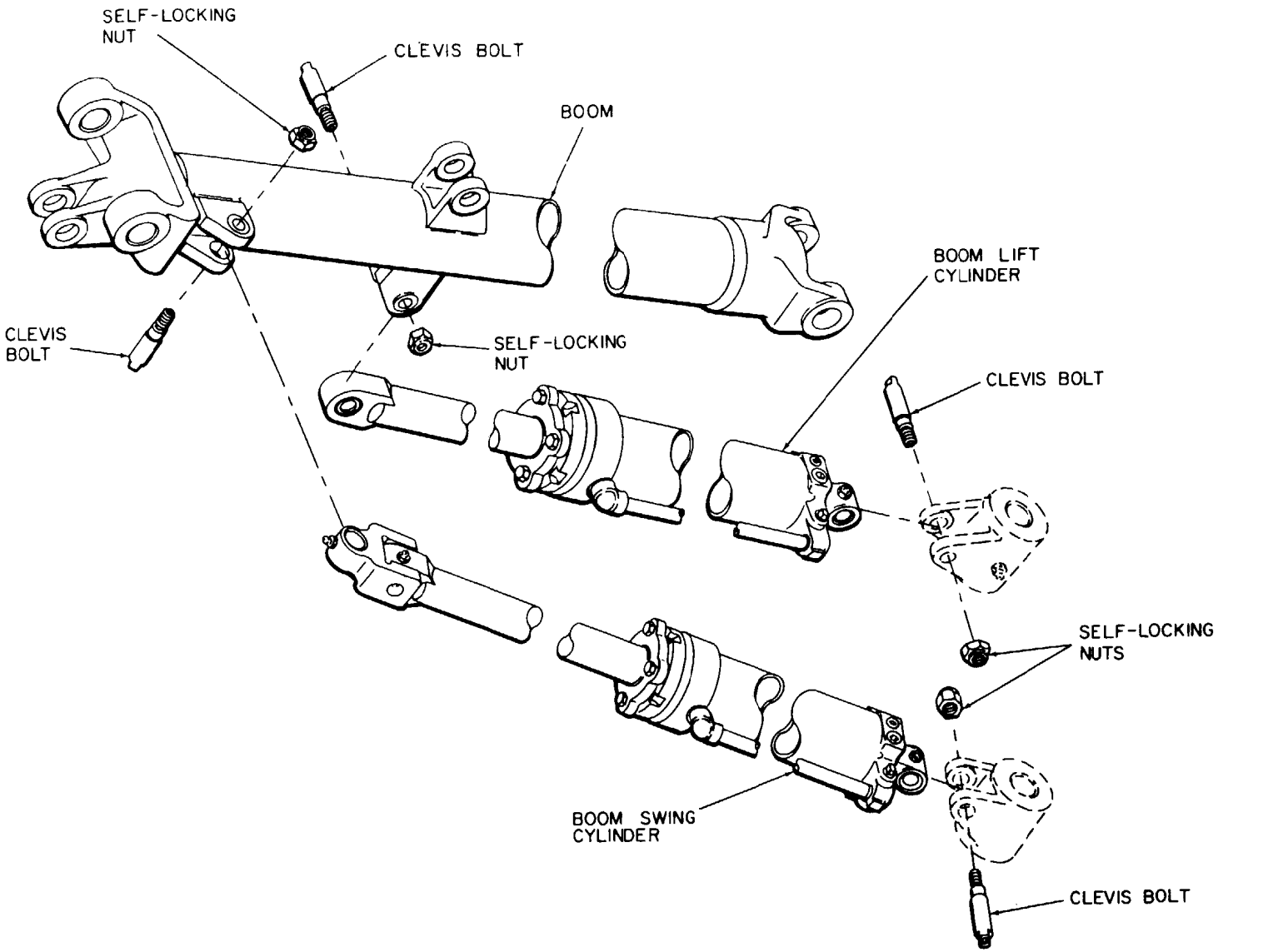


Figure 3-17. Removal of boom swing and boom lift cylinders.

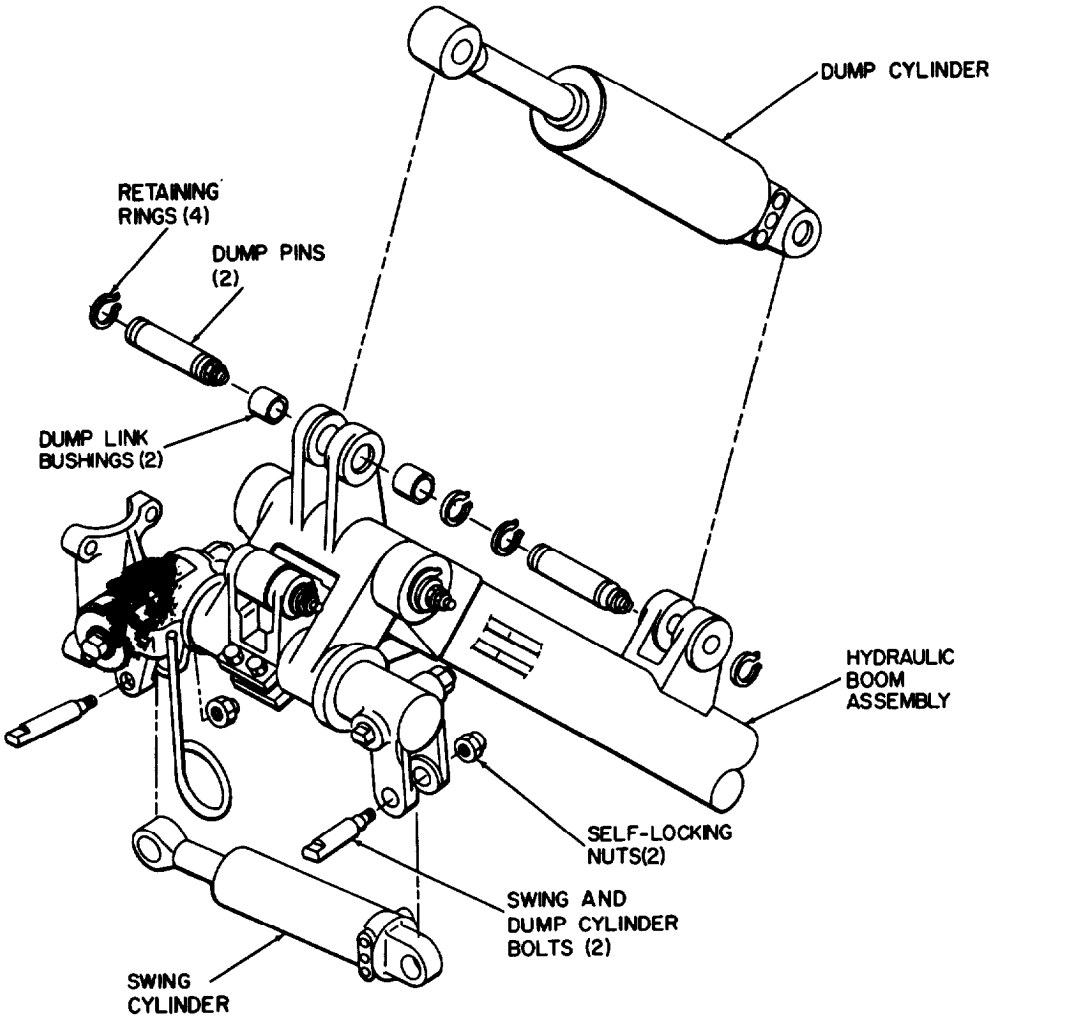


Figure 3-18. Removal of power dump and swing cylinders.

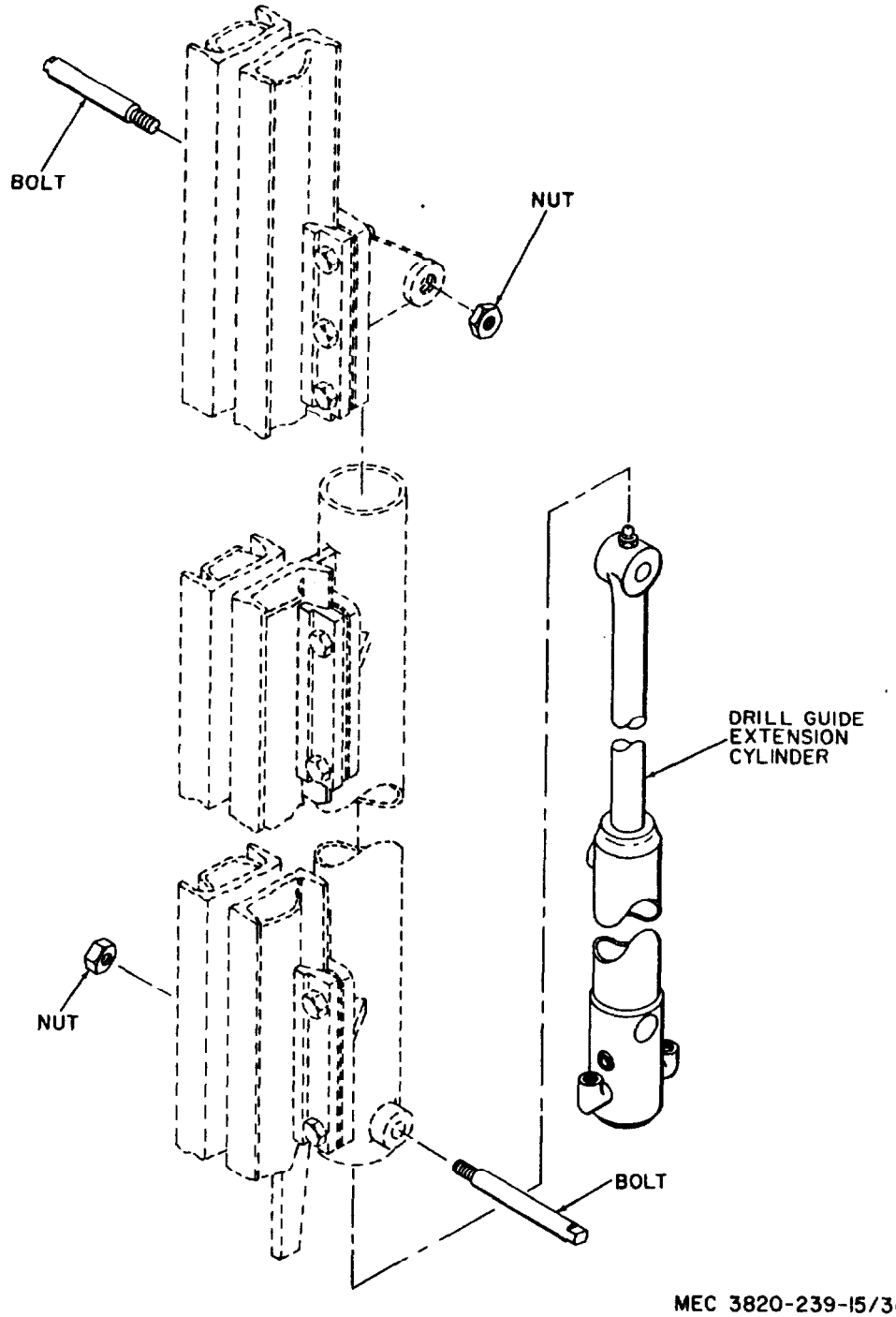


Figure 3-19. Removal of drill guide extension cylinder.

Section XV. MAIN AIR VALVE AND MANIFOLD LUBRICATOR

3-48. General

The main air valve is the on-off control for the air flow from the compressor to the pneumatic drill. The air valve is connected to the manifold lubricator with a 2-inch nipple. The manifold lubricator injects rock drill oil from

the lubricating oil reservoir into the air stream supplying the system (fig. 1-3). The amount of oil injected is a function of the setting of the metering valve on the lubricator.

3-49. Removal

a. See figure 1-3 and disconnect all hoses and fittings.

b. See figure 3-20 and remove the main air valve and the manifold lubricator.

3-50. Installation

a. See figure 3-20 and install the main air valve and the manifold lubricator.

b. See figure 1-3 and connect all hoses and fittings.

Section XVI. AIR FEED MOTOR

3-51. General

The air feed motor (fig. l-l) provides the power to feed the drill and move it up and down the drill guide.

3-52. Removal

a. See figure 1-4 and disconnect the hoses and fittings.

b. Refer to paragraph 3-26 and remove the feed chain.

Note. The feed chain must be removed before the air feed motor can be removed.

c. See figure 3-21 and remove the air feed motor.

3-53. Installation

a. See figure 3-21 and install the air feed motor.

b. Refer to paragraph 3-28 and install the feed chain.

c. See figure 1-4 and connect the hoses and fittings.

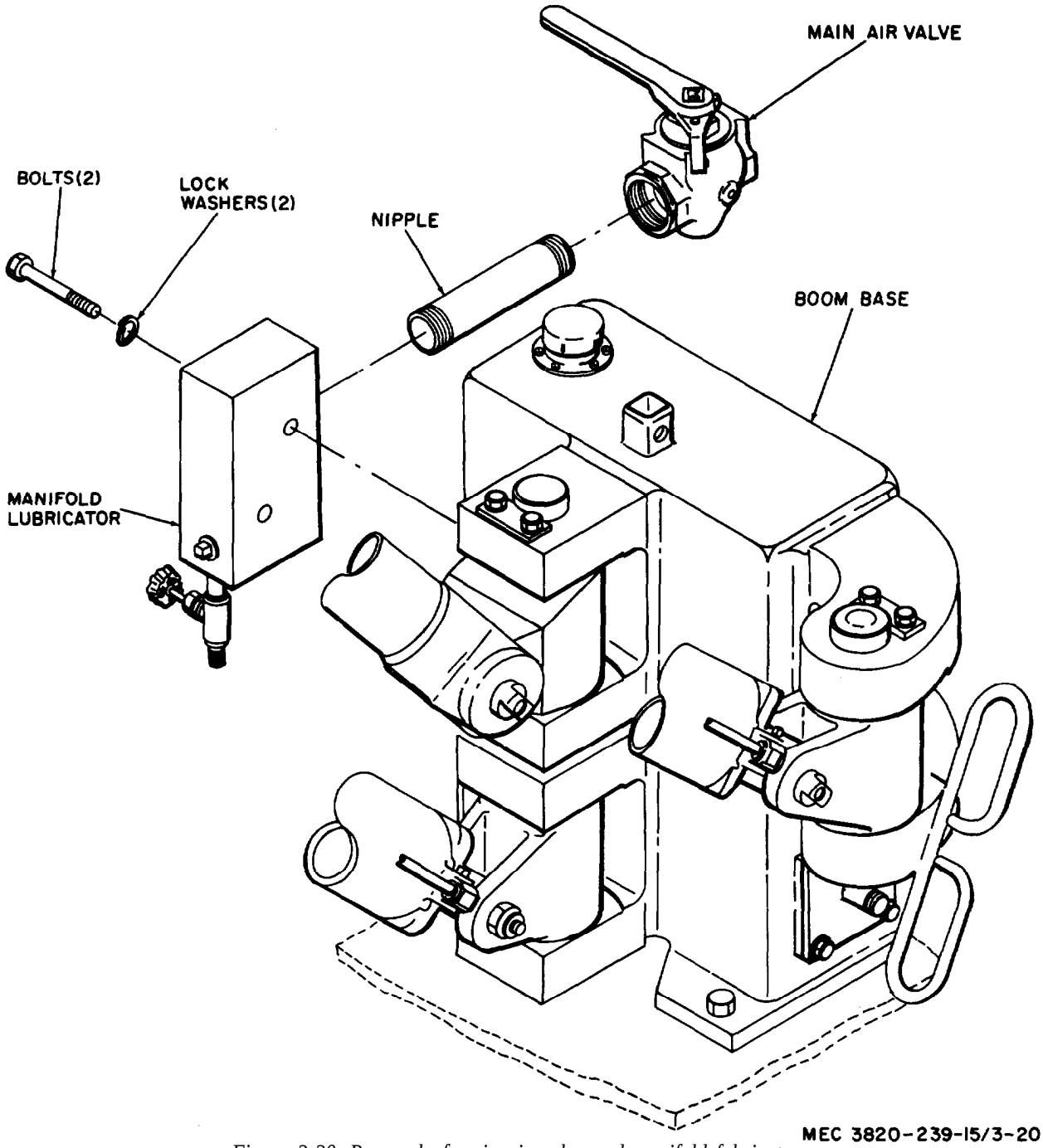


Figure 3-20. Removal of main air valve and manifold fabricator.

Section XVII. REMOTE CONTROL MANIFOLD

3-54. General

The remote control manifold (fig. l-l) is a multiple air valve that controls operation of the air feed motor and drifter drill. It has four working valves (and one unused section) which control drill throttle, drill feed, rotation, and air blowing (for cleaning out the hole).

3-55. Removal

a. See figure 1-4 and disconnect hoses and fittings,

b. See figure 3-22 and remove the remote control manifold.

3-56. Installation

a. See figure 3-22 and install the remote control manifold.

b. See figure 1-4 and connect the hoses and fittings.

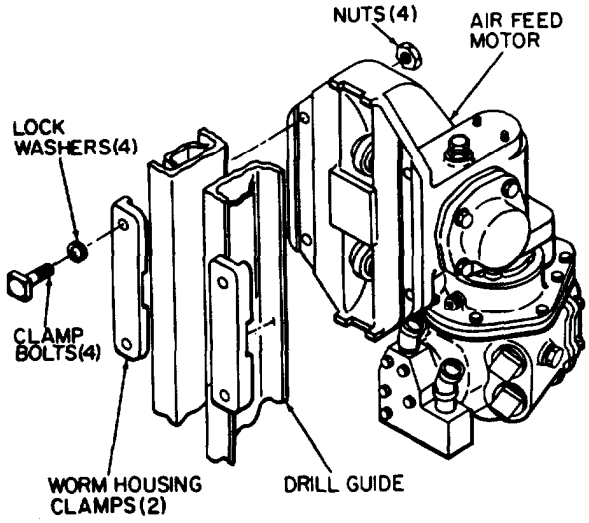


Figure 3-21. Removal of air feed motor,

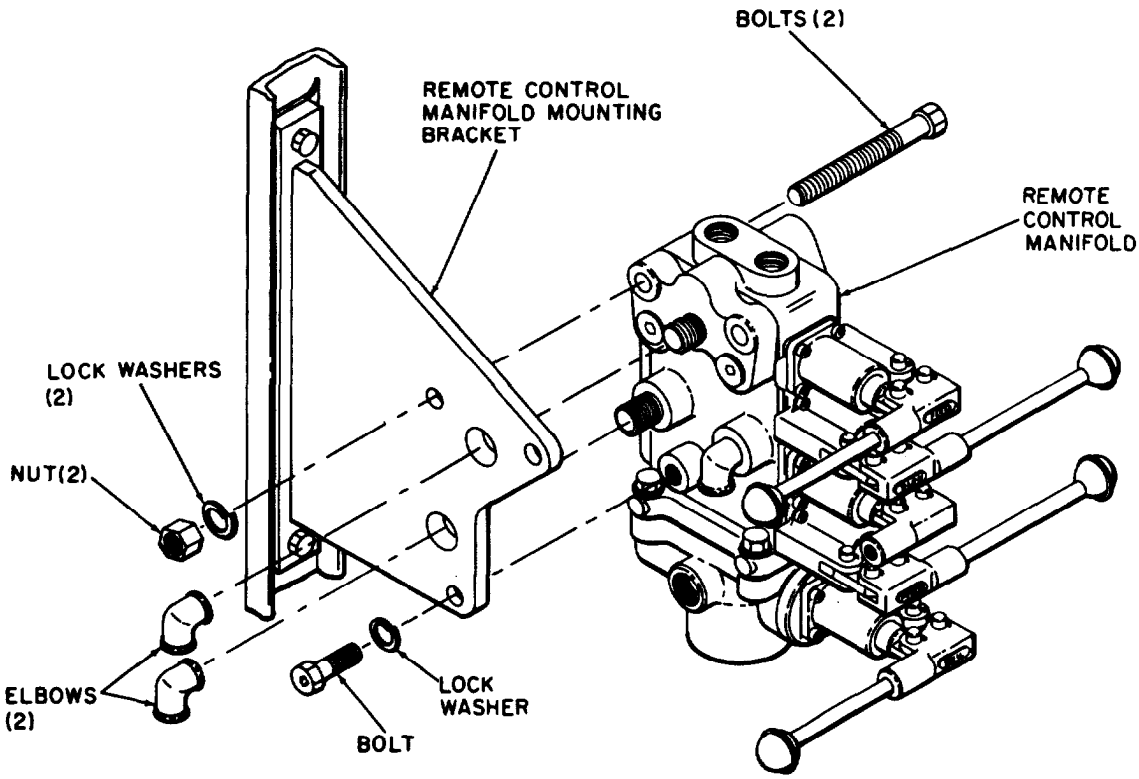


Figure 3-22. Removal of remote control manifold.

Section XVIII. HYDRAULIC VALVE ASSEMBLY

3-57. General

The hydraulic valve assembly (fig. 1-2) consists of five valves which control hydraulic oil flow to each of the five hydraulic cylinders. Twelve lines are connected to the unit; inlet and return lines for each cylinder, plus a main inlet from the hydraulic pump and a return line to the hydraulic reservoir (fig. 1-5).

3-58. Removal

a. See figure 1-5 and disconnect all hoses and fittings.

Note. Label each line to facilitate proper installation.

b. See figure 3-23 and remove the hydraulic valve assembly from the mounting bracket.

3-59. Installation

a. See figure 3-23 and install the hydraulic valve assembly.

b. See figure 1-5 and connect hoses and fittings.

Caution: **Be sure hoses are properly connected.**

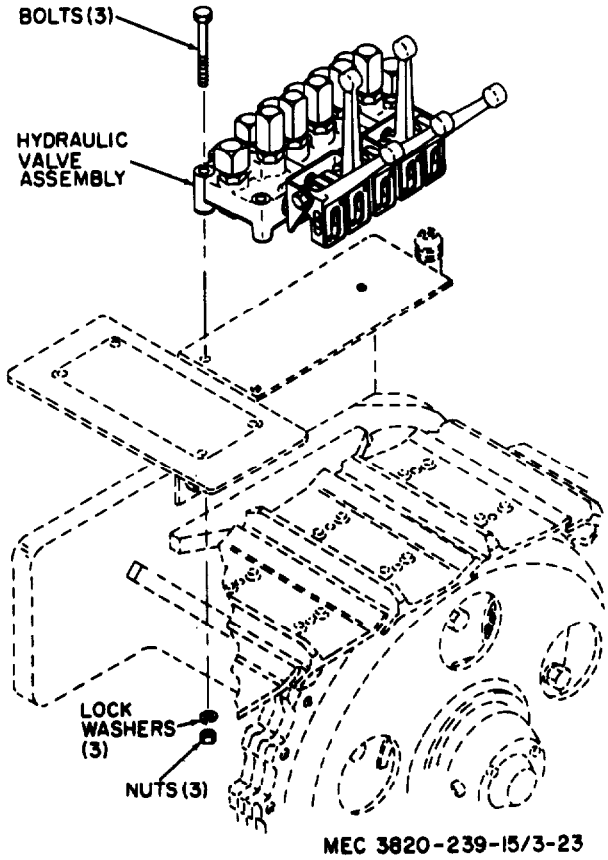
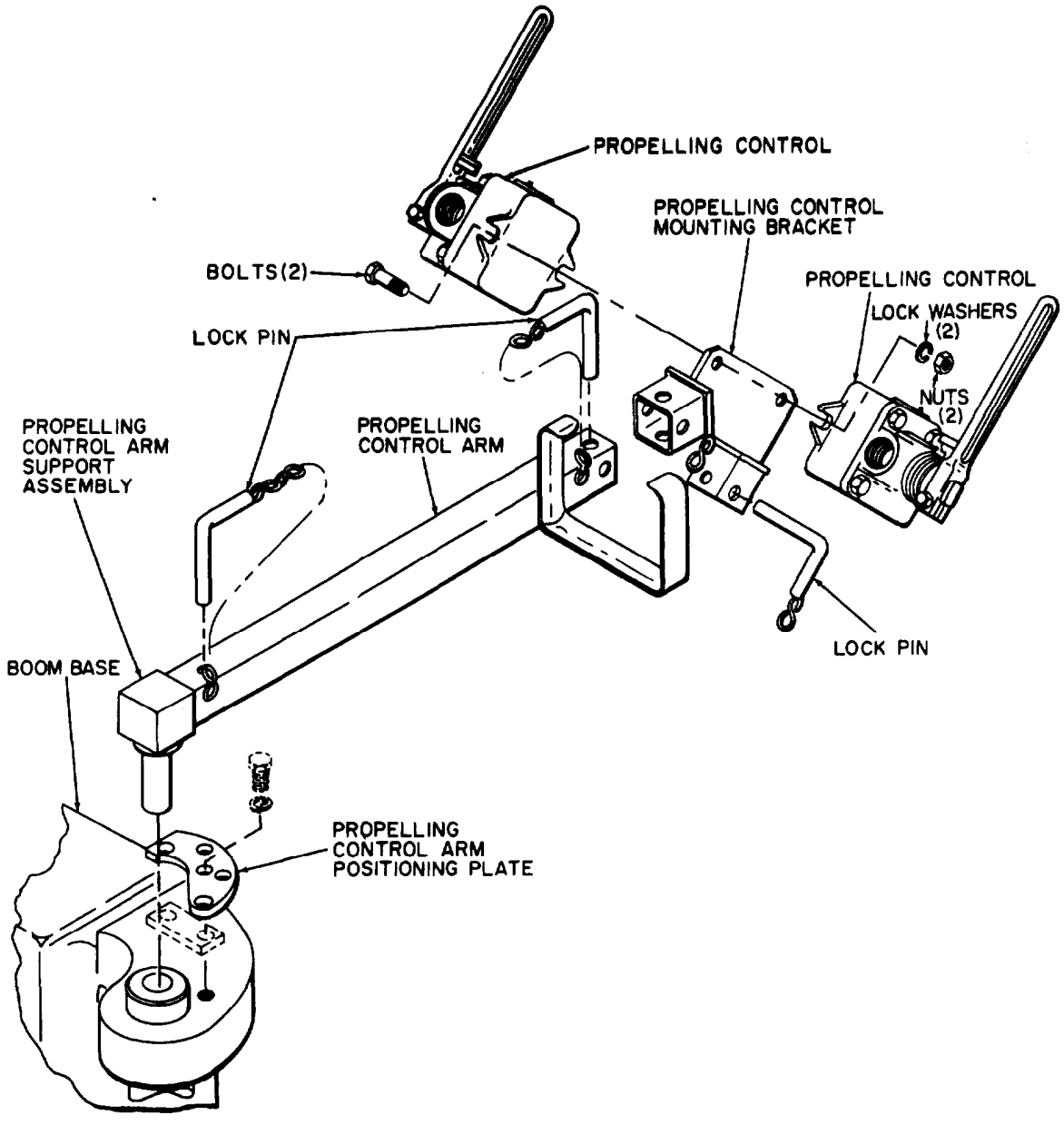


Figure 3-23. Removal of hydraulic valve assembly.



MEC 3820-239-15/3-24

Figure 3-24. Removal of propelling controls.

Section XIX. PROPELLING CONTROLS

3-60. General

The propelling controls (fig. 1-2) control the flow of air to the propelling air motors for each track. Each control consists of a three-position valve, which can be moved either forward or back, to direct the flow of air one way or the other, causing the propelling air motor to move the track forward or reverse (fig. 1-3). The control is spring-loaded to the center (off) position, and each valve can be operated independently of the other.

3-61. Removal

a. See figure 1-3 and disconnect hoses and fittings.

b. See figure 3-24 and remove the propelling controls.

3-62. Installation

a. See figure 3-24 and install the propelling controls.

b. See figure 1-3 and connect the hoses and fittings.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Ingersoll-Rand model CM150A/D475A pneumatic drill. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

4-2. Record and Report Forms

For the record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag mounted on equipment.

Section II. DESCRIPTION AND TABULATED DATA

4-3. Description

For a complete description of the pneumatic drill see paragraph 1-3.

4-4. Tabulated Data

a. General. This paragraph contains the overhaul data pertinent to direct and general support and 'depot maintenance personnel.

b. Traction Units.

Manufacturer ---------- Oliver Corp
Model ----------OT-176770-AS
Number of rollers---------5
Width of grousers --------- 10 in.

c. Hydraulic Pump.

Flow rating ---------- 1.5 gpm (gallons per minute)
Output pressure ----------2000 psi
Torque of cover screws ---22 to 28 ft-lb

d. Return Line Oil Filter

Filtration Limitation ------10 microns
Weight ---------- 6 lb
Torque of bolt ---------- 12 to 15 ft-lb

e. Propelling Air Motors.

Power rating----------11.4 hp (horse power)
Number of cylinders ------5

f. Hydraulic Valve.

Manufacturer ----------Aico
Model ----------1042CM150
Pressure setting ---------2000 psi (pounds per square inch)

g. Torque Data. Refer to paragraph 1-4b (20) for a complete list of all hardware sizes used and the corresponding torque values.

h. Air Piping Diagram. For propelling piping diagram see figure 1-3. For drill control piping diagram see figure 1-4.

i. Hydraulic Piping Diagram. For hydraulic piping diagram see figure 1-5.

j. Repair and Replacement Standards. Table 4-1 lists manufacturer's sizes, tolerances, desired clearances, and maximum allowable wear and clearances.

Table 4-1. Repair and Replacement Standards

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
DRIFTER DRILL:					
Chuck nut flutes	--	--	--		1/16
Piston to cylinder clearance	--	--	0.000	0.009	
Piston to piston stem bearing clearance	--	--	0.000	0.009	
Rifle bar flutes	--	--	--	--	1/16
Rifle nut flutes	--	--	--	--	1/16
Shank to shank aliner clearance	--	--	--	--	1/16
Valve to valve chest clearance	--	--	0.000	0.003	
TRACTION DRIVES:					
Drive shaft OD	2.163	2.165	0.0002T	0.0024L	0.002
Drive shaft, stub OD	1.1803	1.1808	0.0001T	0.0008L	0.0005
Drive shaft, pinion bore OD	2.0462	2.0472	0.0010T	0.0005L	0.0010
Drive shaft ball bearing ID	2.1648	2.1654	0.0002T	0.0024L	0.0006
Drive shaft ball bearing OD	3.9364	3.9370	0.0010T	0.0016L	0.0006
Gear housing, bore OD	3.936	3.938	0.0010T	0.0016L	0.002
Motor pinion ball bearing ID	0.9839	0.9843	0.0010T	0.0001T	0.0004
Motor pinion ball bearing OD	2.0467	2.0472	0.0010T	0.0005L	0.0005
Motor pinion gear OD	0.9844	0.9849	0.0010T	0.0001T	0.0005
Planet gear ID	2.8322	2.8334	0.0024T	0.0007T	0.0012
Planet gear ball bearing ID	1.1807	1.1811	0.0001T	0.0008L	0.0004
Planet gear ball bearing OD	2.8341	2.8346	0.0024T	0.0007T	0.0005
AIR FEED MOTOR:					
Bearing stud OD	0.9835	0.9840	0.0001L	0.008L	0.0005
Connecting rod bushing wall thickness	0.053	0.107	--	--	0.054
Crank pinion bearing ID	0.5906	0.5909	0.0003L	0.0009L	0.0003
Crank pinion bearing OD	1.6535	1.6540	0.0002T	0.0013L	0.0005
Crank pinion, small OD	0.5900	0.5903	0.0003L	0.0009L	0.0003
Crank pinion, large OD	0.6270	0.6275	0.0025T	0.0015T	0.0005
Cylinder case, lower crank bearing bore ID	2.0475	2.0485	0.0002L	0.0014L	0.0010
Cylinder case, upper crank bearing bore ID	1.8508	1.8518	0.0001T	0.0014L	0.0010
Cylinder liner ID	1.7505	1.7530	--	--	0.025
Drive gear, bearing bore ID	2.0475	2.0485	0.0002L	0.0014L	0.0010
Gear case, crank hearing bore ID	1.6538	1.6548	0.0002T	0.0013L	0.0010
Gear case, inner worm bearing bore ID	2.4405	2.4413	0.0015T	0.0007L	0.0008
Idler wheel bushing ID	1.0030	1.0040	0.0030L	0.0045L	0.0010
Idler wheel shaft OD	0.9995	1.0000	0.0030L	0.0045L	0.0005
Inner worm bearing ID	1.1805	1.1810	0.0015T	0.0005T	0.0005
Inner worm bearing OD	2.4410	2.4420	0.0015T	0.0007L	0.0010
Inner worm wheel bearing ID	1.2600	1.2605	0.0015T	0.0005T	0.0005
Inner worm wheel hearing OD	2.8345	2.8355	0.0007T	0.0015L	0.0010
Lower crank bearing ID	0.9841	0.9843	0.0004T	0.0003L	0.0002
Lower crank bearing OD	2.0471	2.0473	0.0002L	0.0014L	0.0002
Lower throw crank, bearing OD	0.9840	0.9845	0.0004T	0.0003L	0.0005
Lower throw crank, pinion ID	0.6250	0.6255	0.0025T	0.0015T	0.0005
Outer worm bearing ID	0.9835	0.9840	0.0015T	0.0005T	0.0005
Outer worm bearing OD	2.4410	2.4420	0.0015T	0.0003L	0.0010
Outer worm wheel bearing ID	1.1805	1.1810	0.0015T	0.0005T	0.0005
Outer worm wheel bearing OD	2.4410	2.4420	0.0007T	0.0015L	0.0010
Piston wrist pin OD	0.3762	0.3765	0.0003L	0.0013L	0.0003
Piston, wrist pin bore ID	0.3768	0.3775	0.0003L	0.0013L	0.0007

Table 4-1. Repair and Replacement Standards--Continued

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Rotary valve, shaft OD	1.1210	1.1240	--	--	0.0030
Sprocket, shaft bore ID	1.2500	1.2505	0.0015T	0.0005T	0.0005
Sprocket shaft, gear surfaces OD	1.2510	1.2515	0.0015T	0.0005T	0.0005
Sprocket shaft, inner bearing OD	1.2610	1.2615	0.0015T	0.0005T	0.0005
Sprocket shaft, outer bearing OD	1.1815	1.1820	0.0015T	0.0005T	0.0005
Thrust bearing ID,	0.9841	0.9843	0.0001L	0.0008L	0.0002
Thrust bearing OD	2.0471	2.0473	0.0002L	0.0014L	0.0002
Upper crank bearing ID	0.7874	0.7878	0.0006T	0.0003L	0.0004
Upper crank bearing OD	1.8504	1.8509	0.0001T	0.0014L	0.0005
Upper throw crank, bearing OD	0.7875	0.7880	0.0006T	0.0003L	0.0005
Worm, shaft bore ID	1.0000	1.0005	0.0005T	0.0005L	0.0005
Worm housing, inner worm wheel bearing bore ID	2.8348	2.8360	0.0007T	0.0015L	0.0012
Worm housing, outer worm bearing	2.4405	2.4413	0.0015T	0.0003L	0.0008
Worm housing cap, bearing bore ID	2.4413	2.4425	0.0007T	0.0015L	0.0012
Worm shaft, inner bearing OD	1.1815	1.1820	0.0015T	0.0005T	0.0005
Worm shaft, outer bearing OD	0.9845	0.9850	0.0015T	0.0005T	0.0005
Worm shaft, worm surface OD	1.0003	1.0008	0.0005T	0.0005L	0.0005
Worm wheel, bore ID	1.2495	1.2505	0.0020T	0.0005T	0.0010
HYDRAULIC PUMP AIR MOTOR:					
Front ball bearing ID	0.9843	0.9847	0.0002T	0.0005T	0.0004
Front ball bearing OD	2.4409	2.4414	0.0010T	0.0001L	0.0005
Front end plate, bore ID	2.4404	2.4410	0.0010T	0.0001L	0.0006
Rear ball bearing ID	0.7874	0.7878	0.0002T	0.0005L	0.0004
Rear ball bearing OD	2.0472	2.0477	0.0012T	0.0002T	0.0005
Rear end plate, bore ID	2.0465	2.0470	0.0012T	0.0002T	0.0005
Rotor, small shaft OD	0.7873	0.7876	0.0002T	0.0005L	0.0003
Rotor, large shaft OD	0.9842	0.9845	0.0002T	0.0005L	0.0003
PROPELLING AIR MOTOR:					
Motor case, bearing bore ID	3.1497	3.1507	0.0004T	0.0011L	0.0010
Pin end crank, bearing OD	1.5750	1.5755	0.0007T	0.0003L	0.0005
Pin end crank ball bearing ID	1.5748	1.5753	0.0007T	0.0003L	0.0005
Valve end crank, bearing OD	1.5750	1.5755	0.0007T	0.0003L	0.0005
Valve end crank ball bearing ID	1.5748	1.5753	0.0007T	0.0003L	0.0005
Valve end crank ball bearing OD	3.1496	3.1501	0.0004T	0.0011L	0.0005
TRACTION UNITS:					
Bearing retainer bore ID	2.4395	2.4405	0.0025T	0.0005T	0.0010
Complete inner bearing ID	1.3750	1.3755	0.0015T	0.0005T	0.0005
Complete inner bearing OD	2.7170	2.7180	0.0025T	0.0005T	0.0010
Complete inner ring gear bearing ID	2.0000	2.0005	0.0001T	0.0009L	0.0005
Complete inner ring gear bearing OD	3.5000	3.5010	0.003T	0.001T	0.0010
Complete outer bearing ID	1.1250	1.1255	0.0020T	0.0010T	0.0005
Complete outer bearing OD	2.4410	2.4420	0.0025T	0.0005T	0.0010
Complete outer ring gear bearing ID	1.6250	1.6255	0.0000T	0.0010L	0.0005
Complete outer ring gear bearing OD	3.1250	3.1260	0.003T	0.001T	0.0010
Flange and hub assembly ID	2.373	2.375	0.006T	0.001T	0.002
Main drive shaft pinion inner bearing OD	1.3760	1.3765	0.0015T	0.0005T	0.0005
Main drive shaft pinion, outer bearing OD	1.1265	1.1270	0.0020T	0.0010T	0.0005

Table 4-1. Repair and Replacement Standards—Continued

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable weart and clearance
	Minimum	Maximum	Minimum	Maximum	
Ring gear and hub assembly, inner bearing ID	3.498	3.499	0.003T	0.001T	0.001
Ring gear and hub assembly, outer bearing OD	3.123	3.124	0.003T	0.001T	0.001
Shaft and spacer housing, inner bearing bore ID	2.7155	2.7165	0.0025T	0.0005T	0.0010
Shaft and spacer housing, inner ring gear bearing OD	1.9996	2.0001	0.0001T	0.0009L	0.005
Shaft and spacer housing, outer ring gear bearing OD	1.6245	1.6250	0.0000T	0.0010L	0.0005
Track idler bushing retainer ID	1.496	1.499	0.004L	0.008L	0.003
Track idler bushing retainer OD	2.376	2.378	0.005T	0.001T	0.002
Track idler hub ID	2.373	2.375	0.005T	0.001T	0.002
Track idler shaft, bushing OD	1.491	1.492	0.004L	0.008L	0.001
Track idler shaft, support OD	1.1250	1.1255	0.0005L	0.0030L	0.0005
Track idler support, shaft ID	1.126	1.128	0.0005L	0.0030L	0.002
Track roller bushing ID	1.4940	1.4975	0.0270L	0.0405L	0.0035
Track roller bushing retainer OD	2.376	2.379	0.006T	0.001T	0.003
Track roller shaft OD	1.457	1.467	0.0270L	0.0405L	0.010

T denotes tight (interference) fit.
L denotes loose (clearance) fit.

CHAPTER 5

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5-1. Special Tools and Equipment

No special tools or equipment is required for performing maintenance on the pneumatic drill.

5-2. Specially Designed Tools and Equipment

No specially designed tools or equipment is required for performing maintenance on the pneumatic drill.

Section II. TROUBLESHOOTING

5-3. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the pneumatic drill or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

5-4. Drifter Drill Inoperative

Probable cause	Possible remedy
Air not getting to drill	Inspect hoses, fittings, remote control manifold and air feed motor (fig. 1-4).
Valve chest clogged	Diaassemble and clean drill parts in approved solvent. Blow scale and dirt from lines before connecting (para 6-3).
Improper lubrication	Adjust manifold lubricator. Check that oil vapor is observed in exhaust.
Damaged or worn parts	Disassemble and inspect drill for damaged parts. Clean and lubricate parts (para 6-3).
Drill assembly rods loose or misalined.	Check for misalinement. Tighten rods evenly and securely.

5-5. Drifter Drill Operates Sluggishly or Eratically

Probable cause	Possible remedy
Dirt or foreign material clogging hoses.	Check hoses and fittings for damage and restrictions. Clean and replace as necessary.
Dirt clogging drill	Disassemble and inspect drill parts. Clean and lubricate (para 6-3).
Dieseling (ignition of air and oil in cylinder) which causes scoring and damage to parts.	Check for possible overlubrication or running on air cushion. Reset manifold lubricator metering valve. Keep drill feed proper and avoid running drill into and out of hole at full throttle.
Compressor supplying insufficient air.	Check compressor and main air line. Make sure main air valve is fully open.
Improper lubrication	Readjust manifold lubricator if required. Check oil level in lubricating oil reservoir. Check piston and cylinder for heat checks. Replace if required.
Blower tube broken	Replace blower tube if damaged (para 6-3).

5-6. Drill Steel does not Rotate

Probable cause	Possible remedy
Rifle bar, pawls, rifle nut, or chuck nut damaged or worn.	Disassemble drill and inspect parts for damage. Clean and lubricate parts before assembling (para 6-3).
Improper lubrication	Readjust manifold lubricator if required. Check oil level in lubricating oil reservoir.

5-7. Air Feed Motor Operates with low Power

Probable cause	Possible remedy
Worn bearings	Disassemble and inspect all bearings (para 6-*10c)*. Replace if required.
Pistons and cylinder liners worn or scored.	Disassemble and inspect for worn and scored parts (para *6-10c)*. Replace if required.
Rotary valve loose in rotary valve bushing.	Inspect and replace rotary valve if required.

5-8. Hydraulic Pump Operating Improperly

Probable cause	Possible remedy
Air supply insufficient	Check hoses and fittings for leakage.
Hydraulic oil flow restricted.	Check suction oil filter, return line oil filter and reservoir for dirt and clogging (fig. 1-5).
Flexible coupling loose	Disassemble and inspect for loose or damaged parts (para 6-17).
Improper lubrication	Check oil level in lubricating oil reservoir or adjust metering valve if required.
Pump vanes damaged or loose.	Disassemble and inspect hydraulic pump and air motor for damaged Parts (para 6-17).
Pump rotating in wrong direction.	Disassemble and reverse-position of ring (para 6-17).

5-9. Hydraulic Valve Operating Improperly

Probable cause	Possible remedy
Excessive leakage	Check hoses and fittings. Check condition of O-rings in valve.
Control level linkage parts damaged.	Disassemble and inspect parts for damage (para 6-24).
Relief valve clogged causing erratic pressure.	Disassemble and inspect relief valve parts (para 6-24). Check that shim thickness is proper for 2000 psi system pressure relief.
Hydraulic oil flow restricted.	Check suction oil filter, return lint oil filter, and all hoses and fittings for dirt and clogging (fig. 1-5).

5-10. Hydraulic Cylinders Operating Improperly

Probable cause	Possible remedy
Excessive oil leakage at gland nut.	Disassemble suspected cylinder and inspect packings. Replace if required (paras 6-52, 6-59, and 6-66).
Oil leakage at check valves at cylinders.	Disassemble and inspect for damaged parts. Replace as necessary (paras 6-52, 6-59, and 6-66).

Section III. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND AUXILIARY ITEMS

5-11. General

a. Removal of major components not covered in this section are provided in Chapter 3. The remainder of the assemblies are covered in Chapter 6.

b. See figures 1-3 through 1-5 for piping connections to be removed and connected for the following assemblies.

5-12. Complete Drill Mounting

a. Removal.

(1) Disconnect the manifold lubricator air line connection to the complete drill mounting (fig. 1-4).

(2) Remove the 14 bolts (1, fig. 5-1), nuts (2), and lock washers (3), securing drill guide mounting plate

clamps (4) and drill guide extension cylinder mounting clamps (5) to the complete drill mounting (7). Keep the clamp shims (6) with the respective clamps to facilitate installation.

b. Installation.

(1) See figure 5-1 and install the complete drill mounting (7). Make sure that the clamp shims (6) are installed in the same manner as removed.

(2) Connect the air piping from the manifold lubricator.

5-13. Power Guide Extension Mounting

a. Removal.

(1) Disconnect the hydraulic lines from the drill guide extension cylinder (fig. 1-5).

(2) Remove the four swivel cap bolts (1, fig. 5-2), nuts (2), and lock washers (3), and separate the two guide mounting swivel caps (4) from the guide mounting swivel of the power dump and swing assembly (6), freeing the power guide extension mounting (5).

b. Installation.

(1) See figure 5-2 and install the power guide extension mounting on the power dump and swing assembly.

(2) Connect the hydraulic lines to the drill guide extension cylinder (see fig. 1-5).

5-14. Power Dump and Swing Assembly

a. Removal.

(1) Disconnect the hydraulic lines from the dump and swing cylinders (fig. 1-5).

(2) Remove the two retaining rings (1, fig. 5-3) and dump pin (2) securing the dump cylinder of power dump and swing assembly (5) to hydraulic boom assembly (6).

(3) Remove the two retaining rings (1) and dump pin (2) securing the dump link of power dump and swing assembly (5) to hydraulic boom assembly (6).

(4) Remove the two retaining rings (3) and dump pivot pin (4) securing the dump arm of power dump and swing assembly (5) to hydraulic boom assembly (6).

(5) Remove the complete power dump and swing assembly (5).

b. Installation.

(1) See figure 5-3 and install the power dump and swing assembly to the hydraulic boom assembly.

(2) Connect the hydraulic lines to the dump and swing cylinders (fig. 1-5).

5-15. Hydraulic Boom Assembly

a. Removal.

(1) Disconnect the hydraulic lines from the boom swing and boom lift cylinders (fig. 1-5).

(2) Remove the screws (1 and 2, fig. 5-4) and lock washers (3) securing king pin locking plates (4) to boom base assembly (6).

(3) Using a suitable hoist to support the weight of hydraulic boom assembly (5), remove the cylinder pedestal king pins of the hydraulic boom assembly from the mounting brackets of the boom base assembly.

b. Installation.

(1) See figure 5-4 and install the hydraulic boom assembly.

(2) Connect the hydraulic lines to the boom swing and boom lift cylinders (fig. 1-5).

5-16. Boom Base Assembly

a. Removal.

Note. Although the boom base assembly is secured to the frame only by five sets of hardware, removal is very time consuming because of the fact that both the hydraulic pump assembly and the manifold lubricator assembly are mounted to this base. This paragraph is written under the assumption that both of these assemblies have already been removed as described in Chapter 3.

(1) Remove vent cap (1, fig. 5-5). Place a suitable container (minimum of 10-gallon capacity) under the hydraulic

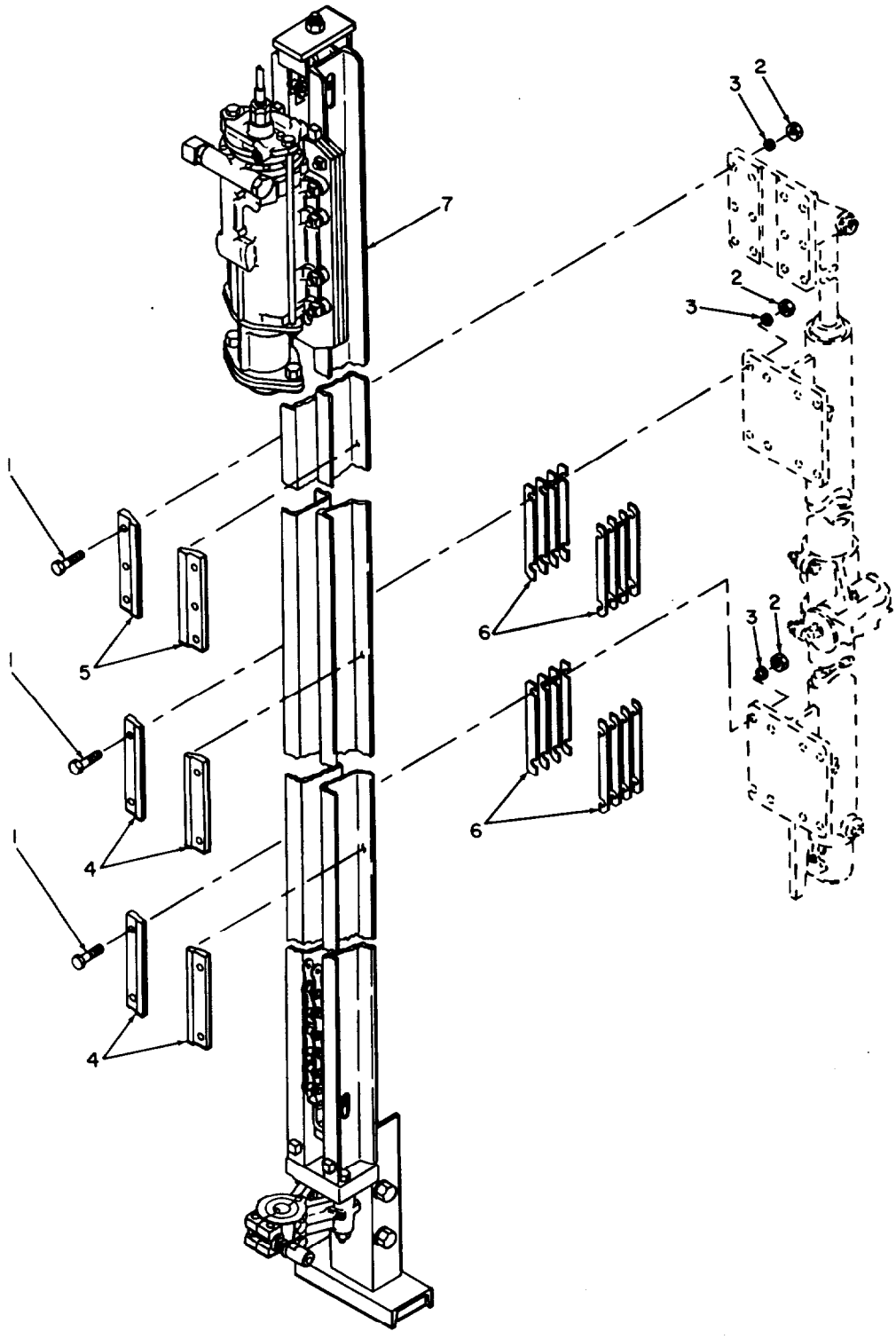
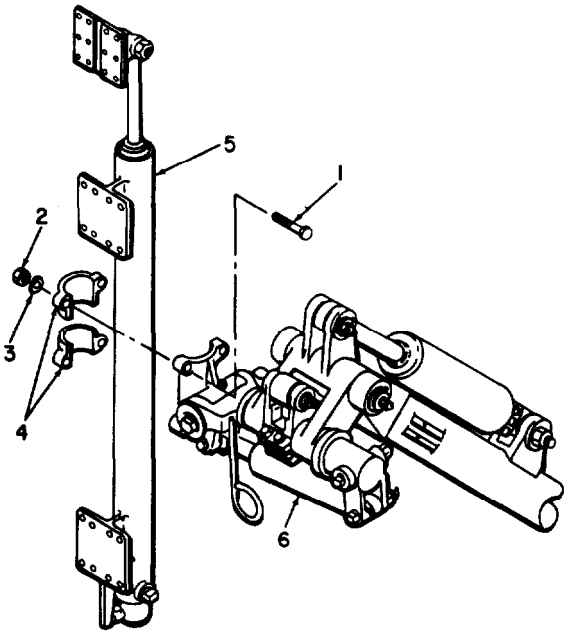


Figure 5-1. Removal and installation of complete drill mounting.

1 Bolt, hex-hd, 5/8-11 x 2 1/4 in. (14)
2 Nut, hex, 5/8-11 (14)
3 Washer, lock, 5/8 in. (14)
4 Drill guide mounting plate clamp (4)
5 Drill guide extension cylinder mounting clamp (2)
6 Clamp shim (16)
7 Complete drill mounting

Figure 5-1-Continued.



MEC 3820-239-15/5-2

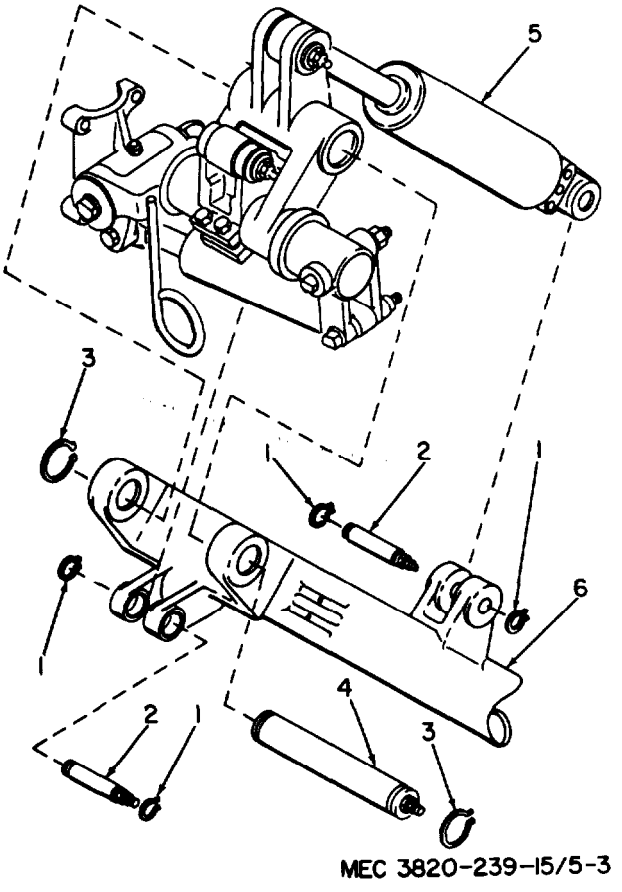
1 Guide mounting swivel cap bolt, 7/8-9 x 5 in. (4),
2 Nut, hex, 7/8-9 (4)
3 Washer, lock, 7/8 in. (4)
4 Guide mounting swivel cap (2)
5 Power guide extension mounting
6 Power dump and swing assembly

Figure 5-2. Removal and installation of power guide extension mounting.

drain adapter under the main frame, and. remove magnetic plug (2) and gasket (3), allowing the hydraulic reservoir to empty.

(2) Disconnect the hydraulic fittings at the suction oil filter and the return line oil filter (fig. 1-5).

(3) Remove the two screws (4, fig. 5-5) and lock washers (7) from the tapped holes in the main frame (9), and remove the three screws (5), nuts (6), and lock washers (7) from the remaining three holes in the boom base assembly (8) and main frame.



MEC 3820-239-15/5-3

1 Retaining ring (4)
2 Dump oin (2)
3 Retaining ring (2)
4 Dimp pivot pin
5 Power dump and swing assembly
6 Hydraulic boom assembly

Figure 5-3. Removal and installation of power dump and swing assembly.

(4) Using a suitable hoist, carefully lift the boom base assembly (8) from the main frame (9), being careful not to damage the protruding hydraulic drain adapter.

Note. If may be desirable to remove the hydraulic drain adapter, nipple, and elbow from the bottom of the boom base assembly before attempting to lift the assembly.

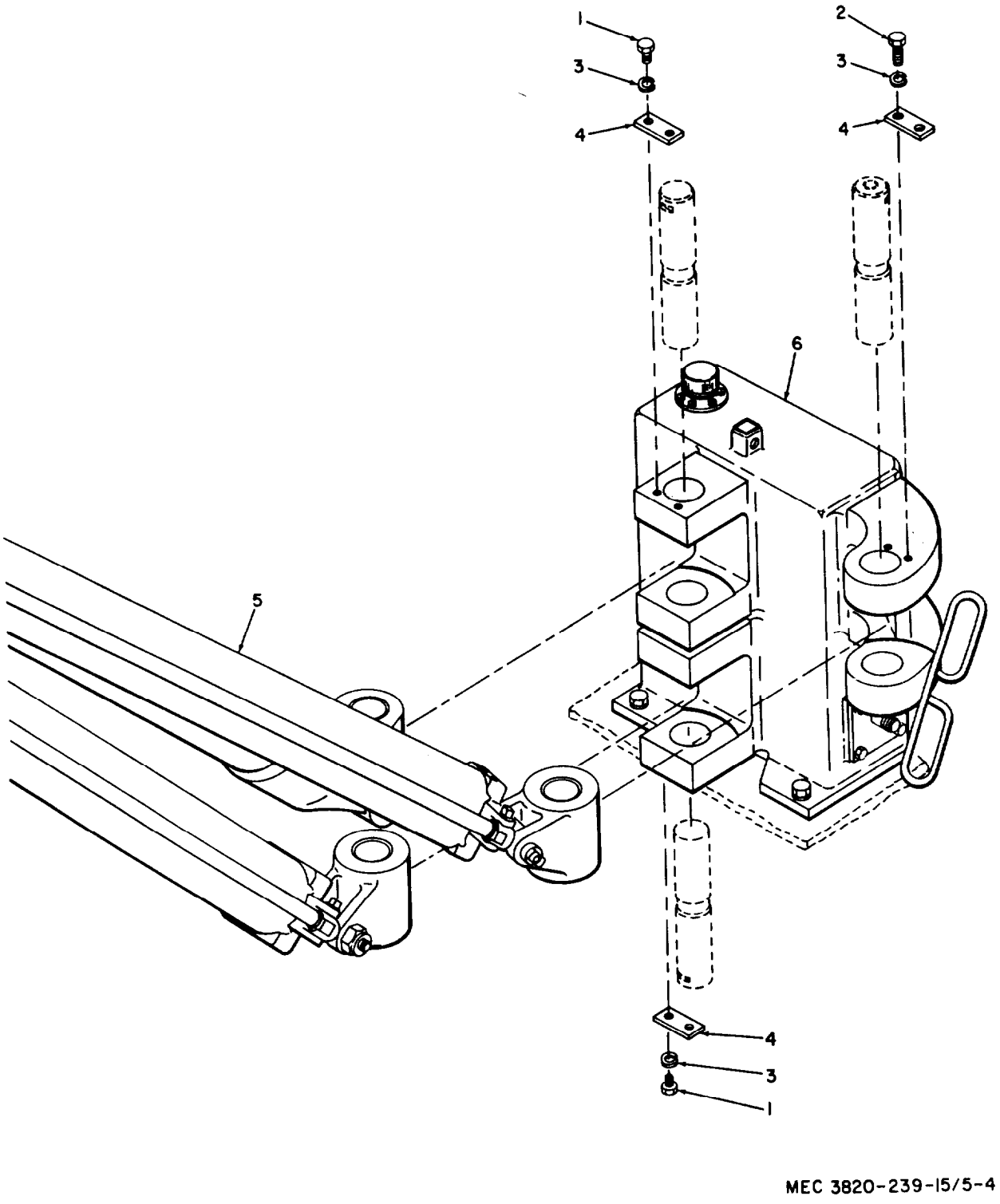


Figure 5-4. Removal and installation of hydraulic boom assembly.

1 Screw, cap, hex-hd, 1/2-13 x 1 in. (4)
2 Screw, cap, hex-hd, 1/2-13 x 1 1/2 in. (2)
3 Washer, lock, 1/2 in. (6)
4 King pin locking plate (8)
5 Hydraulic boom assembly
6 Boom base assembly

Figure 5-4-Continued.

b. Installation.

Note. Before installing the boom base assembly, clean and flush the hydraulic reservoir, clean the suction oil filter and magnetic plug, and replace the return line oil filter as described in Chapter 3, Section IV.

(1) See figure 5-5 and install the boom base assembly.
(2) See figure 1-5 and make all hydraulic connections required.

5-17. Complete Traction Drive

a. Removal.

Note. The procedure for both complete traction drives is identical. Only the orientation is different. The following procedure and illustrations cover only the left (roadside) traction drive.

(1) Disconnect the air piping fittings at the traction drive, propelling air motor, and brake (fig. 1-3).
(2) Remove the six nuts (1, fig. 5-6), and lock washers (2) from the housing flange of traction unit (6).
(3) Slide complete traction drive (4), with studs (3) attached, out of the traction unit housing and the mounting holes in the main frame.

b. Installation.

(1) See figure 5-6 and install the complete traction drive.
(2) See figure 1-3 and make all air piping connections required.

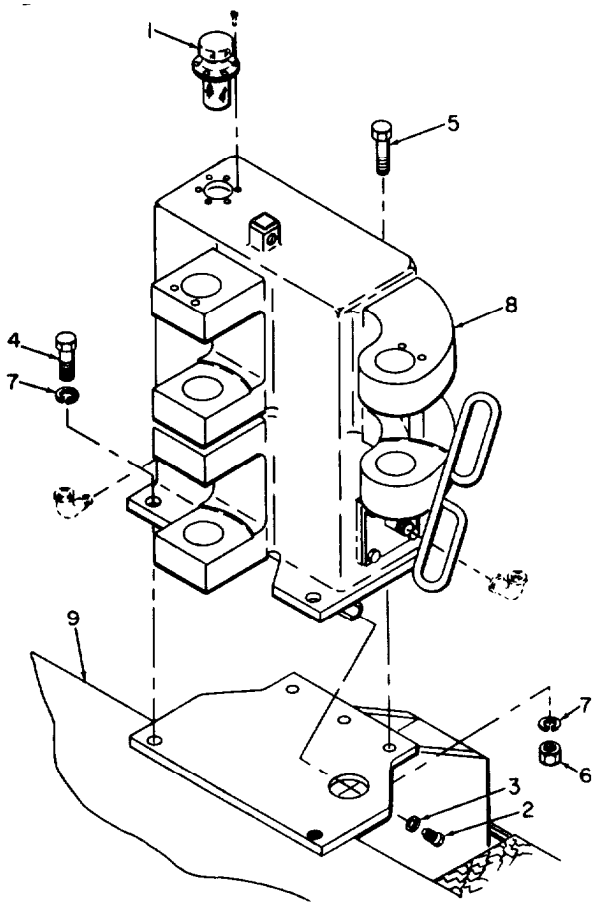
5-18. Auxiliary Items

a. General. The auxiliary items for the pneumatic drill consist of the tool box, the tools provided in the box, drill shank pieces, and instruction and identification plates.

b. Removal.. Normally removal is required only if parts are damaged. The only items requiring removal are the tool box and instruction and identification plates.

(1) To remove the tool box, open the lid and remove any tools within the box. Remove screws (10, fig. 5-7), nuts (11), and lock washers (12), and remove the tool box from the frame.
(2) To remove damaged plates, remove the four drive screws (1) holding the plate.

c. Installation. See figure 5-7 and install the auxiliary items.



1 Vent cap
2 Magnetick drain plug, 3/4-16
3 Gasket
4 Scxrew, cap, hed-hd, 1-8 x 2 1/4 in. (2)
5 Screw, cap, hes-hd, 1-8 x 3 1/4 in. (3)
6 Nut hex, 1-8 (3)
7 Washer, lock 1 in. (5)
8 Boom base assembly
9 Main fram

Figure 5-5. Removal and installation of boom base assembly.

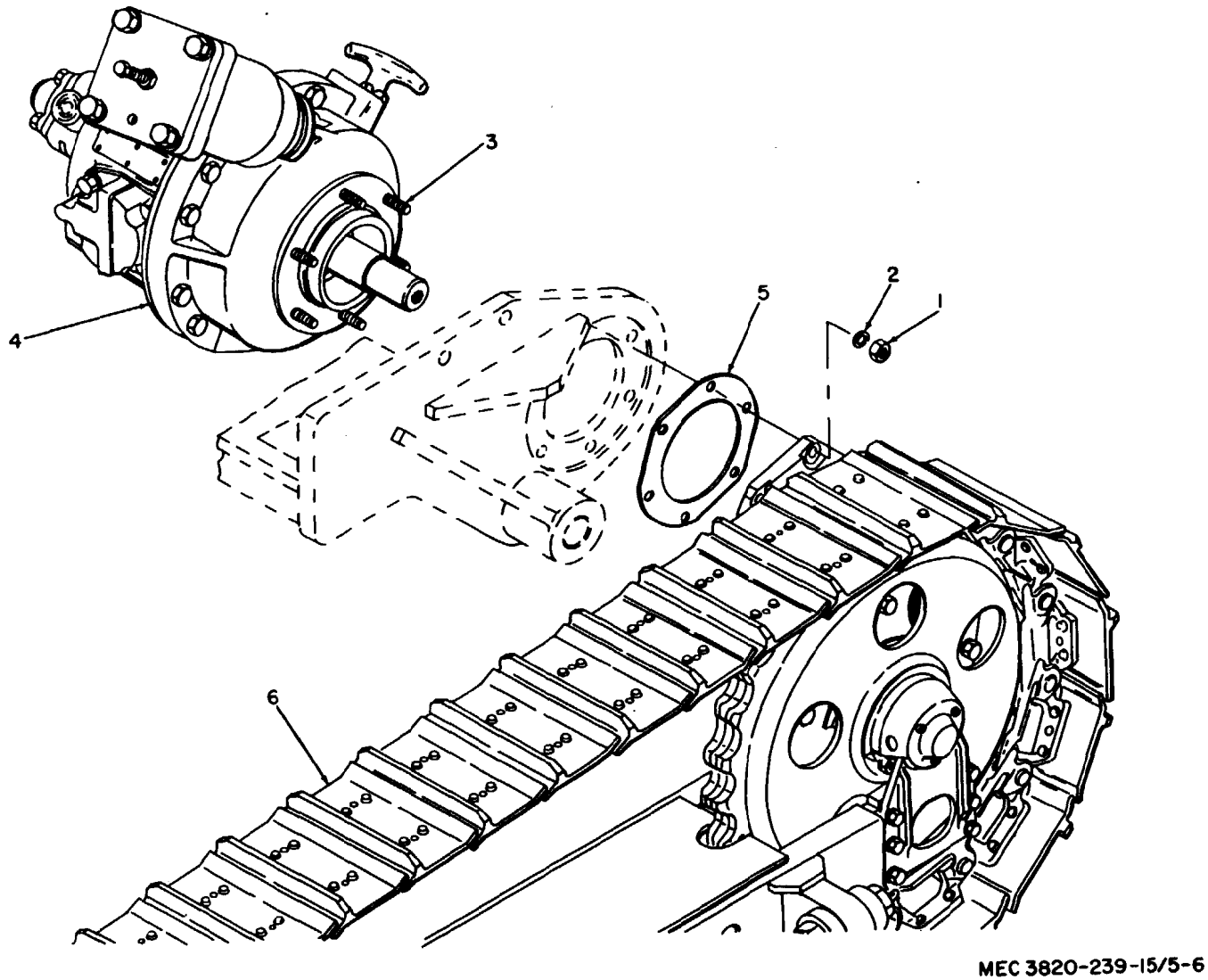


Figure 5-6. Removal and installation of complete traction drive.

1 Nut, hex, 5/8–11 (6)
2 Washer lock, 5/8 in. (6)
3 Stud, 5/8–11 x 3 in. (6)
4 Complete traction drive (lh shown, rh opposite)
5 Spacer plate gasket
6 Traction unit (lh shown, rh opposite)

Figure 5–6—Continued.

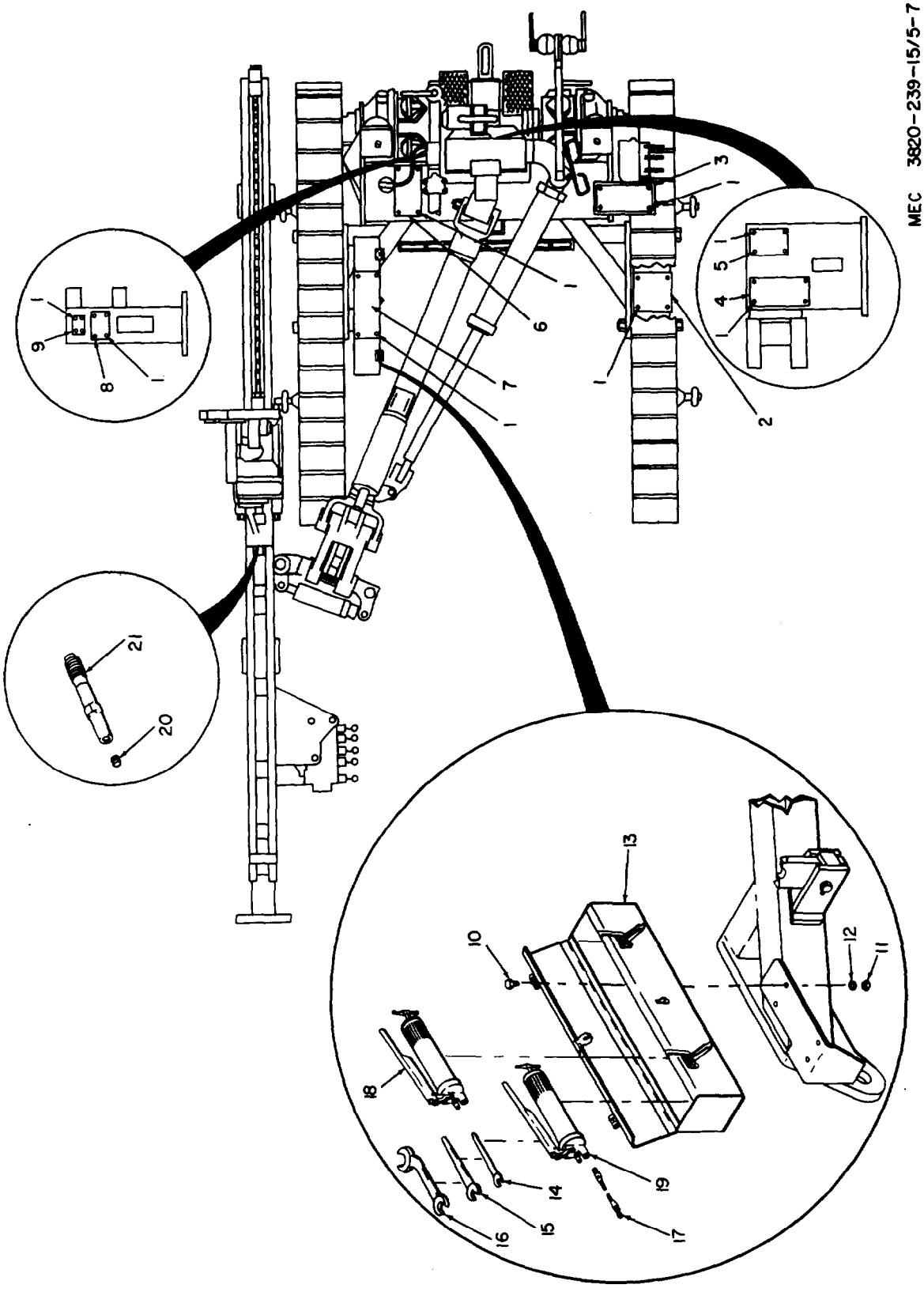


Figure 5-7. Location of auxiliary items.

1 Drive screw, binding-hd, 3/8 in. long (32)
2 Transportation data instruction plate
3 Hydraulic valve operation instruction plate
4 Propelling operation instruction plate
5 Lubrication instruction plate
6 Lubricator operation instruction plate
7 Drill operation instructon plate
8 Military identification plate
9 Commercial nameplate
10 Screw, cap, hex-hd, 1/2–13 x 1 in. (4)
11 Nut, hex, 1/2–13 (3)
12 Washer, lock, 1/2 in. (4)
13 Tool box
14 Open end wrench, 1 in.
15 Open end wrench, 1 5/16 in.
16 Track adjusting wrench
17 Grease gun hose assembly with coupler, 12 in.
18 Grease gun
19 Grease gun
20 Shank piece seal (1 rqr plus 11 spares supplied)
21 Shank piece (1 rqr plus 11 spares supplied)

Figure 5–7—Continued.

CHAPTER 6

REPAIR INSTRUCTIONS

Section I. DRIFTER DRILL

6-1. General

This section contains repair instructions for the drifter drill.

6-2. Removal

Remove the drifter drill as described in paragraph 3-33.

6-3. Disassembly

Disassemble drifter drill in the numerical sequence as illustrated on figure 6-1. Follow the procedures specified below:

a. If the shank piece is attached to the drifter drill, remove chuck jaw retainer bolts (1, fig. 6-1) and nuts (2), and separate chuck jaw retainer (3) with the shank piece.

b. Remove hose stem (4) with related parts (5 through 9), air connection plug (10), and blower hose connection (12) with related parts (13 and 14).

c. Remove tube retainer (15) and O ring (16). Remove blower tube (19) with blower tube washer (17) and blower tube rubber (18) attached.

d. Remove nuts (21) and assembly rods (20), and pull air inlet housing (42) and backhead (36), with assembled parts intact, from cylinder (54).

Note. The air inlet housing and backhead are removed together to avoid the possibility of the rotation pawls (41) falling out.

e. Separate air inlet housing (42) from backhead (36), and remove rifle bar (37).

f. Remove rotation selector cam (22) from backhead (36). Remove nut (23), external tooth lock washer (24), and rotation selector cam pinion handle (25) from the top of the backhead, and slide rotation selector cam pinion (26) out from the bottom of the backhead.

g. Remove backhead cap (27), and all piston parts (29 through 35) from backhead (36).

Note. If the parts do not come out easily, insert a screwdriver into the cam pinion hole of the backhead, and force out' the piston.

h. Force rotation paw1 housing (38) out of air inlet housing (42), and remove rotation pawl housing key (39), rotation pawl plungers (40), and rotation pawls (41).

i. Remove the assembled valve chest parts from cylinder (54) by inserting a 3/4-inch diameter bolt (approximately 10 inches long) into the cylinder with the head down. Engage the bottom of valve chest cover (49) with the bolt and pull the parts out of the cylinder.

Caution: **When the valve chest parts are removed, be careful not to lose valve chest key (43).**

j. Slide out valve chest cover (49). Remove valve (46). Separate front valve chest (47) from the valve chest cover by inserting a screwdriver through the ports in the cover and tapping evenly with a mallet.

Caution: **Tap the front valve chest evenly to avoid cocking the part in the cover.**

k. Insert rifle bar (37) through the cylinder (54) and wedge it into piston (51). Pull the piston out of the cylinder.

l. Separate the cylinder (54) with assembled parts, from fronthead (60).

m. Insert a brass bar into cylinder (54), and tap out piston stem bearing (52).

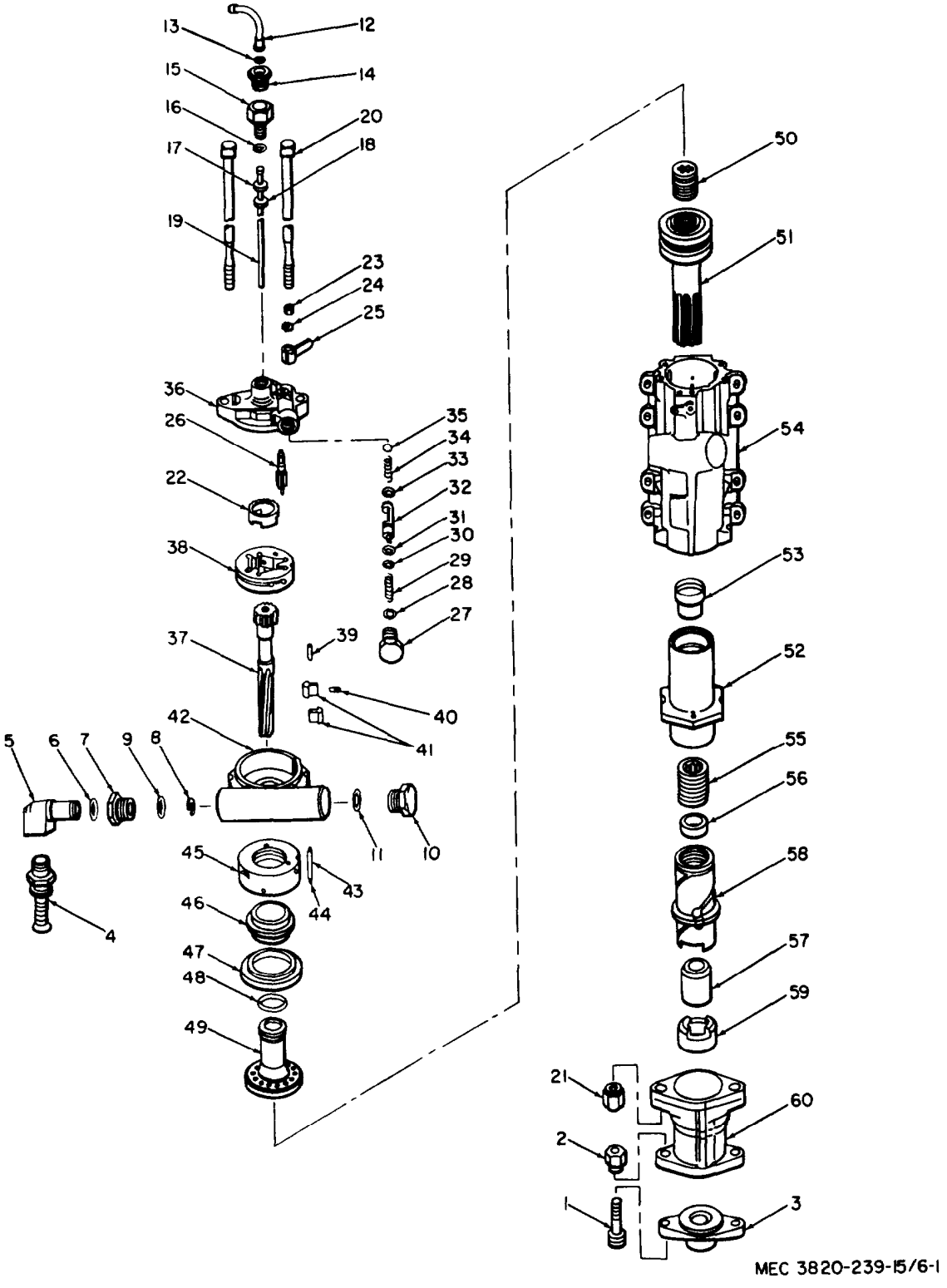


Figure 6-1. Drifter drill, exploded view.

1 Chuck jaw retainer bolt, 7/18-14 x 3 1/2 in.
2 Nut, hed 7/8-14 (2)
3 Chuck jw retainer
4 Hose stem
5 Air connection
6 O-ring
7 Air connection cap
8 Retaining ring
9 O-ring
10 Air connection plug
11 O-ring
12 Blower hose connection
13 O-ring
14 Blower hose connection cap
15 Tube retainer
16 O-ring
17 Blower tube washer
18 Blower tube rubber
19 Blower tube
20 Assembly rod (2)
21 Nut, hed, 7/8-14 (2)
22 Rotation selector cam
23 Nut, hex, 1/2-20
24 Washer, lock, external tooth 1/2 in.
25 Rotation selector cam pinion handle
26 Rotation selector cam pinion
27 Backhead cap
28 O-ring
29 Right-hand cam piston spring
30 Wear washer
31 O-ring
32 Rotation selector cam piston
33 O-ring
34 Left-hand cam piston
35 Cam piston spring seat
36 Backhead
37 Rifle bar
38 Rotation pawl housing
39 Rotation pawl housing key
40 Rotation pawl plunger
41 Rotation pawl (6)
42 Air inlet housing
43 Valve chest key
44 O-ring (2)
45 Back valve chest
46 Valve
47 Front valve chest
48 O-ring
49 Valve chest cover
50 Rifle nut
51 Piston
52 Piston stem bearing
53 piston stem bearing sleeve
54 Cylinder
55 Chuck nut
56 Chuck nut spacer
57 Shank aligner
58 Chuck
59 Chuck jaw
60 Fronthead

Figure 6-1—Continued.

n. Separate remaining parts as necessary.

6-4. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-5. Inspection and Repair

a. General. Inspect all parts for wear and heat checks. Inspect for wear as per table 4-1.

b. Piston and Cylinder. If clearance between piston (51) and cylinder (54) is excessive, determine which part is worn by inserting a new piston in the cylinder and rechecking clearance. If clearance is then satisfactory, the piston was worn.

c. Rifle Bar. Inspect rifle bar (37) for wear of ratchet teeth. If the teeth are rounded to a 1/16-inch radius, replace the rifle bar.

d. Rotation Pawls. To equalize wear on rotation pawls (41), reverse them in the slots of rotation pawl housing (38) when they are worn to a 1/16-inch radius on one edge. If the pawls are worn on both edges, they must be replaced.

6-6. Reassembly

Reassemble drifter drill in reverse of numerical sequence as illustrated on figure 6-1. Note the following special procedures.

a. When assembling rotation pawls (41, fig. 6-1), insert them into the rotation pawl housing (38), and then press the pawl housing into air inlet housing (42).

Caution: **Use extreme care to keep the keyway of rotation pawl housing (38) alined with the keyway of air inlet housing (42). Make sure that the cutout section of the rotation pawl housing is exposed.**

b. Apply a dab of grease on each rotation pawl (41) to keep the pawls free of rotation selector cam (22) when installing backhead (36).

c. When installing rotation selector cam pinion (26) in backhead (36), make sure that the alignment marks (punch dots) on the pinion are alined with the marks on rotation selector cam (22).

d. When installing rotation selector cam piston (32) into backhead (36), make sure that the groove in the piston is aligned with the pinion. If the alignment marks are not visible, proceed as follows:

(1) Install rotation selector cam piston (32) with related parts in backhead (36).

(2) Install rotation selector cam pinion (26) in backhead (36) and mesh with the gear rack of the piston so that when rotation selector cam pinion handle (25) is attached and moved to the neutral position (45 degrees from the stop), the center tooth on the piston will be meshed with the pinion.

(3) Mark the alinement location on the meshing teeth of both the piston and the pinion, to facilitate subsequent repair.

6-7. Installation

See figure 3-12 and install the drifter drill on the drill mounting plate.

Section II. COMPLETE DRILL MOUNTING

6-8. General

This section contains repair instructions for the complete drill mounting. The complete drill mounting consists of the remote control manifold, air feed motor, centralizer, drill mounting plate, and complete drill guide.

6-9. Removal

Remove the complete drill mounting as described in paragraph *5-12a.*

6-10. Disassembly

a. Complete Drill Mounting. Disassemble complete drill mounting in the numerical sequence as illustrated on figure 6-2.

Note. Air hoses and hose fittings are not shown on figure 6-2 in order to avoid confusion. See figure 1-4 for complete piping diagram.

b. Remote Control Manifold. Disassemble remote control manifold in the numerical sequence as illustrated on figure 6-3.

Note. The manifold is made with five valves, four of which are used. The quantities specified in the legend for figure 6-3 reflect the actual parts installed. The valve with no lever ball or extension is complete internally although no connections are made to this valve, and the parts may be used as running spares. The spool is interchangeable only with the BLOW spool. Each of the other spools are different. Stamped letters on the end of each spool indicate the functions.

c. Air Feed Motor. Disassemble air feed motor in the numerical sequence as illustrated on figure 6-4 (Sheets 1 through 3). Follow the procedures specified below:

(1) Remove magnetic plug (1, fig. 6-4) and pipe plugs (45), and drain the oil from the worm housing (71).

(2) Remove manifold bolts (7) and lock washers (8) and separate motor air manifold (9) from cylinder case (96). Remove seal rings (10).

(3) Remove live air stud screw (11) and lock washer (12), and pull out reverse valve hole stud (14), and live air stud (15). Do not attempt to remove reverse valve hole stud pin (13).

(4) Remove screws (20) and lock washers (21), and lift off exhaust cover (22) and thrust plate (23). Remove upper bearing cap (24) and upper bearing spring (25).

(5) Remove screws (27) and lock washers (28), and separate worm housing (71) and gear case (29) from' cylinder case (96).

(6) Remove self-locking nuts (30) and separate gear case (29) from worm housing (71). Using a suitable puller, remove crank pinion bearing (72.

(7) Using a suitable puller, remove drive gear (31) and thrust bearing (32)

from stud (33). Remove rotary valve (34).

(8) Only if worn or damaged, press rotary valve bushing (36) out of cylinder case (96), through the exhause cover opening.

Note. Cylinder liner key (35) is permanently installed in the cylinder case to locate and align the rotary valve bushing (36). Do not attempt to remove the key.

(9) Remove cylinder liner caps (39) from cylinder case (96).

(10) Remove screws (41), lock washers (42), and housing cap (43) with housing cap shim (44).

(11) Remove worm shaft grease seal (62).

(12) Using a suitable puller, remove the assembled worm shaft (63), with inner and outer worm bearings (64 and 69), long and short worm spacers (66 and 68), worm key (67), and worm (66).

Note. Rotate worm shaft (63) to free worm (66) from worm wheel (54).

(13) Using a suitable bearing puller to bear on the inner races, remove inner worm bearing (64) and outer worm bearing (69) from worm shaft (63). Remove other parts from the worm shaft.

(14) Cut or straighten the ends and remove cotter pins (50). Remove sprocket shaft nuts (51) and sprocket shaft washers (52).

(15) Using a suitable press, bear on the sprocket end of sprocket shaft (56), until sprocket (59) and sprocket key (58) are freed and can be removed from the opening in the side of worm housing (71).

(16) Using a suitable press, remove sprocket shaft (56) with assembled parts, from worm housing (71). Remove sprocket shaft gear seal (60) and sprocket spacer (61) from the sprocket shaft.

(17) Using a suitable bearing puller to bear on the inner races, remove outer worm wheel bearings (53) and inner worm wheel bearing (57) from sprocket shaft (56).

(18) Remove worm wheel (54) and worm wheel key (55) from sprocket shaft (56).

(19) Remove lubrication fittings (46) from idler wheel shafts (47). Press out the idler wheel shafts from idler wheel bushings (49) and worm housing (71). Remove idler wheels (48) and the idler wheel bushings. Press the bushings out of the idler wheels.

(20) Remove screws (76), lock washers (77), and crank shaft cap (78).

(21) Using a suitable bearing puller, remove crank pinion parts, consisting of crank pinion (73), lower crank bearing (75), and Woodruff key (74), from lower throw crank (90).

(22) Rotate the crank assembly until one piston (82) is at the end of its stroke, farthest out of cylinder liner (80).

(23) Raise the crank assembly to free the piston from the cylinder liner. When the piston is free from the liner, move the crank sideways to free the other piston on the same throw crank (89 or 90) from its cylinder liner (80).

(24) Free the other two pistons (82) from their cylinder liners (80) in the same manner as in step (23).

(25) Drive out crank pins (85) from crank center piece (95), and upper and lower throw cranks (89 and 90). Cut or straighten the ends and remove cotter pin (86). Remove castellated nut (87) and pinch bolt (88), securing the halves of crank center piece (95). Insert the pinch bolt from the opposite side to spread crank center piece (96) and pull out upper throw crank (89) and lower throw crank (90) with attached parts.

Note. Upper and lower throw cranks (89 and 90) and crank center piece (95) are matched parts and must not be intermixed.

(26) Tap out piston wrist pins (81), and separate pistons (82) from outside

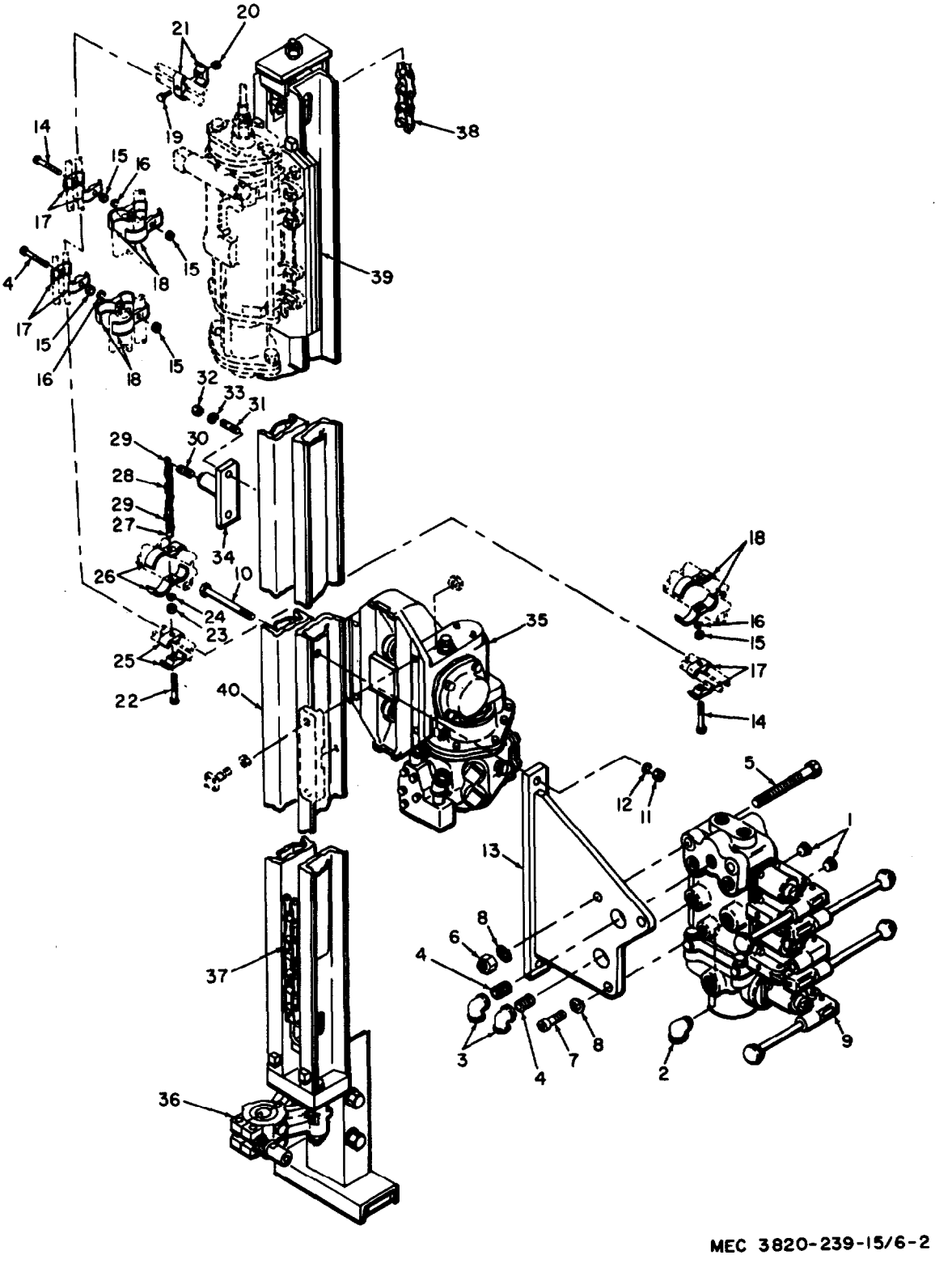


Figure 6-2. Complete drill mounting, exploded viiw.

GPO 812-695-6

1 Pipe plug, 1 on. (5)
2 Street elbow, 1 in.
3 Elbow, 1 in. (2)
4 Nipple, 1 x 1 1/2 in. (2)
5 Screw, cap, hex-hd, 3/4-10 x 6 in. (2)
6 Nut, hex, 3/4-10 (2)
7 Screw, cap, hex-hd, 3/4-10 x 1 1/4 in.
8 Washer, lock, 3/4 in. (3)
9 Remote control manifold
10 Screw, cap, hex-hd, 3/4 - 10 x 7 1/2 in. (2)
11 Nut, hex, 3/4 - 10 (2)
12 Washer, lock, 3/4 ion. (2)
13 Remote control manifld mounting bracket
14 Bolt, hex-hd, 3/8- 16 x 3 1/2 in. (3)
15 Nut, hex, 3/8 16 (6)
16 Washer, lock, 3/8 in. (3)
17 Hose clamp half (6)
18 Hose clamp half (6)
19 Screw, cap hex-hd, 1/4-20 x 1 1/4 in.
20 Nut, hex, 1/4 - 20
21 Hose clamp half (2)
22 Bolt, hex-hd, 3/8-16 x 3 1/2 in.
23 Nut, hex, 3/8-16
24 Washer, lock, 3/8 in.
25 Hose clamp (2)
26 Clamp half (2)
27 Eye nut
28 Straight link chain
29 Cold shut (2)
30 Stud
31 Stud, 5/8- 11 x 2 1/4 in. (2)
32 Nut, hex, 5/8-11 (2)
33 Washer, lock, 5/8 in. (2)
34 Hose hangar block
35 Air feed motor assembly
36 Centralizer
37 Feed chain
38 Feed chain coupler link (2)
39 Drill mounting plate
40 Complete drill guide

Figure 6-2—Continued.

and inside connecting rods (93 and 94).

(27) Remove outside connecting rods (93) and inside connecting rods (94) from the upper and lower throw cranks (89 and 90).

(28) Press out connecting rod bushings (92) from the connecting rods. Pull crank pin sleeves (91) off upper and lower throw cranks (89 and 90).

(29) Remove nut (83). Using a suitable bearing puller to bear on the inner race, pull upper crank bearing (84) off the shaft of upper throw crank (89).

(30) Only if worn or damaged, press cylinder liners (80) out of cylinder case (96), using a wooden block to bear on the liner. Make sure that the block does not interfere with cylinder liner keys (79).

Note. Do not remove cylinder liner keys (79), which are for locating and alining the cylinder liners in cylinder case (96).

d. Centralizer. Disassemble centralizer in the numerical sequence as illustrated on figure 6-5.

e. Drill Mounting Plate. Disassemble drill mounting plate in the numerical sequence as illustrated on figure 6-6.

f. Complete Drill Guide. Disassemble complete drill guide in the numerical sequence as illustrated on figure 6-7.

6-11. Cleaning

Clean all parts with an approved solvent. and blow dry with compressed air.

6-12. Inspection and Repair

a. Inspect all parts for wear and damage, and replace if necessary.

b. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

c. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of a part.

d. Inspect upper and lower throw cranks (89 and 90, fig. 6-4) and crank center piece (95) for scoring marks, cracks, wear, and other damage. If any of the three parts is damaged, the entire set must be replaced, since the parts are machined together and comprise a matched set.

e. Inspect connecting rod bushings (92) for wear. Using a micrometer or other suitable instrument, measure the wall thickness. If worn to less than 0.053 inch, replace the bushings.

f. Inspect. outside and inside connecting rods (93 and 94) for cracks, twisting indications,

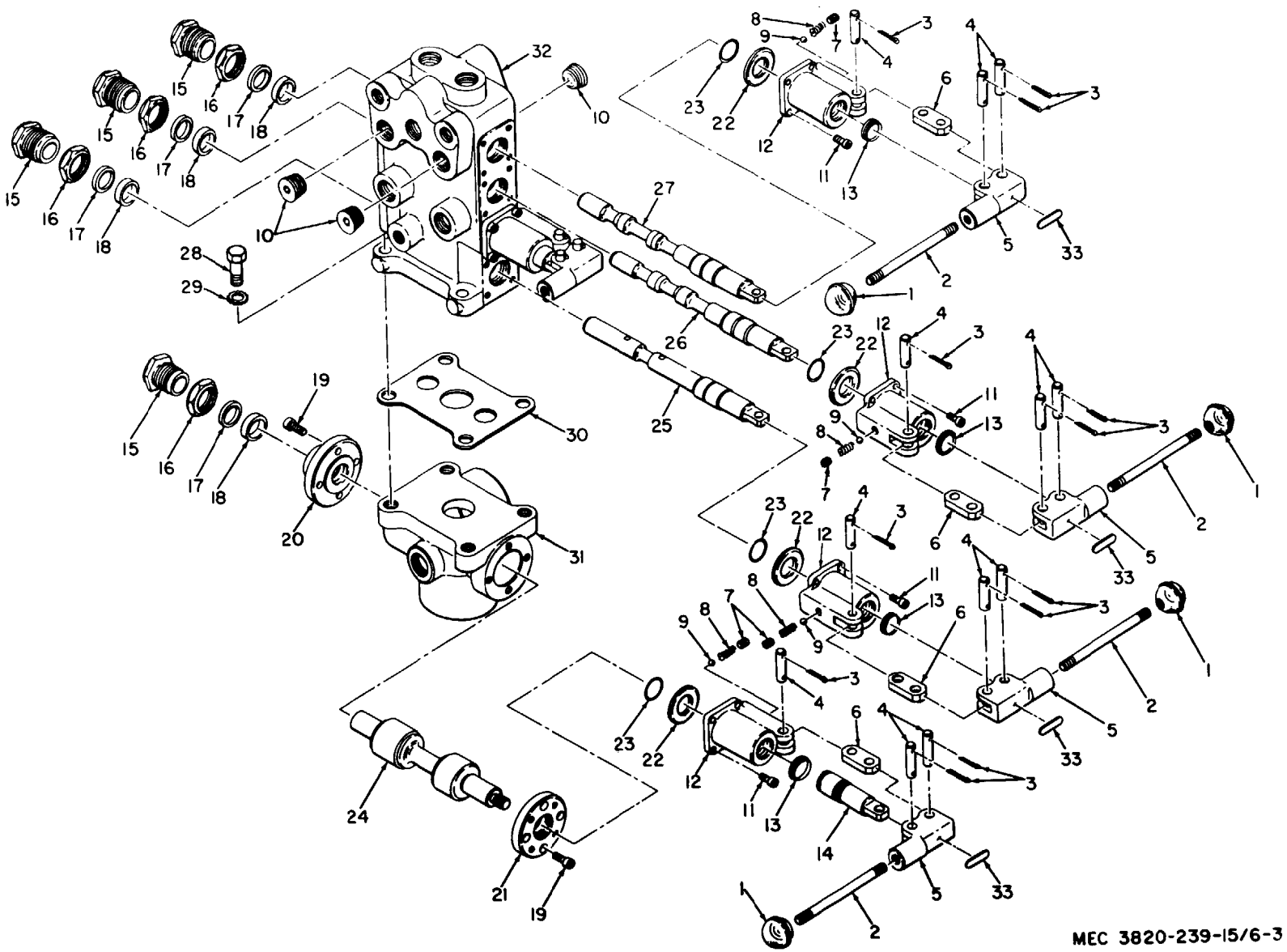


Figure 6-3. Remote control manifold, exploded view.

1 Lever ball (4)
2 Lever extension (4)
3 Cotter pin (30)
4 Hinge pin (15)
5 Lever (5)
6 Lever link (5)
7 Pipe plug, hex socket-hd, 1/8 in. (5)
8 Compression spring (5)
9 Ball (5)
10 Pipe plug, hex socket-hd, 1 in. (3)
11 Screw, cap, hex-hd, 5/16–18 x 3/4 in. (20)
12 Spool end cap (5)
13 Wiper (5)
14 Drill spool detent
15 Spool friction ring adjusting nut (5)
16 Jam nut, hex, 1 1/2–12 (5)
17 Friction washer (5)
18 Friction ring (5)
19 Screw, cap, hex-hd, 5/16–18 x 3/4 in. (8)
20 Drill spool friction end cap
21 Drill spool end cap plate
22 Alignment washer (5)
23 O-ring (5)
24 Drill spool
25 Intermittent spool
26 Blow and rotation spool (2)
27 Feed spool
28 Screw, cap, hex-hd, 5/8–11 x 1 3/4 in. (4)
29 Washer, lock, external tooth, 5/8 in. (4)
30 Drill spool body gasket
31 Drill spool body
32 Manifold body
33 Labels

Figure 6–3—Continued.

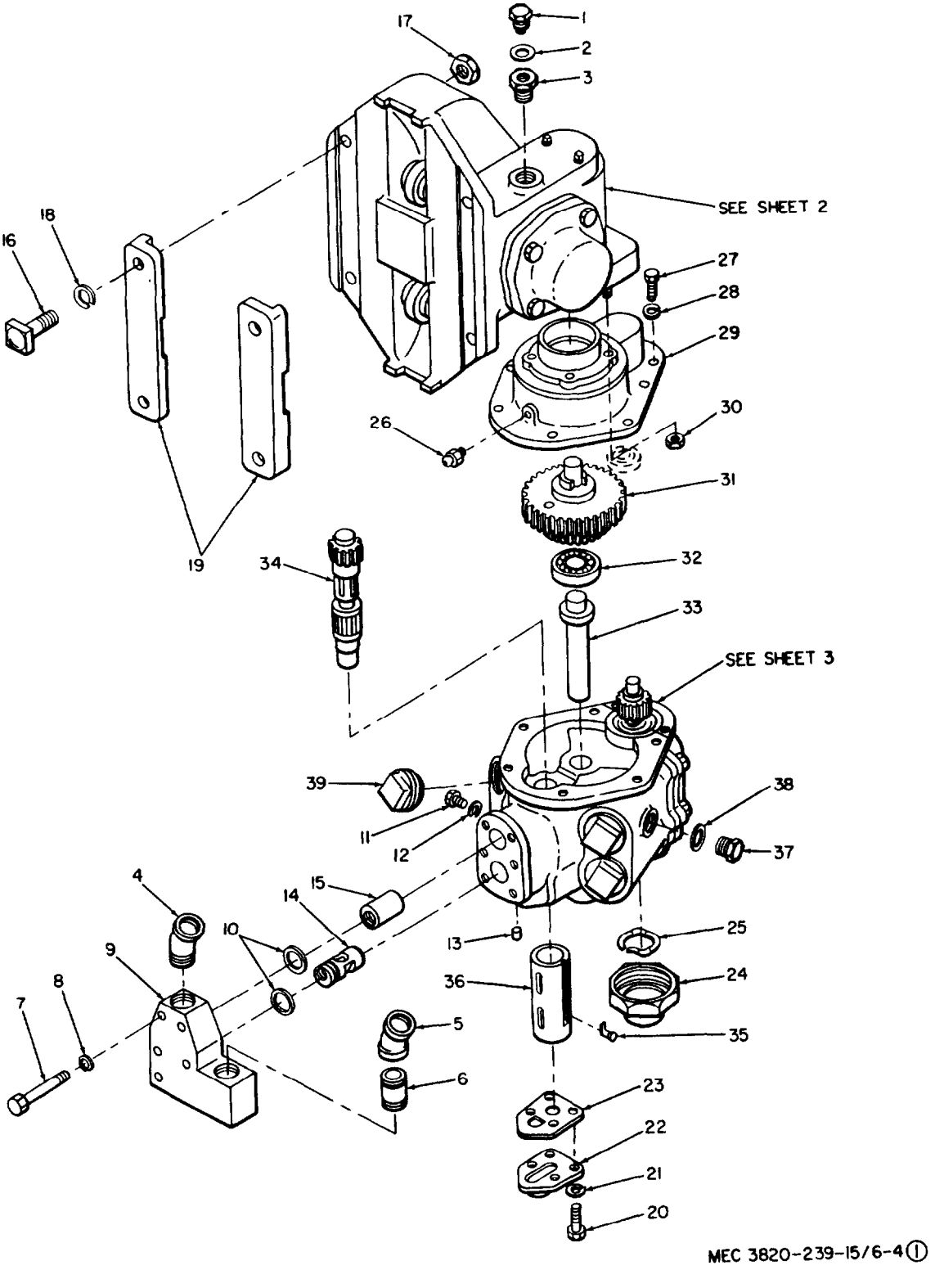


Figure 6-4(1). Air feed motor, exploded view.

1 Magnetic plug, 5/8 in.
2 Gasket
3 Feed motor bushing
4 Street elbow, 45° x 3/4 in.
5 Elbow, 45° x 3/4 in.
6 Nipple, 3/4 x 2 in.
7 Manifold bolt, hex-hd, No. 12-24 x 1 3/4 in. (5)
8 Washer, lock, No. 12 (5)
9 Motor air manifold
10 Seal ring (2)
11 Live air stud screw
12 Washer, lock
13 Reverse valve hold stud pin
14 Reverse valve hole stud
15 Live air stud
16 Screw, cap, sq-hd, 5/8-11 x 2 1/2 in. (4)
17 Nut, hex, 5/8-11 (4)
18 Washer, lock, 5/8 in. (4)
19 Worm housing clamp (2)
20 Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)
21 Washer, lock 5/16 iin. (4)
22 Exhaust cover
23 Thrust plate
24 Upper bearing cap
25 Upper bearing spring
26 Lubrication fitting, 1/8 in.
27 Screw, hex-, 5/16-24 x 3/4 in. (8)
28 Washer, lock, 5/16 in. (8)
29 Gear case
30 Nut, self-locking, hex, 3/8-24 (4)
31 Drive gear
32 Thrust bewaring
33 Bearing stud
34 Rotary valve
35 Cylinder liner key
36 Rotary valve bushiong
37 Grease plug
38 Grease plug washer
39 Cylinder liner cap (4)

Figure 6-4(1)—Continued.

nicks, burrs, and elongated pin holes. Remove minor nicks and burrs with a fine file or handstone. Replace if other damage is evident.

g. Inspect pistons (82) for cracks, nicks, burrs, scoring marks, and out-of-round condition. Check that piston wrist pins (81) have a smooth sliding fit in pistons and connecting rods (93 and 94). Replace pistons if any damage is evident. Do not attempt to repair damaged pistons.

h. Inspect cylinder liners (80) for scoring marks, out-of-round condition, and wear. Using a micrometer or other suitable instrument, check the bore of the cylinder liners. If worn to more than 1.753 inches, replace the cylinder liners.

i. If new pistons (82) or cylinder liners (80 are to be installed, it may be necessary to lap the pistons in the cylinder liners. Use a very fine, mild lapping compound. Install the connecting rod (93 or 94) on the piston to use as a handle. Lap until a smooth, sliding fit is obtained. After lapping, clean parts with an approved solvent to remove all traces of lapping compound.

j. Inspect rotary valve (34) for scoring marks and wear. Using a micrometer or other suitable instrument, check the valve diameter. If worn to less than 1.121 inches, replace the rotary valve.

k. Inspect rotary valve bushing (36), sprocket and worm spacers (61, 65, and 68), and idler wheel bushings (49) for wear, scoring marks, and out-of-round condition. Replace parts if unserviceable.

l. Inspect motor air manifold (9), cylinder case (96), gear case (29) and worm housing (71) for cracks, breaks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove minor nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace the parts if damage cannot be repaired.

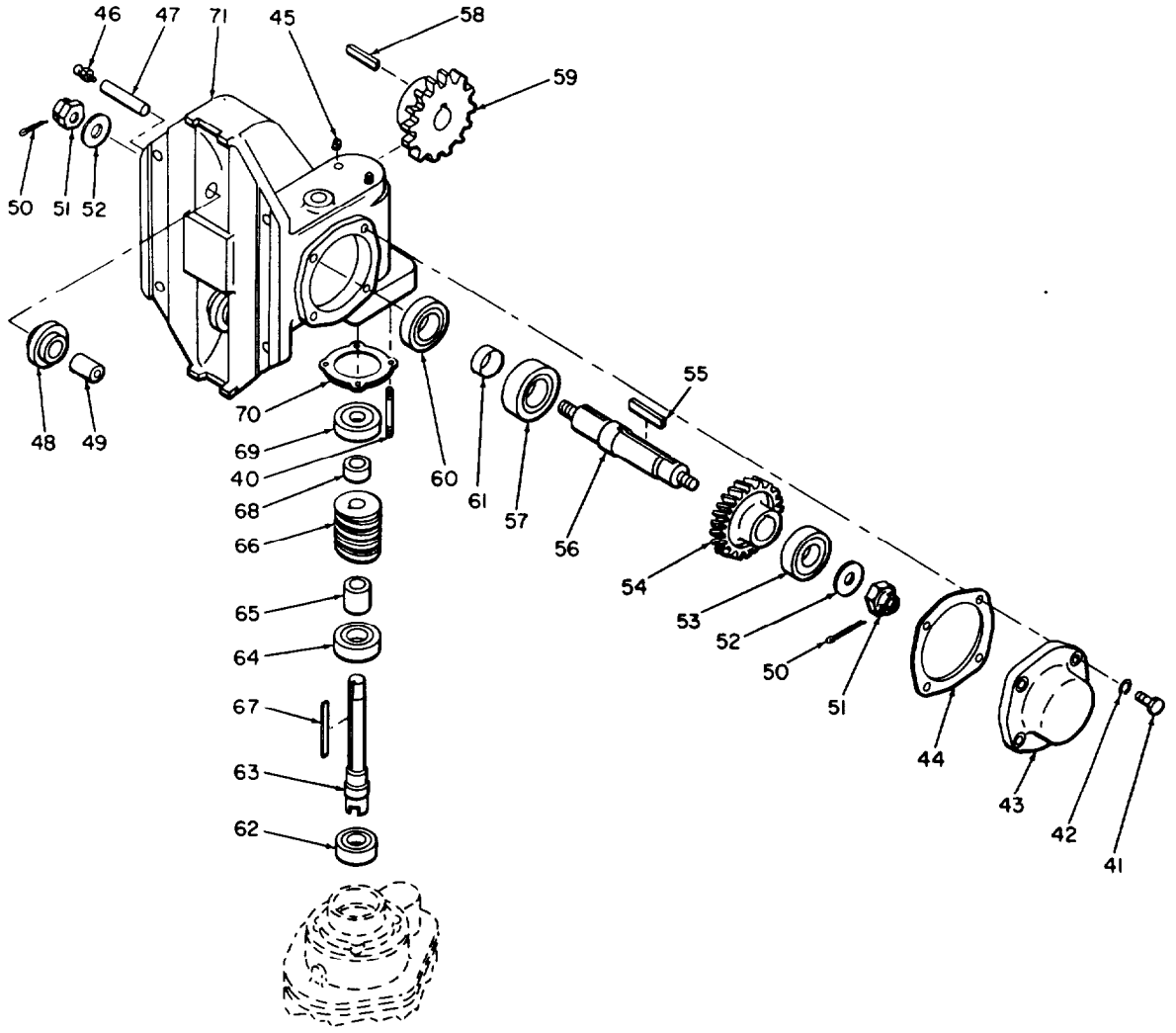
m. Inspect reverse valve hole stud (14), live air stud (15), bearing stud (33), idler wheel shafts (47), sprocket shaft (56), and worm shaft (63) for cracks, wear, and breaks. Replace parts if unserviceable.

n. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

o. Inspect compression springs (8, fig. 6-3) for damage and distortion. Replace if unserviceable.

p. Replace all O-rings in remote control manifold (fig. 6-3).

q. Inspect spools (24 through 27) and drill spool body (31) of remote control manifold for cracks, burrs, chips, and other damage. Do not attempt to repair damaged spools.



MEC 3820-239-15/6-4②

Figure 6-4(2)—Continued.

40 Worm housing stud (4)
41 Screw, cap, hex-hd, 1/2-13 x 1 in.
42 Washer, lock 1/2 in. (4)
43 Housing cap
44 Housing cap shim
45 Pipe plyg, 1/8 in. (2)
46 Lubrication fitting, 1/8 in. (2)
47 Idler wheel shaft (2)
48 Idler wheel (2)
49 Idler wheel bushing (2)
50 Cotter pin (2)
51 Sprocket shaft nut, 5/8-18 (2)
52 Sprocket shaft washer, 5/8 in. (2)
53 Outer worm wheel bearing
54 Worm wheel
55 Worm wheel key
56 Sprocket shaft
57 Inner worm whhel bearing
58 Sprocket key
59 Sprocket
60 Sprocket shaft gear seal
61 Sprocket spacer
62 Worm shaft grease seal
63 Worm shaft
64 Inner worm bearing
65 Long worm spacer
66 Worm
67 Worm key
68 Short worm spacer
69 Outer worm bearing
70 Gear case shim
71 Worm housing

Figure 6-4(2)-Continued.

6-13. Reassembly

a. Complete Drill Guide. Reassemble complete drill guide in reverse of numerical sequence as illustrated on figure 6-7.

b. Drill Mounting Plate. Reassemble drill mounting plate in reverse of numerical sequence as illustrated on figure 6-6.

c. Centralizer. Reassemble centralizer in reverse of numerical sequence as illustrated on figure 6-5.

d. Air Feed Motor. Reassemble air feed motor in reverse of numerical sequence as illustrated on figure 6-4 ((1) through (3)) Follow the procedure specified below:

Note. Coat all parts with clean engine oil as an aid in reassembly.

(1) Install cylinder liners (80, fig. 6-4) in cylinder case (96) using cylinder liner keys (79) to aline the keyways of the cylinder liners. Use a hammer and wooden block to seat the cylinder liners. Install cylinder liner caps (39).

(2) Install connecting rods (93 and 94) in pistons (82), and secure with piston wrist pins (81).

(3) Insert Woodruff key (74) in the keyway of crank pinion (73). Using a suitable bearing pusher to bear on the inner race, install lower crank bearing (75) on the crank pinion.

Note. Do not install crank pinion bearing (72) at this time.

(4) Alining the Woodruff key with the slot in lower throw crank (90), install the crank pinion and attached parts.

(5) Using a suitable hearing pusher to bear on the inner race, install upper crank bearing (84) on upper throw crank (89). Install nut (83).

(6) Mesh an inside connecting rod (94) with an outside connecting rod (93), and press connecting rod bushing (92) into the rods. Repeat the procedure for the other set.

(7) Install crank pin sleeves (91) on shafts of upper and lower throw cranks (89 and 90), and insert the connecting rod bushings, with attached connecting rods and pistons, into the crank pin sleeves.

(8) Insert pinch bolt (88) through the wrong side of crank center piece (95 to spread the web.

(9) Insert the assembled throw cranks into crank center piece (95) so that the“X” marked on the end of the crank and the crank center piece are matched. Aline the pin holes and lightly tap in crank pins (85). Remove the pinch bolt (88), and insert it in the correct position (fig. 6-4). Install castellated nut (87), tighten nut and bolt securely, and install cotter pin (86). Spread the ends of

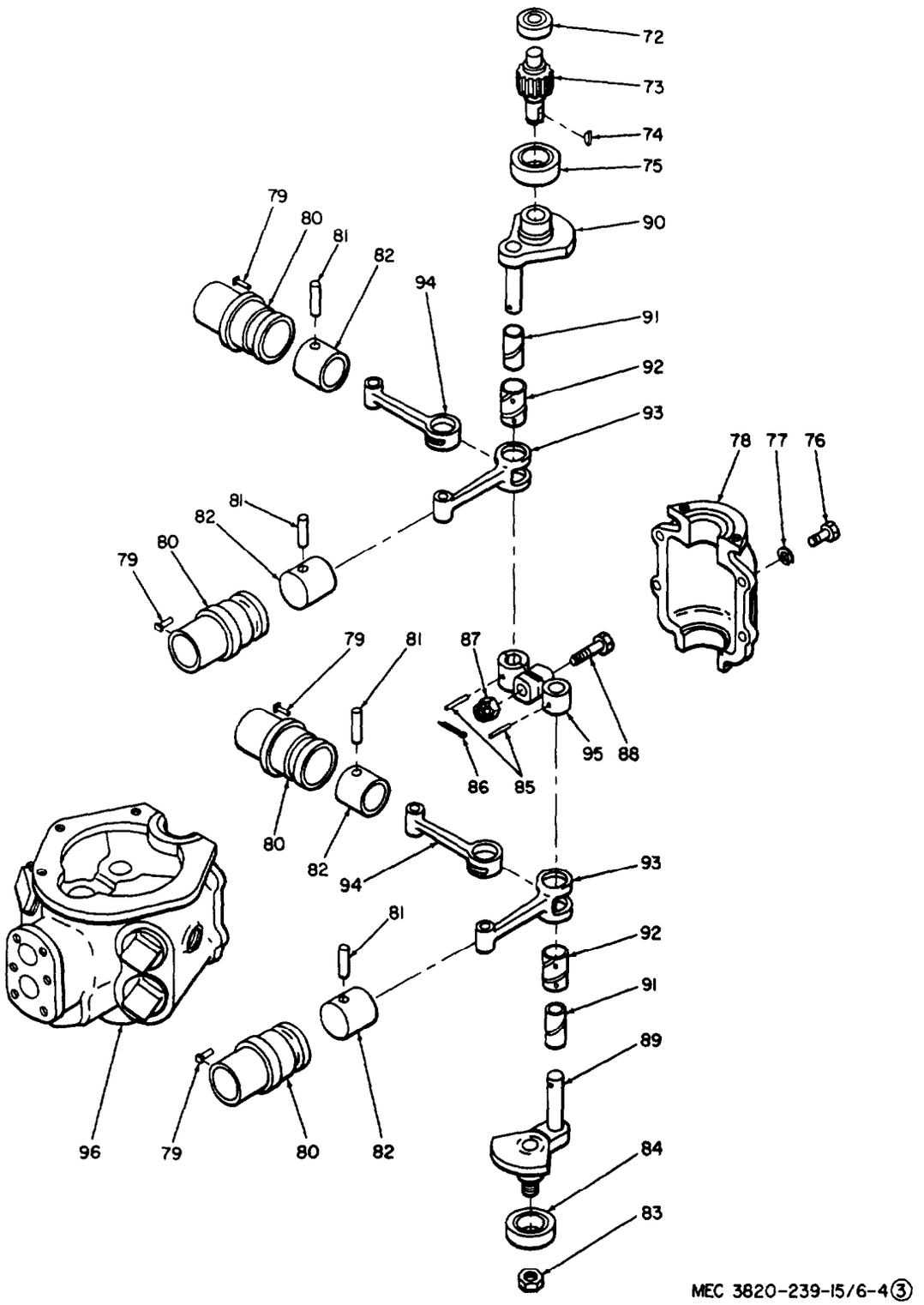


Figure 6-4(3)—Continued.

72 Crank pinion bearing
73 Crank pinion
74 Woodruff key
75 Lower crank bearing
76 Screw, cap, hex-hd, 5/16 -24
77 Washer, lock 5/16 in. (4)
78 Crank shaft cap
79 Cylinder liner key (4)
80 Cylinder liner (4)
81 Piston wrist pin (4)
82 Piston (4)
83 Nut, hex, 9/16-20
84 Upper crank bearing
85 Crank pin (2)
86 Cotter pin
87 Nut, castellated, 7/16-20
88 Pinch bolt, hex 7/16-20 x 1/58 in.
89 Upper throw crank
90 Lower throw crank
91 Crank pin sleve (2)
92 Connnecting rod bushing (2)
93 Outside connecting rod (2)
94 Inside connecting rod (2)
95 Crank center piece
96 Cylinder case

Figure 6-4(3)--Continued.

crank pins (85) and bend over the ends of the cotter pin.

(10) Install the assembled crank parts into cylinder case (96), being careful not to damage the pistons (82). Tilt the crank as necessary to allow each piston to enter its cylinder liner (80).

(11) Install crank shaft cap (78).

(12) Press idler wheel bushings (49) into idler wheels (48). Position the idler wheels in the recess of worm housing (71) and press idler wheel shafts (47) through the housing and the bushings. Install lubrication fittings (46) on the idler wheel shafts.

(13) Insert worm wheel key (55) in the slot of sprocket shaft (56). Aline the keyway of worm wheel (54) with the key, and press the worm wheel onto the shaft.

(14) Using a suitable bearing pusher to bear on the inner races, press inner and outer worm wheel bearings (57 and 53) onto sprocket shaft (56).

(15) Install sprocket shaft washer (52) and sprocket 'shaft nut (51) on the worm wheel end of sprocket shaft (56). Install cotter pin (50) and bend over the ends to lock the nut.

(16) Install sprocket spacer (61) and sprocket shaft gear seal (60) on the sprocket end of sprocket shaft (56).

(17) Insert sprocket key (58) in the slot o sprocket shaft (56). Insert sprocket (59) into the side of worm housing (71), and install the assembled sprocket shaft (56), so that the sprocket fits over the shaft and the keyway is alined with the key. Secure the parts by installing sprocket shaft washer (52), sprocket shaft nut (51), and cotter pin (50).

(18) Install housing cap shim (44) and housing cap (43), and secure with screws (41) and lock washers (42).

(19) Using a suitable bearing pusher to bear on the inner race, install inner worm bearing (64) on worm shaft (63). Install long worm spacer (65). Insert worm key (67) in the slot of worm shaft (63), and install worm (66) over the key on the shaft. Install short worm spacer (68).

(20) Using a suitable bearing pusher to bear on the inner race, install outer worm bearing (69) on worm shaft (63).

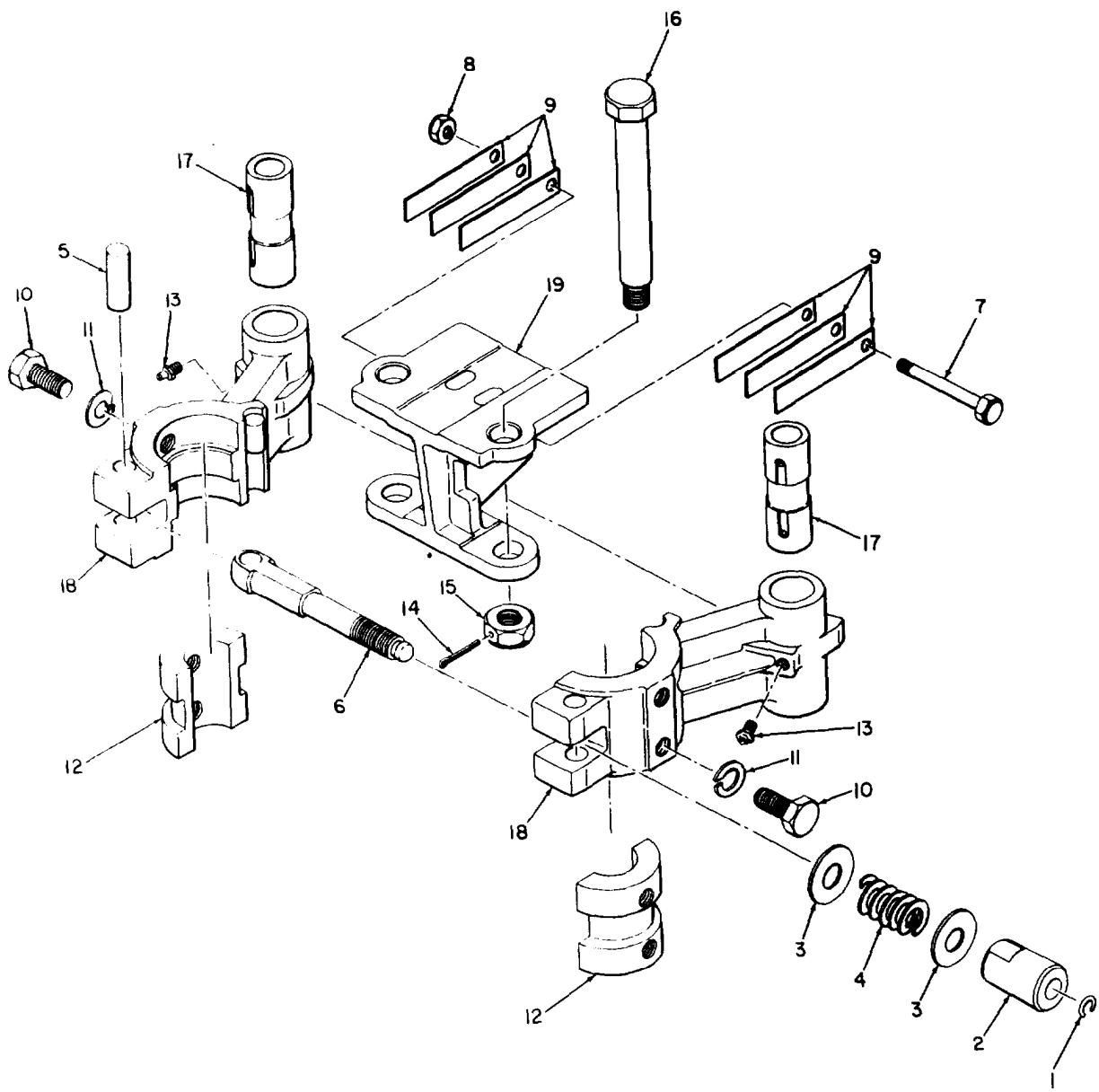
(21) Install the assembled worm shaft parts (62 through 69) in worm housing (71), turning the shaft to engage worm (66) with worm wheel (54).

(22) Install worm housing studs (40) and place gear case shim (70) over the studs on the machined surface of worm housing (71).

(23) Install pipe plugs (45).

(24) Install worm shaft grease seal (62) in the upper (worm housing) end of gear case (29).

(25) Mount gear case (29) over the studs installed in worm housing (71), and secure with self-locking nuts (30).



MEC 3820-239-15/6-5

Figure 6-5. Centralizer, exploded view.

1 Retaining ring
2 Centralizer swing bolt hand grip
3 Washer, flat, 3/4 in. (2)
4 Centralizer swing bolt spring
5 centralizer swing bolt pin
6 Centralizer swing bolt
7 Screw, cap, hex-hd, 3/8-16 x 3 1/2 in.
8 Nut, self-locking hex, 3/8-16
9 Centralizer arm spring (6)
10 Screw, cap, hex-hd, 5/8-18 x 1 1/2 (4)
11 Washer, lock 5/8 in. (4)
12 Centralizer am half bushing (2)
13 Alemite fitting (2)
14 Cotter pin (2)
15 Nut, hex, slotted, 7/8-14 (2)
16 Centralizer arm bolt, 7/8-14 x 7 3/8 in. (2)
17 Centralizer arm botl bushing (2)
18 Centralizer arm (2)
19 Centralizer bracket

Figure 6-5—Continued.

(26) Press rotary valve bushing (36) into cylinder case (96) through the exhaust cover opening. Make sure that the keyway in the bushing is alined with cylinder liner key (35). Ream the bushing if necessary.

(27) Install rotary valve (34) into cylinder case (96).

(28) Using a suitable bearing pusher to bear on the inner race, press thrust bearing (32), with the stamped marking THRUST HERE facing outward (away from the cylinder case), onto bearing stud (33). Press the bearing stud into the cylinder case (96).

(29) Rotate the crank assembly (in the cylinder case) until the 1/16-inch milled cut in crank pinion (73) is closest to bearing stud (33). Aline drive gear (31) on thrust bearing (32) so that the gear tooth marked with an arrow engages, the milled cut in the crank pinion (fig. 6-8). Insert a suitable piece of wire or a nail through the hole in the drive gear, and rotate the rotary valve (34, fig. 6-4) until the nail engages the hole in the rotary valve pinion (see fig. 6-3). When these criteria are met, seat the drive gear so that it meshes with crank pinion (73, fig. 6-4) and the pinion of rotary valve (34).

(30) Install crank pinion bearing (72) over drive gear (31) onto the shaft of crank pinion (73).

(31) Install upper bearing spring (25) and upper bearing cap (24). Install thrust plate (23) and exhaust cover (22).

(32) Install reverse valve hole stud (14) and live air stud (15) into cylinder case (96). Install seal rings (10) in motor air manifold (9).

(33) Secure motor air manifold (9) to cylinder case (96).

(34) Secure the assembled worm housing (71) and gear case (29) to cylinder case (96).

(35) If the air feed motor is to be installed immediately, do not install worm housing clamps (19) until the motor is mounted on the drill guide.

Note. If pistons (82) or cylinder liners (80) are replaced, it is recommended that the air feed motor be operated at approximately half-speed for several hours, to run in the parts.

e. Remote Control Manifold. Reassemble remote control manifold in reverse of numerical sequence as illustrated on figure 6-3.

f. Complete Drill Mounting. Reassemble complete drill mounting in reverse of numerical sequence as illustrated on figure 6-2.

6-14. Installation

Install the complete drill mounting as described in paragraph *5-12b.*

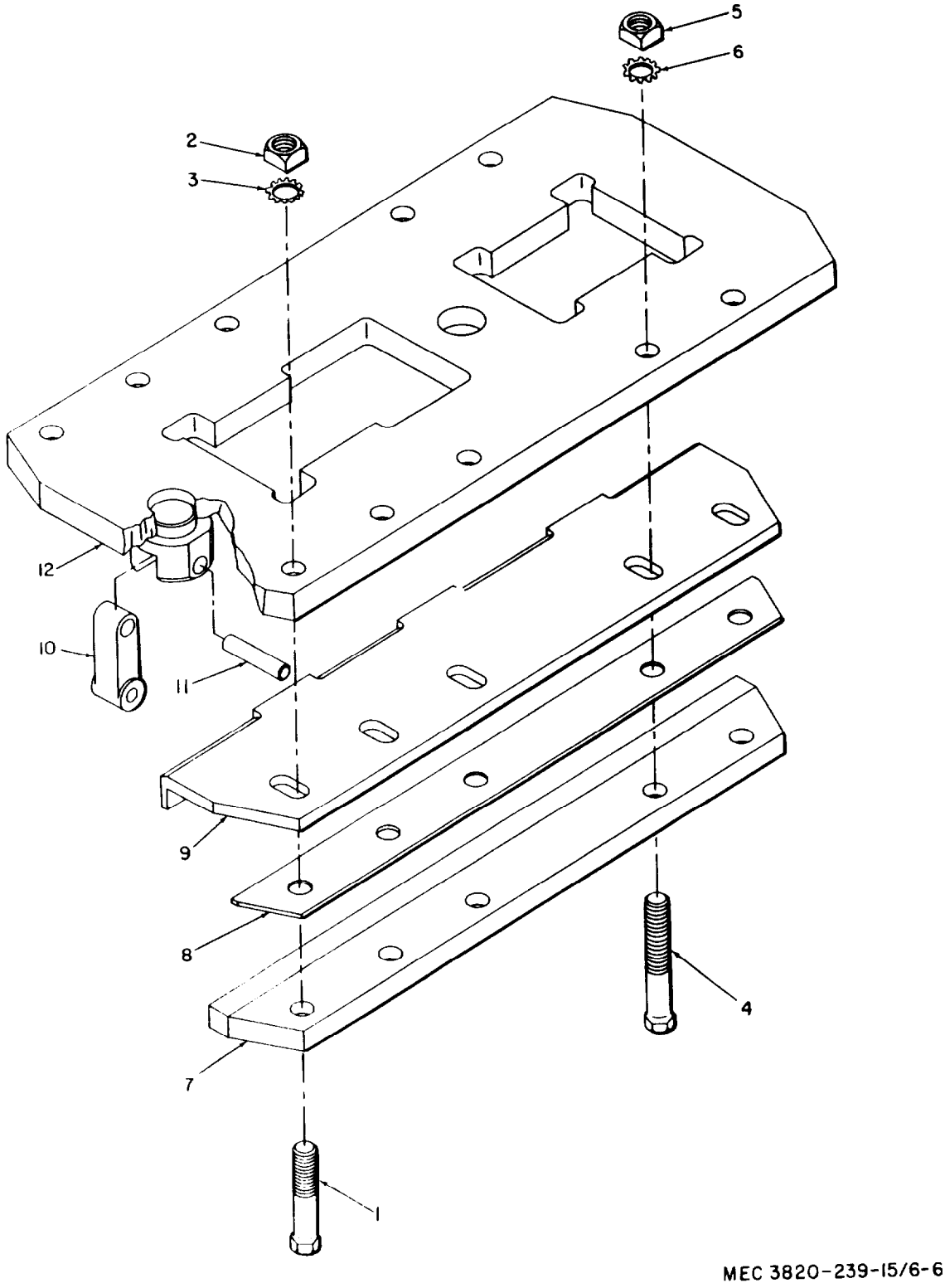


Figure 6-6. Drill mounting plate, exploded view.

1 Screw, cap, hex-hd, 5/8-11 x 3 1/4 in. (8)
2 Nut, square, 5/8-11 (8)
3 Washer, lock, external tooth, 5/8 in.
4 Screw, cap, hex-hd, 5/8-11 x 2 1/2 in. (2)
5 Nut, square 5/8-11 (2)
6 Washer, lock external tooth, 5/8 in. (2)
7 Drill mountihng clamp (2)
8 Drill mounting plate shim (12)
9 Drilll mounting plate shoe (2)
10 Drill mounting plate ink (2)
11 Link pin (2)
12 Drill mounting plate

Figure 6-6—-Continued.

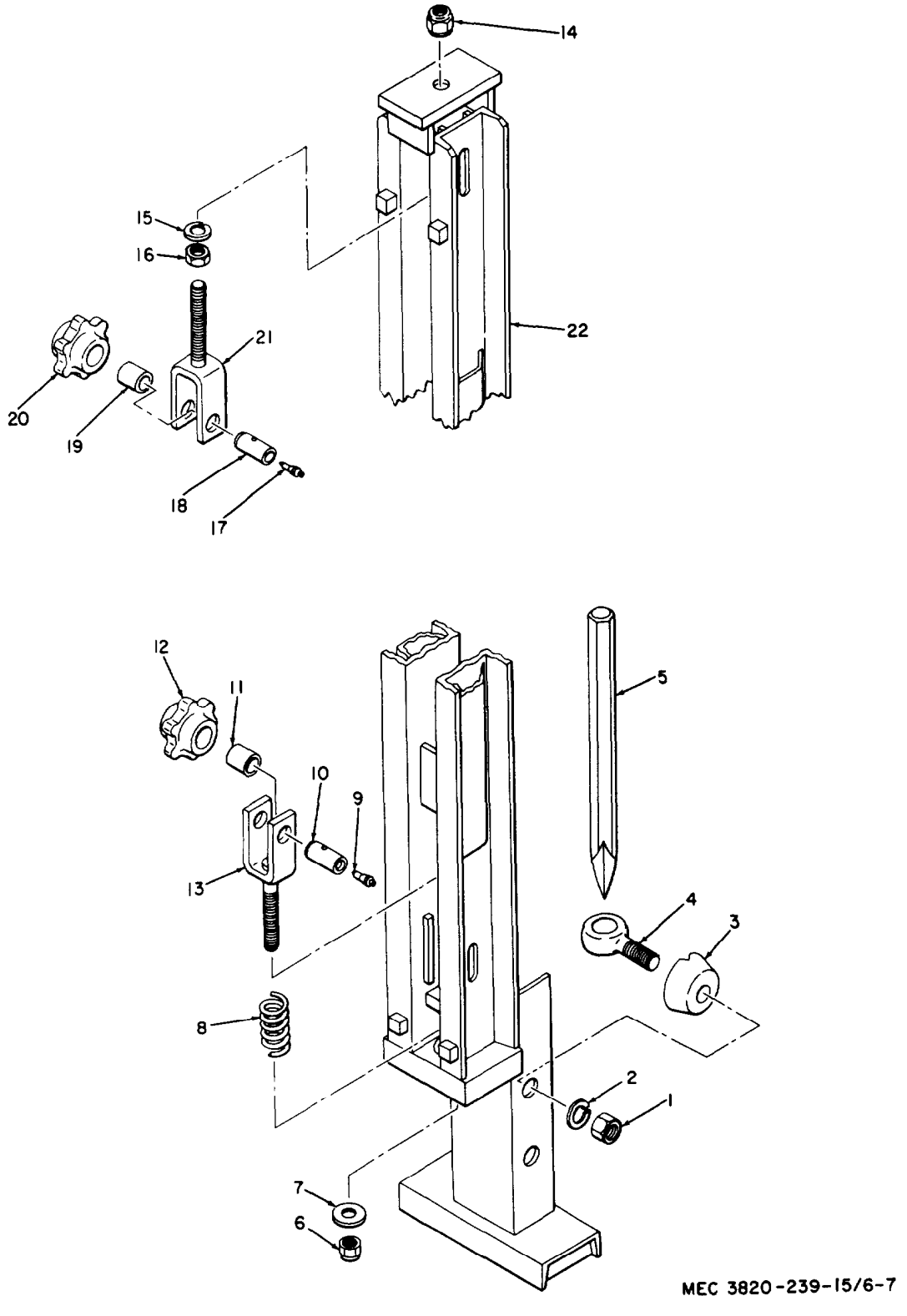


Figure 6-7. Complete drill guide, exploded view.

1 Nut, hex, 1-8 (2)
2 Washer, lock 1 in. (2)
3 Foot piece pointer clamp (2)
4 Foot piece clamp bolt (2)
5 Foot piece pinter
6 Nut, self-locking hex, 3/4-10
7 Washer, flat, 3/4 in.
8 Spring
9 Lubrication fitting
10 Sprocket shaft
11 Tower sprocket bearimg
12 Tower sprocket
13 Sprocket yoke
14 Nut, self-locking hex, 3/4-10
15 Washer, lock, 3/4 in.
16 Nut, jam, 3/4-10
17 Lubricating fitting
18 Sprocket shaft
19 Tower sprocket bearing
20 Tower sprocket
21 Sprocket yoke
22 Drill guide

Figure 6-7—Continued.

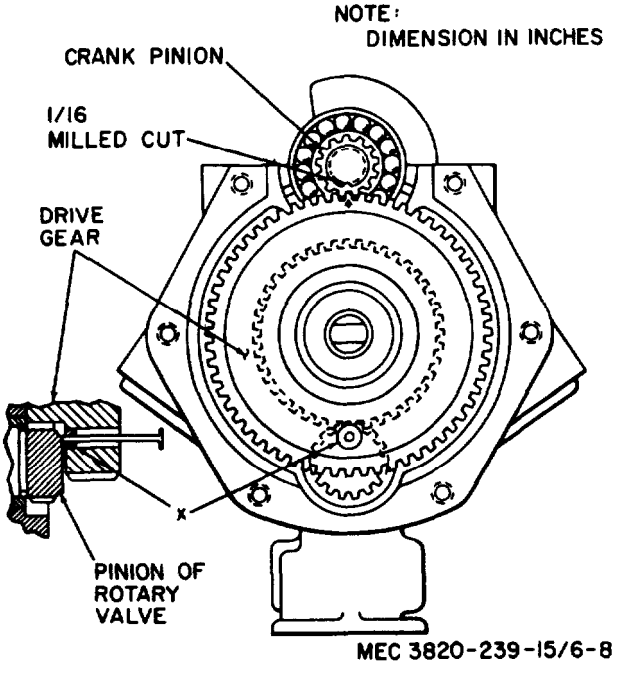


Figure 6-8. Air feed motor, valve timing details.

Section III. HYDRAULIC PUMP ASSEMBLY

6-15. General

This section contain repair instructions for the hydraulic pump assembly. The assembly consists essentially of an air motor which drives a hydraulic pump through a flexible coupling. The pump provides all of the hydraulic power to drive the hydraulic cylinders, which position the boom and drill guide.

6-16. Removal

Remove the hydraulic pump assembly as described in paragraph 3-43.

6-17. Disassembly

a. General. Disassemble hydraulic pump assembly in the numerical sequence as illustrated on figure 6-9. Note the following special procedures.

(1) Rotate flexible coupling (14, fig. 6-9) until setscrews (1) are visible. Loosen both setscrews.

(2) Remove screws (10), nuts (11), and lock washers (12), and slide hydraulic pump (13) out of flexible coupling (14). Remove the flexible coupling and square key (15).

Note. Tighten set-screws in flexible coupling (14) to avoid their falling out and becoming lost. If the key of the hydraulic pump falls out, keep it with the pump.

b. Hydraulic Pump. Disassemble hydraulic pump in the numerical sequence as illustrated on figure 6-10. Note the following special procedures:

(1) Mark the position of cover (2, fig. 6-10) with respect to body (17) before removal, so that the parts will be assembled with the proper orientation.

(2) Pull pressure plate (4), spring (3), pins (5), ring (7), and rotor (8) off drive shaft (16).

Note. Mark the position of ring (7) and pins (6) to facilitate assembly.

(3) Remove and discard O-rings (6).

(4) Remove snap ring (10). Using a mallet, tap on the end of drive shaft (16), to free the shaft with assembled parts from body (17).

Note. Bearings (11 and 13), seal (14), and spacer (16) are press-fitted on drive shaft (16).

(5) Using a suitable bearing puller, remove bearing (11) from drive shaft (16).

(6) Remove bearing (13) from body (17) by tapping it out with a drift punch.

Note. Do not remove seal (14) from drive shaft (16) unless it is damaged. The seal must be replaced once it is removed.

(7) If required, tap key (12) out of the slot in drive shaft (16).

c. Air Motor. Disassemble air motor in the numerical sequence as illustrated on figure 6-11. Note the following special procedures:

(1) After removing housing cover (4, fig. 6-11), loosen the motor in the housing by tapping the end of motor pinion (14) with a mallet. Remove the assembled parts from motor housing (19).

(2) Hold the assembly in an upright position by clamping motor pinion (14) in soft vise jaws. Remove the left-hand threaded rotor lock screw (6).

(3) Insert a 5/16-inch diameter steel rod (approximately 5 1/2 inches long) through rotor (15).

(4) Holding cylinder (12) with one hand (never clamp the cylinder in a vise), drive on the end of the steel rod until rotor (15) is freed from rear ball bearing, rear end plate (10), rotor bearing spacer (11), cylinder (12), and vanes (13) from rotor (16).

(5) Support front end plate (17) as closely as possible to the large diameter of rotor (15), and press on the end of motor pinion (14) until front ball bearing (16) and the front end plate are freed.

(6) Only if replacement of either motor pinion (14) or rotor (15) is required, support the front face of rotor, and insert a steel rod per step (3) into the bore of the rotor. Press on the rod until the motor pinion is freed.

6-18. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

Caution: **Do not spin ball bearings with compressed air.**

6-19. lnspection and Repair

a. Inspect bearings (11 and 13, fig. 6-10, and 9 and 16, fig. 6-11) for looseness, wear, roughness and binding while being rotated. Replace bearings if these defects are noted.

b. Inspect vanes (9, fig. 6-10 and 13, fig. 6-11) for chips and wear. If any vanes require replacement, use a complete set (12 for the hydraulic pump or 5 for the air motor).

c. Inspect rotors (8, fig. 6-10 and 15, fig. 6-11) for cracks, scores, and rough spots. Remove rough spots and score marks with a piece of emery cloth. Replace if badly worn or damaged.

d. Inspect cylinder (12, fig. 6-11) for cracks, nicks, and burrs on the machined surface. Check that the bore is smooth. Remove slight nicks and burrs using a fine file or handstone. Polish the bore with emery cloth to remove scratches and sligh score marks. Replace if necessary.

GPO 812-695-7

e. Inspect housings and covers for cracks, nicks and burrs on machined surfaces, and for stripped and crossed threads. Remove nicks and burrs with a fine file or handstone. Retap or rechase damaged threads.

f. Inspect gaskets (5 and 18, fig. 6-11). Replace if worn, frayed, or otherwise damaged. Replace O-rings (6, fig. 6-10) regardless of condition.

g. Inspect all hardware for damaged threads. Retap or rechase all stripped and crossed threads. Replace if unserviceable.

h. Inspect end plates (10 and 17, fig. 6-11) for scratches or score marks on the faces. Remove slight damage by rubbing the plate on a piece of emery cloth placed on a smooth flat surface. If plates are badly scored or scratched, replace them.

6-20. Reassembly

a. Air Motor. Reassemble air motor by carefully following the step-by-step procedure given below:

(1) Place front end plate (17, fig. 6-11) on the bed of an arbor press. Start front ball bearing (16) squarely into the recess in the plate. Using the arbor press to bear only on the outer race of the bearing, press it in until seated.

(2) Stand rotor (15) on the arbor press. Using the press to bear only on the inner race of front ball bearing (16), press the bearing and end plate onto the rotor.

Caution: **Do not allow the end plate to bind against the rotor.**

(3) If motor pinion (14) was. removed from rotor (15), aline the serrations in the pinion shank with the rotor and press the pinion in up to the flange.

(4) Hold motor pinion (14) in soft vise jaws with the rotor upright. Install vanes (13), making sure they fit freely and do not project from either end of the rotor.

(6) Install cylinder (12) over rotor (15), and against front end plate (17). Make sure that the cylinder is installed correctly (when facing the air port in the cylinder, the dowel hole is to be to the right of the air port). Reverse the cylinder position if necessary.

(6) Install rotor bearing spacer (11) (chamfered side first) on shaft of rotor (15).

(7) Install rear ball bearing (9) (shield side first) in rear end plate (4) in the same manner as step (1).

(8) Stand rotor (15) with assembled parts on the bed of an arbor press. Position rear end plate (10), bearing side up, over the rotor, and using the arbor press to bear only on the bearing inner race, press the rear end plate on until the bearing contacts rotor bearing spacer (11).

(9) Install rotor bearing spring (7) over rear ball bearing (9) so that the spring prongs contact the bearing outer race.

(10) Install the left-hand threaded rotor lock screw securely.

(11) Install air port gasket (18), large open end first, into the air inlet side of motor housing (19) (fig. 6-11).

(12) Aline the dowel holes in rear end plate (10) and front end plate (17) with those in cylinder (12), and insert a 1/4-inch diameter rod at least 12 inches long, into the dowel holes, allowing the rod to protrude from the front end plate.

(13) Insert the rod into the dowel hole of motor housing (19) and slide the assembled motor parts into the housing. If necessary, tap the flanged face of the motor housing with a mallet to securely seat the motor assembly.

(14) Remove the rod and install cylinder dowel (8) to the bottom.

Note. When the dowel is completely seated, the end of the dowel should be slightly below the back face of mar end plate (10).

(15) Place housing cover gasket (5) over the boss on rear end plate (10). Seat the gasket centrally.

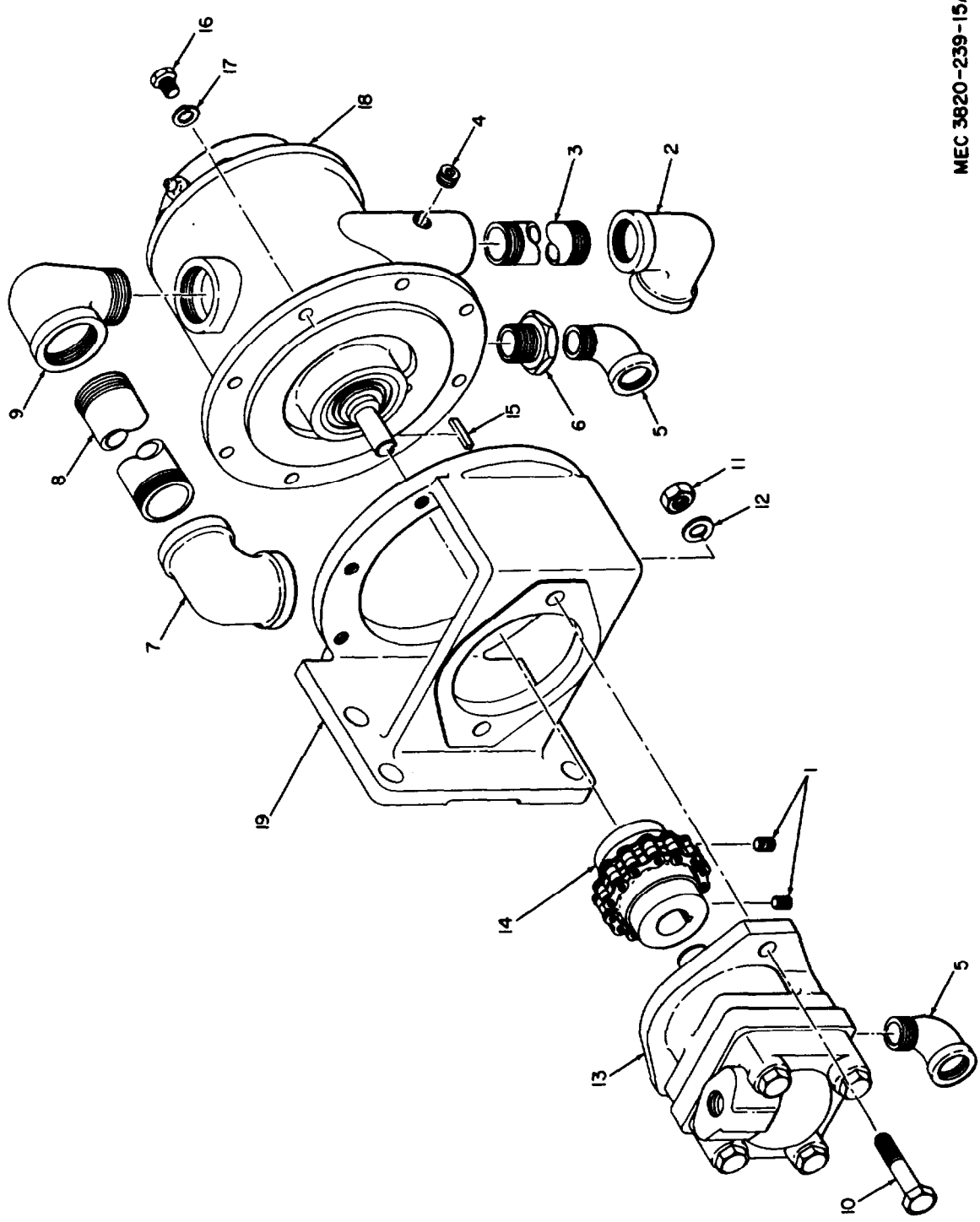
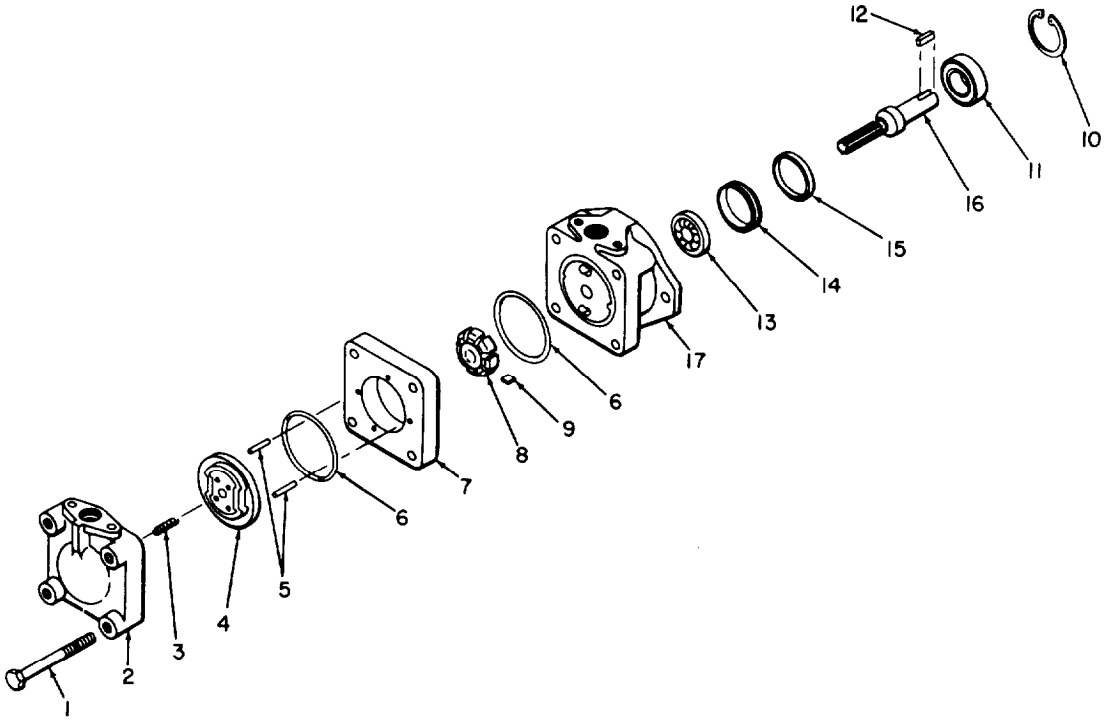


Figure 6-9. Hydraulic pump assembly, exploded view.

1 Setscrew (2)
2 Elbow, 90° x 3/4 in.
3 Nipple, 3/4 x 7 in.
4 Pipe plug, 1/8 in.
5 Street elbow, 90° x 1/2 in. (2)
6 Reducing bushing, 3/4 to 1/2 in.
7 Elbow, 90° x 1 in
8 Nipple, 1 x 6 in.
9 Street elbow, 90° x 1 in.
10 Screw, cap, hex-hd, 3/8-16 x 1 1/2 in. (2)
11 Nut, hex, 3/8-16 (2)
12 Washer, lock, 3/8 in. (2)
13 Hydraulic pump
14 Flexible coupling
15 Square key, 1/8 x 3/4 in.
16 Screw, cap, hex-hd, 5/16-18 x 7/8 in. (8)
17 Washer, lock, 6/16 in. (8)
18 Air motor
19 Pump mounting housing

Figure 6-9—Continued.



MEC 3820-239-15/6-10

1 Screw, hex-hd, 3/8-16 x 2 1/4 in. (4)
2 Cover
3 Spring
4 Pressure plate
5 Pin (2)
6 O-ring (2)
7 Ring
8 Rotor
9 Vane (12)
10 Snap ring
11 Bearing
12 Key
13 Bearing
14 Seal
15 Spacer
16 Drive shaft
17 Body

Figure 6-10. Hydraulic pump, exploded view.

(16) Install housing cover (4) with the mounting holes alined with tapped holes in motor housing (19). Install screws (2) and lock washers (3), tightening each screw evenly, in turn, to avoid binding. Check while tightening, by rotating motor pinion (14) by hand. If any binding is noted, tap

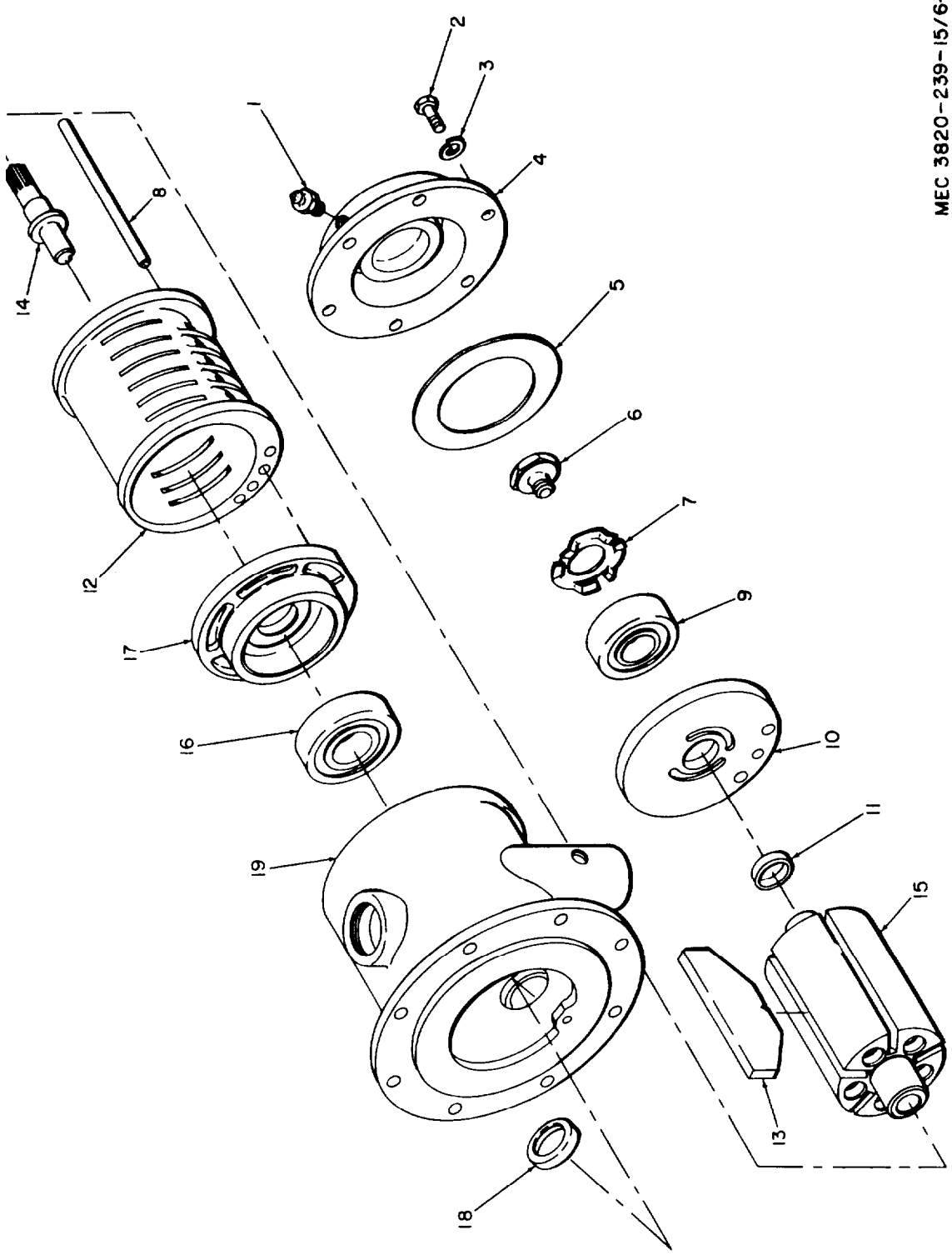


Figure 6-11. Hydraulic pump air motor, exploded view.

1 Alemite fitting, 1/8 in.
2 Screw, cap, hex-hd 1/4–20 x 3/4 in. (6)
3 Washer, lock, 1/4 in. (6)
4 Housing cover
5 Housing cover gasket
6 Rotor lock screw
7 Rotor bearing spring
8 Cylinder dowel
9 Rear ball bearing
10 Rear end plate
11 Rotor bearing spacer
12 Cylinder
13 Vane (5)
14 Motor pinion
15 Rotor
16 Front ball bearing
17 Front end plate
18 Air port gasket
19 Motor housing

Figure 6–11—Continued.

the flanged face of motor housing (19) with a mallet, to seat the parts and eliminate binding.

Note. Make sure motor pinion (14) can be rotated freely when housing cover (4) is installed.

b. Hydraulic Pump. Reassemble hydraulic pump by carefully following the step-by-step procedure given below:

(1) Before assembling, dip all parts in clean hydraulic oil. This will facilitate assembly, and provide adequate initial lubrication.

(2) Using a suitable bearing pusher to bear on the inner race of bearing (11, fig. 6-10), install the bearing on drive shaft (16).

(3) Using a suitable bearing pusher to bear on the outer race of bearing (13), install the bearing in body (17).

(4) Install spacer (15), seal (14), and key (12) on drive shaft (16).

Note. Make sure the seal is installed with the sealing lip facing the key end of the shaft, to prevent the entry of air into the system.

(5) Slide the assembled drive shaft (16) into body (17) until seated in bearing (13). Tap the drive shaft lightly with a mallet if necessary, to seat the parts.

(6) Using retaining ring pliers, install snap ring (10).

(7) Insert an O-ring (6) in the groove of body (17) and cover (2). Make sure the O-rings are seated properly to prevent leakage.

(8) Install ring (7) in the proper position as marked during disassembly, and secure with pins (5).

(9) Install rotor (8) on drive shaft (16) and insert vanes (9) in the rotor slots with the rounded edges facing outward.

(10) Stand the pump on its shaft end, and position pressure plate (4) on ring (7). Insert spring (3) into the center recess hole of the pressure plate.

(11) Install cover (2) in the proper position as marked during disassembly, and tighten screws (1) to a torque of 22 to 28 feet-pound.

Note. Check that the pump turns freely by hand. If the pump binds, disassemble and determine the cause of trouble.

c. Hydraulic Pump Assembly. Reassemble hydraulic pump assembly in reverse of numerical sequence as illustrated on figure 6-9. Note the following special procedures:

(1) After securing air motor (18, fig. 6-9) to pump mounting housing (19), loosen setscrews on flexible coupling (14). Make sure that square key (15) is installed in slot of air motor shaft, and slide the flexible coupling onto the shaft. Tighten the setscrew.

(2) Make sure that key of hydraulic pump (13) is installed on the shaft and insert the pump so that the key enters the keyway of flexible coupling (14). Install screws (10), nuts (ll), and lock washers (12), and tighten the setscrew (1) of the flexible coupling.

(3) Install elbows and fittings as shown on figure 6-9.

6-21. Installation

Install the hydraulic pump assembly as described in paragraph 3-44.

Section IV. HYDRAULIC VALVE ASSEMBLY

6-22. General

This section contains repair instructions for the hydraulic valve assembly. The hydraulic valve assembly contains the controls for operating the hydraulic cylinders to position the boom and the drill guide (fig. 1-5).

6-23. Removal

Remove the hydraulic valve assembly as described in paragraph 3-58.

6-24. Disassembly

a. Hydraulic Valve Assembly. Disassemble hydraulic valve assembly in the numeri-

cal sequence as illustrated on figure 6-12.

b. Hydraulic Valve. Disassemble hydraulic valve in the numerical sequence as illustrated on figure 6-13.

Note. Label each valve section as the parts are removed, and do not intermix spools (16, fig. 6-13) since they are individually fitted to the bores.

6-25. Cleaning

Clean all parts in an approved solvent and blow dry with compressed air. Be sure to thoroughly clean out and dry all internal passages in body (20, fig. 6-13).

6-26. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

c. Replace all O-rings, seals, and valve spacers.

d. Do not attempt to rework damaged spools (16, fig. 6-13) as this will result in excessive leakage and pressure loss.

6-27. Reassembly

a. Hydraulic Valve. Reassemble hydraulic valve in reverse of numerical sequence as illustrated on figure 6-13.

b. Hydraulic Valve Assembly. Reassemble hydraulic valve assembly in reverse of numerical sequence as illustrated on figure 6-12.

6-28. Installation

Install the hydraulic valve assembly as described in paragraph 3-59.

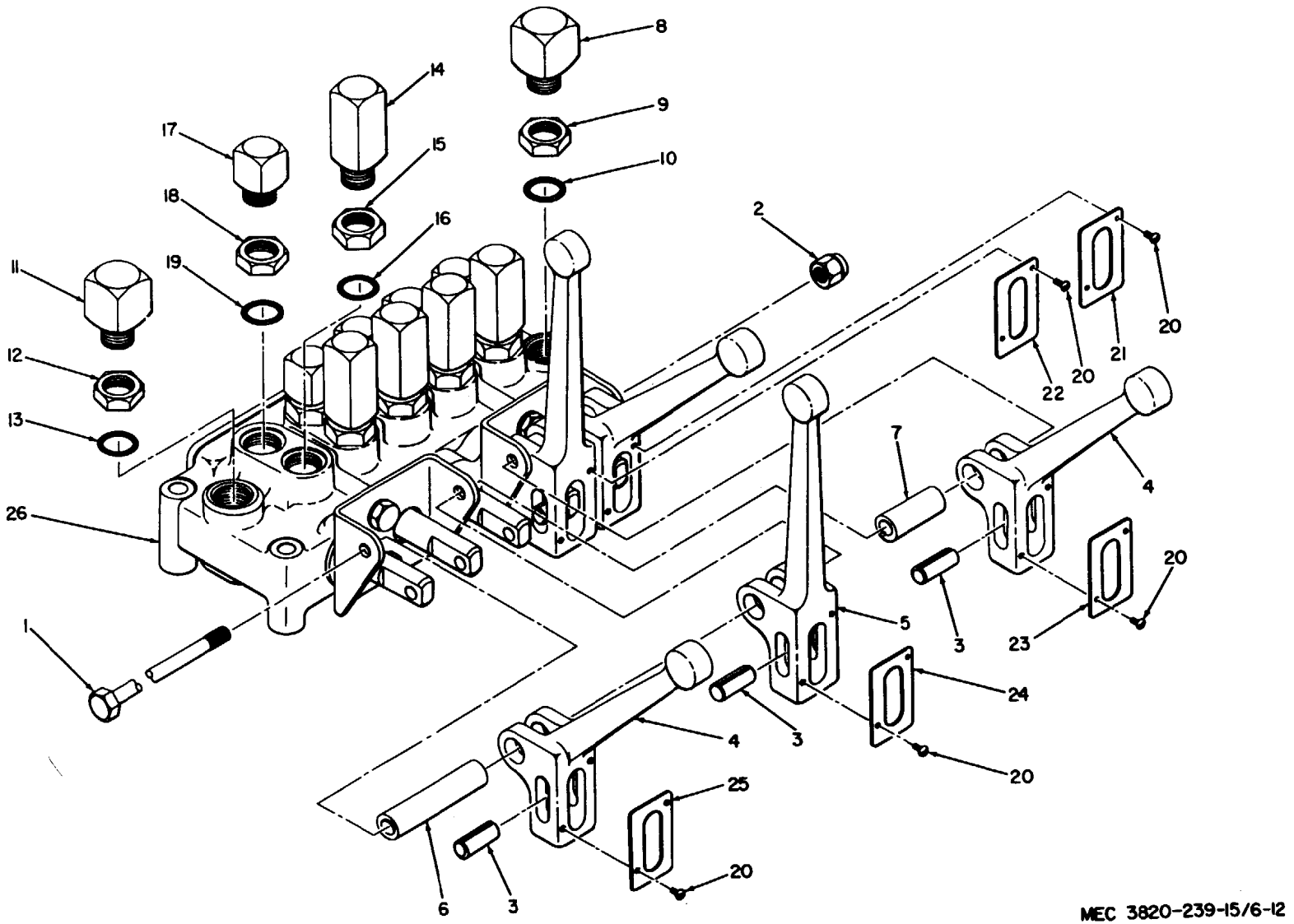


Figure 6-12. Hydraulic valve assembly, exploded

1 Control valve lever bolt, hex-hd, 3/8 x 8 1/2
2 Nut, self-locking, hex, 3/8-16
3 Spring pin (5)
4 Control valve lever (3)
5 Control valve lever (2)
6 Long spacer bushing (2)
7 Short spacer bushing
8 Boss fitting
9 Lock nut
10 O-ring
11 Boss fitting
12 Lock nut
13 O-ring
14 Boss fitting (5)
15 Lock nut (5)
16 O-ring (5)
17 Boss fitting (5)
18 Lock nut (5)
19 O-ring (5)
20 Drive screw, rd-hd, No. 2 x 3/16 in. (10)
21 Boom lift nameplate
22 Boom swing nameplate
23 Guide dump cylinder nameplate
24 Guide swing cylinder nameplate
25 Guide extension cylinder nameplate
26 Hydraulic valve

Figure 6-12—Continued.

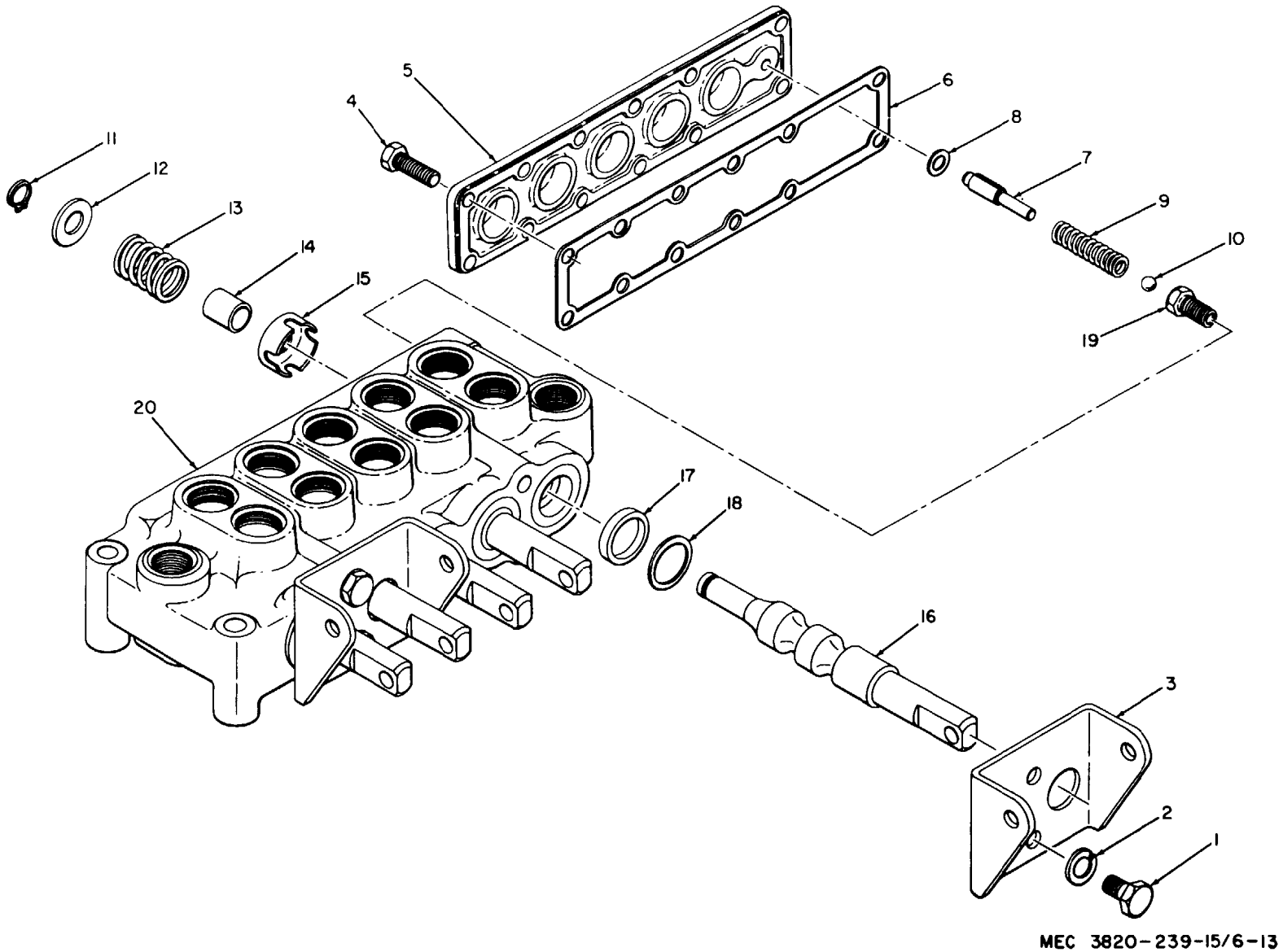


Figure 6-13. Hydraulic valve, exploded view.

1 Screw, cap, hex-hd, 3/8–16 x 5/8 in. (4)
2 Washer, lock, 3/8 in. (4)
3 Lever bracket (2)
4 Screw, cap, hex-hd, 1/4–20 x 5/8 in. (12)
5 Back cover
6 Back cover gasket
7 Limit pin
8 Pressure adjusting shim (as rqr)
9 Relief spring
10 Relief ball
11 Retaining ring (5)
12 Spool washer (5)
13 Spool return spring (5)
14 Spool stop (5)
15 Cup washer (5)
16 Spool (5)
17 V-ring packing (5)
18 Back-up ring (5)
19 Relief seat
20 Body

Figure 6–13—Continued.

Section V. MAIN AIR VALVE AND MANIF0LD LUBRICATOR

6-29. General

This section contains repair instructions for the main air valve and manifold lubricator. The main air valve is the on-off control for the air supply from the compressor. The manifold lubricator injects a preset quantity of rock drill oil into the air stream to provide lubrication for the air motors and drifter drill.

6-30. Removal

Remove the main air valve and manifold lubricator as described in paragraph 3-49.

6-31. Disassembly

a. Main Air Valve. Disassemble main air valve in the numerical sequence as illustrated on figure 6-14.

b. Manifold Lubricator. Disassemble manifold lubricator in the numerical sequence as illustrated on figure 6-15.

6-32. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-33. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

c. Replace all O-rings.

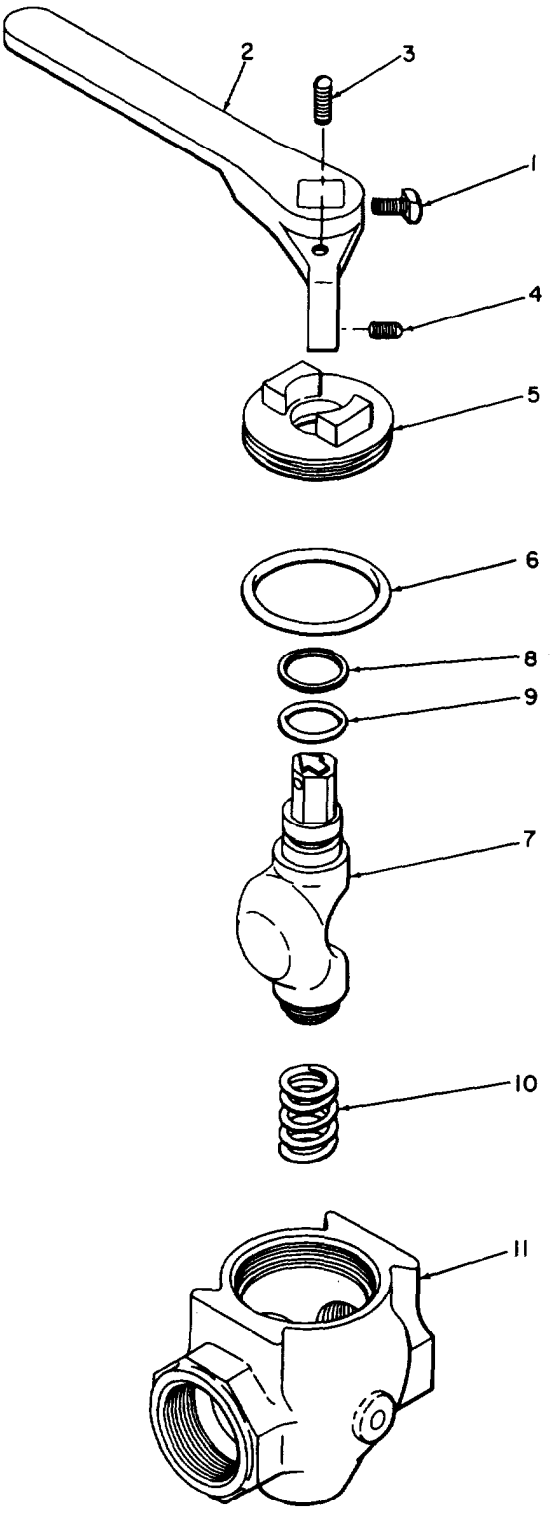
6-34. Reassembly

a. Main Air Valve. Reassemble main air valve in reverse of numerical sequence as illustrated on figure 6-14.

b. Manifold Lubricator. Reassemble manifold lubricator in reverse of numerical sequence as illustrated on figure 6-15.

6-35. Installation

Install the main air valve and manifold lubricator as described in paragraph 3-50.

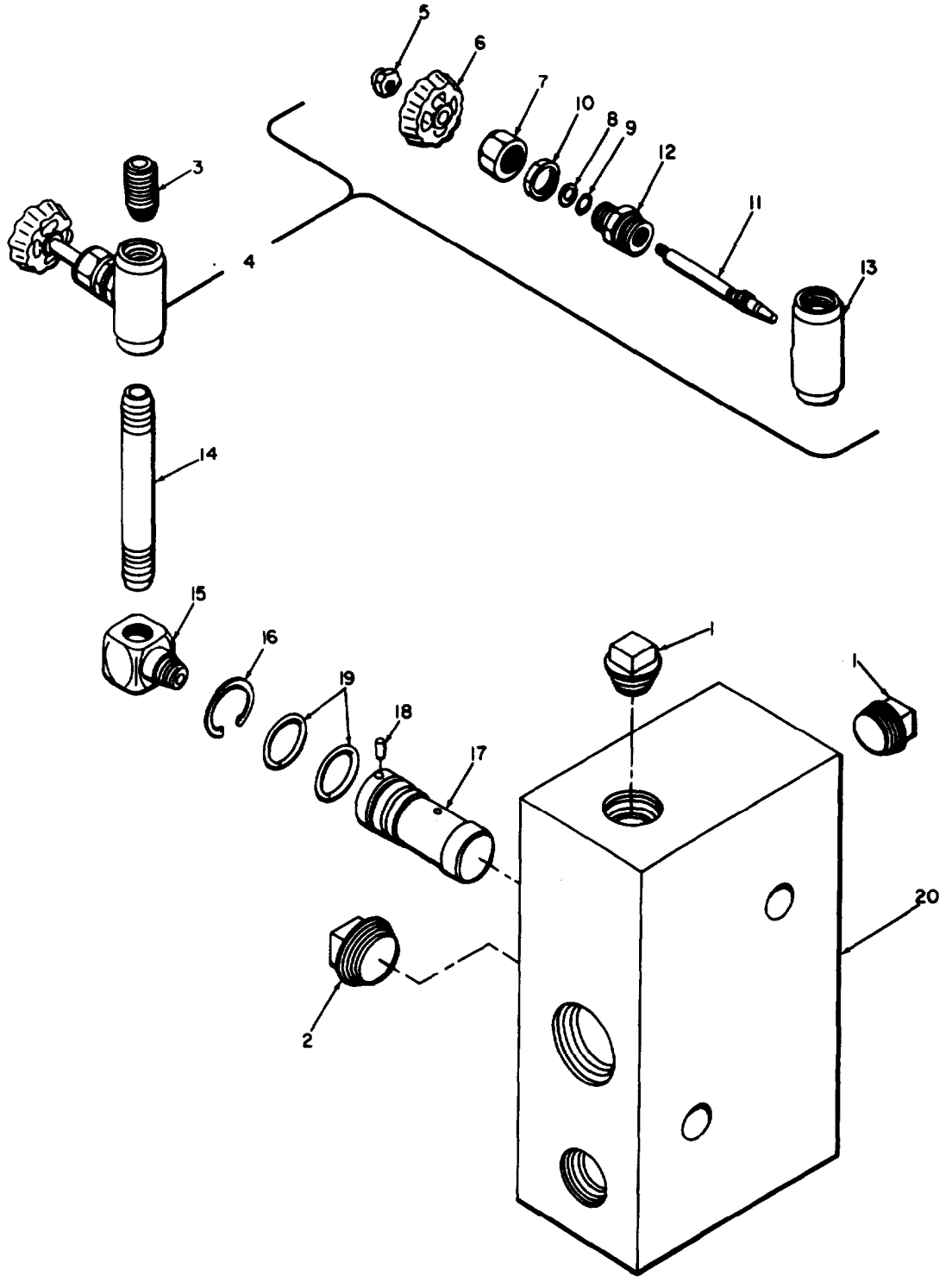


MEC 3820-239-15/6-14

Figure 6-14. Main air valve, exploded view.

1 Setscrew, sq-hd, 5/16-18 x 3/4 in.
2 Handle
3 Lock screw, headless, 5/16-18 x 1 1/4 in.
4 Setscrew, self-locking, 5/16-18 x 5/8 in.
5 Bonnet
6 O-ring
7 Plug
8 Backup ring
9 O-ring
10 Spring
11 Body

Figure 6-14—Continued.



MEC 3820-239-15/6-15

Figure 6-15. Manifold lubricator, exploded view.

GPO 812-695-8

1 Pipe plug, sq-hd, 3/4 in. (2)
2 Pipe plug, sq-hd, 1 in.
3 Nipple
4 Needle valve
5 Acorn nut
6 Handwheel
7 Packing nut
8 Packing washer
9 O-ring
10 Mounting nut
11 Spindle
12 Bonnet
13 Body
14 Nipple
15 Elbow
16 Retaining ring
17 Differential pressure nozzle
18 Dowel pin
19 O-ring (2)
20 Bare manifold lubricator

Figure 6-l5—Continued.

Section VI. PROPELLING CONTROL VALVES

6-36. General

This section contains repair instructions for the propelling control valves. The propelling control valves supply air to the propelling air motors to tram the pneumatic drill either forward or reverse. There are two valves used, one for each traction drive, and quantities specified throughout this section are for one valve.

6-37. Removal

Remove the propelling control valves as ,described in paragraph 3-61.

6-38. Disassembly

Disassemble propelling control valve in the numerical sequence as illustrated on figure 6-16.

6-39. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-40. inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unservicable.

c. Note that disc (11) and body (8) are matched parts and may not be replaced individually.

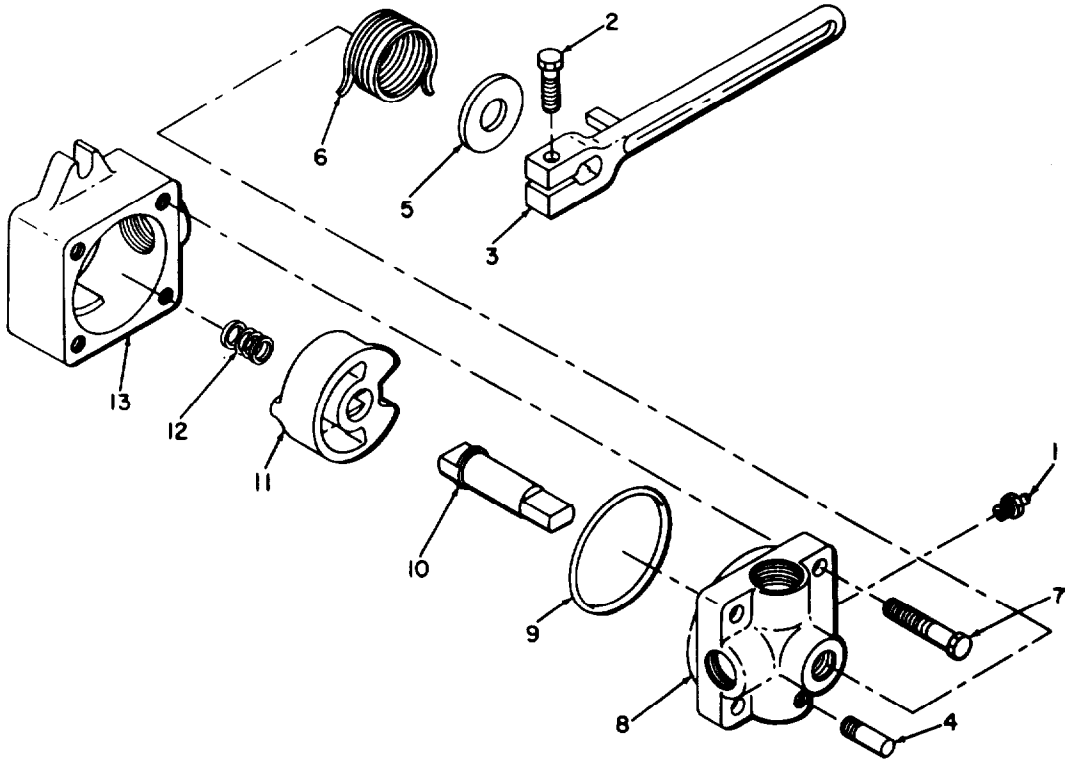
d. Replace O-ring (9).

6-41. Reassembly

Reassemble propelling control valve in reverse of numerical sequence as illustrated on figure 6-16.

6-42. Installation

Install the propelling control valves as described in paragraph 3-62.



MEC 3820-239-15/6-16

1 Lubrication fitting, 1/8 in.
2 Screw, cap, hex-hd, 5/l6-18 x 7/8 in.
3 Lever
4 Spring stop pin
5 Washer, flat, 21/32 ID x 2 OD x 1/8 in. thk
6 Lever spring
7 Screw, cap, hex-hd, 1/2-13 x 1 l/2 in. (4)
8 Body
9 O-ring
10 Spindle
11 Disc
12 Disc spring
13 Cap

Figure 6-16. Propelling control valve, exploded view.

Section VII. RETURN LINE OIL FILTER AND THROTTLE VALVE

6-43. General

This section contains repair instructions for the return line oil filter and throttle valve. The return line oil filter filters the hydraulic fluid before it returns to the hydraulic reservoir (fig. 1-5). The throttle valve is the on-off control for the hydraulic pump assembly, which furnishes the hydraulic power to position the booms and drill guide (fig. 1-5).

6-44. Removal

a. Return Line Oil Filter. To remove return line oil filter disconnect fittings (fig. l-5) from boom base area.

b. Throttle Valve. To remove throttle valve, disconnect fittings (fig. 1-5) and remove the throttle valve from the nipple on hydraulic valve mounting bracket.

6-45. Disassembly

a. Return Line Oil Filter. Disassemble return line oil filter in the numerical sequence as illustrated on figure 6-17. Discard filter element (5, fig. 6-17) and gasket (6).

b. Throttle Valve. Disassemble throttle valve in the numerical sequence as illustrated on figure 6-18.

6-46. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-47. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-48. Reassembly

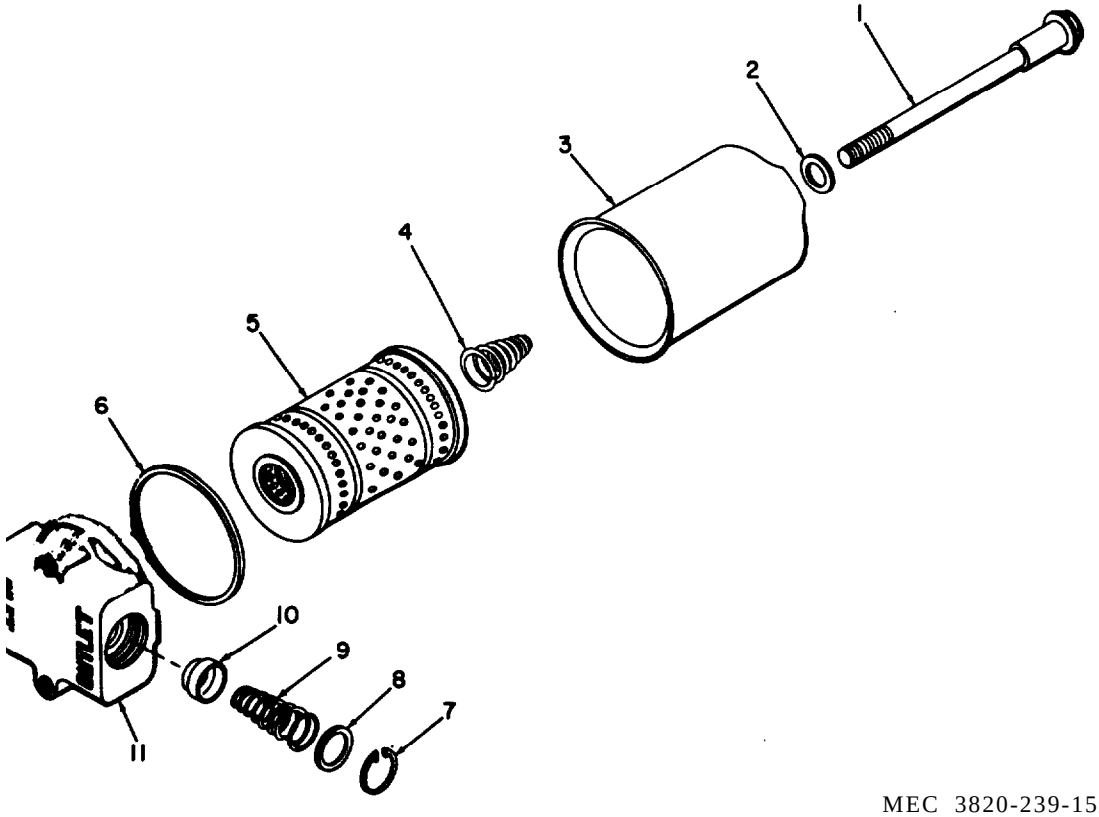
a. Return Line Oil Filter. Reassemble return line oil filter in reverse of numerical sequence as illustrated on figure 6-17. Tighten body bolt (1, fig. 6-17) to a torque of 12 to 16 feet-pound.

b. Throttle Valve. Reassemble throttle valve in reverse of numerical sequence as illustrated on figure 6-18.

6-49. Installation

a. Return Line Oil Filter. See figure 1-5 and connect the return line oil filter in the line to the hydraulic reservoir in the boom base assembly.

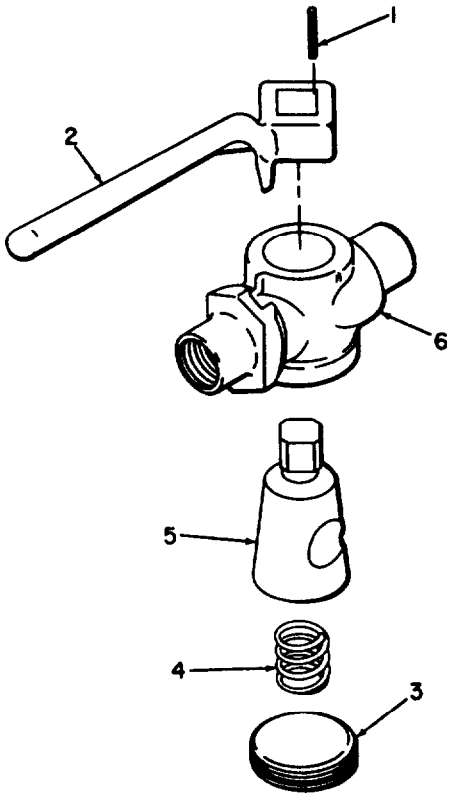
b. Throttle Valve. Mount the throttle valve on the nipple of the hydraulic valve mounting bracket. See figure 1-5 and connect the throttle valve fittings.



MEC 3820-239-15/6-17

1 Body bolt, hex-hd
2 Washer, flat
3 Filter body
4 Spring
5 Filter element
6 Gasket
7 Retaining ring
8 Washer, flat
9 Spring
10 Poppet
11 Base

Figure 6-17. Return line oil filter, exploded view.



MEC 3620-239-15/6-18

1 Spring pin, 5/32 dia x 1 3/16 in.
2 Handle
3 Plug
4 Spring
5 Stem
6 Valve body

Figure 6-18. Throttle valve, exploded view.

Section VIII. POWER DUMP AND SWING ASSEMBLY

6-50. General

This section contains repair instructions for the power dump and swing assembly. This assembly consists essentially of a dump cylinder and a swing cylinder, which hydraulically position the drill guide at the desired drilling angle in response to commands from the hydraulic valve assembly (fig. 1-5).

6-51. Removal

Remove the power dump and swing assembly as described in paragraph 5-14a.

6-52. Disassembly

a. Power Dump and Swing Assembly. Disassemble the power dump and swing assembly in the numerical sequence as illustrated on figure 6-19.

b. Dump Cylinder. Disassemble dump cylinder in the numerical sequence as illustrated on figure 6-20. Note the following special procedures:

(1) Using a suitable spanner wrench, unscrew retainer ring (8, fig. 6-20), and slide piston rod assembly (22) with all parts attached, out of barrel assembly (23).

(2) Remove lock nut (9). and take all parts off piston rod assembly (22) from the nut end of the rod.

(3) Discard all O-rings.

c. Swing Cylinder. Disassemble swing cylinder in the numerical sequence as illustrated on figure 6-21. Note the following special procedures:

(1) Pry snap ring (20, fig. 621) out of the groove in cylinder head (13).

(2) Using a suitable spanner wrench, unscrew cylinder head (13), and slide piston rod assembly (21) with all parts attached, out of barrel assembly (22).

Note. The cylinder head cannot be removed when unscrewed, since it will not fit over the fitting of the piston rod.

(3) Remove lock nut (8), and take all parts off piston rod assembly (21) from the nut end of the rod.

(4) After sliding cylinder head (13) off piston rod assembly (21) remove the parts (16 through 19) from the cylinder head.

(5) Discard all O-rings.

6-53. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-54. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-55. Reassembly

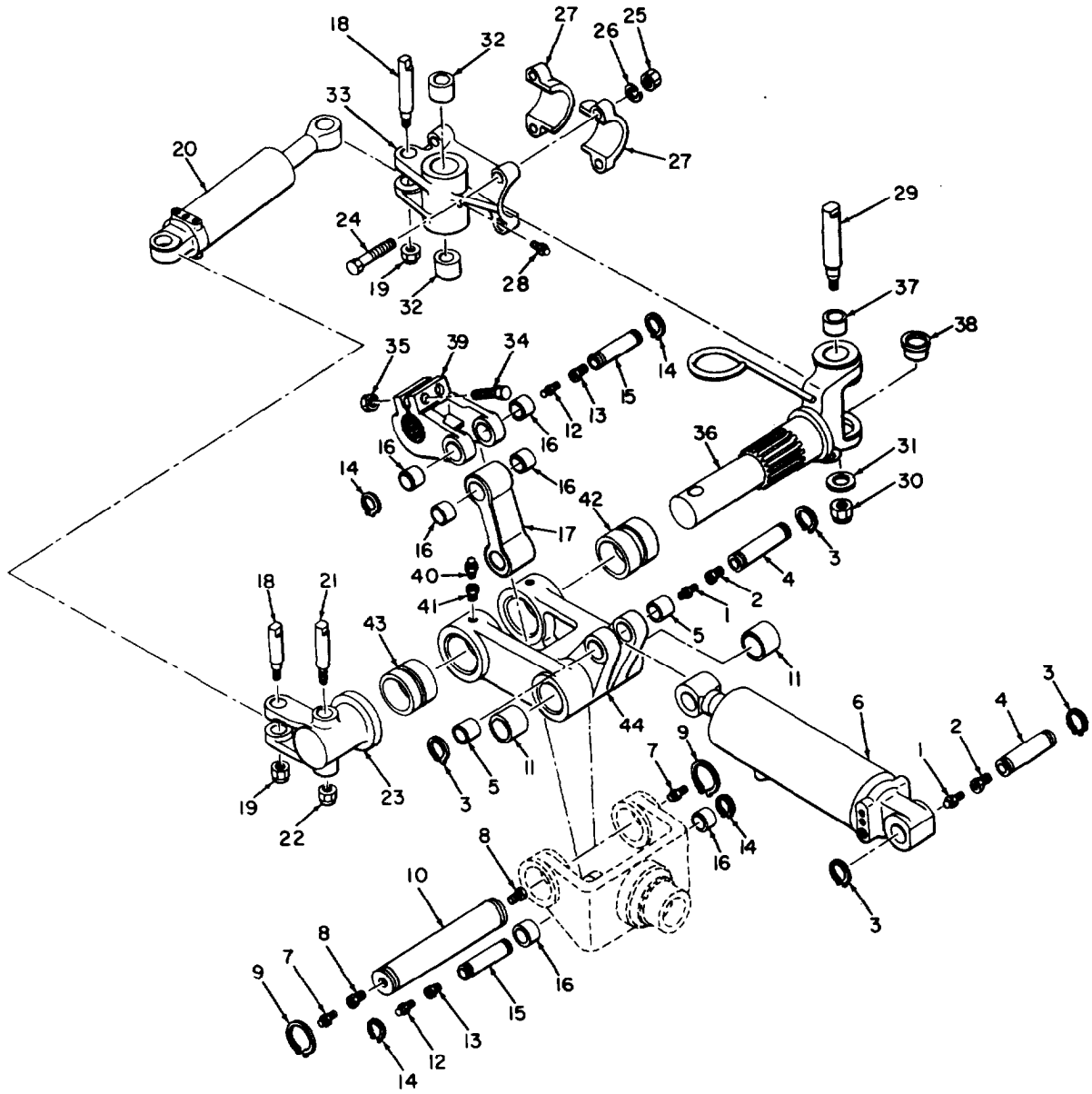
a. Swing Cylinder. Reassemble swing cylinder in reverse of numerical sequence as illustrated on figure 6-21.

b. Dump Cylinder. Reassemble dump cylinder in reverse of numerical sequence as illustrated on figure 6-20.

c. Power Dump and Swing *Assembly.* Reassemble power dump and swing assembly in reverse of numerical sequence as illustrated on figure 6-19.

6-56. Installation

Install power dump and swing assembly as described in paragraph *5-14b.*

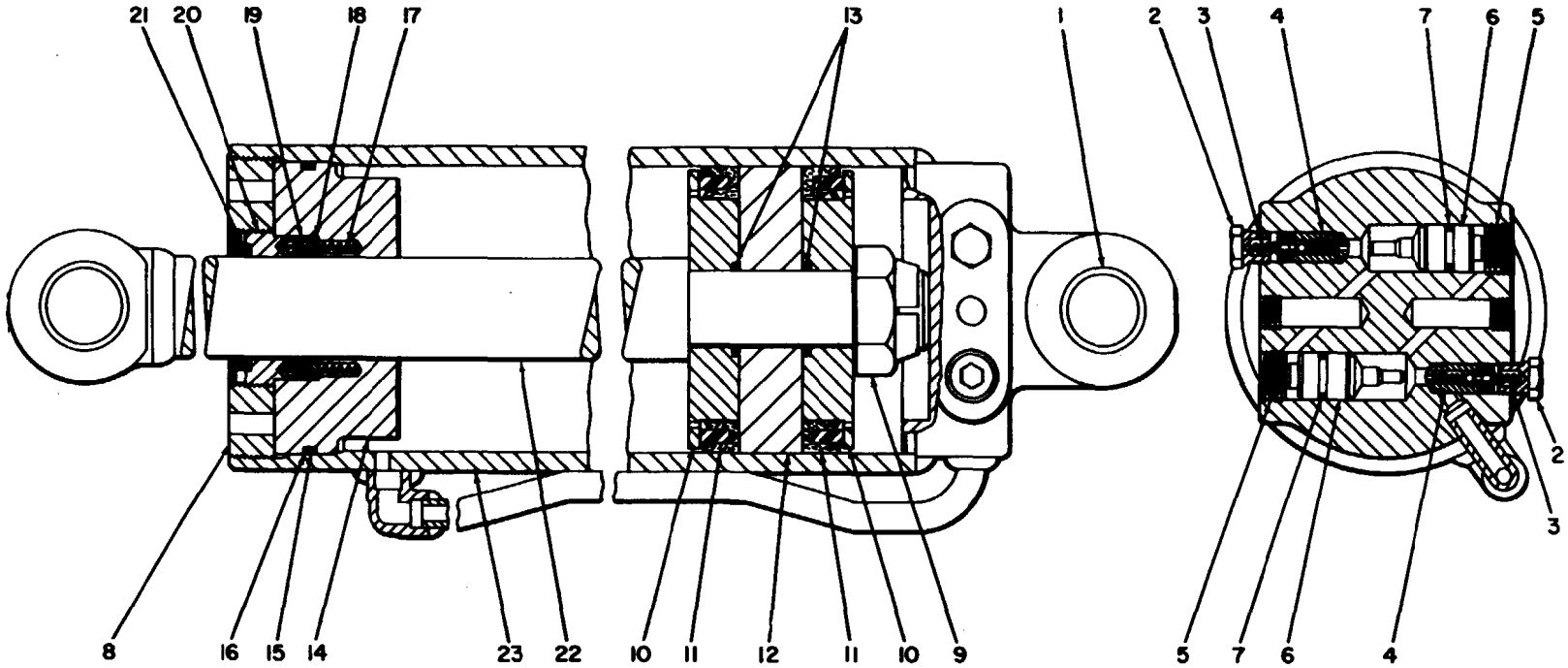


MEC 3820-239-15/6-19

Figure 6-19. Power dump and swing assembly, exploded view.

1 Lubrication fitting (2)
2 Reducing bushing (2)
3 Retaining ring (4)
4 Dump pin (2)
5 Dump link bushing (2)
6 Dump cylinder
7 Lubrication fitting (2)
8 Reducing bushing (2)
9 Retaining ring (2)
10 Dump pivot pin
11 Front boom bushing (2)
12 Lubrication fitting (2)
13 Reducing bushing (2)
14 Retaining ring (4)
15 Dump pin (2)
16 Dump link bushing (6)
17 Dump link
18 Swing and dump cylinder bolt, 7/8-14 x 5 11/16 in. (2)
19 Nut, self-locking hex, 7/8-14 (2)
20 Swing cylinder
21 Swing clevis bolt, 7/8-14 x 7 1/8 in.
22 Nut, self-locking hex, 7/8-14
23 Swing clevis
24 Guide mounting swivel cap bolt, 7/8-9 x 6 in. (4)
25 Nut, hex 7/8-9 (4)
26 Washer, lock, 7/8 in. (4)
27 Guide mounting swivel cap (2)
28 Lubrication fitting
29 Guide mounting swivel bolt, 1 1/2-12 x 11 7/16 in.
30 Nut, self-locking hex, 1 1/2-12.
31 Washer, flat, 1 1/2 in.
32 Guide mounting swivel bushing (2)
33 Guide mounting swivel
34 Pinch bolt, sq-hd, 3/4-10 x 3 in. (2)
35 Nut, hex, 3/4-10 (2)
36 Dump shaft assembly
37 Dump shaft hinge bushing
38 Dump shaft hinge bushing
39 Dump clevis
40 Lubrication fitting
41 Reducing bushing
42 Dump shaft hinge bushing
43 Dump shaft bushing
44 Dump arm

Figure 6-19—Continued.

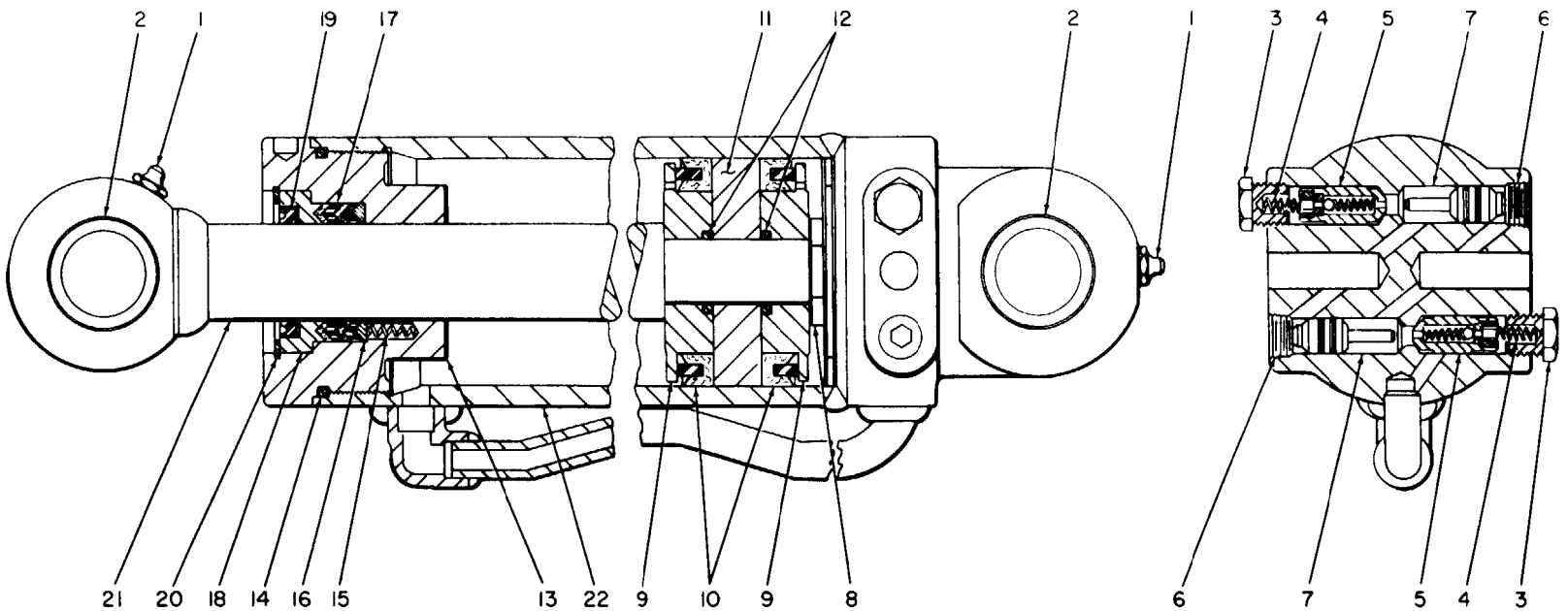


MEC 3820-239-15/6-20

Figure 6-20. Dump cylinder, cutaway view.

1 Dump link bushing
2 Pipe plug, hex-hd, 3/8 in. (2)
3 Spring (2)
4 Thermal relief poppet (2)
5 Pipe plug, socket-hd, 3/4 in. (2)
6 Pilot check piston (2)
7 Piston ring (2)
8 Retainer ring
9 Nut, lock, hex, 1 1/2-12
10 Backing plate (2)
11 U-cup (2)
12 Piston
13 O-ring (2)
14 Cylinder head
15 O-ring
16 Backup ring
17 Spring (4)
18 Male adapter
19 V-packing (4)
20 Gland nut
21 Rod wiper
22 Piston rod assembly
23 Barrel assembly

Figure 6-20—Continued.



MEC 3820-239-15/6-21

Figure 6-21. Swing cylinder, cutaway view.

1 Lubrication fitting (2)
2 Swing cylinder bushing (2)
3 Pipe plug, hex-hd, 3/8 in. (2)
4 Spring (2)
5 Thermal relief poppet (2)
6 Pipe plug, socket-hd, 3/8 in. (2)
7 Pilot check piston (2)
8 Nut, lock, hex, 1–14
9 Backing plate (2)
10 U-cup (2)
11 Piston
12 O-ring (2)
13 Cylinder head
14 O-ring
15 Spring (3)
16 Male adapter
17 V-packing (4)
18 Gland nut
19 Rod wiper
20 Snap ring
21 Piston rod assembly
22 Barrel assembly

Figure 6–21—Continued.

Section IX. POWER GUIDE EXTENSION MOUNTING

6-57. General

This section contains repair instructions for the power guide extension mounting. This assembly contains a hydraulic cylinder which moves the drill guide up and down in response to commands from the hydraulic valve assembly (fig. 1-5).

6-58. Removal

Remove the power guide extension mounting as described in paragraph *5-13a.*

6-59. Disassembly

a. Power Guide Extension Mounting. Disassemble the power guide extension mounting in the numerical sequence as illustrated on figure 6-22.

b. Drill Guide Extension Cylinder. Disassemble drill guide extension cylinder in the numerical sequence as illustrated on figure 6-23. Note the following special procedures:

(1) Pry snap ring (24, fig. 6-23) out of the groove in cylinder head (30).

(2) Using a suitable spanner wrench, unscrew cylinder head (30), and slide piston rod assembly (23) with all parts attached, out of barrel assembly (32).

(3) Straighten or cut lock pin (16), and take all parts off piston rod assembly (23) from the pin end of the rod.

(4) After sliding cylinder head (30) off piston rod assembly (23), remove the parts (25 through 29) from the cylinder head.

(5) Discard all O-rings.

6-60. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-61. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

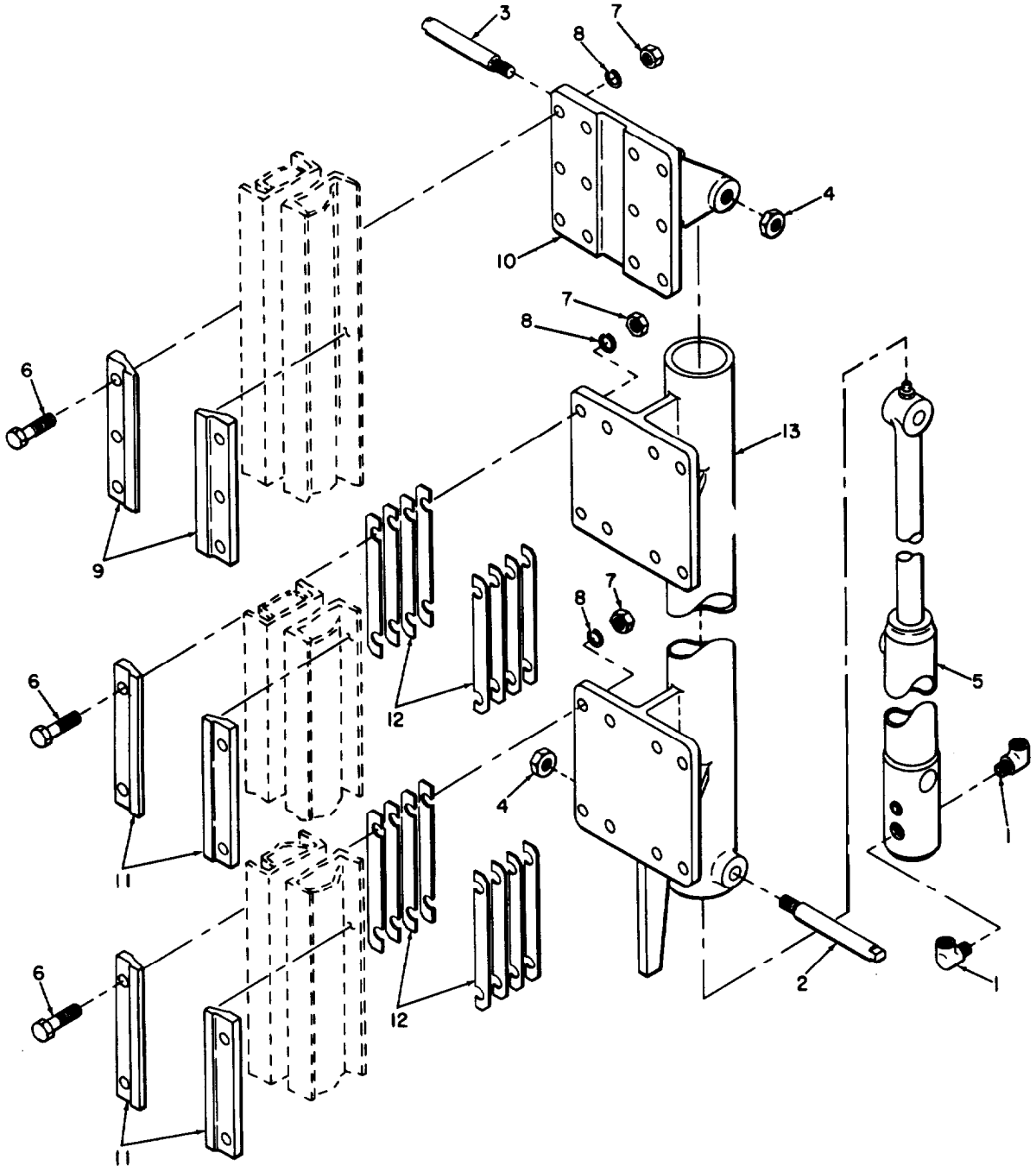
6-62. Reassembly

a. Drill Guide Extension Cylinder. Reassemble drill guide extension cylinder in reverse of numerical sequence as illustrated on figure 6-23. After all parts are installed on piston rod assembly (23, fig. 6-23), insert lock pin (16) so that equal lengths project from both sides of the rod, and flare over the ends of the pin to retain it in position.

b. Power Guide Extension Mounting. Reassemble power guide extension mounting in reverse of numerical sequence as illustrated on figure 6-22. Do not install clamps or shims until ready to install the assembly on the drill guide.

6-63. Installation

Install the power guide extension mounting as described in paragraph *5-13b.*

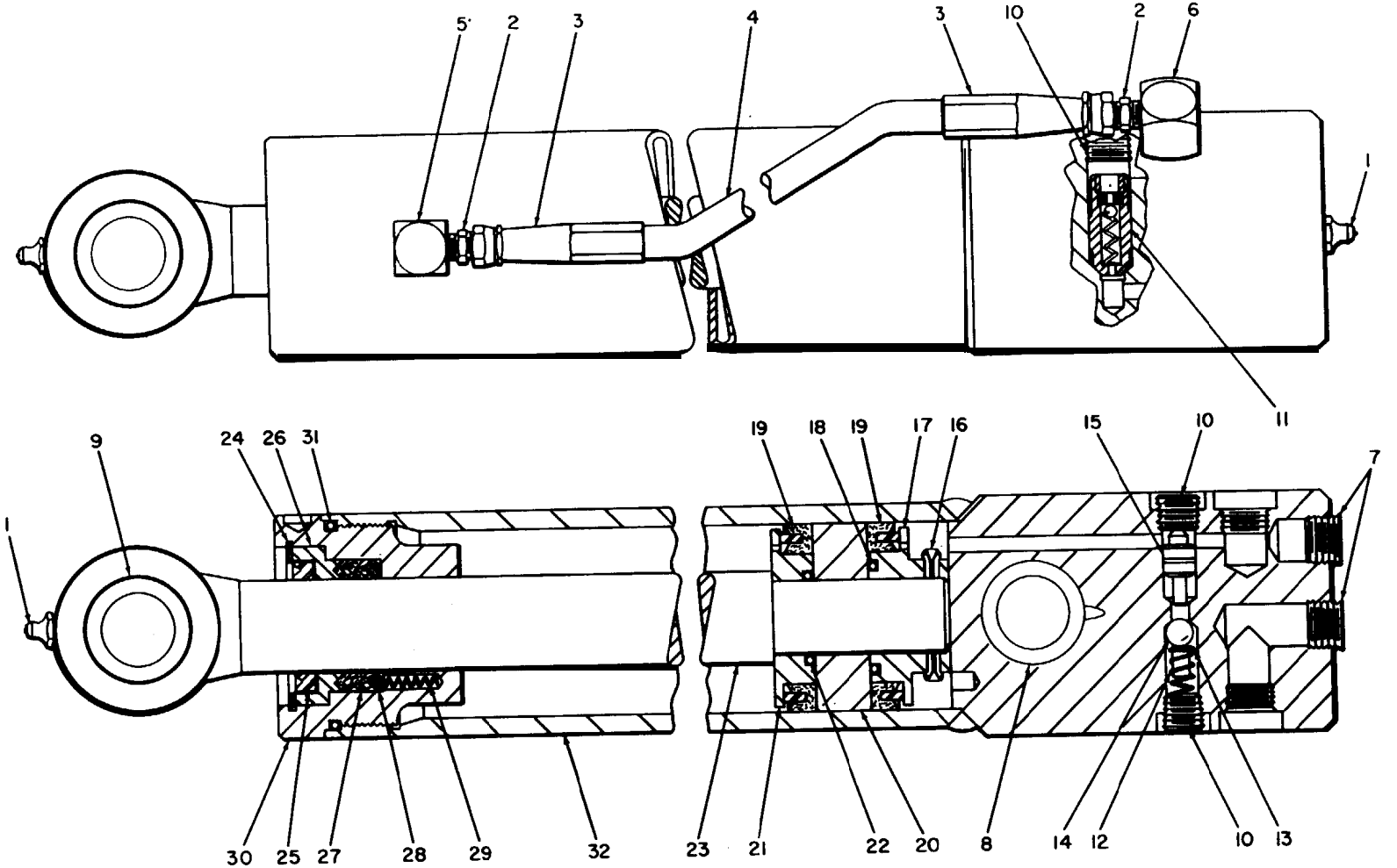


MEC 3820-239~15/6-22

Figure 6-22. Power guide extension mounting, exploded view.

1 Street elbow, 90° (2)
2 Extension cylinder bolt, 3/4-16
3 Extension cylinder rod bolt, 3/4-16
4 Nut, hex, 3/4-16 (2)
5 Drill guide extension cylinder
6 Bolt, hex-hd, 5/8-11 x 2 1/4 in. (14)
7 Nut, hex, 5/8-11 (14)
8 Washer, lock, 5/8 in. (14)
9 Drill guide extension cylinder mounting clamp (2)
10 Drill guide extension cylinder anchor
11 Drill guide mounting plate clamp (4)
12 Clamp shims (16)
13 Drill guide mounting plate

Figure 6-22—Continued.



MEC 3820-239-15/6-23

Figure 6-23. Drill guide extension cylinder, cutaway view.

1 Lubrication fitting (2)
2 Adapter (2)
3 Swivel fitting (2)
4 Hose
5 Elbow
6 Elbow
7 Pipe plug, 3/8 in. (2)
8 Extension cylinder bushing
9 Extension cylinder rod bushing
10 Pipe plug (3)
11 Thermal relief poppet
12 Spring
13 Stop pin
14 Steel ball
15 Pilot piston
16 Lock pin
17 Backing plate
18 O-ring
19 U-cup (2)
20 Piston
21 Backing plate
22 O-ring
23 Piston rod assembly
24 Snap ring
25 Rod wiper
26 Gland nut
27 V-packing
28 Male adapter
29 Spring (3)
30 Cylinder head
31 O-ring
32 Barrel assembly

Figure 6–22—Continued.

Section X. HYDRAULIC BOOM ASSEMBLY

6-64. General

This section contains repair instructions for the hydraulic boom assembly. This assembly consists essentially of a boom swing cylinder and a boom lift cylinder, which hydraulically position the boom in response to commands from the hydraulic valve assembly (fig. 1-5).

6-65. Removal

Remove the hydraulic boom assembly as described in paragraph *5-15a.*

6-66. Disassembly

a. Hydraulic Boom Assembly. Disassemble the hydraulic boom assembly in the numerical sequence as illustrated on figure 6-24.

b. Boom Swing Cylinder. Disassemble boom swing cylinder in the numerical sequence as illustrated on figure 6-25. Note the following special procedures:

(1) Cut the lockwire and remove screws (10, fig. 6-25), gland nut (12), and rod wiper (11).

Note. The gland nut and rod wiper cannot be taken off completely since they will not fit over the rod fittings.

(2) Unscrew cylinder head (13) and slide piston rod assembly (26) with all parts attached, out of barrel assembly (27).

(3) Remove lock nut (19), and take all parts off piston rod assembly (26) from the nut end of the rod.

(4) Discard all O-rings.

c. Boom Lift Cylinder. Disassemble boom lift cylinder in the numerical sequence as illustrated on figure 6-26. Note the following special procedures.

(1) Cut the lockwire and remove screws (11, fig. 6-26), gland nut (13), and rod wiper (12).

Note. The gland nut and rod wiper cannot be taken off completely since they will not fit over the rod fitting.

(2) Unscrew cylinder head (14) and slide piston rod assembly (27) with all parts attached, out of barrel assembly (28).

(3) Remove lock nut (20) and take all parts off piston rod assembly (27) from the nut end of the rod.

(4) Discard all O-rings.

6-67. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-68. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-69. Reassembly

a. Boom Lift Cylinder. Reassemble boom lift cylinder in reverse of numerical sequence as illustrated on figure 6-26.

b. Boom Swing Cylinder. Reassemble boom swing cylinder in reverse of numerical sequence as illustrated on figure 6-25.

Note. Install lockwire through screws (11, fig. 6-26 and 10, fig. 6-25) to keep them tight.

c. Hydraulic Boom Assembly. Reassemble hydraulic boom assembly in reverse of numerical sequence as illustrated on figure 6-24.

6-70. Installation

Install the hydraulic boom assembly as described in paragraph *5-15b.*

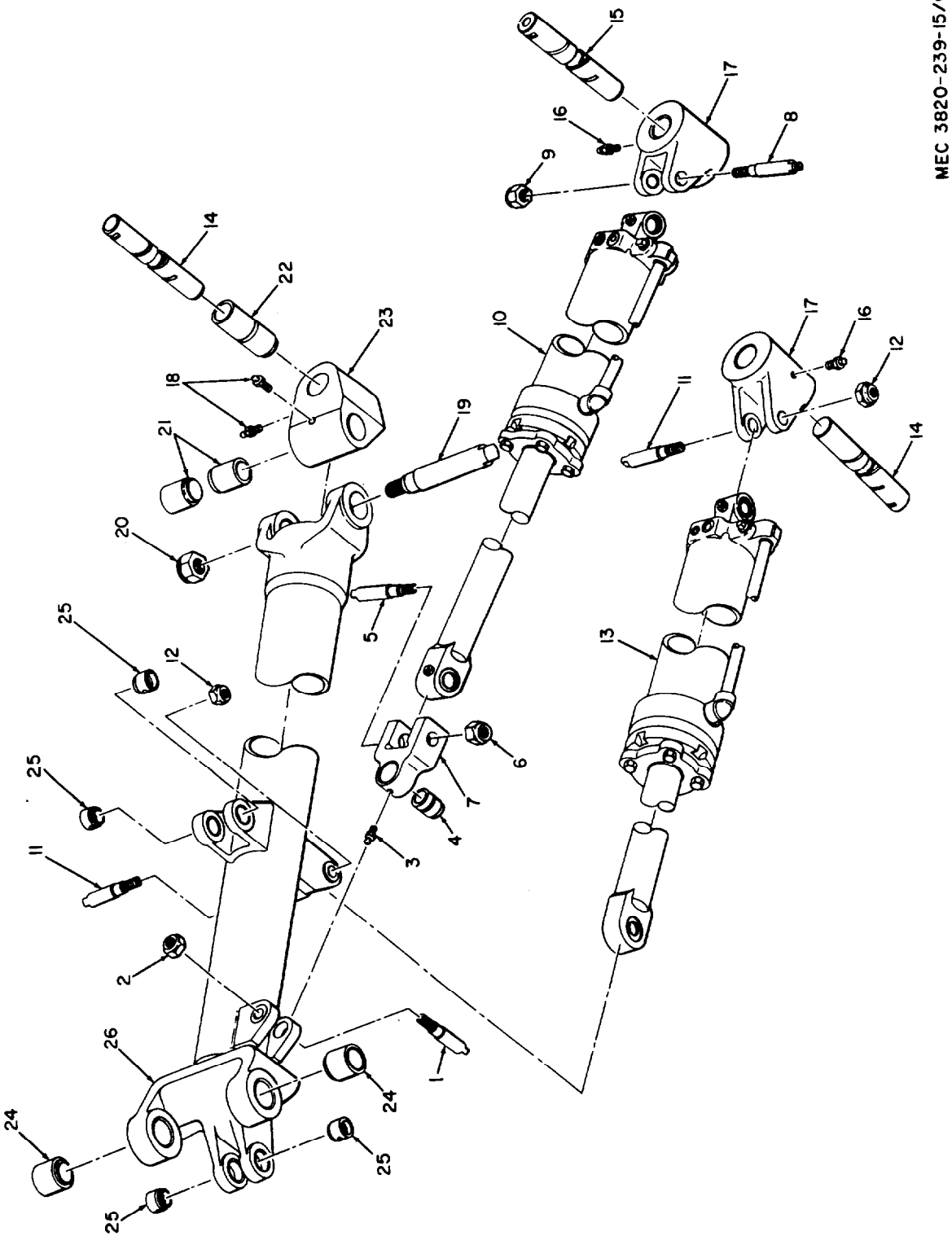
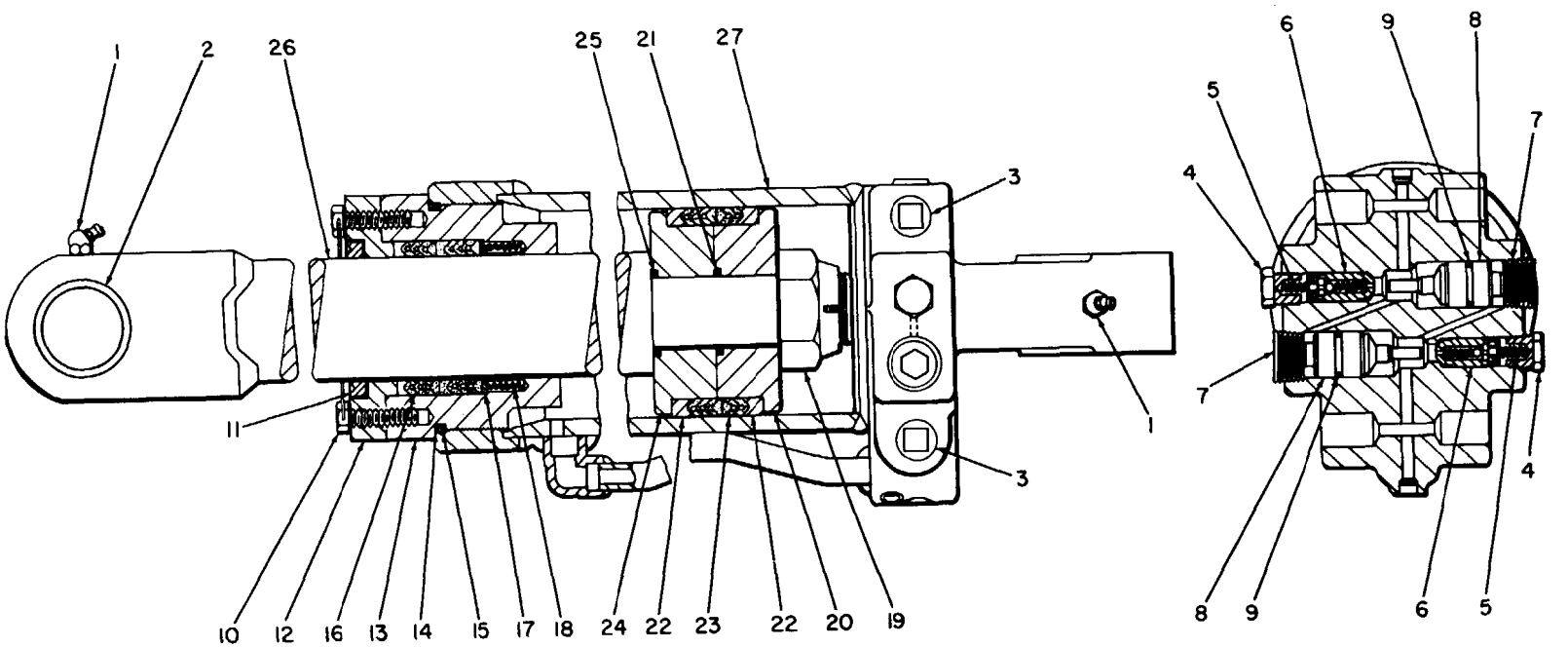


Figure 6-24. Hydraulic boom assembly, exploded view.

1 Clevis bolt, 1–12 x 5 1/4 in.
2 Nut, self-locking hex, 1–12
3 Lubrication fitting
4 Boom cylinder bushing
5 Clevis bolt, 1–12 x 5 1/4 in.
6 Nut, self-locking hex, 1–12
7 Swing cylinder clevis
8 Clevis bolt, 1–12 x 5 1/4 in.
9 Nut, self-locking hex, 1–12
10 Boom swing cylinder
11 Clevis bolt, 1–12 x 5 1/4 in. (2)
12 Nut, self-locking hex, 1–12 (2)
13 Boom lift cylinder
14 Cylinder pedestal king pin (2)
15 Boom swing cylinder pedestal pin
16 Lubrication fitting (2)
17 Cylinder pedestal (2)
18 Lubrication fitting (2)
19 Boom pedestal pin
20 Nut, self-locking hex, 1 1/2–12
21 Boom pedestal bushing (2)
22 Boom pedestal king pin bushing
23 Boom pedestal
24 Front boom bushing (2)
25 Dump link bushing (4)
26 Bare boom

Figure 6–24—Continued.

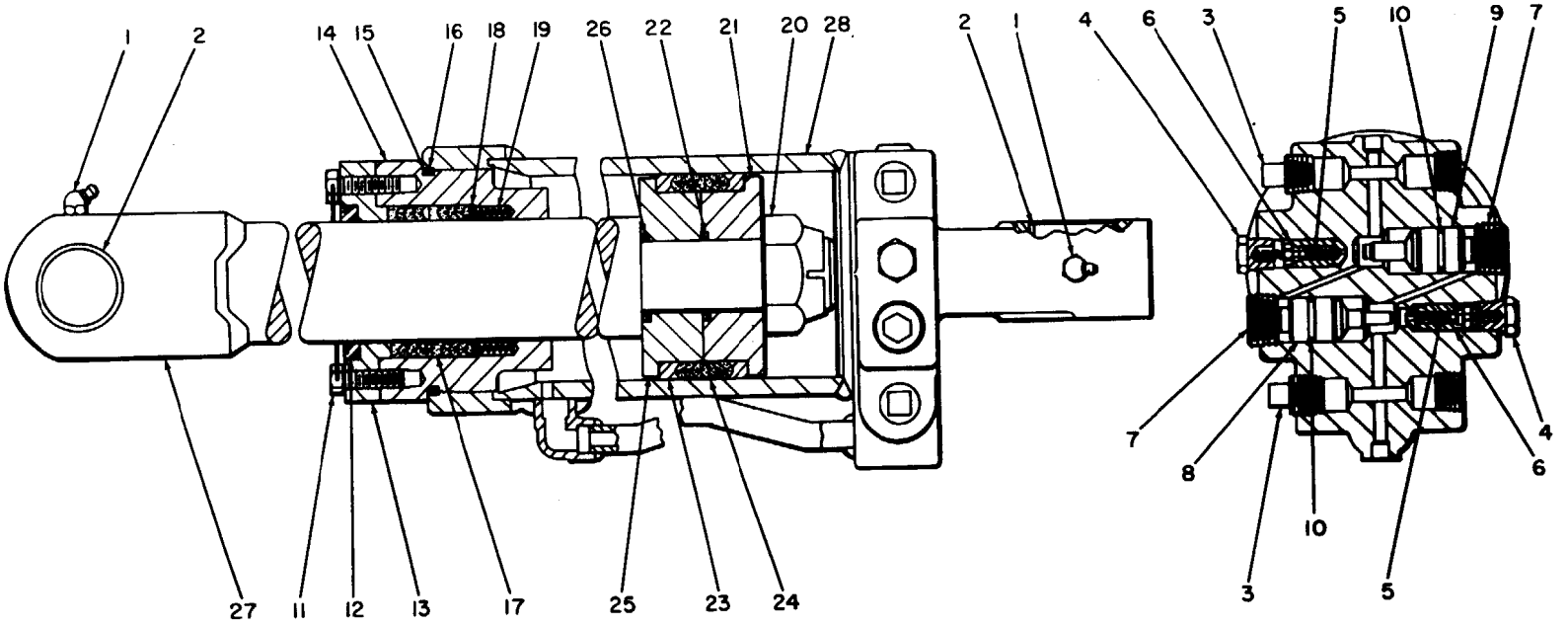


MEC 3820-239-15/6-25

Figure 6-25. Boom swing cylinder, cutaway view.

1 Lubrication fitting (2)
2 Boom cylinder bushing (2)
3 Pipe plug, sq-hd, 1/2 in. (2)
4 Pipe plug, hex-hd, 3/8 in. (2)
5 Spring (2)
6 Thermal relief poppet (2)
7 Pipe plug, socket-hd, 3/4 in. (2)
8 Pilot check piston (2)
9 Piston ring (2)
10 Cap screw (4)
11 Rod wiper
12 Gland nut
13 Cylinder head
14 Backup ring
15 O-ring
16 Rod packing (2 sets)
17 Packing washer
18 Spring (6)
19 Nut, lock, hex, 1 1/2-12
20 Rear backing plate
21 O-ring
22 Female adapter (2)
23 Piston packing
24 Front backing plate
25 O-ring
26 Piston rod assembly
27 Barrel assembly

Figure 6-25—Continued.



MEC 3820-239-15/6-26

Figure 6-26. Boom lift cylinder, cutaway view.

1 Lubrication fitting (2)
2 Boom cylinder bushing (2)
3 Pipe plug, sq-hd, 1/2 in. (2)
4 Pipe plug, hex-hd, 3/8 in. (2)
5 Spring (2)
6 Thermal relief poppet (2)
7 Pipe plug, socket-hd, 3/4 in. (2)
8 Pilot check piston
9 Pilot check piston
10 Piston ring (2)
11 Cap screw (4)
12 Rod wiper
13 Gland nut
14 Cylinder head
15 Backup ring
16 O-ring
17 Rod packing (2 sets)
18 Packing washer
19 Spring (6)
20 Nut, lock, hex, 1 1/2–12
21 Rear backing plate
22 O-ring
23 Female adapter (2 rqr)
24 Piston packing
25 Front backing plate
26 O-ring
27 Piston rod assembly
28 Barrel assembly

Figure 6–26—Continued.

Section Xl. BOOM BASE ASSEMBLY

6-71. General

This section contains repair instructions for the boom base assembly. This assembly contains an integral hydraulic reservoir, and serves as the mounting pad for the hydraulic boom assembly, hydraulic pump assembly, and manifold lubricator.

6-72. Removal

Remove the boom base assembly as described in paragraph *5-16a*.

6-73. Disassembly

Disassemble boom base assembly in the numerical sequence as illustrated on figure 6-27.

6-74. Cleaning

a. Clean all parts with an approved solvent, and blow dry with compressed air.

b. Flush the hydraulic reservoir to insure freedom from contamination.

6-75. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-76. Reassembly

Reassemble boom base assembly in reverse of numerical sequence as illustrated on figure 6-27.

Caution: **Cleanliness of the hydraulic reservoir is of the utmost importance. Any contamination entering this closed system may cause erratic boom operation and accelerated wear on parts.**

6-77. Installation

Install the boom base assembly as described in paragraph *5-16b.*

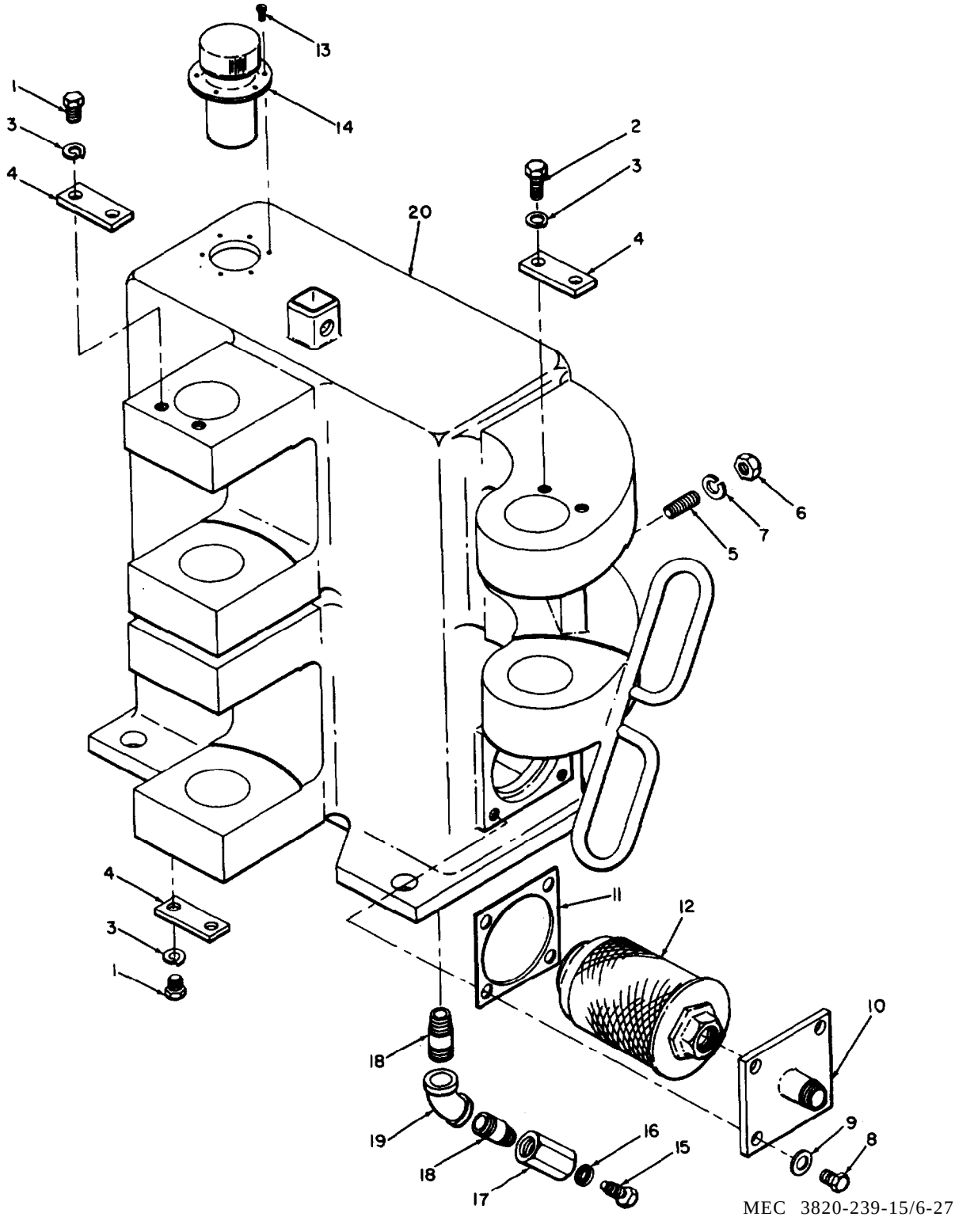


Figure 6-27. Boom base assembly, exploded view.

1 Screw, cap, hex-hd, 1/2–13 x 1 in. (4)
2 Screw, cap, hex-hd, 1/2–13 x 1 1/2 in. (2)
3 Washer, lock, 1/2 in. (6)
4 King pin locking plate (3)
5 Stud, hex-hd, 1/2–13 x 1 3/4 in. (4)
6 Nut, hex, 1/2–13 (4)
7 Washer, lock, 1/2 in. (4)
8 Screw, cap, hex-hd, 3/8–16 x 3/4 in. (4)
9 Washer, flat 3/8 in. (4)
10 Oil filter cap
11 Oil filter cap gasket
12 Suction oil filter
13 Drive screw (6)
14 Vent cap
15 Magnetic plug
16 Gasket
17 Hydraulic drain adapter
18 Short nipple, 1 x 2 in. (2)
19 Elbow, 1 in.
20 Boom base

Figure 6–27—Continued.

Section XII. COMPLETE TRACTION DRIVE

6-78. General

This section contains repair instructions for the complete traction drive. The pneumatic drill contains two complete traction drives (one for each traction unit), which are identical except for orientation, and quantities specified throughout this section are for one traction drive.

6-79. Removal

Remove the complete traction drive as described in paragraph 5-17a.

6-80. Disassembly

a. Complete Traction Drive. Disassemble complete traction drive in the numerical sequence as illustrated on figure 6-28. Note the following special procedures:

(1) After draining the hydraulic oil by removing magnetic plug (1, fig. 6-28) and pipe plugs in bottom of gear housing (53) and propelling air motor (10), remove screws (7), nuts (8), and lock washers (9), and carefully pull the propelling air motor off the shaft of motor pinion gear (12).

(2) Remove casing cover (14). Remove and discard both motor case gaskets (13).

(3) Remove motor pinion gear spacer (11) and pull out motor pinion gear (12). If motor pinion ball bearing (41) comes out with the gear, remove the bearing using a suitable bearing puller to bear on the inner race only.

(4) Using retaining ring pliers, remove retaining rings (15), and pull the assembled planet gears (18), ball bearings (17), and retaining rings (16) off the stubs of drive shaft (42).

Note. The ball bearings are press-fitted into the planet gears, and should not be removed unless replacement is required.

(5) Pull on clutch lock pin handle (46), and twist to lock it in the disengaged position. Remove internal gear (19).

(6) Remove screws (22), nuts (23), lock washers (24) and brake cylinder cover (25), with setscrew (20) and jam nut (21) attached.

(7) Insert two 5/8-11 threaded bolts into the holes in the tip of brake piston (27), and pull out the piston and O-ring (28).

(8) Loosen jam nut (30) and turn brake shaft setscrew (29) to release pressure on the trunnion of brake band assembly (39).

(9) Remove brake band anchor pin (31).

(10) Remove bolt (32), with brake spring washer (33) and brake spring (34).

(11) Remove brake cylinder (37) and brake cylinder case gasket (38).

(12) Remove brake band assembly (39) from the housing.

(13) Using retaining ring pliers; remove retaining ring (40), and pull drive shaft (42), with or without motor pinion ball bearing (41) attached, out of gear housing (53). If the bearing is installed in the shaft, pull it out of the recess in the drive shaft with an internal bearing puller.

(14) If necessary for replacement, remove retaining ring (43) and press drive shaft ball bearing (44) out of the bore in gear housing (53), using a bearing pusher to bear on the outer race of the bearing.

(15) Drive out roll pin (45) and remove clutch lock pin handle (46).

(16) Drive out roll pin (47) and unscrew clutch spring cap (48). Remove remaining parts.

b. Propelling Air Motor. Disassemble propelling air motor in the numerical sequence as illustrated on figure 6-29. Note the following special procedures:

(1) Remove one cylinder (12, fig. 6-29) and cylinder gasket (13).

(2) Rotate crank assembly (25) until the piston (18) from which the cylinder was removed is at top dead center. Remove wrist pin caps (14) wrist pin

(15), and piston (18) from connecting rod (34).

Note. Do not attempt to drive the wrist pin out. It will be easily removable with the fingers.

(3) Remove piston ring (16) and oil regulating ring (17) from piston (18).

(4) Repeat the above procedure until all pistons are removed.

(5) Pull the entire crank (26 through 39) out of motor case (43). If necessary, tap the face of the motor case with a mallet to free ball bearing (39) from its bore.

Note. If the crank parts cannot be removed, first remove rotary valve (24) as described in steps 10 and 11. Then insert a hardwood arbor through rotary valve bushing (41), and drive out the crank.

(6) Remove cotter pin (27) and castellated nut (28). Drive out crank lock pin (29).

(7) Separate valve end crank (30) from pin end crank (37).

Note. These parts are matched and must not be replaced individually.

(8) Remove connecting rod rings (33), connecting rods (34), connecting rod bushing (32) and crank pin sleeve (31).

(9) If necessary to remove ball bearings (26 and 39), use a suitable bearing puller to remove them from the crank.

(10) Remove valve chest cover (21).

(11) Screw a 1 l/&inch threaded bolt into the tapped hole in the exposed rotary valve (24). Pull the bolt to remove the rotary valve.

Note. Do not remove valve chest (40) unless necessary to replace rotary valve bushing (41).

(12) To remove valve chest (40) screw two 5/8-11 threaded bolts (at least 4 inches long) into the tapped holes of the valve chest. Turn in the bolts evenly until they hear against motor case (43) to free the valve chest.

(13) Support the face of valve chest (40) that bears against motor case (43), and press rotary valve bushing (41) out of the valve chest using a suitable arbor.

Caution: **Be careful not to shear off bushing key (42). Make sure that the arbor clears the key during removal.**

6-81. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-82. Inspection and Repair

a. Inspect all parts for wear and damage. Refer to table 4-l for permissible wear measurements.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

c. Inspect casing cover (14, fig. 6-28), brake piston (27), brake cylinder (37) drive shaft (42), and gear housing (53) for cracks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace if unserviceable.

d. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

e. Inspect motor pinion gear spacer (11) for scoring marks and wear. Replace if damaged.

f. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of a part.

g. Inspect brake band assembly (39) for wear and damage. Replace if unserviceable.

6-83. Reassembly

a. Propelling Air Motor. Reassemble propelling air motor in reverse of numerical sequence as illustrated on figure 6-29. Note the following special procedures:

(1) Slide crank pin sleeve (31, fig. 6-29) (plain end first) over pin end crank (37).

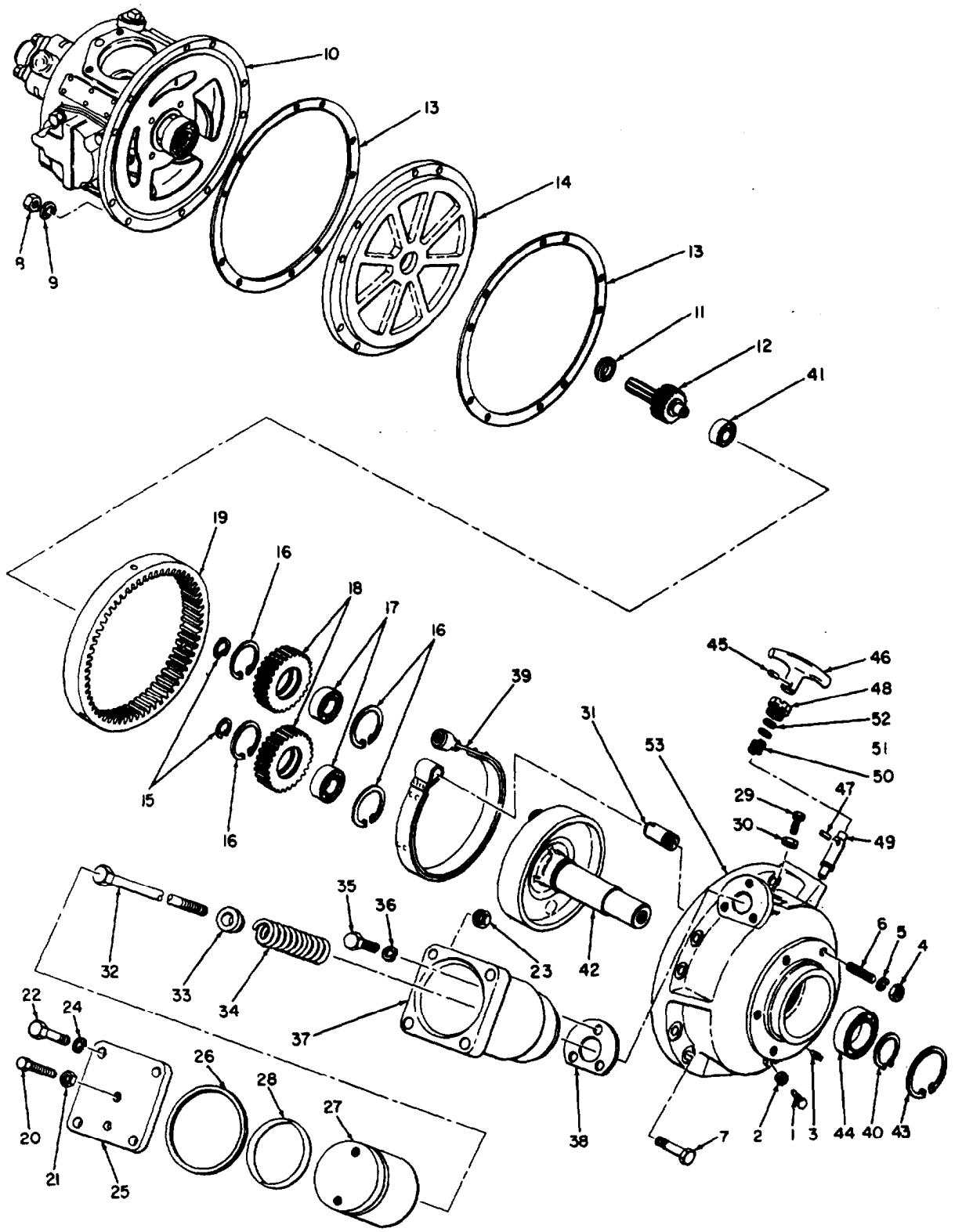


Figure 6-28. Complete traction drive, exploded view.

GPO 812-695-10

Note. This figure applies to both the left-hand and right-hand traction drive assemblies, which are identical except for orientation. Quantities specified are for one assembly (either left-hand or right-hand drive).

1 Magnetic plug, 3/4-16
2 Gasket
3 Pipe plug, sq-hd, 1/2 in.
4 Nut, heat, 5/8-11 (6)
5 Washer, lock, 5/8 in. (6)
6 Stud, 5/8-11 x 3 in. (8)
7 Screw, cap, hex-hd, 1/2-13 x 2 1/2 in. (9)
8 Nut, hex, 1/2-18 (9)
9 Washer, lock, 1/2 in. (9)
10 Propelling air motor
11 Motor pinion gear spacer
12 Motor pinion gear
13 Motor case gasket (2)
14 Casing cover
15 Retaining ring (2)
16 Retaining ring (4)
17 Ball bearing (2)
18 Planet gear (2)
19 Internal gear
20 Setscrew, hex-hd, 1/2-13 x 2 in.
21 Jam nut, hex, 1/2-18
22 Screw, cap, hex-hd, 5/811 x 2 in. (4)
23 Nut, hex, 5/8-11 (4)
24 Washer, lock, 5/8 in. (4)
25 Brake cylinder cover
26 Brake cylinder gasket
27 Brake piston
28 O-ring
29 Brake shaft setscrew, 1/2-13 x 1 1/4 in.
30 Jam nut, hex, 1/2-18
31 Brake band anchor pin
32 Bolt, machine, hex-hd, 3/4-10 x 8 l/2 in.
33 Brake spring washer
34 Brake spring
36 Screw, cap, hex-hd, 1/2-13 x 1 1/4 in. (3)
36 Washer, lock, 1/2 in. (8)
37 Brake cylinder
38 Brake cylinder case gasket
39 Brake band assembly
40 Retaining ring
41 Motor pinion ball hearing
42 Drive shaft
43 Retaining ring
44 Drive shaft ball hearing
45 Roll pin
46 Clutch lock pin handle
47 Roll pin
48 Clutch spring cap
49 Clutch lock pin
50 Spring
51 Spring washer
52 O-ring
53 Gear housing

Figure 6-28—Continued.

Note. Pin end crank (87) and valve end crank (80) are matched parts and must not be intermixed. Make sure that both pieces have identical identification marks.

(2) Install connecting rod bushing (32) over crank pin sleeve (81).

(3) Install connecting rod rings (33) and connecting rods (34) so that the rods fit between the bushing and rings.

(4) Join the valve end crank (30) with pin end crank (37), inserting the tang on crank pin sleeve (31) in. the crank slot.

(5) Aline lock pin holes in the crank sections, and drive crank lock pin (29) into position from the larger end of the tapered hole. Strike the larger end of the lock pin to make sure that it is seated properly, and install castellated nut (28) securely. Install cotter pin (27) and bend the ends over.

(6) Press ball bearings (26 and 39) onto the crank, using a suitable bearing pusher to bear on the inner races of the bearings.

(7) Only if the rotary valve bushing (41) was removed, install bushing key (42) in valve chest (40). Aline the slot in the rotary valve bushing with the key, and press in the bushing with the valve chest supported, until the bushing is flush with the outer (valve chest cover) supported face.

Note. If the rotary valve bushing is carefully insalled, it will not be necessary to ream out the inside diameter.

(8) Check the fit of rotary valve (24) in rotary valve bushing (41). If tighter than a good running fit, lap the valve to a proper fit, using a fine grain lapping compound with an abrasive that will not break up rapidly. If the valve is too tight to lap, ream the bushing to a diameter of 2.375 inches and then lap if necessary. Blow out all reamer cuttings and wash the

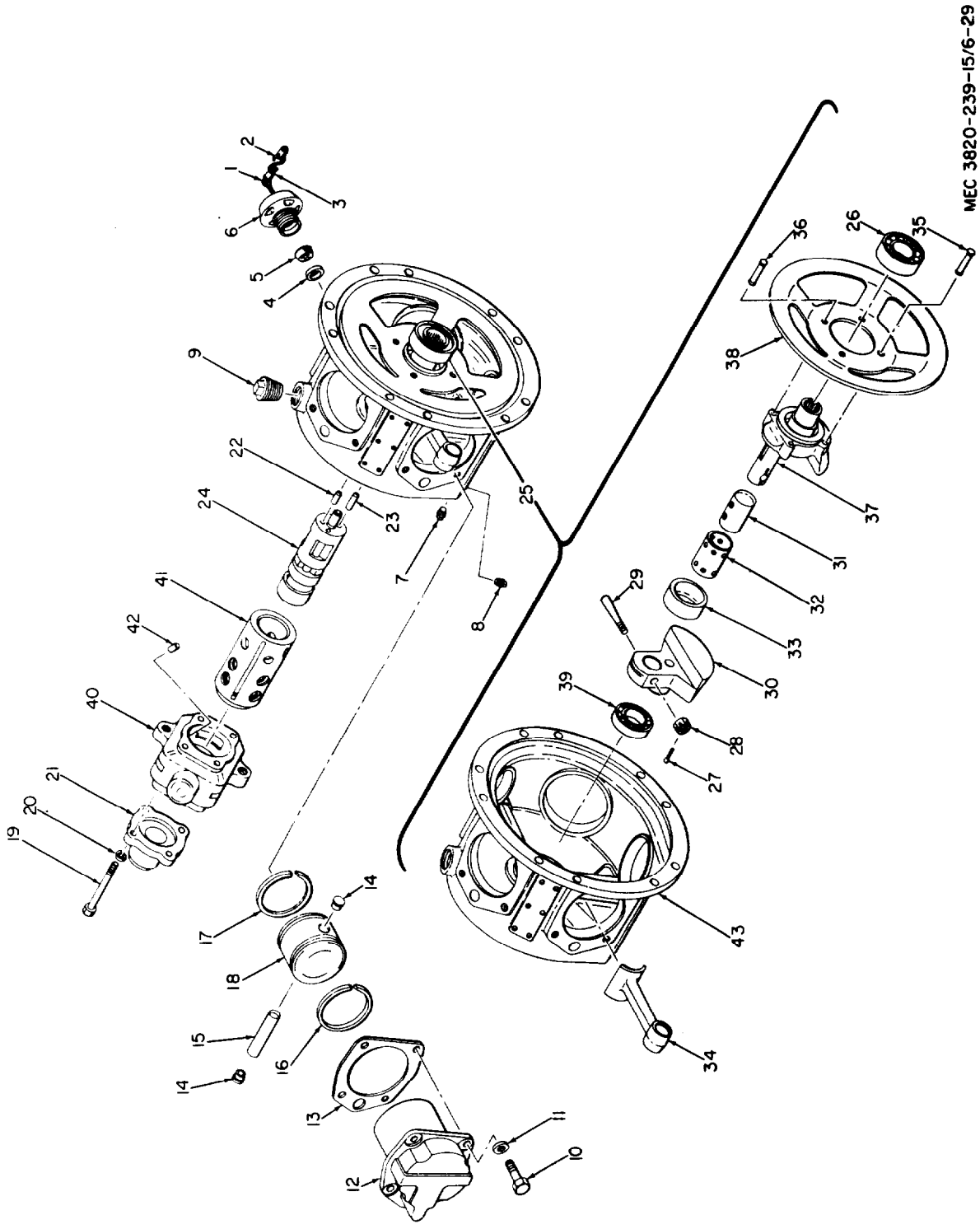


Figure 6-29. Propelling air motor, exploded view.

1 Vent cap cotter pin
2 S-hook
3 Vent cap chain
4 Screen retainer
5 Vent cap screen
6 Vent cap
7 Pipe plug, 1/4 in. (2)
8 Pipe plug, 3/4 in.
9 Pipe plug, 1/4 in.
10 Screw, cap, hex-hd, 1/2–13 x 1 in. (20)
11 Washer, flat, 1/2 in. (20)
12 Cylinder (5)
13 Cylinder gasket (5)
14 Wrist pin cap (10)
15 Wrist pin (5)
16 Piston ring (5)
17 Oil regulating ring (5)
18 Piston (5)
19 Valve chest screw, hex-hd, 3/8–16 x 4 in. (4)
20 Washer, lock, 3/8 in. (4)
21 Valve chest cover
22 Dowel pin, 0.3125 dia x 1 in. (2)
23 Dowel pin 0.376 dia x 1 1/4 in
24 Rotary valve
25 Crank assembly
26 Ball bearing
27 Cotter pin
28 Nut, castellated, hex, 1/2–20
29 Crank lock pin
30 Valve end crank
31 Crank pin sleeve
32 Connecting rod bushing
33 Connecting rod ring (2)
34 Connecting rod (5)
35 Oil splasher rivet, 2 1/2 in. (2)
36 Oil splasher rivet, 3/4 in. (2)
37 Pin end crank
38 Oil splasher
39 Ball bearing
40 Valve chest
41 Rotary valve bushing
42 Bushing key
43 Motor case

Figure 6–29—Continued.

parts in an approved solvent to remove all traces of lapping compound.

(9) Install dowel pins (22 and 23) in rotary valve (24) if they were removed, and insert the rotary valve into rotary valve bushing (41).

(10) Install valve chest cover (21).

(11) Aline bolt holes in valve chest (40) with those in motor case (43), and press the projecting end of rotary valve bushing (41) into the motor case.

(12) Make sure that the bushing enters the motor case bore squarely (with the bolt holes alined) and press the valve chest on until it contacts the motor case.

Note. Support the open end of the motor case during this operation.

(13) Aline the holes in the end of valve end crank (30) with the dowel pins of rotary valve (24) and install the assembled crank assembly into motor case (43). Make sure that ball bearing (39) is seated properly in the motor case.

(14) Rotate the crank until one of the connecting rods is at top dead center. Place a piston (18) over this rod and secure with wrist pin (16) and wrist pin caps (14).

(15) Using a suitable piston ring compressor to hold oil regulating ring (17) and piston ring (16) compressed, install cylinder (12) with cylinder gasket (13) over piston (18) and into the cylinder wall in motor case (43). Secure with screws (10) and washers (11).

(16) Repeat steps 14 and 15 until all pistons and cylinders are installed.

(17) Install all plugs and caps.

b. Complete Traction Drive. Reassemble complete traction drive in reverse of numerical sequence as illustrated on figure 6-28. Note the following special procedures:

Note. Coat gears, bushings, bearings, etc. with clean oil to facilitate reassembly.

(1) Using a suitable fixture to bear on the outer race, press drive shaft ball bearing (44, fig. 6-28) into gear housing (53). Using retaining ring pliers, install retaining ring (43) in the housing groove to lock the bearing in place.

(2) Press motor pinion ball bearing (41) into the recess in drive shaft (42). Insert the drive shaft into gear housing (63), tapping with a mallet to seat the drive shaft shoulder against drive shaft ball bearing (44). Using retaining ring pliers, intall retaining ring (40) in the shaft groove.

(3) Lay brake band assembly (39) around drive shaft (42) so that the trunnion can be inserted in the hole leading to brake cylinder (37). Insert brake band anchor pin (31) through the loop in the brake band assembly and screw it into the tapped hole in gear housing (53), until the end of the pin is slightly below the upper shoulder of the brake band assembly.

(4) Insert brake shaft setscrew (29). Back off setscrew 1/2 turn and tighten jam nut (30).

(5) Install brake cylinder (37) with brake cylinder case gasket (38).

(6) Mount brake spring washer (33) and brake spring (34) on bolt (32) and install the bolt to the required distance for proper brake adjustment (pra 3-38).

(7) Install O-ring (28) on brake piston (27) and install in the brake cylinder (37). Install brake cylinder cover (25) and brake cylinder gasket (26). Install setscrew (20) and jam nut (21). Turn the setscrew in until it contacts the piston. Back off 1/8 turn and secure the jam nut. Apply 60 psi air pressure through a 1/4-inch hose nipple connected to the release port in the brake cylinder cover, and make sure the brake can be rotated by hand.

(3) Install clutch parts (45 through 52). Install internal gear (19) in gear housing (53). Pull clutch lock pin handle (46) and align the internal

gear so that the lock pin fits into one of the holes in the gear.

(9) If ball bearings (17) were removed from planet gears (18) use a suitable bearing pusher to bear on the outer races, and press the bearings into the gears. Using retaining ring pliers, install four retaining rings (16) in the planet gear grooves.

(10) Install assembled planet gears (18) and ball bearings (17) onto the stubs of drive shaft (42). Using retaining ring pliers, install retaining rings (16) in the stub grooves, to lock the planet bearings in place.

(11) Insert motor pinion gear (12) between the planet gears until meshed, and press or tap the gear into motor pinion ball bearing (41) installed in the bore of drive shaft (42).

(12) Insert screws (7) through gear housing (52). Place a motor case gasket (13) over the screws, install casing cover (14), and place another motor case gasket (13) over the screws.

Note. Install casing cover (14) so that the raised portion is facing outward, and is perpendicular to the clutch lock pin handle.

(13) Install assembled propelling air motor (10), and secure with lock washers (9) and nuts (8).

(14) Install pipe plug (3) and magnetic plug (1) with gasket (2).

(15) Install studs (6).

Note. If the traction drive is to be installed immediately, do not install lock washers (6) and nuts (4).

6-84. Installation

Install the complete traction drive as described in paragraph *5-17b*.

Section XIII. MAIN FRAME AND TRACK ASSEMBLY

6-85. General

This section contains repair instructions for the main frame and track assembly. This assembly forms the basic structure for the pneumatic drill, on which all of the various units are mounted. In addition, the lubricating oil reservoir is an integral part of the frame.

6-86. Disassembly

Disassemble main frame and track assembly in the numerical sequence as illustrated on figure 6-30. Note the following special procedures:

a. Only if necessary to remove traction units (3, fig. 6-30), use a hoist to remove the weight of the frame from the traction units. Remove bolts (1) and nuts (2) to free the traction units from the frame.

b. Only if necessary to remove tow hitch (4), straighten the ends and remove cotter pin (1, fig. 6-33) remove nut (2) washer (3) and pull out tow hitch (4, fig. 6-30).

c. Remove oil filler plug (5) with O-ring (6). Place a container (2 gallon capacity, minimum) under the frame to collect the rock drill oil from the reservoir, and remove magnetic drain plug (7) with gasket (8) from the bottom of the reservoir.

d. Remove remaining parts only as necessary.

6-87. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

6-88. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-89. Reassembly

Reassemble main frame and track assembly in reverse of numerical sequence as illustrated on figure 6-30.

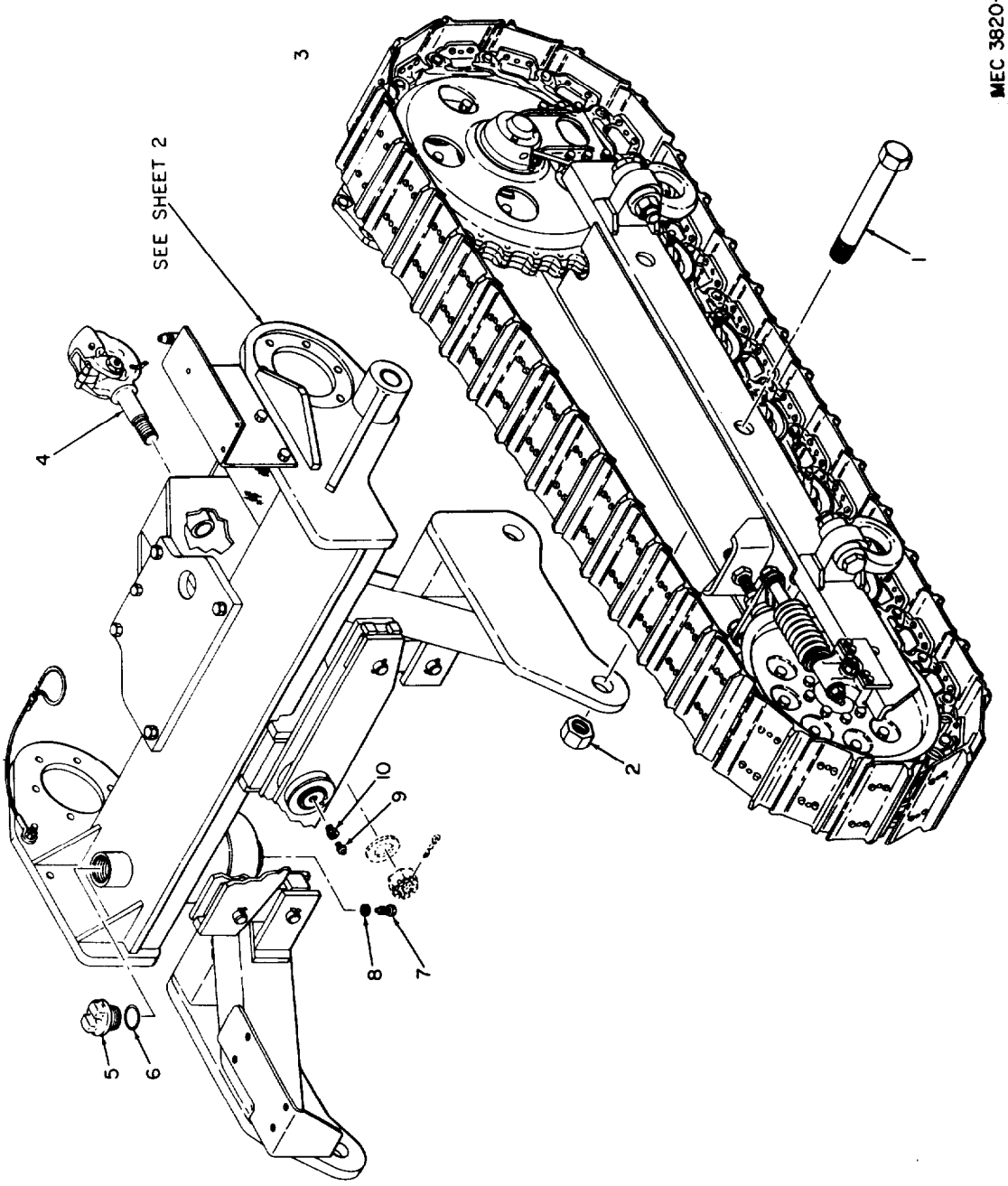
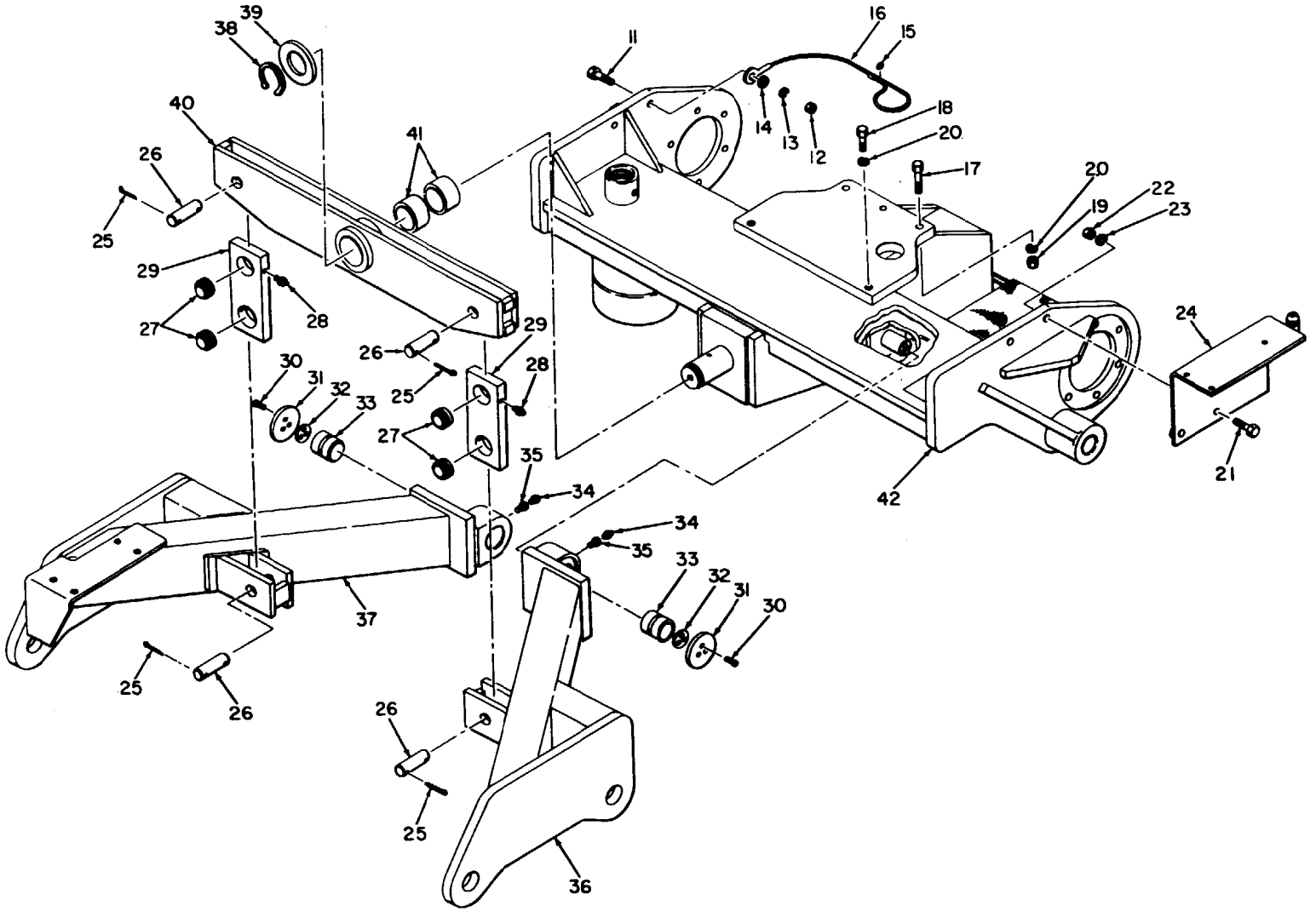


Figure 6–30 (1). Main frame and track assembly, exploded view.

1 Bolt, machine, hex-hd, 1 3/4–5 x 13 in. (4)
2 Nut, hex, 1 3/4–5 (4)
3 Traction unit (2)
4 Tow hitch
5 Oil filler plug
6 O-ring
7 Magnetic drain plug, 3/4–16
8 Gasket
9 Lubrication fitting
10 Reducing bushing, 1/4 to 1/8 in.

Figure 6–30—Continued.



MEC 3820-239-15/6-30②

Figure 6-30(2)—Continued.

11 Screw, cap, hex-hd, 5/8–11 x 2 1/4 in.
12 Nut, hex, 5/8–11
13 Washer, lock, 5/8 in.
14 Washer, flat, 5/8 in.
15 Wire rope clip
16 Air hose connection safety cable
17 Bolt, machine, hex-hd, 1–8 x 3 1/4 in. (3)
18 Bolt, machine, hex-hd, 1–8 x 2 1/4 in. (2)
19 Nut, hex 1–8 (3)
20 Washer, lock, 1 in. (5)
21 Screw, cap, hex-hd, 5/8–11 x 2 1/4 in. (2)
22 Nut, hex, 5/8–11 (2)
23 Washer, lock 5/8 in. (2)
24 Hydraulic valve mounting bracket
25 Cotter pin (8)
26 Strut suspension link pin (4)
27 Self-alining bushing assembly (4)
28 Lubrication fitting (4)
29 Suspension link (2)
30 Screw, cap, socket-hd, 7/16–20 x 1 in. (6)
31 Strut retainer (2)
32 Strut shaft spacer (4)
33 Strut bushing (2)
34 Lubrication fitting (2)
35 Reducing bushing, 1/4 to 1/8 in. (2)
36 Strut, lh
37 Strut, rh
38 Retaining ring
39 Yoke retaining washer
40 Yoke
41 Yoke bushing (2)
42 Bare frame

Figure 6–30 (2)—Continued.

Section XIV. TRACTION UNIT

6-90. General

This section contains repair instructions for the traction units. The pneumatic drill uses two traction units, which are identical except for orientation, and quantitites specified throughout this section are for one unit. All illustrations used depict the left-hand traction unit.

6-91. Removal

Remove the traction units as described in paragraph 6-86.

6-92. Disassembly

a. General. Disassemble traction unit in the numerical sequence as illustrated on figure 6-31. Note the following special procedures:

b. Track Assembly.

(1) If necessary to remove track assembly (5, fig. 6-31), tow or propel the pneumatic drill until the track hookup pin (7) is at the rear, approximately half-way up the sprocket wheel of the final drive assembly (52).

(2) Pry out track hookup pin lock pins (6).

(3) Using a drift of a smaller diameter than the track hookup pin (7) and a backup plate to support the grouser, drive out the track hookup pin with a hammer.

(4) Remove the track assembly either by hoisting the entire unit, or by propelling it until the track is free.

c. Track Roller Assemblies.

(1) Remove the track assembly (para *6-92b).*

(2) Jack up the frame to allow clearance for track roller removal.

(3) Remove self-locking nuts (19) (4 per roller), and lower the entire track roller assembly (23), with track roller shaft supports (20) and dust shield assemblies (21) attached, until free from roller track frame studs (22).

(4) Remove track roller shaft supports (20) and dust shield assemblies (21).

(5) Remove oil seals (26) by cutting them with a small sharp chisel and prying out.

(6) Pry off snap rings (27). Remove lubrication fittings (24) and reducing bushings (26).

(7) Support the assembly on flange and hub assembly (31). Using a heavy hammer and a piece of bronze to protect the shaft, drive out track roller bushing retainers (28).

Note. Remove the retainer closest to the lubrication fitting first.

(8) If necessary to remove track roller bushings (29), drive a small chisel down along the split line, being careful not to damage any parts.

d. Track Idler Assembly.

(1) Remove the track assembly (para 6-92b).

(2) Remove nuts (16) and slide the track idler assembly and related parts (18) off track frame channel assembly (53).

(3) Remove self-locking nuts (54) and track roller adjusting forks (55).

(4) Remove self-locking nuts (56), and slide out assembled buffer spring parts (57 through 60).

(5) After removing support guide plates (63) and track idler supports (67), remove oil seals (76) by cutting them with a small sharp chisel and prying out.

(6) Pry off snap rings (76).

Note. If necessary to remove track idler flanges (74), be sure to first remove lubrication fittings (68) and reducing bushings (69).

(7) Support the assembly so that track idler shaft (79) can be driven out. Install a nut (65) on the shaft to act as a driving surface, and drive out track idler bushing retainer (77) and bushing (78). Reverse the wheel and

drive out the opposite bushing and retainer.

e. Final Drive Assembly.

(1) Remove the track assembly (para *6-92b).*

(2) After removing outer and inner support brackets (42 and 51) jack up the frame and remove final drive assembly (52).

Note. Use a chain hoist to support the final drive assembly.

(3) Remove sprocket stud nuts (88) and lift out sprocket assembly (90) with collets (89) attached.

(4) Remove hardware (93 through 97) and bearing retainer (98) with bearing retainer shims (99). Tie the shims together to facilitate reassembly.

(5) Remove screws (100), dowel screws (101), cover plate assembly (106), and cover gasket (103). Discard the cover gasket.

(6) Remove dust shield (104) from cover plate assembly (106) and tap out large oil seal (105).

(7) Install a cap screw in the tapped hole of main drive shaft pinion (109). Using a pry bar and a support block, remove main drive shaft pinion (109) with complete inner and outer bearings (107 and 108) from shaft and spacer housing (110). Using a suitable bearing puller, remove the bearings from the pinion.

Note. Bearings (107, 108, 114, and 115) consist of two pieces each; an outer race and an inner race with roller, which are removable separately, but which are matched to each other and must, be kept together. Do not intermix bearing races

(8) Remove track sprocket bearing shims (92) from shaft and spacer housing (110). Tie the shims together to facilitate reassembly.

(9) To remove ring gear and hub assembly (117) from shaft and spacer housing (110) insert pry bars under both sides of the ring gear, and pry off evenly.

(10) Using a pry bar, remove oil seal wear plate (111) from ring gear and hub assembly (117).

(11) Tapping lightly with a blunt-nosed drift, remove small oil seal (112), oil seal retainer (113), and complete outer ring gear bearing (114) from the hub of ring gear and hub assembly (117).

(12) Tapping lightly with a blunt-nosed drift, remove complete inner ring gear bearing (116) from the hub of ring gear and hub assembly (117).

6-93. Cleaning

Clean all parts with an approved cleaning solvent and blow dry with compressed air.

6-94. Inspection and Repair

a. Inspect all parts for wear and damage, and replace if necessary.

b. Inspect shaft and spacer housing (110, fig. 6-31), cover plate assembly (106), bearing retainer (98) track idler shaft (79), track idler supports (67), support guide plates (63), and buffer spring clamp rods (60) for cracks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove all minor nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace the parts if damage cannot be repaired.

c. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of any part.

d. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

e. Inspect oil seals, wear plates, and oil seal retainers for scoring marks and excessive wear. Replace all unserviceable parts.

f. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-95. Reassembly

a. General. Reassemble traction unit in reverse of numerical sequence as illustrated on

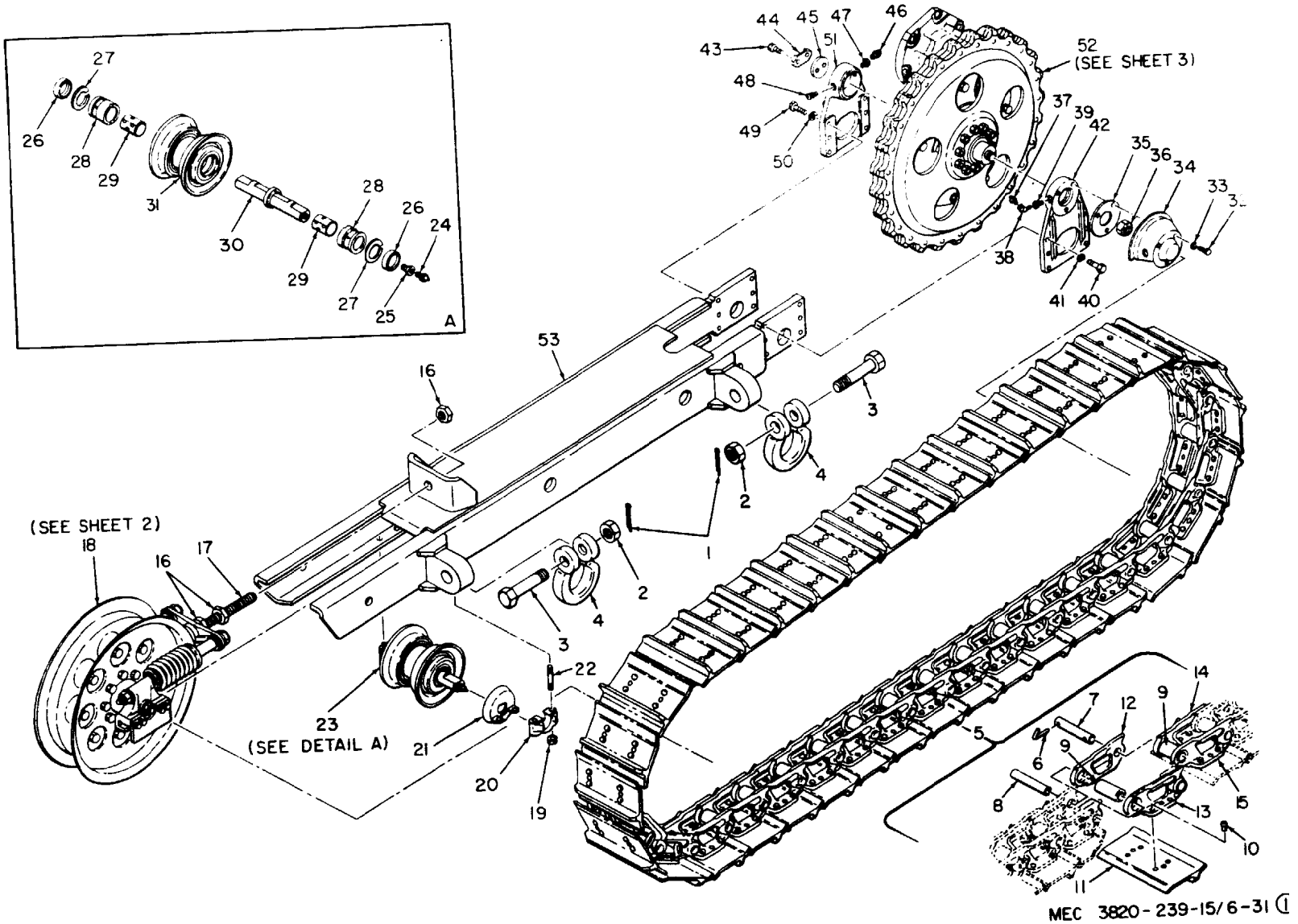


Figure 6-31(1). Traction unit, exploded view.

Note. This figure applies to both the left-hand and right-hand traction units, which are identical except for orientation. Quantities specified are for one unit (either left-hand or right-hand traction unit).

1 Cotter Pin (2)
2 Nut, hex 1 3/8-6 (2)
3 Screw, cap, hex-hd, 1 3/8 x 6-5/16 in. (2)
4 Lifting and tie-down shackle (2)
5 Track assembly
6 Track hookup pin luck pin (2)
7 Track hookup pin
8 Track link pin ($6)
9 Track link bushing (36)
10 Rivet (144)
11 Grouser (36)
12 Track hookup link, rh
13 Track hookup link, lh
14 Track link, rh (35)
15 Track link, Ih (35)
16 Nut, hex, 1 1/8-7 (3)
17 Track idler adjusting screw
18 Track idler assembly and related parts
19 Nut, self-locking, hex, 1/2-20 (20)
20 Track roller shaft support (10)
21 Dust shield assembly (10)
22 Roller to track frame stud, 1/2-20 (20)
23 Track roller assembly (6)
24 Lubrication fitting (5)
25 Reducing bushing (5)
26 Oil seal (10)
27 Snap ring (10)
28 Track roller bushing retainer (10)
29 Track roller bushing (10)
30 Track roller shaft (5)
31 Flange and hub assembly (5)
32 Screw, cap, hex-hd, 5/16-18 x 58 in. (3)
33 Washer, lock, 5/16 in (3)
34 Dust shield
35 Dust shield gasket
36 Nut, hex, 1-14
37 Lubrication fitting
38 Elbow
39 Reducing bushing, 1/4 to 1/8 in.
40 Screw, cap, hex, 1/2-13 x 1 3/4 in. (6)
41 Washer, lock, 1/2 in. (6)
42 Outer support bracket
43 Screw,cap,hex-hd, 1/2-13 x 1 in. (2)
44 Lock plate
45 Track frame shaft retainer
46 Lubrication fitting
47 reducing bushing, 1/4-13 x 2 in. (6)
48 pipe plug
49 Screw,cap,hex-hd, 1/2-13 x 2 in. (6)
50 Washer,lock, 1/2 in. (6)
51 Inner support bracket
52 Final drive assembly (Ih shown, rh opposite)
53 Track frame channel assembly

Figure 6-31(1)-Continued

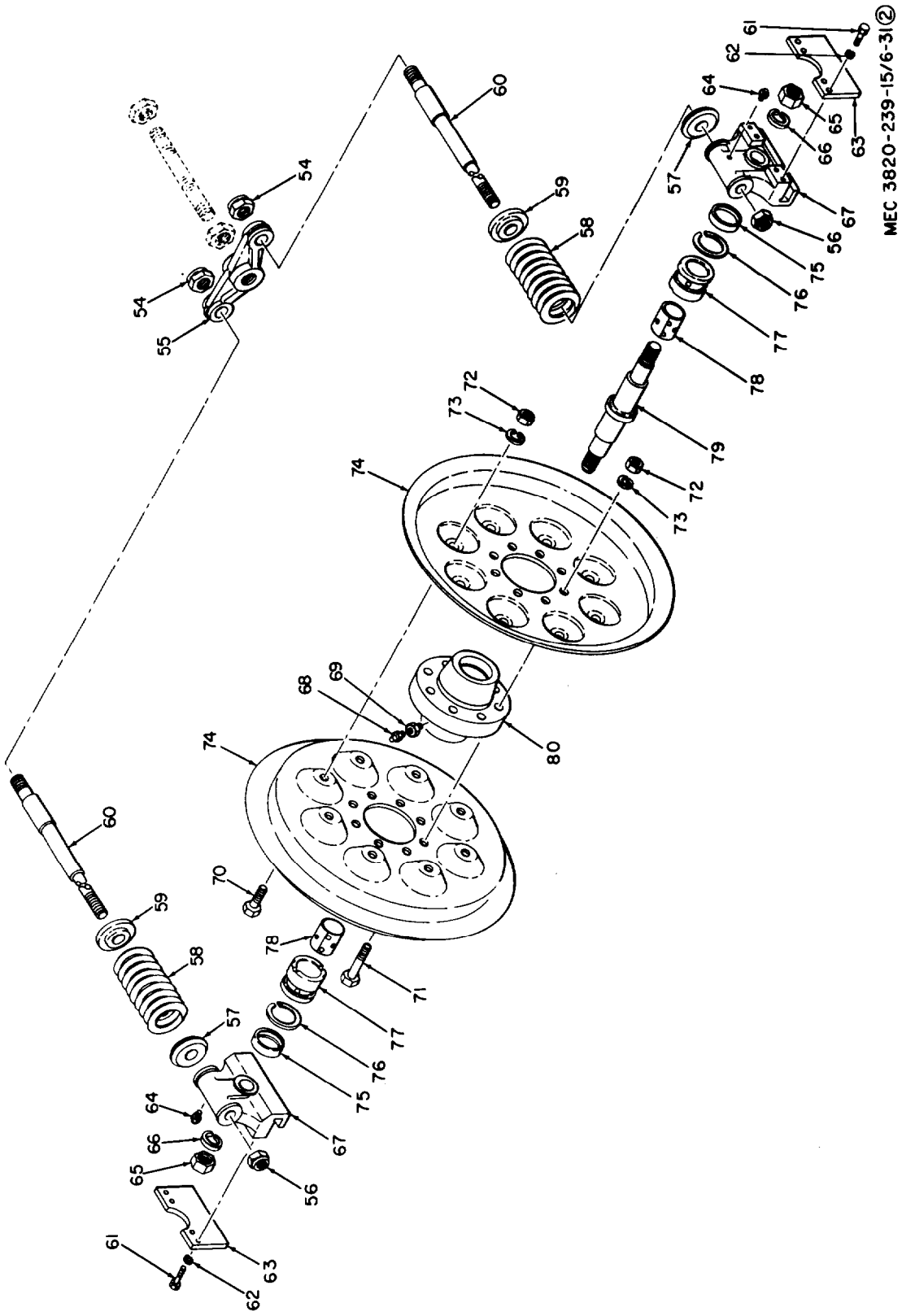


Figure 6-31(2)—Continued.

54 Nut, self-locking, hex, 7/8–14 (2)
55 Track idler adjusting fork
56 Nut, self-locking, hex, 3/4–16 (2)
57 Buffer spring front seat (2)
58 Buffer spring (2)
59 Buffer spring rear seat (2)
60 Buffer spring clamp rod
61 Screw, cap, hex-hd, 3/8–16 x 1 1/2 in. (8)
62 Washer, lock, 3/8 in. (8)
63 Support guide plate (2)
64 Lubrication fitting (2)
65 Nut, hex, 1–12 (2)
66 Washer, lock, 1 in. (2)
67 Track idler support (2)
68 Lubrication fitting
69 Reducing bushing, 1/4 to 1/8 in.
70 Screw, cap, hex-hd, 1/2–20 x 1 1/2 in. (8)
71 Screw, cap, hex-hd, 1/2–20 x 2 3/4 in. (8)
72 Nut, hex, 1/2–20 (16)
73 Washer, lock, 1/2 in. (16)
74 Track idler flange (2)
75 Oil seal (2)
76 Snap ring (2)
77 Track idler bushing retainer (2)
78 Track idler bushing (2)
79 Track idler shaft
80 Track idler hub

Figure 6–31(2)—Continued.

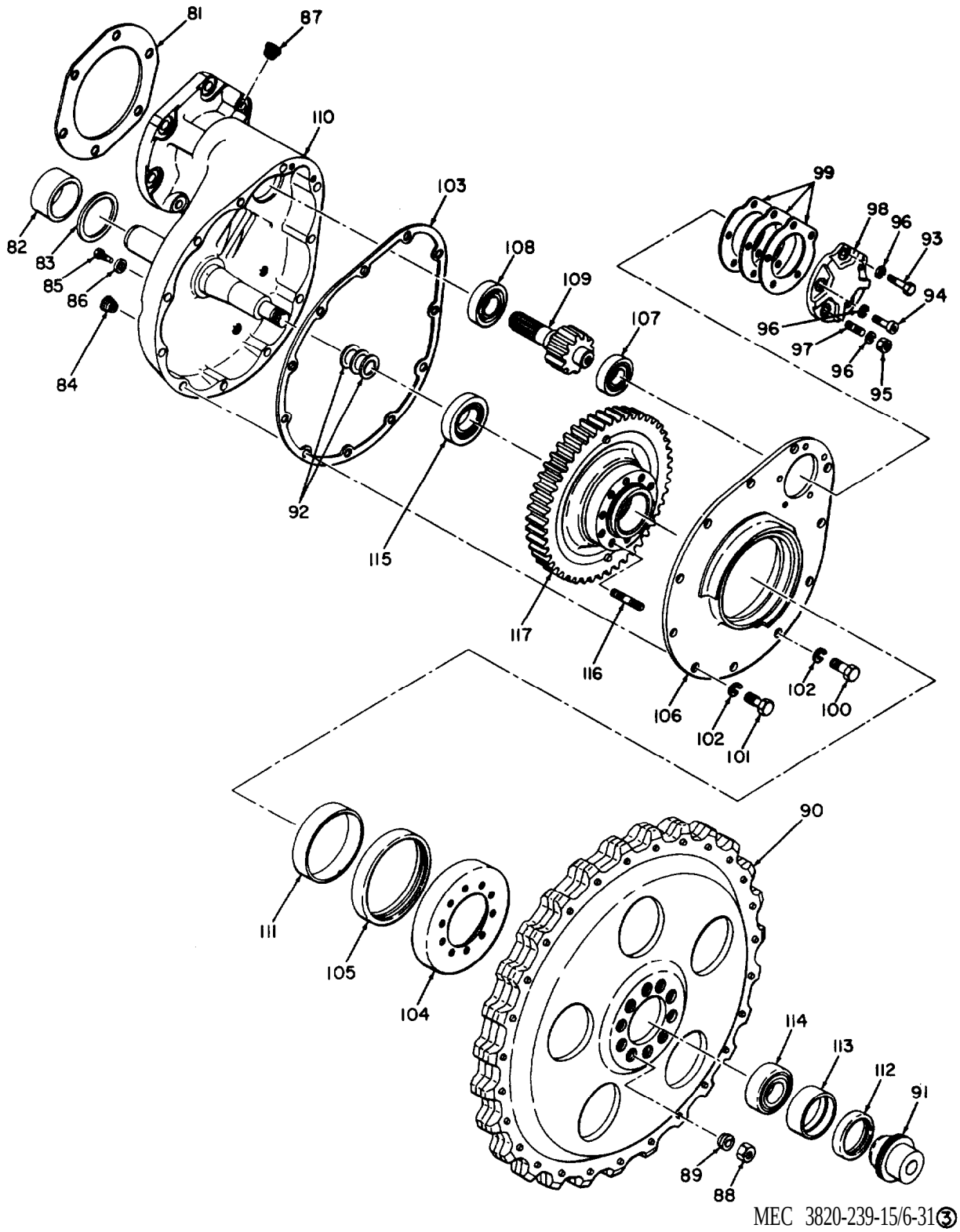


Figure 6-31(3)-Continued.

GPO 812-695-11

81 Spacer plate gasket
82 Spacer housing sleeve
83 Inner support bracket shim (2)
84 Oil level plug
85 Magnetic drain plugwr, 1/2 in.
86 Gasket
87 Oil filler plug
88 Sprocket stud nut (10)
89 Collet (10)
90 Sprocket assembly
91 Shaft trunnion
92 Track sprocket bearing shim (as rqr)
93 Screw, cap, hex-hd, 3/8-16 x 1 1/4 in. (2)
94 Screw, cap, hex-hd, 3/8-24 x 1 in. (2)
95 Nut, hex, 3/8-24
96 Washer, lock, 3/8 in. (6)
97 Stud, 3/8-24 x 15/16 in.
98 Bearing retainer
99 Bearing retaining shim (as rqr)
100 Screw, cap, hex-hd, 1/2-18 x 1 1/4 in. (8)
101 Screw, dowel, cap, hex-hd, 1/2-18 x 1 3/8 in. (3)
102 Washer, lock, 1/2 in. (11)
103 Cover gasket
104 Dust shield
105 Large oil seal
106 Cover plate assembly
107 Complete outer bearing
108 Complete inner bearing
109 Main drive shaft pinion
110 Shaft and spacer housing (lh shown rh opposite)
111 Oil seal wear plate
112 Small oil seal
113 Oil seal retainer
114 Complete outer ring gear bearing
115 Complete inner ring gear bearing
116 Track sprocket stud (10)
117 Ring gear and hub assembly

Figure 6-31(3)-Continued.

figure 6-31. Note the following special procedures:

b. Find Drive Assembly.

(1) Press large oil seal (106, fig. 6-31), into cover plate assembly (106), with the lip facing outward.

(2) Press small oil seal (112) into the deep bore of oil seal retainer (113), with the lip facing the shallow bore of the retainer.

(3) Tap or press the outer races of outer and inner ring gear bearings (114 and 116) into the hub of ring gear and hub assembly (117).

(4) Tap or press the outer race of inner bearing (108) into the bore of shaft and spacer housing (110).

(5) Using a suitable press and bearing pusher to bear on the inner races, install bearings (107 and 108) on main drive shaft pinion (109).

(6) Tap or press the inner race and rollers of outer and inner ring gear bearings (114 and 116) in place on shaft and spacer housing (110).

(7) Install ring gear and hub assembly (117) into shaft and spacer housing (110).

(8) To check ring gear adjustment, install the same thickness of track sprocket bearing shims (92) as was removed during disassembly, on shaft and spacer housing (110). Install the assembled small oil seal (112) and oil seal retainer (113) on the shaft. Install shaft trunnion (91) and secure with nut (36).

Note. If the shim thickness used previously cannot be determined, start with 0.125 inch thickness of shims.

(9) Engage the hook of a spring scale in a tooth of ring gear and hub assembly (117) as shown in figure 6-32 and check the pull against rotation of the gear. If the spring scale does not read between 6 to 8 pounds, add or remove track sprocket bearing shims (92, fig. 6-31) as required to obtain the correct reading.

(10) Carefully install oil seal wear plate (111) on the rim of ring gear and hub assembly (117), tapping the plate in place with a piece of wood. Be careful not to damage the plate.

(11) Install the assembled main drive shaft pinion (109) with bearings (107 and 108), into shaft and spacer housing (110).

(12) Align a new cover gasket (103) with shaft and spacer housing (110). Install cover plate assembly (106) carefully over ring gear and hub assembly (117) onto the shaft and spacer

housing. Make sure that the holes are aligned properly. Install and securely tighten screws (100) and dowel screws (101) with lock washers (102).

(13) Loosen nut (36) enough to allow ring gear and hub assembly (117) to turn freely.

(14) Install the same thickness of bearing retainer shims (99) as was removed during disassembly, over cover plate assembly (106). Install bearing retainer (98) and hardware (93 through 97).

Note. If the shim thickness used previously cannot be determined, start with 0.050 inch thickness of shims.

(15) Wrap some string around the protruding (splined) end of main drive shaft pinion (109) and hook a spring scale on the string to check the pull against rotation of the main drive shaft pinion. If the drag is not between 2 and 4 pounds, add or remove bearing retainer shims (99) as required to obtain the correct reading.

(16) Remove nut (36) and shaft trunnion (91). Install the assembled small oil seal (112) and oil seal retainer (113), so that the deep bore containing the oil seal is facing outward (toward the end of the shaft). Tap or press in the oil seal retainer until seated. Reinstall the shaft trunnion (91) and nut (36). Tighten the nut securely.

(17) Install dust shield (104). Install sprocket assembly (90) and collets (89). Install and tighten sprocket stud nuts (88) to a torque of 150 foot-pounds.

Note. After 100 hours of operation, re check and retighten the sprocket stud nuts to the specified torque.

(18) Jack up the frame and install final drive assembly (52) and related parts

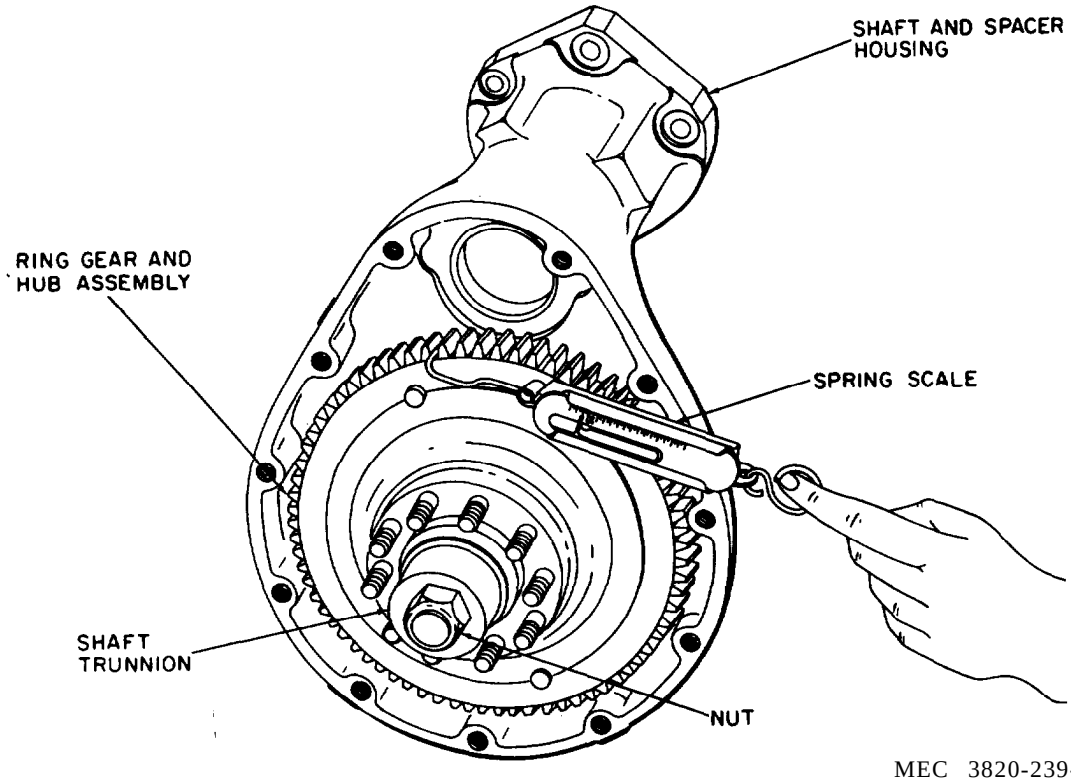


Figure 6-32. Checking drag of traction unit ring gear.

(32 through 51) on track frame channel assembly (53).

c. Track Idler Assembly.

(1) Using a mallet, tap track idler bushing retainers (77) and track idler bushings (78) into track idler hub (80).

(2) Install track idler shaft (79). Install snap rings (76) and oil seals (75).

(3) If track idler flanges (74) were removed, install them on track idler hub (80). Tighten screws (70 and 71) evenly to make sure that the wheel will run true. Install reducing bushing (69) and lubrication fitting (68).

(4) Install track idler supports (67) and support guide plates (63).

(5) Install buffer spring parts (54 through 60).

(6) Jack up the frame and install track assembly and related parts (18) with track idler adjusting screw (17) and nuts (16).

(7) Check the assembled length of buffer springs (58) on both traction units to insure correct running alinement of the wheels. Set the assembled length of both buffer springs to 6 1/8 inches.

d. Track Roller Assemblies.

(1) Using a vise and a hard wooden block, press track roller bushings (29) into track roller bushing retainers (28) so that the oil holes are alined.

(2) Using a suitable bearing driver, install the assembled bushings and retainers into flange and hub assembly (31), with the tapered ends toward the center. Press in the parts until seated and install snap rings (27).

(3) Install track roller shaft (30), tapping with a mallet if necessary to avoid binding.

(4) Using a suitable bearing driver, tap oil seals (26) in place with the lips of the seals facing outward.

(5) Install dust shield assemblies (21). Jack up the frame and install track roller shaft supports (20) with track roller assemblies (23), on roller to track frame studs (22). Secure with self-locking nuts (19).

e. Track Assembly.

(1) Loosen track adjusting nuts (16) if necessary.

(2) Jack up the frame and mount the track around the final drive sprocket, track idler, and track rollers, bringing the ends together.

(3) Aline the pin holes of left- and right-hand track hookup links (13 and 12) with a drift.

(4) With track link bushing (9) installed and the outer track hookup pin lock pin (6) inserted in track hookup pin (7) place the hookup pin through the hookup links and bushing.

(5) Turn the track hookup pin (7) so that the holes are alined with the slots in the link.

(6) Insert and drive the track hookup pin lock pin (6) completely in until seated.

(7) Adjust the tracks (para *3-36a).*

6-96. Installation

See figure 6-30 and install the traction units.

Section VX. TOW HITCH

6-97. General

This section contains repair instructions for the tow hitch. The tow‘hitch may be used for both towing the compressor or for connecting the pneumatic drill to a tractor or truck.

6-98. Removal

Remove the tow hitch as described in paragraph 3-40.

6-99. Disassembly

Disassemble tow hitch in the numerical sequence as illustrated on figure 6-33.

6-100. Cleaning

Clean parts in an approved solvent and blow dry with compressed air.

6-101. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

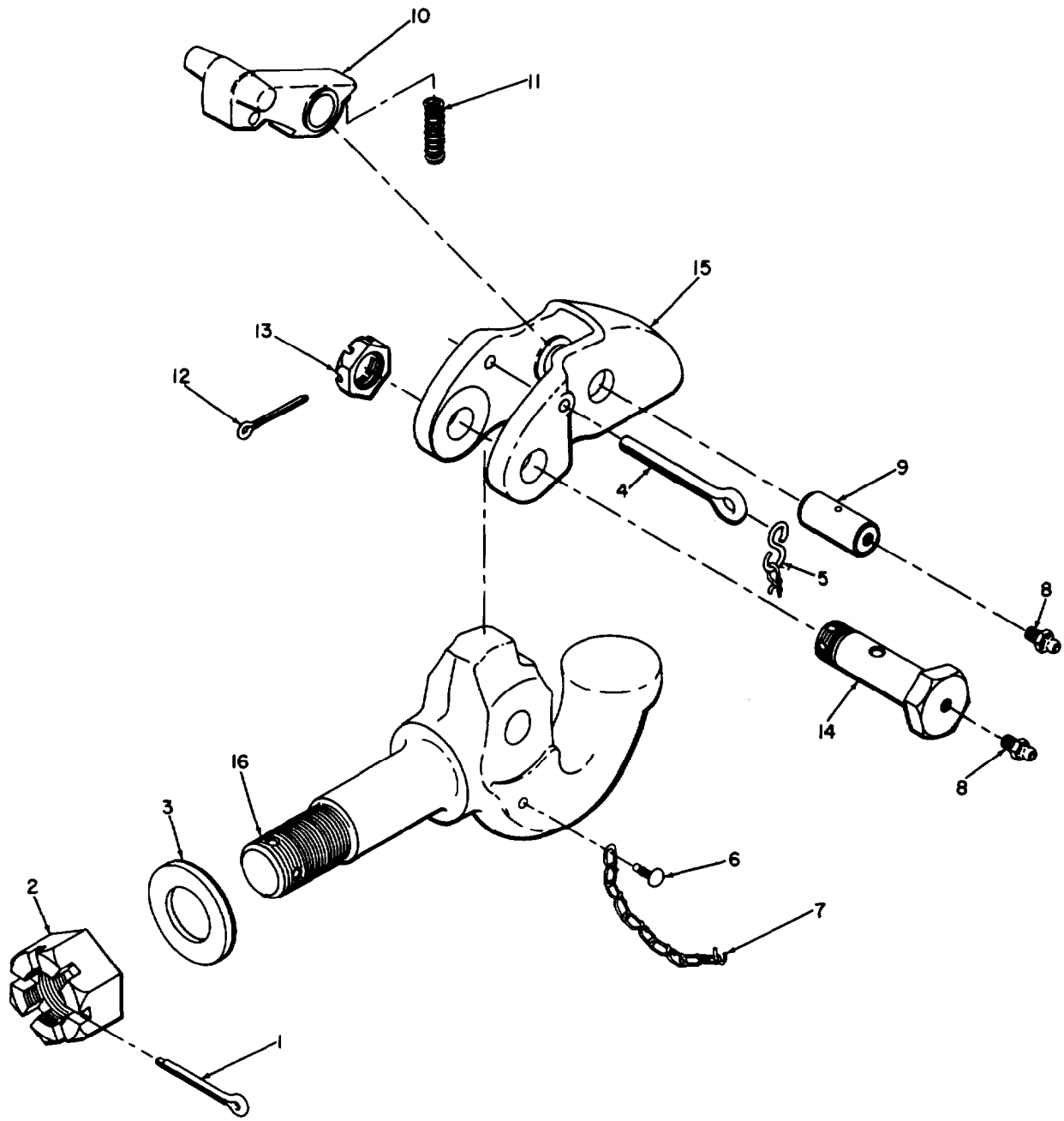
c. If cotter pins were removed, discard them and install new ones at assembly.

6-102. Reassembly

Reassemble tow hitch in reverse of numerical sequence as illustrated on figure 6-33.

6-103. Installation

Install the tow hitch as described in paragraph 3-41.



MEC 3820-239-15/6-33

Figure 6-33. Tow hitch, exploded view.

1 Cotter pin
2 Nut, hex, slotted, 1 1/2-12
3 Washer, flat, 1 1/9 in.
4 Cotterpin
5 S-link
6 Drive screw
7 Chain
8 Lubrication fitting (2)
9 Pintle latch pin
10 Pintle latch
11 Spring
12 Cotter pin
13 Nut, hex, slotted, 1-14
14 Latch bolt, hex-hd, 1-14 x 8 7/8 in.
15 Pintle lock
16 Pintle

Figure 6-33-Continued.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers For Army Users

A-2. Lubrication

C9100IL	Fuels, Lubricants, Oils and Waxes
LO 5-3820-239-12	Department of the Army Lubrication Order for Drill, Pneumatic, Drifter Crawler Mounted, Self-Propelled Ingersoll-Band Model CM150A/D475A

A-3. Painting

TM 9-213	Painting Instructions for Field Use

A-4. Radio Suppression

TM 11-488	Radio Interference Suppression

A-5. Maintenance

TM 38-750	Army Equipment Record Procedures
TM 5-3820-239-	Department of the Army Operator, Organizational, Direct and General Support, and Depot Maintenance Manual
TM 5-3820-239-2OP	Department of the Army Operator and Organizational Maintenance Repair Parts and Special Tools List Manual
TM 5-3820-239-35P	Department of the Army Direct and General Support and Depot Maintenance Repair Parts and Special Tools List Manual
TM 5-764	Electric Motor and Generator Repair

A-6. Shipment and Storage

TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TB 740-93-3	Administrative Storage of USAMEC Mechanical Equipment

APPENDIX B

BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

B-l. Scope

This appendix lists items which accompany the pneumatic drill or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items-Section II is a list of items which accompany the pneumatic drill or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies-Section III is a listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column (1):

(1) Source Code, indicates the selection status and sources for the listed item. Source codes are:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
A	Applied to assemblies which are not procured to stocked as such, but made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item, and the failure of which should result in retirement of the end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of the next higher assembly or compenents.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Applied to repair parts authorized for local procurementes If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Applied to major assemblies that are pro cured with PEMA (Procurement Equip ment Missile Army) funds for initial issue only to be used as exchange assemblies at DSU and GSU level or returned to depot supply level.

Note. Source code is not shown on common hardware items known to be readily available in Army supply channels and through local procurement.

(2) Maintenance Code, indicates the lowest category of maintenance author-

ized to install the listed item. The maintenance level codes are:

Code	Explanation
C	Operator/crew
O	Organizational maintenance

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column (2). This column indicates the Federal stock number for the item.

c. Description, Column (3). This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Units of Issue, Column (4). This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit Pack, Column (5). This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column (6). This column indicates the quantity of the item used in the functional group.

g. Quantity Furnished With Equipment, Column (7). This column indicates the quantity of an item furnished with the equipment.

h. Quantity Authorized, Column (8). This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

i. Illustration, Column (9). This column is divided as follows:

(1) *Figure Number, column 9a.* Indicates the figure number of the illustration in which the item is shown.

(2) Item Number, column 9b. Indicates the callout number used to reference the item in the illustration.

B-4. Explanation of Columns In the Tabular list of Maintenance and Operating Supplies-Section III

a. Component Application, Column (1). This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number, Column (2). This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

c. Description, Column (3). This column indicates the item and brief description.

d. Quantity Required for Initial Operation, Column (4). This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equip ment.

e. Quantity Required for 8 Hours Operation, Column (5). This column indicates the estimated quantities required for an average eight hours of operation.

f. Notes, Column (6). This column indicates informative notes keyed to data appearing in a preceding column.

B-5. Federal Supply Code for Manufacturers

Code	Manufacturer
30760	Ingersoll-Rand Co. New York, New York
88033	Alemite Corp Long Island City, New York
93343	Oliver Corp Charles City, Iowa

Section II. BASIC ISSUE ITEMS LIST

(1) Source, maint, and recov code			(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9) Illustration	
(A) S	(B) M	(C) R	Federal stock No.	Description	Unit of issue	Qty inc in unit pack	Qty inc in unit	Qty furn with equip	Qty auth	(A) Fig No.	(B) Item No.
				GROUP 31—BASIC ISSUE ITEMS MANUFACTURER INSTALLED.							
				3100—BASIC ISSUE ITEMS MANUFACTURER OR DEPOT INSTALLED.							
P	O		7510–889–3494	Binder, loose Leaf: U.S. Army Equipment Log Book	Ea			1	1		
P	O		7520–559–9618	Case, Maintenance and Operational Manuals, cotton duck, water repellent, mildew resistant, MIL–B–117438.	Ea			1	1		
P	O			Department of the Army Organizational, Direct and General Support, and Depot Maintenance Manual, TM 5–3820–239–15.	Ea			1	1		
P	O			Department of the Army Operator and Organizational Maintenance Repair Parts and Special Tools List Manual, TM 5–3820–239–20P.	Ea			1	1		
				GROUP 32—BASIC ISSUE ITEMS, TROOP INSTALLED.							
				3200—BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED.							
				Wrench, Track Adjusting (93343) 112659	Ea			1	1		
				Wrench, 1 inch Open End (30760) 1013	Ea			1	1		
				Wrench, 1 5/16 inch Open End (30760) 8A	Ea			1	1		
				Gun, Grease (88033) 4040	Ea			1	1		
				Gun, Oil (88033) 4032	Ea			1	1		
				Hose Assembly, Grease Gun (88033) 6652A	Ea			1	1		

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
1. 1103 Final Drives (1)		Lubricating Oil Gear: 5 gal drum as follows:			(1) Includes quantity of gear oil for both units.
	9150–577–5844 (2)	GO–90	3 qt	(3)	(2) See C91001L for additional data and requesting procedure.
	9150–257–5440 (2)	GOS	3 qt	(3)	(3) See current L.O. for grade application and replenishment intervals.
2. 4308 Hydraulic Reservoir	9150–265–9428 (2)	Oil, Lubricating: 5 gal pail as follows: OEID	40 qt (4)	(3)	(4) Reservoir capacity
	9150–242–7603 (2)	OES	40 qt (4)	(3)	(5) Average oil consumption is 1 qt per hour of operation.
3. 5006 Manifold Lubricator	9150–265–9435 (2)	Oil, Lubricating: 5 gal pail as follows: OE 30	8 qt (4)	(5)	
	9150–265–9428 (2)	OE 10	8 qt (4)	(5)	
	9150–242–7603 (2)	OES	8 qt (4)	(5)	
4. 5019 Air Feed Motor (1)	9150–577–5844 (2)	Lubricating Oil Gear: 5 gal drum as follows: GO–90		(3)	
	9150–257–5440 (2)	GOS		(3)	
5. 5019 Propelling Air Motor (1)	9150–265–9435 (2)	Oil Lubricating 5 gal drum as follows: OE–30	2 qt	(3)	
	9150–265–9428 (2)	OE–10	2 qt	(3)	
6. Drill Steel, Bitts	9150–223–4004 (2)	Grease, Molybdenum Disulfide: 5 lb can GMD		(3)	

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
7. Grease Points	9150–190–0955 (2)	Grease, automotive and artillary: 5 lb can as follows: GAA		(3)	

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintnance levels.

b. Section II designates pverall responsibility for the performance of maintenancde operations on the identified end item or component. The implementation of the maintenance tasks upon the end item or component will be consistent with the assigned maintenance operations.

c Section III lists the special tools and test equipment required for each maintenance opation as referenced from section II.

d. Section IV contains supplemental structions, explanatory notes and /or illustrations required for a particular maintenance function.

C-2. Explanation of Column

a. Functional Group Number. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the Maintenance Assignment in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Component Assembly Nomenclature. This column contains a brief description of the components of each functional group.

c. Maintenace Functions and Maintenance Categories. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these operations. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew
O - Organizational maintenance
F - Direct support maintenance
H - General support maintenance
D - Depot maintenance

The maintenance functions are defined as follows:

A- INSPECT	Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.
B- TEST	Verify serviceability and detect incipient electrical or mechanical failure by measuring the mechanical or electrical characteristics of the item and comparing those characteristicsr with authorized standards. Tests will be made commensurate with test procedures and with calibrated tools and/or test equipment referenced in the Maintenance Assignment.
C- SERVICE	Operations required periodically to keep the item in proper operating condition, i.e., to clean, preserve, drain, paint, and replenish fuel, lubricants, hydraulic, and deicing fluids, or compressed air supplies.
D- ADJUST:	Regulated periodically to prevent malfunction. Adjust ments will be made commen surate with adjustment procedures and associated equip ment adjustment specifications.
E-ALINE:	Adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized or adjusted.

F-CALIBRATE: Determine, check, or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.

G-INSTALL: Remove and install the same item for service or when required for the performance of other maintenance operations.

H-REPLACE: Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts.

I-REPAIR: Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills, including welding, grinding, riveting, straightening, adjusting and facing.

J-OVERHAUL: Restore an item to a completely serviceable condition (as prescribed by serviceability standards developed and pub lished by the commodity commands) by employing techniques of "Inspect and Repair Only As Necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul applied to end items, is limited to depot maintenance leval.

K-REBUILD: Restore to a condition comparable to a new by disassembling to determine the condition of each component part and re assembling using serviceable rebuilt, or new assemblies, subassemblies and parts.

d. Reference Note. This column, subdivided into columns L and M, is provided for referencing the Special Tool and Test Equipment Requirements (sec. III) and Remarks (sec. IV) that may be associated with maintenance functions (sec. II).

C-3. Explanation of Columns in Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the Tools and Equipment requirements column on the Maintenance Assignment. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the Maintenance Assignment.

b. Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal stock number of tools and test equipment.

C-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column M and the second letter references a maintenance operation, columns A through K.

b. Remarks. This column lists information pertinent to the maintenance operation being performed, as indicated on the Maintenance Assignment section II.

Section II. MAINTENANCE ASSIGNMENT

Functional group number		Component assembly nomenclature	Maintenance functions A INSPECT	B TEST	C SERVICE	D ADJUST	E ALINE	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	Note Reference L Tools and equipment	M Remarks
11		REAR AXLE													
	1103	Final Drive	C	--	--	--	--	--	--	F	F				
13		TRACKS													
	1301	Suspension System:													
		Suspension assembly, track	C	--	--	--	--	--	--	F	F				
	1302	Track Support Rolers and Brackets:													
		Roller assembly support bushings	C	--	--	--	--	--	--	F	F				
	1303	Track Idlers and Brackets:													
		Idler assembly, track adjuster	C	--	--	--	--	--	--	F	F				
	1304	Track Drive Sprocket:													
		Sprocket, drive	C	--	--	--	--	--	--	F	F				
	1305	Track Assembly													
		Plate, assembly	C	--	--	--	--	--	--	F	F				
15		FRAME													
	1501	Frame Assembly:													
		Deck assembly	C	--	--	--	--	--	--	F	F				
		Crossbar, struts	C	--	--	--	--	--	--	F	F				
	1503	Towing Attachments:													
		Hitch, towing	C	--	--	--	--	--	--	O					
22		BODY CHASSIS OR HULL, AND ACCESSORY ITEMS													
	2210	Data Plates:													
		Plates, data	C	--	--	--	--	--	--	F					
		Plates, instruction	C	--	--	--	--	--	--	F					
43		HYDRAULIC													
	4301	Hose, Pipe Fittings, Tubing:													
		Hose and fittings	C	--	--	--	--	--	--	O					
		Tender assembly, hose support	C	--	--	--	--	--	--	O					
	4302	Pump and Pump Drive:													
		Coupling, flexible	C	--	--	--	--	--	--	O					
		Pump, hydraulic	C	F	--	--	--	--	--	O	F				
	4305	Manifold and/or Control Valves:													
		Valve, master control	C	--	--	--	--	--	--	O	F				
		Valve, knee action and turret swing	C	--	--	--	--	--	--	O	F				
	4307	Hydraulic Cylinders	C	--	--	--	--	--	--	O	F				
	4308	Reservoir	C	--	C	--	--	--	--	--	--	--	--	----	A
50		PNEUMATIC EQUIPMENT													
	5006	Lubrication System:													
		Cap and fill tube	C	--	--	--	--	--	--	O					
		Plug, drain	--	--	--	--	--	--	--	O					
		Lubricator, air line	--	--	--	C	--	--	--	O	F	--	--	----	B
	5008	Air Intakes:													
		Hoses, fittings, manifolds	C	--	--	--	--	--	--	O					
		Strainer, air	C	--	C	--	--	--	--	O					
		Valve, shut-off	C	--	--	--	--	--	--	O					
	5019	Pneumatic Motor Assembly:													
		Drill assembly, drifter, pneumatic	--	--	C	--	--	--	--	O	F	F			
		Motor, tramming	F	--	--	--	--	--	--	F	F				

Functional group number	Component assembly nomenclature	Maintenance functions											Note Reference	
		A	B	C	D	E	F	G	H	I	J	K	L	M
		INSPECT	TEST	SERVICE	ADJUST	ALINE	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	Tools and equipment	Remarks
	5019 Pneumatic Motor Assembly:													
	Motor, feed	F	--	--	--	--	--	--	O	F				
	Gear case, feed motor	F	--	C	--	--	--	--	F	F				
	Gear case, tramming motor	F	--	C	--	--	--	--	F	F				
	Clutch, throw-out, tramming motor	--	--	--	--	--	--	--	F	F				
	5020 Governor Pneumatic Motor:													
	Control, feed motor	F	--	--	--	--	--	--	O	F				
	Control, tramming motor	F	--	--	--	--	--	--	O	F				
	Control, drifter rotation	F	--	--	--	--	--	--	O	F				
74	EARTH MOVING EQUIPMENT COMPONENTS													
	7473 Lift and Swing Mechanism:													
	Bearing plate, turret	C	--	--	--	--	--	--	F					
	Boom assembly	C	--	--	--	--	--	--	F	F				
	Dumpercrank assembly	C	--	--	--	--	--	--	F	F				
	Pin, boom bushing	C	--	--	--	--	--	--	F					
	Pin, dump cylinder and turret	C	--	--	--	--	--	--	O					
	Turret	C	--	--	--	--	--	--	F	F				
	7476 Feed and Leveling:													
	Carriage assembly	--	--	--	--	--	--	--	F	F				
	Centralizer	--	--	--	--	--	--	--	O	O				
	Chain	--	--	--	O	--	--	--	O					
	Slide, drill mounting	C	--	--	--	--	--	--	O	O				
	Sprockets, chain	C	--	--	--	--	--	--	O					
	Sprocket, gear case	F	--	--	--	--	--	--	F					
	7477 Hand Control and Linkage:													
	Control, assembly, pump	C	--	--	--	--	--	--	O	O				
	Cables, hand control	C	--	--	--	--	--	--	O	O				
	Levers, hand control	C	--	--	--	--	--	--	O					

Section III. SPECIAL TOOL AND TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
		No special tools or test equipment required.	

Section IV. REMARKS

Reference	Remarks
A - A	Service only
B - H	Repair includes installing repair kit

INDEX

INDEX

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Stuff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

USASA (2)
ACSI (1)
DCSLOG (1)
CNGB (1)
TSG (1)
CofEngrs (3)
ACSC-E (1)
Dir of Trans (1)
CofSptS (1)
USAMB (1)
USAIB (2)
USARADBD (2)
USAAESWBD (2)
USAAVNTBD (2)
USA Arty Bd (2)
USA Armor Bd (2)
USCONARC (8)
OS Maj Comd (5) except
USARJ (1)
USASETAF (2)
USAMC (1)
USAMECOM (46)
USACDCEC (10)
MDW (1)
Armies (2)
Corps (2)
USAC (1)
Div (2)
Engr Bde (1)
USMA (2)
Svc Colleges (2)
Br Svc Sch (2)
Gen Dep (10)
Engr Dep (10)
Army Dep (2) except
TOAD (3)
EAMTMTS (2)
WAMTMTS (2)
MOTBA (1)
MOTBY (1)
MOTKI (1)
MOTSU (1)
Div Engr (2)
Engr Dist (2)
Engr Cen (5)
Engr FLDMS (2)
Ft Knox FLDMS (10)
AMS (3)
MAAG (1)
JBUSMC (1)
USARMA (1)
USARMIS (1)
USACOMZEUR (2)
Fld Comd, DASA (8)
USAREUR Engr Proc Cen (2)
USAREUR Engr Sup Con Agcy (10)
USA Mbl Equip R&D Cen (3)
Units org under fol TOE:
5-48 (2)
5-237 (5)
5-262 (5)
5-267 (1)
5-278 (5)
5-279 (2)
5-500 (EA, EB) (2)

NG: None.

USAR: Same as Active Army except allowance is one (1) copy for each unit.

For explanation of abbreviations used, AR 320-50.

*U.S. GOVERNMENT PRINTING OFFICE: 1980-319-425/70

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

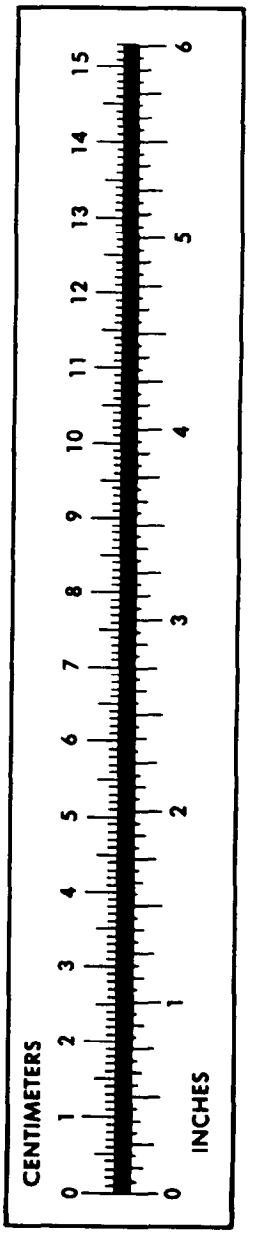
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN: 012288-005