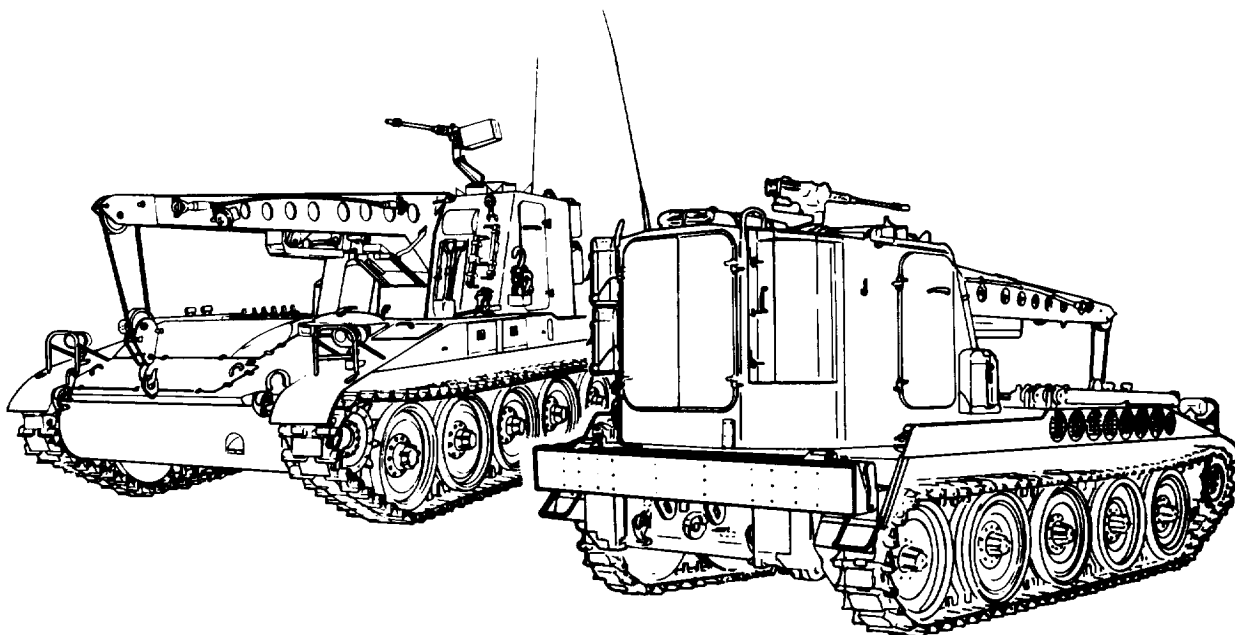


Supersedes copy
dated 4 October
1982. See page i
for details.

TECHNICAL MANUAL DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

CRANE (CAB) COMPONENTS
RECOVERY VEHICLE, FULL-TRACKED:
LIGHT, ARMORED, M578
(2350-00-439-6242) (EIC:3LA)

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DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 26 November 1993

TECHNICAL MANUAL
DIRECT SUPPORT AND GENERAL
SUPPORT MAINTENANCE MANUAL
FOR
CRANE (CAB) COMPONENTS
RECOVERY VEHICLE, FULL-TRACKED:
LIGHT, ARMORED, M578
(2350-00-439-6242)

TM 9-2350-238-34-2, dated 14 April 1992, is changed as follows:

1. The purpose of this change notice is to provide notification under Section 326 of Public Law 102-484, FY 93 National Defense Authorization Act, that Ozone Depleting Chemicals may no longer be used on Army equipment.

2. Throughout this publication the following items should be substituted for Ozone Depleting Chemicals used on your equipment:

FOR:

SUBSTITUTE:

Page B-2 (2 places)
MIL-C-22750

MIL-C-22750, Type 1.

Page B-3
MIL-P-23377

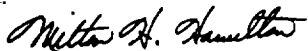
MIL-P-23377, Type 1.

3. File this change notice in the front of the publication for reference purposes.

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
05538

DISTRIBUTION:

To be distributed in accordance with DA Form 12-37-E, block 1443 requirements for TM 9-2350-238-34-2.

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 28 May 1993

DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL

CRANE (CAB) COMPONENTS
RECOVERY VEHICLE, FULL-TRACKED:
LIGHT, ARMORED, M578
(2350-00-439-6242) (EIC:3LA)

TM 9-2350-238-34-2, January 1992, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added or revised illustrations are indicated by a miniature pointing hand, or vertical bar adjacent to the illustration identification number.

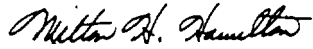
| Remove Pages | Insert Pages |
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| 2-19 and 2-20 | 2-19 and 2-20 |
| 2-35 and 2-36 | 2-35 and 2-36 |
| 2-41 and 2-42 | 2-41 and 2-42 |
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| A-1 and A-2 | A-1 and A-2 |
| B-3/(B-4 blank) | B-3/(B-4 blank) |
| Index-1 through Index-4 | Index-1 through Index-4 |

File this change sheet in front of the publication for reference purposes.

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
04175

DISTRIBUTION:

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requirements for TM 9-2350-238-34-2.

WARNING

GENERAL

Dry cleaning solvent (SD2) is toxic and flammable. Wear protective goggles and gloves and use only in well-ventilated areas.

Unusable CARC mixtures may be considered hazardous waste and may require disposal IAW Federal, state, DoD, and DA hazardous waste regulations. Consult the installation environmental office for proper disposal guidance. Mixed CARC has a flashpoint of approximately 38°F (3°C) due to the incorporation of solvents and is highly flammable.

CARC paint contains isocyanate, a constituent that can cause respiratory effects during and after the application of the material. During the application of CARC paint, coughing, shortness of breath, pain on respiration, increased sputum, and chest tightness may occur. CARC paint also produces itching and reddening of the skin, a burning sensation of the throat and nose, and watering of the eyes. An allergic reaction may occur after initial exposure (ranging from a few days to a few months later), producing asthmatic symptoms including coughing, wheezing, tightness in the chest, or shortness of breath. The following precautions must be observed to insure the safety of personnel when CARC paint is applied.

- For brush/roller painting in confined spaces, an airline respirator is required, unless an air sampling shows exposure to be below standards. If the air sampling is below standards, either chemical cartridge or airline respirators are required.
- Spot painters applying CARC paint by brush or roller must wear clothing and gloves affording full coverage.
- Do not use water, alcohol, or amine based solvents to thin or remove CARC paints. Use of these solvents with CARC paints can produce chemical reactions resulting in nausea, disease, burns, or severe illness to personnel.
- Do not use paint solvents to remove paint/coating from your skin
- Mix paint/coating in a well-ventilated mixing room or spraying area away from open flames. Personnel mixing paint/coating should wear eye protection.
- Use paint/coating with adequate ventilation.

HYDRAULICS

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

Make sure hydraulic system is depressurized before performing any hydraulic maintenance to prevent injury to personnel.

When testing hydraulic system, be sure boom is in stowed position as failure of system may result in injury to personnel.

WARNING (CONT)

BOOM AND WINCH

Make sure all personnel stand clear when operating boom to avoid injury to personnel.

Make sure all personnel stand clear of boom and block before traversing cab or operating boom.

Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries, Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.

Vehicle drum winch assembly weighs approximately 400 lb (182 kg); use care when removing or installing. Failure to observe this warning could result in injury to personnel and damage to equipment.

Use hoist with lifting capacity of 2000 lb (908 kg) to prevent injury to personnel or damage to equipment.

HYDRAULIC MOTOR

Hydraulic motor seal contains parts under spring tension. Use caution when removing or installing hydraulic motor seal.

STAGE THREE BOOM WINCH CARRIER ASSEMBLY

Clutch release carrier contains spring under high tension. Use caution during removal and installation.

CAB

Make sure MASTER switch is OFF before repairing electrical components. Failure to observe this warning could result in injury to personnel.

Use hoist and chain sling of 30,000 lb (13,620 kg) minimum lifting capacity to prevent injury to personnel and damage to equipment.

RELIEF VALVE

Do not disconnect fittings or remove retainer caps until hydraulic pumps are shut off and system pressure is relieved, Failure to follow instructions may result in injury to personnel or damage to equipment.

FIRST AID

Refer to FM 21-11, First Aid for Soldiers.

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

CRANE (CAB) COMPONENTS
RECOVERY VEHICLE, FULL-TRACKED:
LIGHT, ARMORED, M578
(2350-00-439-6242) (EIC:3LA)

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual, direct to: Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished to you.

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*This manual supersedes TM 9-2350-238-34-2, dated 4 October 1982, including all changes.

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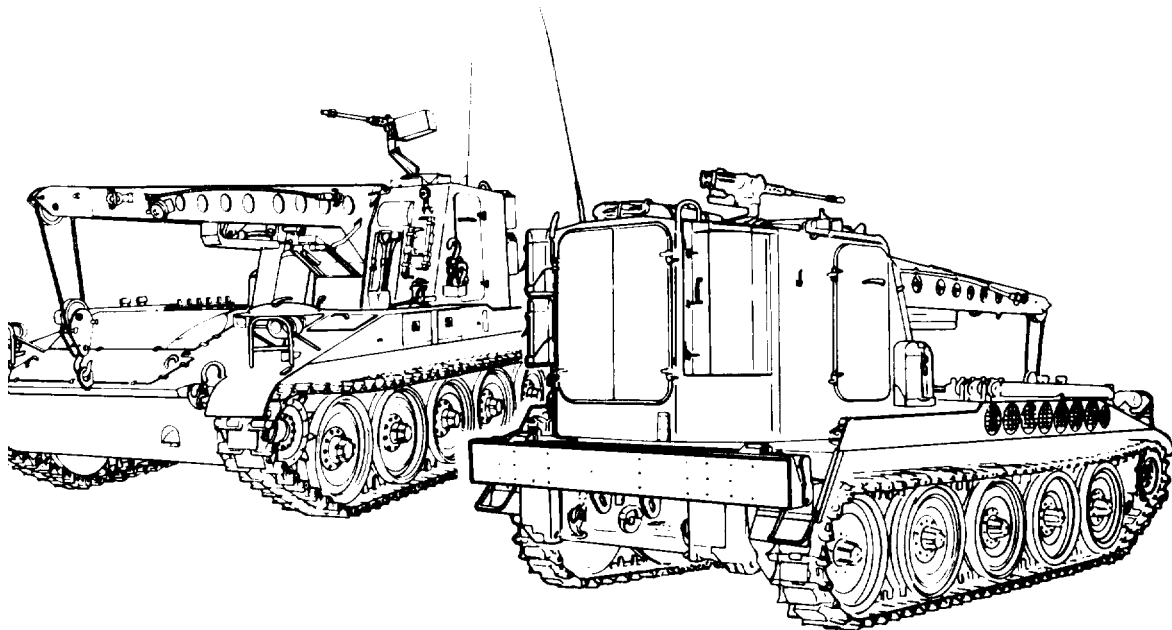
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HOW TO USE THIS MANUAL

This manual (TM 9-2350-238-34-2) contains direct support and general support maintenance procedures for the crane (cab) components of the M578 Recovery Vehicle, This manual is to be used in conjunction with TM 9-2350 -238-20-2 and TM 9-2350-238-24P2. Chapter 1 contains general information and equipment description and data. Chapter 2 contains information concerning repair parts, special tools, TM DE, and support equipment; direct support troubleshooting; and direct support maintenance procedures and information concerning preparation for storage and shipment, Chapter 3 contains general support maintenance procedures and information concerning preparation for storage or shipment.

Be sure to read and understand maintenance instructions before beginning any maintenance task. Also, read and understand information in Chapter 1 and general maintenance procedures on page 2-16 before beginning any maintenance task,

M578 ARMORED, LIGHT, FULL-TRACKED RECOVERY VEHICLE



CHAPTER 1 INTRODUCTION

CHAPTER INDEX

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Section 1. GENERAL INFORMATION

1-1. SCOPE.

a. Type of Manual. Direct support and general support maintenance.

b. Model Number and Equipment Name. M578 light armored, full-tracked recovery vehicle.

c. Purpose of Equipment. The vehicle is provided with a boom, winches, and equipment to perform its recovery mission. Special purpose kits are provided to aid recovery operations in cold climates.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS. 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).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

a. Tactical Situations. For destruction of materiel to prevent enemy use, refer to TM 750-244-6. For complete details on use of demolition materials and methods of priming

and detonating demolition charges, refer to FM 5-25.

b. Plans.

(1) Plans for destruction of equipment must be adequate, uniform, and easily carried out in the field.

(2) Destruction must be as complete as the available time, equipment, and personnel will permit. Since complete destruction requires considerable time, priorities must be established so the more essential parts are destroyed first.

(3) The same essential parts must be destroyed on all like units to prevent the enemy from constructing a complete unit from undamaged parts.

(4) Spare parts and accessories must be given the same priority as parts installed on the equipment.

c. Methods. To destroy equipment adequately and uniformly, all personnel of the unit must know the plan and priority of destruction and be trained in the methods of destruction.

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE (CONT).

d. *References.* Read TM 750-244-6 for information on destruction of mechanical equipment. Read TM 750-244- 5-1 for information on destruction of ammunition.

1-4. PREPARATION FOR STORAGE OR SHIPMENT. Administrative storage is restricted to 90 days and must not be extended. Refer to TM 9-2350 -238-20-2 for detailed instructions on administrative storage.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS.

Nomenclature Cross-Reference List.

| <i>Common Name</i> | <i>Official Nomenclature</i> |
|--------------------|------------------------------|
| Arbor press | Bench press |
| Lockwire | Nonelectrical wire |

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). If your M578 Recovery Vehicle needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, U.S. Army Armament,

Munitions and Chemical Command, ATTN: AMSMC-QAD, Rock Island, IL 61299-6000. We'll send you a reply.

1-7. CORROSION PREVENTION AND CONTROL (CPC).

a. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in the future.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words such as "corrosion, " "rust, " "deterioration, " or "cracking" will assure that the information is identified as a CPC problem.

d. The form should be submitted to: Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAS/ Customer Feedback Center, Rock Island, IL 61299-6000.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. *Purpose.* The M578 Recovery Vehicle is used to pick up or tow disabled mechanized equipment, as a crane at repair base, and as a carrying platform for spare parts and maintenance personnel.

b. *Capabilities and Features.*



Do not ford water which exceeds 42 in. (106.7 cm) in depth, Check for soft mud or sandy bottoms.

(1) The M578 Recovery Vehicle is a light, full-tracked, self-propelled, diesel-powered vehicle with a 30,000 lb (13,620 kg) boom winch and a 60,000 lb (27,240 kg) tow winch mounted in an armored cab. It is highly mobile and maneuverable and may be air transported. The vehicle is capable of long-range, high-speed operation on improved roads. It can travel over rough terrain, muddy or marshy ground, snow or ice, and can ford streams of a depth of 42 in. (106.7 cm).

(2) A hydraulic suspension lockout system and a spade assembly provide a stable platform and increase lifting and winching capabilities of the vehicle. Suspension lockout system, boom, winches, cab, and spade are hydraulically powered.

(3) A machine gun mount support is installed on the rigger/gunner cupola to accommodate a Browning M2.50 caliber machine gun.

(4) The cab can traverse 360 degrees using hydraulic power and travel up or down hills up to 30 percent grade.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. Refer to TM 9-2350-238-20-2.

1-10. EQUIPMENT DATA. Necessary equipment data not furnished in this manual can be found in TM 9-2350-238-10 or TM 9-2350-238-20-2.

a. *Boom Winch.*

- (1) Rated Load Capacity
 - Full Drum 15,000 lb (6810 kg)
 - Bare Drum 30,000 lb (13,620 kg)
- (2) Hydraulic Motor to Drum Ratio
 - (a) Low 73.09 to 1
 - (b) High 16.64 to 1
- (3) Wire Rope Diameter 5/8 in. (1.59cm)
- (4) Wire Rope Length 220 ft (67m)
- (5) Wire Rope Breaking Strength. 33,200 lb (15,073 kg)
- (6) Wire Rope Spooling (line anchored) Line pull 7500 lb (3405 kg)
- (7) Drum Capacity
 - (a) Perfect Layup 356 ft (109m)
 - (b) Uneven Layup 329 ft (100m)
- (8) Line Pull
 - (a) Low Speed, Bare Drum 31,200 lb (14,165 kg)
 - (b) Low Speed, Full Drum 19,100 lb (8671 kg)
 - (c) High Speed, Bare Drum 7120 lb (3232 kg)
 - (d) High Speed, Full Drum 4360 lb (1979 kg)
- (9) Line Speed (approximate)
 - (a) Low Speed, Bare Drum..... 69 fpm (21 m/min)
 - (b) Low Speed, Full Drum 113 fpm (34 m/min)
 - (c) High Speed, Bare Drum 304 fpm (93 m/min)
 - (d) High Speed, Full Drum..... 496 fpm (151 m/min)

1-10. EQUIPMENT DATA (CONT).

b. *Traversing System.*

- (1) Power Unit
 - (a) Weight123 lb (56 kg)
 - (b) Dimensions. .17.25 x 16.50 x 14.50 in. (43.82 x 41.91 x 36.83 cm)
 - (c) Traversing range of cab360 degrees
- (2) Final Drive
 - (a) Weight76 lb (35 kg)
 - (b) Dimensions 16.00 x 11.75 x 7.50 in. (40.64 x 29.85 x 19.05 cm)

c. *Tow Winch.*

- (1) Rated Load Capacity, Bare Drum. 60,000 lb (27,240 kg)
- (2) Hydraulic Motor to Drum Ratio
 - (a) Low 255 to 1
 - (b) High63 to 1
- (3) Wire Rope Diameter 1.0 in. (2.5 cm)
- (4) Wire Rope Length230 ft (70 meters)
- (5) Wire Rope Breaking Strength 84,000 lb (38,136 kg)
- (6) Wire Rope Spooling (line anchored) Line pull 30,000 lb (13,620 kg)
- (7) Drum Capacity, Perfect Layup 325 ft (99 meters)
- (8) Line Pull
 - (a) Low Speed, Bare Drum 71,500 lb (32,461 kg)
 - (b) Low Speed, Full Drum 45,500 lb (20,657 kg)
 - (c) High Speed, Bare Drum..... . 17,650 lb (8013 kg)
 - (d) High Speed, Full Drum 11,250 lb (5108 kg)
- (9) Line Speed (approximate)
 - (a) Low Speed, Bare Drum 28.7 fpm (8.7 m/min)
 - (b) Low Speed, Full Drum 45.0 fpm (13.7 m/min)
 - (c) High Speed, Bare Drum 116.5 fpm (35.5 m/min)
 - (d) High Speed, Full Drum183 .5 fpm (55.9 m/min)

d. *Reservoir and Hydraulic System.*

- (1) Reservoir Integral with cab weldment
- (2) Reservoir capacity 140 gal (530 l) refill, 165 gal (625 l) dry
- (3) System pressure 0 to 2000 psi (0 to 13,790 kPa)
- (4) 8 GPM pump
 - (a) Type Dual vane
 - (b) Output (1350 to 1450 rpm) 7.6 gpm at 2000 psi
(28.8 l/min at 13,790 kPa)
- (5) 80 GPM pump (dual section)
 - (a) Type Dual vane
 - (b) Output (each section at 1350 to 1450 rpm)
 - 1 Maximum 52 gpm at 0 psi (197 l/min at 0 psi)
 - 2 Minimum 42 gpm at 2000 psi (159 l/min at 13,790 kPa)

CHAPTER 2 DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT. Tools, special tools, and test equipment necessary to maintain the M578 Recovery Vehicle are listed in TM 9-2350-238-24P-2 and appendix B of TM 9-2350-238-20-2. For an illustrated list of special tools and equipment, refer to appendix E of this manual.

2-3. REPAIR PARTS. Repair parts are listed and illustrated in TM 9-2350-238-24P-2 covering unit, direct support, general support, and depot maintenance for this equipment.

Section II. DIRECT SUPPORT TROUBLESHOOTING

2-4. TROUBLESHOOTING INFORMATION.

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order under each major assembly, which appear in MAC order, with a page number reference to the troubleshooting table where a test or inspection and corrective action are provided.

b. The direct support troubleshooting table lists the malfunction, the test or inspection indicating the malfunction, and the necessary corrective action.

c. If the malfunction still exists after all listed direct support maintenance corrective actions have been performed, notify general support maintenance.

d. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

DIRECT SUPPORT TROUBLESHOOTING SYMPTOM INDEX

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Procedure
Page

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- Cab air purifier unit does not operate 2-15

2-4. TROUBLESHOOTING INFORMATION (CONT).

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|--|---|
| CAB | | |
| 1. CAB DOES NOT TRAVERSE. | <p><i>Step 1.</i> Check to make sure brake pressure selector knob is pushed in (normal position) to allow system to operate.</p> | |
| | <p><i>Step 2.</i> Check for damaged traversing control linkage.</p> | <p>Replace or repair damaged traversing control linkage. Refer to TM 9-2350-238-20-2.</p> |
| <div style="border: 2px solid black; padding: 5px; display: inline-block;">WARNING</div> | | |
| | <p>Make sure hydraulic system is depressurized before performing any hydraulic maintenance to prevent injury to personnel.</p> | |
| | <p><i>Step 3.</i> Check for leaking and damaged or clogged hydraulic lines.</p> | <p>Tighten all loose connections. Replace damaged hydraulic lines. Refer to TM 9-2350-238-20-2.</p> |
| | <p><i>Step 4.</i> Check for damaged hydraulic motor.</p> | <p>Replace or repair damaged hydraulic motor. Refer to page 2-247.</p> |
| | <p><i>Step 5.</i> Check for damaged traversing power unit.</p> | <p>Replace or repair damaged traversing power unit. Refer to page 2-222.</p> |
| | <p><i>Step 6.</i> Check for damaged final drive assembly.</p> | <p>Replace or repair damaged final drive assembly. Refer to page 2-253.</p> |

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|---|---|
| 2. CAB TRAVERSES SLUGGISHLY IN EITHER DIRECTION. | WARNING | |
| | Make sure all personnel stand clear of boom and block before traversing cab. | |
| <i>Step 1.</i> Check for leaking and damaged or clogged hydraulic lines. | | Tighten all loose fittings. Replace damaged hydraulic lines. Refer to TM 9-2350-238-20-2. |
| | <i>Step 2.</i> Check turret traverse control directional linear valve for damage. | |
| <i>Step 3.</i> Check for damaged mini check valve in hydraulic flow divider manifold. | | |
| | <i>Step 4.</i> Check for damaged traversing hydraulic motor. | |
| TOW WINCH | | |
| 3. TOW WINCH DOES NOT OPERATE. | <i>Step 1.</i> Check for damaged winch control lever linkage. | Replace or repair damaged winch control lever linkage. Refer to TM 9-2350-238-20-2. |
| | | <i>Step 2.</i> Check for damaged shift rod. |
| | <i>Step 3.</i> Check adjustment of winch control cylinder. Refer to page 2-111. | |

2-4. TROUBLESHOOTING INFORMATION (CONT).

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|--|--------------------|-------------------|
| TOW WINCH (CONT) | | |
| 3. TOW WINCH DOES NOT OPERATE (CONT). | | |
| <p><i>Step 4.</i> Check for damaged hydraulic motor.</p> | | |
| <p style="padding-left: 40px;">Replace or repair damaged hydraulic motor. Refer to page 2-30.</p> | | |
| <div style="border: 2px solid black; padding: 5px; width: fit-content; margin: 0 auto;">WARNING</div> | | |
| <p style="padding-left: 40px;">Always wear leather gloves when handling winch cable. Never allow cable to run through hands, Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.</p> | | |
| <p><i>Step 5.</i> Check adjustment of tow winch pressure relief valve. Refer to page 2-179.</p> | | |
| <p style="padding-left: 40px;">If pressure relief valve cannot be adjusted, replace or repair relief valve. Refer to page 2-154.</p> | | |
| <p><i>Step 6.</i> Remove and disassemble vehicle tow drum winch. Refer to page 2-111. Check for damaged parts.</p> | | |
| <p style="padding-left: 40px;">Replace or repair vehicle tow drum winch. Refer to page 2-111.</p> | | |
| 4. TOW WINCH PAYS IN, BUT WILL NOT PAY OUT. | | |
| <div style="border: 2px solid black; padding: 5px; width: fit-content; margin: 0 auto;">WARNING</div> | | |
| <p style="padding-left: 40px;">Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.</p> | | |
| <p><i>Step 1.</i> Check adjustment of pressure relief valve. Refer to page 2-163.</p> | | |
| <p style="padding-left: 40px;">If pressure relief valve cannot be adjusted, replace or repair pressure relief valve. Refer to page 2-154.</p> | | |

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|--|--|
| | | |
| | <p><i>Step 2.</i> Check for damaged check valve.</p> | <p>Replace or repair damaged check valve. Refer to page 2-154.</p> |
| 5. TOW WINCH PAYS OUT, BUT WILL NOT PAY IN. | | |
| | | <div style="border: 2px solid black; padding: 5px; text-align: center; width: fit-content; margin: 0 auto;">WARNING</div> |
| | <p>Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.</p> | |
| | <p>Check adjustment of pressure relief valve. Refer to page 2-154.</p> | <p>If pressure relief valve cannot be adjusted, replace or repair pressure relief valve. Refer to page 2-154.</p> |
| 6. TOW WINCH OPERATES SLUGGISHLY IN EITHER DIRECTION. | | |
| | <p><i>Step 1.</i> Check adjustment of winch control cylinder. Refer to page 2-111.</p> | <p>If winch control cylinder cannot be adjusted, replace or repair winch control cylinder. Refer to page 2-111.</p> |
| | <p><i>Step 2.</i> Check for leaks and damaged or clogged hydraulic lines.</p> | <p>Tighten all loose connections. Replace damaged hydraulic lines. Refer to TM 9-2350-238-20-2.</p> |

2-4. TROUBLESHOOTING INFORMATION (CONT).

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|--------------------|-------------------|
| TOW WINCH (CONT) | | |
| 7. TOW WINCH OPERATES SLUGGISHLY WHEN PAYING IN. | | |
| WARNING | | |
| Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel. | | |
| Check adjustment of pressure relief valve. Refer to page 2-154. | | |
| If pressure relief valve cannot be adjusted, replace or repair pressure relief valve, Refer to page 2-154. | | |
| 8. TOW WINCH GEARS CANNOT BE SHIFTED. | | |
| Check for damaged tow winch control lever. | | |
| Replace or repair damaged tow winch control lever. Refer to TM 9-2350-238-20-2. | | |
| BOOM WINCH | | |
| 9. BOOM WINCH DOES NOT OPERATE. | | |
| <i>Step 1.</i> Check for damaged winch control lever linkage. | | |
| Replace damaged winch control lever linkage. Refer to TM 9-2350-238-20-2. | | |
| <i>Step 2.</i> Check for damaged manual control lever. | | |
| Replace or repair damaged manual control lever. Refer to TM 9-2350-238-20-2. | | |
| <i>Step 3.</i> Check adjustment of winch control cylinder. Refer to page 2-111. | | |
| If winch control cylinder cannot be adjusted, replace or repair winch control cylinder. Refer to page 2-111. | | |

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|---|--|
| <i>Step 4.</i> Check for damaged hydraulic motor. | | Replace or repair damaged hydraulic motor. Refer to page 2-30. |
| <i>Step 5.</i> Check adjustment of boom winch pressure relief valve. Refer to page 2-179. | | If boom winch pressure relief valve cannot be adjusted, replace or repair boom winch pressure relief valve. Refer to page 2-154. |
| <i>Step 6.</i> Remove and disassemble vehicle drum winch assembly. Refer to page 2-38. | | Check for damaged parts. Replace or repair vehicle drum winch assembly. Refer to page 2-38. |
| 10. BOOM WINCH PAYS IN, BUT WILL NOT PAY OUT. | | Check adjustment of pressure relief valve. Refer to page 2-163. If pressure relief valve cannot be adjusted, replace or repair pressure relief valve. Refer to page 2-154. |
| 11. BOOM WINCH PAYS OUT, BUT WILL NOT PAY IN. | | Check adjustment of boom winch pressure relief valve. Refer to page 2-179. If boom winch pressure relief valve cannot be adjusted, replace or repair boom winch pressure relief valve. Refer to page 2-163. |
| 12. BOOM WINCH OPERATES SLUGGISHLY IN EITHER DIRECTION. | <i>Step 1.</i> Check adjustment of winch control cylinder. Refer to page 2-111. | If winch control cylinder cannot be adjusted, replace or repair winch control cylinder. Refer to page 2-111. |

2-4. TROUBLESHOOTING INFORMATION (CONT).

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|--|---|--|
| BOOM WINCH (CONT) | | |
| 12. BOOM WINCH OPERATES SLUGGISHLY IN EITHER DIRECTION (CONT). | <i>Step 2.</i> Check for leaks and damaged or clogged hydraulic lines. | Tighten all loose connections. Replace damaged hydraulic lines. Refer to TM 9-2350-238-20-2. |
| 13. BOOM WINCH OPERATES SLUGGISHLY WHEN PAYING IN. | Check adjustment of boom winch pressure relief valve. Refer to page 2-179. | If boom winch pressure relief valve cannot be adjusted, replace or repair boom winch pressure relief valve. Refer to page 2-163. |
| 14. BOOM WINCH GEARS CANNOT BE SHIFTED. | Check for damaged manual control lever. | Replace or repair manual control lever. Refer to TM 9-2350-238-20-2. |
| BOOM | | |
| 15. BOOM DOES NOT RAISE OR LOWER. | WARNING | |
| | Make sure all personnel stand clear when operating boom to avoid injury to personnel. | |
| | <i>Step 1.</i> Check for jammed or damaged control lever and/or linkage. | Replace or repair damaged lever and/or linkage. Refer to TM 9-2350-238-20-2. |
| | <i>Step 2.</i> Check boom winch control cylinders for damage and leaks. | Replace or repair damaged or leaking boom winch control cylinders. Refer to page 2-84. |

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|--|--|
| 16. BOOM RAISES BUT WILL NOT LOWER. | <i>Step 1.</i> Check adjustment of pressure relief valve. Refer to page 2-163. | If pressure relief valve cannot be adjusted, replace or repair pressure relief valve. Refer to page 2-154. |
| | <i>Step 2.</i> Check for damaged check valve. | Replace or repair damaged boom cylinder check valve. Refer to page 2-154. |
| 17. BOOM LOWERS BUT WILL NOT RAISE. | | Close boom cylinder hydraulic stop-check valve at counterbalance manifold. |
| | | If boom still will not raise, replace boom cylinder hydraulic stop-check valve. Refer to page 2-154. |
| 18. BOOM OPERATES SLUGGISHLY WHEN RAISING AND LOWERING. | <i>Step 1.</i> Check for leaks and damaged or clogged hydraulic lines and hoses. | Tighten all loose connections. Replace damaged hydraulic lines and hoses, Refer to TM 9-2350-238-20-2. |
| | <i>Step 2.</i> Check boom winch control cylinders for damage and leaks. | Replace or repair damaged or leaking boom winch control cylinders. Refer to page 2-84. |
| 19. BOOM OPERATES SLUGGISHLY IN RAISING. | | Check adjustment of boom cylinder pressure relief valve. Refer to page 2-179. |
| | | If boom cylinder pressure relief valve cannot be adjusted, replace or repair boom cylinder pressure relief valve. Refer to page 2-154. |

2-4. TROUBLESHOOTING INFORMATION (CONT).

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|--------------------|-------------------|
| BOOM (CONT) | | |
| 20. BOOM DROPS WHEN HOLDING LOAD IN NEUTRAL POSITION. | | |
| <div style="border: 2px solid black; padding: 5px; display: inline-block;">WARNING</div> | | |
| <p>Make sure all personnel stand clear when operating the boom to avoid injury to personnel.</p> | | |
| <p><i>Step 1.</i> Test boom for acceptable boom drop rates. Refer to page 2-84.</p> | | |
| <p>If drop rate is faster than acceptable limits, go to step 2.</p> | | |
| <p><i>Step 2.</i> Check for leaking boom winch control cylinders.</p> | | |
| <p>Replace or repair leaking boom winch control cylinders. Refer to page 2-84. Recheck boom drop rate. Refer to page 2-84.</p> | | |
| <p><i>Step 3.</i> Check for leaks in hydraulic lines and hoses.</p> | | |
| <p>Tighten all loose connections. Replace damaged hydraulic lines and hoses. Refer to TM 9-2350-238-20-2. Recheck boom drop rate. Refer to page 2-84.</p> | | |
| <p><i>Step 4.</i> Check for leaks around counterbalance manifold pressure relief valves.</p> | | |
| <p>If leaks are found, replace damaged preformed packings. Refer to page 2-154. Recheck boom drop rate. Refer to page 2-84.</p> | | |
| <p><i>Step 5.</i> Check adjustment of boom cylinder counterbalance valve. Refer to page 2-179.</p> | | |
| <p>If boom cylinder counterbalance valve cannot be adjusted, replace or repair pressure relief valve. Refer to page 2-163. Recheck boom drop rate. Refer to page 2-84.</p> | | |
| <p><i>Step 6.</i> Check adjustment of boom cylinder pressure relief valve. Refer to page 2-179.</p> | | |
| <p>If boom cylinder pressure relief valve cannot be adjusted, replace or repair boom cylinder pressure relief valve. Refer to page 2-154. Recheck boom drop rate. Refer to page 2-84.</p> | | |

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|---|--|
| | <i>Step 7.</i> Check boom cylinder hydraulic stop-check valve for damage. | Replace damaged boom cylinder hydraulic stop-check valve. Refer to page 2-154. |
| | <i>Step 8.</i> Check for damaged three-spool directional linear valve. | Replace or repair damaged three-spool directional linear valve. Refer to page 2-151. |
| LEVEL WIND | | |
| 21. LEVEL WIND TRAVERSES CAB IN ONLY ONE DIRECTION. | | |
| WARNING | | |
| | <ul style="list-style-type: none"> • Make sure all personnel stand clear of boom and block before traversing cab or operating boom. • Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel. | |
| | <i>Step 1.</i> Check adjustment of level wind assembly. Refer to TM 9-2350-238-20-2. | |
| | <i>Step 2.</i> Check for damaged level wind sensing switch. | Replace damaged level wind sensing switch. Refer to TM 9-2350-238-20-2. |
| | <i>Step 3.</i> Check for damaged level wind solenoid valve. | Replace damaged level wind solenoid valve. Refer to TM 9-2350-238-20-2. |

2-4. TROUBLESHOOTING INFORMATION (CONT).

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|---|--------------------|-------------------|
| LEVEL WIND (CONT) | | |
| 22. LEVEL WIND TRAVERSES CAB SLUGGISHLY. | | |
| WARNING | | |
| Make sure all personnel stand clear of boom and block before traversing cab. | | |
| Check adjustment of hull return line solenoid valve. Refer to page 2-199. | | |
| If hull return line solenoid valve cannot be adjusted, replace or repair hull return line solenoid valve. Refer to page 2-192. | | |
| HYDRAULIC SYSTEM | | |
| 23. WINCHES, BOOM, AND TRAVERSING SYSTEM ALL OPERATE SLUGGISHLY. | | |
| WARNING | | |
| <ul style="list-style-type: none"> • Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel. | | |
| <ul style="list-style-type: none"> • Make sure all personnel stand clear when operating boom to avoid injury to personnel. | | |
| <ul style="list-style-type: none"> • Make sure all personnel stand clear of boom and block before traversing cab. | | |
| <i>Step 1.</i> Check adjustment of pressure relief valve. Refer to page 2-179. | | |
| If pressure relief valve cannot be adjusted, replace or repair pressure relief valve. Refer to page 2-205. | | |
| <i>Step 2.</i> Check for damaged hydraulic pump. | | |
| Replace or repair damaged hydraulic pump (TM 9-2350-238-34-1). | | |

Table 2-1. DIRECT SUPPORT TROUBLESHOOTING (CONT)

| MALFUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|--|--|--|
| 24. WINCHES, BOOM, AND TRAVERSING SYSTEM WILL NOT OPERATE. | <p><i>Step 1.</i> Check for low fluid level in hydraulic reservoir.</p> <p><i>Step 2.</i> Check for damaged clutch in auxiliary drive.</p> <p><i>Step 3.</i> Check for damaged hydraulic pump.</p> | <p>Fill hydraulic reservoir to full mark with lubricating oil (item 13, appx B). Refer to TM 9-2350-238-10.</p> <p>Replace or repair damaged clutch. Refer to TM 9-2350-238-34-1.</p> <p>Replace or repair damaged hydraulic pump. Refer to TM 9-2350-238-34-1.</p> |
| CAB FILTER INSTALLATION | | |
| 25. CAB AIR PURIFIER UNIT DOES NOT OPERATE. | <p><i>Step 1.</i> Check motor ground for bad connections.</p> <p><i>Step 2.</i> Troubleshoot cab air purifier circuit.</p> | <p>Clean ground connections with crocus cloth (item 3, appx B). Make sure ground connections are tight.</p> <p>Refer to TM 9-2350-238-20-2.</p> <p>If cab air purifier unit still does not operate, refer to TM 3-4240-276-30&P for repair of precleaned and housing assembly.</p> |

Section III. MAINTENANCE OF HYDRAULIC LINES AND FITTINGS

2-5. GENERAL.

a. This section contains instructions on repair of hydraulic lines and fittings. Repair of hydraulic lines and fittings consists of replacement of preformed packings, tube fitting locknuts, lockwashers, and defective sleeve spacers and washers. Page 2-16 thru 2-17 show exploded views of typical hydraulic lines and fittings used on the vehicle and give procedures for disassembly and reassembly of fittings. For complete inspection procedures, refer to b. and c. below. Refer to TM 9-2350-238-24P-2 for ordering of authorized parts. Ensure hydraulic pressure is relieved before performing any disassembly of hydraulic lines and fittings.

b. Inspect all unions, nipples, tees, reducers, plugs, elbows, and parts, on which end fittings are used, for thread damage, fractures, corrosion, distortion, slivers, restrictions, sealing surface scratches, or mutilation. Hex corners shall not be rounded.

c. Inspect tube assemblies for kinks, fractures, cracks, thread damage, restrictions, corrosion, or mutilation. Tube ends shall be squared, deburred inside and out, and unprimed or unpainted from sleeve flange to tube end. Tubes, 1/4 to 3/8 in. (6.35 to 9.53 mm) in diameter, shall show no deformation of sleeves as a result of overapplication of torque. Repair is by replacement of authorized parts (TM 9-2350-238-24P-2) which do not meet inspection criteria.

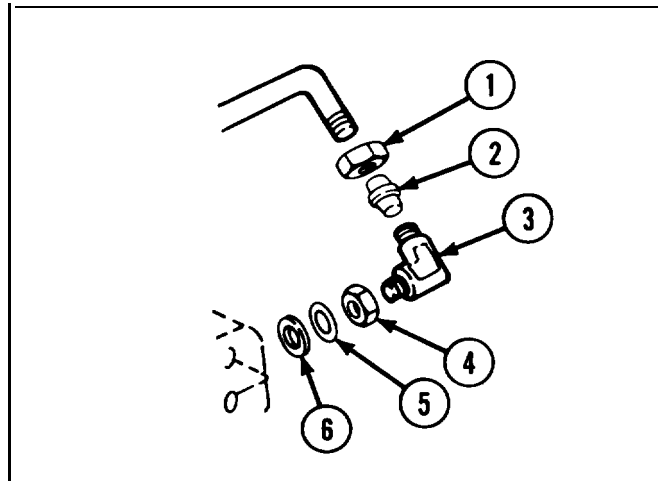
2-6. TUBE ELBOW TO TUBE FITTING.

DISASSEMBLY

Remove tube fitting locknut (1), sleeve spacer (2), tube elbow (3), tube fitting locknut (4), flat washer (5), and preformed packing (6).

REASSEMBLY

Install new preformed packing (6), flat washer (5), new tube fitting locknut (4), tube elbow (3), sleeve spacer (2), and new tube fitting locknut (1).



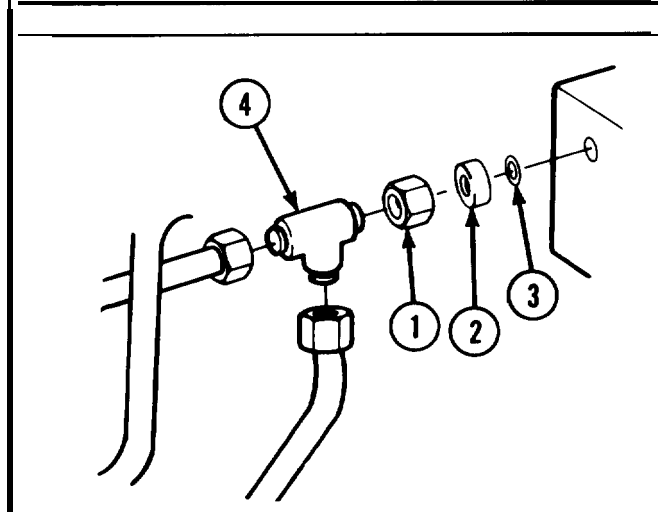
2-7. TUBE TEE TO TUBE FITTING.

DISASSEMBLY

Remove tube fitting locknut (1), flat washer (2), and preformed packing (3). Disconnect tube assemblies from tube tee (4) and remove tube tee.

REASSEMBLY

Install tube tee (4), new preformed packing (3), flat washer (2), and new tube fitting locknut (1).



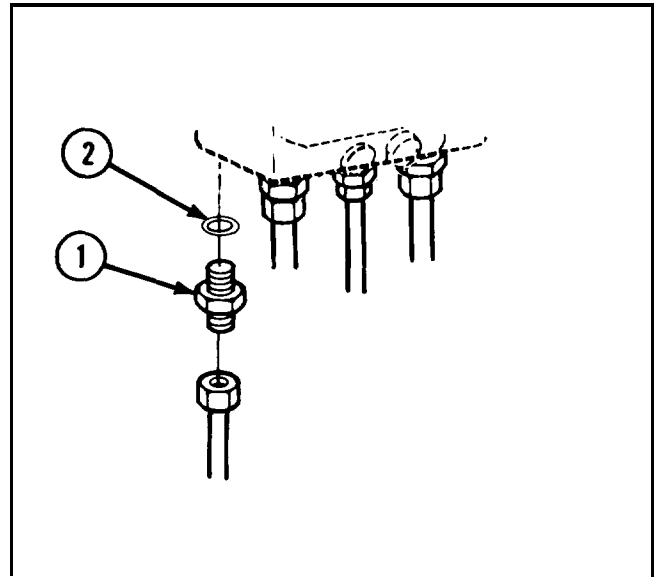
2-8. TUBE REDUCER TO TUBE FITTING.

DISASSEMBLY

Disconnect tube assembly, and remove tube reducer (1) and preformed packing (2).

REASSEMBLY

Install new preformed packing (2) and tube reducer (1), and connect tube assembly.



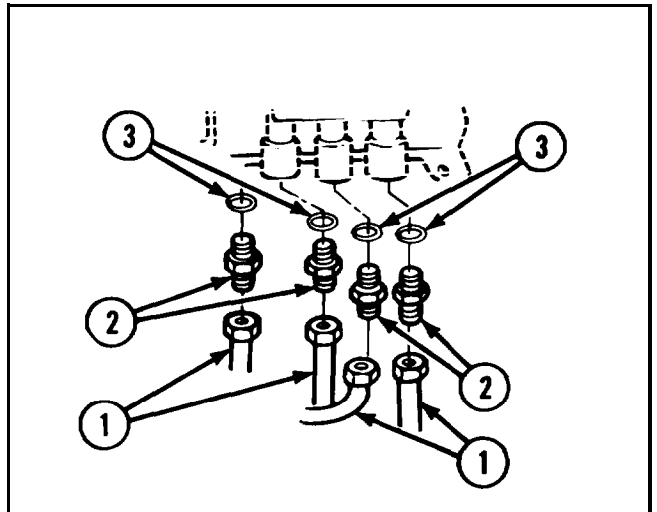
2-9. TUBE NIPPLE TO TUBE FITTING.

DISASSEMBLY

Disconnect tube fitting (1), and remove tube nipple (2) and preformed packing (3).

REASSEMBLY

Install new preformed packing (3) and tube nipple (2) and connect tube fitting (1).



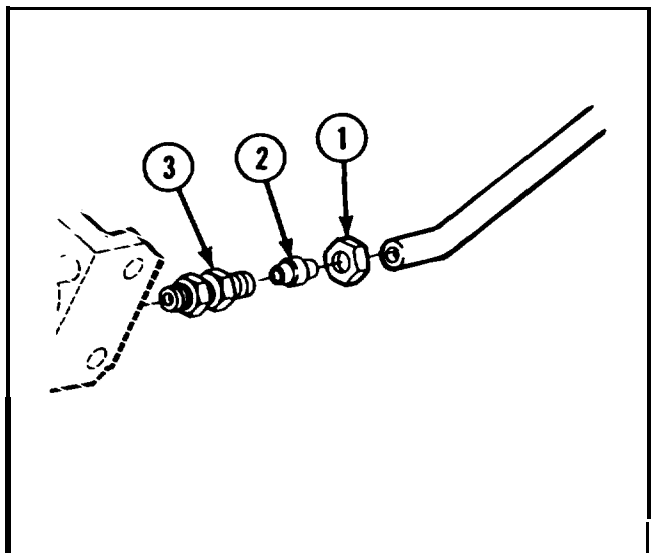
2-10. STRAIGHT ADAPTER TO TUBE FITTING,

DISASSEMBLY

Remove tube fitting locknut (1), sleeve spacer (2), and straight adapter (3).

REASSEMBLY

Install straight adapter (3), sleeve spacer (2), and new tube fitting locknut (1).



Section IV. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

2-11. GENERAL. This section contains general repair methods and cleaning procedures. Special repair and cleaning procedures are provided, as required, in the individual maintenance instructions.

2-12. REPAIR METHODS.

- 1 Complete disassembly is not always necessary to make a repair. Exercise good judgment to keep disassembly and assembly to a minimum.
- 2 Repair or replace unserviceable parts and hardware. Always replace preformed packings, gaskets, seals, and cotter pins with new parts.
- 3 Remove burrs with a stone or file. Remove burrs on closely fitted mating surfaces by lapping the surfaces with lapping grinding compound (item 11, appx B).
- 4 Remove corrosion or rust with sandblasting, vapor blast cleaning, or crocus cloth (item 3, appx B). Use the method that will not damage the surface being cleaned. Crocus cloth should be used to remove corrosion and rust from polished surfaces. Make sure that critical dimensions are not changed when using crocus cloth.
- 5 Repair damaged threads with a thread chaser, or by chasing in a lathe or die.
- 6 When welding is authorized, procedures in TM 9-237 must be followed. Welds must be inspected for cracks.
- 7 Bearings should be inspected and maintained per TM 9-214.

2-13. TORQUE VALUES. Follow torque values given throughout this manual. When no torque value is given, follow the torque limits guide, provided in appendix D of this manual, to prevent damaged parts. The guide is based on using clean, dry threads.

2-14. CLEANING.

- 1 Wire brush metal parts to remove rust and corrosion.

WARNING

Dry cleaning solvent (SD2) is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated areas.

- 2 Clean metal parts with dry cleaning solvent (item 5, appx B). Metal or fiber brushes may be used to apply cleaning solvent and to remove softened or dissolved material. Hand scraping with metal scrapers may be used to remove soft coatings or deposits.
- 3 Soak very oily or greasy metal parts in a tank containing dry cleaning solvent (item 5, appx B). The time parts must be in solvent varies with the type and amount of material to be removed.
- 4 Do not use solvent to clean electrical insulation, wires, cables, or wiring harnesses. Clean these parts by wiping with a damp cloth. Use a mild soap solution if necessary. Dry immediately with clean, dry cloths. Clean contact points with flint abrasive paper (item 8, appx B) and dust thoroughly after cleaning.
- 5 Do not use solvent to clean rubber parts. Clean rubber parts by washing with mild solution of soap and water.
- 6 Dry parts by blowing with low-pressure compressed air or wiping with clean lint-free cloths (item 4, appx B).
- 7 Bearings should be cleaned according to procedures in TM 9-214.

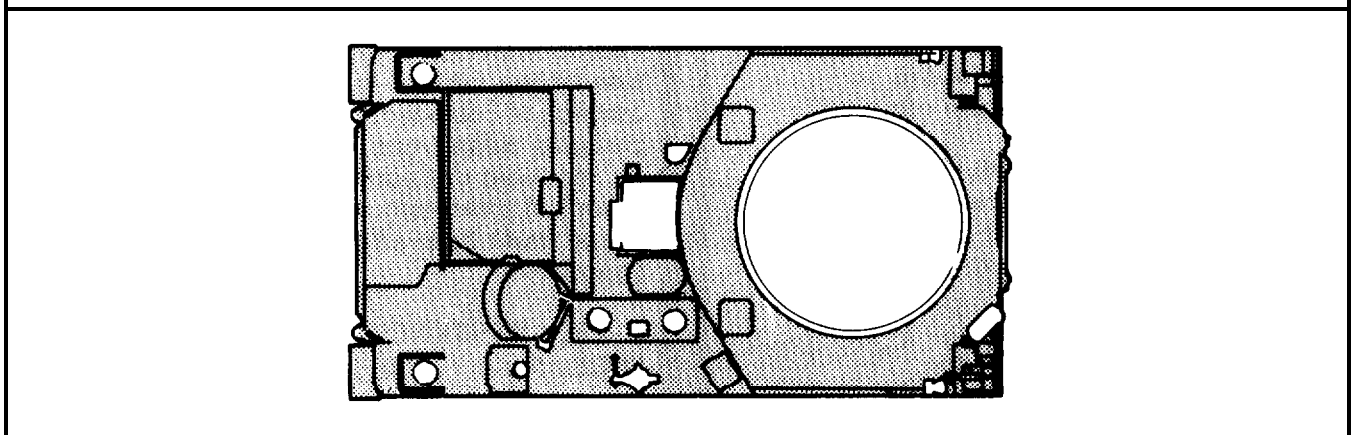
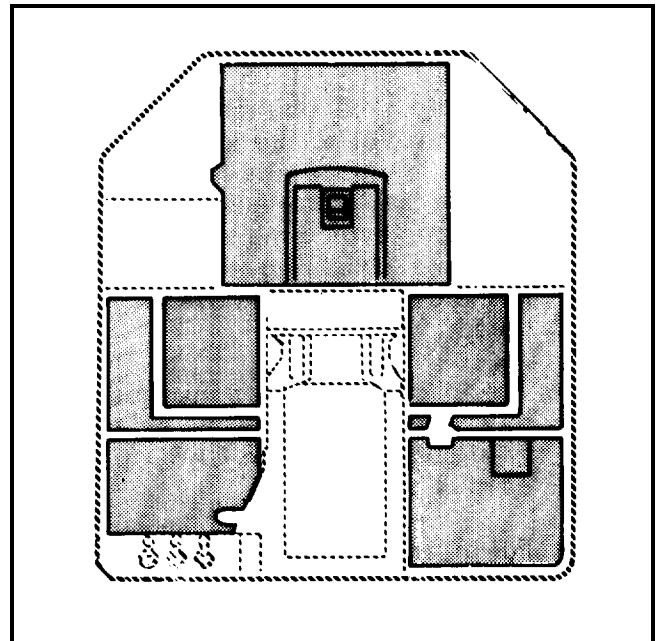
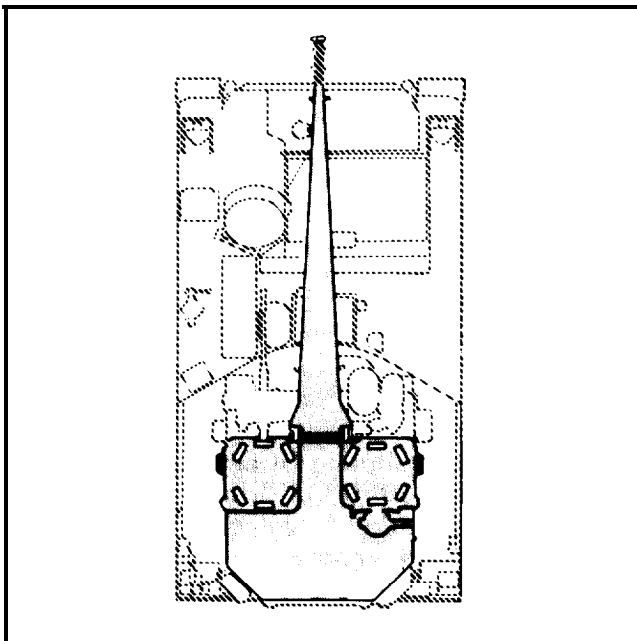
8 Paint metal surfaces after repair as required. Sand and paint damaged areas. Apply one coat of rust inhibitor primer (item 17, appx B). Allow primer to dry for 30 minutes minimum before applying enamel. Paint with enamel to match existing color; use white enamel (item 7, appx B) or olive drab enamel (item 6, appx B).

2-15. LUBRICATION. Keep a light coat of lubricating oil (item 15, appx B) on parts during repair procedures to prevent rusting. Lubricate parts during repair and assembly as required by TM 9-2350-238-10 and TM 9-2350-238-20-2.

2-16. PAINTING INSTRUCTIONS. Complete painting is authorized for and done by general support maintenance personnel or higher. Spot painting and restenciling vehicle markings is done by unit maintenance personnel. Instructions for materiel preparation, priming, and finish are given in TM 43-0139.

2-17. NONSKID AREAS.

Nonslip paint (item 16, appx B) will be used to coat deck areas where personnel walk. The areas to be coated with nonslip paint are shown shaded in the figures below.



2-18. TOUCHUP AND RECOATING.

WARNING

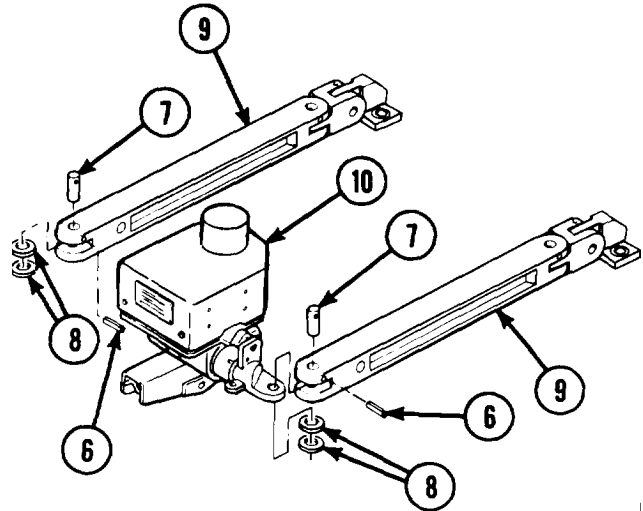
- Chemical Agent Resistant Coating (CARC) Paint: CARC paint contains isocyanate, a constituent that can cause respiratory effects during and after the application of the material. During the application of CARC paint, coughing, shortness of breath, pain on respiration, increased sputum, and chest tightness may occur. CARC paint also produces itching and reddening of the skin, a burning sensation of the throat and nose, and watering of the eyes.
 - An allergic reaction may occur after initial exposure (ranging from a few days to a few months later), producing asthmatic symptoms including coughing, wheezing, tightness in the chest, or shortness of breath.
 - The following precautions must be observed to insure the safety of personnel when CARC paint is applied.
 - For brush/roller painting in confined spaces, an airline respirator is required, unless an air sampling shows exposure to be below standards. If the air sampling is below standards, either chemical cartridge or airline respirators are required.
 - Spot painters applying CARC paint by brush or roller must wear clothing and gloves affording full coverage,
 - Do not use water, alcohol, or amine based solvents to thin or remove CARC paints. Use of these solvents with CARC paints can produce chemical reactions resulting in nausea, disease, burns, or severe illness to personnel.
 - Do not use paint solvents to remove paint/coating from your skin.
 - Mix paint/coating in a well-ventilated mixing room or spraying area away from open flames. Personnel mixing paint/coating should wear eye protection.
 - Use paint/coating with adequate ventilation.
 - Unusable CARC mixtures may be considered hazardous waste and may require disposal IAW Federal, state, DoD, and DA hazardous waste regulations. Consult the installation environmental office for proper disposal guidance. Mixed CARC has a flashpoint of approximately 38°F (3°C) due to the incorporation of solvents and is highly flammable.
- When touching up damaged areas, the procedure should be as similar to the original method of finishing as possible; a clean surface is imperative where general disintegration of the surface is evident, or the under surface is corroded, the coating must be stripped clean from the part. Corrosion must be removed or neutralized by mechanical or chemical treatment, or both, and the surface metal must be pretreated, primed, and then topcoated.

2-19. RESTENCILING VEHICLE MARKINGS. Refer to TM 9-2350-238-20-2.

2-20. MAINTENANCE OF WINCH LEVEL WIND AND CONNECTING LINK SLIDE
(CONT).

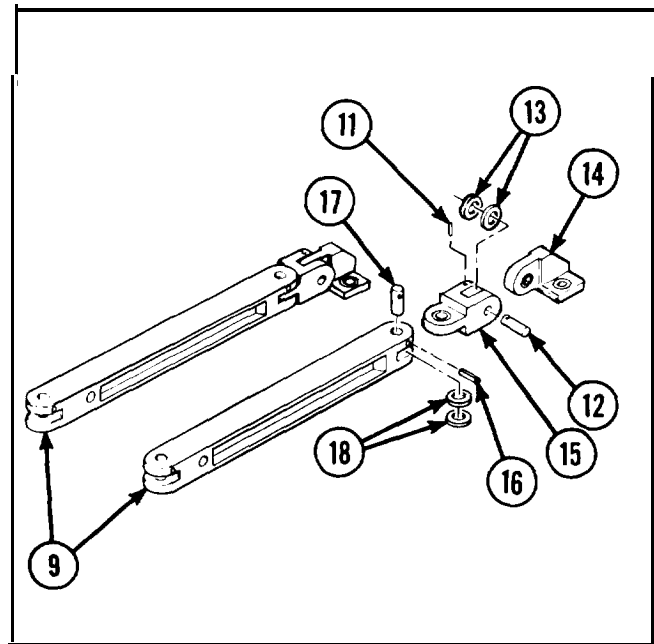
DISASSEMBLY (CONT)

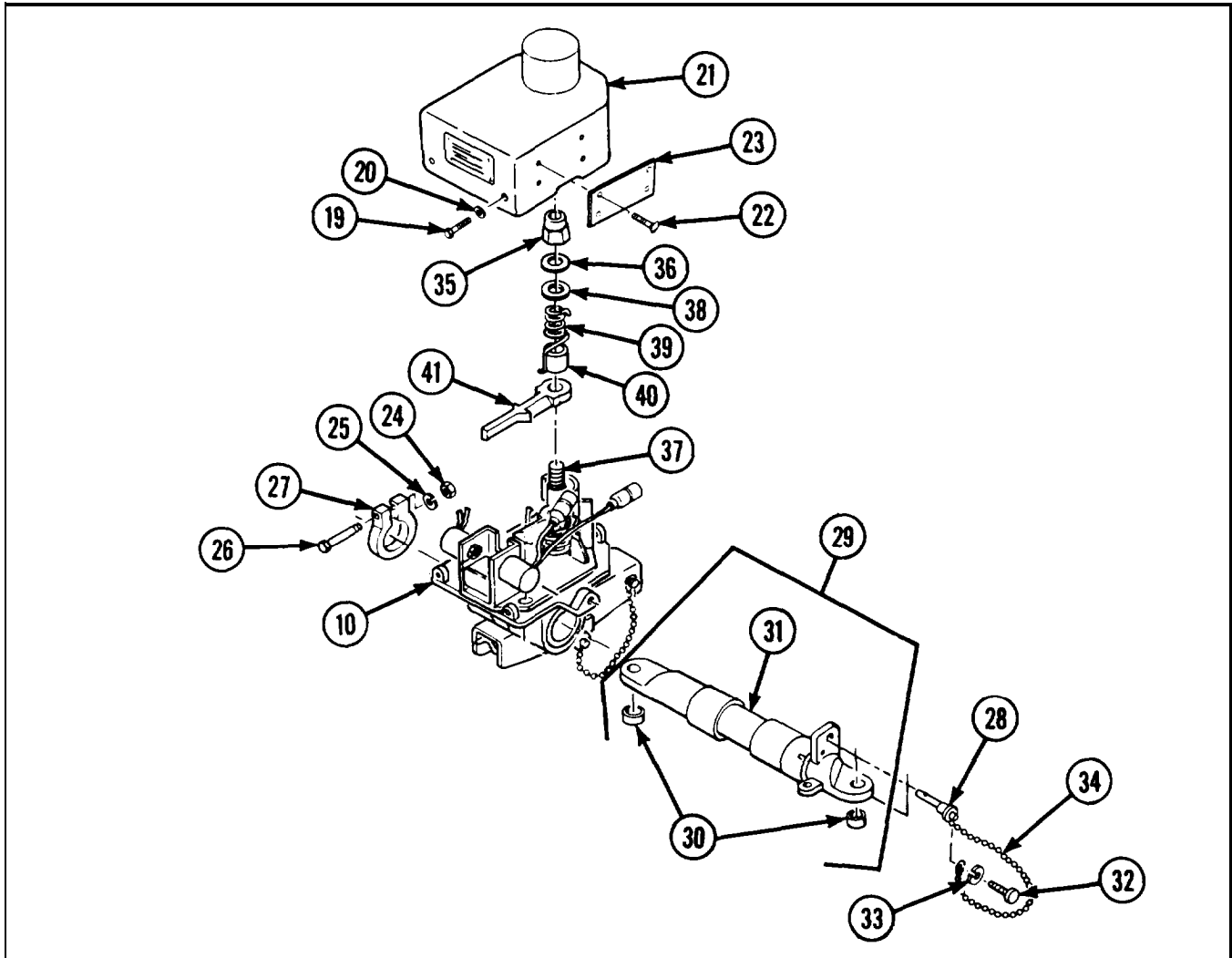
- 3 Using hammer and punch, remove two spring pins (6), two slide bar headless straight pins (7), four thrust washer bearings (8), and two manual control clevis handles (9) from level wind housing (10).



- 4 Using hammer and punch, remove spring pin (11), slide bar headless straight pin (12), two thrust washer bearings (13), and clevis rotating eye bracket (14) from each of two rod end clevises (15).

- 5 Using hammer and punch, remove spring pin (16), slide bar headless straight pin (17), two thrust washer bearings (18), and rod end clevis (15) from each of two manual control clevis handles (9).



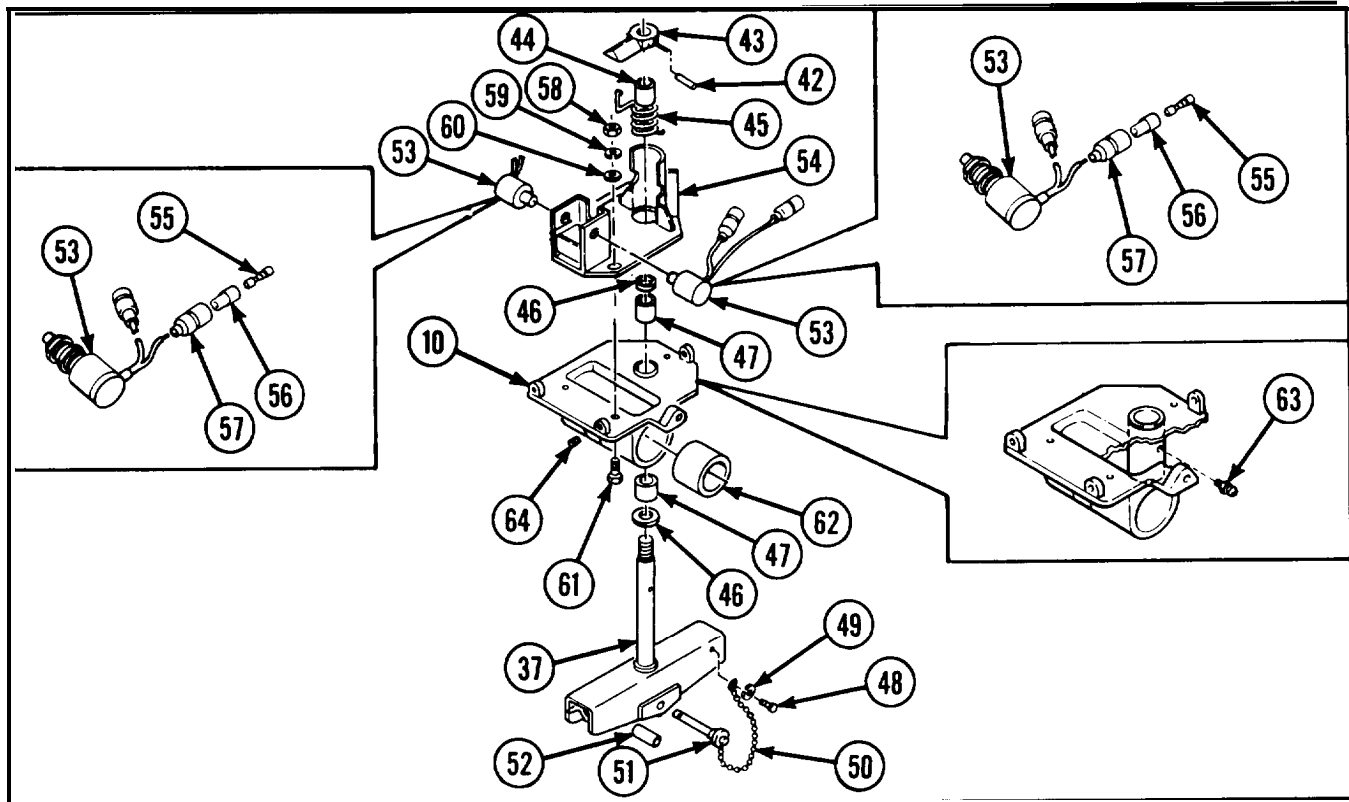


- 6 Remove three machine bolts (19), three flat washers (20), and level wind access cover (21).
- 7 If damaged, remove four drive screws (22) from each of three instruction plates (23) and remove three instruction plates from level wind access cover (21).
- 8 Remove nut (24), lockwasher (25), hexagon head capscrew (26), and hub slide clamp (27) from level wind housing (10).
- 9 Disconnect quick release pin (28) and remove rigid connecting link (29) from level wind housing (10).

- 10 If damaged, remove two sleeve bearings (30) from cross weldment bar (31).
- 11 Remove machine screw (32), lockwasher (33), chain assembly (34), and quick release pin (28) from cross weldment bar (31).
- 12 Remove self-locking nut (35), and flat washer (36) from shaft of cable guide (37).
- 13 Remove thrust washer bearing (38), helical spring (39), sleeve spacer (40), and remote control lever (41) from shaft of cable guide (37).

2-20. MAINTENANCE OF WINCH LEVEL WIND AND CONNECTING LINK SLIDE (CONT).

DISASSEMBLY (CONT)



NOTE

Rotate cable guide to allow for removal of spring pin.

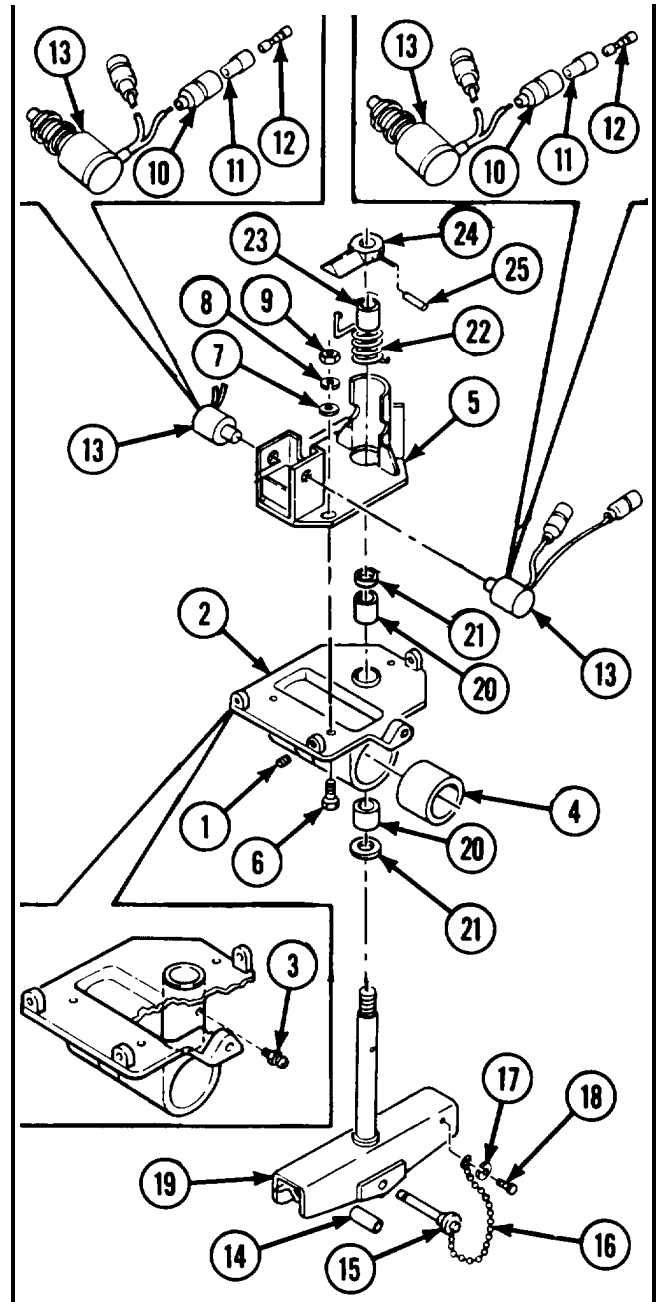
- | | |
|---|--|
| <p>14 Using hammer and punch, remove spring Pin (42) from manual control lever (43).</p> <p>15 Remove manual control lever (43), sleeve spacer (44), and helical spring (45), from shaft of cable guide (37).</p> <p>16 Using soft-faced hammer, remove cable guide (37) and two thrust washer bearings (46).</p> <p>17 Using arbor press, remove two needle roller bearings (47) from level wind housing (10).</p> <p>18 Remove machine screw (48), lockwasher (49), chain assembly (50), quick release pin (51), and sleeve bushing (52) from cable guide (37).</p> | <p>19 Remove two level wind sensing push stitches (53) with attached parts from level wind bracket (54).</p> <p>20 Remove two female terminal assemblies (55), two bushing sleeve insulators (56), and two electrical shells (57) from each level wind sensing push switch (53).</p> <p>21 Remove three nuts (58), three lockwashers (59), three flat washers (60), three hexagon head capscrews (61), and level wind bracket (54) from level wind housing (10).</p> <p>22 Remove two sleeve bearings (62) from level wind housing (10).</p> <p>23 Remove lubrication fitting (63) from level wind housing (10).</p> <p>24 If damaged, remove three inserts (64) from level wind housing (10).</p> |
|---|--|

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If level wind housing is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

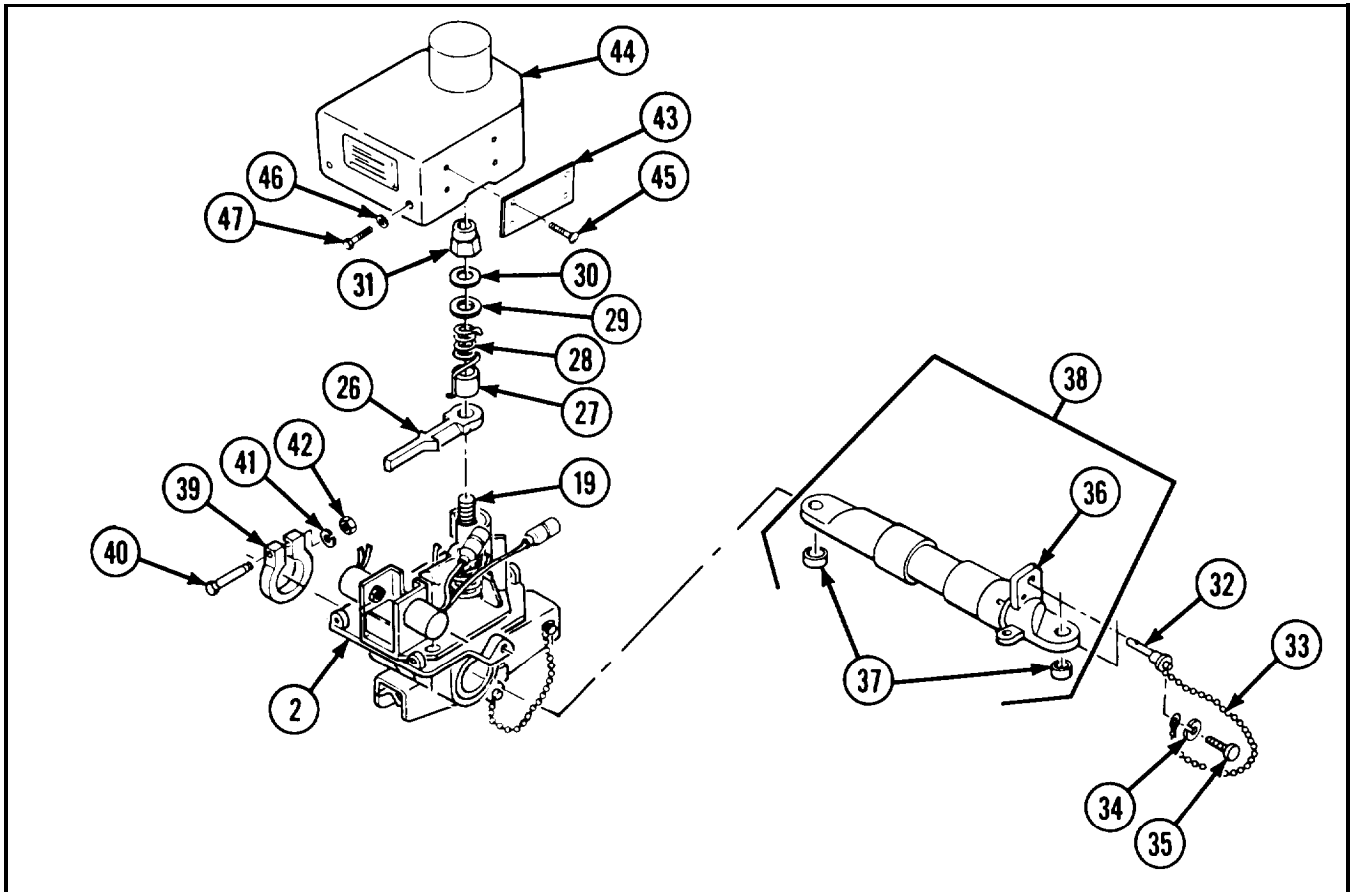
REASSEMBLY

- 1 If removed, install three new inserts (1) to level wind housing (2).
- 2 Install lubrication fitting (3) to level wind housing (2).
- 3 Install two sleeve bearings (4) to level wind housing (2).
- 4 Install level wind bracket (5), three hexagon head capscrews (6), three flat washers (7), three new lockwashers (8), and three nuts (9) to level wind housing (2).
- 5 Install two electrical shells (10), two bushing sleeve insulators (11), and two female terminal assemblies (12) to each of two level wind sensing push switches (13).
- 6 Install two level wind sensing push switches (13) with attached parts to level wind bracket (5),
- 7 Install sleeve bushing (14), quick release pin (15), chain assembly (16), new lock-washer (17), and machine screw (18) to cable guide (19).
- 8 Install two needle roller bearings (20), two thrust washer bearings (21), and cable guide (19) to level wind housing (2).
- 9 Install helical spring (22), sleeve spacer (23), and manual control lever (24) to shaft of cable guide (19).
- 10 Using hammer and punch, install spring pin (25) to secure manual control lever (24).



2-20. MAINTENANCE OF WINCH LEVEL WIND AND CONNECTING LINK SLIDE (CONT).

REASSEMBLY (CONT)



11 Install remote control lever (26), sleeve spacer (27), helical spring (28), and thrust washer bearing (29) to shaft of cable guide (19).

12 Install flat washer (30) and new self-locking nut (31) to shaft of cable guide (19).

13 Install quick release pin (32), chain assembly (33), new lockwasher (34), and machine screw (35) to cross weldment bar (36).

14 If removed, install two sleeve bearings (37) to cross weldment bar (36).

15 Apply a thin coat of grease (item 9, appx B) to the bearing surfaces of the rigid connecting link (38).

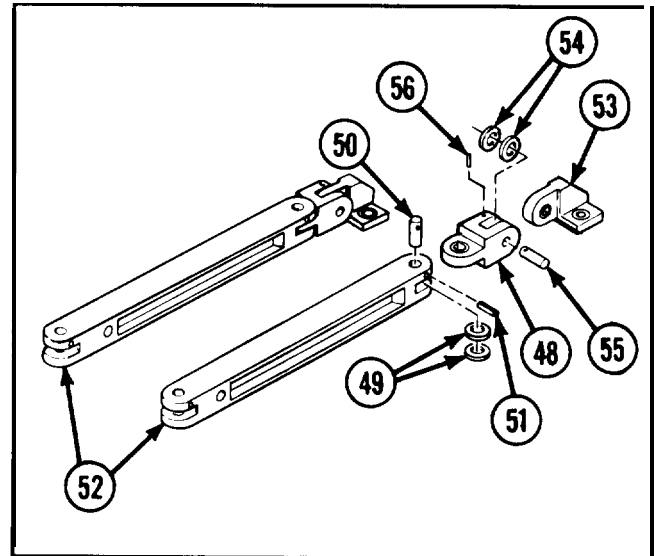
16 Install rigid connecting link (38) and secure with quick release pin (32) to level wind housing (2).

17 Install hub slide clamp (39), hexagon head capscrew (40), new lockwasher (41), and nut (42) to level wind housing (2).

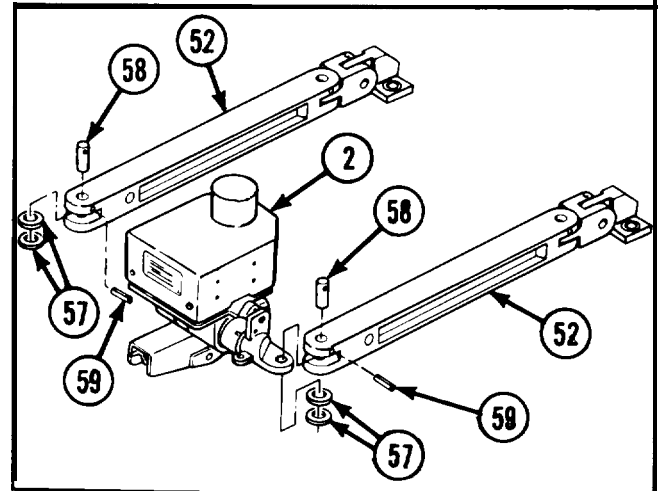
18 If removed, install three instruction dates (43) to level wind access cover (44) with 12 new drive screws (45); four drive screws in each plate.

19 Install level wind access cover (44), three flat washers (46), and three machine bolts (47).

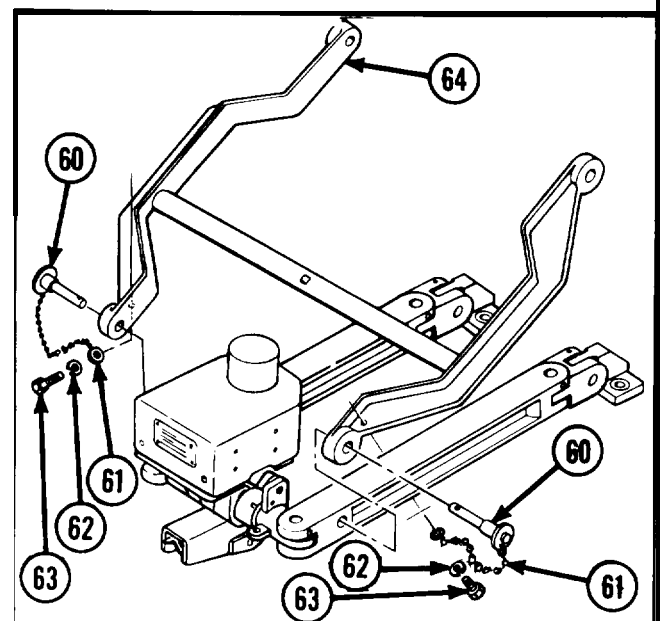
- 20 Install rod end clevis (48), and two thrust washer bearings (49), and using hammer and punch, install slide bar headless straight pin (50) and spring pin (51) to each of two manual control clevis handles (52).
- 21 Install clevis rotating eye bracket (53), two thrust washer bearings (54), and using hammer and punch, install slide bar headless straight pin (55) and spring pin (56) to each of two rod end clevises (48).



- 22 Install two manual control clevis handles (52), four thrust washer bearings (57), and using hammer and punch, install two slide bar headless straight pins (58) and two spring pins (59) to level wind housing (2).

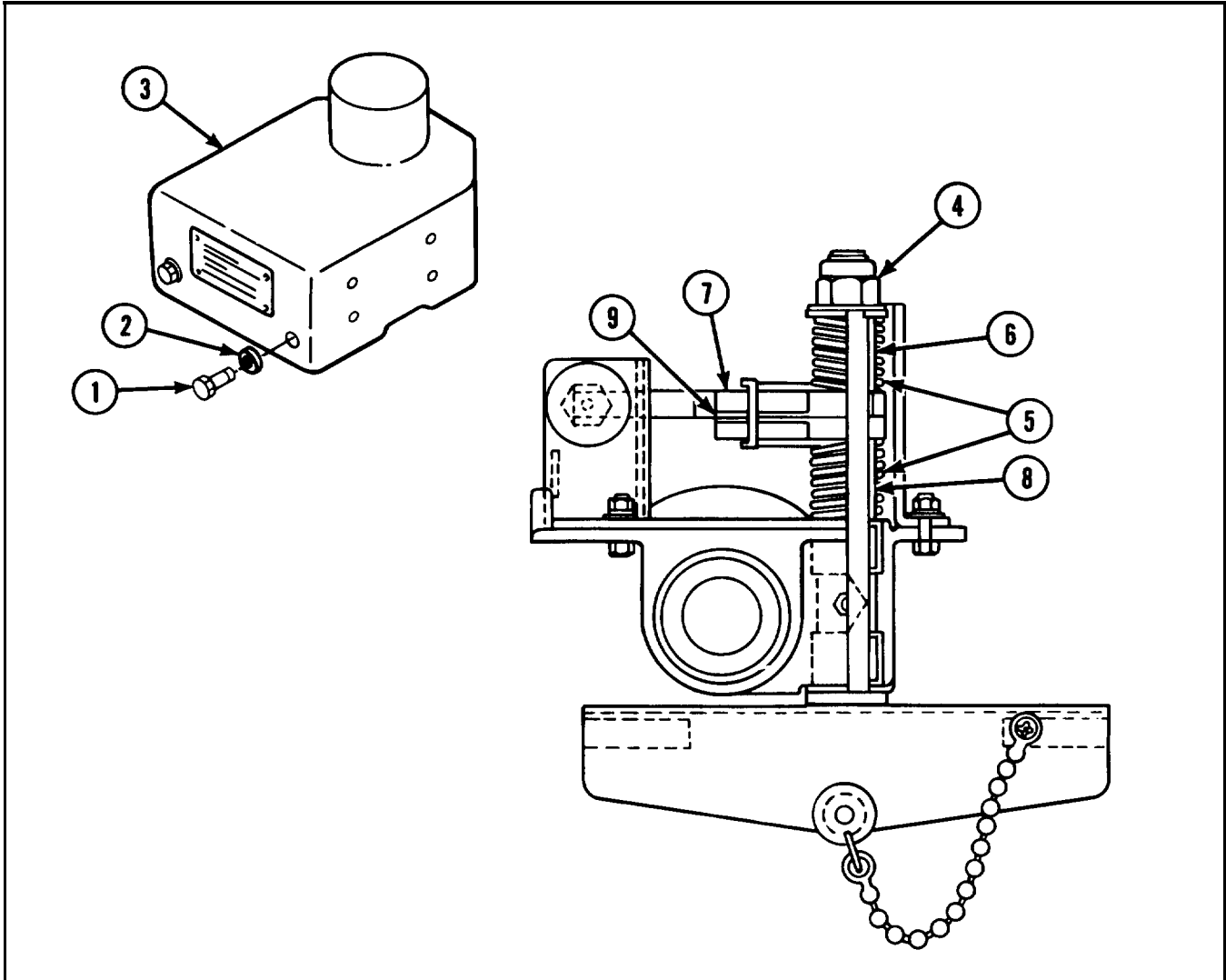


- 23 Install two quick release pins (60), two chain assemblies (61), two new lock-washers (62), and two machine screws (63) to yoke level wind bracket (64).
- 24 Install yoke level wind bracket (64) and secure with two quick release pins (60).



2-20. MAINTENANCE OF WINCH LEVEL WIND AND CONNECTING LINK SLIDE
(CONT),

ADJUSTMENT



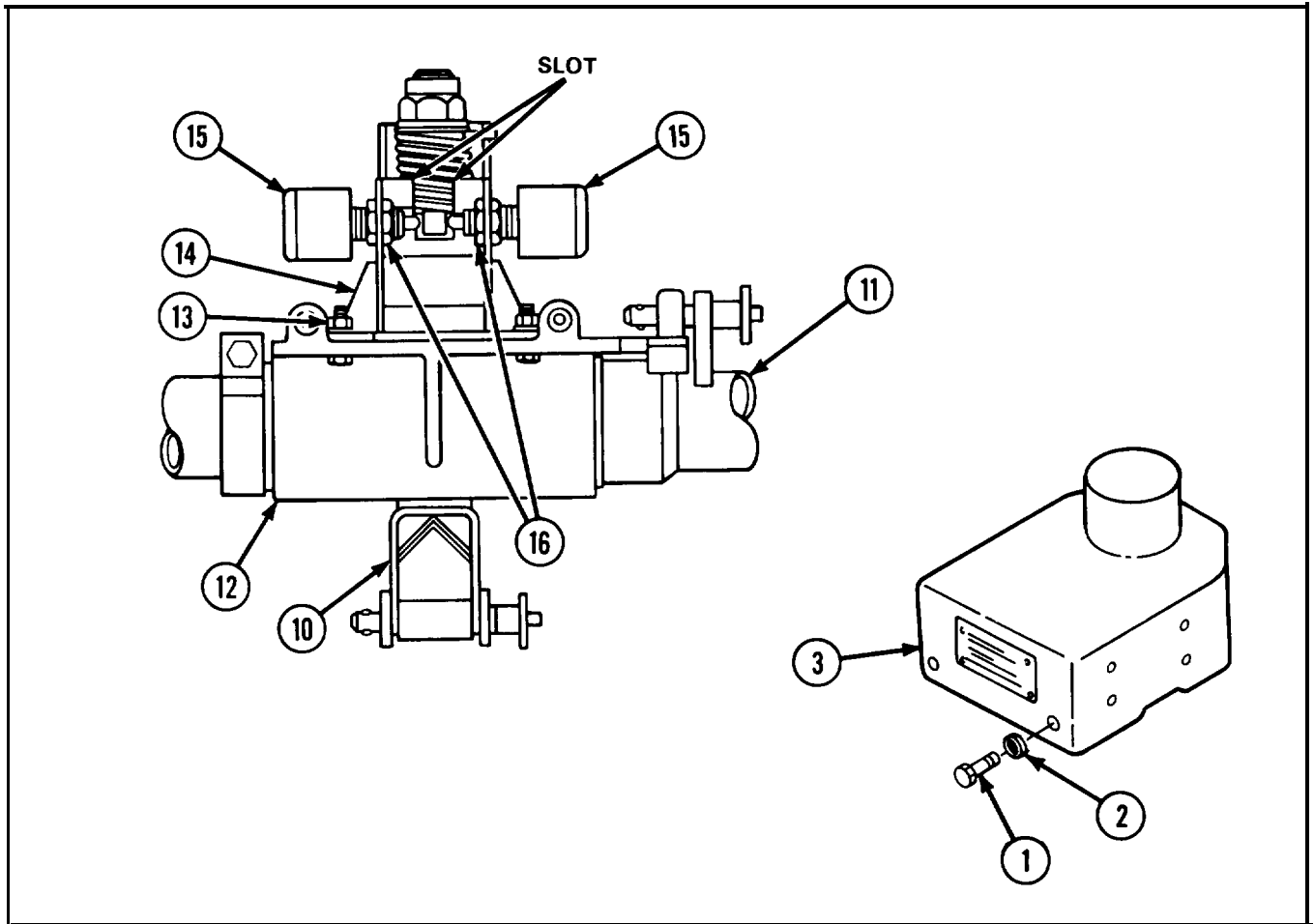
NOTE

The following adjustment must be made at time of reassembly.

remote control lever (7), and lower sleeve spacer (8) is tight against manual control lever (9).

- 1 Remove three machine bolts (1), three flat washers (2), and level wind access cover (3).
- 2 Tighten self-locking nut (4) until two helical springs (5) are compressed and upper sleeve spacer (6) is tight against

- 3 Back off self-locking nut (4) one-half turn.
- 4 Tap underside of manual control lever (9) to free lower sleeve spacer (8).



- 5 Turn cable guide (10) until side of cable guide is perpendicular to axis of rigid connecting link (11) within 0.030 in. (0.076 cm).
- 6 Clamp cable guide (10) to level wind housing (12) and hold in position.
- 7 Loosen three nuts (13) securing level wind bracket (14) to level wind housing (12).
- 8 Adjust level wind bracket (14) until remote control lever (7) is centered in slot of level wind bracket (14).
- 9 Tighten three nuts (13) and unclamp cable guide (10).
- 10 Position level wind sensing push switches (15) so they contact remote control lever (7), and then back off push switches (15) one-half turn. Secure level wind push switches (15) with mounting nuts (16).
- 11 Install level wind access cover (3) and secure with three flat washers (2) and three machine bolts (1).
- 12 After installation of level wind assembly on vehicle, refer to TM 9-2350 -238-20-2 for final adjustment.

NOTE

Level wind sensing push switches (15) may be loosened if necessary,

2-21. MAINTENANCE OF HYDRAULIC MOTOR.

This task covers: a. *Disassembly*

b. *Inspection/Repair*

c. *Reassembly*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC5180-90-CL-N26)

Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC4910-95-A31)

Key set, socket head screw
Pliers, retaining ring internal
Press, arbor

Materials/Parts

Spring tension washer (350-10025)
Winch motor parts kit (5702998)

References

TM 9-2350-238-24P-2

Equipment Conditions

2-103 Vehicle tow winch hydraulic motor removed

2-38 Boom winch hydraulic motor removed

General Safety Instructions

WARNING

Hydraulic motor seal contains parts under spring tension. Use caution when removing or installing hydraulic motor seal.

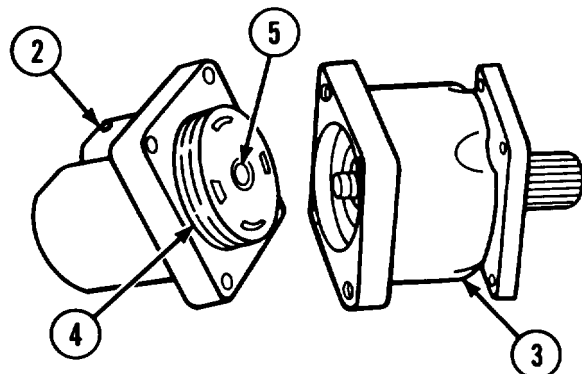
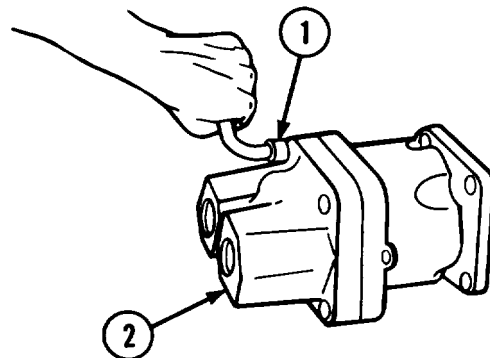
DISASSEMBLY

1 Remove four socket head capscrews (1) from cap (2).

2 Remove cap (2) from motor housing (3).

3 Remove preformed packing (4) from cap (2).

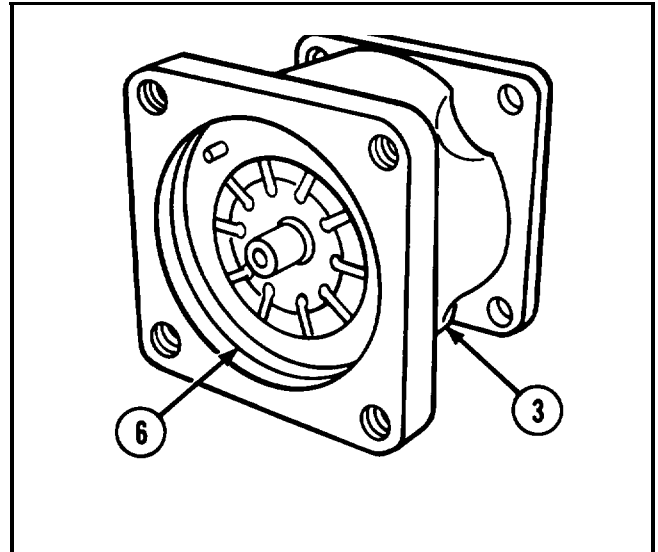
4 Remove needle roller bearing (5) from cap (2).



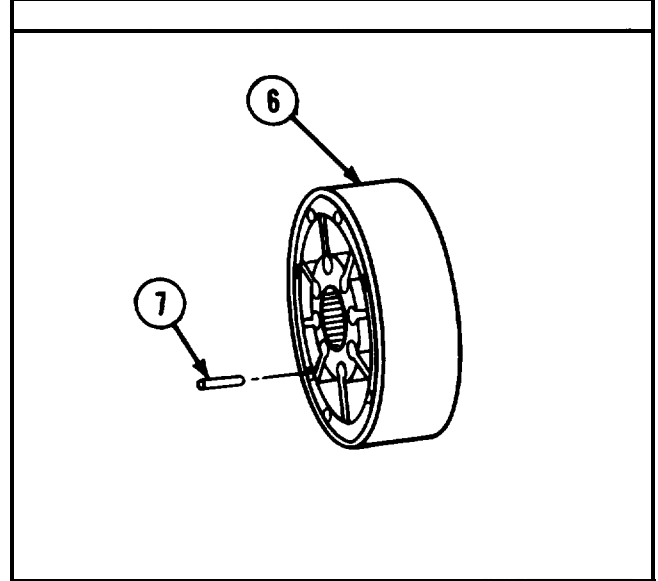
NOTE

Use care to ensure winch motor cam ring and rotor do not separate.

- 5 Remove winch motor cam ring and rotor (6) from motor housing (3).

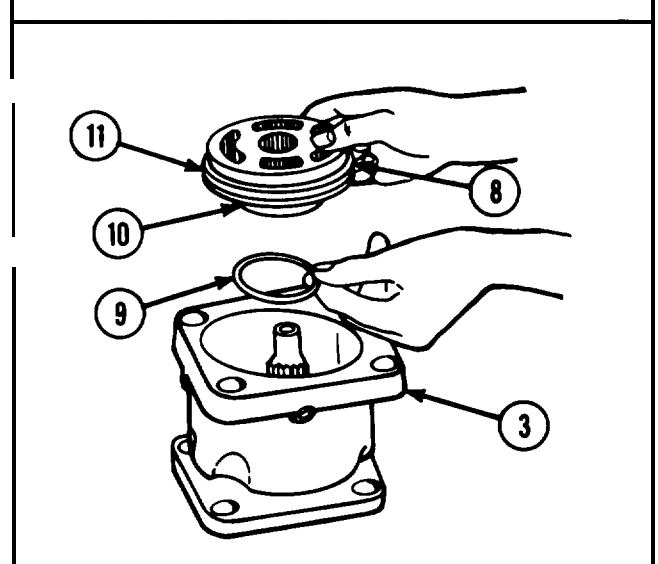


- 6 Remove cam ring to cap headless straight pin (7) from winch motor cam ring and rotor (6).



- 7 Remove plate (8) and spring tension washer (9) from motor housing (3).

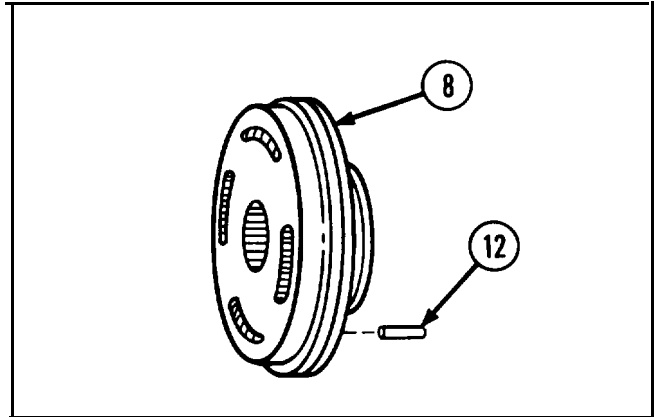
- 8 Remove preformed packing (10) and preformed packing (11) from plate (8).



2-21. MAINTENANCE OF HYDRAULIC MOTOR (CONT).

DISASSEMBLY (CONT)

- 9 Remove motor plate pin (12) from plate (8).



WARNING

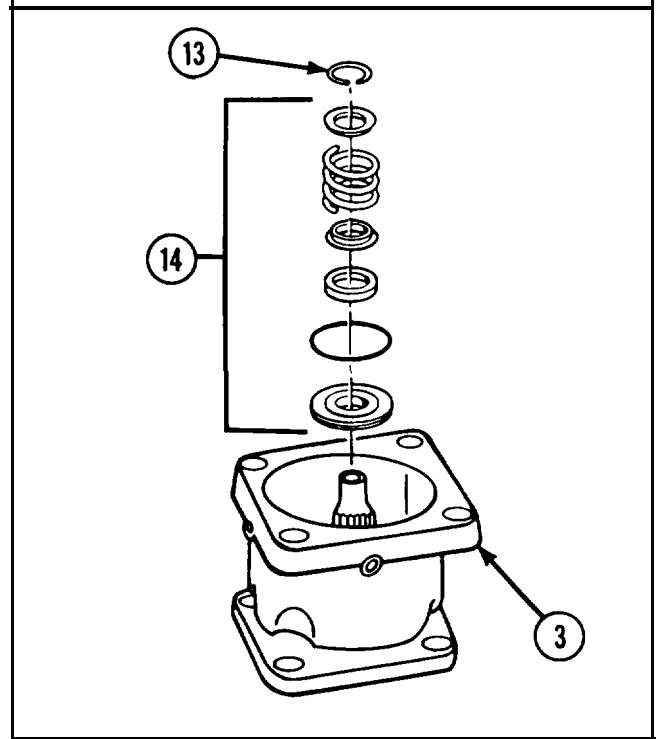
Hydraulic motor seal contains parts under spring tension. Use caution when removing hydraulic motor seal.

- 10 Using retaining ring pliers, remove retaining ring (13) from motor housing (3).

NOTE

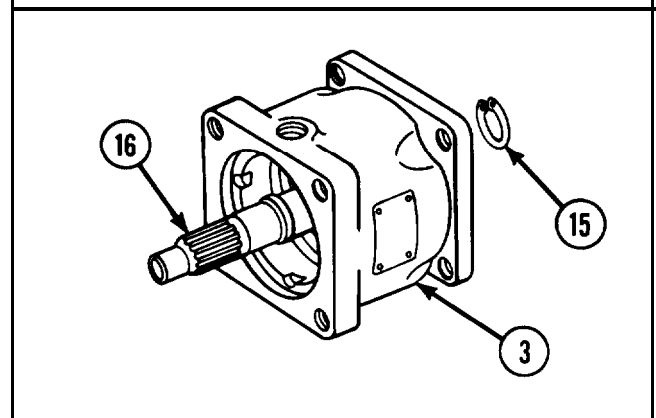
Hydraulic motor seal is made up of parts that are not repairable. If any part(s) are damaged, repair is by replacement of entire hydraulic motor seal.

- 11 Remove hydraulic motor seal (14) from motor housing (3).

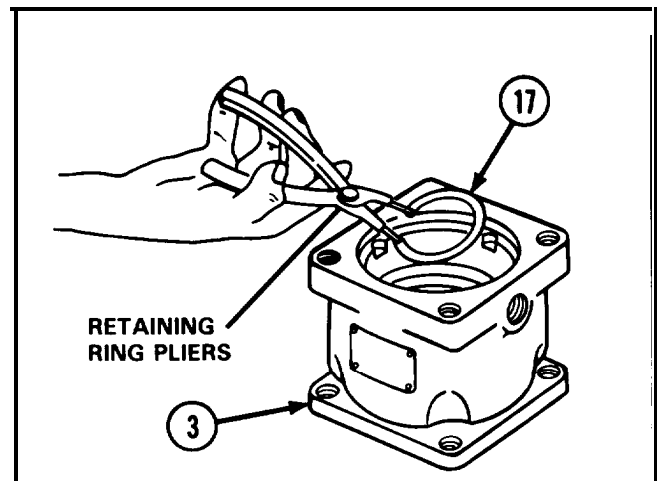


- 12 Using retaining ring pliers, remove retaining ring (15) from motor housing (3).

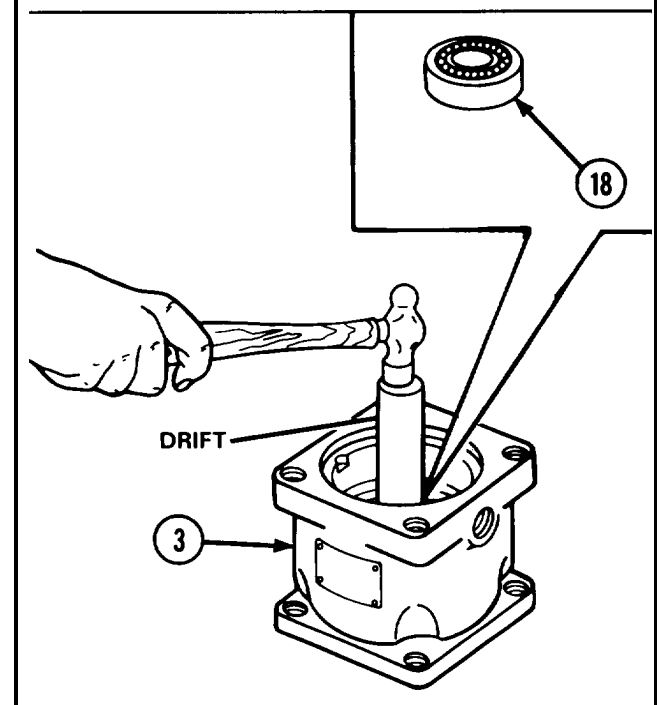
- 13 Remove shouldered shaft (16) from motor housing (3).



- 14 Using retaining ring pliers, remove retaining ring (17) from motor housing (3).



- 15 Using hammer and drift, remove motor shaft annular ball bearing (18) from motor housing (3).



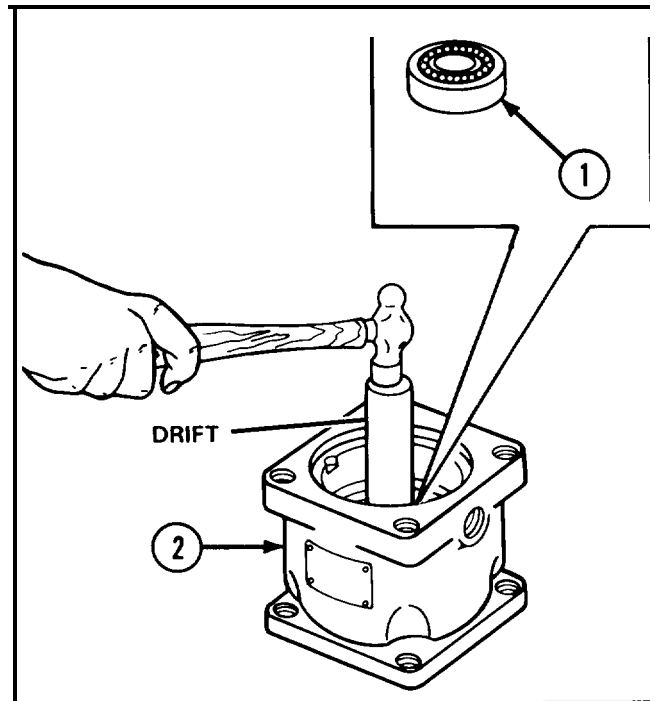
INSPECTION/REPAIR

- | | |
|---|---|
| <p>1 Inspect for broken, damaged, or missing parts.</p> <p>2 If cap is broken, damaged, or missing, repair is by replacement of next higher assembly.</p> <p>3 If plate is broken, damaged, or missing, repair is by replacement of next higher assembly.</p> <p>4 If motor plate pin is broken, damaged, or missing, repair is by replacement of next higher assembly.</p> | <p>5 If shouldered shaft is broken, damaged, or missing, repair is by replacement of next higher assembly.</p> <p>6 If motor housing is broken, damaged, or missing, repair is by replacement of next higher assembly.</p> <p>7 If any kit components are damaged, replace entire winch motor parts kit.</p> <p>8 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).</p> |
|---|---|

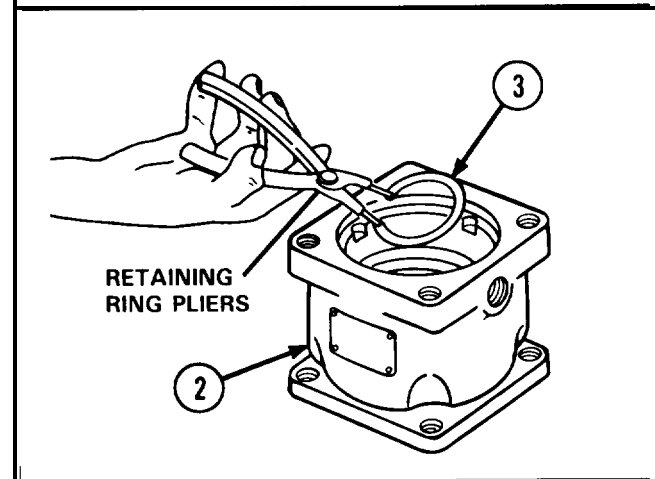
2-21. MAINTENANCE OF HYDRAULIC MOTOR (CONT).

REASSEMBLY

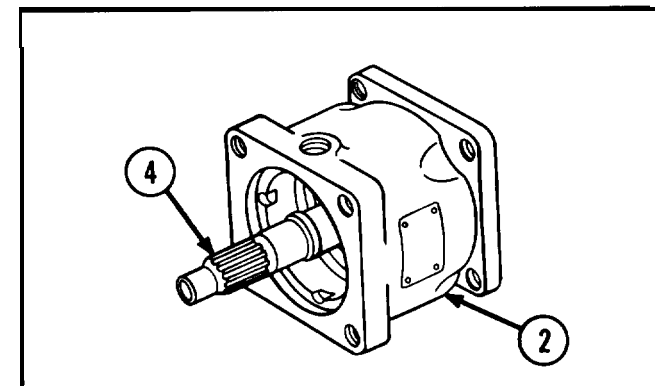
- 1 Using arbor press or hammer and drift, install motor shaft annular ball bearing (1) in motor housing (2).



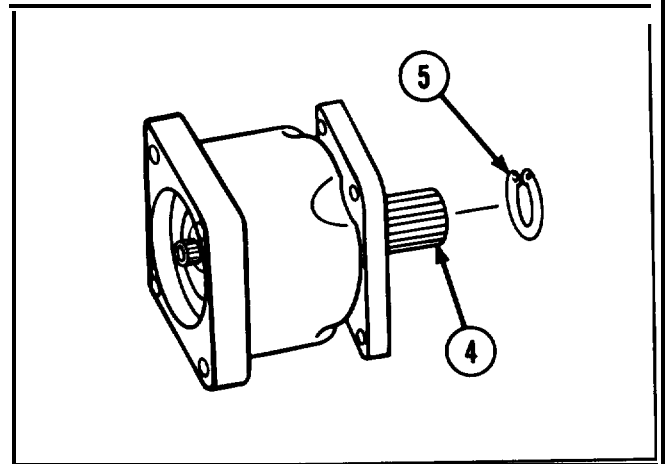
- 2 Using retaining ring pliers, install retaining ring (3) in motor housing (2).



- 3 Install shouldered shaft (4) in motor housing (2).

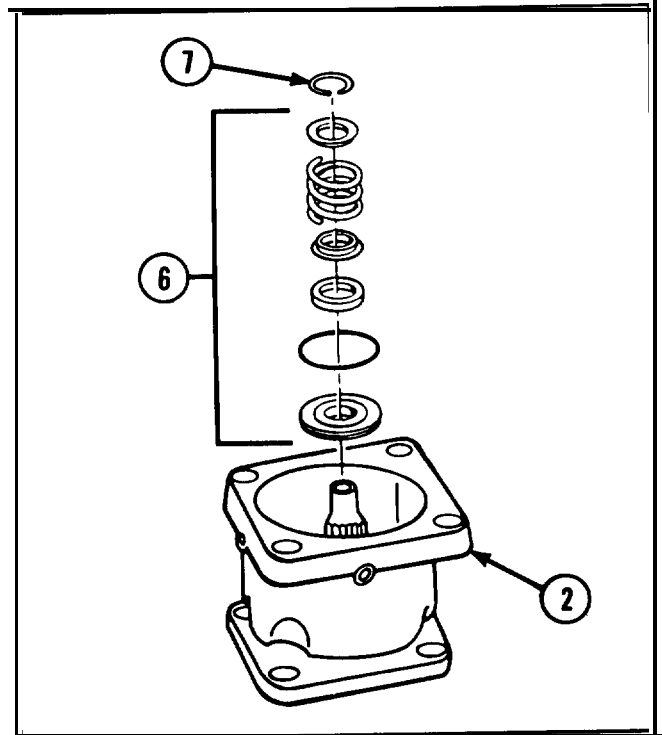


- 4 Using retaining ring pliers, install retaining ring (5) on shouldered shaft (4).

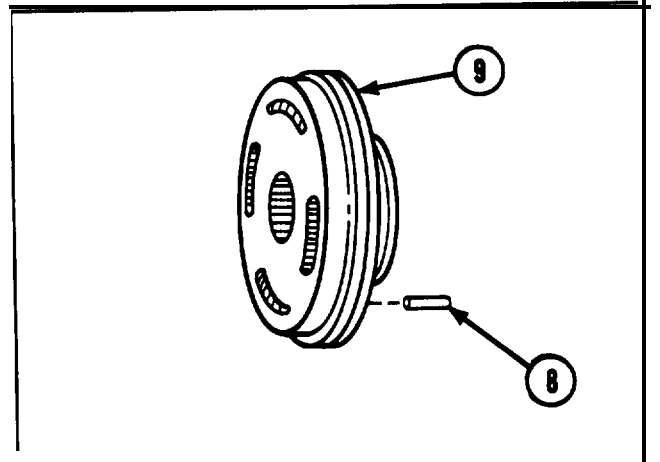


Hydraulic motor seal contains parts under spring tension. Use caution when installing hydraulic motor seal.

- 5 Install hydraulic motor seal (6) in motor housing (2).
 6 Using retaining ring pliers, install retaining ring (7) in motor housing (2).



- 7 Install motor plate pin (8) in plate (9).

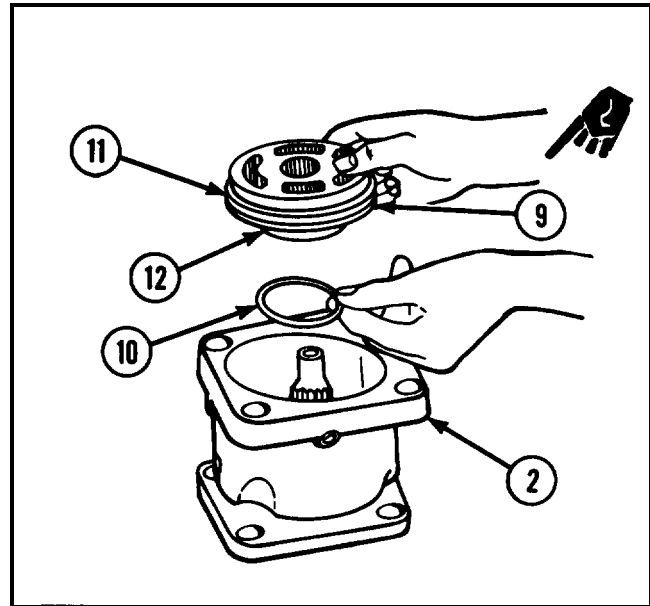


2-21. MAINTENANCE OF HYDRAULIC MOTOR (CONT).

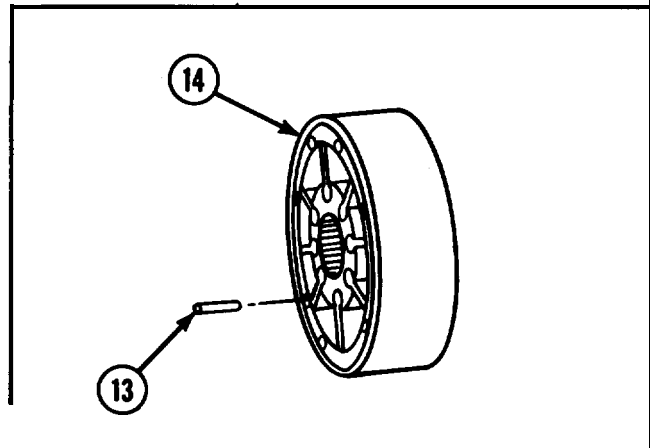
REASSEMBLY (CONT)

8 Install new spring tension washer (10) in motor housing (2).

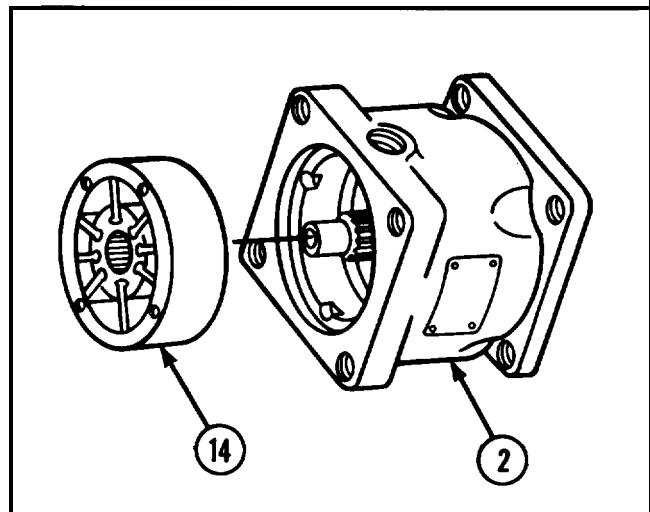
9 Install preformed packing (11) and preformed packing (12) on plate (9), and install plate in motor housing (2).



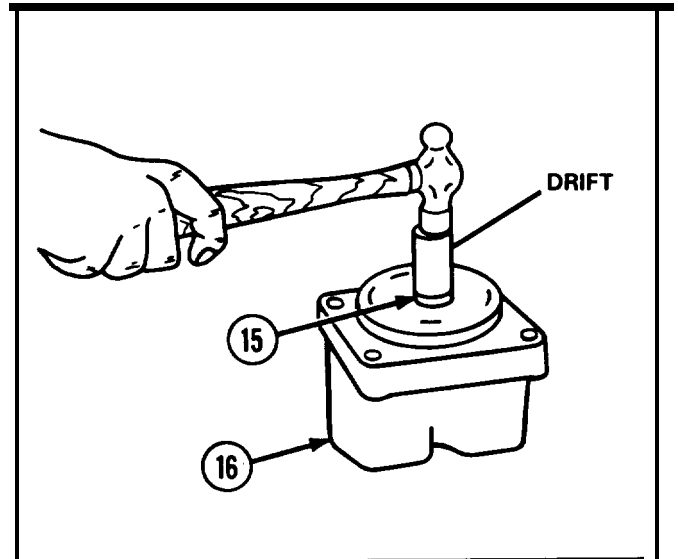
10 Install cam ring to cap headless straight pin (13) in winch motor cam ring and rotor (14).



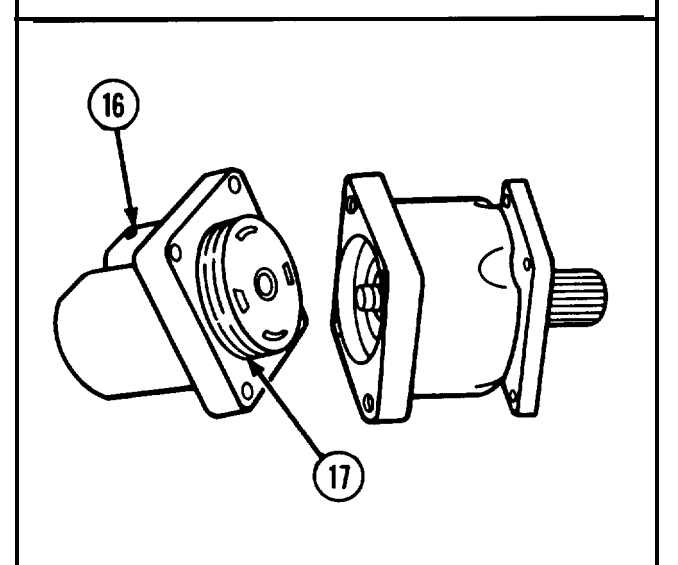
11 Install winch motor cam ring and rotor (14) in motor housing (2).



- 12 Using arbor press or hammer and drift, install needle roller bearing (15) in cap (16).



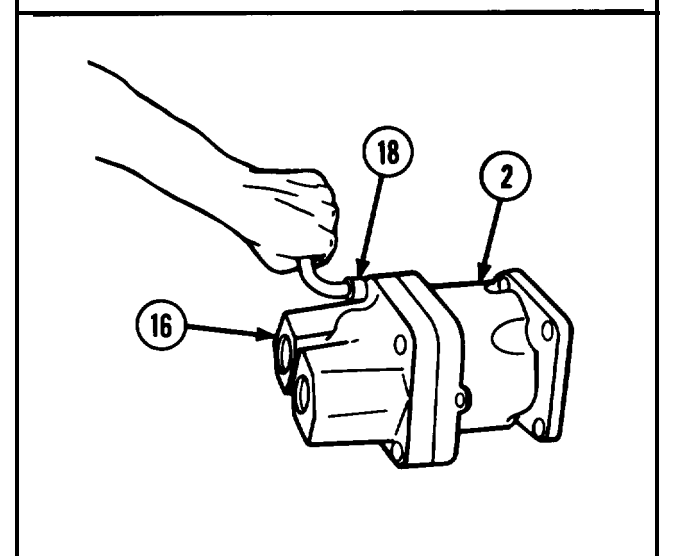
- 13 Install preformed packing (17) on cap (16).



NOTE

Ensure guide pin is installed in clockwise position.

- 14 Install cap (16) on motor housing (2) and secure by installing four socket head capscrews (18).



REMOVAL

WARNING

Use hoist with minimum lifting capacity of 2000 lb (908 kg) to prevent injury to personnel and damage to equipment.

NOTE

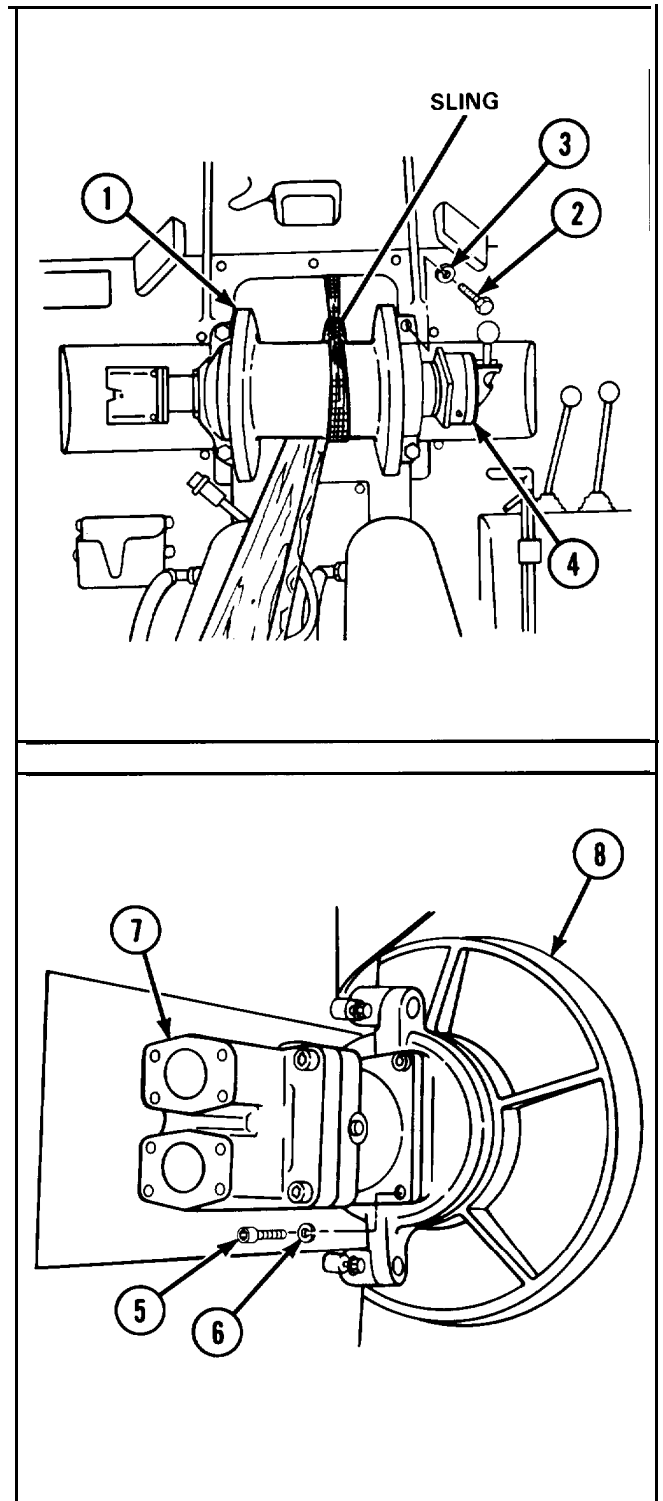
Another M578 Recovery Vehicle or M88A1 Recovery Vehicle may be used, if available, for lifting.

- 1 Lower sling through front of cab and position around center of vehicle drum winch assembly (1). Take up slack until vehicle drum winch assembly is supported by sling.

WARNING

Vehicle drum winch assembly weighs approximately 400 lb (182 kg); use care when removing. Failure to observe this warning could result in injury to personnel and damage to equipment.

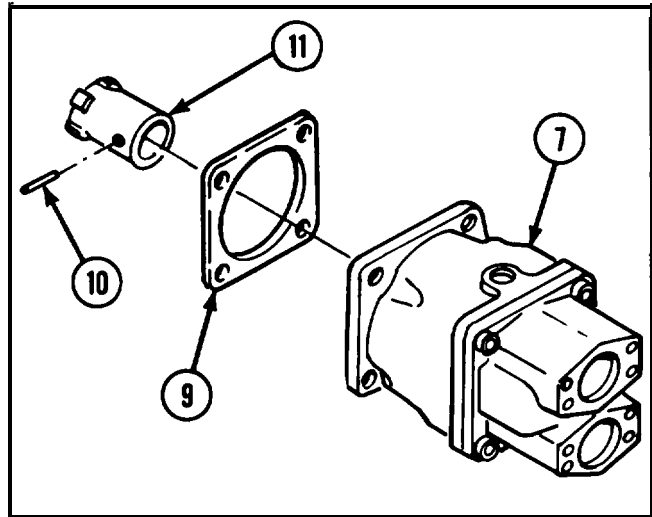
- 2 Remove four hexagon head capscrews (2) and four lockwashers (3) from vehicle drum winch assembly (1).
- 3 Using hoist with 2000 lb (908 kg) minimum lifting capacity, lift vehicle drum winch assembly (1) to make space for 4 in. x 4 in. (10 cm x 10 cm) piece of support lumber. Place lumber on boom winch opening end between boom cylinders.
- 4 Rotate vehicle drum winch assembly (1) until winch control cylinder (4) is facing opening in front of cab.
- 5 Remove vehicle drum winch assembly (1) through opening in front of cab and lower to ground.
- 6 Remove four socket head capscrews (5), four lockwashers (6), and hydraulic motor (7) from planetary (boom) winch (8).



2-22. MAINTENANCE OF BOOM AND WINCH –VEHICLE DRUM WINCH (CONT).

REMOVAL (CONT)

- 7 Remove motor to winch gasket (9) from hydraulic motor (7).
- 8 Remove spring pin (10) and winch motor positive clutch half (11) from hydraulic motor (7).

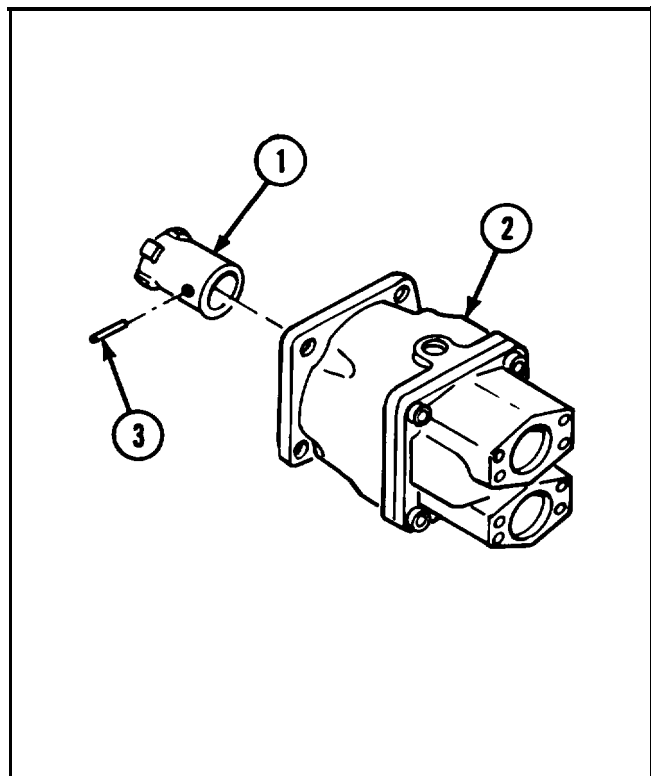


INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 Hydraulic motor is a repairable assembly. Refer to page 2-30.
- 3 Planetary boom winch is a repairable assembly. Refer to page 2-42.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

INSTALLATION

- 1 Install winch motor positive clutch half (1) on hydraulic motor (2) and secure with spring pin (3).



- 2 Install new motor to winch gasket (4) to hydraulic motor (2).
- 3 Install hydraulic motor (2), four new lockwashers (5), and four socket head capscrews (6) to planetary boom winch (7),

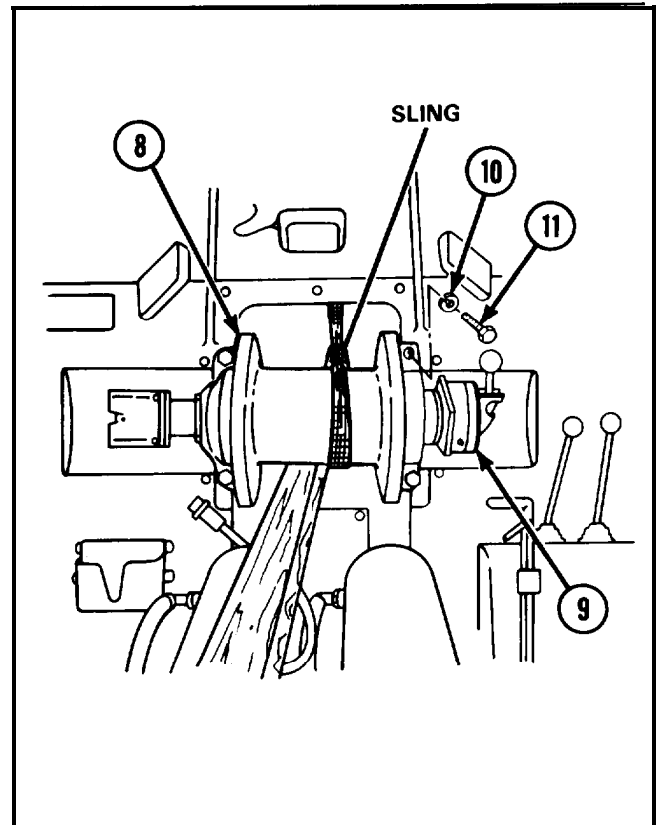
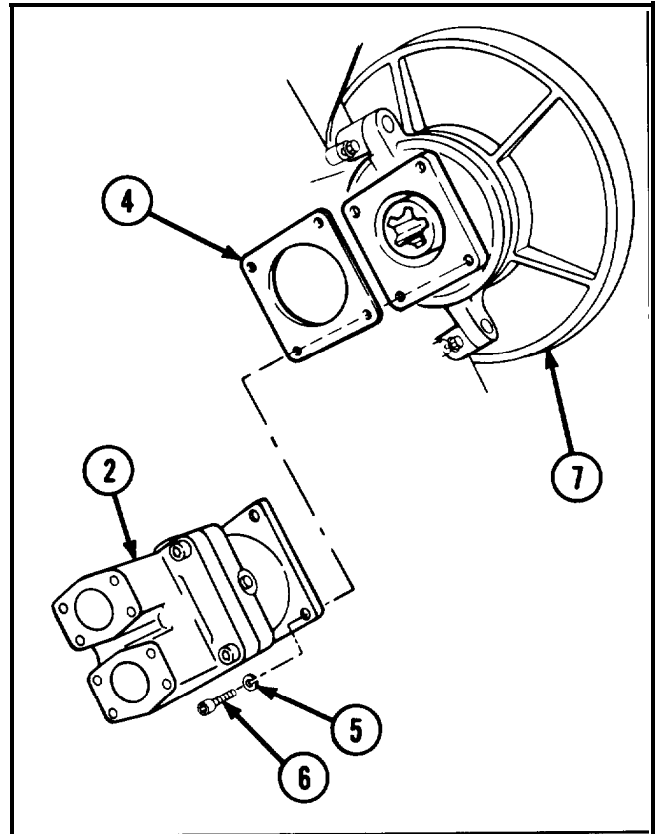
WARNING

- Vehicle drum winch assembly weighs approximately 400 lb (182 kg); use care when installing. Failure to observe this warning could result in injury to personnel and damage to equipment.
- Use hoist with minimum lifting capacity of 2000 lb (908 kg) to prevent injury to personnel and damage to equipment.

NOTE

Another M578 Recovery Vehicle or M88A1 Recovery Vehicle may be used, if available, for lifting.

- 4 Using sling positioned around center of vehicle drum winch assembly (8), install vehicle drum winch assembly through opening in front of cab.
- 5 If necessary, rotate vehicle drum winch assembly (8) until winch control cylinder (9) is facing opening in front of cab.
- 6 Place 4 in. x 4 in. (10 cm x 10 cm) piece of lumber on boom winch opening and between boom cylinders. Using hoist with 2000 lb (908 kg) minimum lifting capacity, lift vehicle drum winch assembly into place.
- 7 Install four new lockwashers (10) and four hexagon head capscrews (11) securing vehicle drum winch assembly (8). Torque hexagon head capscrews to 480 to 500 ft-lb (651 to 678 N-m).



2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH.

This task covers: a. *Disassembly* c. *Reassembly*
b. *Inspection/Repair* d. *Adjustment*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC 5180-90-CL-N26)
Jacking screws (4) (MS35295-64)
Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
Key set, socket head screw
Pliers, retaining ring
Wrench, torque, 0 to 175 ft-lb

Materials/Parts

Control cylinder gasket (10908418)
Cotter pin (MS24665-285)
Cylinder adapter plate gasket (10908428)
Hydraulic parts kit (5702990)
Lockwasher (4) (MS35338-46)
Preformed packing (MS28775-012)
Preformed packing (MS28775-212)
Sealing compound (item 18, appx B)
Winch brake parts kit (5702993)

References

TM 9-2350-238-20-2
TM 9-2350-238-24P-2
TM 9-4940-468-14

Equipment Conditions

2-38 Vehicle drum winch assembly removed
2-38 Hydraulic motor removed from vehicle drum winch
Manual control lever removed (TM 9-2350-238-20-2)

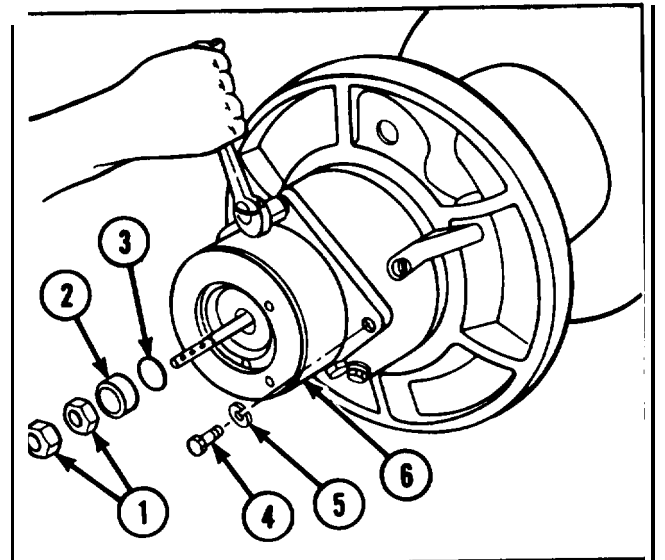
General Safety Instructions

WARNING

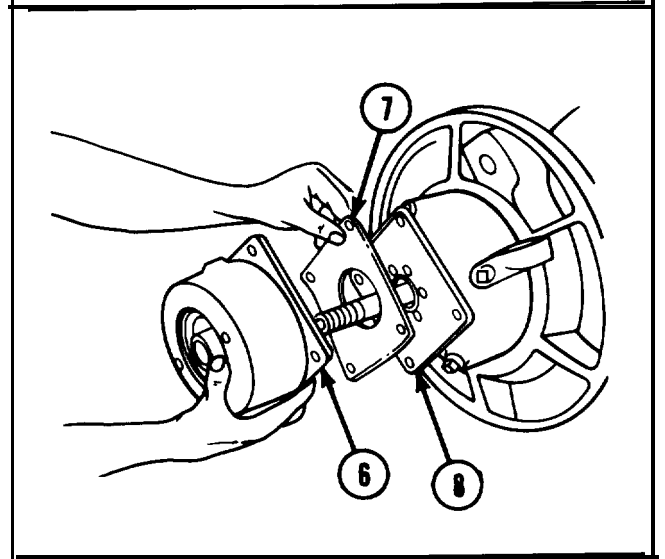
Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

DISASSEMBLE

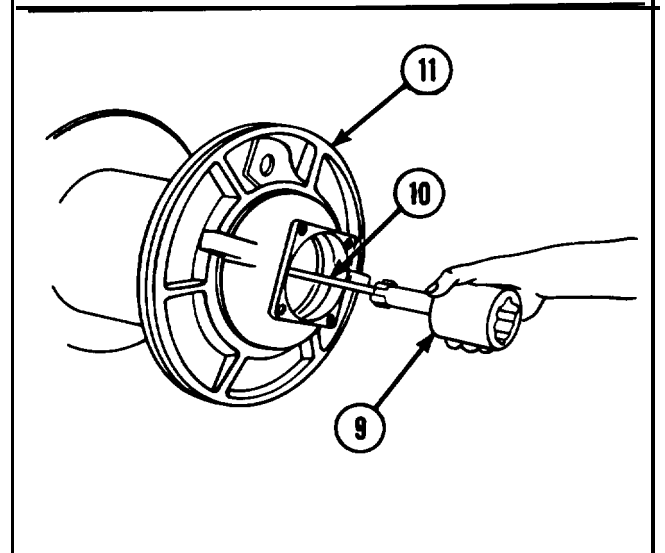
- 1 Remove two hexagon plain nuts (1), winch cylinder control collar (2), and preformed packing (3).
- 2 Remove four hexagon head capscrews (4) and four lockwashers (5) from winch control cylinder (6).



- 3 Remove winch control cylinder (6) and control cylinder gasket (7) from control cylinder mounting adapter plate (8).



- 4 Remove shift rod spool assembly (9) and winch shift rod (10) from motor end of cable reel (11).

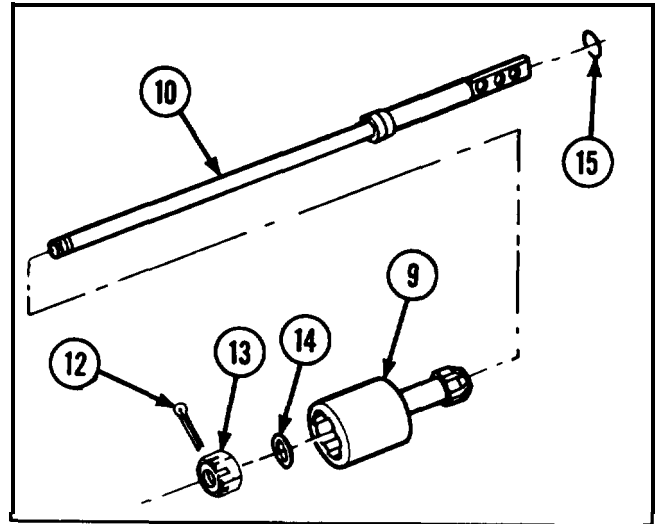


2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

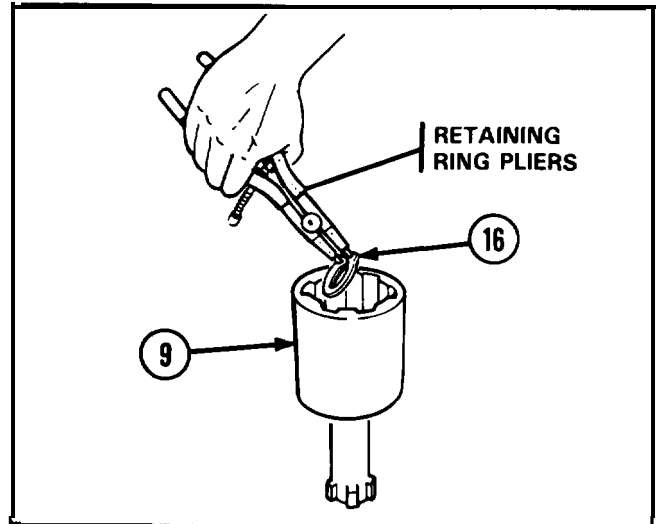
DISASSEMBLY (CONT)

5 Remove cotter pin (12), slotted plain nut (13), coupling shift rod thrust washer bearing (14), and shift rod spool assembly (9) from winch shift rod (10).

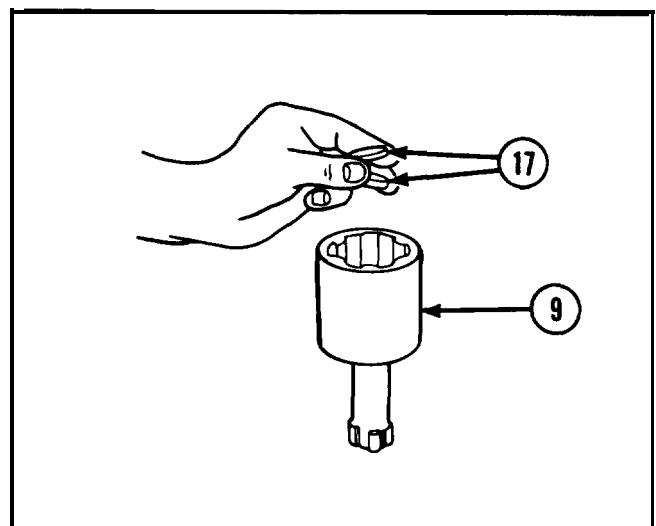
6 Remove preformed packing (15) from winch shift rod (10).



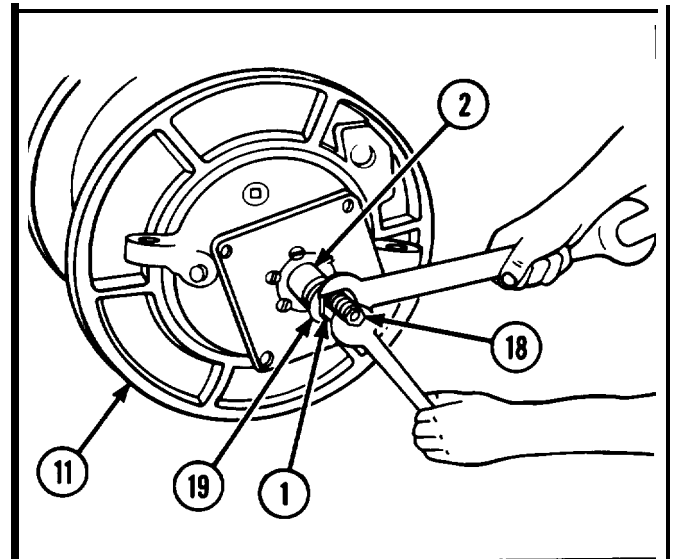
7 Using retaining ring pliers, remove retaining ring (16) from shift rod spool assembly (9).



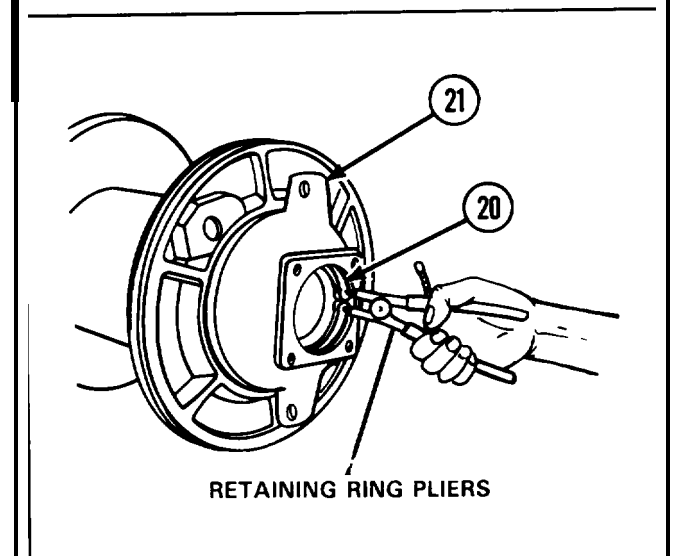
8 Remove two shift rod coupling spool annular ball bearings (17) from shift rod spool assembly (9).



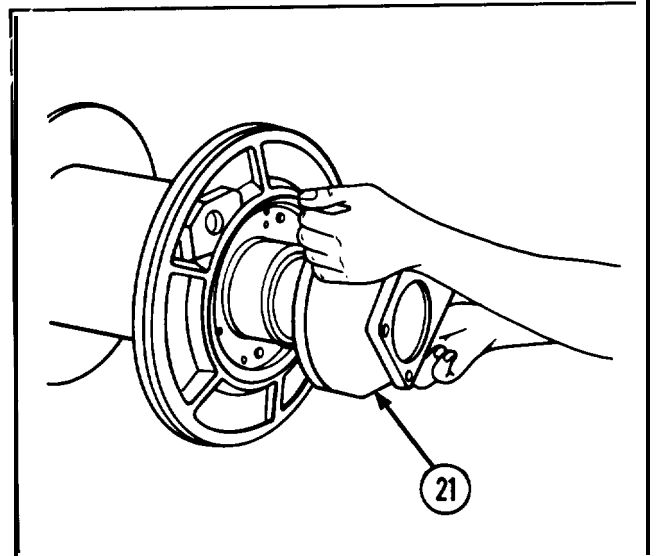
- 9 Install winch cylinder control collar (2), on brake rod of stage one boom winch carrier assembly (18).
- 10 Install washers (19) as needed to allow one of the hexagon plain nuts (1) to be tightened on brake rod of stage one boom winch carrier assembly (18).
- 11 Tighten hexagon plain nut (1) on brake rod of stage one boom winch carrier assembly (18) to relieve pressure on brake plates inside cable reel (11).



- 12 Using retaining ring pliers, remove retaining ring (20) from end mounting bracket (21).



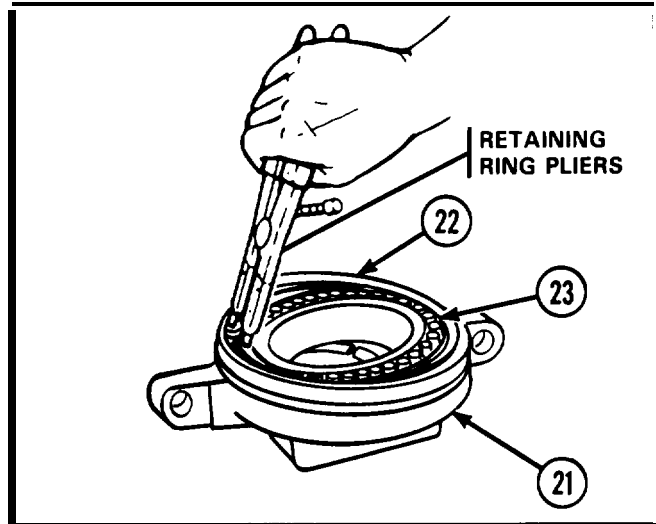
- 13 Remove motor end mounting bracket (21)



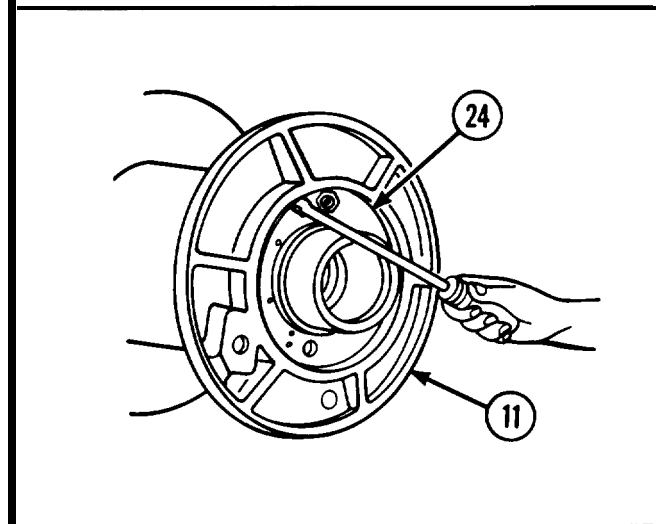
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

DISASSEMBLE (CONT)

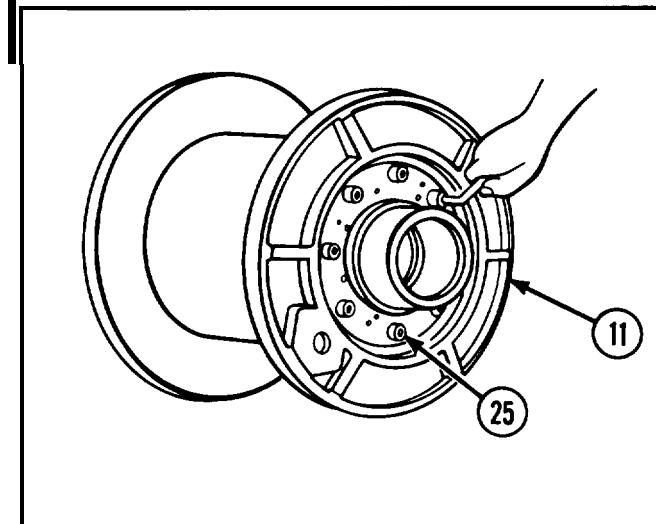
14 Using retaining ring pliers, remove retaining ring (22) and self-aligning roller bearing (23) from motor end mounting bracket (21).



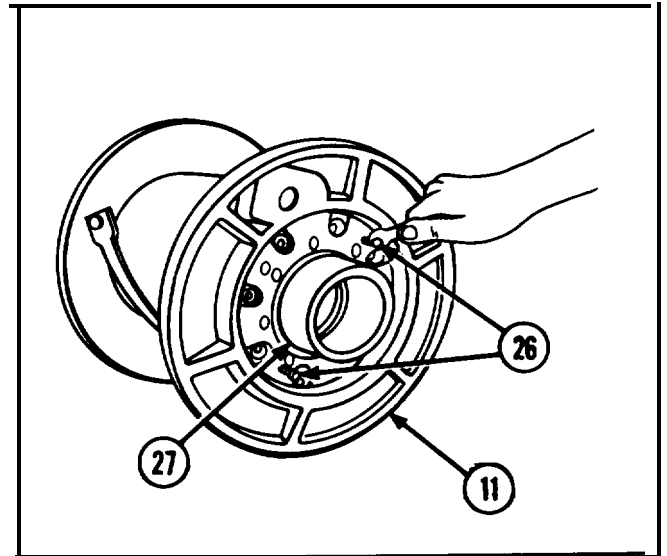
15 Remove winch drum plain encased seal (24) from cable reel (11).



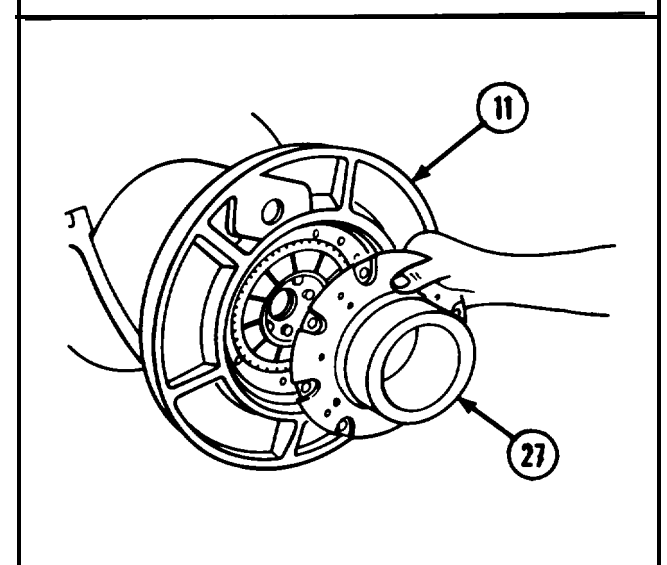
16 Remove eight socket head cascrews (25) from brake control end of cable reel (11).



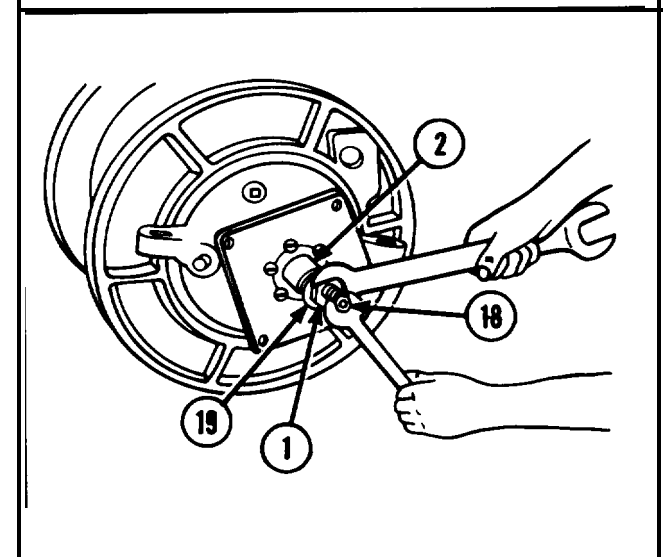
- 17 Working from motor end of cable reel (11), install four 1.5-in. (3.8-cm) long by 3/8-in. (0.96-cm) diameter jacking screws (26) in boom winch bearing winch housing (27) and tighten until boom winch bearing winch housing is free. Remove jacking screws.



- 18 Remove boom winch bearing housing (27) from cable reel (11).



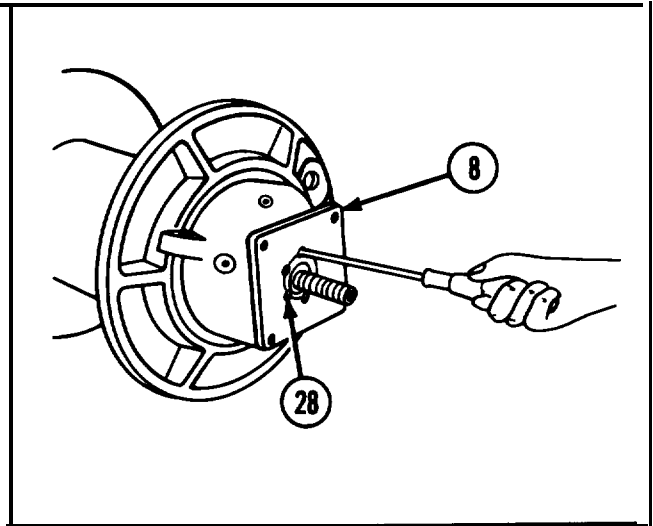
- 19 Remove hexagon plain nut (1), washers (19), and winch cylinder control collar (2) from brake rod of stage one boom winch carrier assembly (18).



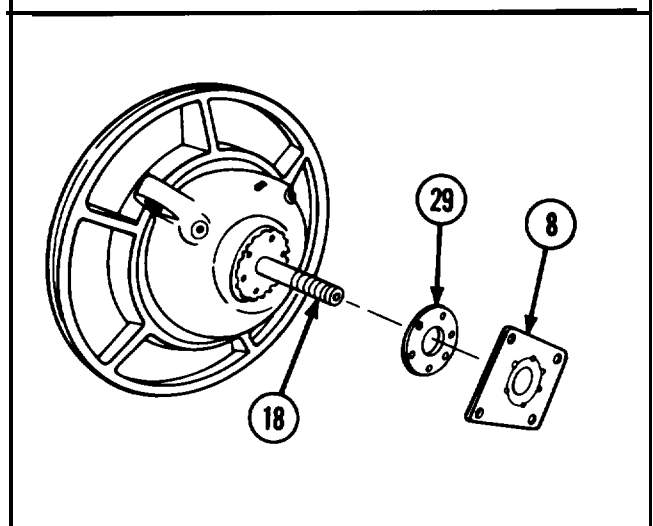
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

DISASSEMBLY (CONT)

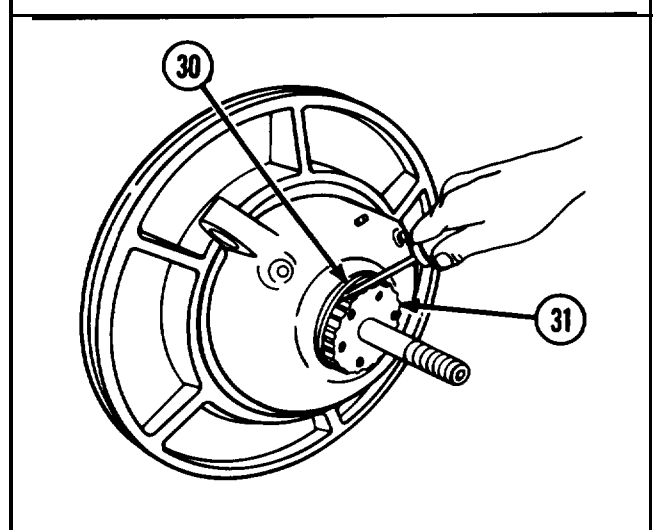
20 Remove six machine screws (28) from control cylinder mounting adapter plate (8).



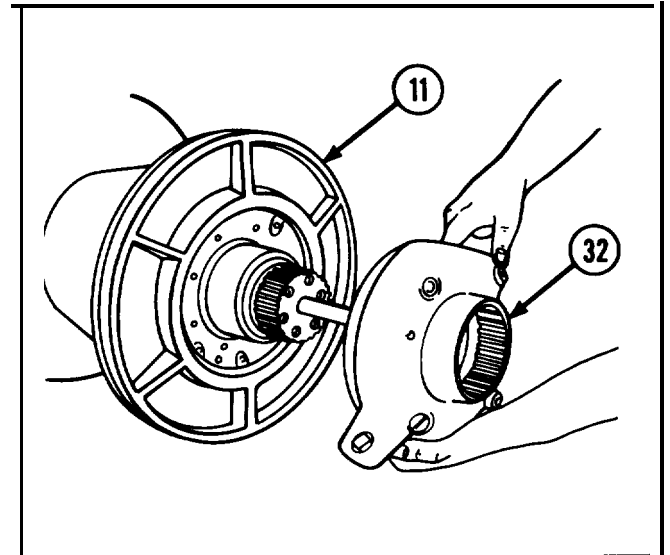
21 Remove control cylinder mounting adapter plate (8) and cylinder adapter plate gasket (29) from stage one boom winch carrier assembly (18).



22 Remove drum support retaining ring (30) from stage three boom winch carrier assembly (31).

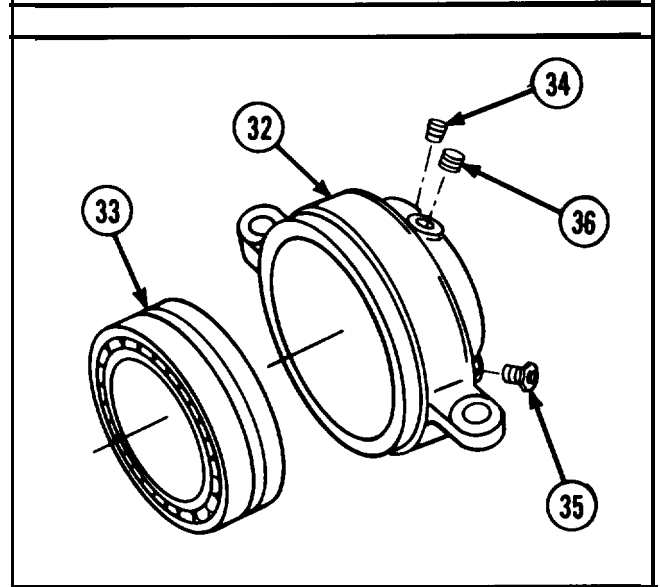


23 Remove reaction end support (32) from cable reel (11).

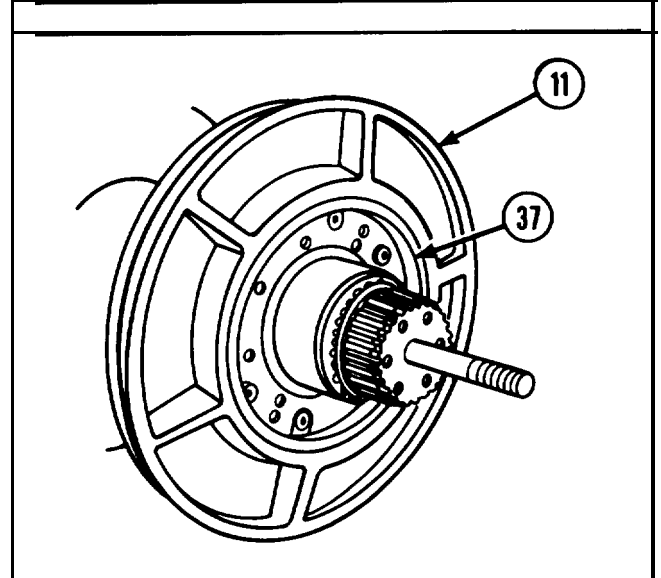


24 Remove self-aligning roller bearing (33) from reaction end support (32).

25 Remove pipe plug (34), pressure relief safety relief valve (35), and four pipe plugs (36) from reaction end support (32).



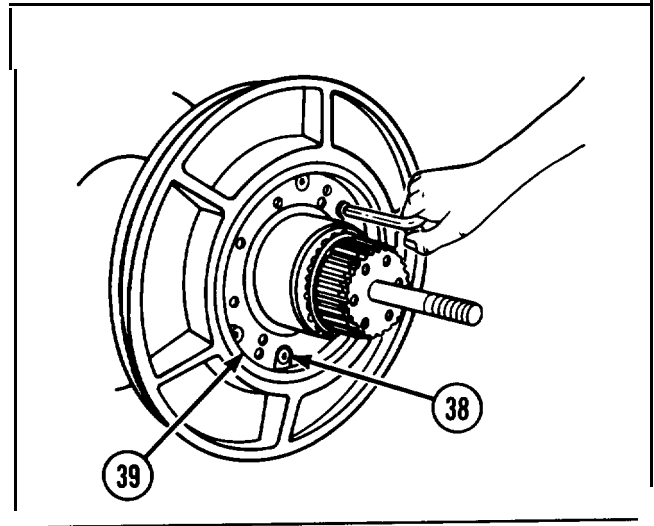
26 Remove winch drum plain encased seal (37) from cable reel (11).



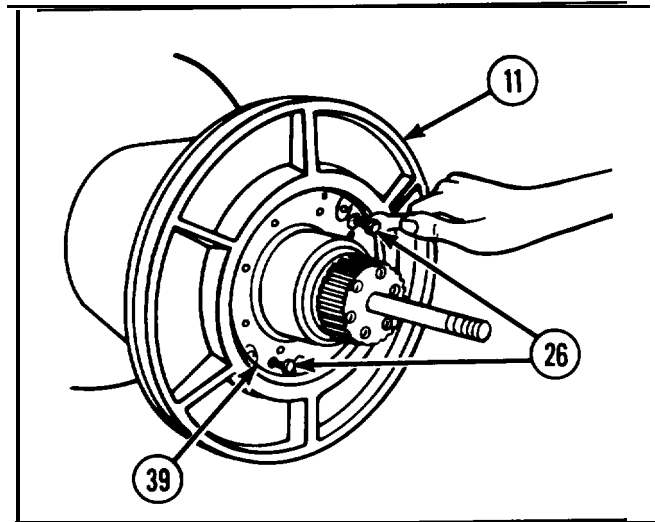
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

DISASSEMBLY (CONT)

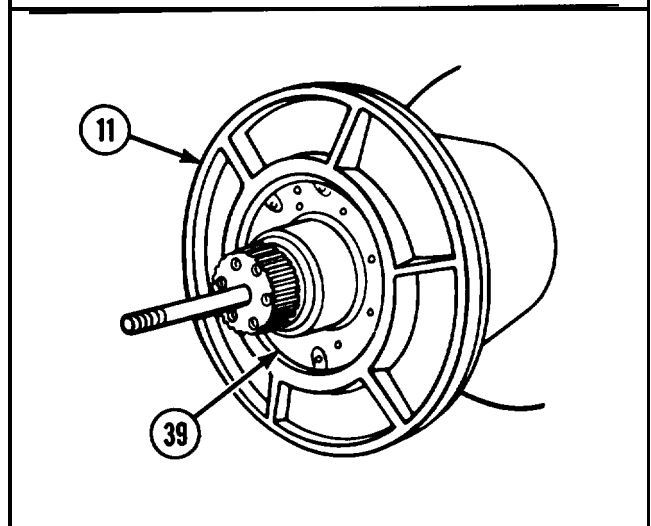
27 Remove eight socket head capscrews (38) from winch bearing boom winch housing (39).



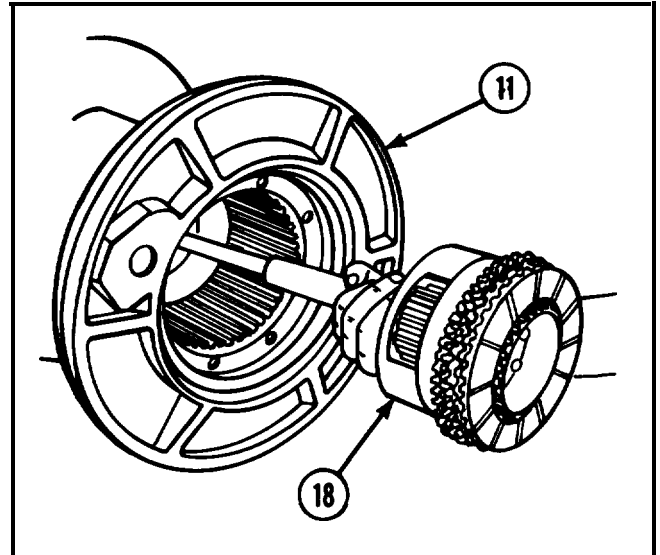
28 Working from brake control end of cable reel (11), install four 1.5-in. (3.8-cm) long by 3/8-in. (0.96-cm) diameter jacking screws (26) in winch bearing boom winch housing (39) and tighten until winch bearing boom winch housing is free. Remove jacking screws.



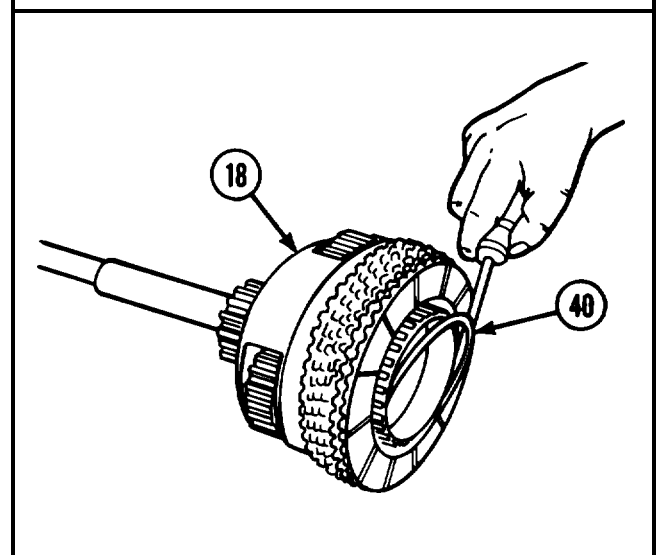
29 Remove winch bearing boom winch housing (39) from cable reel (11).



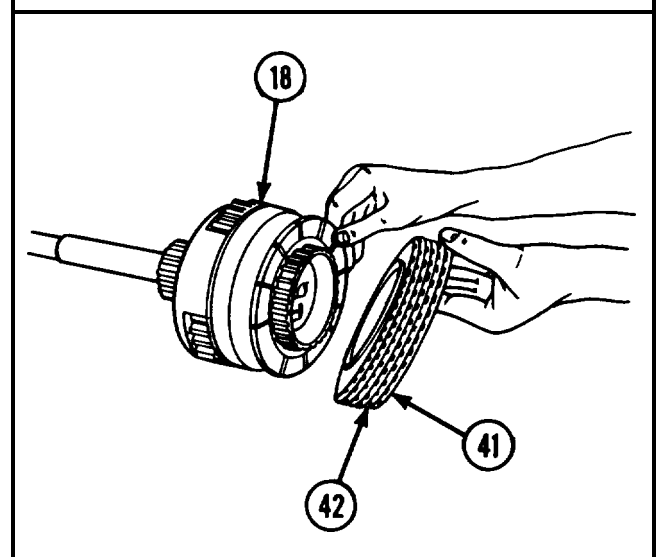
30 Remove stage one boom winch carrier assembly (18) from cable reel (11).



31 Remove winch housing retaining ring (40) from stage one boom winch carrier assembly (18).



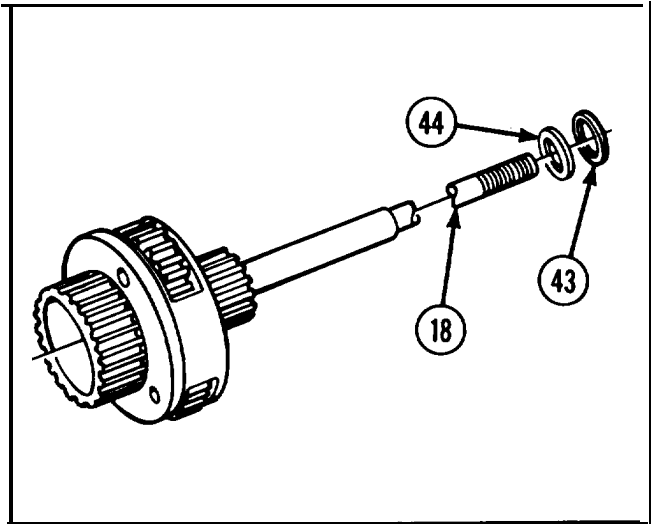
32 Remove eight plates (41) and seven plates (42) from stage one boom winch carrier assembly (18).



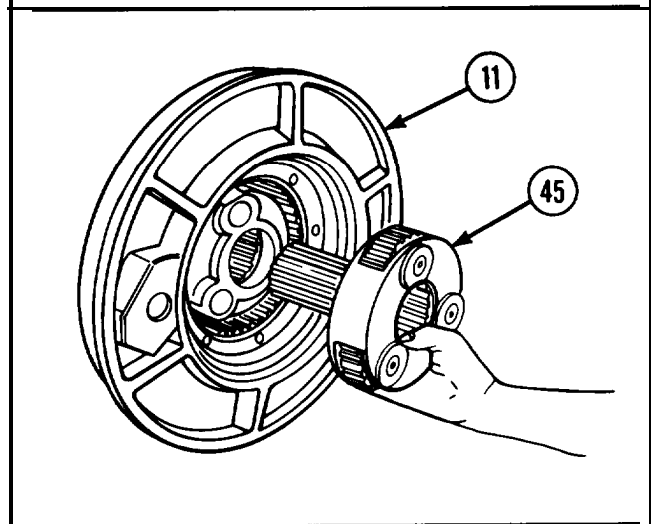
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

DISASSEMBLY (CONT)

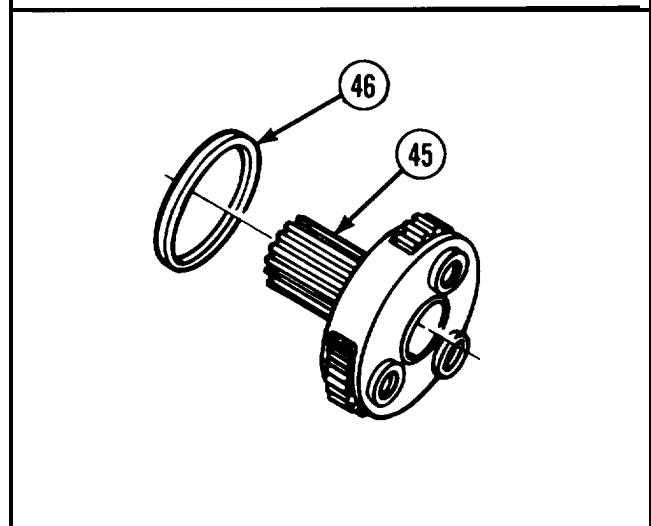
33 Remove thrust washer (43) and packing retainer (44) from stage one boom winch carrier assembly (18).



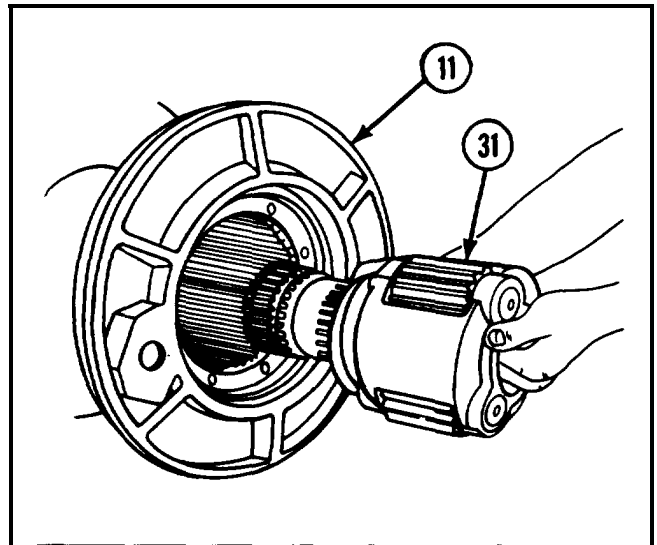
34 Remove stage two boom winch carrier assembly (45) from cable reel (11).



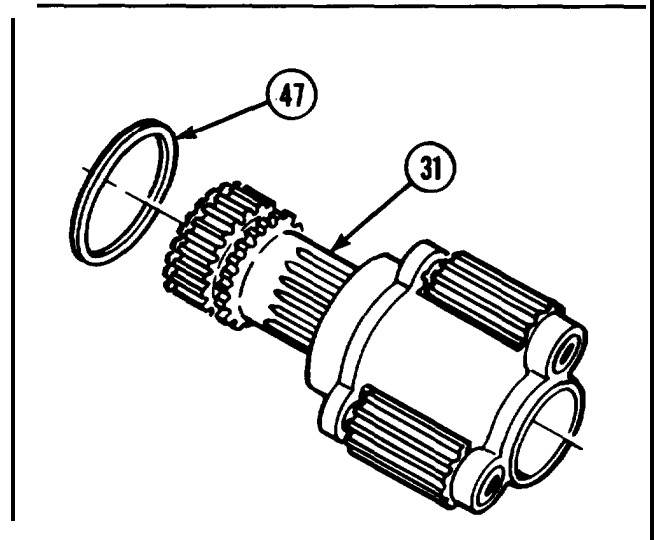
35 Remove washer (46) from stage two boom winch carrier assembly (45).



- 36 Remove stage three boom winch carrier assembly (31) from cable reel (11).



- 37 Remove thrust ring spacer (47) from stage three boom winch carrier assembly (31).



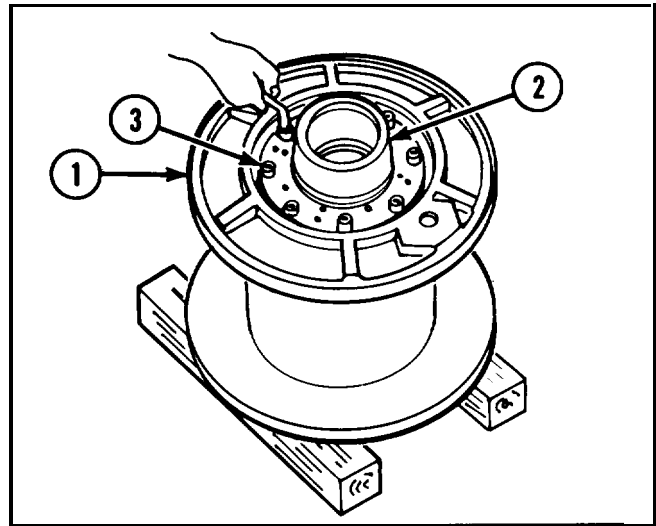
INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If any kit component is damaged, replace entire repair parts kit.
- 3 If cable reel is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 Stage one boom winch carrier assembly is a repairable assembly. Refer to page 2-69.
- 5 Stage two boom winch carrier assembly is a repairable assembly. Refer to page 2-77.
- 6 Stage three boom winch carrier assembly is a repairable assembly. Refer to page 2-81.
- 7 Winch control cylinder is a repairable assembly. Refer to page 2-64.
- 8 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

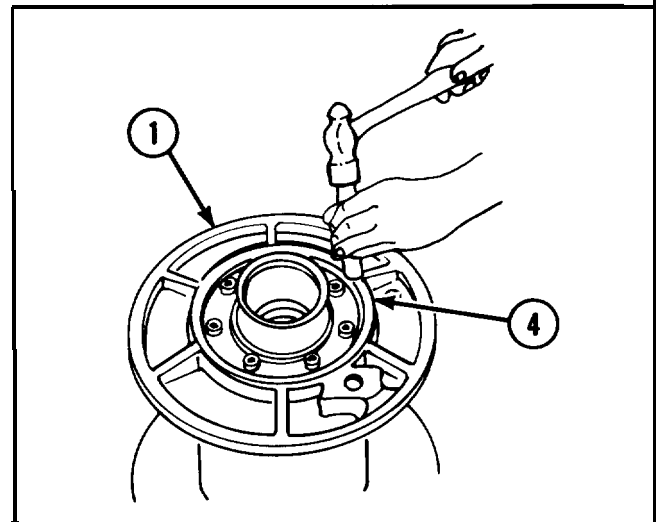
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

REASSEMBLY

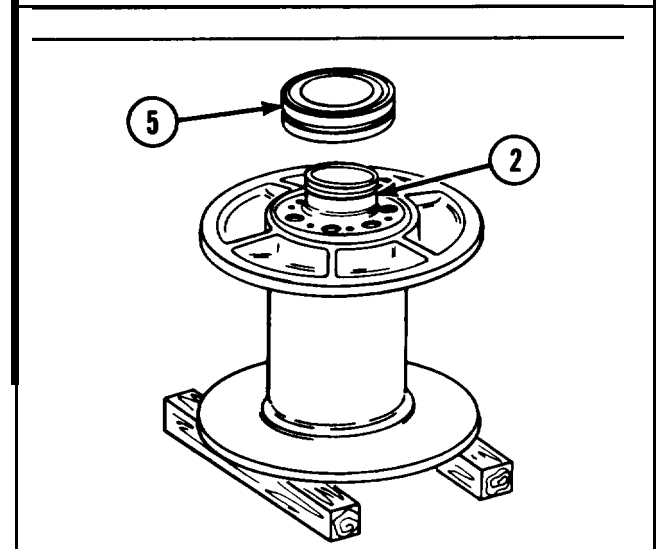
- 1 Support cable reel (1) in a vertical position.
- 2 Install boom winch bearing housing (2) into cable reel (1) and secure with eight socket head capscrews (3). Torque socket head capscrews to 50 ft-lb (68 N-m).



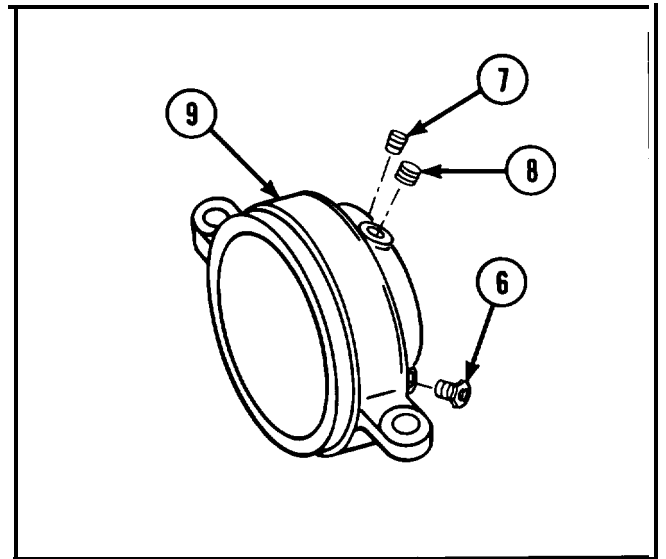
- 3 Coat mating surfaces of cable reel (1) and winch drum plain encased seal (4) with sealing compound (item 18, appx B) and install winch drum plain encased seal in cable reel. Using drift and hammer, tap winch drum plain encased seal into recess of cable reel.



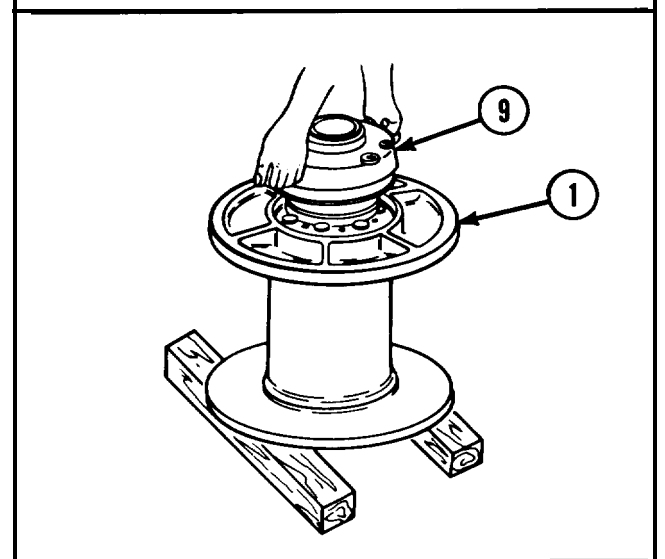
- 4 Install self-aligning roller bearing (5) on boom winch bearing housing (2).



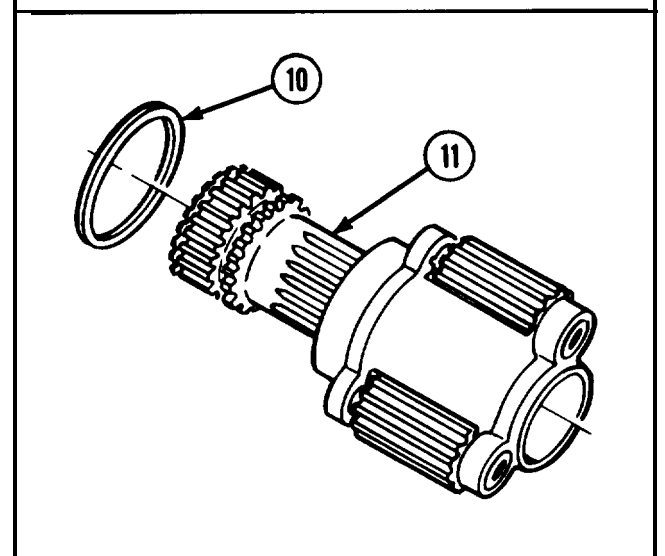
- 5 Install pressure relief safety relief valve (6), pipe plug (7), and four pipe plugs (8) in reaction end support (9).



- 6 Install reaction end support (9) on cable reel (1).



- 7 Install thrust ring spacer (10) on stage three boom winch carrier assembly (11).



2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

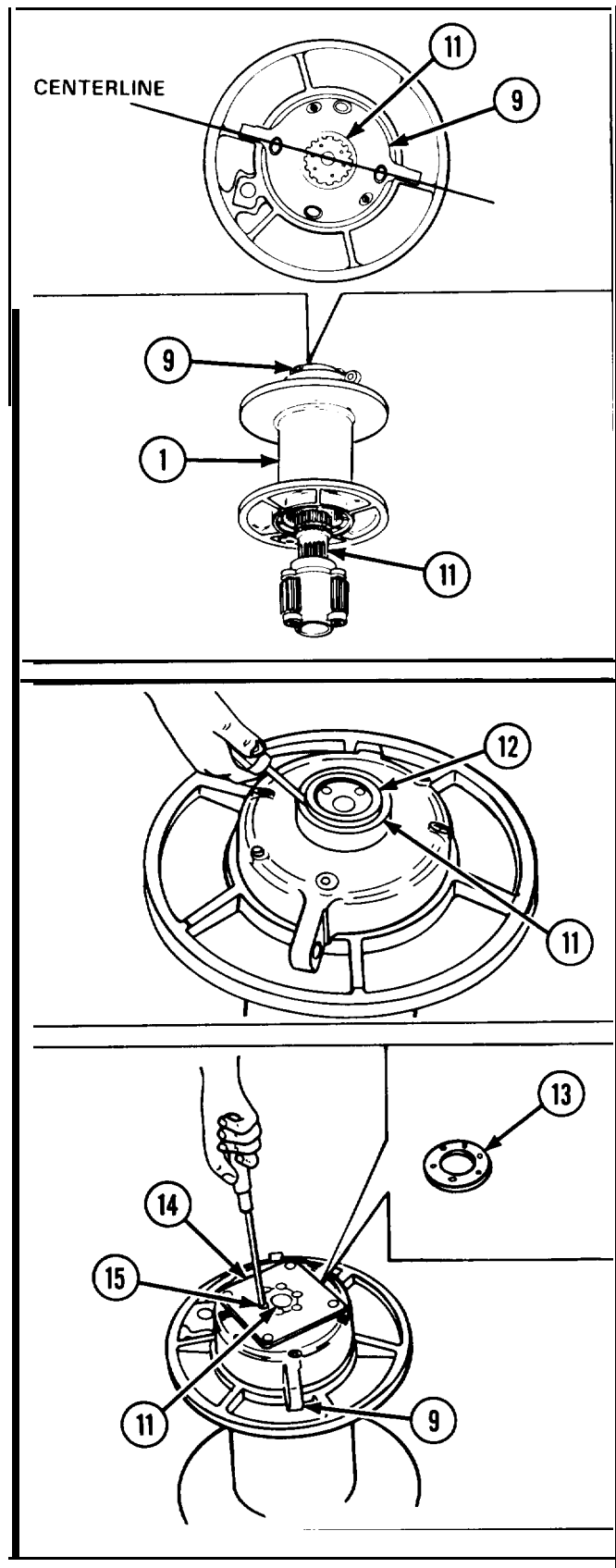
REASSEMBLY (CONT)

8 Position shaft of stage three boom winch carrier assembly (11) in reaction end support (9) so that two tapped holes are aligned with centerline of reaction end support as shown.

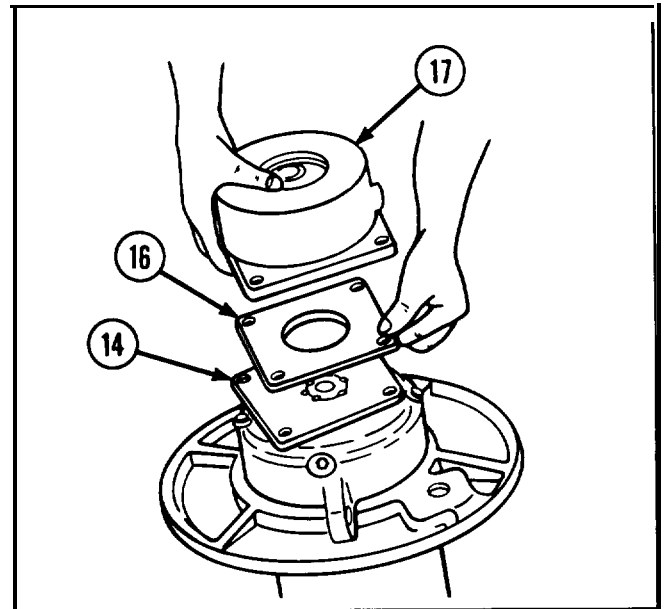
9 Install drum support retaining ring (12) in groove of stage three boom winch carrier assembly (11).

10 Install new cylinder adapter plate gasket (13) and control cylinder mounting adapter plate (14) on shaft of stage three boom winch carrier assembly (11). Make sure control cylinder mounting adapter plate is installed in same position to mounting lugs of reaction end support (9) as shown.

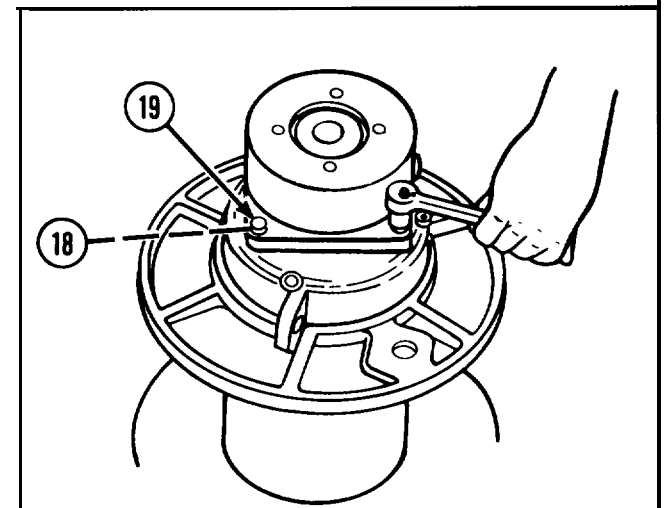
11 Install six machine screws (15) and torque to 5 ft-lb (7 N-m).



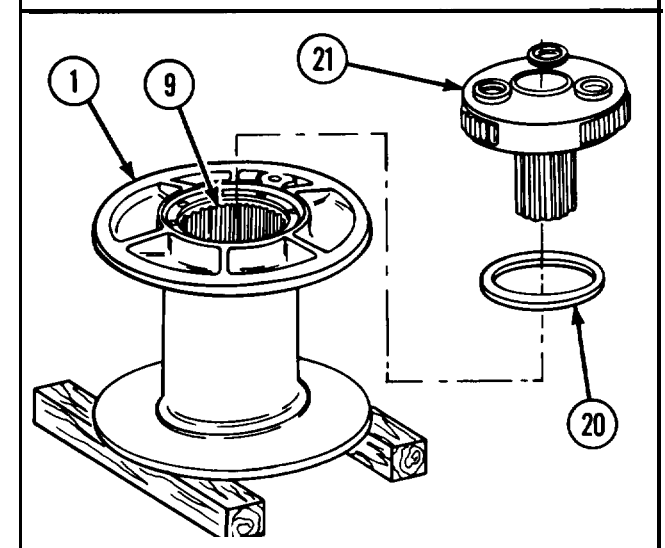
- 12 Install new control cylinder gasket (16) and winch control cylinder (17) on control cylinder mounting adapter plate (14). Make sure inlet port of winch control cylinder is positioned as shown.



- 13 Install four new lockwashers (18) and four hexagon head capscrews (19). Torque hexagon head capscrews to 18 ft-lb (24 N-m).



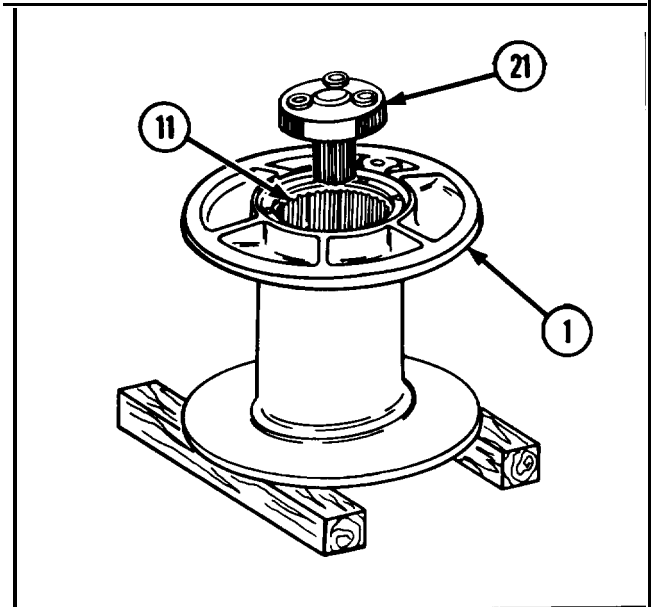
- 14 Turn cable reel (1) and reaction end support (9) so that open end is upward.
- 15 Install new washer (20) on stage two boom winch carrier assembly (21).



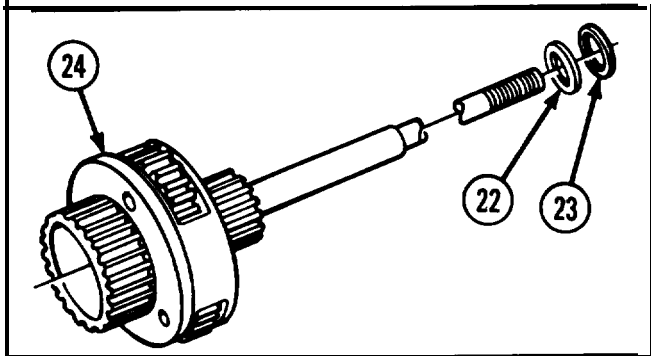
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

REASSEMBLY (CONT)

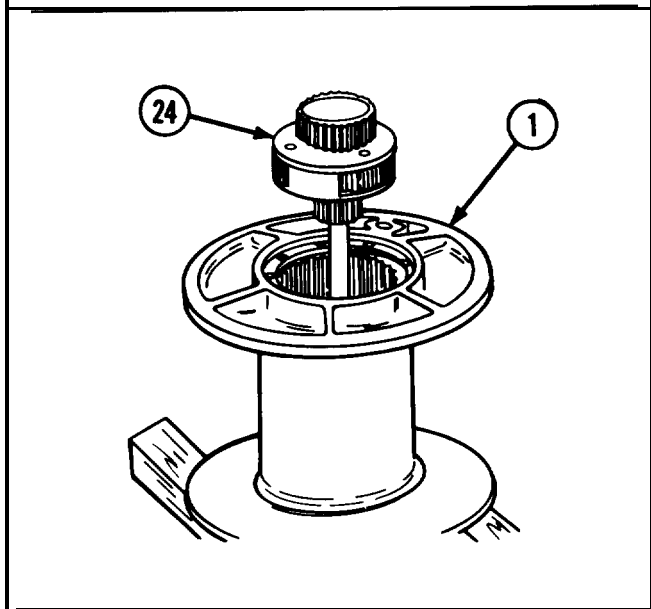
16 Lower stage two boom winch carrier assembly (21) into cable reel (1). Turn stage two boom winch carrier assembly until gear lines up with gears of stage three boom winch carrier assembly (11) inside cable reel and stage two boom carrier assembly drops into place.



17 Install packing retainer (22) and new thrust washer (23) on brake rod of stage one boom winch carrier assembly (24).



18 Lower stage one boom winch carrier assembly (24) into cable reel (1).



- 19 Install new preformed packing (25), winch cylinder control collar (26), and two hexagon plain nuts (27) on brake rod of stage one boom winch carrier assembly (24). Hand-tighten hexagon plain nuts.

WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

NOTE

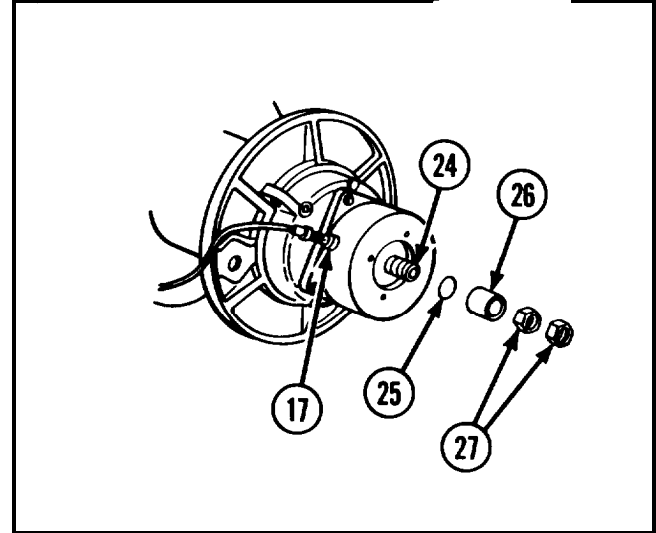
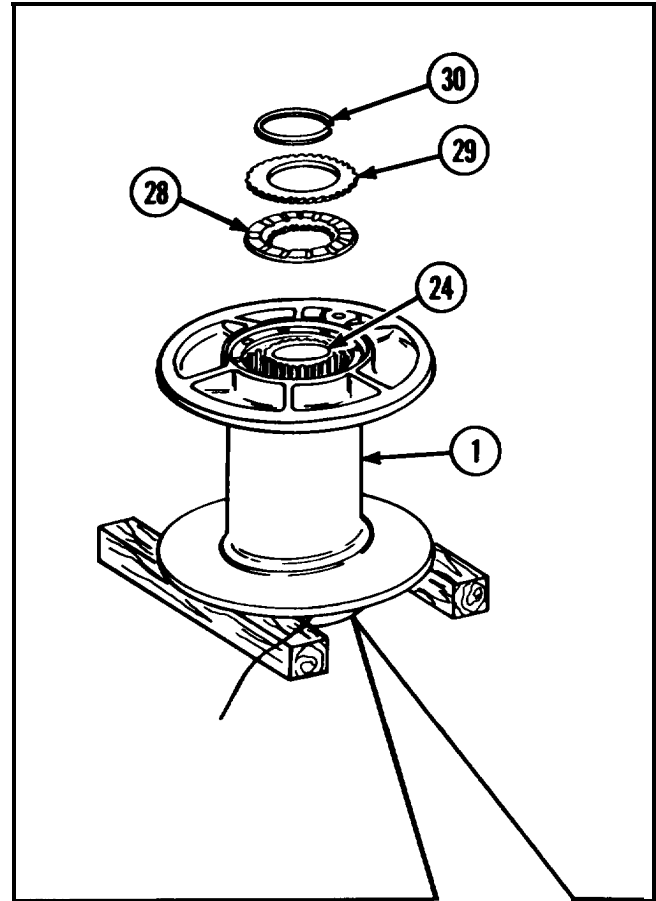
Refer to TM 9-4940-468-14 for step 20 setup procedures.

- 20 Connect hydraulic line to intake port of winch control cylinder (17). Apply 200 psi (1379 kPa) hydraulic pressure to winch control cylinder. Maintain even pressure until motor and housing are assembled to cable reel (1).

CAUTION

Make sure plate (10915157) and plate (10908659) are installed one after another until all fifteen plates are installed.

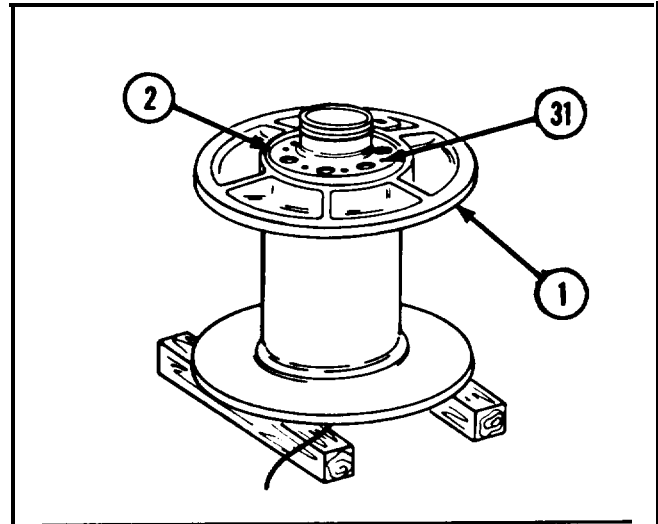
- 21 Install eight new plates (28), seven new plates (29), and new winch housing retaining ring (30) on stage one boom winch carrier assembly (24) inside cable reel (1).



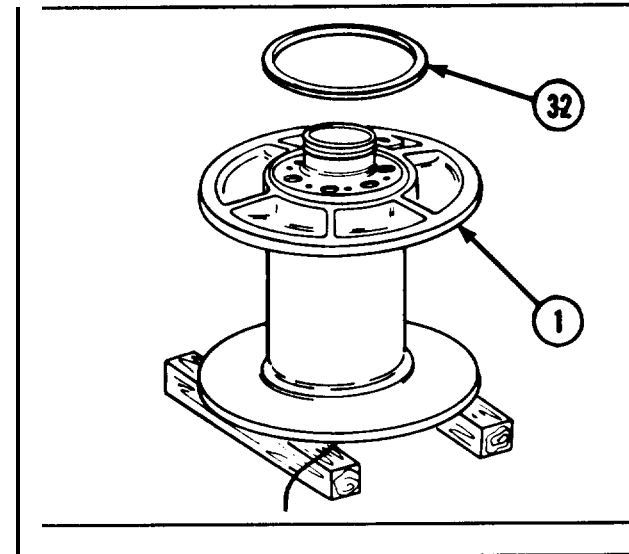
2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

REASSEMBLY (CONT)

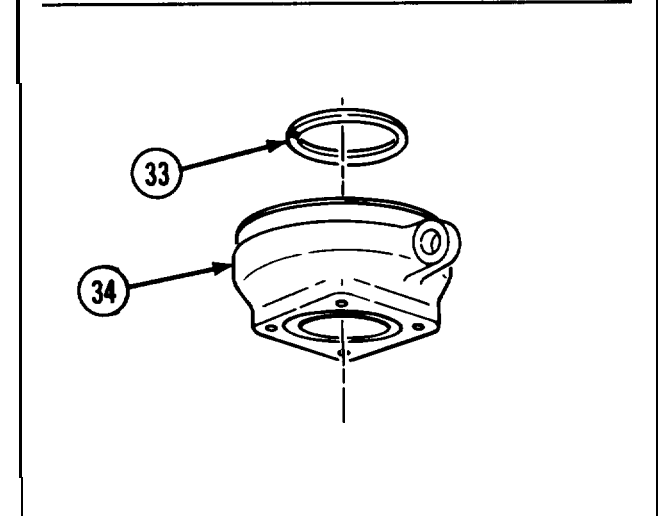
22 Install boom winch bearing housing (2) on cable reel (1) and secure with eight socket head capscrews (31). Torque socket head capscrews to 50 ft-lb (68 N-m).



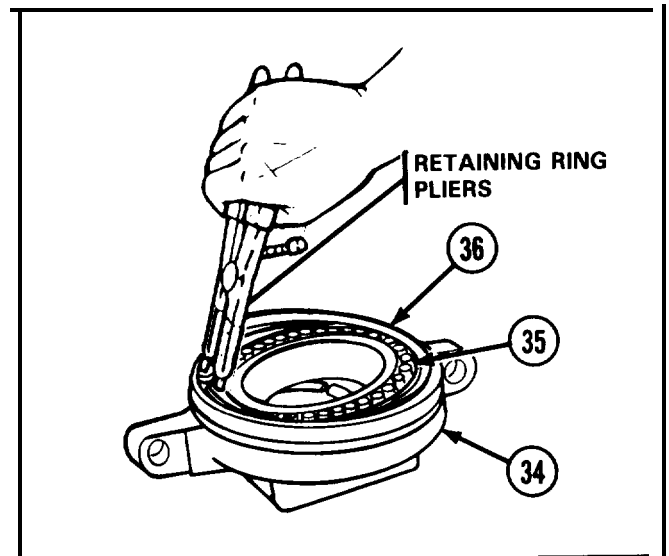
23 Coat mating surfaces of winch drum plain encased seal (32) and cable reel (1) with sealing compound (item 18, appx B), and install winch drum plain encased seal in cable reel.



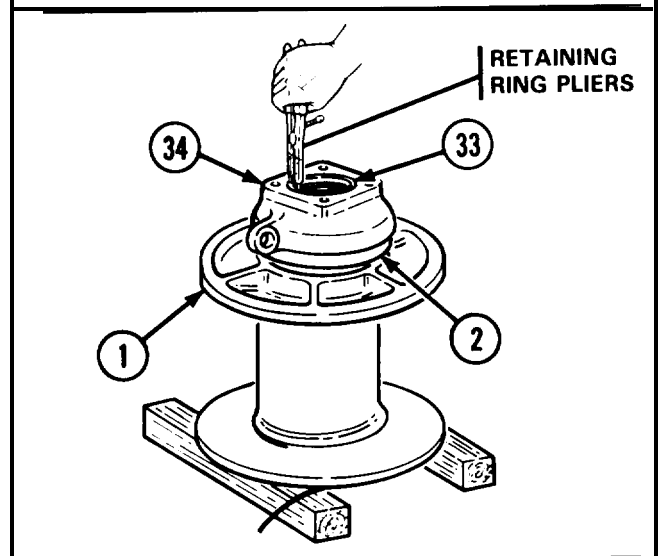
24 Using retaining ring pliers, position retaining ring (33) in bottom of motor end mounting bracket (34).



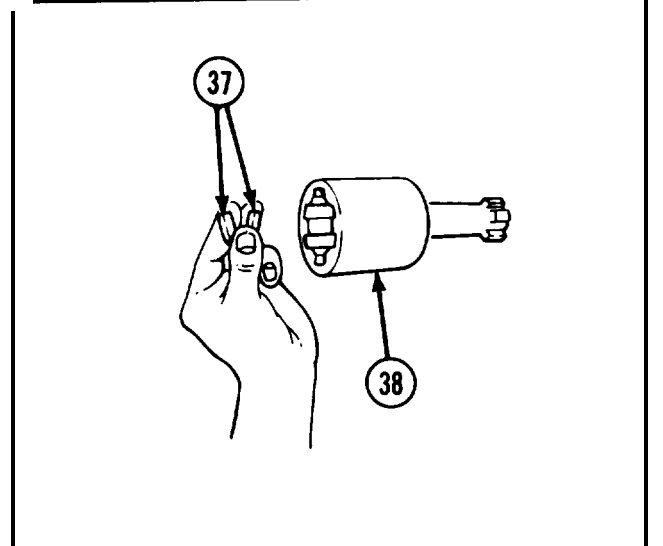
- 25 Install self-aligning roller bearing (35) in motor end mounting bracket (34) and using retaining ring pliers, secure with retaining ring (36).



- 26 Install motor end mounting bracket (34) over boom winch bearing housing (2) on cable reel (1).
- 27 Using retaining ring pliers, secure motor end mounting bracket (34) with retaining ring (33).
- 28 Release hydraulic pressure and remove hydraulic line.



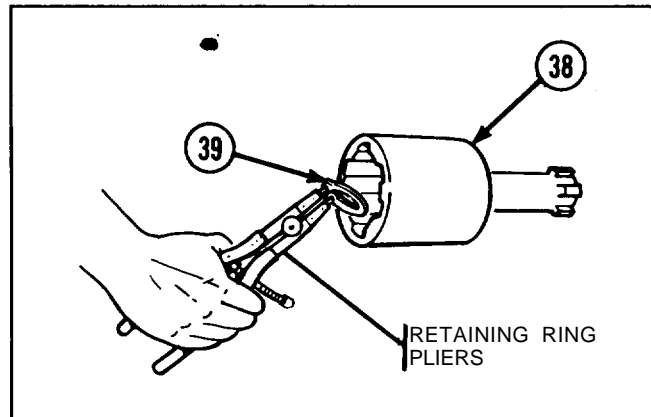
- 29 Install two shift rod coupling spool annular ball bearings (37) in shift rod spool assembly (38).



2-23. MAINTENANCE OF PLANETARY (BOOM) WINCH (CONT).

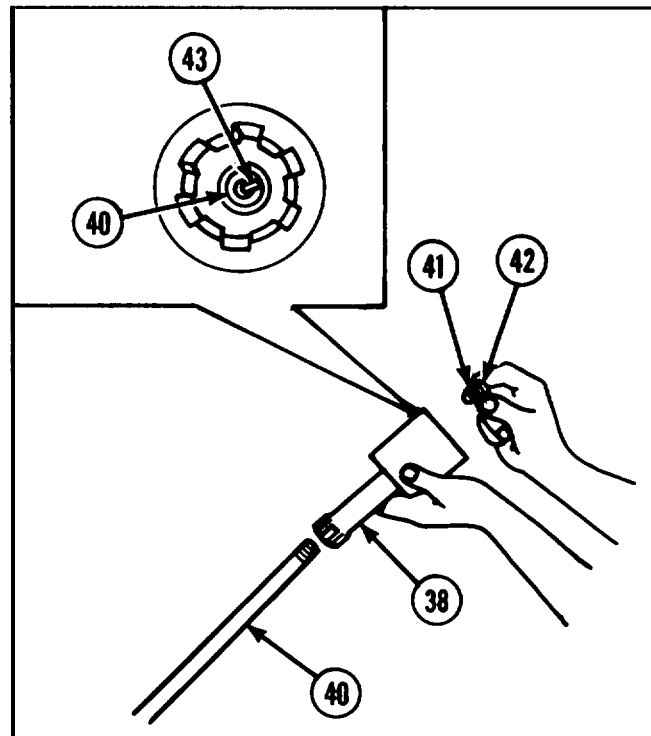
REASSEMBLY (CONT)

30 Using retaining ring pliers, install external retaining ring (39) in shift rod spool assembly (38).

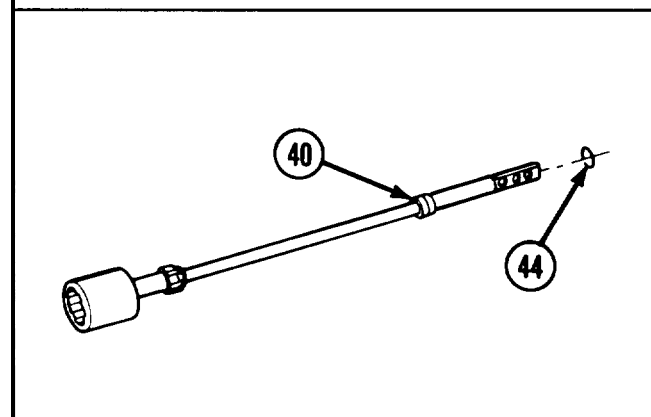


31 Install winch shift rod (40) in shift rod spool assembly (38).

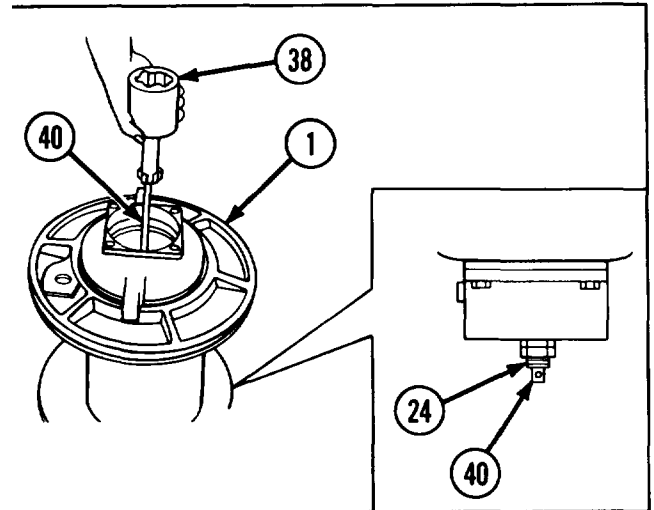
32 Install coupling shift rod thrust washer bearing (41), hexagon slotted plain nut (42), and new cotter pin (43) on winch shift rod (40).



33 Install new preformed packing (44) on winch shift rod (40).



- 34 Install shift rod spool assembly (38) and winch shift rod (40) into cable reel (1) through motor end until winch shift rod comes through brake rod of stage one boom winch carrier assembly (24) at reaction end of cable reel.

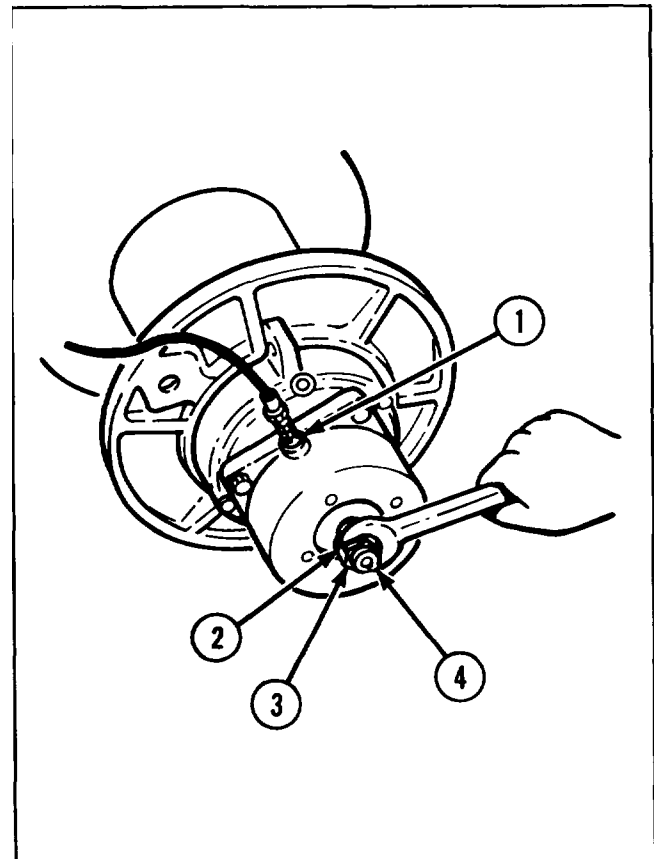


ADJUSTMENT

WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

- 1 Refer to TM 9-4940-468-14 for test setup and testing procedures.
- 2 Connect a hydraulic line to inlet port of winch control cylinder (1).
- 3 Back off two hexagon plain nuts (2 and 3) to end of threads on brake rod of stage one boom winch carrier assembly (4).
- 4 Apply and hold 200 psi (1379 kPa) pressure on winch control cylinder (1).
- 5 Tighten hexagon plain nut (2) until all slack is taken up.
- 6 Tighten hexagon plain nut (2) an additional 1-1/2 turns, and secure hexagon plain nut in place with other hexagon plain nut (3).
- 7 Release hydraulic pressure and remove hydraulic line from winch control cylinder (1).



2-24. MAINTENANCE OF WINCH CONTROL CYLINDER.

This task covers: a. *Disassembly* c. *Reassembly*
 b. *Inspection/Repair* d. *Test*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC5180-90-CL-N26)
 Lockout cylinder locknut wrench (10904219)

2-42 Winch control cylinder removed from planetary winch
 2-111 Winch control cylinder removed from vehicle tow drum winch

Materials/Parts

Hydraulic winch control cylinder parts kit (5702983)

General Safety Instructions



Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

References

TM 9-2350-238-20-2
 TM 9-2350-238-24P-2
 TM 9-4940-468-14

Equipment Conditions

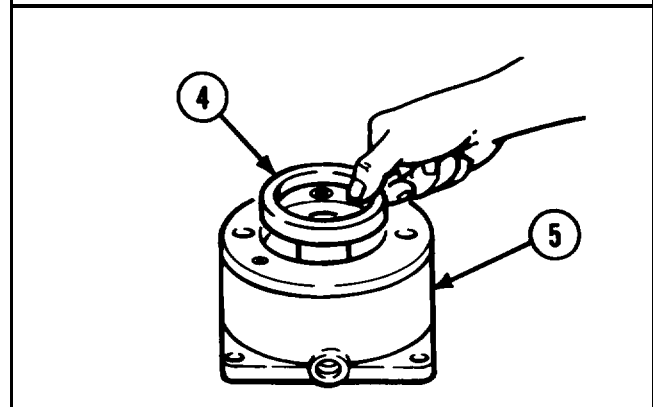
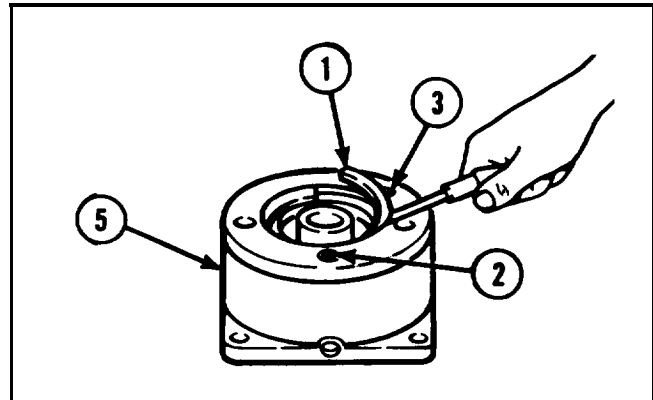
Hydraulic oil drained (TM 9-2350 - 238-10)

DISASSEMBLY

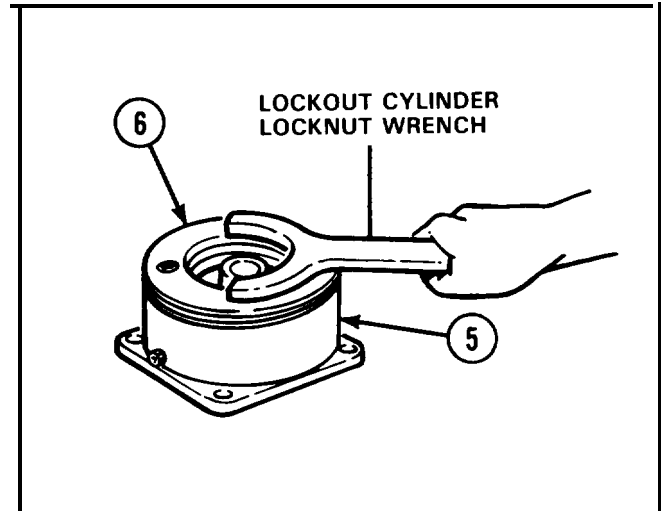
NOTE

- There are two winch control cylinders in the M578 vehicle. Maintenance can be performed on either winch control cylinder without removing both cylinders.
- Maintenance procedures are written for one winch control cylinder, but apply to both.

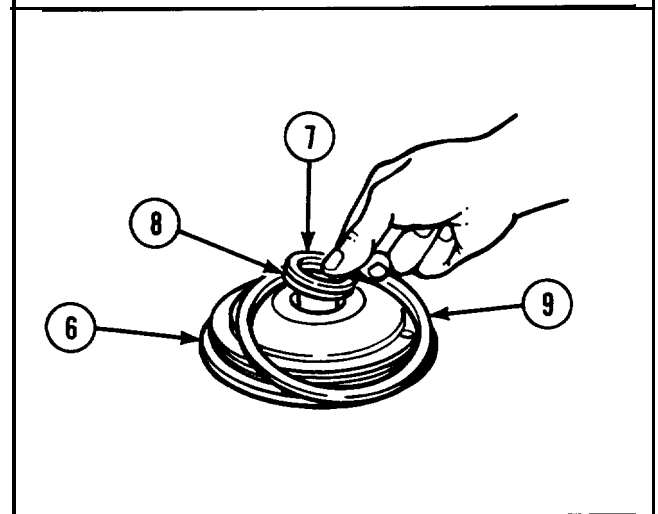
1 Remove internal retaining ring (1), head breather machine thread plug (2), set-screw (3), and plate positioner spacer (4) from cylinder (5).



- 2 Using lockout cylinder locknut wrench, remove cylinder head 6) from cylinder (5).

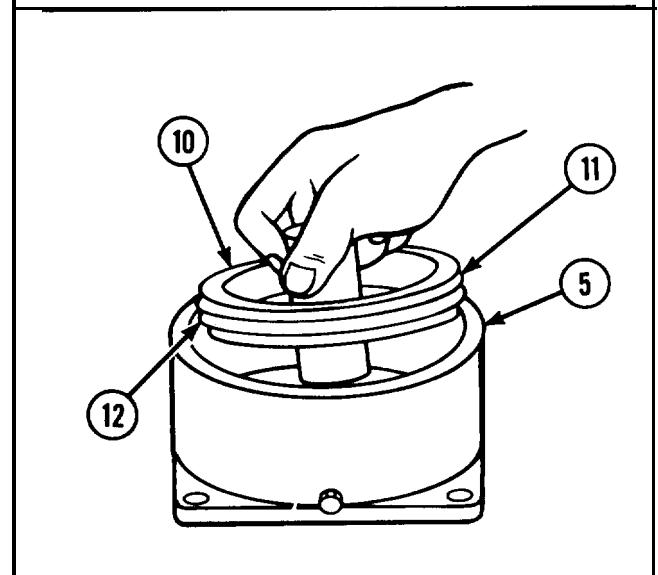


- 3 Remove preformed packing (7), packing retainer (8), and preformed packing (9) from cylinder head (6).



- 4 Remove piston (10) from cylinder (5).

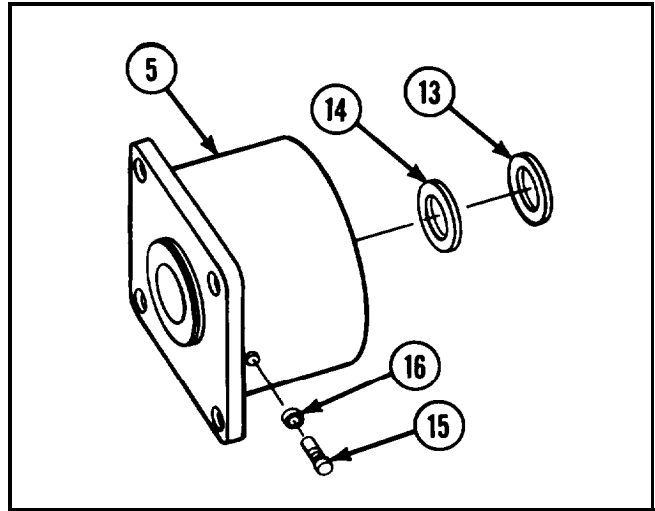
- 5 Remove preformed packing (11) and gasket (12) from piston (10).



2-24. MAINTENANCE OF WINCH CONTROL CYLINDER (CONT).

DISASSEMBLY (CONT)

- 6 Remove preformed packing (13), packing retainer (14), machine thread plug (15), and preformed packing (16) from cylinder (5).

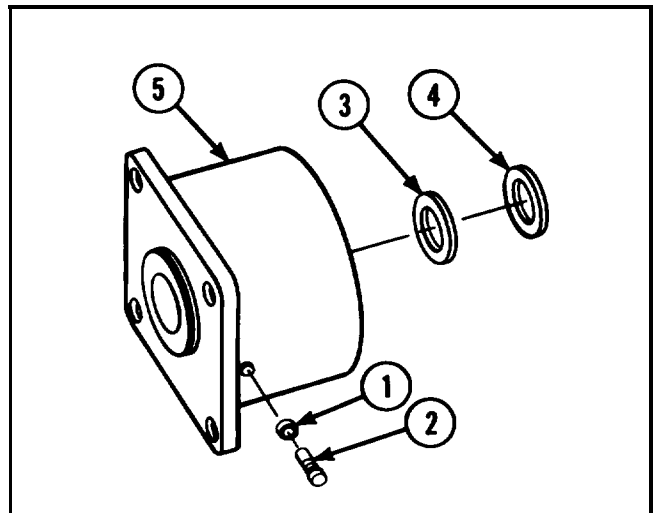


INSPECTION/REPAIR

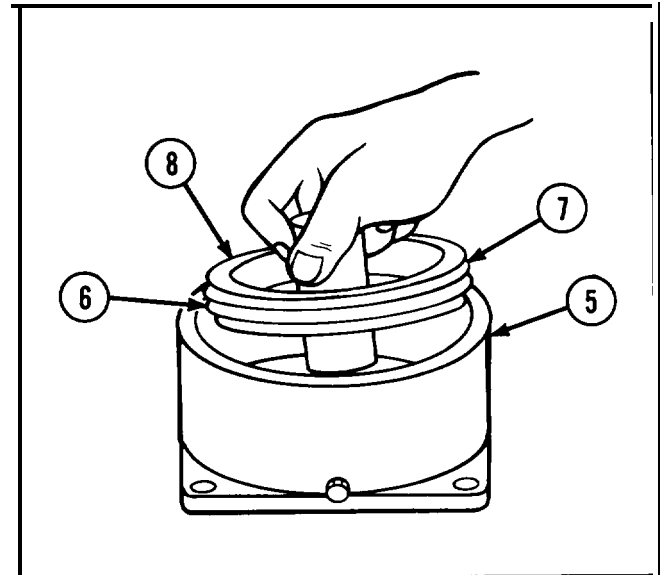
- 1 Inspect for broken, damaged, or missing parts.
- 2 If any kit component is damaged, replace entire repair kit.
- 3 If cylinder is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If cylinder head is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 If piston is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 6 If plate positioner spacer is broken, damaged or missing, repair is by replacement of next higher assembly.
- 7 Repair is by replacement of authorized parts (TM9-2350-238-24P-2).

REASSEMBLY

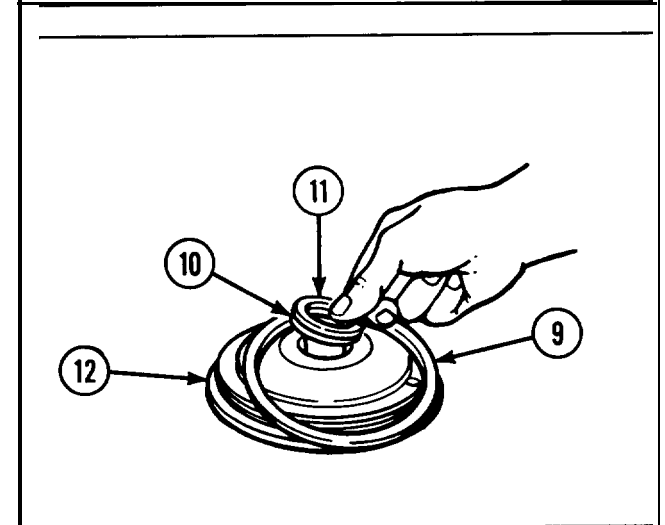
- 1 Install new preformed packing (1), machine thread plug (2), new packing retainer (3), and new preformed packing (4) on cylinder (5).



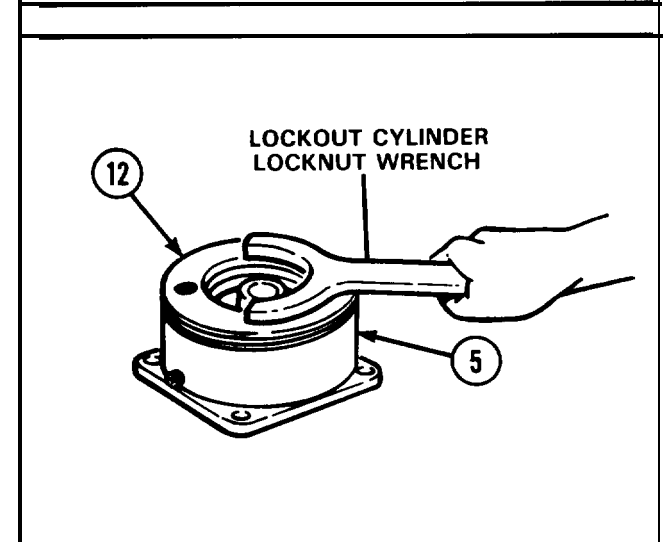
- 2 Install new gasket (6) and new preformed packing (7) on piston (8).
- 3 Install piston (8) in cylinder (5).



- 4 Install new preformed packing (9), new packing retainer (10), and new preformed packing (11) on cylinder head (12).



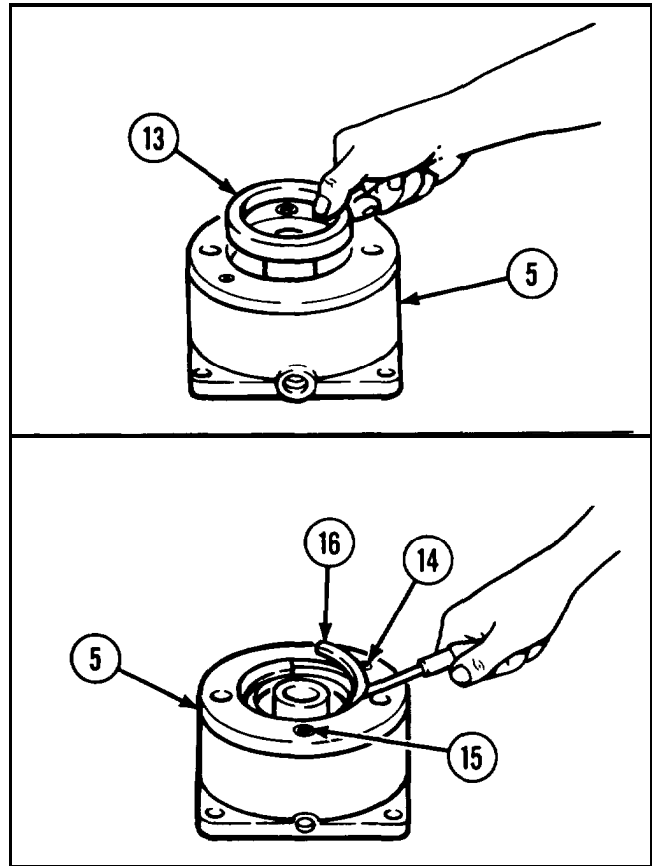
- 5 Install cylinder head (12) on cylinder (5). Tighten securely using lockout cylinder locknut wrench.



2-24. MAINTENANCE OF WINCH CONTROL CYLINDER (CONT).

REASSEMBLY (CONT)

- 6 Install plate positioner spacer (13), setscrew (14), head breather machine thread plug (15), and internal retaining ring (16) on cylinder (5).



test

WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2), Wipe up spilled hydraulic fluid.

- 1 Refer to TM 9-4940-468-14 for test setup and testing procedures.
- 2 Connect hydraulic line to inlet port of cylinder.
- 3 Apply 3000 psi (20,685 kPa) pressure and hold for 5 minutes. If leakage occurs, replace winch control cylinder.
- 4 Release pressure. Remove hydraulic line and cover inlet port.

2-25. MAINTENANCE OF STAGE ONE BOOM WINCH CARRIER ASSEMBLY.

This task covers: a. *Disassembly* b. *Inspection/Repair* c. *Reassembly*

INITIAL SETUP

Tools and Special Tools

- General mechanic's tool kit, automotive (SC5180-90-CL-N26)
- Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
- Drill, twist, no. 3
- Drill press
- Grinder
- Tap and die set
- Shop equipment, sets, kits, outfits, and tools: welding shop, trailer mounted (SC 3431-95-A04)
- Apron, welder's
- Electrode, welding
- Gloves, welder's
- Helmet, welder's
- Holder, electrode
- Welding machine, arc

Materials/Parts

- Lockwire (QQW461)

References

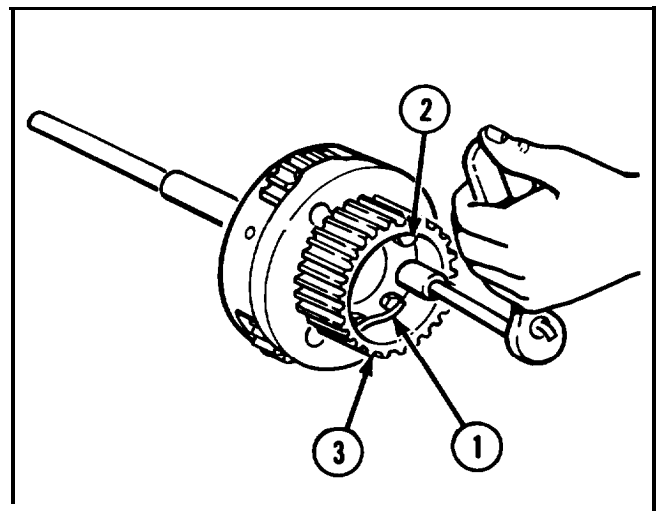
- MIL-STD1261C(MR)
- TM 9-2350-238-24P-2

Equipment Conditions

- 2-42 Stage one boom winch carrier assembly removed

DISASSEMBLY

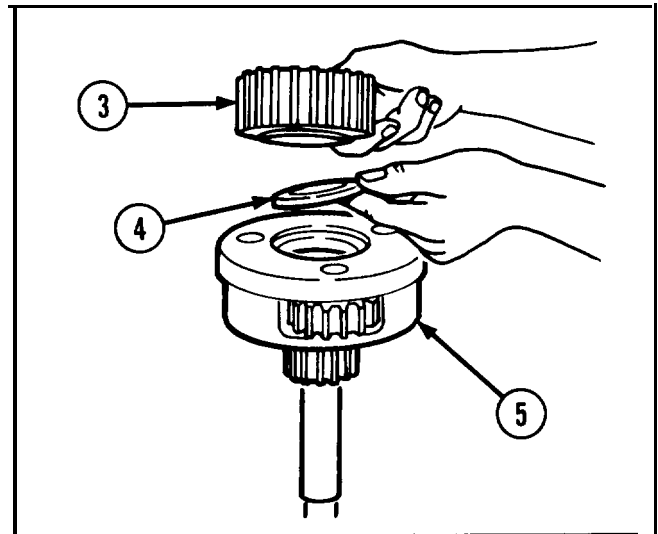
- 1 Remove and discard lockwire (1) and remove eight machine bolts (2) from carrier brake ring (3).



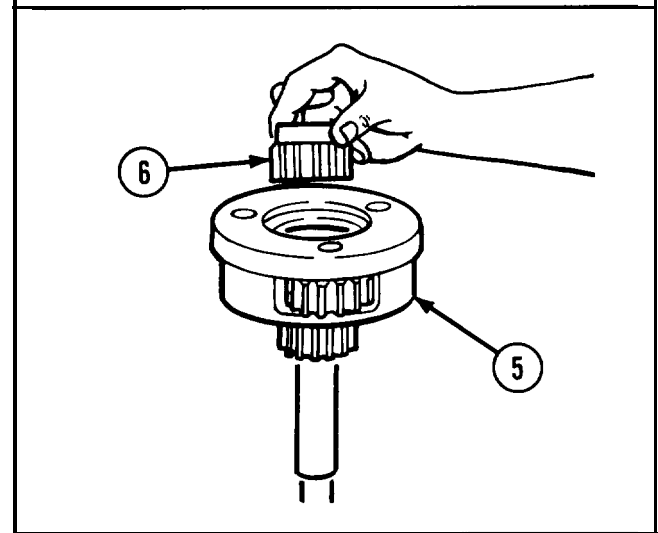
2-25. MAINTENANCE OF STAGE ONE BOOM WINCH CARRIER ASSEMBLY (CONT).

DISASSEMBLY (CONT)

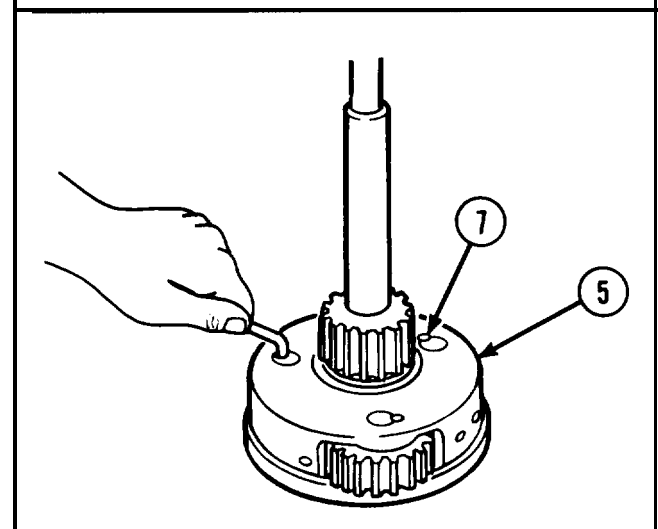
2 Remove carrier brake ring (3) and sun gear shift rod lock flat washer (4) from carrier (5).



3 Remove spur gear (6) from carrier (5).



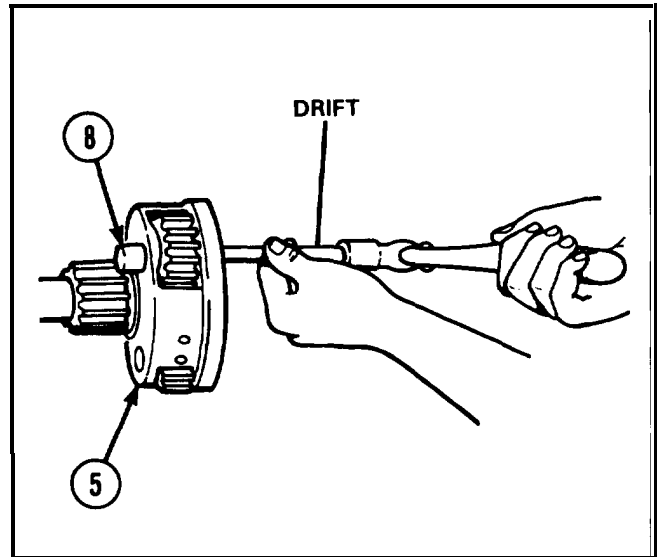
4 Remove three setscrews (7) from carrier (5).



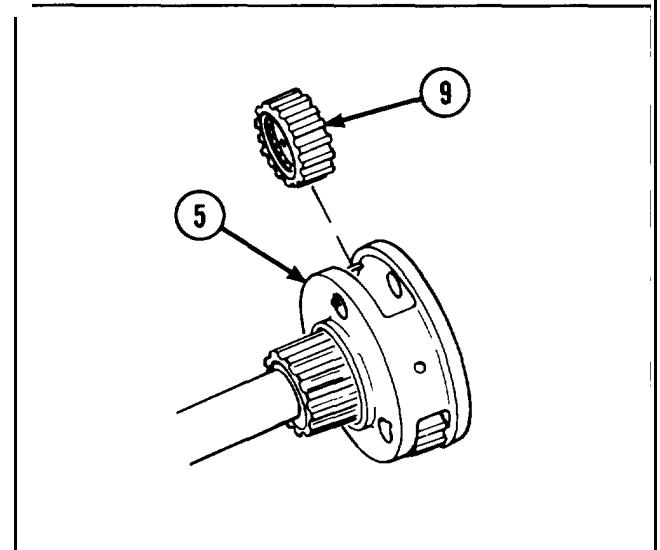
CAUTION

Mark each of three planet gear headless straight pins and their location in carrier so that planet gear headless straight pins can be put in same holes during reassembly.

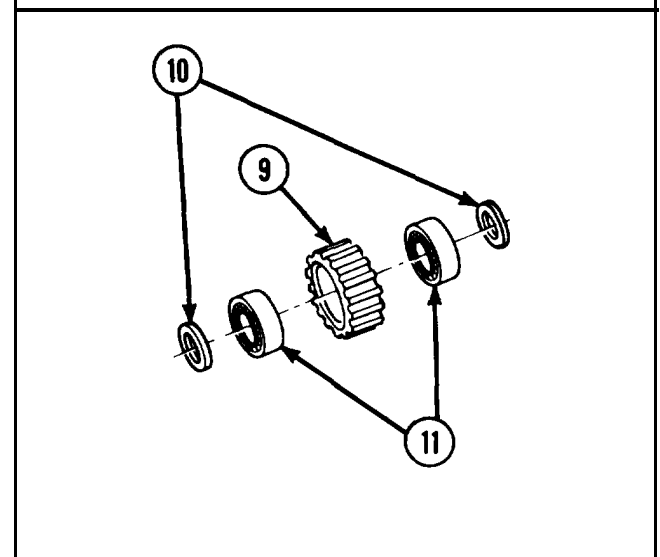
- Using drift, remove three planet gear headless straight pins (8) from carrier (5).



- Remove three spur gears (9) from carrier (5).



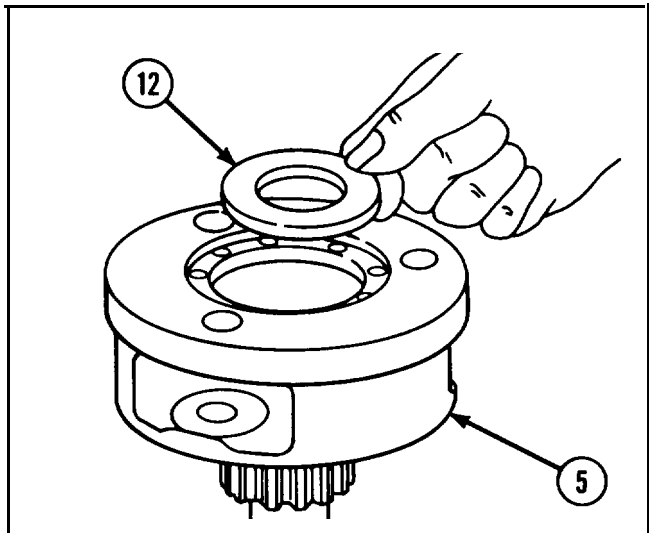
- Remove two planet gear flat washers (10) and two planet gear annular ball bearings (11) from each of three spur gears (9).



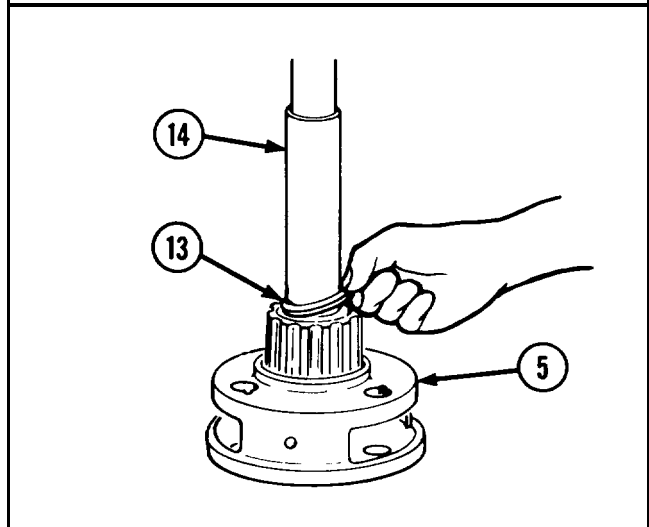
2-25. MAINTENANCE OF STAGE ONE BOOM WINCH CARRIER ASSEMBLY (CONT).

DISASSEMBLY (CONT)

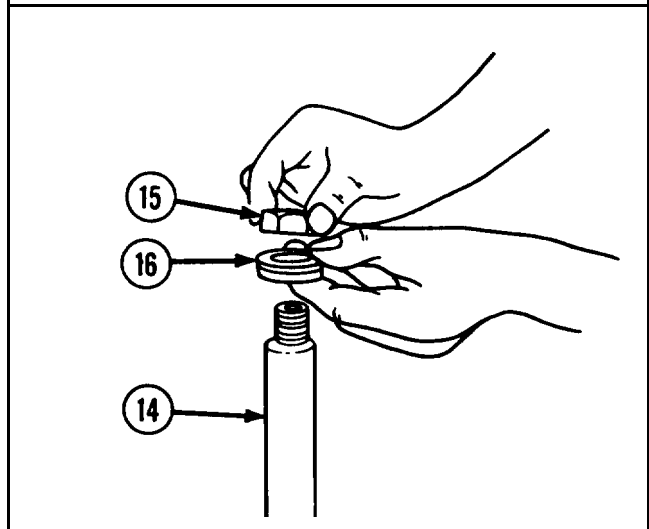
- 8 Remove sun gear shift rod lock flat washer (12) from carrier (5).



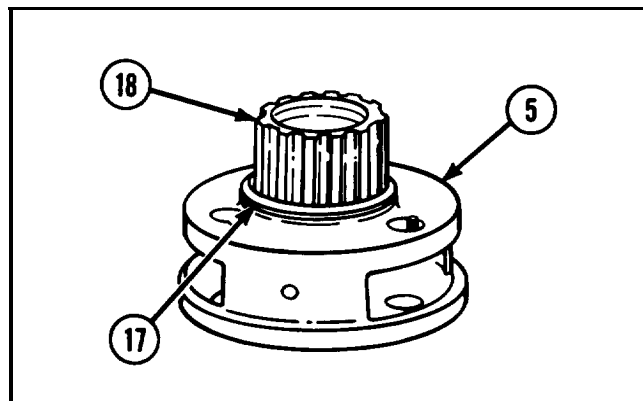
- 9 Remove sun gear bearing retaining ring (13) and brake rod (14) from carrier (5).



- 10 Remove sun gear shift rod lock hexagon plain nut (15) and thrust ball bearing (16) from brake rod (14).



- 11 If necessary, grind welds securing retaining stop ring (17) and remove spur gear (18) and retaining stop ring from carrier (5).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If carrier is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

NOTE

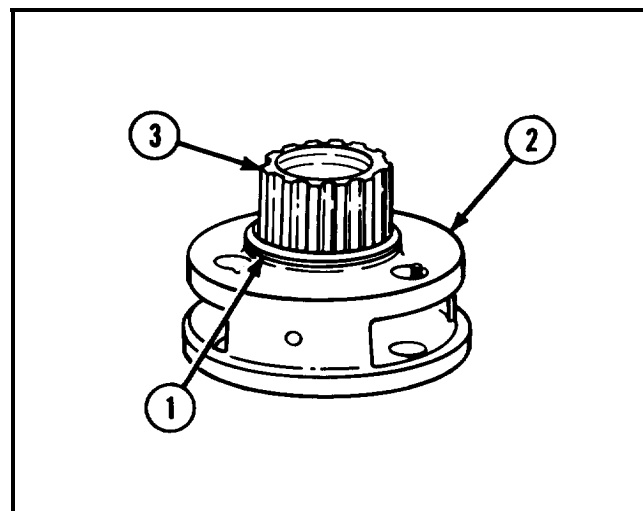
If retaining stop ring and spur gear were removed, new welds are necessary during reassembly.

- 1 If removed, install new retaining stop ring (1) to carrier (2). Do not weld to spur gear (3).
- 2 Insert spur gear (3) into carrier (2), seating retaining stop ring (1) firmly against carrier.

CAUTION

Weld retaining stop ring to carrier. Do not weld to spur gear.

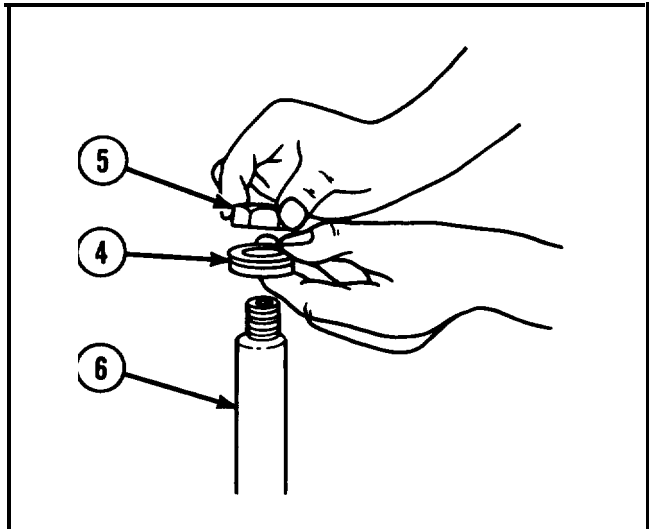
- 3 Weld retaining stop ring (1) to carrier (2) with 0.12-in. (0.30-cm) fillet welds. Weld three 1.00-in. (2.54-cm) spots placed an equal distance apart around circle of retaining stop ring (1). Weld per MIL-STD-1261C(MR).



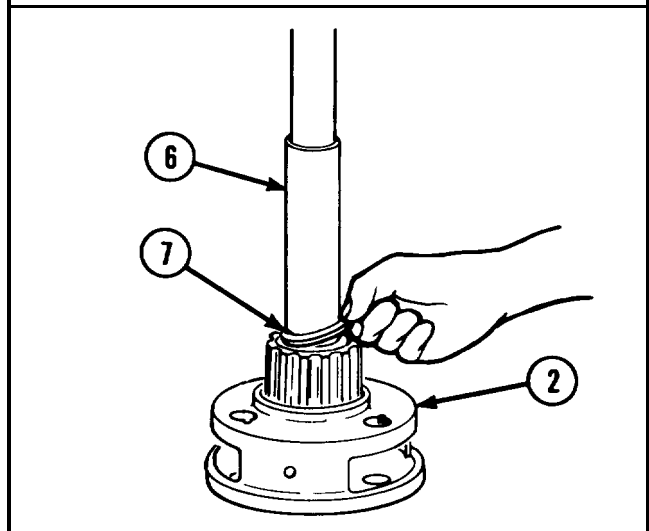
2-25. MAINTENANCE OF STAGE ONE BOOM WINCH CARRIER ASSEMBLY (CONT).

REASSEMBLY (CONT)

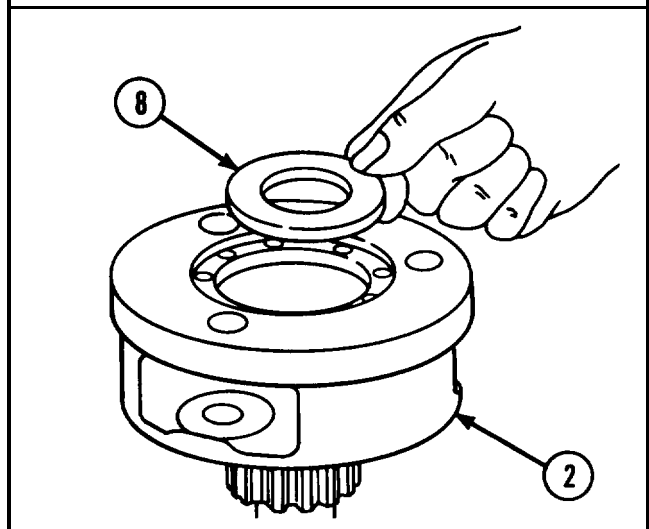
4 Install thrust ball bearing (4) and sun gear shift rod lock hexagon plain nut (5) on brake rod (6). Stake sun gear shift rod lock hexagon plain nut.



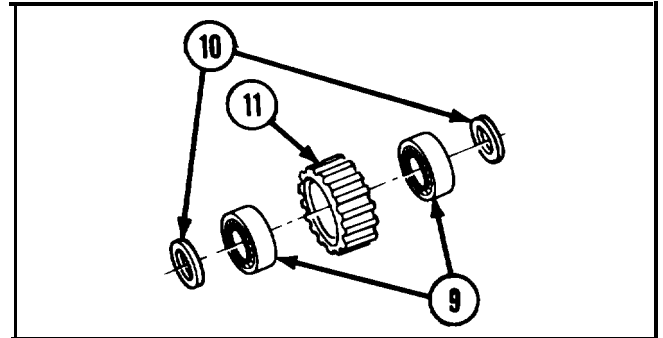
5 Install brake rod (6) in carrier (2) and secure with sun gear bearing retaining ring (7).



6 Install sun gear shift rod lock flat washer (8) in carrier (2).



- 7 Install two planet gear annular ball bearings (9) and two planet gear flat washers (10) in each of three spur gears (11).



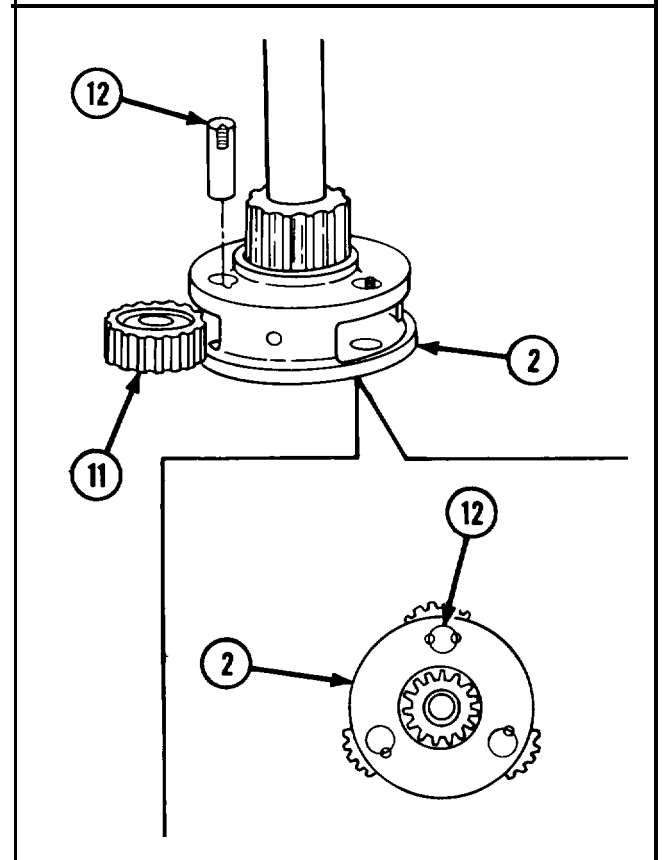
CAUTION

Make sure each planet gear headless straight pin is installed in the same hole from which it was removed during disassembly.

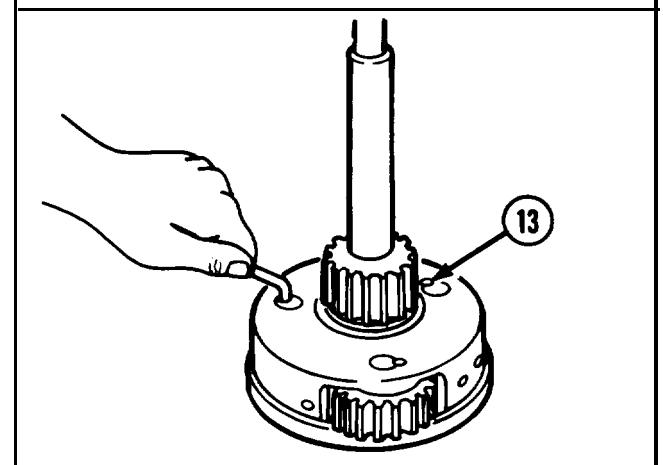
- 8 Install three spur gears (11), with two planet gear annular ball bearings (9) and two planet gear flat washers (10) each, in carrier (2) and secure in place with three planet gear headless straight pins (12).

NOTE

- If a new carrier is used, drill and tap a 0.250-in. (0.635-cm), 28 UNF-2B hole, 0.375 in. (0.953 cm) deep between each gear headless straight pin and carrier.
- If only new gear headless straight pins are used, drill and tap a new hole between each new gear headless straight pin and carrier. Drill new holes approximately 180 degrees from old holes.



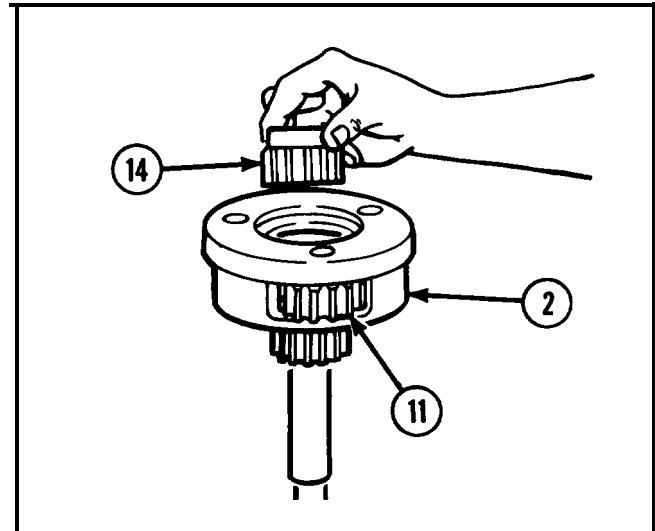
- 9 Install three setscrews (13). Tighten and stake each setscrew.



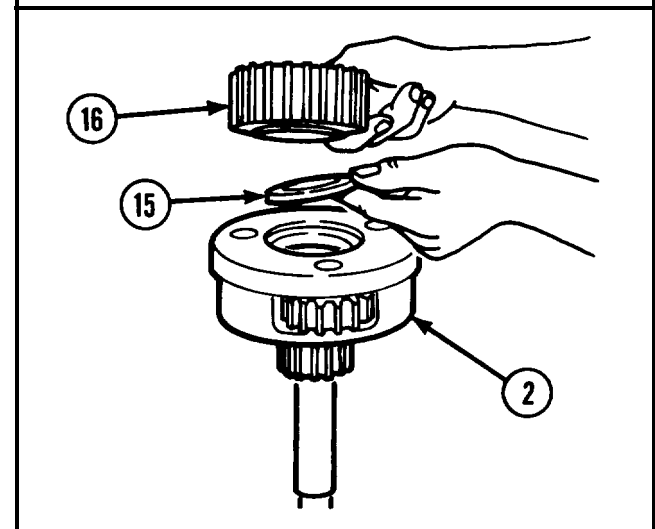
2-25. MAINTENANCE OF STAGE ONE BOOM WINCH CARRIER ASSEMBLY (CONT).

REASSEMBLY (CONT)

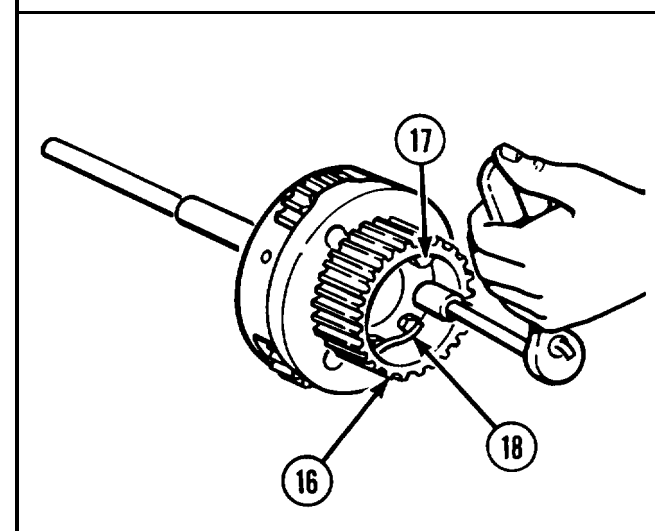
- 10 Install spur gear (14) in carrier (2). Mesh teeth of spur gear with teeth of three spur gears (11) inside carrier.



- 11 Install sun gear shift rod lock flat washer (15) and carrier brake ring (16) in carrier (2).



- 12 Install eight machine bolts (17). Tighten machine bolts and install new lockwire (18) to carrier brake ring (16).



2-26. MAINTENANCE OF STAGE TWO BOOM WINCH CARRIER ASSEMBLY.

This task covers: a. *Disassembly* b. *Inspection/Repair* c. *Reassembly*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC5180-90-CL-N26)
 Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
 Drill press
 Drill, twist, no. 3
 Grinder
 Press, arbor
 Tap and die set
 Shop equipment sets, kits, outfits, and tools: welding shop, trailer mounted (SC 3431-95-A04)
 Apron, welder's

Electrode, welding
 Gloves, welder's
 Helmet, welder's
 Holder, electrode
 Welding machine, arc

Materials/Parts

Hydraulic parts kit (5702992)

References

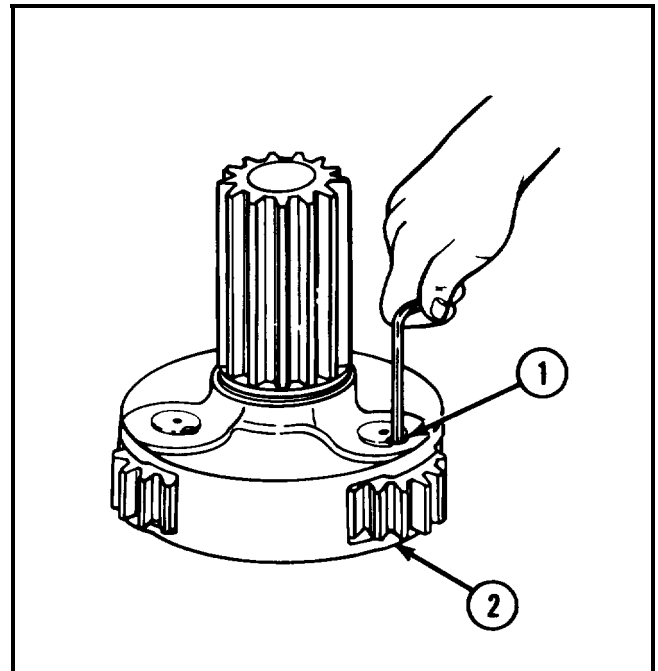
MIL-STD-1261C (MR)
 TM 9-2350-238-24P-2

Equipment Conditions

2-42 Stage two boom winch carrier assembly removed

DISASSEMBLY

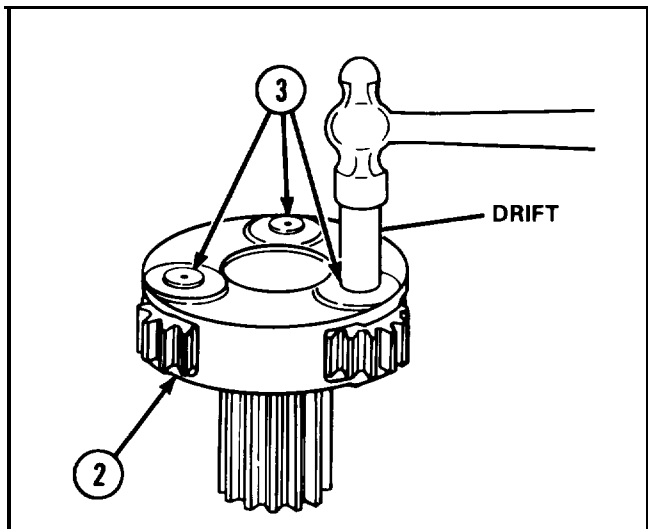
- 1 Remove three setscrews (1) from carrier (2).



2-26. MAINTENANCE OF STAGE TWO BOOM WINCH CARRIER ASSEMBLY (CONT).

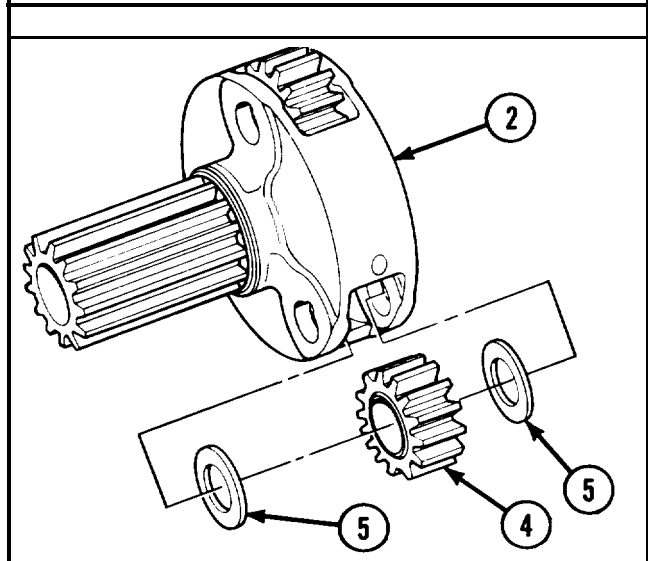
DISSASSEMBLY (CONT)

2 Using hammer and drift, remove three planet gear pins (3) from carrier (2).

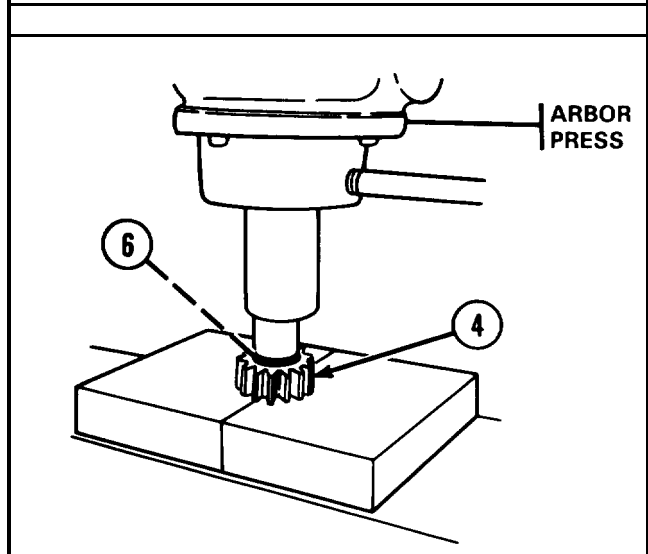


3 Remove three spur gears (4) from carrier (2).

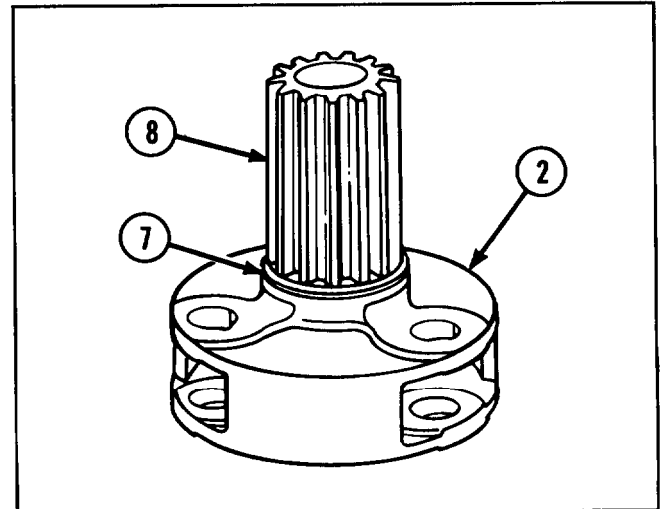
4 Remove two pinion gear flat washers (5) from each of three spur gears (4).



5 Using arbor press, remove one roller bearing (6) from each of three spur gears (4).



- 6 If necessary, grind welds securing retaining stop ring (7) to carrier (2), and remove spur gear (8) and retaining stop ring.



- 1 Inspect for broken, damaged, or missing parts.
- 2 If carrier is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If any kit component is damaged, replace entire hydraulic parts kit.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

NOTE

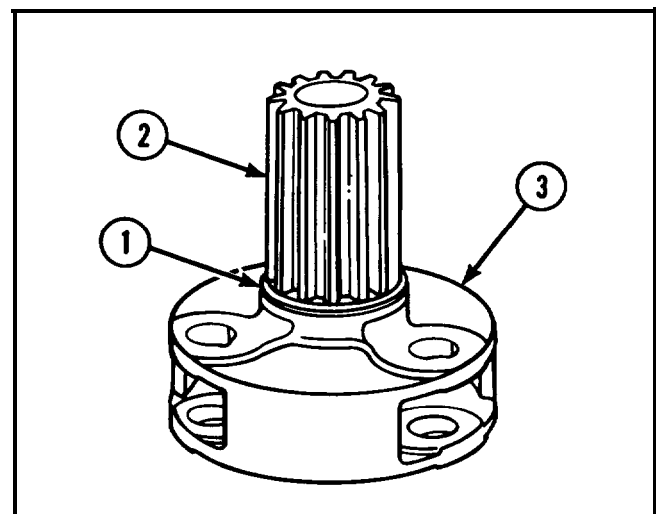
If retaining stop ring and spur gear were removed, new welds are necessary during reassembly.

- 1 If removed, install new retaining stop ring (1) in groove in spur gear (2).
- 2 Insert spur gear (2) into carrier (3), seating retaining stop ring (1) firmly against carrier.

CAUTION

Weld retaining stop ring to carrier.
Do not weld to spur gear.

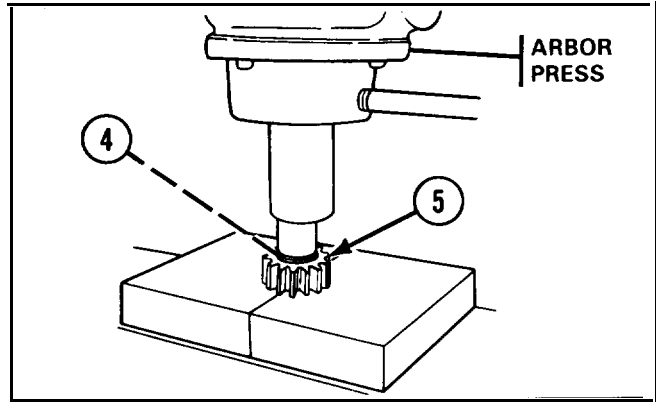
- 3 Weld retaining stop ring (1) to carrier (3) with 0.12-in. (0.30-cm) fillet welds. Weld three 1.00-in. (2.54-cm) spots placed an equal distance apart around circle of retaining stop ring (1). Weld per MIL-STD-1261C (MR).



2-26. MAINTENANCE OF STAGE TWO BOOM WINCH CARRIER ASSEMBLY (CONT).

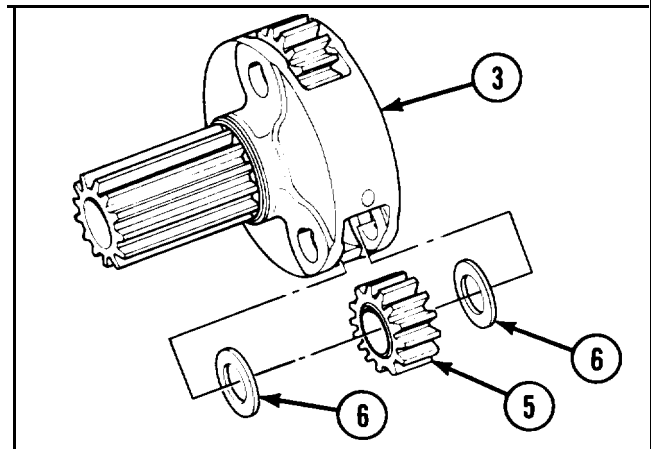
REASSEMBLY (COIVT)

4 Using arbor press, install new roller bearing (4) in each of three spur gears (5).



5 Install two pinion gear flat washers (6) on each of three spur gears (5).

6 Install three spur gears (5), with two pinion gear flat washers (6) each, in carrier (3).



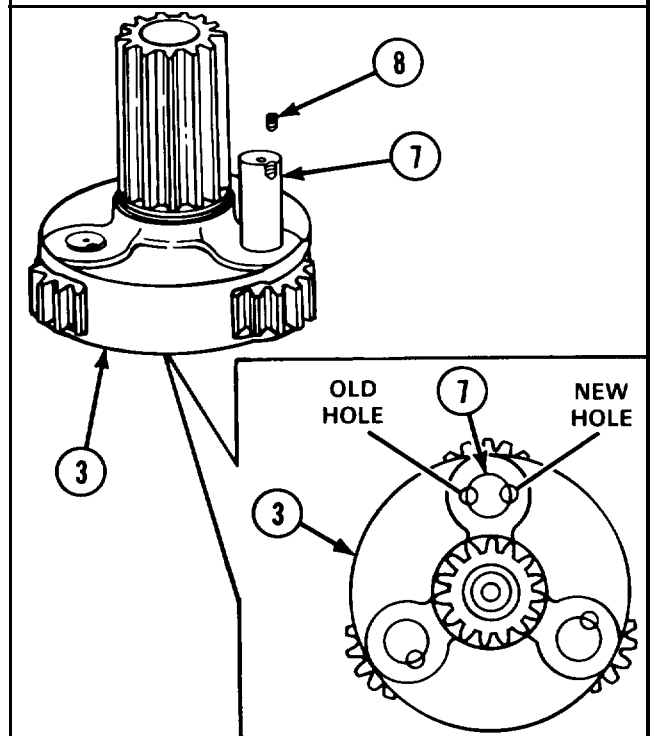
7 Install three new planet gear pins (7) in carrier (3).

NOTE

. If a new carrier is used, drill and tap a 0.250-in. (0.635-cm), 28 UNF-2B hole 0.375 in. (0.953 cm) deep between each planet gear pin and carrier.

● If only new pins are used, drill and tap a new hole between each new planet gear pin and carrier. Drill new holes approximately 180 degrees from old holes.

8 Install three new setscrews (8) in tapped holes. Tighten and stake each new setscrew.



2-27. MAINTENANCE OF STAGE THREE BOOM WINCH CARRIER ASSEMBLY.This task covers: a. *Disassembly*b. *Inspection/Repair*c. *Reassembly***INITIAL SETUP***Tools and Special Tools*General mechanic's tool kit, automotive
(SC 5180-90-CL-N26)Shop equipment, automotive
maintenance and repair: field
maintenance, basic, less power (SC
4910-95-A31)

Drill press

Drill, twist, no. 3

Grinder

Press, arbor

Tap and die set

Materials/Parts

Grease (item 9, appx B)

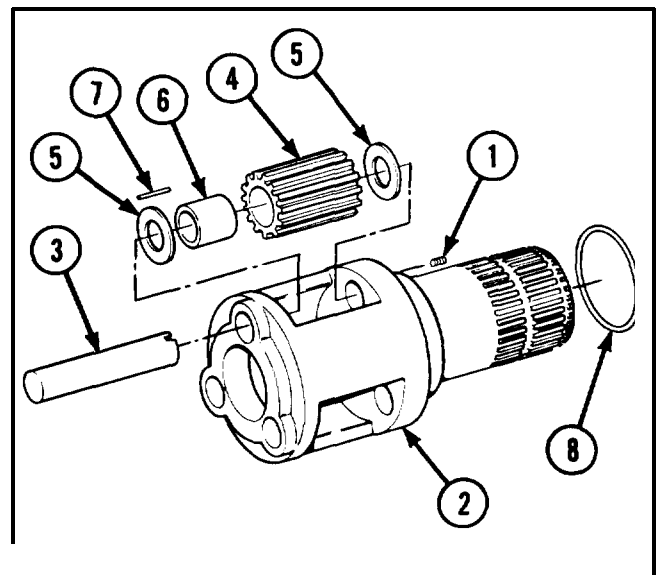
Carrier assembly parts kit (5704875)

References

TM 9-2350-238-24P-2

*Equipment Conditions*2-42 Stage three boom winch carrier
assembly removed*General Safety Instructions***WARNING**Clutch release carrier contains
spring under high tension. Use
caution during removal and
installation.**DISASSEMBLY**

- 1 Remove three setscrews (1) from clutch release carrier (2).
- 2 Using drift, remove three planet gear pins (3) from clutch release carrier (2).
- 3 Remove three spur gears (4) from clutch release carrier (2).
- 4 Remove two flat washers (5), one bearing sleeve spacer (6), and 68 roller bearings (7) from each of three spur gears (4).
- 5 Remove preformed packing (8) from reaction shaft of clutch release carrier (2).



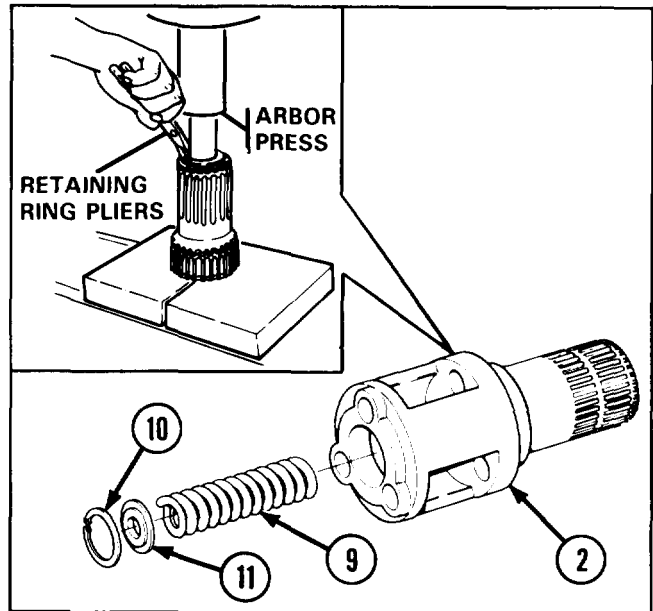
2-27. MAINTENANCE OF STAGE THREE BOOM WINCH CARRIER ASSEMBLY {CONT.}

DISASSEMBLY (CONT)

WARNING

Clutch release carrier contains spring under high tension. Use caution during removal.

- 6 Using arbor press, compress helical compression spring (9) inside body of clutch release carrier (2) and using retaining ring pliers, remove retaining ring (10). Slowly release pressure on body of clutch release carrier.
- 7 Remove spring stop (11) and helical compression spring (9) from reaction shaft of clutch release carrier (2).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts
- 2 If clutch release carrier is broken, damaged, or missing, repair is by replacement of next higher assembly,
- 3 If any kit component is damaged, replace entire carrier assembly parts kit.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

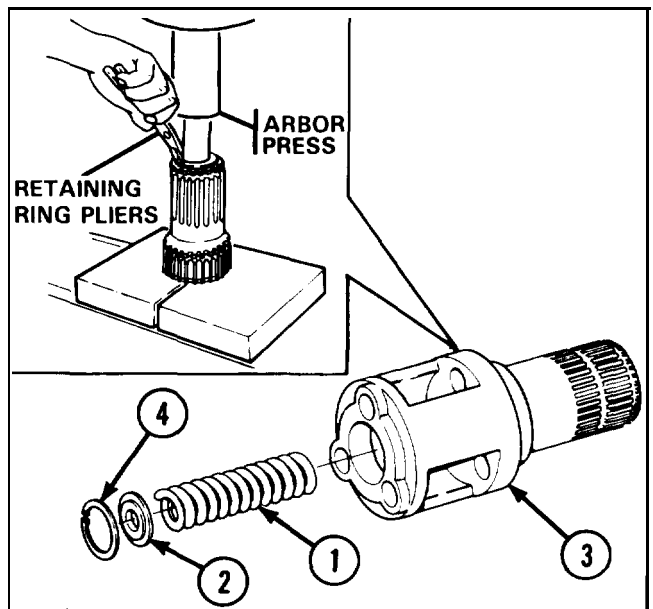
REASSEMBLY

- 1 Install helical compression spring (1) and spring stop (2) in body of clutch release carrier (3).

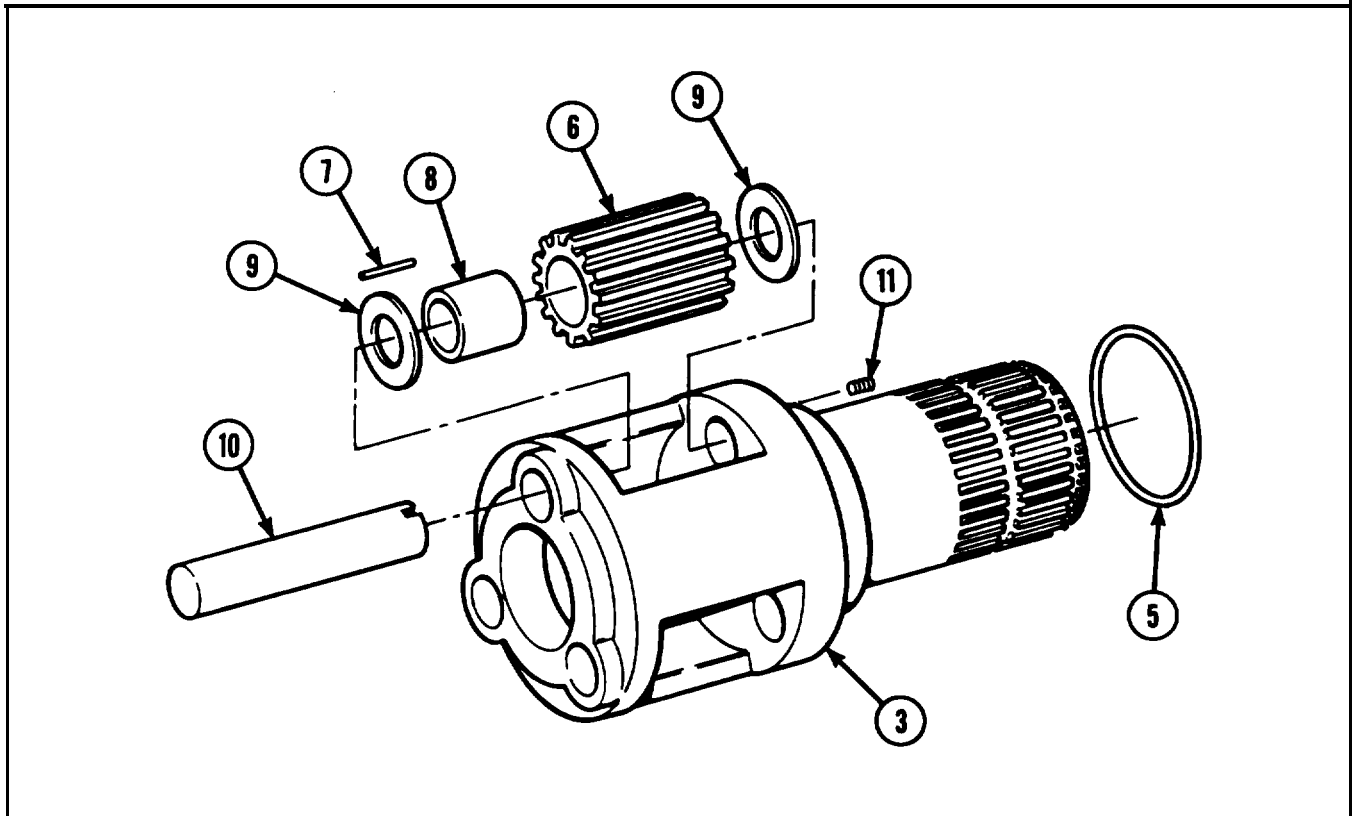
WARNING

Clutch release carrier contains spring under high tension. Use caution during installation.

- 2 Using arbor press, compress helical compression spring (1) and spring stop (2) inside body of clutch release carrier (3).
- 3 Using retaining ring pliers, install new retaining ring (4) on body of clutch release carrier (3). Slowly release pressure and remove clutch release carrier from arbor press.



2-27. MAINTENANCE OF STAGE THREE BOOM WINCH CARRIER ASSEMBLY (CONT).



- 4 Install new preformed packing (5) to reaction shaft of clutch release carrier (3).
- 5 Coat bores of three spur gears (6) with grease (item 9, appx B).
- 6 Install three rows of 68 new roller bearings (7), separated by one new sleeve spacer (8), into each bore of three spur gears (6).
- 7 Install two flat washers (9) over each end of three spur gears (6).
- 8 Hold each of three spur gears (6) in place in clutch release carrier (3), and secure spur gears with three new planet gear pins (10).

NOTE

If a new clutch release carrier is used, drill and tap a 0.250-in. (0.635-cm), 28 UNF-2B hole 0.375 in. (0.953 cm) deep between each planet gear pin and clutch release carrier.

If only new planet gear pins are used, drill and tap a new hole between each new planet gear pin and clutch release carrier. Drill new holes approximately 180 degrees from old holes.

- 9 Install three new setscrews (11). Tighten and stake each new setscrew.

2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY.

This task covers:

| | |
|-----------------------------|-------------------------------|
| a. <i>Removal</i> | e. <i>Test</i> |
| b. <i>Disassembly</i> | f. <i>Installation</i> |
| c. <i>Inspection/Repair</i> | g. <i>Boom Drop Rate Test</i> |
| d. <i>Reassembly</i> | |

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC 5180-90-CL-N26)
Lumber, 4x4
Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 491-95-A31)
Press, arbor
Shop equipment, automotive maintenance and repair: supplemental no. 1, less power (SC 4910-95-A62)
Hoist, chain, 6000 lb (2724 kg)
Sling (RE1-91-1618)
Spanner wrench (10909066)
Strap wrench (GGG-W-651)
Thermometer (1797)

Materials/Parts

Boom cylinder parts kit (5702996)
Boom winch control cylinder barrel identification plate (10891588)
Grease (item 9, appx B)
Hydraulic fluid (item 10, appx B)
Lockwasher (4) (MS35338-46)
Sealing compound (item 19, appx B)

Personnel Required

3

References

TM 9-2350-238-10
TM 9-2350-238-20-2
TM 9-2350-238-24P-2
TM 9-4940-468-14

Equipment Conditions

Chemical, biological, and radiological (CBR) unit removed (TM 9-2350-238-20-2)
Metal cab grille removed (TM 9-2350-238-20-2)

General Safety Instructions

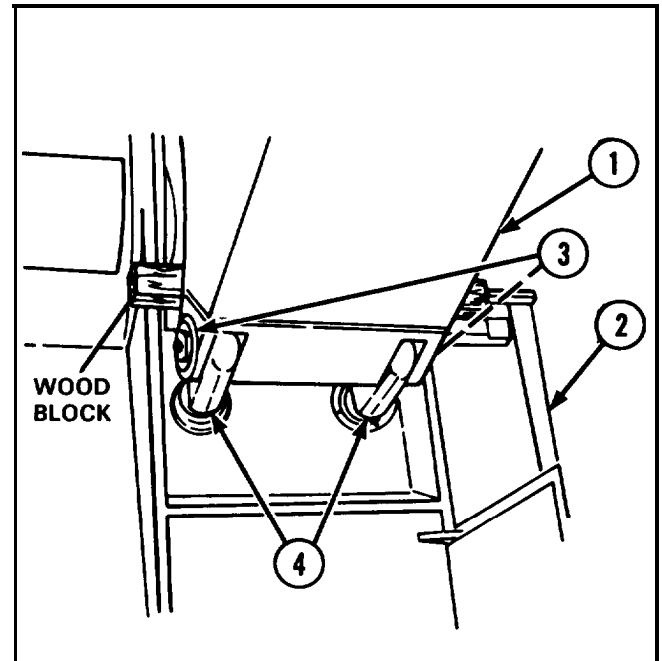
WARNING

- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up all spilled hydraulic fluid.
 - Make sure hydraulic system is depressurized before performing any hydraulic maintenance to prevent injury to personnel.
- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position as failure of system may result in injury to personnel.
- Use hoist with minimum lifting capacity of 2000 lb (908 kg) to prevent injury to personnel and damage to equipment.

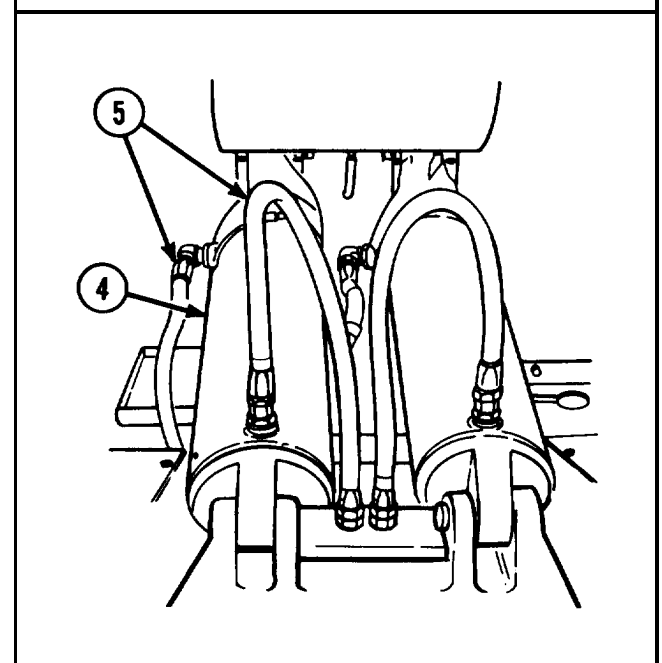
REMOVAL**WARNING**

- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up all spilled hydraulic fluid.
- Make sure hydraulic system is depressurized before performing any hydraulic maintenance to prevent injury to personnel.

- 1 Raise boom far enough to get a 4x4 wood block between crane boom (1) and front of cab (2). Place wood block above lower boom cylinder eyes and across opening in cab. Insert wood block until two upper boom cylinder headless straight pins (3) can be removed from two boom winch control cylinder assemblies (4) and crane boom.



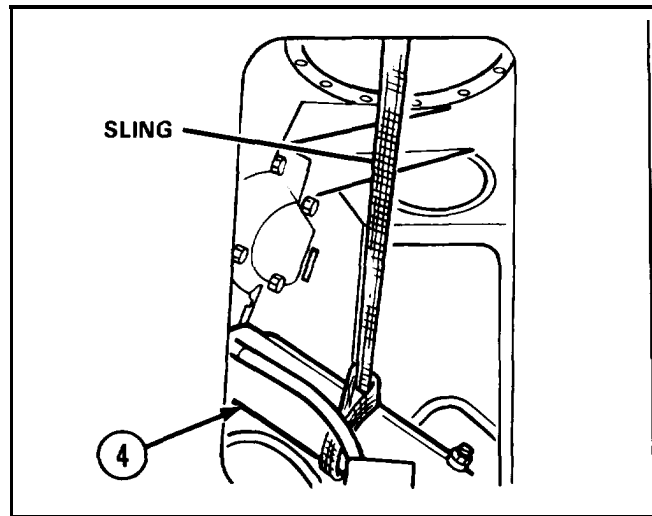
- 2 Disconnect two hoses (5) from each boom winch control cylinder assembly (4).
- 3 Cover hose openings and plug holes in two boom winch control cylinder assemblies (4).



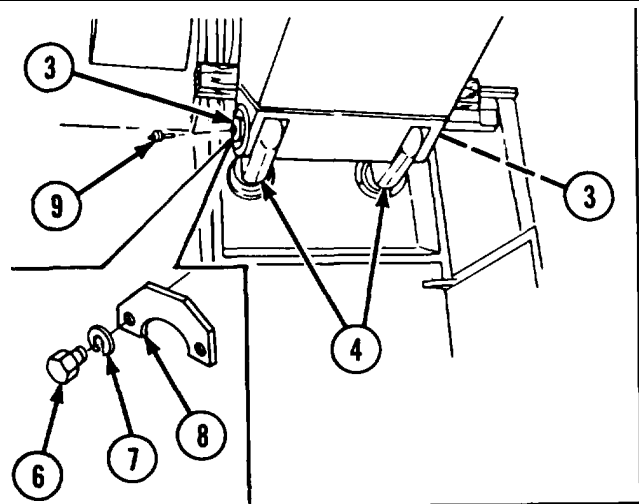
2-28. MAINTENANCE OF BOOM AND WINCH –CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

REMOVAL (CONT)

- 4 Lower sling through cupola opening and secure around boom winch control cylinder assemblies (4).



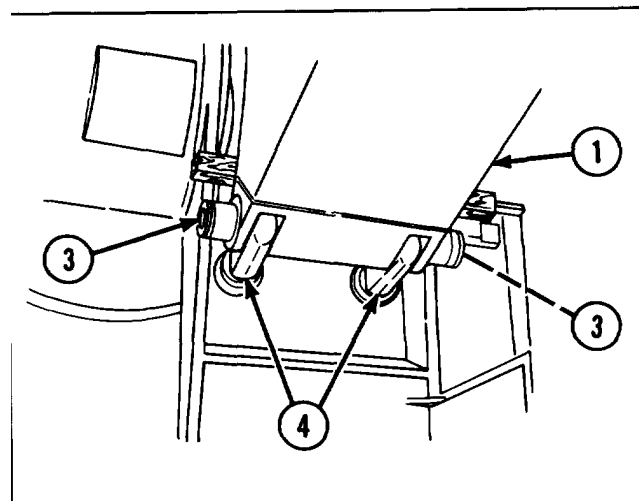
- 5 Remove four hexagon head capscrews (6), four lockwashers (7), and two boom cylinder hinge pin locking plates (8) securing two lower boom cylinder headless straight pins to upper rod end connectors of boom winch control cylinder assemblies (4) and crane boom. Remove lubrication fittings (9) from each upper boom cylinder headless straight pin (3).



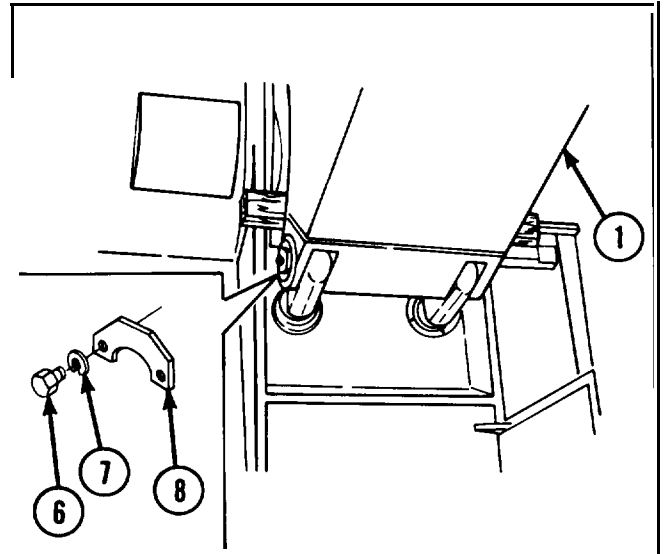
CAUTION

Place rags or suitable padding between the bottom of the cylinder rods and cab wall to prevent damage to machine surface of cylinder rods.

- 6 Pry out and remove two upper boom cylinder headless straight pins (3) from upper rod end connector of boom winch control cylinder assemblies (4) and crane boom (1).



- 7 Install two boom cylinder hinge pin locking plates (8), four lockwashers (7), and four hexagon capscrews (6) on crane boom (1).



NOTE

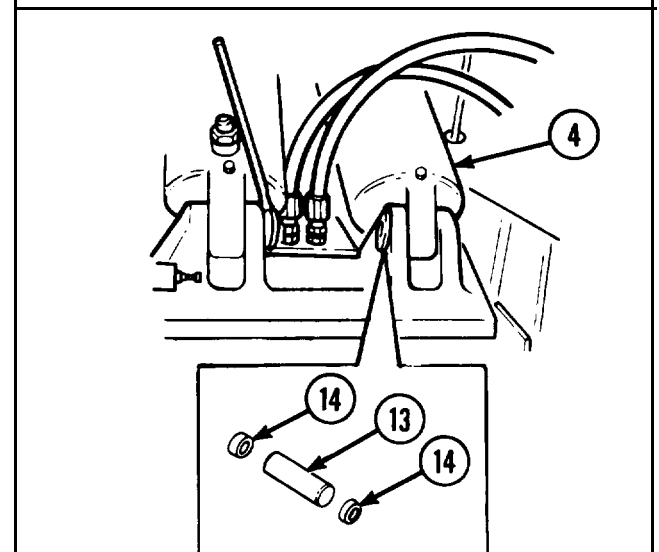
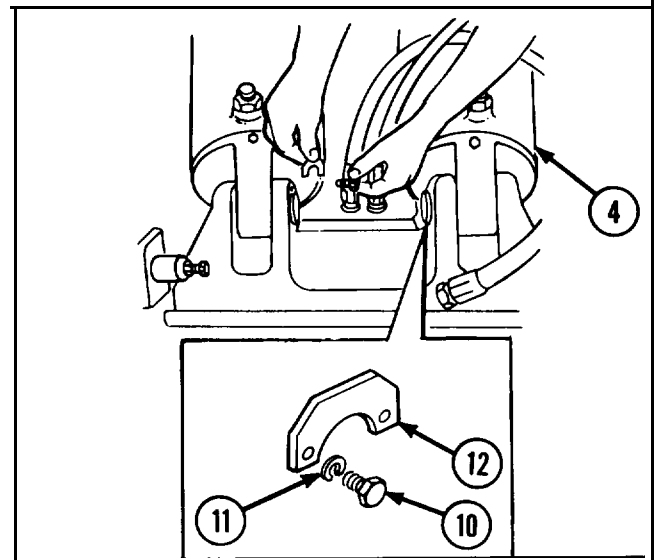
Steps 8 through 13 are written and illustrated for removal of one boom winch control cylinder assembly, but apply to both.

- 8 Remove two hexagon head capscrews (10), two lockwashers (11), and boom cylinder hinge pin locking plate (12) from lower boom cylinder headless straight pin (13) of boom winch control cylinder assembly (4).

NOTE

Number of spacers in step 9 may vary depending on alinement of boom winch control cylinder assembly.

- 9 Using pry bar, pry out lower boom cylinder headless straight pin (13) from lower end of boom winch control cylinder assembly (4). Remove three spacers (14).
- 10 Install boom cylinder hinge pin locking plate (12), two lockwashers (11), and two hexagon head capscrews (10) in each anchor after removing lower boom cylinder headless straight pin (13).



2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

REMOVAL (CONT)

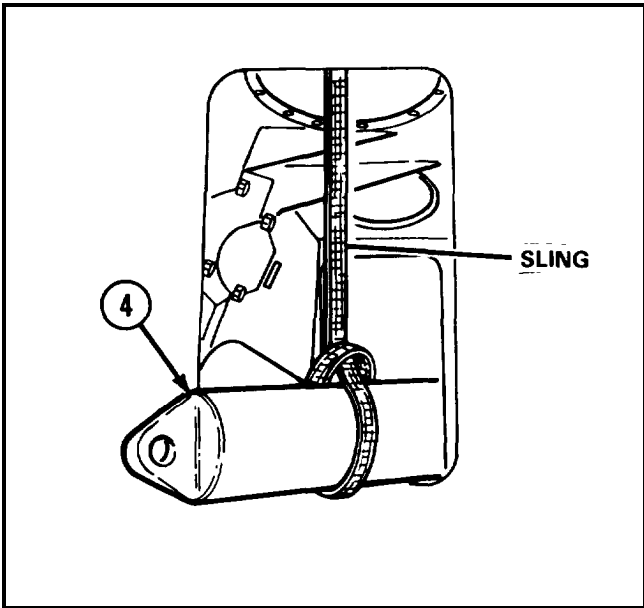
WARNING

Use hoist with minimum lifting capacity of 2000 lb (908 kg) to prevent injury to personnel **and damage to equipment.**

NOTE

Another M578 Recovery Vehicle or M88A1 Recovery Vehicle may be used, if available, for lifting.

- 11 Lift boom winch control cylinder assembly (4) and move to cab door.
- 12 Remove sling. Reset sling around boom winch control cylinder assembly (4) from outside of cab door.
- 13 Lift boom winch control cylinder assembly (4) through cab door and lower to ground.

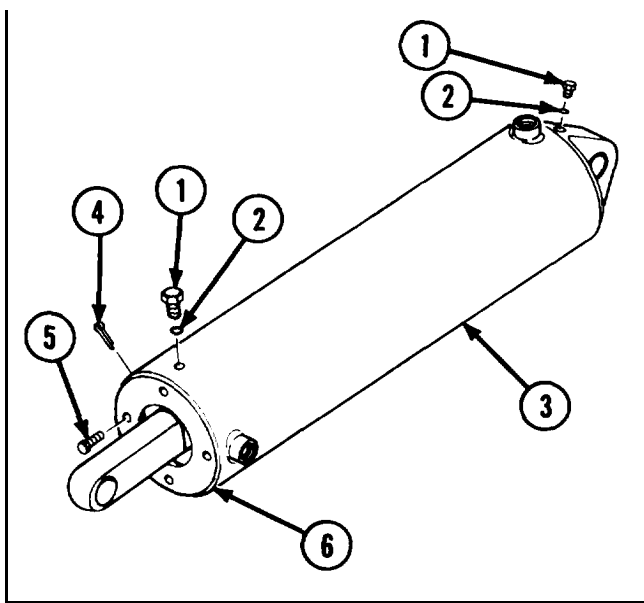


DISASSEMBLY

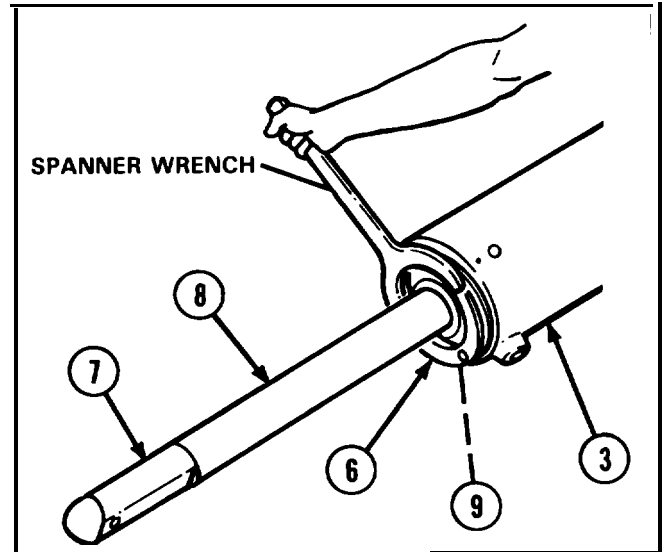
NOTE

Disassembly procedures are written and illustrated for one boom winch control cylinder assembly but apply to both.

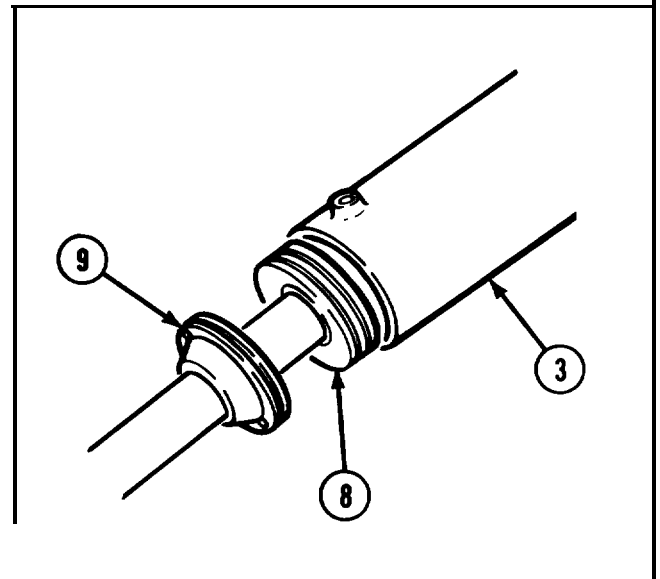
- 1 Remove two machine thread plugs (1) and two preformed packings (2) from cylinder boom barrel (3).
- 2 Remove cotter pin (4) from cylinder boom barrel (3).
- 3 Remove four socket head capscrews (5) from boom cylinder head externally threaded ring (6).



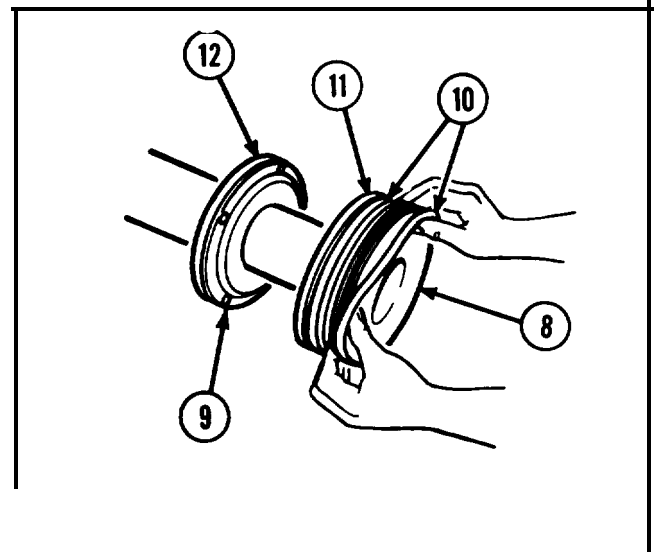
- 4 Pull out boom cylinder piston rod end connector (7) until hydraulic piston (8) bottoms on boom cylinder head (9).
- 5 Using spanner wrench, unscrew and remove boom cylinder head externally threaded ring (6) from cylinder boom barrel (3).



- 6 Remove boom cylinder head (9) and hydraulic piston (8) from cylinder boom barrel (3).



- 7 Remove two preformed packings (10) and packing (11) from hydraulic piston (8) and preformed packing (12) from boom cylinder head (9).



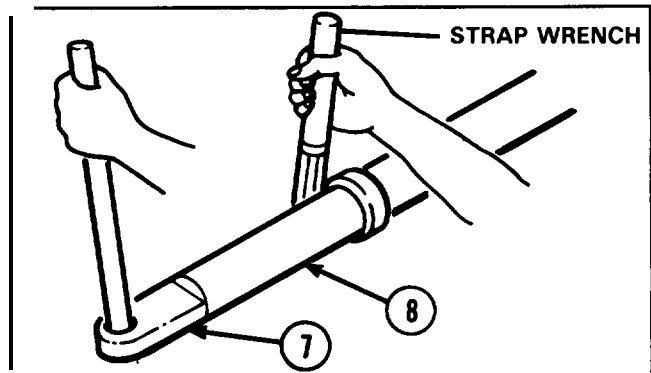
2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

DISASSEMBLY (CONT)

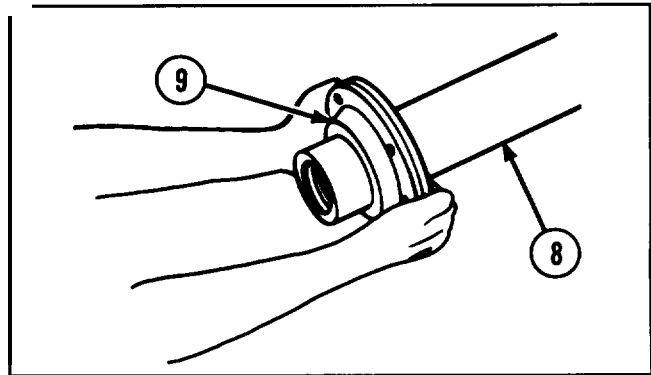
CAUTION

Do not place piston in vise for disassembly. Damage can result, causing malfunction or leakage.

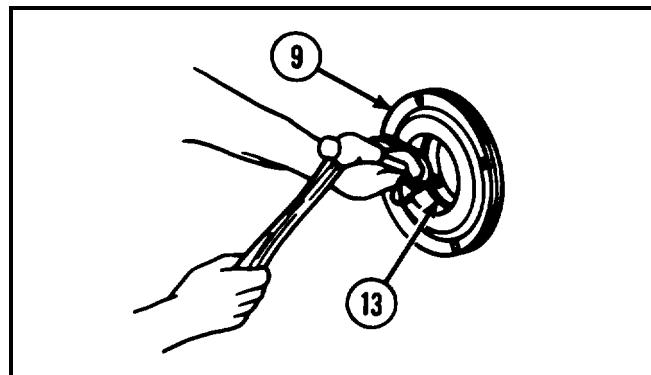
- 8 Using strap wrench, remove boom cylinder piston rod end connector (7) from hydraulic piston (8).



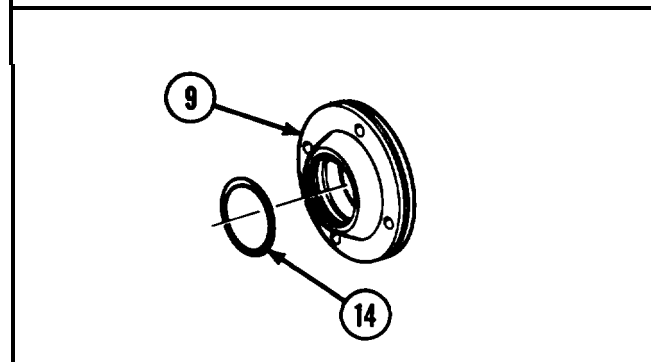
- 9 Remove boom cylinder head (9) from piston (8).



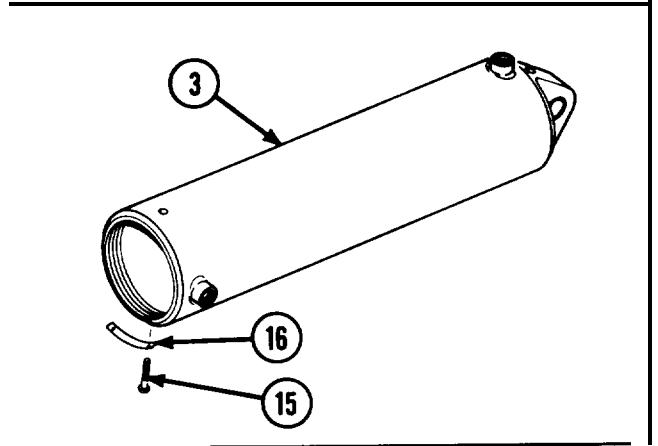
- 10 Using hammer and drift, remove seal (13) from boom cylinder head (9).



- 11 Remove packing (14) from boom cylinder head (9).



- 12 If damaged, remove three drive screws (15) and boom winch control cylinder barrel identification plate (16) from cylinder boom barrel (3).

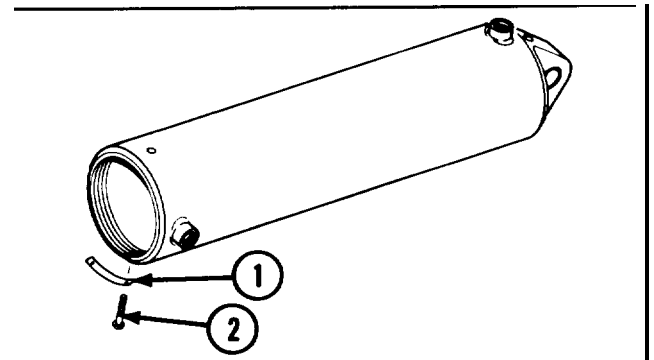


INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If cylinder boom barrel is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If any kit component is damaged, replace entire repair parts kit.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

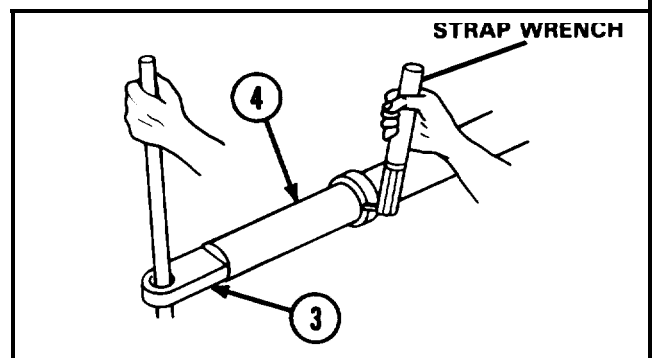
- 1 If removed, install new boom winch control cylinder barrel identification plate (1) and three new drive screws (2).
- 2 Apply sealing compound (item 19, appx B) to threads of boom cylinder piston rod end connector (3).



CAUTION

Do not place piston in vise for disassembly. Damage can result, causing malfunction or leakage.

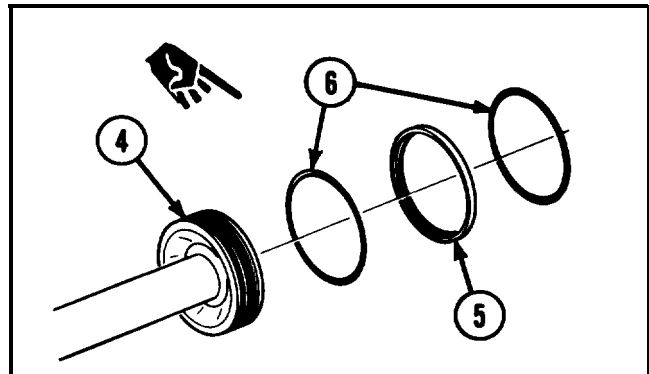
- 3 Using strap wrench, screw boom cylinder piston rod end connector (3) into hydraulic piston (4) until it bottoms against hydraulic piston shoulder.



2-28. MAINTENANCE OF BOOM AND WINCH –CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

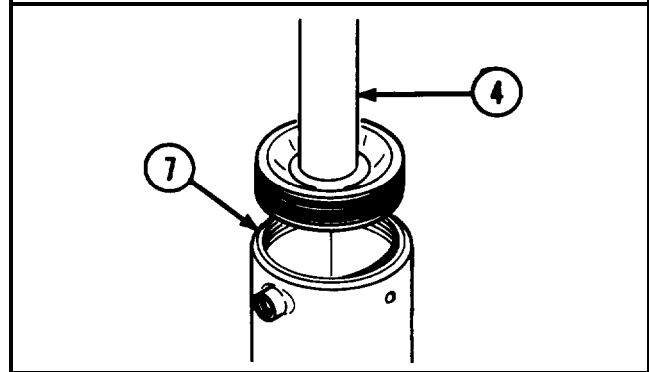
REASSEMBLY (CONT)

4 Install new packing (5) and two new pre-formed packings (6) on hydraulic piston (4) and lubricate with hydraulic fluid (item 10, appx B).

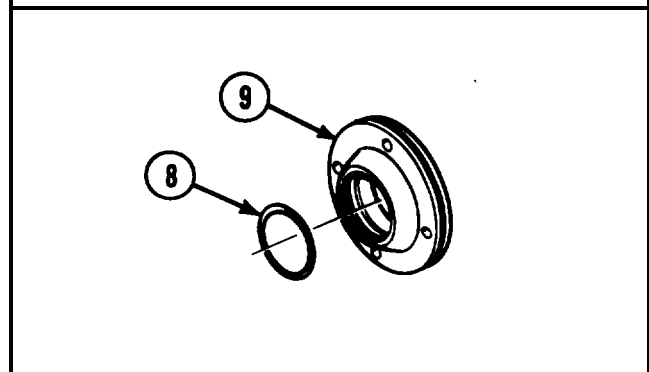


5 Lubricate cylinder bore in cylinder boom barrel (7) with hydraulic fluid (item 10, appx B).

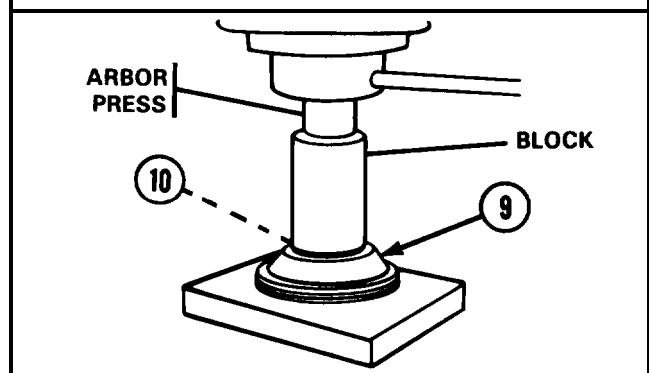
6 Hold cylinder boom barrel (7) in vertical position and power hydraulic piston (4) into bore, using care not to damage new preformed packings.



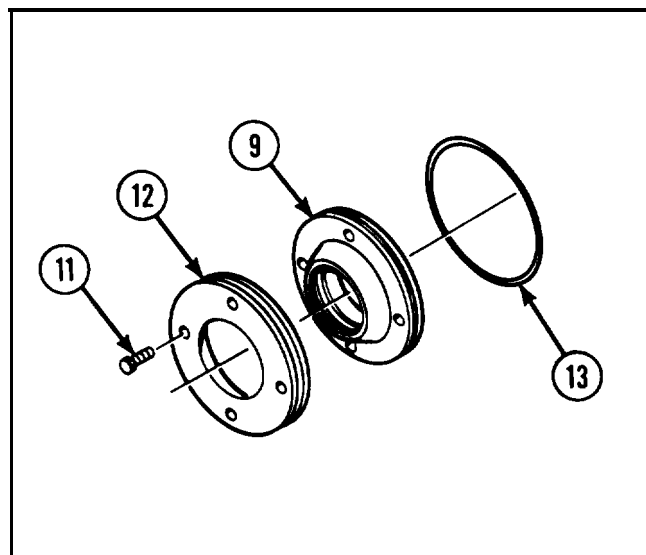
7 Install new packing (8) in boom cylinder head (9).



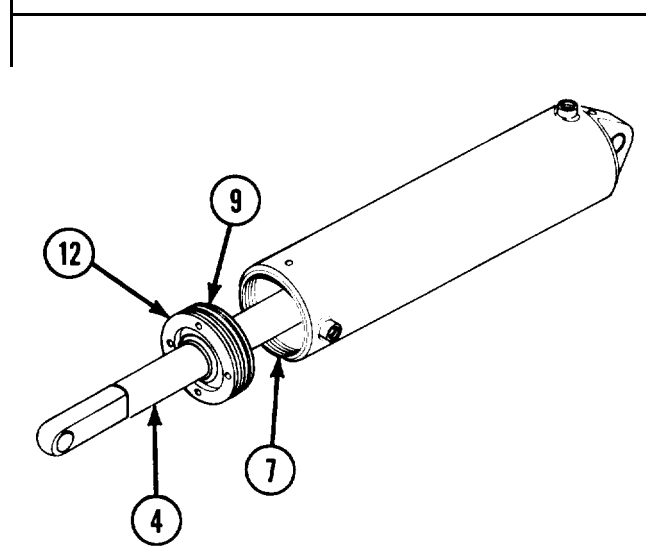
8 Using arbor press and block with a 3.9-in, (9.9-cm) diameter, install new seal (10) in boom cylinder head (9).



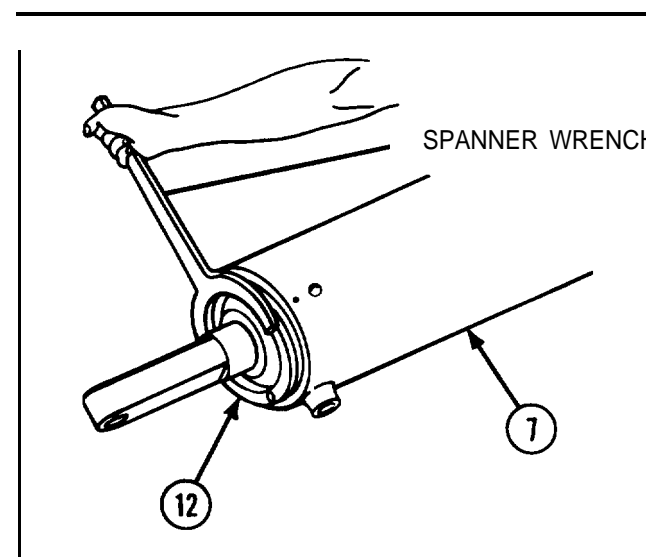
- 9 Apply sealing compound (item 19, appx B) to threads of four socket head capscrews (11).
- 10 Install boom cylinder head externally threaded ring (12) on boom cylinder head (9).
- 11 Insert and tighten four new socket head capscrews (11) to boom cylinder head externally threaded ring (12).
- 12 Install new preformed packing (13) on boom cylinder head (9) and lubricate with hydraulic fluid (item 10, appx B).



- 13 Install boom cylinder head (9) and boom cylinder head externally threaded ring (12) onto hydraulic piston (4).
- 14 Coat threads inside cylinder boom barrel (7) and on boom cylinder head externally threaded ring (12) with grease (item 9, appx B).



- 15 Screw boom cylinder head externally threaded ring (12) into threaded cylinder boom barrel (7) and tighten with spanner wrench.

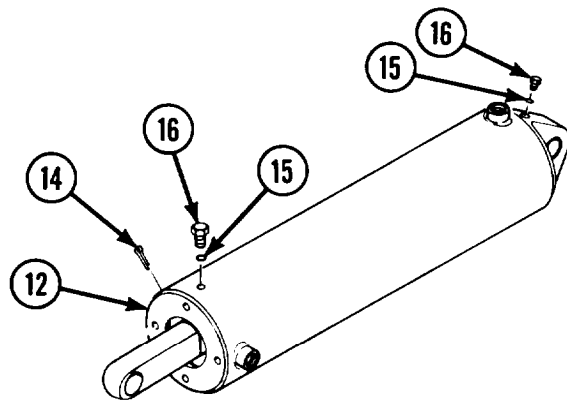


2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

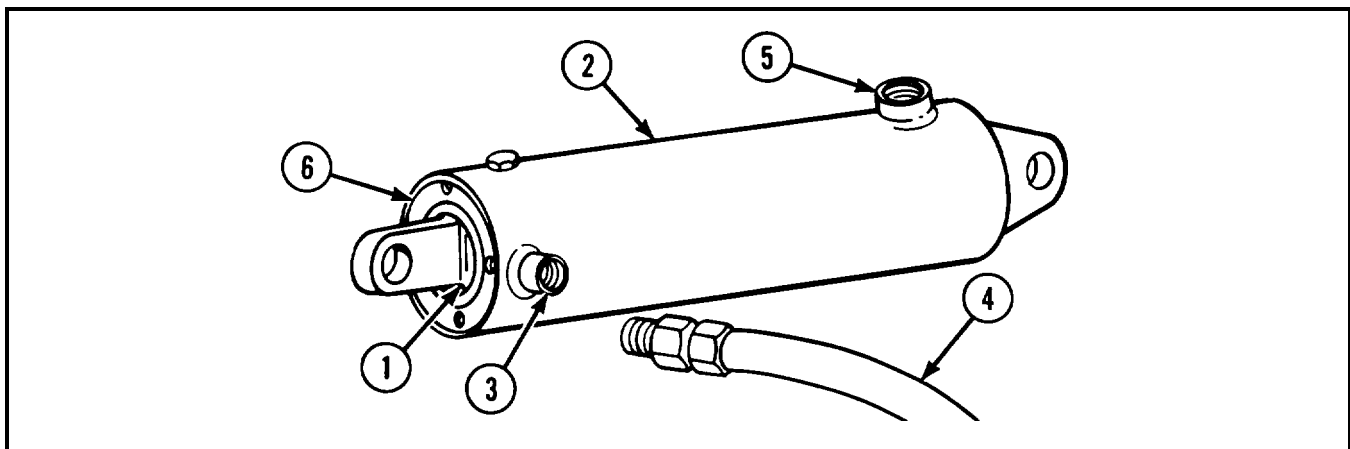
REASSEMBLY (CONT)

16 Align pin hole in cylinder boom barrel with pin hole in boom cylinder head externally threaded ring. Insert new cotter pin (14) through pin holes to secure boom cylinder head externally threaded ring (12).

17 Install two new preformed packings (15), and two machine thread plugs (16).



TEST



- 1 Refer to TM 9-4940-468-14 for test setup and testing procedures.
- 2 Retract hydraulic piston (1) into boom control cylinder assembly (2).
- 3 Fill boom control cylinder assembly (2) through upper port (3) with hydraulic fluid (item 10, appx B).

- 4 Connect hydraulic line or hose (4) to port (3). Leave port (5), at closed end of boom control cylinder assembly (2), open.
- 5 Apply 4000 psi (27,580 kPa) hydraulic pressure to boom control cylinder assembly (2) through hydraulic line or hose (4) for 5 minutes.

- 6 No leakage is allowed around open port (5), around hydraulic piston (1), or around boom cylinder head (6).
- 7 If leakage occurs, disassemble boom control cylinder assembly (2) and check for damaged parts.
- 8 If no leakage occurs, reduce pressure and remove hydraulic line or hose (4).
- 9 Drain hydraulic fluid (item 10, appx B) and plug cylinder ports (3) and (5).

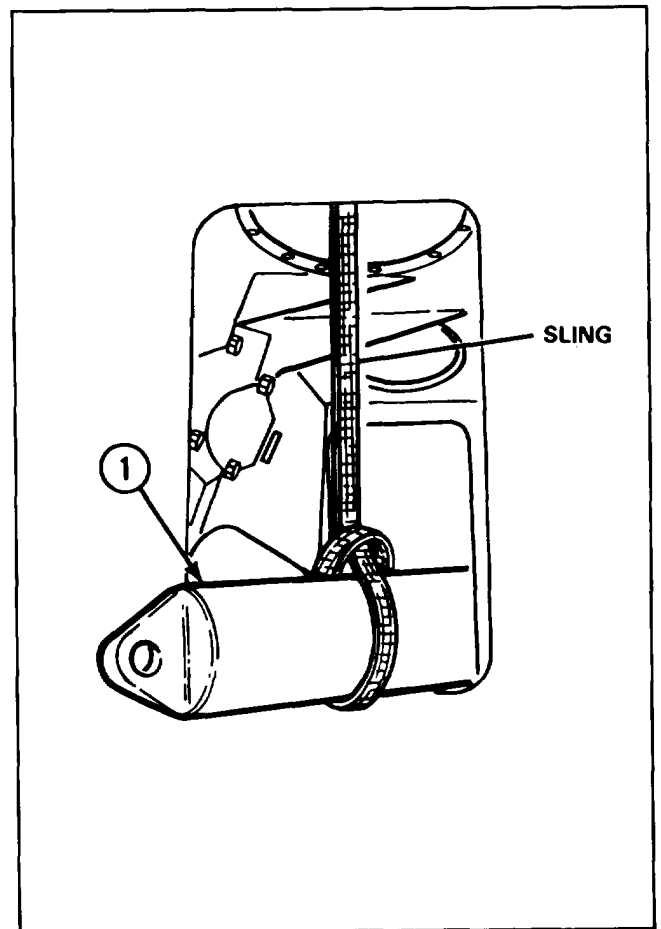
INSTALLATION

WARNING

- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up all spilled hydraulic fluid.
- Make sure hydraulic system is depressurized before performing any hydraulic maintenance to prevent injury to personnel.
- Use hoist with minimum lifting capacity of 2000 lb (908 kg) to prevent injury to personnel and damage to equipment.

NOTE

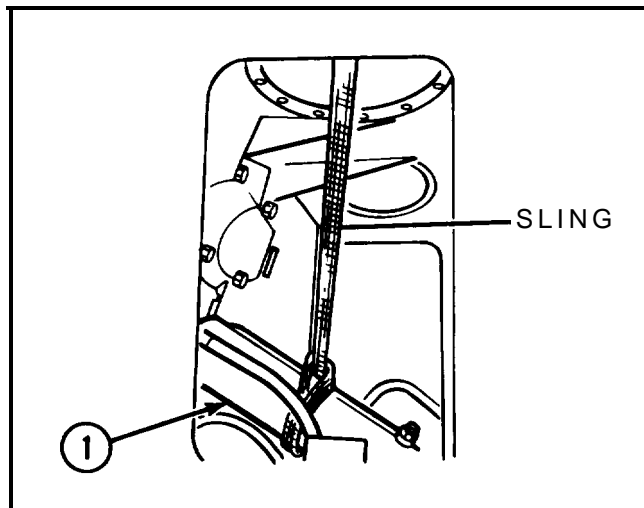
- Another M578 Recovery Vehicle or M88A1 Recovery Vehicle may be used, if available, for lifting.
 - The following steps are written and illustrated for installation of one boom winch control cylinder assembly, but apply to both.
- 1 Secure sling around boom winch control cylinder assembly (1). Lift boom winch control cylinder assembly and lower through cab door into place.



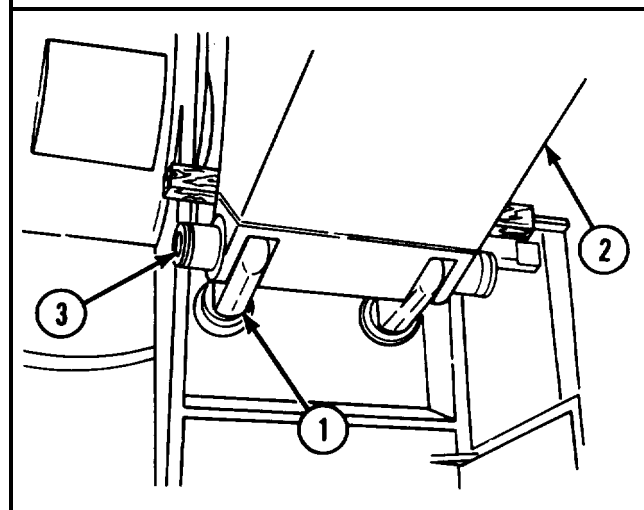
2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

INSTALLATION (CONT)

- 2 Remove sling. Reset sling through cupola opening and secure around boom winch control cylinder assembly (1).

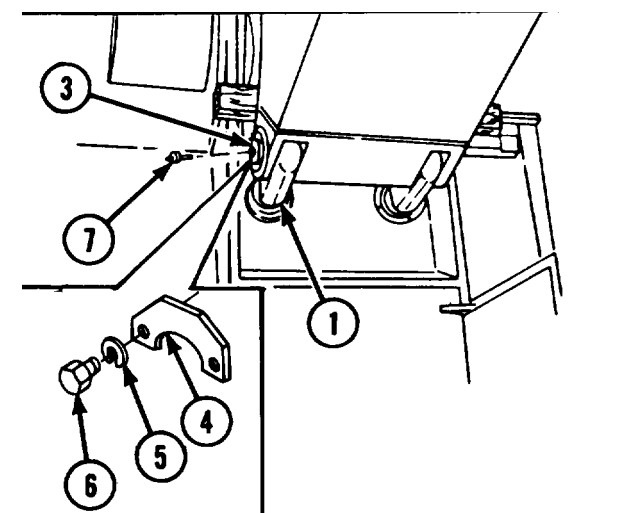


- 3 Install boom winch control cylinder assembly (1) and secure to crane boom (2) with upper boom cylinder headless straight pin (3).



- 4 Install boom cylinder hinge pin locking plate (4), two new lockwashers (5), and two hexagon head capscrews (6) securing upper boom cylinder headless straight pin (3) in boom winch control cylinder assembly (1).

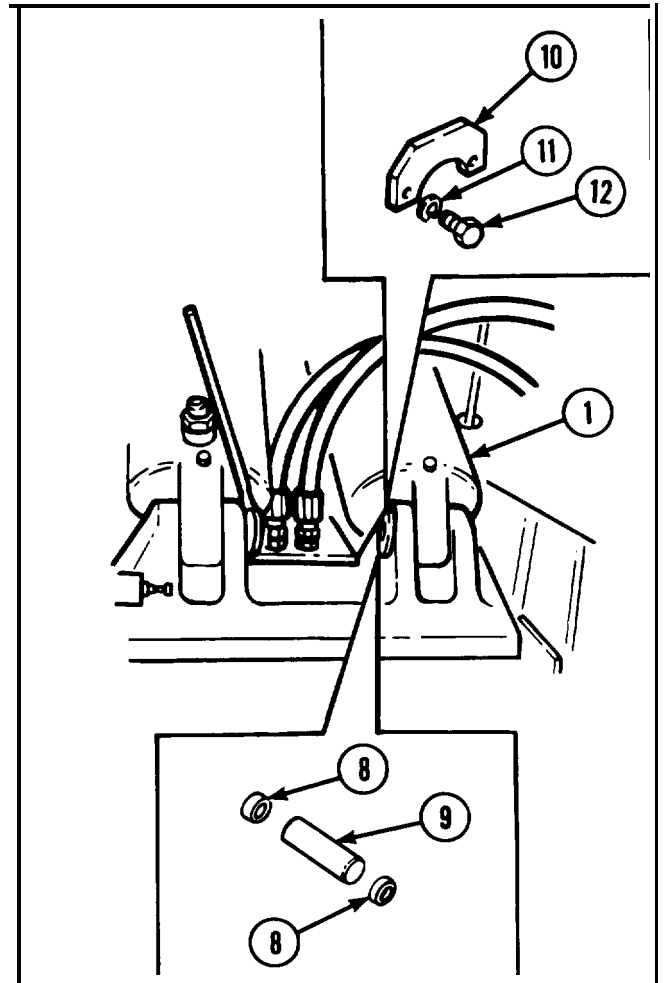
- 5 Lubricate with grease (item 9, appx B) and install lubrication fitting (7) to upper boom cylinder headless straight pin (3).



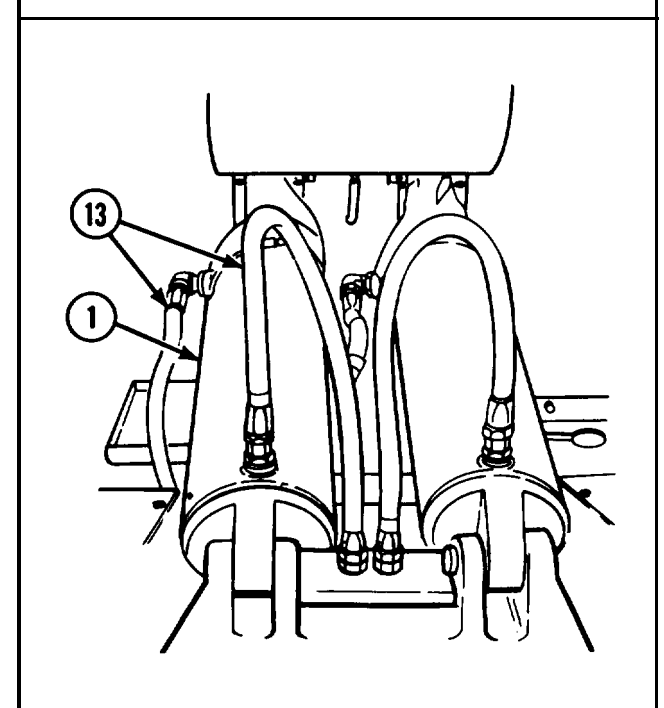
NOTE

Number of spacers in step 6 may vary depending on alignment of boom winch control cylinder assembly.

- 6 Install three spacers (8) and lower boom cylinder headless straight pin (9) to boom winch control cylinder assembly (1).
- 7 Install boom cylinder hinge pin locking plate (10), two new lockwashers (11), and two hexagon head capscrews (12) securing boom cylinder lower headless straight pin (9) in boom winch control cylinder assembly (1).



- 8 Unplug holes and uncover hose openings in boom winch control cylinder assembly (1).
- 9 Connect two hoses (13) to boom winch control cylinder assembly (1).



2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

BOOM DROP RATE TEST

WARNING

- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position as failure of system may result in injury of personnel.

1 Turn off hydraulic system (TM 9-2350-238-10)

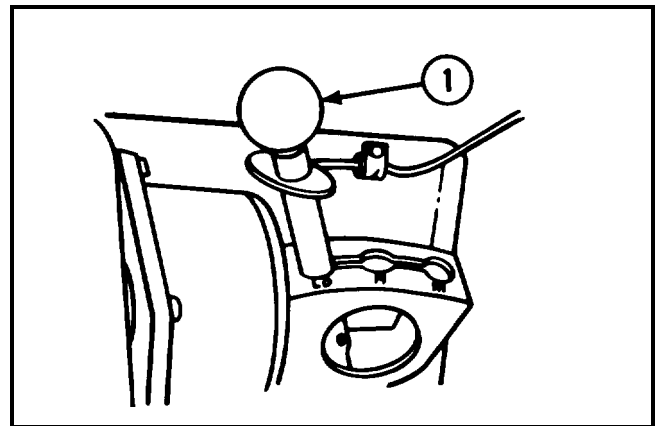
2 Using thermometer, measure and record temperature of hydraulic fluid TM 9-2350-20-2

WARNING

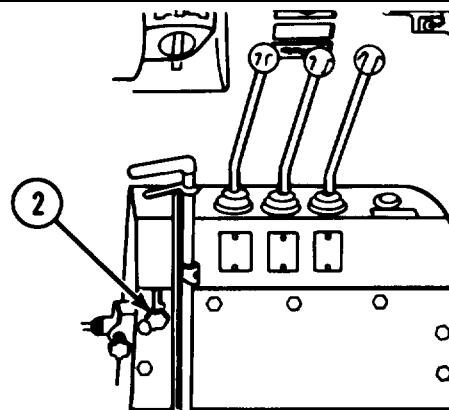
Hydraulic system is under high pressure. Follow hydraulic system, safety procedures to prevent injury TM 9-2350-238-20

3 Turn on hydraulic system (TM 9-2350-238-10).

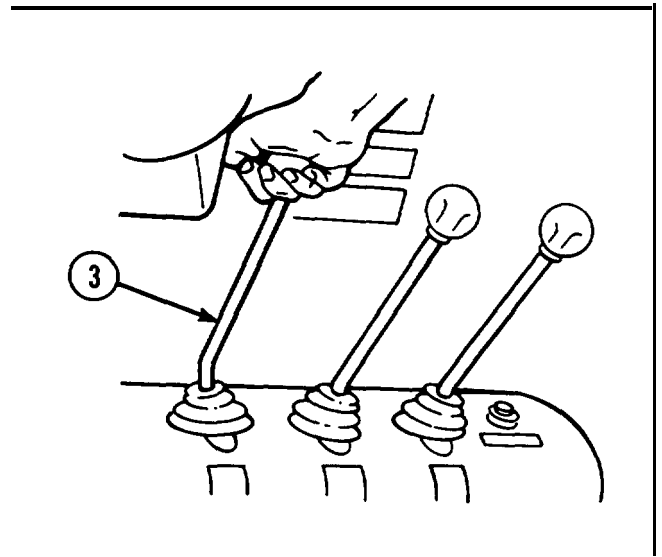
4 Set boom winch shift control lever (1) to LO.



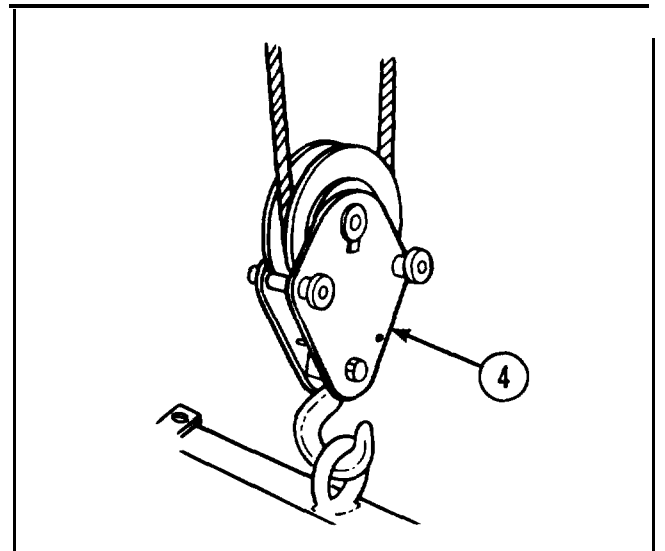
5 Push in BOOM WINCH BRAKE PRESSURE SELECTOR knob (2).



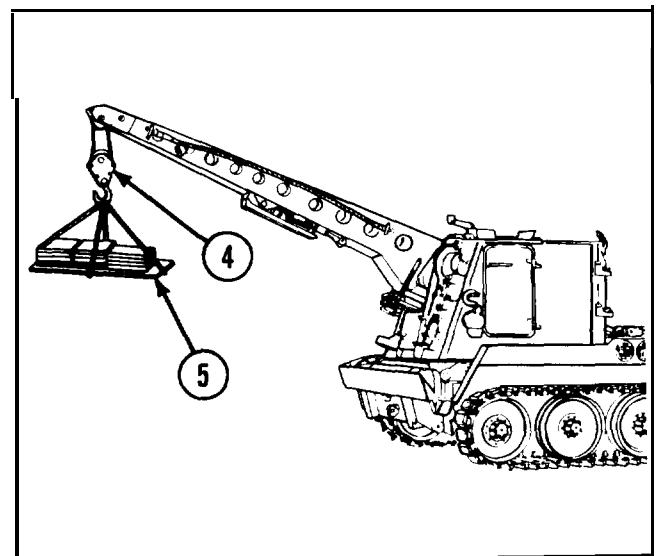
- 6 Push BOOM WINCH control handle (3) to LOWER for about 1 minute. Release BOOM WINCH control handle (3).



- 7 Release single boom block (4) from front of vehicle.



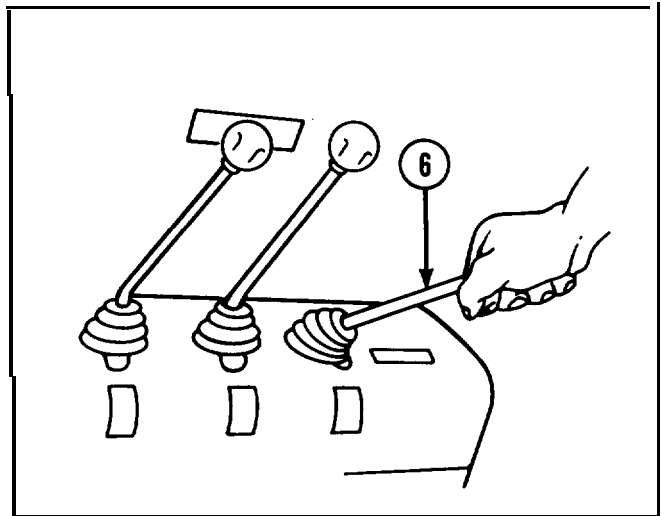
- 8 Attach 5 ton (4.54 metric ton) load (5) to boom block (4).



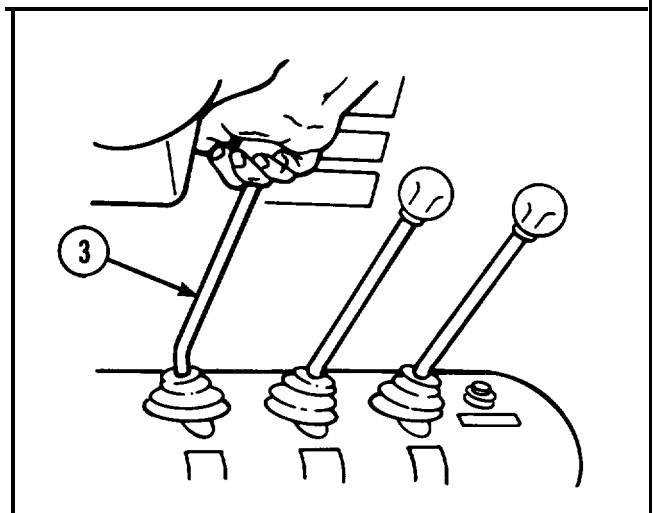
2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

BOOM DROP RATE TEST (CONT)

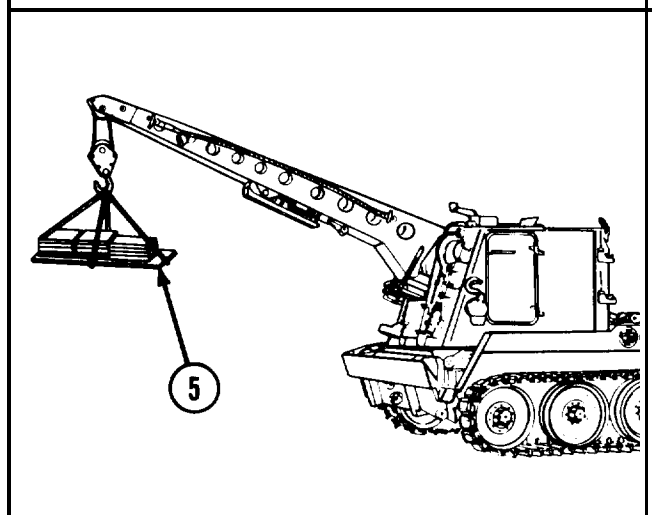
- 9 Pull BOOM cylinder control handle (6) to RAISE until boom is at about a 5-degree angle above the ground.
- 10 Release BOOM cylinder control handle (6) to hydraulically lock boom in position.

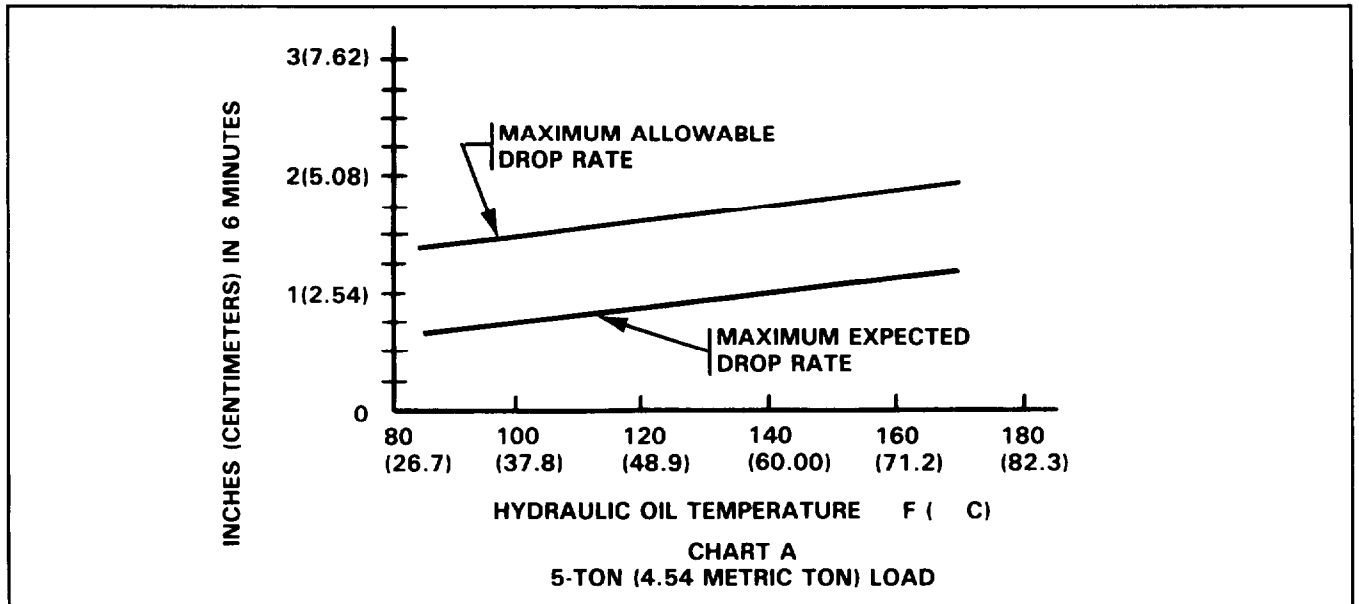


- 11 Pull BOOM WINCH control handle (3) to RAISE until load is about 18 in. (46 cm) above ground.
- 12 Release BOOM WINCH control handle (3) to set boom winch brake.



- 13 Measure and record height of load above ground (5).
- 14 Allow load (5) to hang for 6 minutes.
- 15 Measure and record height of load (5) above ground.
- 16 Subtract result in step 15 from result in step 13 to figure load drop rate.





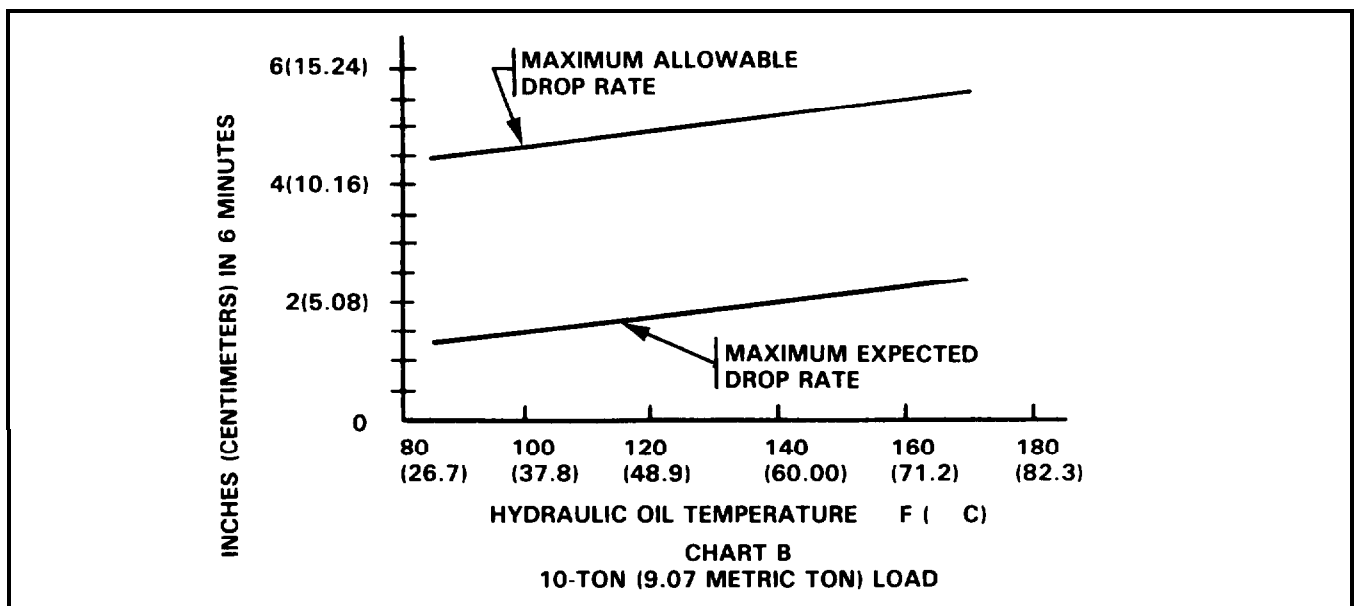
17 Using oil temperature recorded in step 2 and load drop rate figured in step 16, find boom drop rate on chart A.

18 Record boom drop rate.

NOTE

The boom drop rate is within limits when it is below the maximum allowable drop rate line in chart A.

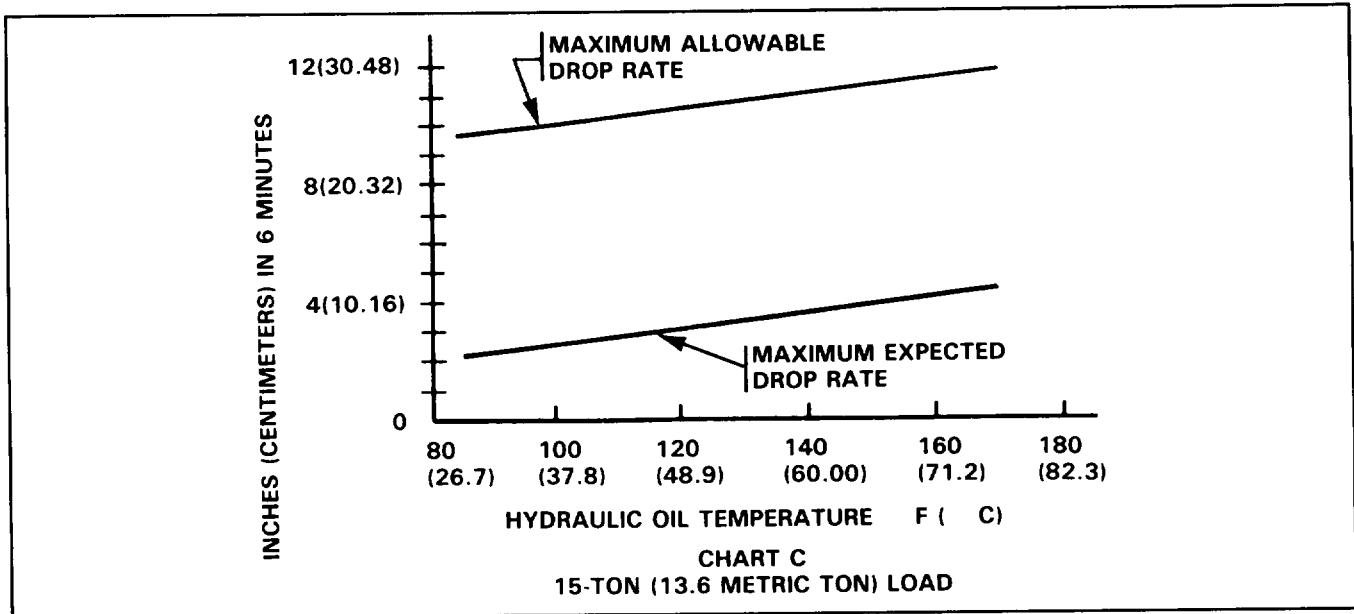
19 Remove load from boom if boom drop rate is above the maximum allowable drop rate line in chart A. Troubleshoot boom, refer to page 2-2.



20 Repeat steps 8 thru 19 for 10 ton (9.07 metric ton) load. (See chart B.)

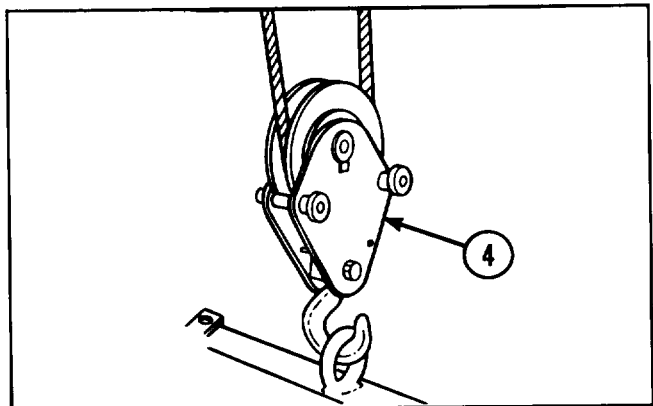
2-28. MAINTENANCE OF BOOM AND WINCH-CONTROL CYLINDERS AND ATTACHING PARTS AND BOOM CONTROL CYLINDER ASSEMBLY (CONT).

BOOM DROP RATE TEST (CONT)



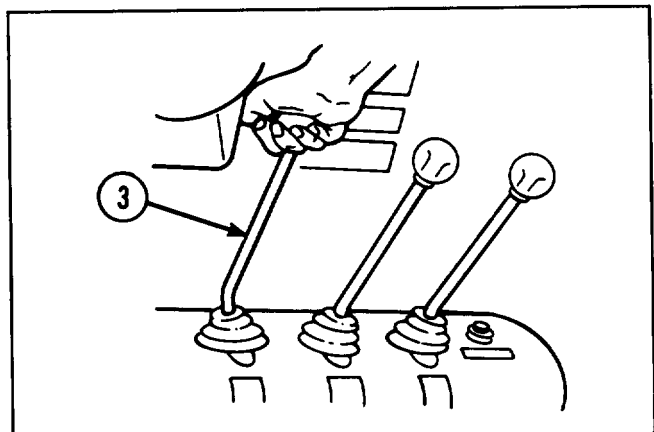
21 Repeat steps 8 thru 19 for 15 ton (13.6 metric ton) load. (See chart C.)

22 Secure single boom block (4) to vehicle.



23 Push BOOM WINCH control handle (3) to LOWER until boom is in STOW position.

24 Release BOOM WINCH control handle (3).

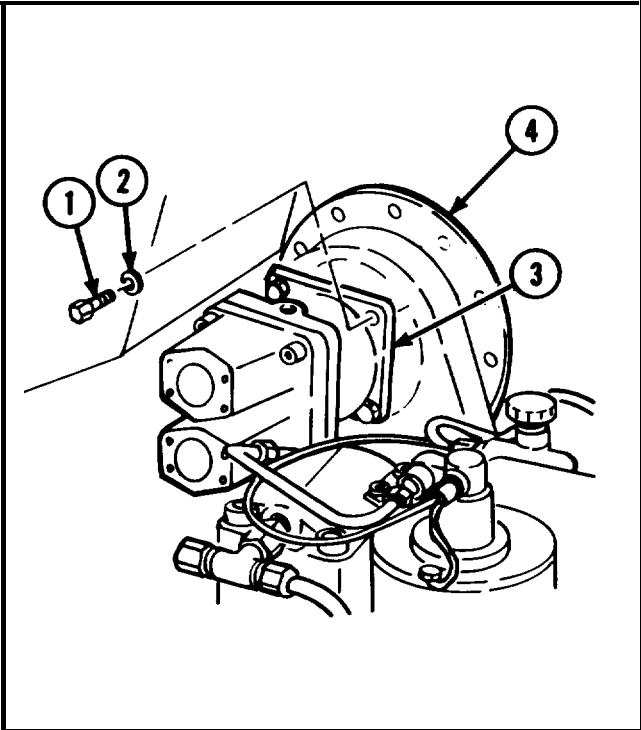


2-29. MAINTENANCE OF BOOM AND WINCH –TOW WINCH ASSEMBLY (CONT).

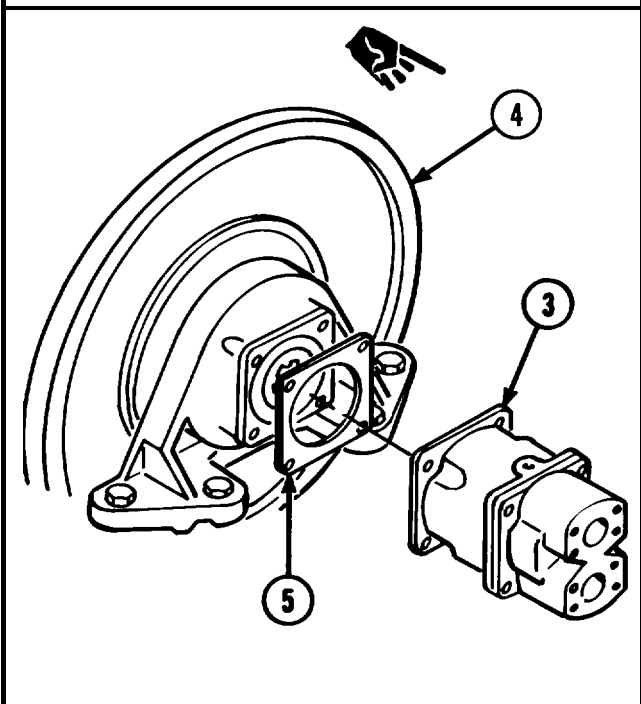
REMOVAL

WARNING

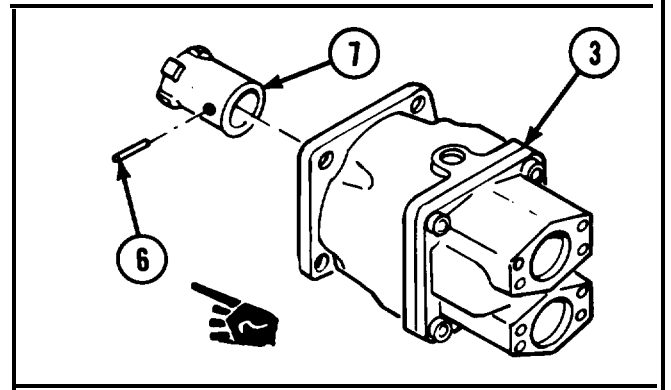
- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.
 - Make sure hydraulic system is re-pressurized before performing any hydraulic maintenance to prevent injury to personnel.
- 1 Remove four socket head capscrews (1) and four lockwashers (2) securing hydraulic motor (3) to vehicle tow drum winch (4).



- 2 Remove hydraulic motor (3) and motor to winch gasket (5) from vehicle tow drum winch (4).

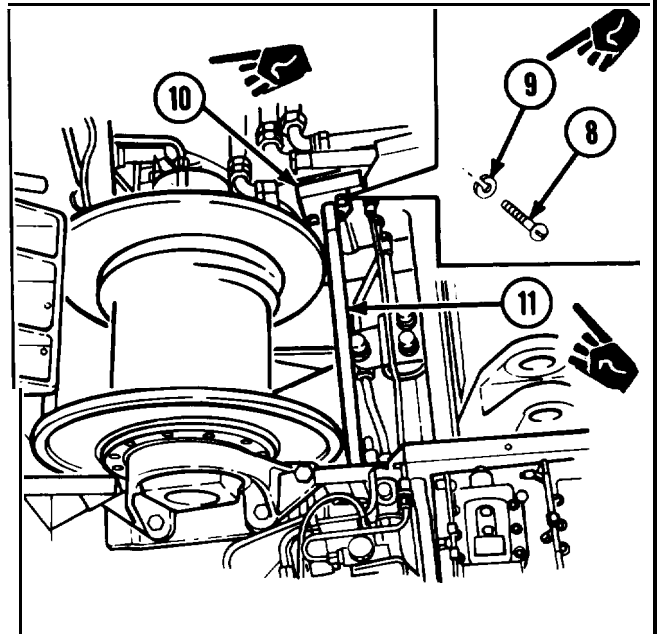


- 3 Using hammer and punch, remove spring pin (6) and winch motor positive clutch half (7) from hydraulic motor (3).

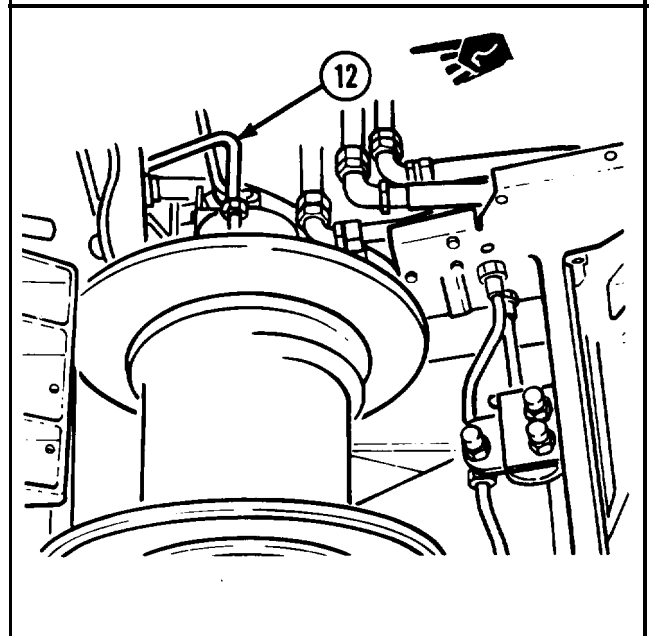


- 4 Remove six screws (8) and six lockwashers (9) from guard stub (10).

- 5 Remove tow winch guard (11) and guard stub (10).



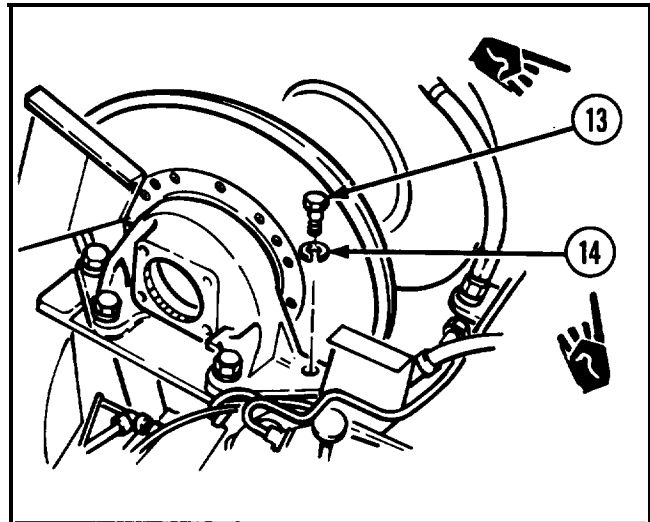
- 6 Disconnect boom and tow winch motor drain metal tube assembly (12) and cover opening.



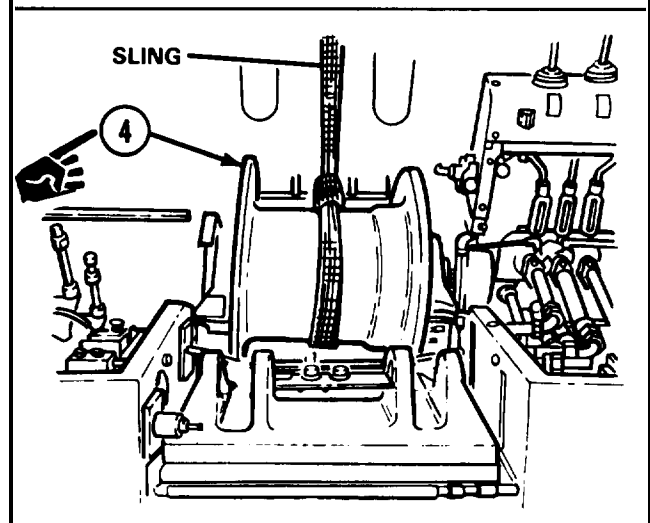
2-29. MAINTENANCE OF BOOM AND WINCH-TOW WINCH ASSEMBLY (CONT).

REMOVAL (CONT)

- 7 Remove eight hexagon head capscrews (13) and eight lockwashers (14).



- 8 Lower sling through boom opening and secure center of vehicle tow drum winch (4).



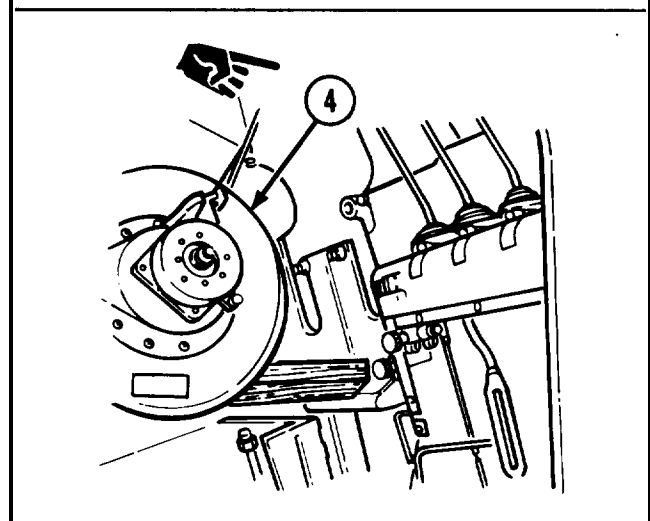
WARNING

Use hoist with minimum lifting capacity of 2000 lb (908 kg) to prevent injury to personnel and damage to equipment.

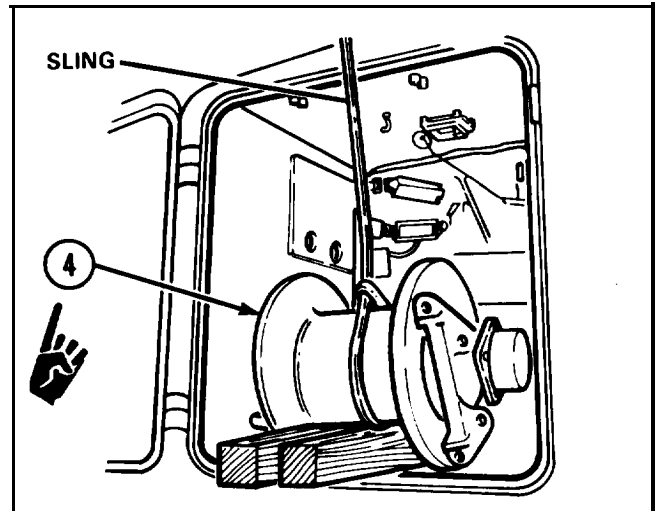
NOTE

Another M578 Recovery Vehicle or M88A1 Recovery Vehicle, if available, may be used for lifting.

- 9 Using 2000 lb (908 kg) minimum lifting capacity hoist, lift vehicle tow drum winch (6) to make space for two 4 in. x 4 in. (10 cm x 10 cm) pieces of support lumber. Place lumber on rear cab door sill and on ledge below boom opening.
- 10 Lower vehicle tow drum winch (4) onto lumber and roll it to opening of rear cab door.



- 11 From outside rear cab door, secure sling to vehicle tow drum winch (4).
- 12 Lift vehicle tow drum winch (4) out of cab and lower to ground.



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 Hydraulic motor is a repairable assembly. Refer to page 2-30.
- 3 Vehicle tow drum winch is a repairable assembly. Refer to page 2-111.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

INSTALLATION

- 1 Secure sling to center of vehicle tow drum winch (1).

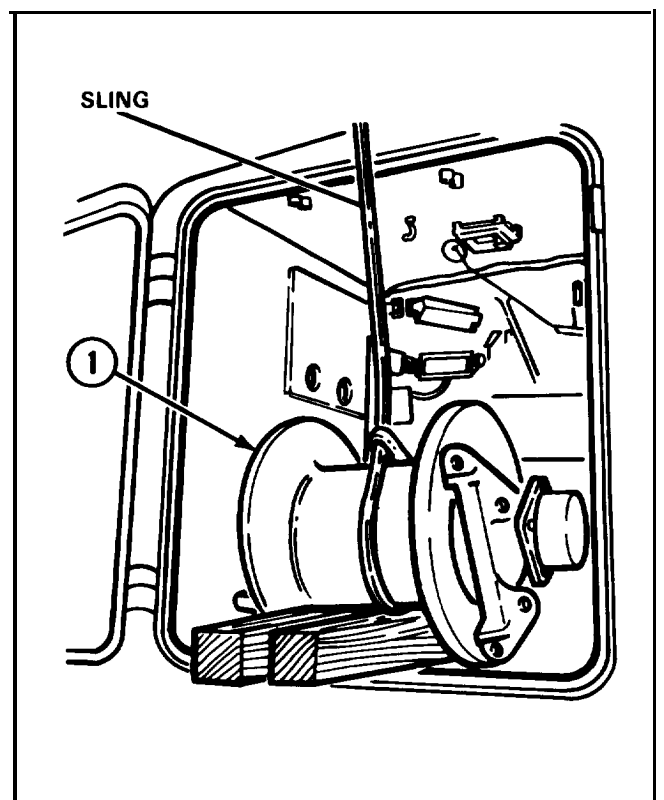
WARNING

Use hoist with lifting capacity of 2000 lb (908 kg) to prevent injury to personnel and damage to equipment.

NOTE

Another M578 Recovery Vehicle or M88A1 Recovery Vehicle, if available, may be used for lifting.

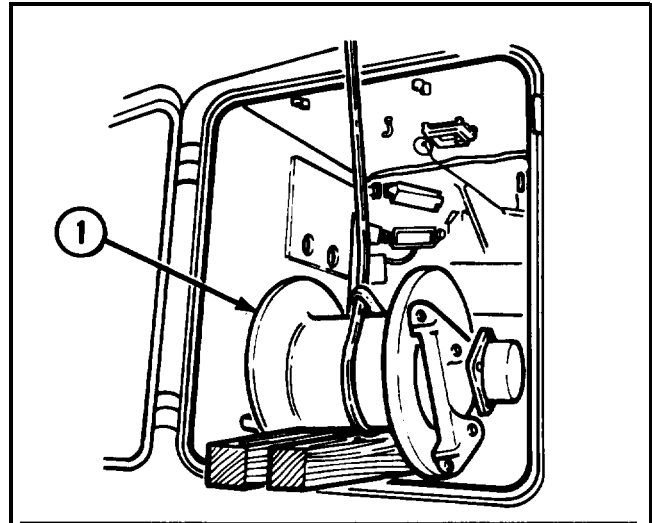
- 2 Using 2000 lb (908 kg) minimum lifting capacity hoist, lift vehicle tow drum winch (1) into rear cab door.
- 3 Lower vehicle tow drum winch (1) onto lumber and remove sling from hoist.



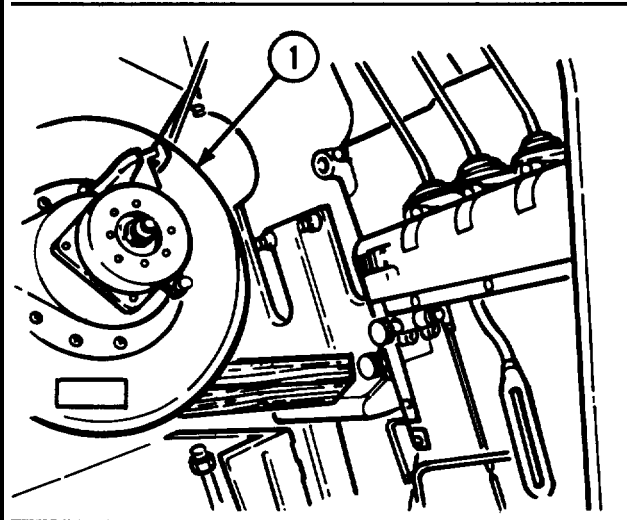
2-29. MAINTENANCE OF BOOM AND WINCH-TOW WINCH ASSEMBLY (CONT).

INSTALLATION (CONT)

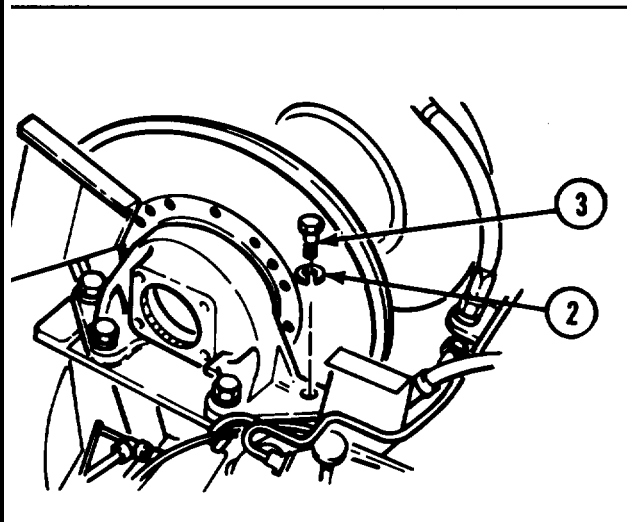
4 Roll vehicle tow drum winch (1) up lumber to front of cab into position for installation.



5 Pass sling through boom winch opening and attach to hoist.

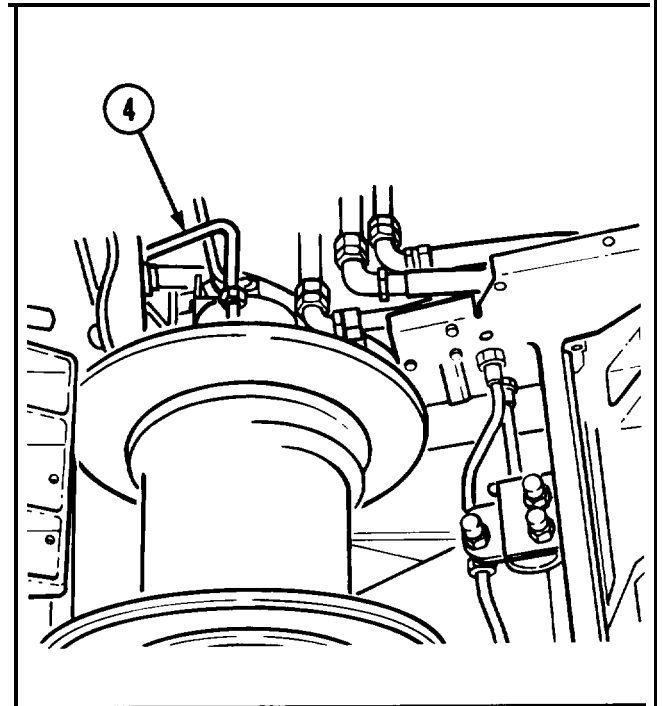


6 Lift vehicle tow drum winch (1), remove lumber, and lower tow drum winch into position into floor of cab.

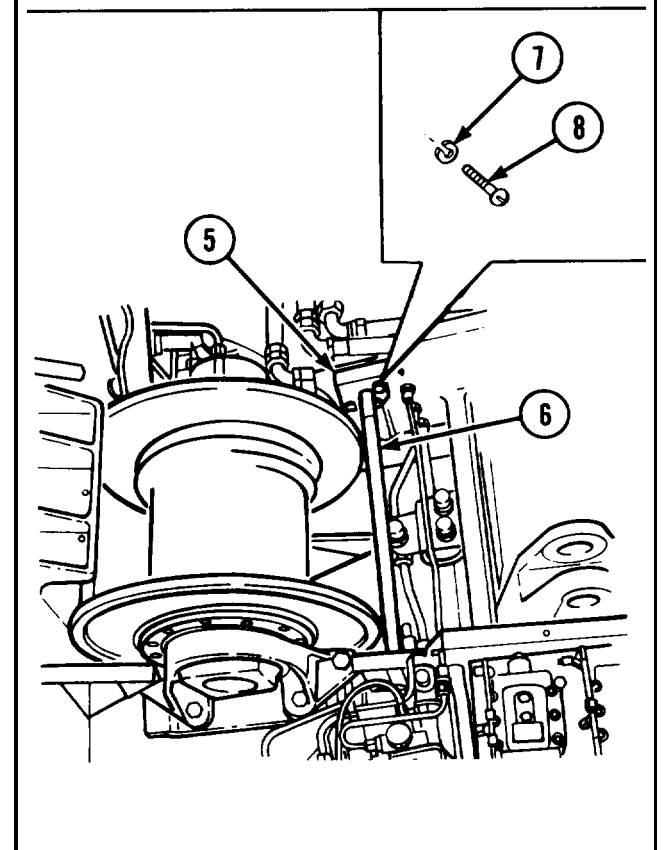


7 Install eight new lockwashers (2) and eight hexagon head capscrews (3). Torque hexagon head capscrews to 580 to 620 ft-lb (786 to 841 N-m).

- 8 Connect boom and tow winch motor drain metal tube assembly (4).



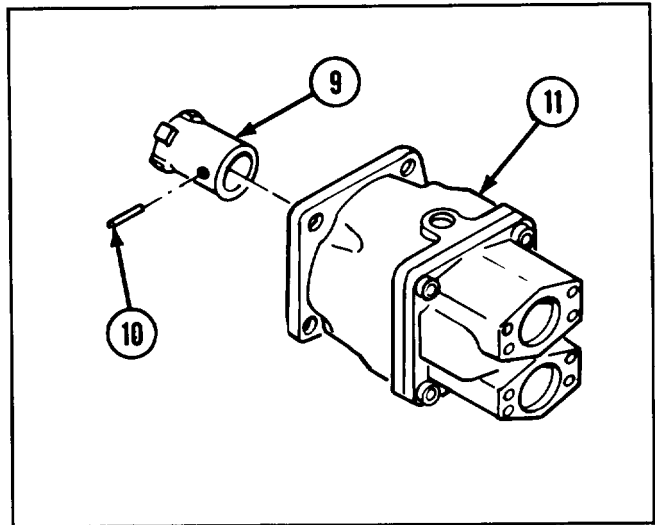
- 9 Install guard stub (5) and tow winch guard (6).
- 10 Install six new lockwashers (7) and six screws (8) on guard stub (5).



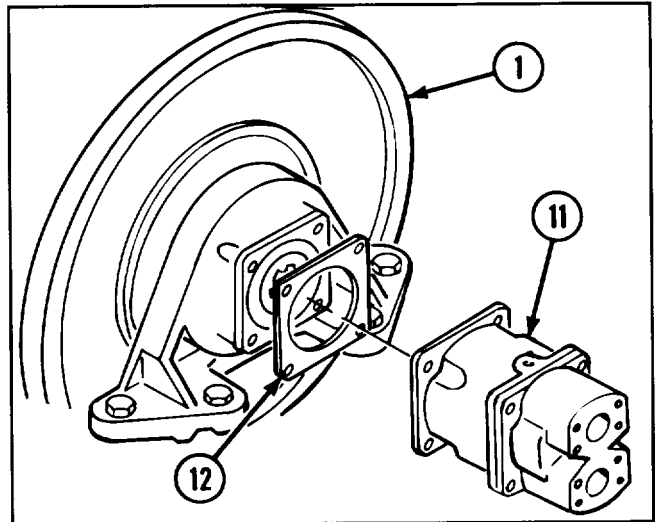
2-29. MAINTENANCE OF BOOM AND WINCH-TOW WINCH ASSEMBLY (CONT).

INSTALLATION (CONT)

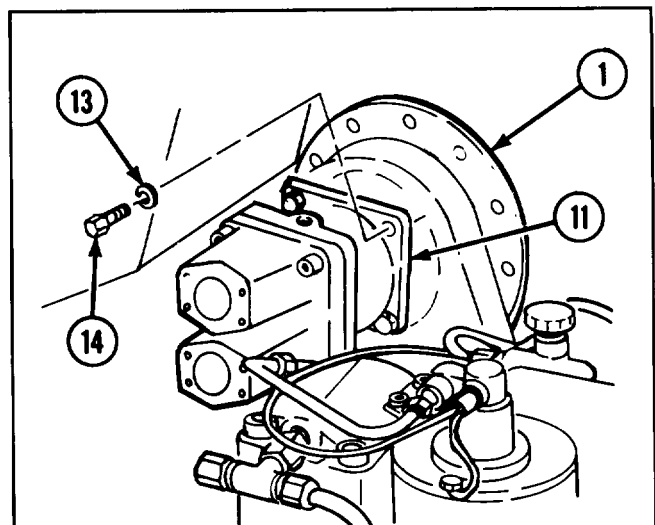
- 11 Using hammer and punch, install winch motor positive clutch half (9) and secure with spring pin (10) to hydraulic motor (11).



- 12 Install new motor to winch gasket (12) and hydraulic motor (11) to vehicle tow drum winch (1).



- 13 Install four new lockwashers (13) and four socket head capscrews (14) to secure hydraulic motor (11) to vehicle tow drum winch (1).



2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH.

This task covers: a. *Disassembly* c. *Reassembly*
 b. *Inspection/Repair* d. *Adjustment*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC5180-90-CL-N26)
 Jacking screws (4) (MS90726-123)
 Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
 Pliers, retaining ring
 Wrench set, open end fixed
 Wrench, torque, 0 to 175 ft-lb

Materials/Parts

Cotter pin (MS24665-285)
 Control cylinder gasket (10908418)
 Cylinder mounting plate gasket (10908428)
 Lockwasher (4) (MS35338-46)
 Lockwire (QQW461)
 Plain encased seal (2) (10911090)
 Preformed packing (MS28775-212)
 Preformed packing (M83461/11-341)
 Preformed packing (2) M83461/1-450)
 Sealing compound (item 18, appx B)

Spool repair kit (5702997)
 Tow winch brake plate carrier parts kit (5702984)
 Tow winch carrier parts kit (5702979)

References

TM 9-2350-238-24P-2

Equipment Conditions

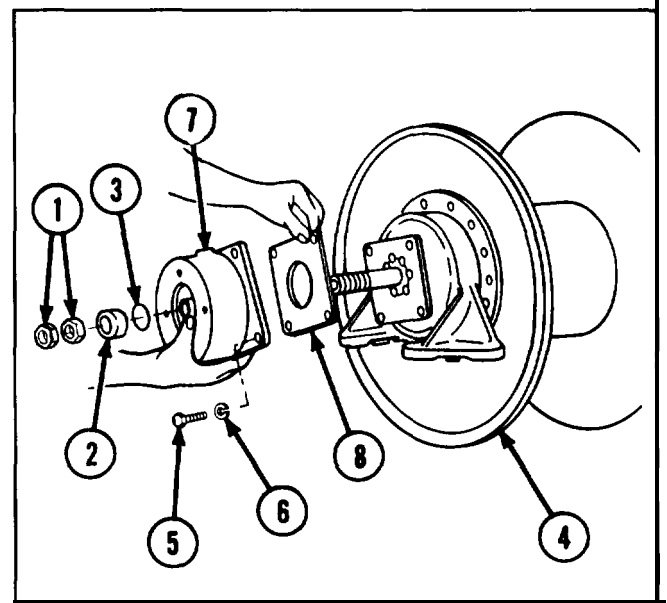
2-103 Vehicle drum winch removed
 2-103 Vehicle tow drum winch hydraulic motor removed

General Safety Instructions



Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

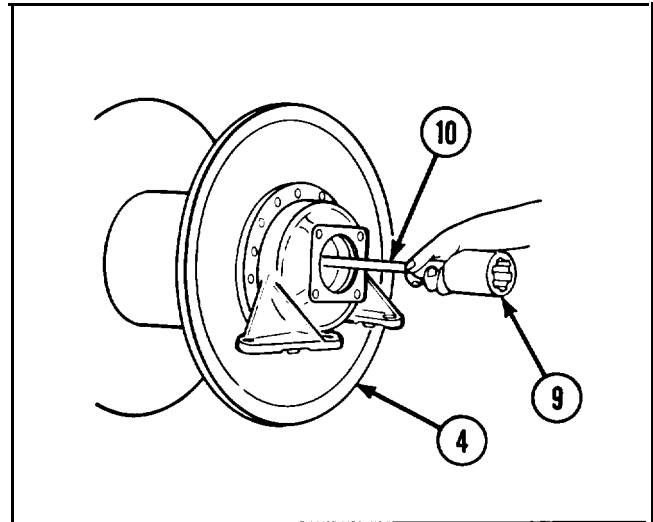
- 1 Remove two hexagon plain nuts (1), winch cylinder collar (2), and preformed packing (3) from brake control end of planetary winch drum (4).
- 2 Remove four hexagon capscrews (5), four lockwashers (6), winch control cylinder (7), and control cylinder gasket (8) from winch control end of planetary winch drum (4).



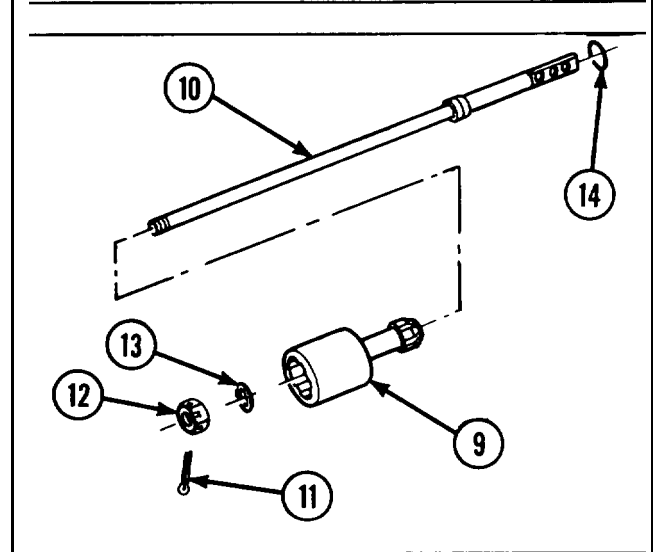
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

DISASSEMBLY (CONT)

3 Remove spool (9) and winch shift rod (10) from motor end of planetary winch drum (4).

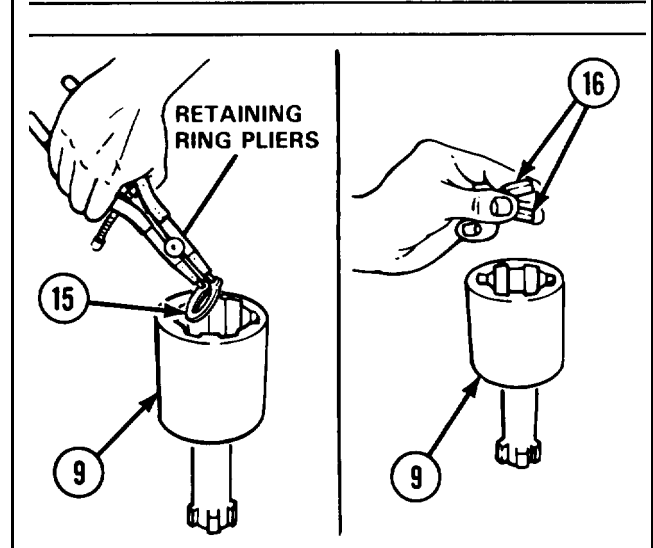


4 Remove cotter pin (11), slotted plain nut (12), rod and bearing to winch shaft thrust washer bearing (13), and spool (9) from winch shift rod (10).

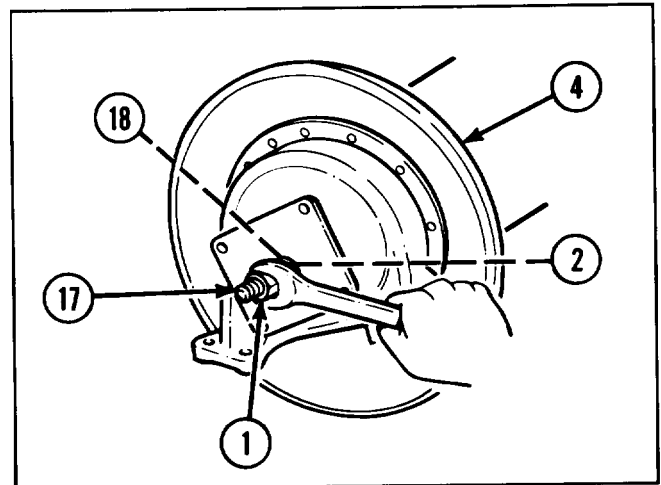


5 Remove preformed packing (14) from winch shift rod (10).

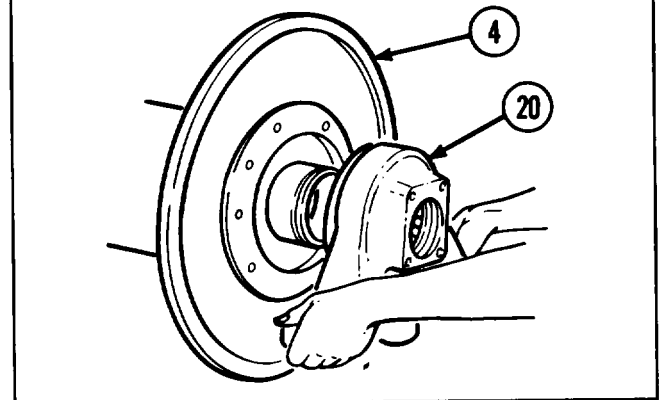
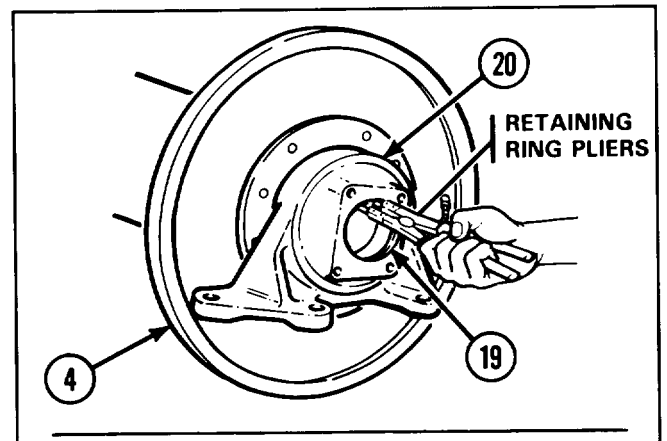
6 Using retaining ring pliers, remove retaining ring (15) and two shift rod annular ball bearings (16) from spool (9).



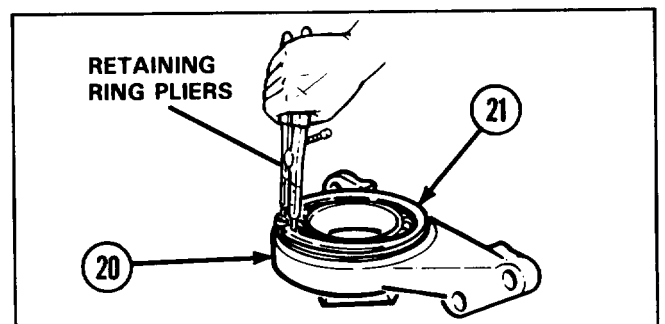
- 7 Working from winch control end of planetary winch drum (4), install winch cylinder collar (2) removed in disassembly step 1 on winch carrier brake rod (17).
- 8 Install flat washers (18), as needed, to allow one of the hexagon nuts (1) removed in disassembly step 1 to be tightened on winch carrier brake rod (17).
- 9 Install and tighten hexagon plain nut (1) on winch carrier brake rod (17) to relieve pressure on brake plates inside planetary winch drum (4).



- 10 Using retaining ring pliers, remove retaining ring (19) and motor end winch support (20) from motor end of planetary winch drum (4).



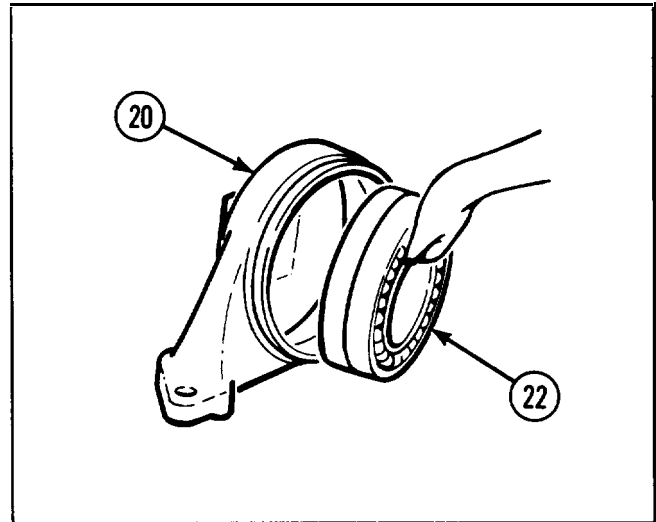
- 11 Using retaining ring pliers, remove retaining ring (21) from inside motor end winch support (20).



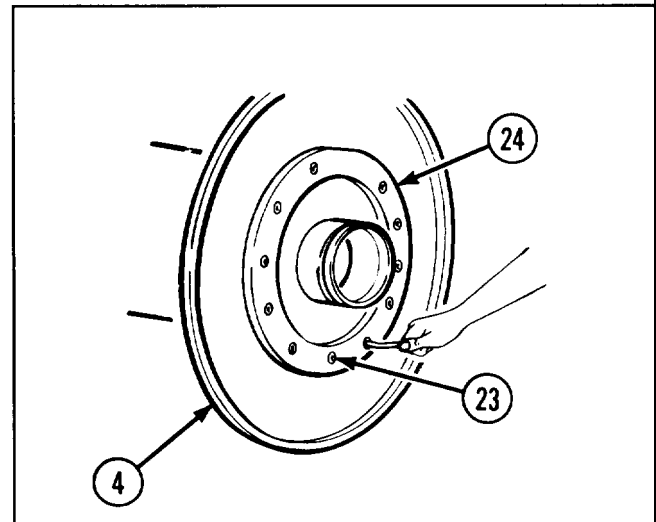
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

DISASSEMBLY (CONT)

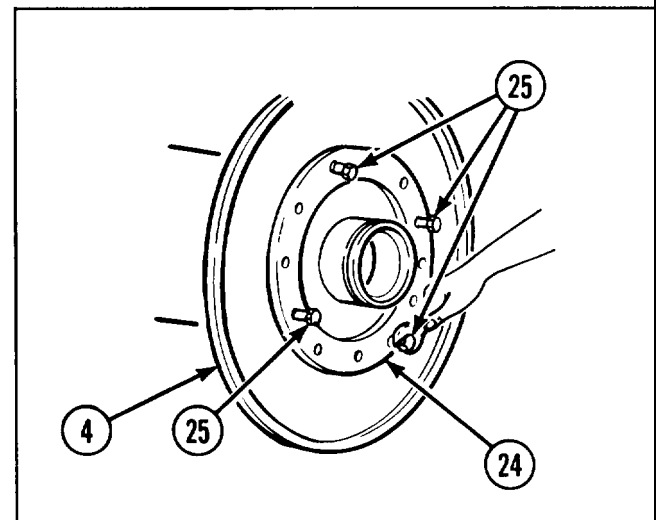
12 Remove self-aligning roller bearing (22) from inside motor end winch support (20).



13 Remove 11 socket head capscrews (23) from winch brake housing (24) on motor end of planetary winch drum (4).

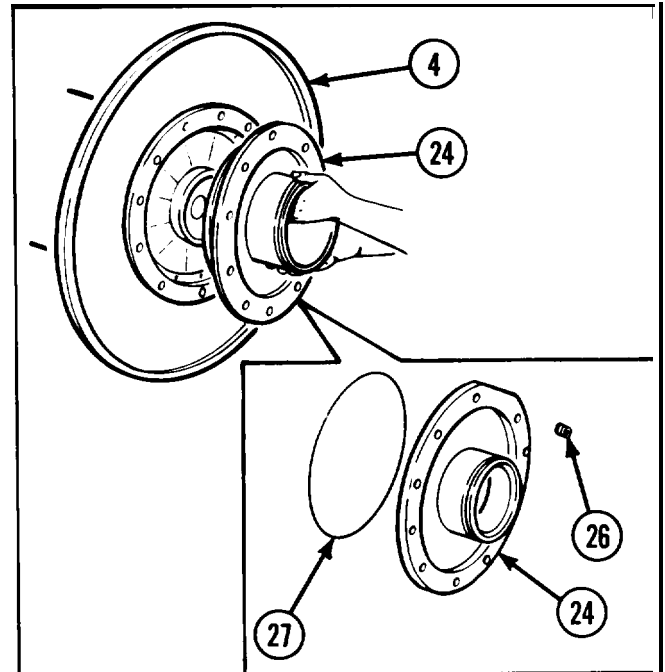


14 Working from motor planetary winch drum (4), install four jacking screws (25) in winch brake housing (24). Tighten until winch brake housing is free. Remove four jacking screws (25).

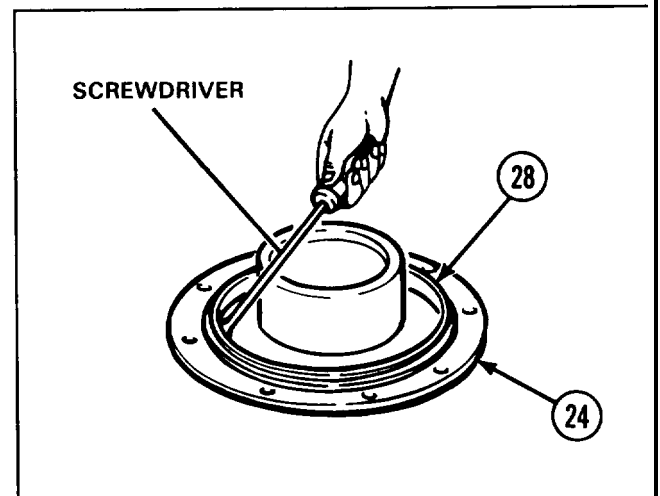


15 Remove winch brake housing (24) from motor end of planetary winch drum (4).

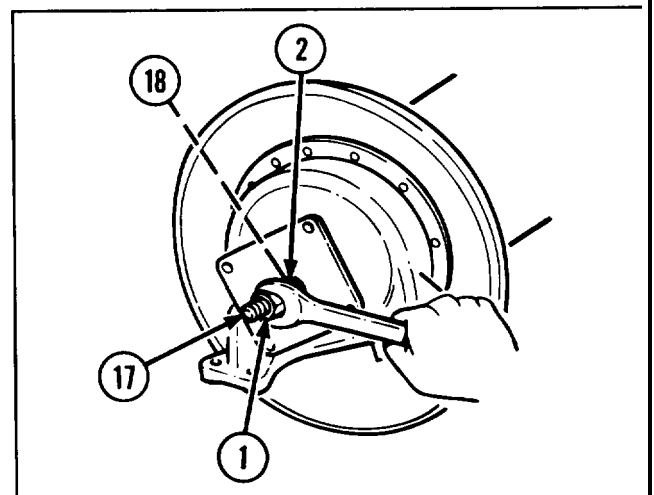
16 Remove pipe plug (26) and preformed packing (27) from winch brake housing (24).



17 Using screwdriver, remove carrier housing plain encased seal (28) from winch brake housing (24).



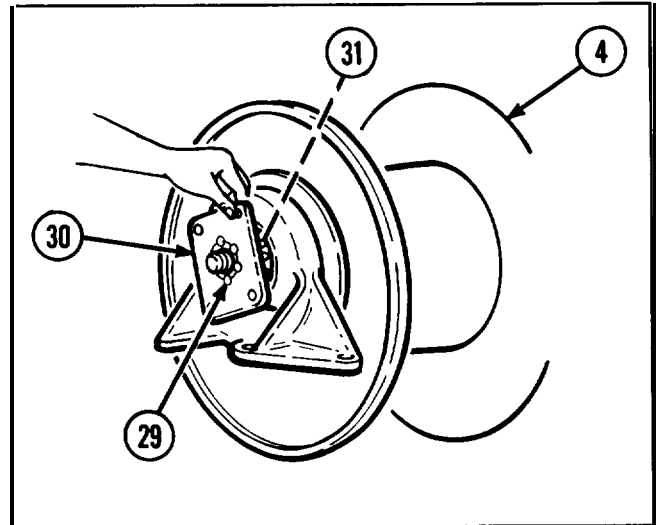
18 Remove hexagon plain nut (1), flat washer (18), and winch cylinder collar (2) from winch carrier brake rod (17).



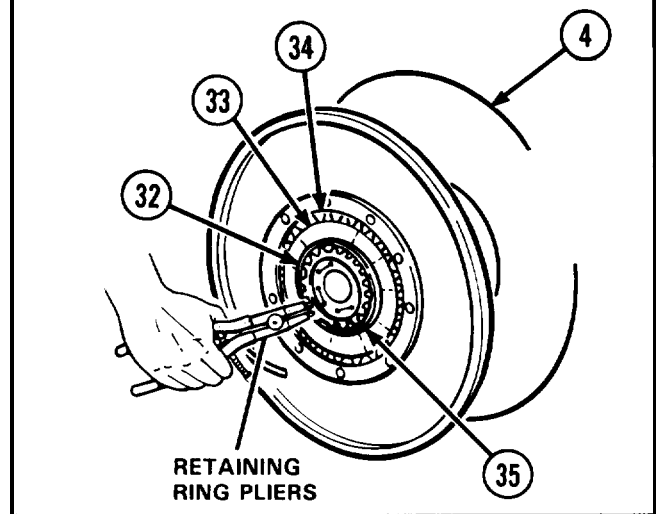
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

DISASSEMBLY (CONT)

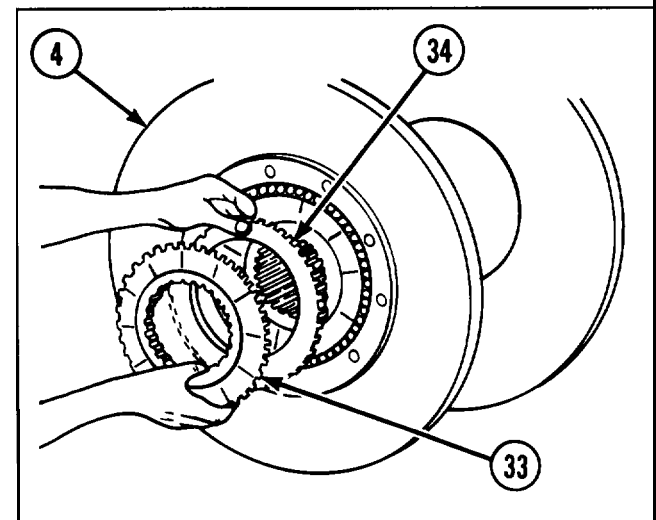
19 Remove six machine screws (29), cylinder mounting adapter plate (30), and cylinder mounting plate gasket (31) from winch control end of planetary winch drum (4).



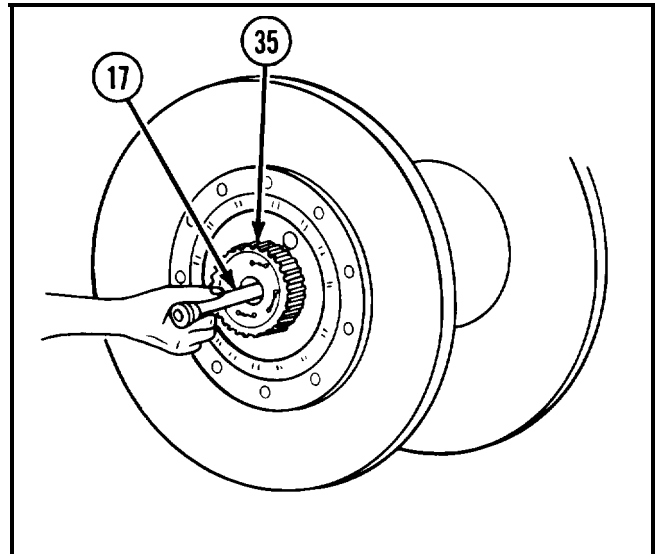
20 Using retaining ring pliers, remove retaining ring (32) from motor end of planetary winch drum (4) securing three brake plates (33) and four sliding sleeve brake clutches (34) to stage one carrier assembly (35).



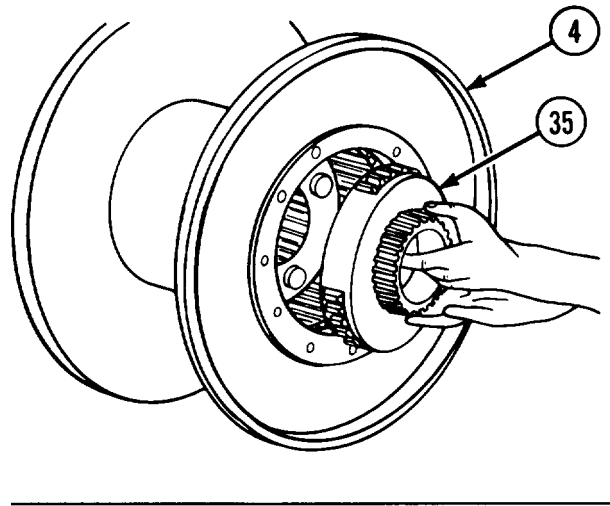
21 Remove three brake plates (33) and four sliding sleeve brake clutches (34) from motor end of planetary winch drum (4).



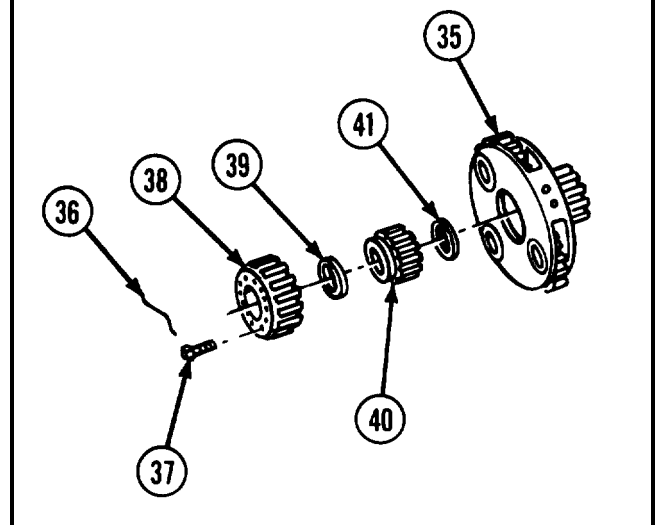
- 22 Remove winch carrier brake rod (17) through bore of stage one carrier assembly (35).



- 23 Remove stage one carrier assembly (35) from motor end of planetary winch drum (4).



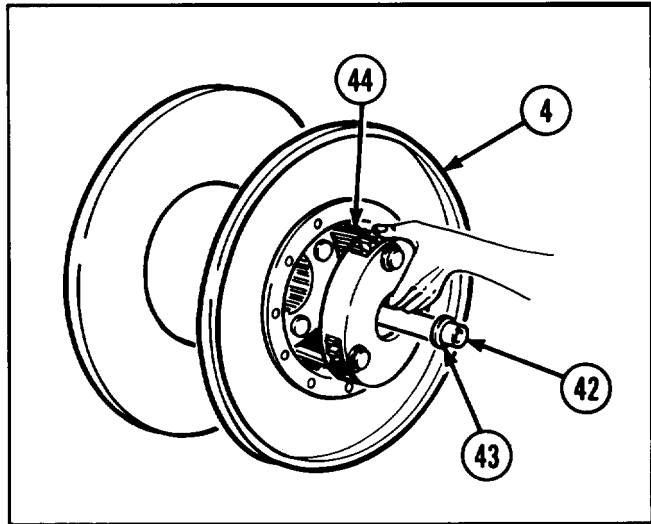
- 24 Remove lockwire (36), 12 machine bolts (37), carrier brake spur gear (38), flat washer (39), first stage carrier spur gear (40), and flat washer (41) from stage one carrier assembly (35).



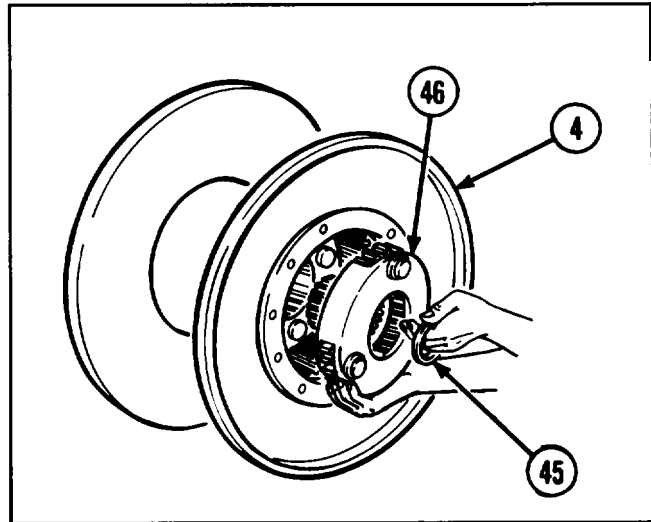
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

DISASSEMBLY (CONT)

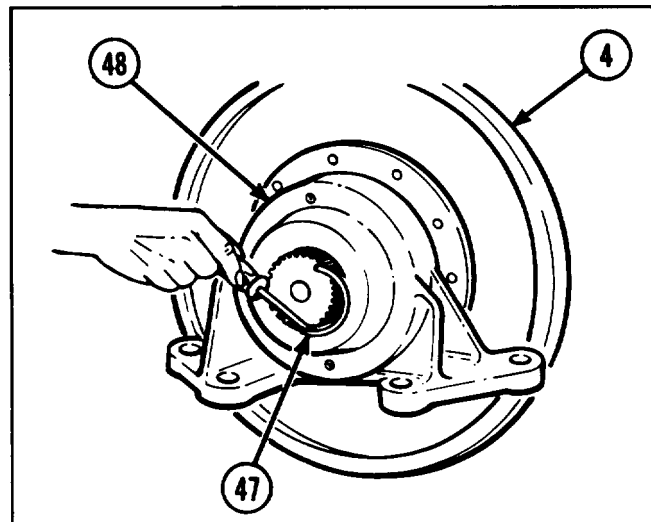
25 Remove metallic tubing (42), flat washer (43), and stage two carrier assembly (44) from motor end of planetary winch drum (4).



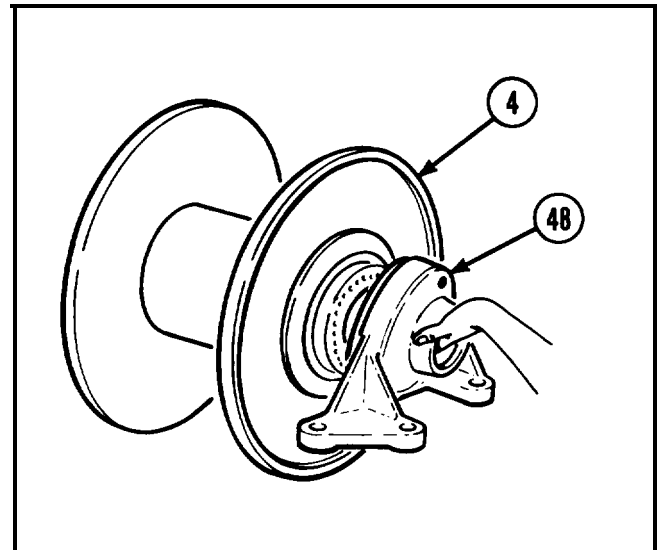
26 Remove flat washer (45) and stage three carrier assembly (46) from motor end of planetary winch drum (4).



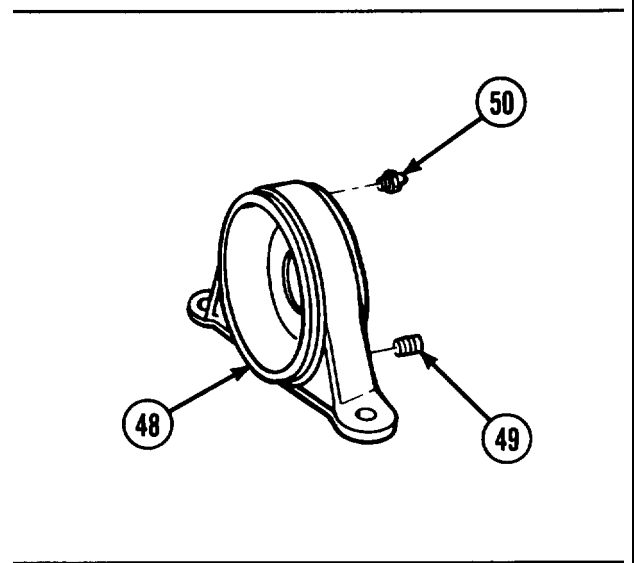
27 Working from winch control end of planetary winch drum (4), remove carrier shaft retaining ring (47) from winch reaction end support (48).



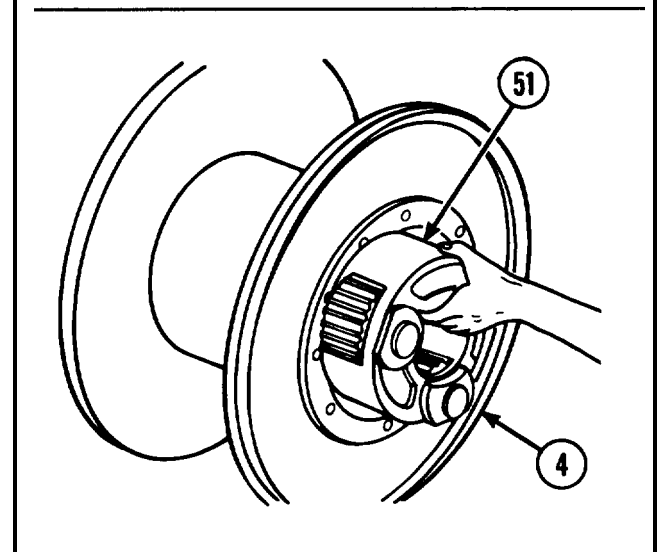
- 28 Remove winch reaction end support (48) from winch control end of planetary winch drum (4).



- 29 Remove two pipe plugs (49) and safety relief valve (50) from winch reaction end support (48).



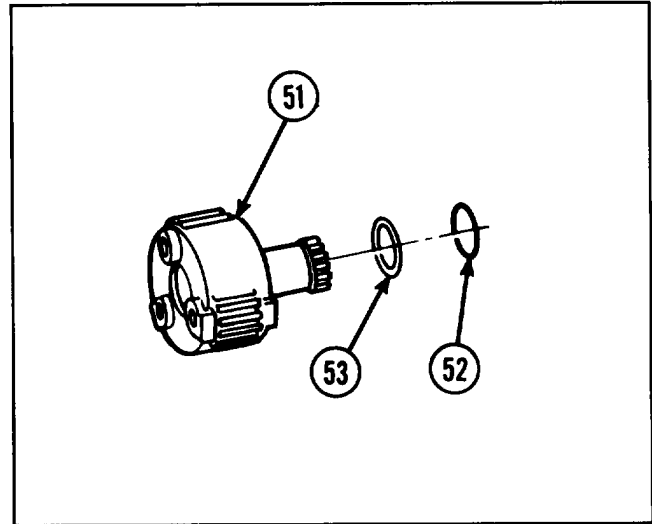
- 30 Remove stage four carrier assembly (51) from motor end of planetary winch drum (4).



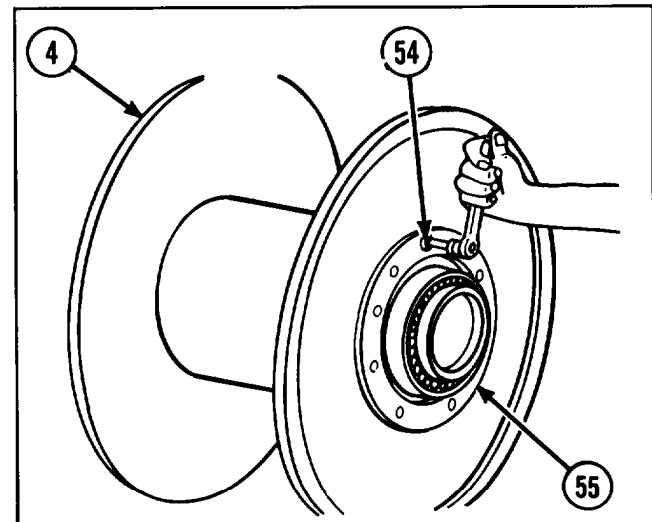
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

DISASSEMBLY (CONT)

- 31 Remove preformed packing (52) and carrier housing thrust washer-bearing (53) from stage four carrier assembly (51).



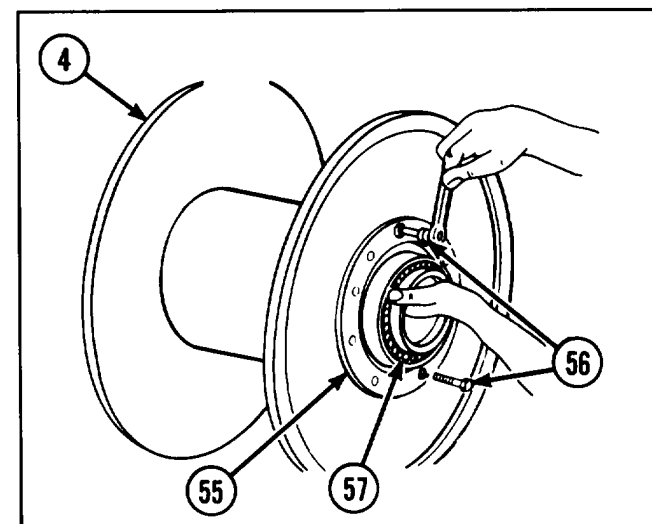
- 32 Remove 11 socket head capscrews (54) from winch brake housing (55) on brake control end of planetary winch drum (4).



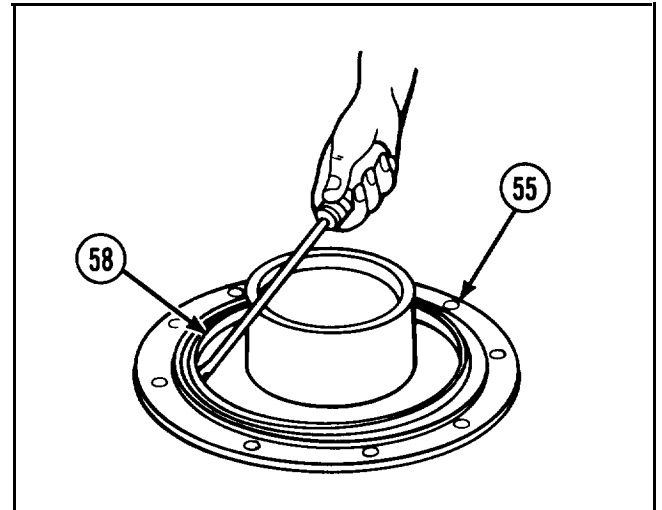
- 33 Install four jacking screws (56) in winch brake housing (55). Tighten until winch brake housing (55) is free. Remove four jacking screws (56).

- 34 Remove winch brake housing (55) from brake control end of planetary winch drum (4).

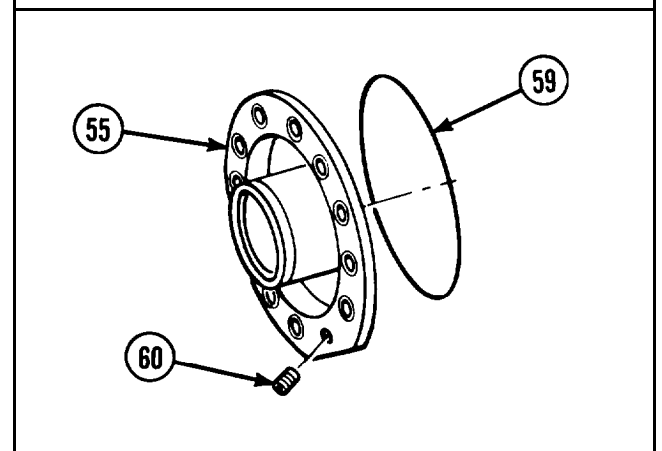
- 35 Remove self-aligning roller bearing (57) from winch brake housing (55).



36 Remove carrier housing plain encased seal (58) from winch brake housing (55).



37 Remove preformed packing (59) and pipe plug (60) from winch brake housing (55).



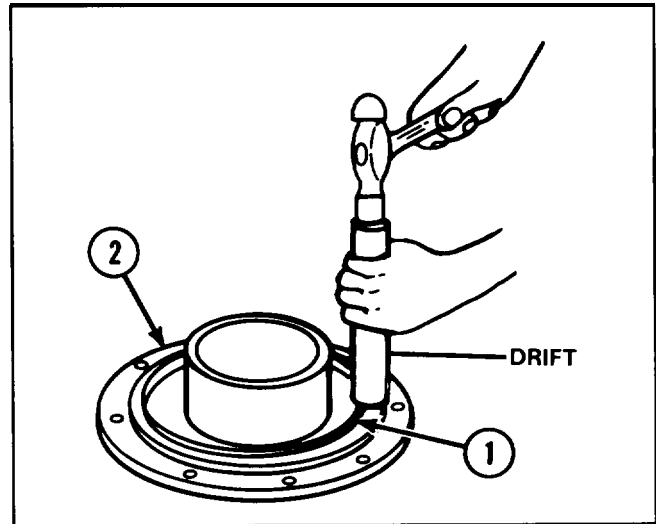
INSPECTION/REPAIR

- 1 Check for broken, damaged, or missing parts.
- 2 If planetary winch drum is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If winch brake housing is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 Stage one carrier assembly is a repairable assembly. Refer to page 2-132.
- 5 Stage two carrier assembly is a repairable assembly. Refer to page 2-137.
- 6 Stage three carrier assembly is a repairable assembly. Refer to page 2-141.
- 7 Stage four carrier assembly is a repairable assembly. Refer to page 2-145.
- 8 Winch control cylinder is a repairable assembly. Refer to page 2-64.
- 9 If any kit component is damaged replace entire parts kit.
- 10 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

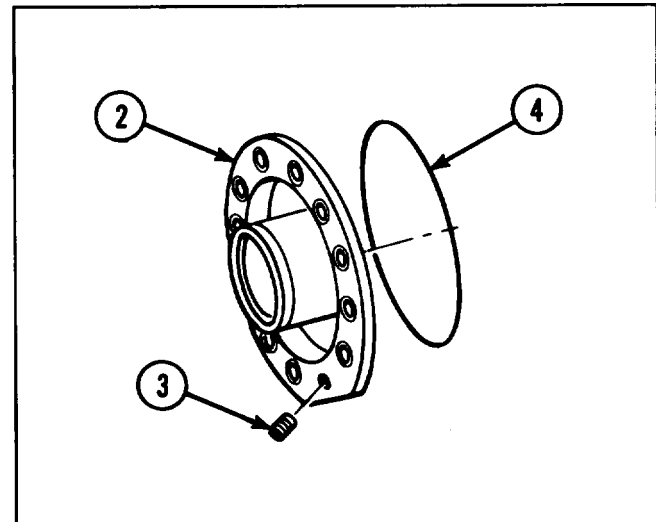
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

REASSEMBLY

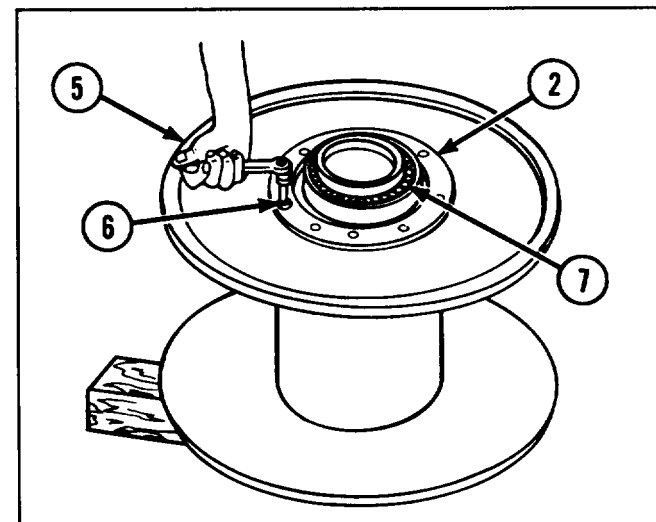
- 1 Coat mating surfaces of new carrier housing plain encased seal (1) and winch brake housing (2) with sealing compound (item 18, appx B). Using hammer and drift, install new carrier housing plain encased seal (1) on winch brake housing (2).



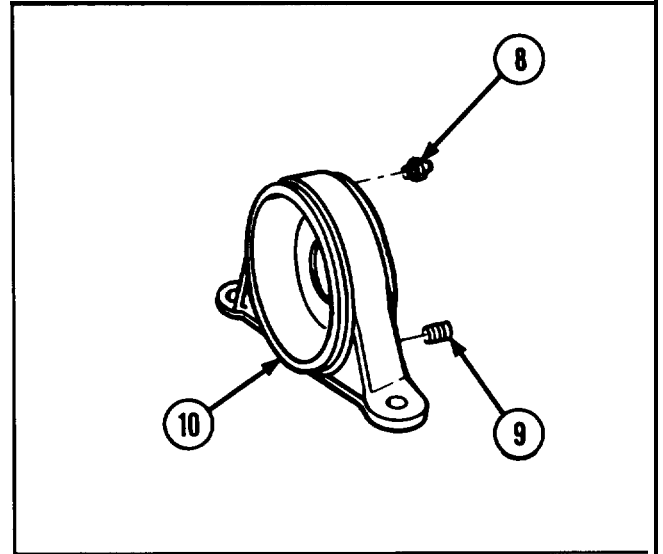
- 2 Install pipe plug (3) and new preformed packing (4) in winch brake housing (2).



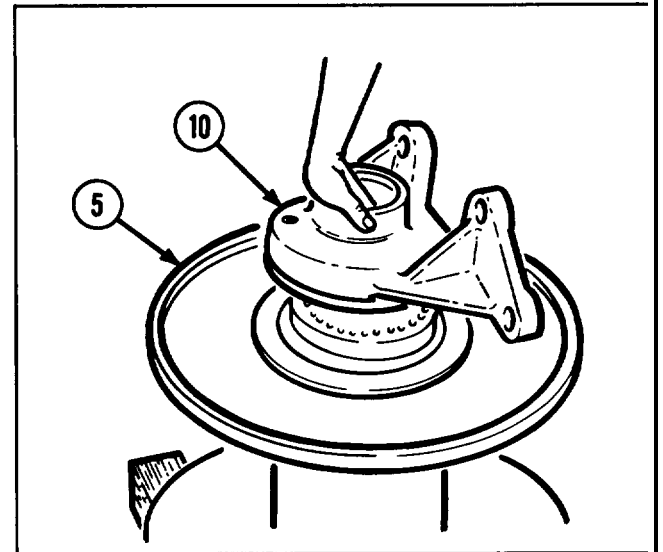
- 3 Support planetary winch drum (5) in a vertical position with winch control end on top.
- 4 Install winch brake (2) on planetary winch drum (5) and secure with 11 socket head capscrews (6). Torque socket head capscrews to 40 ft-lb (54 N-m).
- 5 Install self-aligning roller bearing (7) on winch brake housing (2).



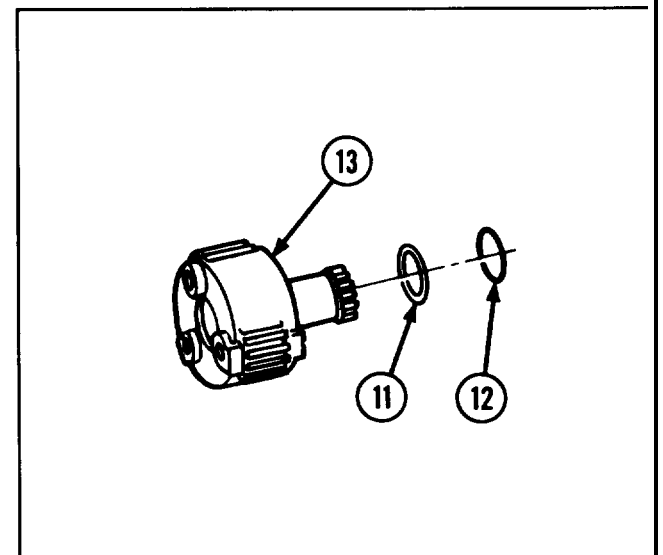
- 6 Install safety relief valve (8) and two pipe plugs (9) in winch reaction end support (10),



- 7 Install winch reaction end support (10) on winch control end of planetary winch drum (5).



- 8 Install carrier housing thrust washer bearing (11) and new preformed packing (12) on stage four carrier assembly (13).



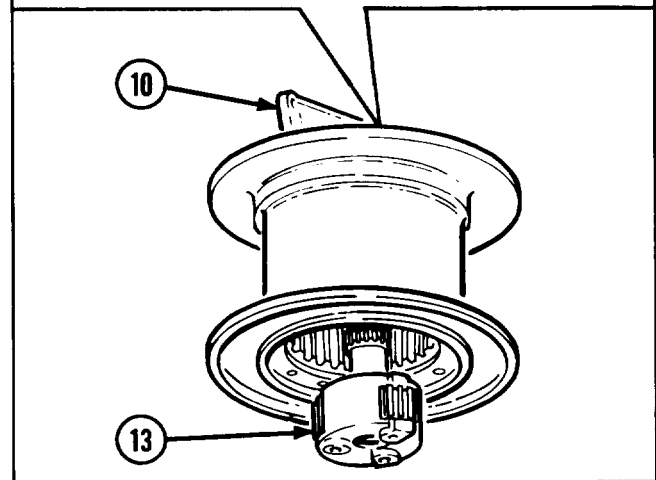
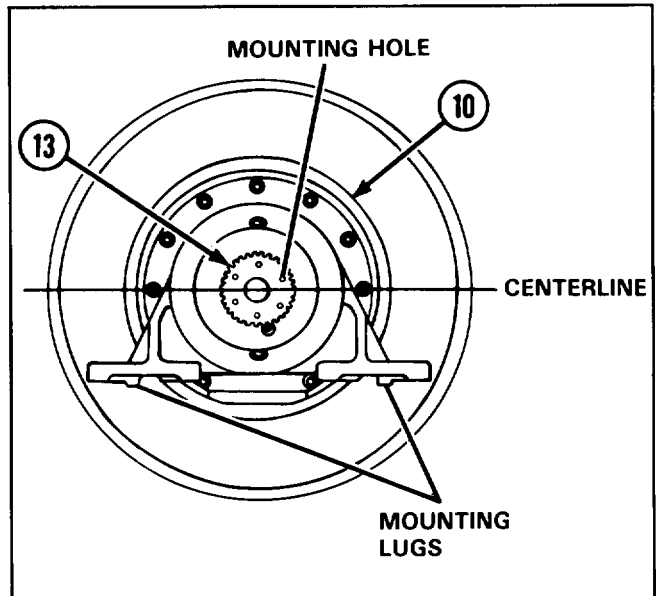
2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

REASSEMBLY (CONT)

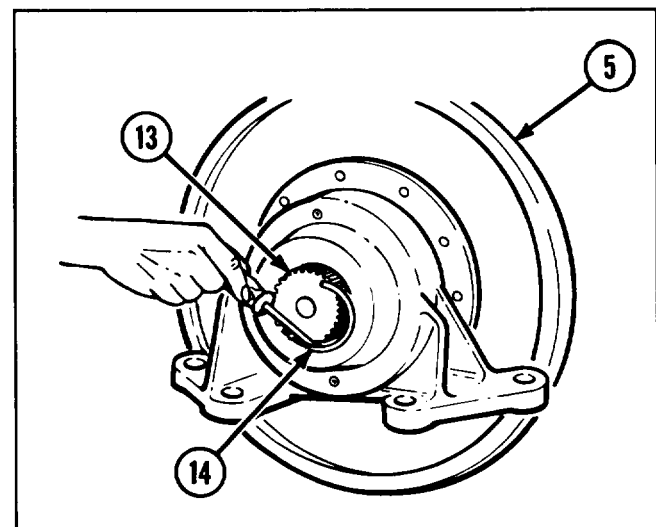
NOTE

Centerline of reaction end winch support is drawn between mounting lugs as illustrated.

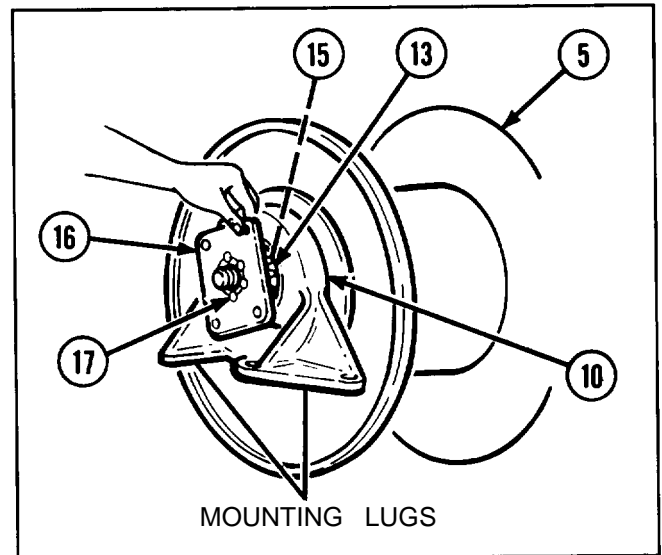
- 9 Position shaft of stage four carrier assembly (13) in reaction end winch support (10) so that one tapered adapter plate mounting hole is located two gear teeth counterclockwise from centerline of reaction end winch support (10).



- 10 Working from winch control end of planetary winch drum (5), install retaining ring (14) in groove of stage four carrier assembly (13).

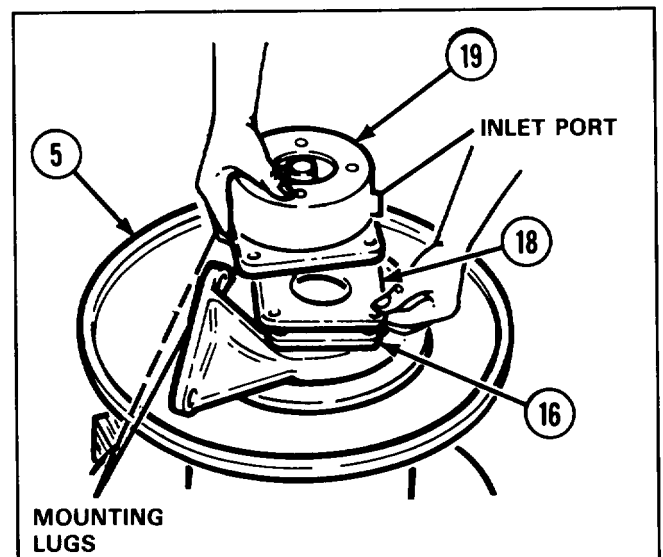


- 11 Working from winch control end of planetary winch drum (5), install new cylinder mounting plate gasket (15) and cylinder mounting adapter plate (16) on shaft of stage four carrier assembly (13). Ensure cylinder mounting adapter plate (16) is installed in same position to mounting lugs of reaction end winch support (10).

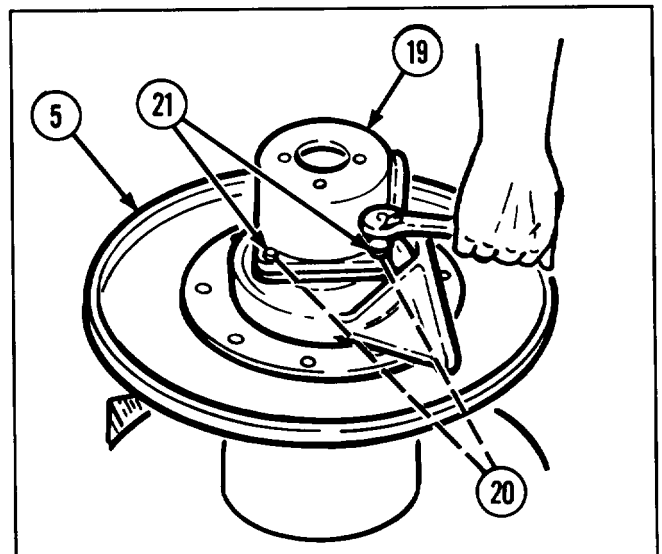


- 12 Install six machine screws (17) and torque to 5.0 ft-lb (6.8 N-m).

- 13 Install new control cylinder gasket (18) and winch control cylinder (19) on cylinder mounting adapter plate (16) at winch control end of planetary winch drum (5). Ensure inlet port of winch control cylinder (19) is positioned opposite mounting lugs.



- 14 Install four new lockwashers (20) and four hexagon capscrews (21) securing winch control cylinder (19) to winch control end of planetary winch drum (5). Torque four hexagon capscrews to 18 ft-lb (24 N-m).

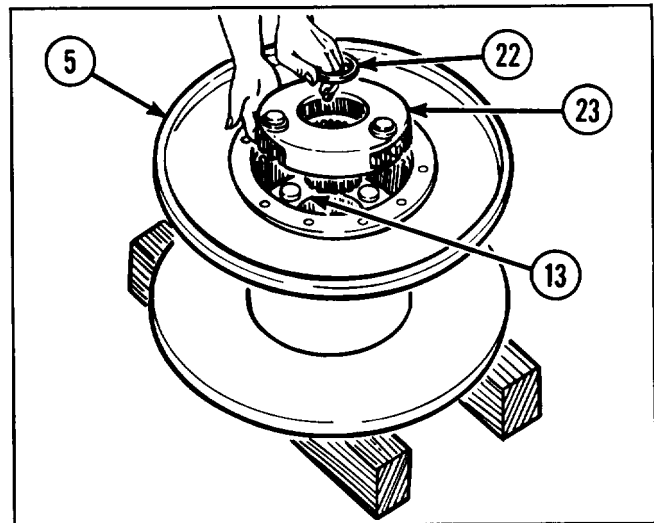


2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

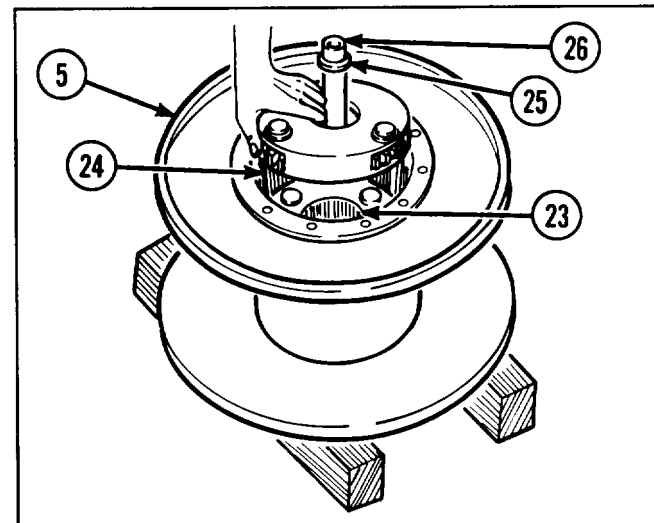
REASSEMBLY (CONT)

15 Turn planetary winch drum (5) over so that open end (motor end) is facing upward.

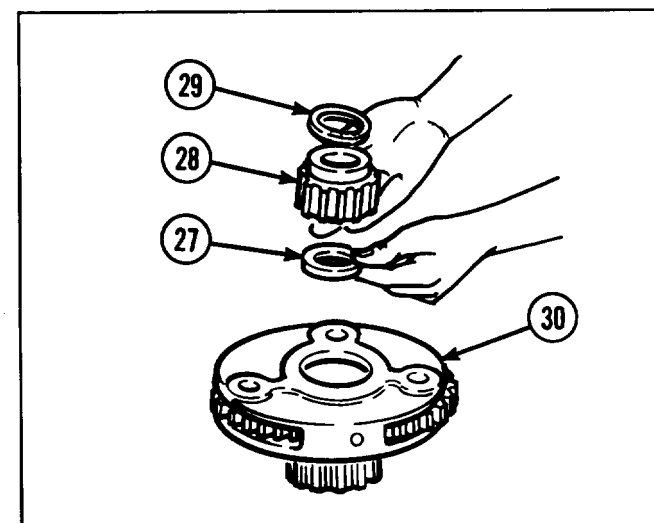
16 Install new flat washer (22) in stage three carrier assembly (23) and install stage three carrier assembly in planetary winch drum (5). Turn stage three carrier assembly (23) until it aligns with stage four carrier assembly (13) inside planetary winch drum (5) and drops into place.



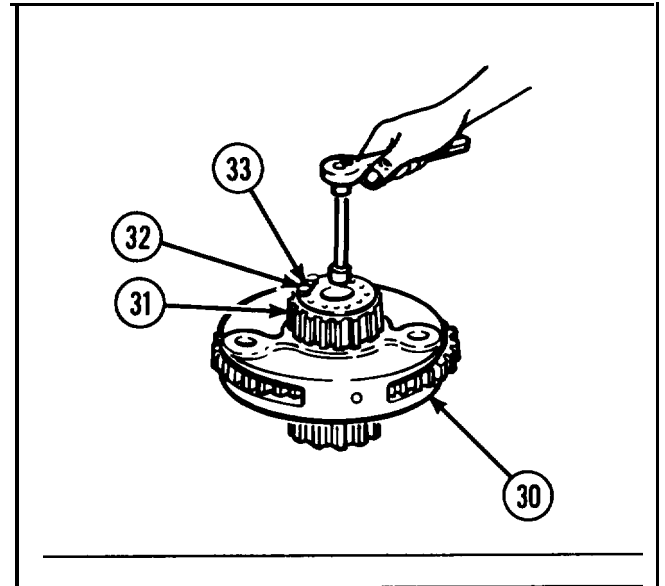
17 Install stage two carrier assembly (24), new flat washer (25), and metallic tube (26) in motor end of planetary winch drum (5). Turn stage two carrier assembly (24) until it aligns with stage three carrier assembly (23) in planetary winch drum (5) and drops into place.



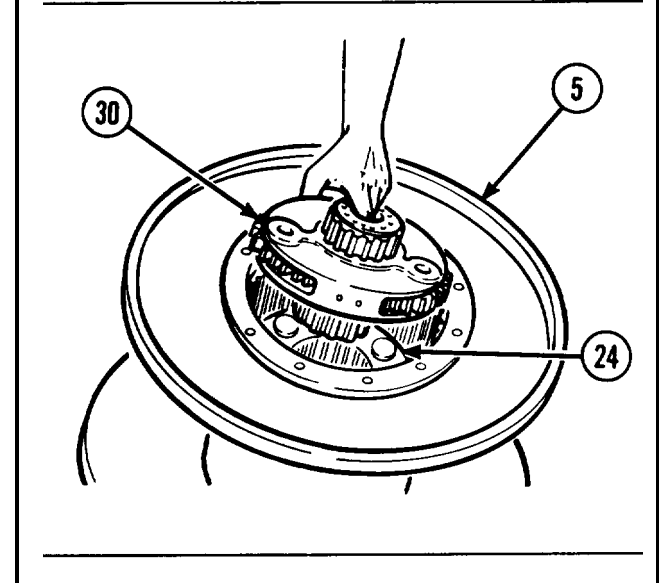
18 Install new flat washer (27), first stage carrier spur gear (28), and new flat washer (29) in stage one carrier assembly (30).



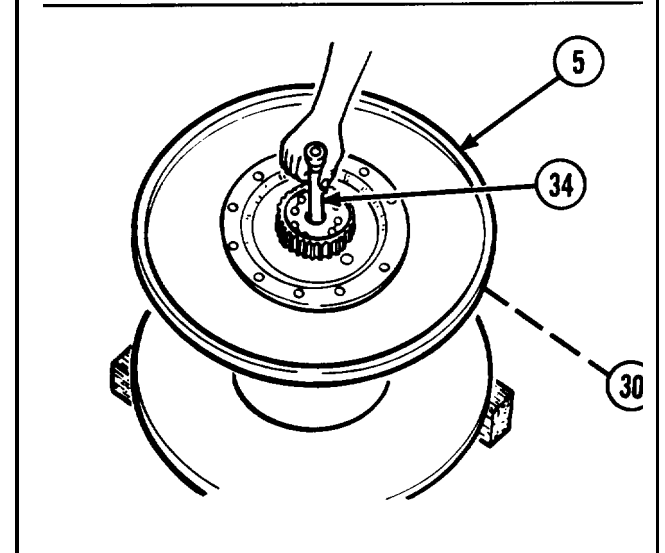
- 19 Install carrier brake spur gear (31) on stage one carrier assembly (30) and secure with 12 machine bolts (32) and new lockwire (33).



- 20 Install stage one carrier assembly (30) in motor end of planetary winch drum (5). Turn stage one carrier assembly until it aligns with stage two carrier assembly (24) and drops into place.



- 21 Install carrier brake rod (34) through all carrier assemblies inside planetary winch drum (5) until it seats in stage one carrier assembly (30).



2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

REASSEMBLY (CONT)

- 22 Install new preformed packing (35), winch collar (36), and two hexagon plain nuts (37) on carrier brake rod (34) at brake control end of planetary winch drum (5).

WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2), Wipe up spilled hydraulic fluid.

NOTE

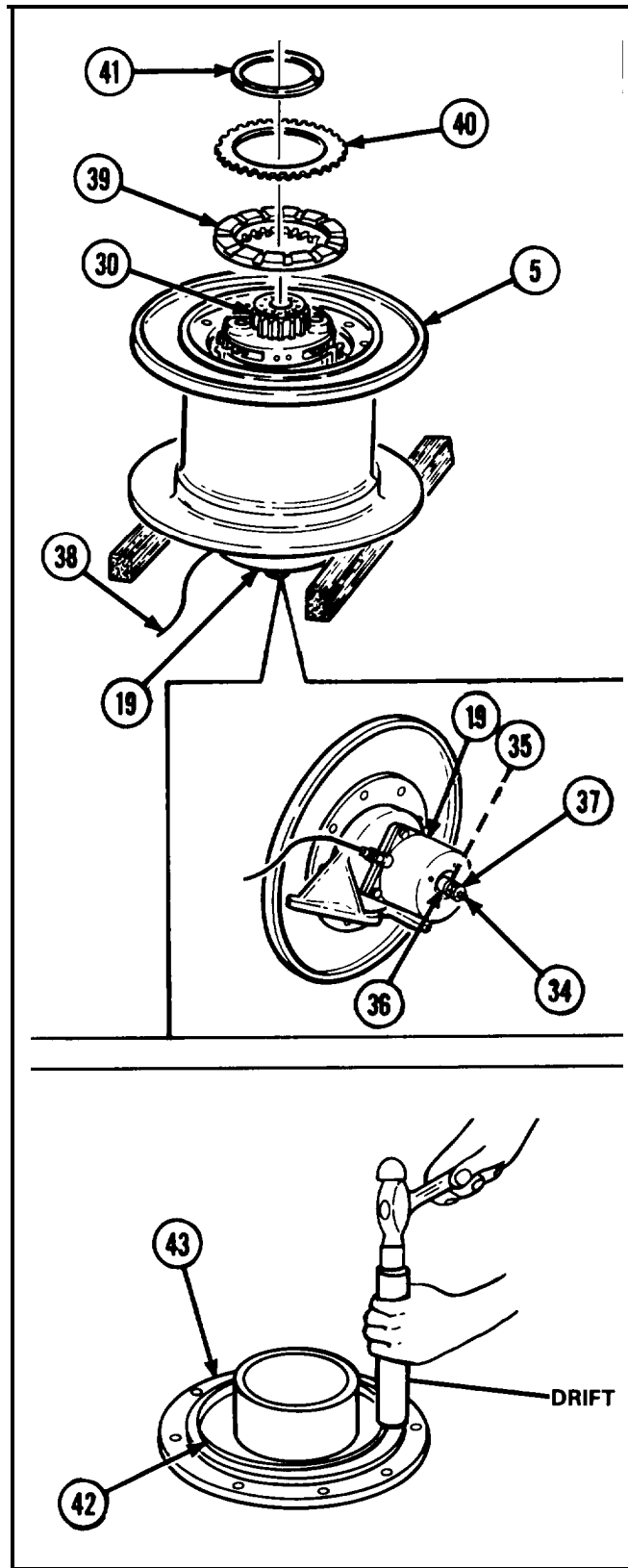
Refer to TM 9-4940-468-14 for step 23 setup procedures.

- 23 Connect hydraulic line (38) to intake port of winch control cylinder (19). Apply 200 psi (1379 kPa) hydraulic pressure to winch control cylinder. Maintain even pressure until motor end winch support is installed on planetary winch drum (5) in reassembly step 30.

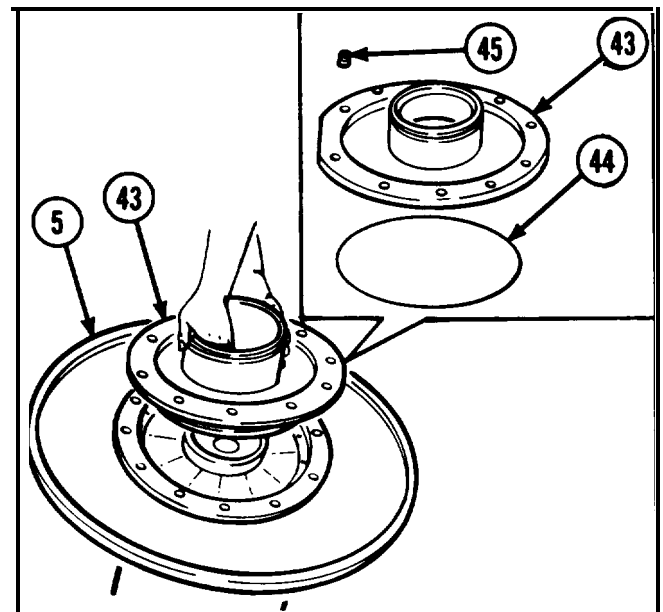
CAUTION

Ensure sliding sleeve brake clutch and brake plate are installed one after another until all seven items are installed.

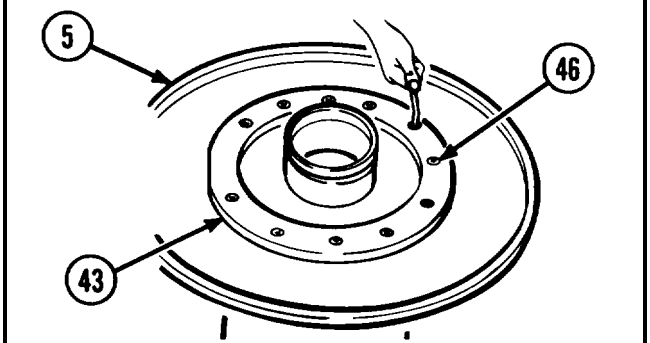
- 24 Install four sliding sleeve brake clutches (39), three brake plates (40), and retaining ring (41) on stage one carrier assembly (30) inside motor end of planetary winch drum (5).
- 25 Coat mating surfaces of new carrier housing plain encased seal (42) and winch brake housing (43) with sealing compound (item 18, appx B). Using drift and hammer, install new carrier housing plain encased seal (42) on winch brake housing.



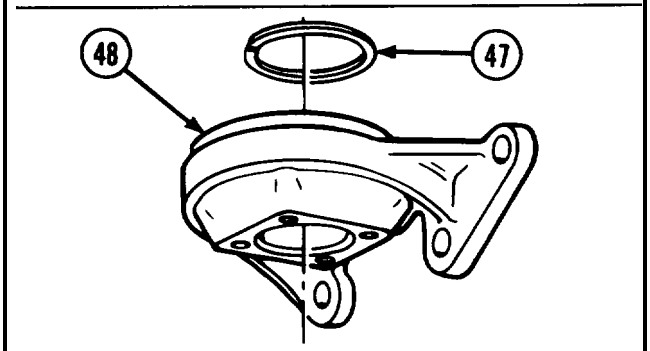
- 26 Install new preformed packing (44) and pipe plug (45) on winch brake housing (43).



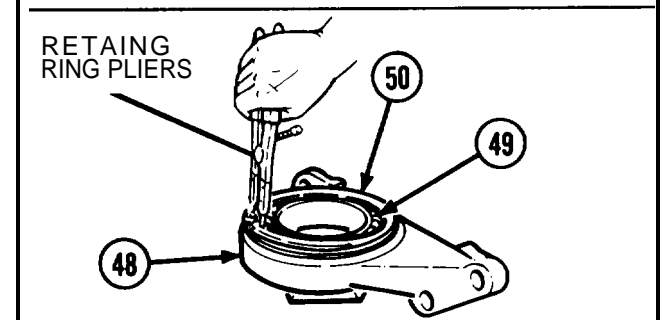
- 27 Install winch brake housing (43) on motor end of planetary winch drum (5) and secure with 11 socket head cap-screws (46). Torque socket head cap-screws to 50 ft-lb (68 N-m).



- 28 Position retaining ring (47) in bottom of motor end winch support (48).



- 29 Install self-aligning roller bearing (49) and, using retaining ring pliers, install retaining ring (50) in motor end winch support (48).

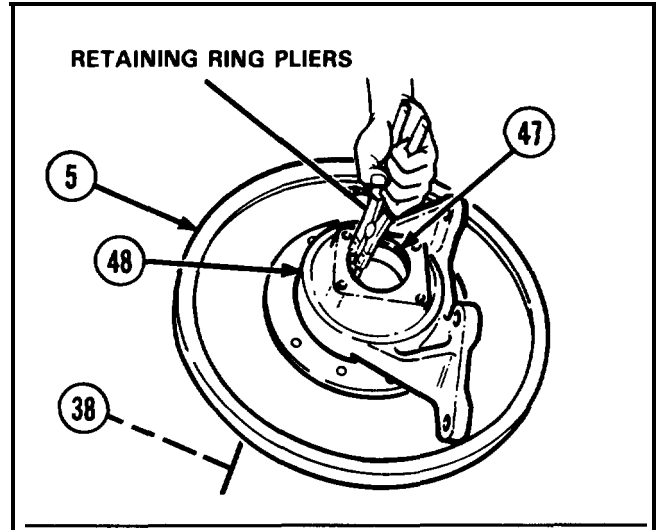


2-30. MAINTENANCE OF VEHICLE TOW DRUM WINCH (CONT).

REASSEMBLY (CONT)

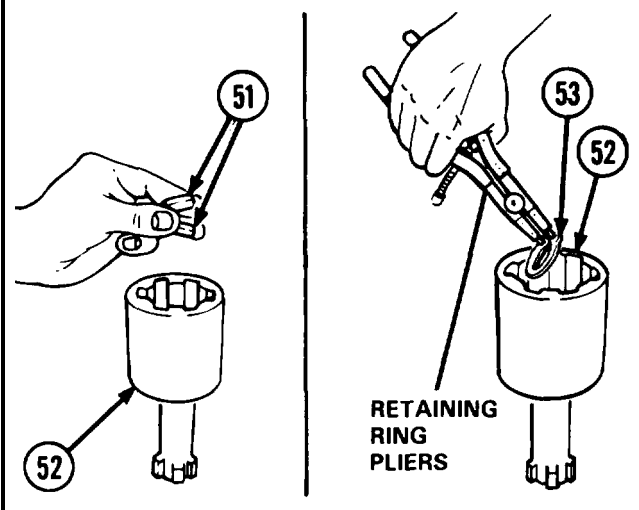
30 Install motor end winch support (48) on motor end of planetary winch drum (5) and using retaining ring pliers, secure with retaining ring (47).

31 Release hydraulic pressure and remove hydraulic line (38) installed in reassembly step 24,



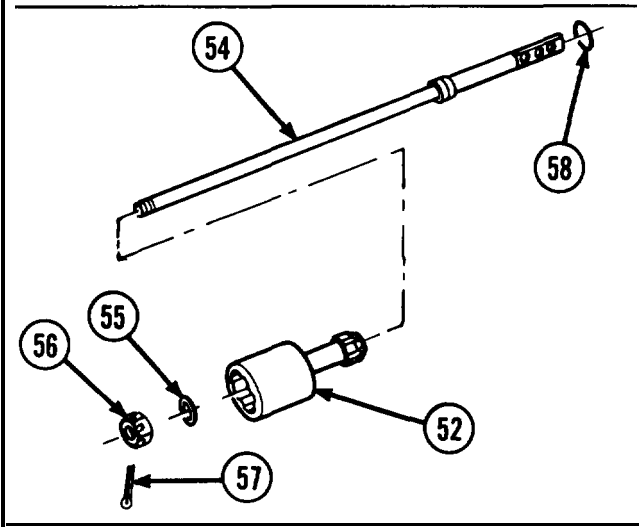
32 Install two shift rod annular roller bearings (51) in new spool (52).

33 Using retaining ring pliers, install retaining ring (53) in spool (52).



34 Install winch shift rod (54) in spool (52) and secure with rod and bearing to winch shaft thrust washer bearing (55), plain slotted nut (56), and new cotter pin (57).

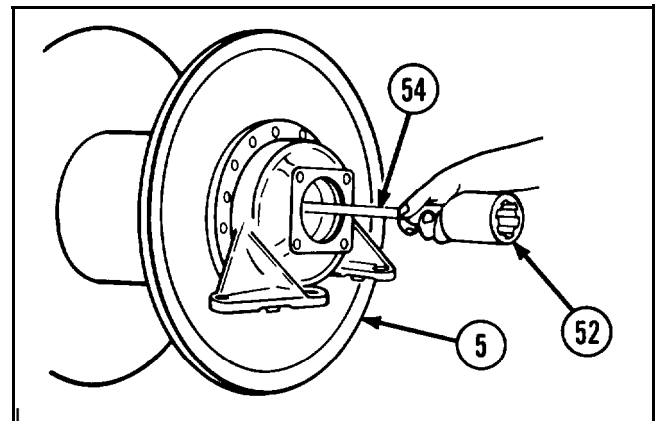
35 Install new preformed packing (58) on winch shift rod (54).



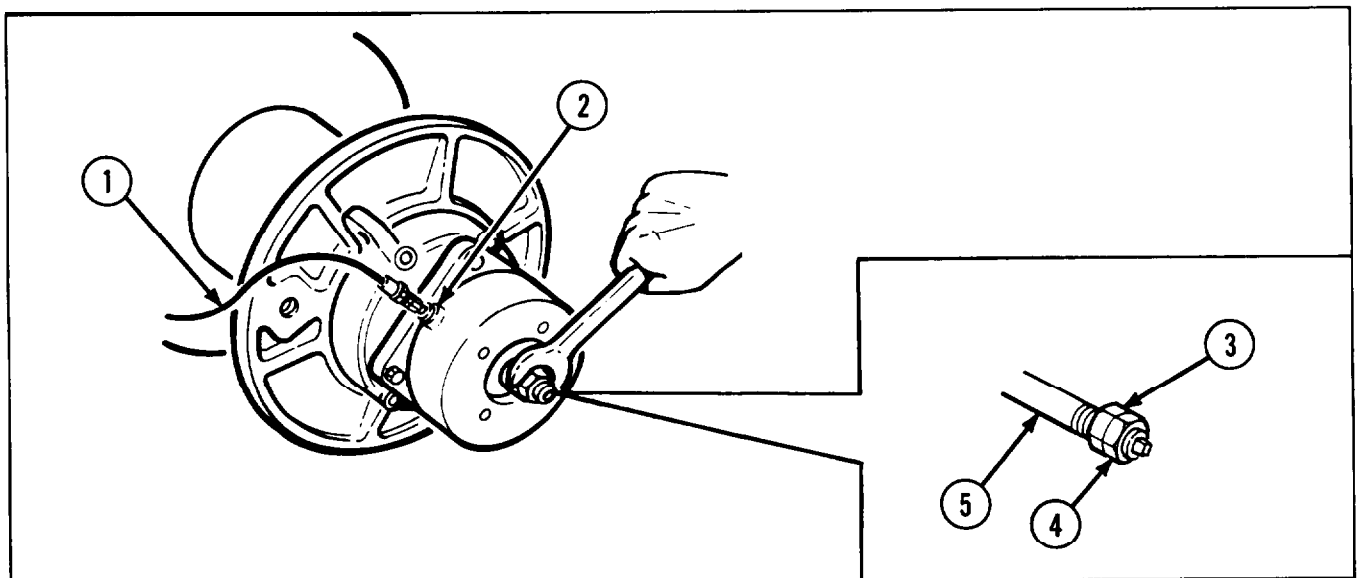
36 Install spool (52) and winch shift rod drum (5).

NOTE

Refer to page 2-103 for tow winch installation procedures.



ADJUSTMENT



WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

- 1 Refer to TM 9-4940-468-14 for test setup and testing procedures.
- 2 Connect hydraulic line (1) to inlet port of winch control cylinder (2).
- 3 Back off two hexagon plain nuts (3 and 4) to end of threads on winch carrier brake rod (5).

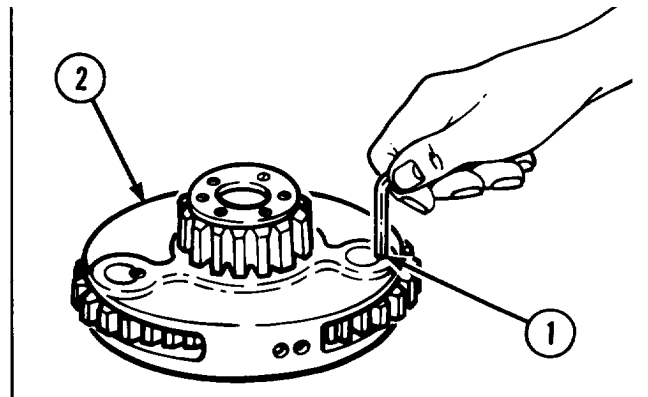
- 4 Apply and hold 200 psi (1379 kpa) pressure on winch control cylinder (2).
- 5 Tighten hexagon plain nut (3) until all slack is taken up.
- 6 Tighten hexagon plain nut (3) an additional 1-1/2 turns, and secure hexagon plain nut (3) in place with hexagon plain nut (4).
- 7 Release hydraulic pressure and remove hydraulic line from winch control cylinder (2).

2-31. MAINTENANCE OF STAGE ONE CARRIER ASSEMBLY.

| | | |
|--|---|--|
| This task covers: a. <i>Disassembly</i> b. <i>Inspection/Repair</i> c. <i>Reassembly</i> | | |
| INITIAL SETUP | | |
| <p><i>Tools and Special Tools</i></p> <p>General mechanic's tool kit, automotive (SC 5180-90-CL-N26)</p> <p>Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)</p> <p>Drill press</p> <p>Drill, twist, no. 3</p> <p>Grinder</p> <p>Press, arbor</p> <p>Tap and die set</p> <p>Shop equipment, sets, kits, outfits and tools: welding shop, trailer mounted (SC 3431-95-A04)</p> <p>Apron, welder's</p> <p>Electrode, welding</p> | <p>Gloves, welder's</p> <p>Helmet, welder's</p> <p>Holder, electrode</p> <p>Welding, machine, arc</p> | <p><i>Materials/Parts</i></p> <p>Sealing compound (item 18, appx B)</p> |
| | <p><i>References</i></p> <p>MIL-STD-1261C (MR)</p> <p>TM 9-2350-238-24P-2</p> | <p><i>Equipment Conditions</i></p> <p>2-111 Stage one carrier assembly removed</p> |

DISASSEMBLY

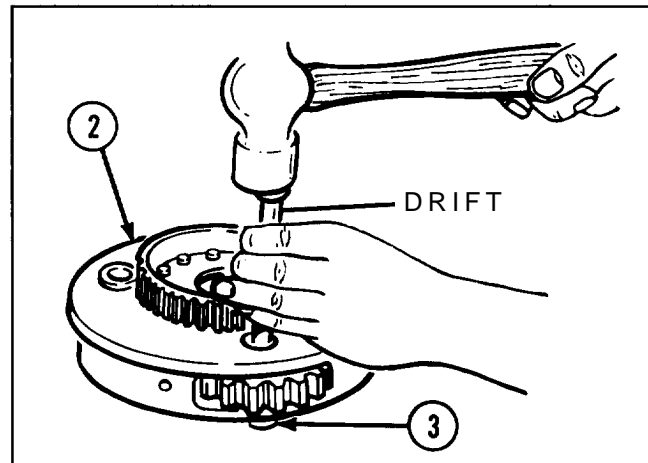
- 1 Remove three setscrews (1) from carrier (2).



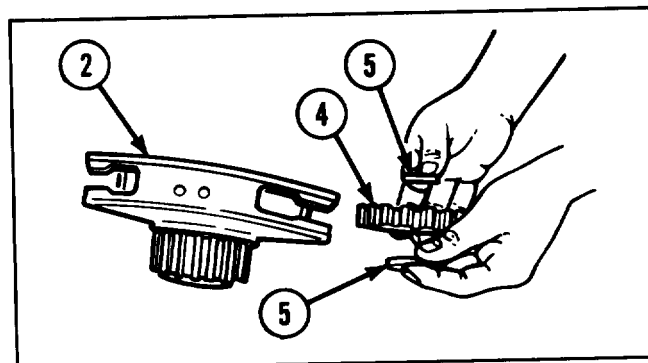
CAUTION

Mark each of three planet gear headless straight pins and their location in carrier so that planet gear headless straight pins can be put in same holes during reassembly.

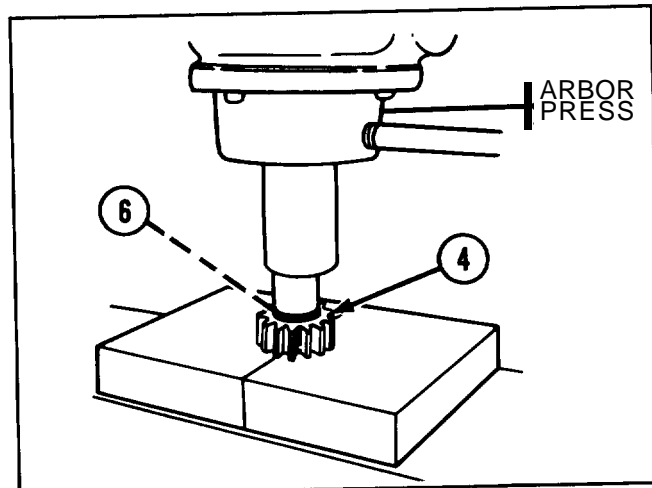
- 2 Using hammer and drift, remove three planet gear headless straight pins (3) from carrier (2).



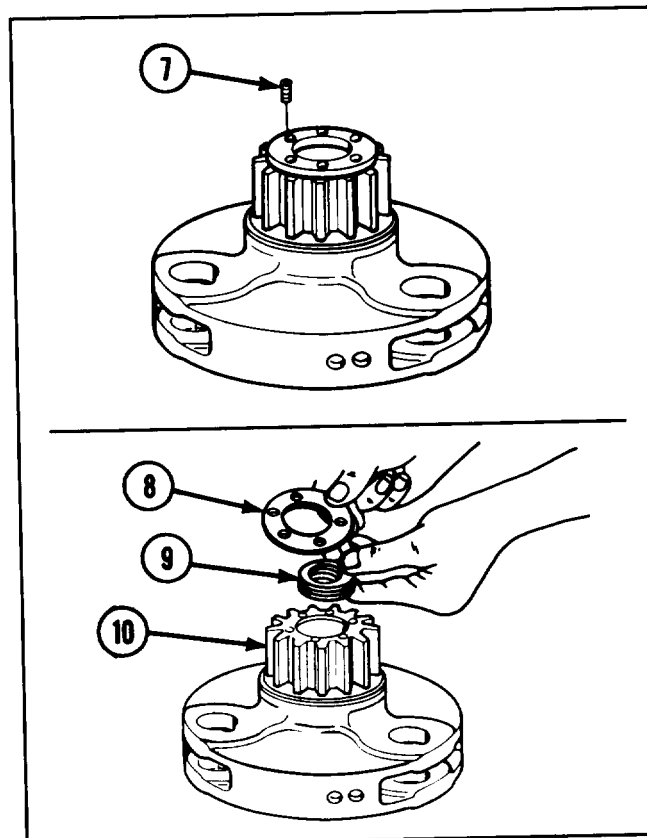
- 3 Remove three spur gears (4) and six planet gear flat washers (5) from carrier (2).



- 4 Using arbor press, remove three planet gear annular ball bearings (6) from three spur gears (4).



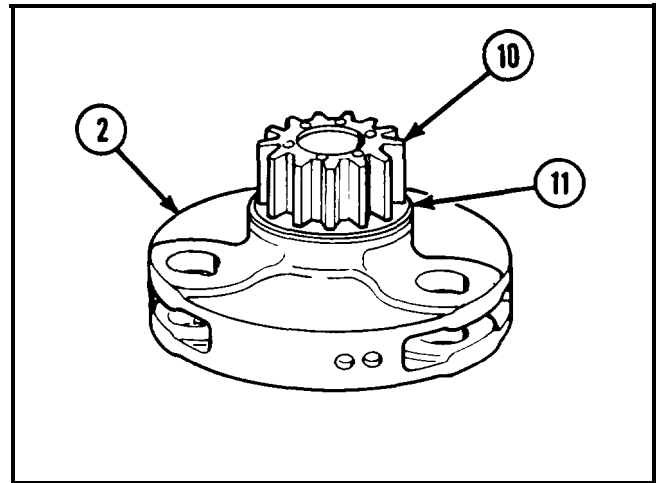
- 5 Remove six machine screws (7), sun gear thrust bearing retainer (8), and thrust ball bearing (9) from spur gear (10).



2-31. MAINTENANCE OF STAGE ONE CARRIER ASSEMBLY (CONT).

DISASSEMBLY (CONT).

- 6 if necessary, grind welds securing retaining stop ring (11) and remove spur gear (10) and retaining stop ring from carrier (2).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If carrier is damaged, repair is by replacement of next higher assembly.
- 3 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

NOTE

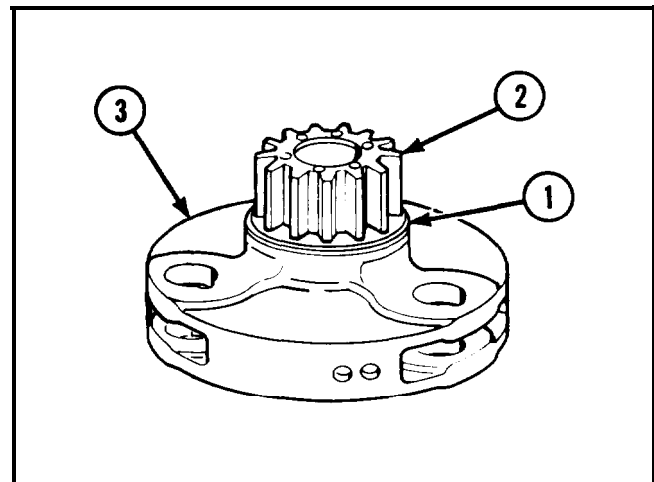
If retaining stop ring and spur gear were removed, new welds are necessary during reassembly.

- 1 If removed, install new retaining stop ring (1) in groove in spur gear (2).
- 2 Insert spur gear (2) into carrier (3), seating retaining stop ring (1) firmly against carrier.

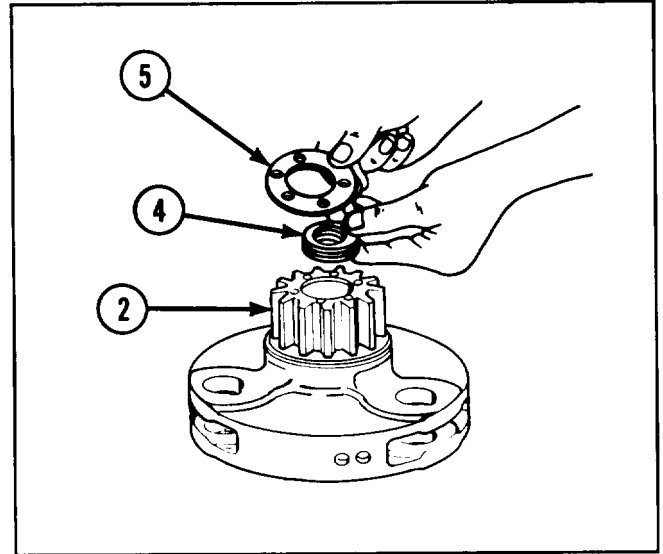
CAUTION

Weld retaining stop ring to carrier.
Do not weld to spur gear.

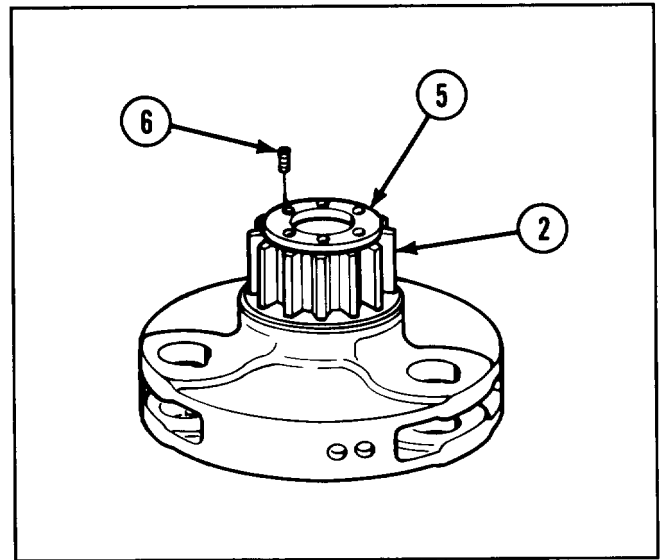
- 3 Weld retaining stop ring (1) to carrier (3) with 0.12-in. (0.30-cm) fillet welds. Weld three 1.00-in. (2.54-cm) spots placed an equal distance apart around circle of retaining stop ring IAW MIL-STD-1261C (MR).



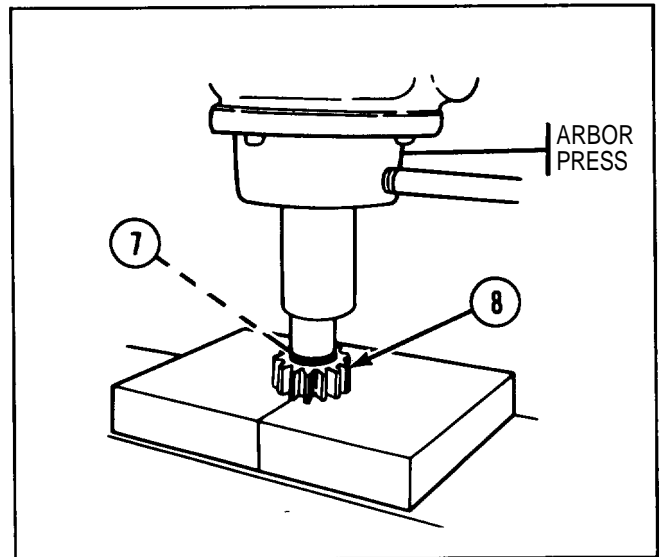
- 4 Install thrust ball bearing (4) in bore of spur gear (2).
- 5 Install sun gear thrust bearing retainer (5) on spur gear (2).



- 6 Apply sealing compound (item 18, appx B) to threads of six machine screws (6). Install six machine screws in spur gear (2) to secure sun gear thrust bearing retainer (5).



- 7 Using arbor press, install three planet gear annular ball bearings (7) in three spur gears (8).



2-31. MAINTENANCE OF STAGE ONE CARRIER ASSEMBLY (CONT).

REASSEMBLY (CONT)

- 8 Using hammer and punch, peen lip of each of three spur gears (8) in four equally spaced places around each planet gear annular ball bearing (7).

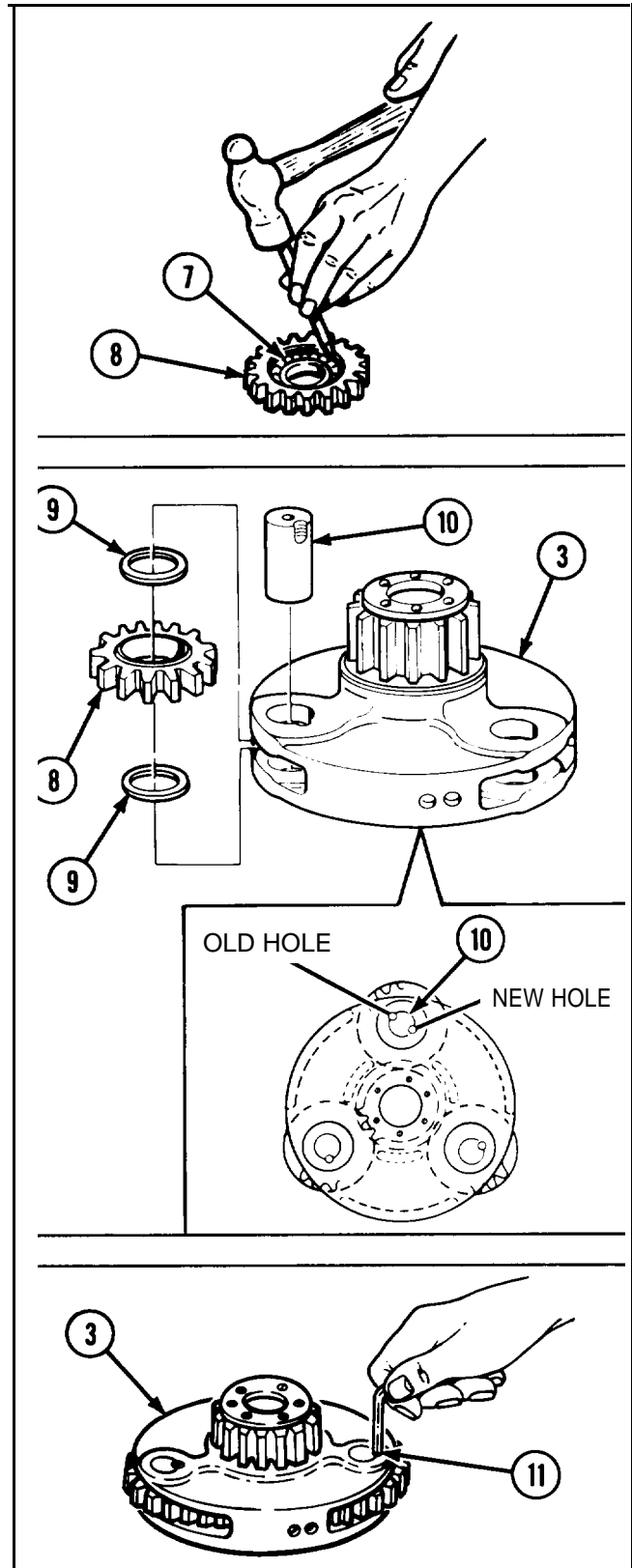
CAUTION

Make sure each planet gear headless straight pin is installed in same hole from which it was removed during disassembly.

- 9 Install three spur gears (8) with two planet gear flat washers (9) each, in carrier (3), and secure in place with three planet gear headless straight pins (10).

NOTE

- If a new carrier is used, drill and tap a 0.250-in. (0.635-cm), 28 UNF-2B hole 0.375 in. (0.953 cm) deep between each planet gear headless straight pin and carrier.
- If only new planet gear headless straight pins are used, drill and tap a new hole between each new planet gear headless straight pin and carrier. Drill new holes approximately 180 degrees from old holes.



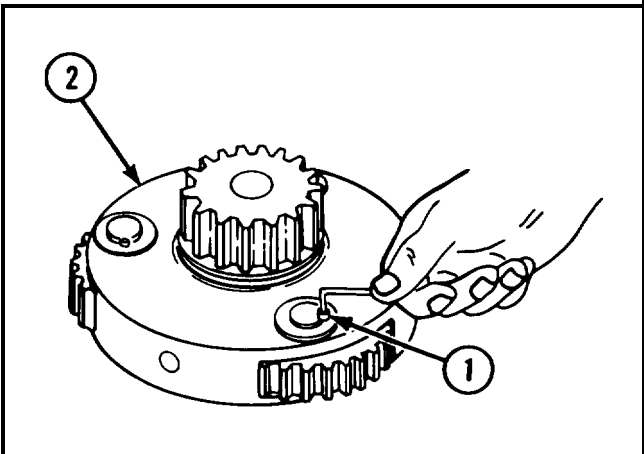
- 10 Install three setscrews (11) in carrier (3). Tighten and stake each setscrew.

2-32. MAINTENANCE OF STAGE TWO CARRIER ASSEMBLY.

| | | |
|---|---|--|
| This task covers: a. <i>Disassembly</i> b. <i>Inspection/Repair</i> c. <i>Reassembly</i> | | |
| INITIAL SETUP | | |
| <p><i>Tools and Special Tools</i></p> <p>General mechanic's tool kit, automotive (SC5180-90-CL-N26)</p> <p>Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)</p> <p>Drill press</p> <p>Drill twist, no. 3</p> <p>Grinder</p> <p>Press, arbor</p> <p>Tap and die</p> <p>Shop equipment, sets, kits, outfits, and tools: welding shop, trailer mounted (SC 3431-95-A04)</p> <p>Apron, welder's</p> | <p>Electrode, welding</p> <p>Gloves, welder's</p> <p>Helmet, welder's</p> <p>Holder, electrode</p> <p>Welding, machine, arc</p> | |
| | <p><i>References</i></p> <p>MIL-STD-1261C(MR)</p> <p>TM 9-2350-238-24P-2</p> | |
| | <p><i>Equipment Conditions</i></p> <p>2-111 Stage two carrier assembly removed</p> | |

DISASSEMBLY

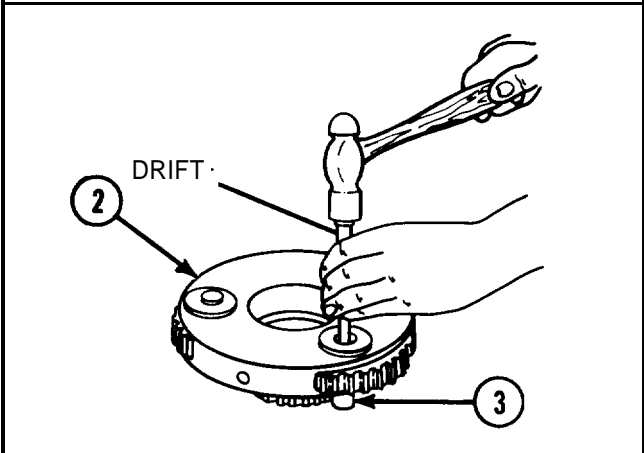
- 1 Remove three setscrews (1) from carrier (2),



CAUTION

Mark each of three planet gear headless straight pins and their location in carrier so that planet gear headless straight pins can be put in same holes during reassembly.

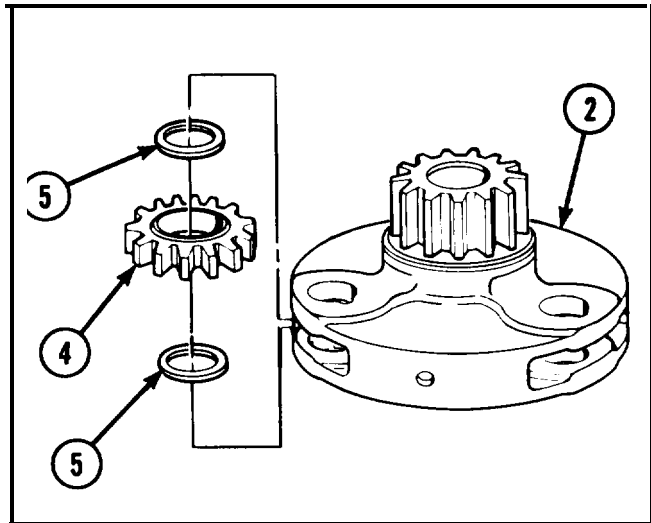
- 2 Using hammer and drift, remove three planet gear headless straight pins (3) from carrier (2).



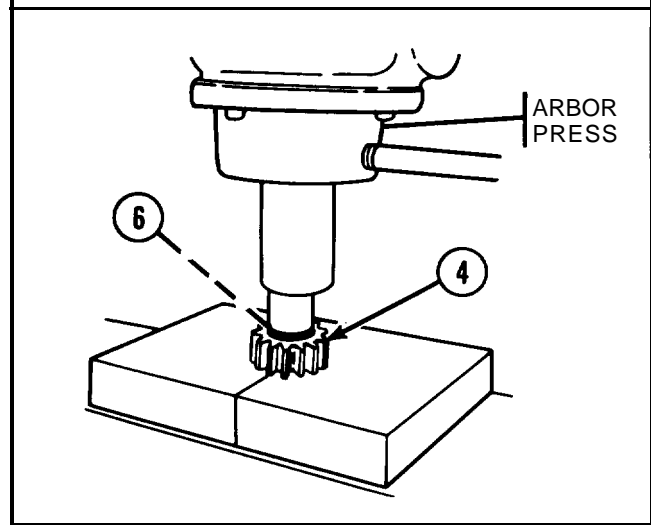
2-32. MAINTENANCE OF STAGE TWO CARRIER ASSEMBLY (CONT).

DISASSEMBLY (CONT)

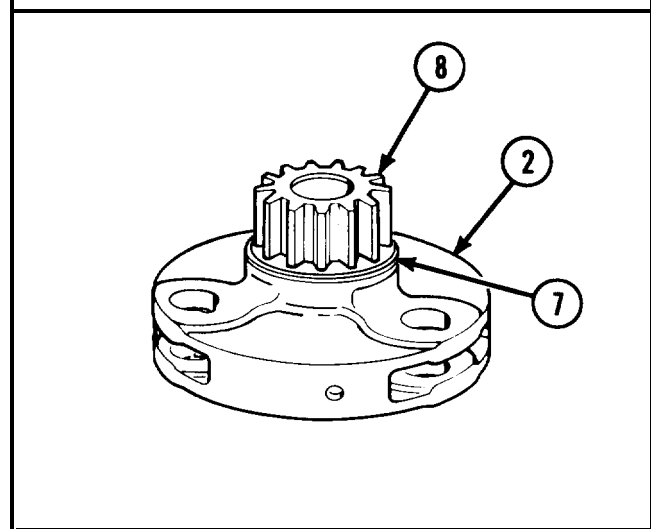
3 Remove three spur gears (4) and six flat washers (5) from carrier (2).



4 Using arbor press, remove three planet gear annular ball bearings (6) from three spur gears (4).



5 If necessary, grind welds securing retaining stop ring (7) and remove spur gear-shaft (8) and retaining stop ring from carrier (2).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If carrier is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 Repair is by replacement of authorized parts (TM 9-23509-238-24P-2).

REASSEMBLY

NOTE

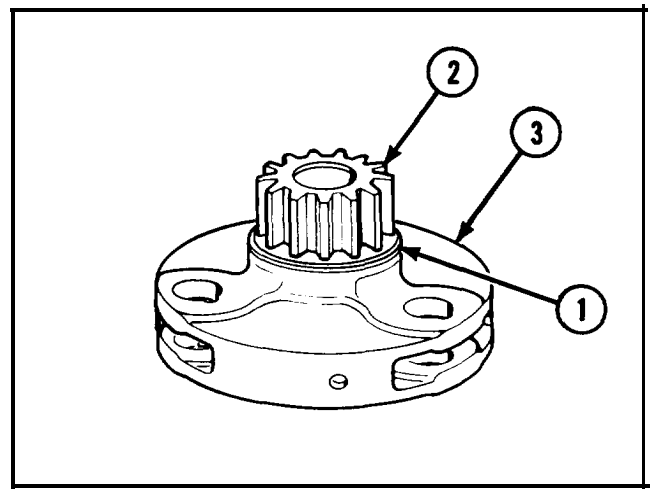
If retaining stop ring and spur gear shaft were removed, new welds are necessary during reassembly.

- 1 If removed, install new retaining stop ring (1) in groove in spur gear shaft (2).
- 2 Insert spur gear shaft (2) into carrier (3), seating retaining stop ring (1) firmly against carrier.

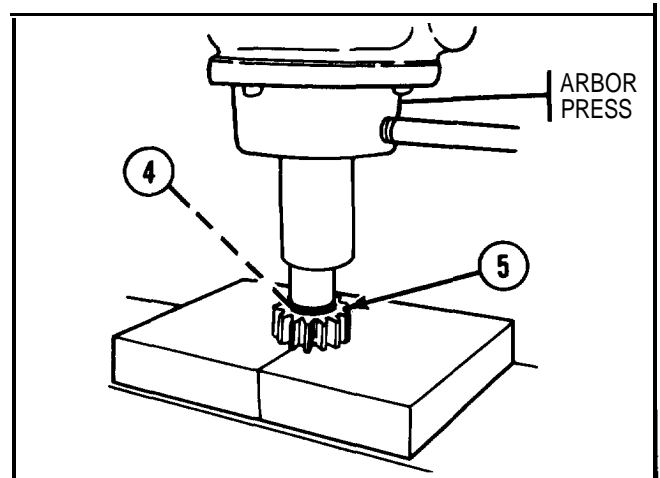
CAUTION

Weld retaining stop ring to carrier.
Do not weld to spur gear shaft.

- 3 Weld retaining stop ring (1) to carrier (3) with 0.12-in. (0.30-cm) fillet welds. Weld three 1.00-in. (2.54-cm) spots placed an equal distance apart around circle of retaining stop ring. Weld per MIL-STD-1261C(MR).



- 4 Using arbor press, install three planet gear annular ball bearings (4) in three spur gears (5).



2-32. MAINTENANCE OF STAGE TWO CARRIER ASSEMBLY (CONT).

REASSEMBLY (CONT)

- 5 Using hammer and punch, peen lip of each of three spur gears (5) in four equally spaced places around each of three annular ball bearings (4).

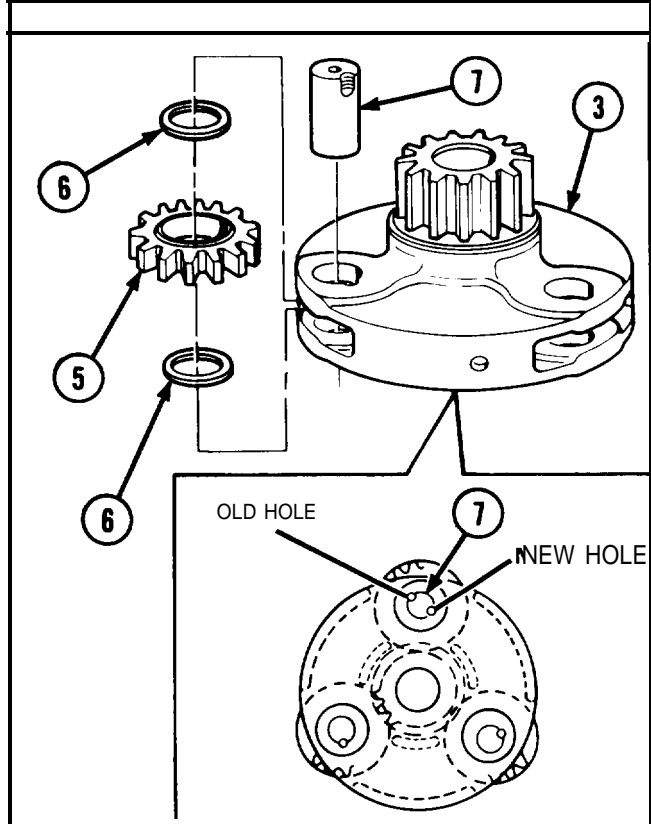
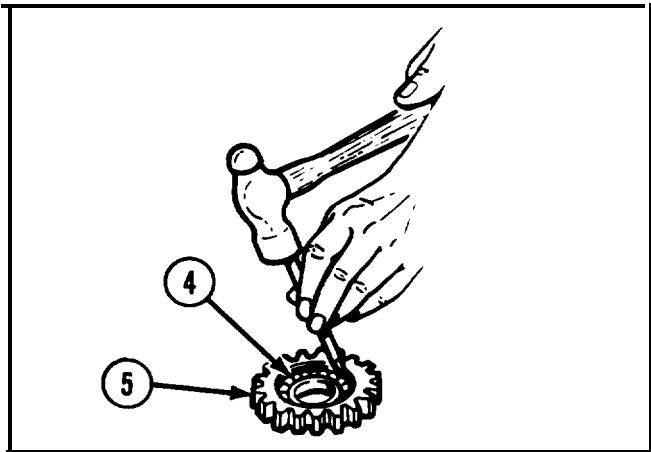
CAUTION

Make sure each planet gear headless straight pin is installed in same hole from which it was removed during disassembly.

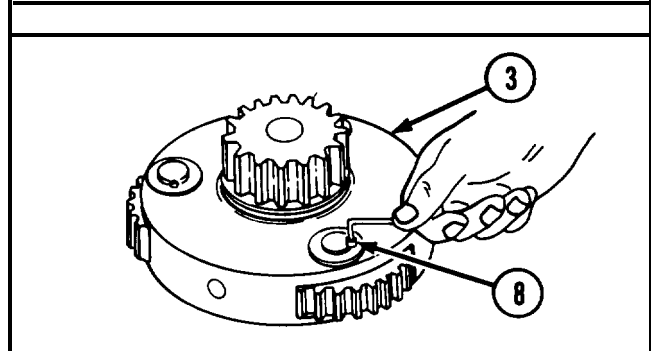
- 6 Install three spur gears (5) with two flat washers (6) each, in carrier (3), and secure in place with three planet gear headless straight pins (7).

NOTE

- If a new carrier is used, drill and tap a 0.250-in. (0.635-cm), 28 UNF-2B hole 0.375 in. (0.953 cm) deep between each planet gear headless straight pin and carrier.
- If only new planet gear headless straight pins are used, drill and tap a new hole between each new planet gear headless straight pin and carrier. Drill new holes approximately 180 degrees from old holes.



- 7 Install three setscrews (8) in carrier (3). Tighten and stake each setscrew.

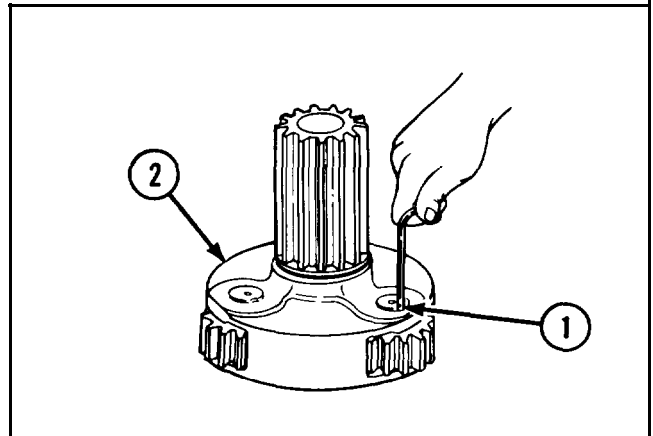


2-33. MAINTENANCE OF STAGE THREE CARRIER ASSEMBLY.

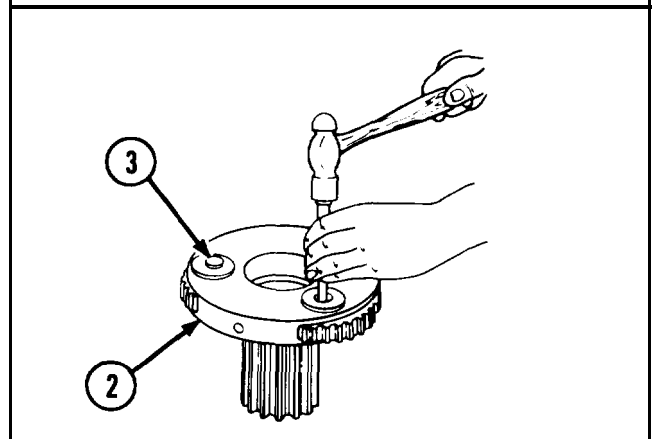
| | | |
|--|---|---|
| This task covers: a. <i>Disassembly</i> b. <i>Inspection/Repair</i> c. <i>Reassembly</i> | | |
| INITIAL SETUP | | |
| <p><i>Tools and Special Tools</i></p> <p>General mechanic's tool kit, automotive (SC5180-90-CL-N26)</p> <p>Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC4910-95-A31)</p> <p>Drill press</p> <p>Drill, twist, no. 3</p> <p>Grinder</p> <p>Press, arbor</p> <p>Tap and die set</p> <p>Shop equipment, sets, kits, outfits, and tools: welding shop, trailer mounted (SC3431-95-A04)</p> <p>Apron, welder's</p> <p>Electrode, welding</p> | <p>Gloves, welder's</p> <p>Helmet, welder's</p> <p>Holder, electrode</p> <p>Welding, machine, arc</p> | <p><i>Materials/Parts</i></p> <p>Winch stage three carrier parts kit (5702980)</p> <p><i>References</i></p> <p>MIL-STD-161C(MR)</p> <p>TM 9-2350-238-24P-2</p> <p><i>Equipment Conditions</i></p> <p>2-111 Stage three carrier assembly removed</p> |

DISASSEMBLY

1 Remove three setscrews (1) from carrier (2).



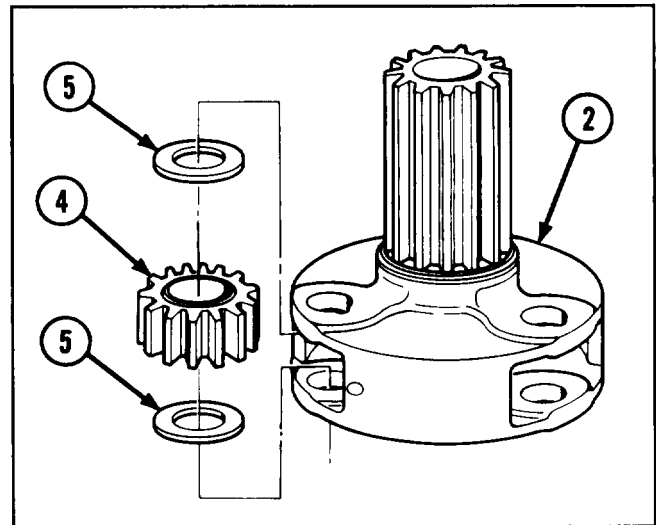
2 Using hammer and drift, remove three pins (3) from carrier (2).



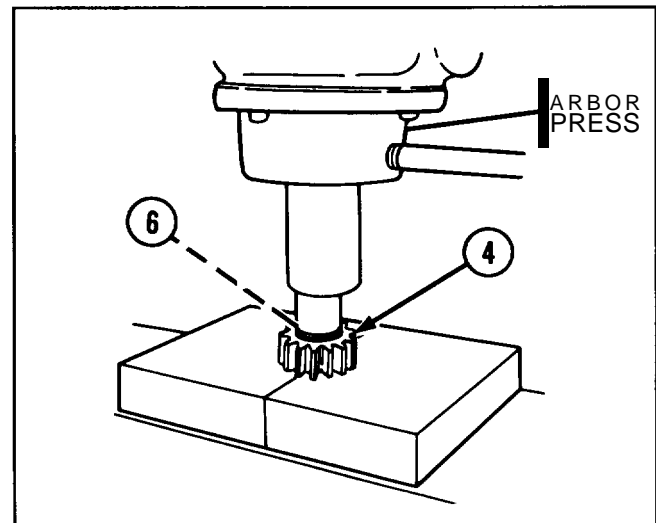
2-33. MAINTENANCE OF STAGE THREE CARRIER ASSEMBLY (CONT).

DISASSEMBLY (CONT)

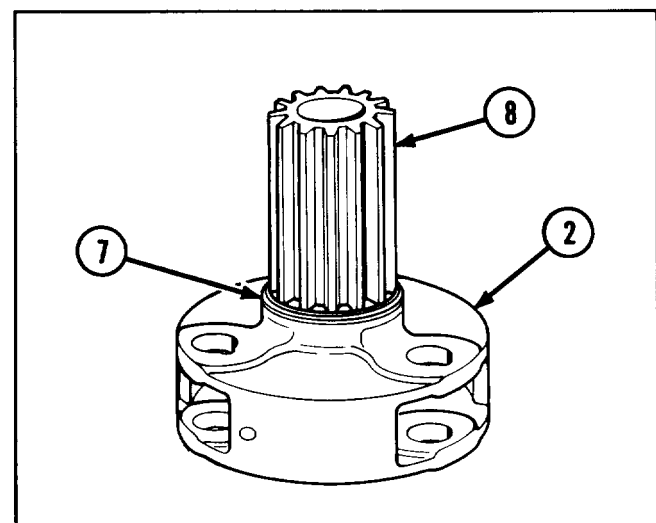
3 Remove three planet pinion gears (4) and six pinion gear flat washers (5) from carrier (2).



4 Using arbor press, remove three roller bearings (6) from three planet pinion gears (4).



5 If necessary, grind welds securing retaining stop ring (7) and remove spur gear (8) and retaining stop ring from carrier (2).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If carrier is broken, damaged, or missing, repair is by replacement of next higher assembly
- 3 If any kit component is damaged, replace entire parts kit.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY**NOTE**

If retaining stop ring and spur gear shaft were removed, new welds are necessary during reassembly.

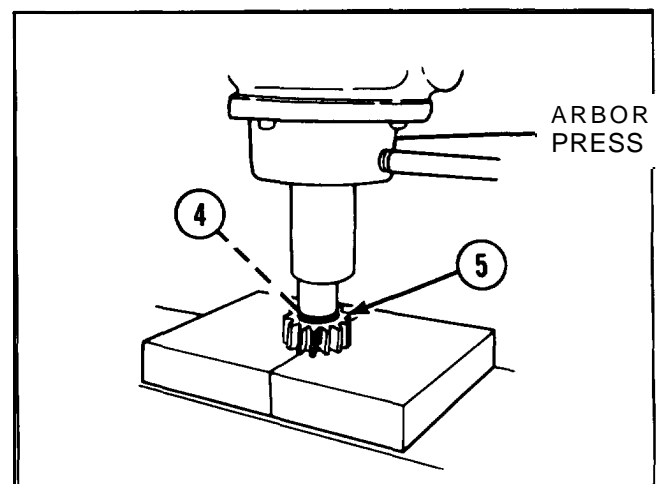
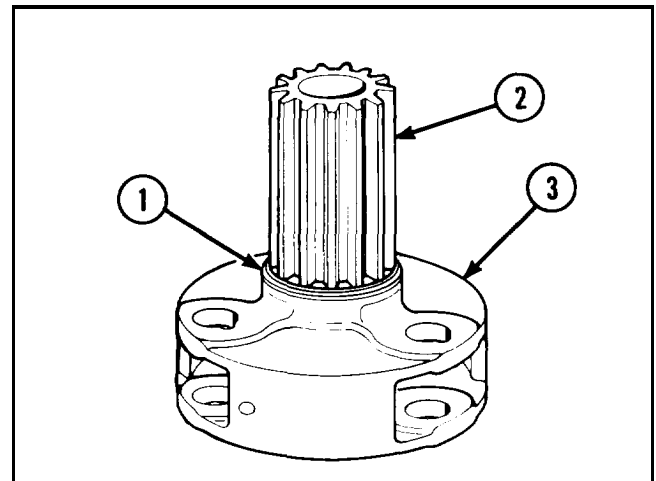
- 1 If removed, install new retaining stop ring (1) in groove in spur gear shaft (2).
- 2 Insert spur gear (2) into carrier (3), seating retaining stop ring (1) firmly against carrier.

CAUTION

Weld retaining stop ring to carrier.
Do not weld to spur gear.

- 3 Weld retaining stop ring (1) to carrier (3) with 0.12-in. (0.30-cm) fillet welds. Weld three 1.00-in. (2.54-cm) spots placed an equal distance apart around circle of retaining stop ring. Weld per MIL-STD-1261C(MR).

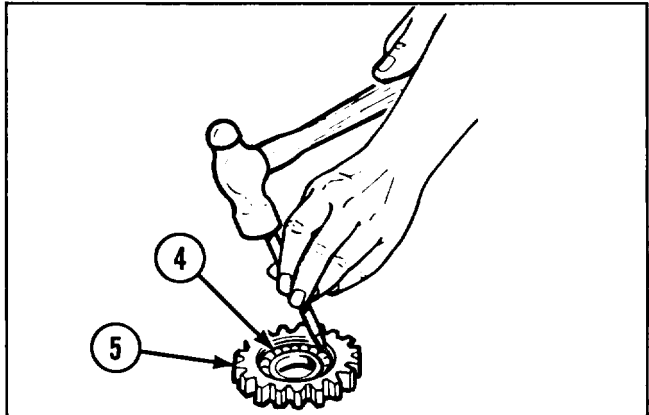
- 4 Using arbor press, install three roller bearings (4) in three planet pinion gears (5).



2-33. MAINTENANCE OF STAGE THREE CARRIER ASSEMBLY (CONT).

REASSEMBLY (CONT)

5 Using hammer and punch, peen lip of each of three planet pinion gears (5) in four equally spaced places around each roller bearing (4).

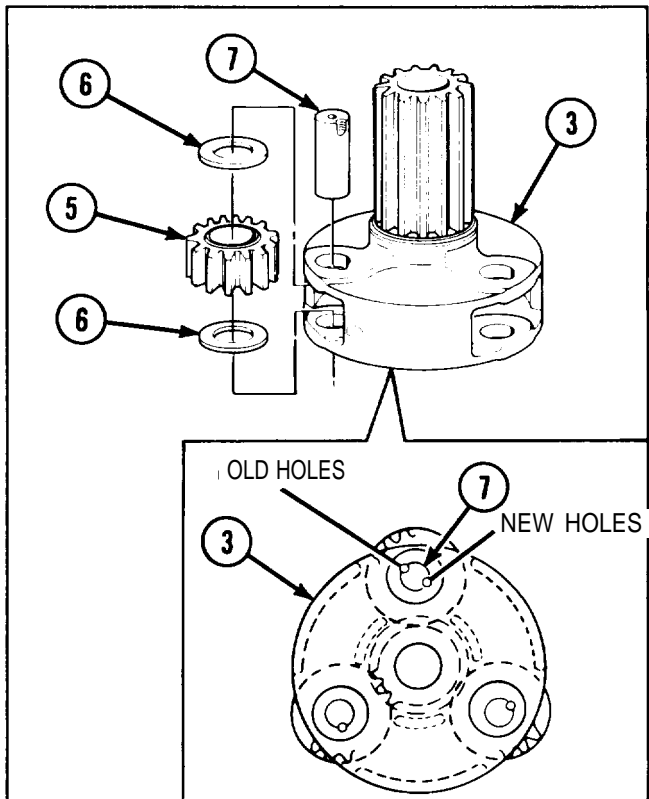


6 Install three planet pinion gears (5) and six pinion gear flat washers (6) each, in carrier (3).

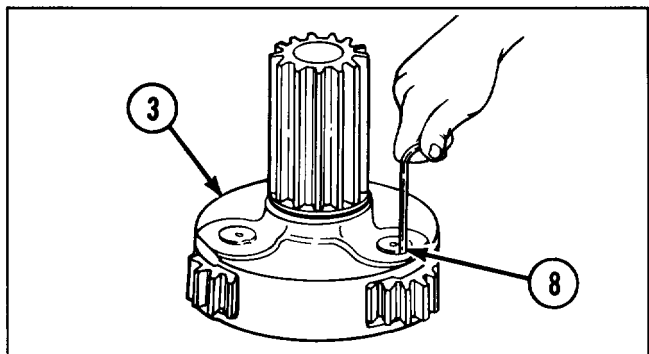
7 Install three new gear pins (7) in carrier (3).

NOTE

- If a new carrier is used, drill and tap a 0.250-in.(0.635-cm), 28 UNF-2B hole 0.375 in. (0.953 cm) deep between each gear pin and carrier.
- If only new gear pins are used, drill and tap a new hole between each new gear pin and carrier. Drill new holes approximately 180 degrees from old holes.



8 Install three new setscrews (8) in carrier (3). Tighten and stake each new setscrew.



2-34. MAINTENANCE OF STAGE FOUR CARRIER ASSEMBLY.

This task covers: a. *Disassembly* b. *Inspection/Repair* c. *Reassembly*

INITIAL SETUP

Tools and Special Tool

General mechanic's tool kit, automotive (SC5180-90-CL-N26)
 Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
 Drill press
 Drill, twist, no. 3
 Press, arbor
 Tap and die set

Materials/Parts

Grease (item 9, appx B)
 Winch stage four carrier parts kit (5702981)

References

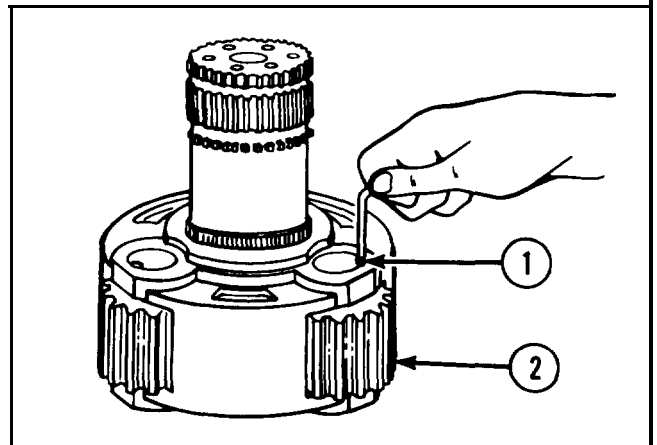
TM9-2350-238-24P-2

Equipment Conditions

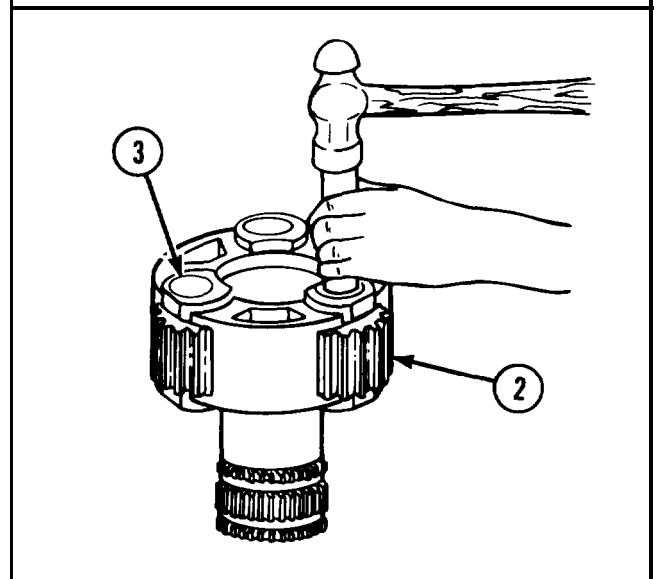
2-111 Stage four carrier assembly removed

DISSEMBLY

1 Remove three setscrews (1) from carrier (2).



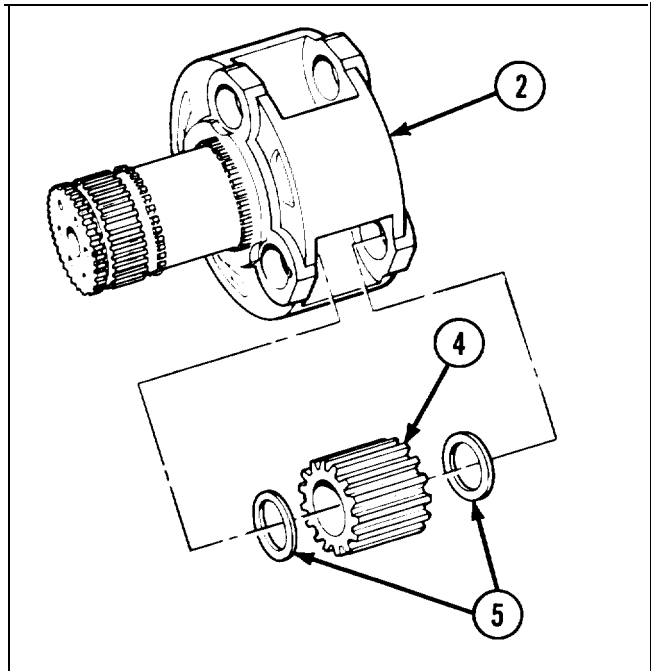
2 Using hammer and drift, remove three pins (3) from carrier (2).



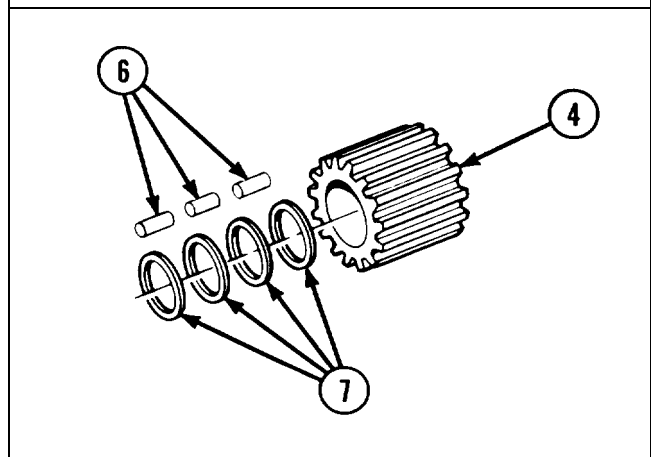
2-34. MAINTENANCE OF STAGE FOUR CARRIER ASSEMBLY (CONT).

DISASSEMBLY (CONT)

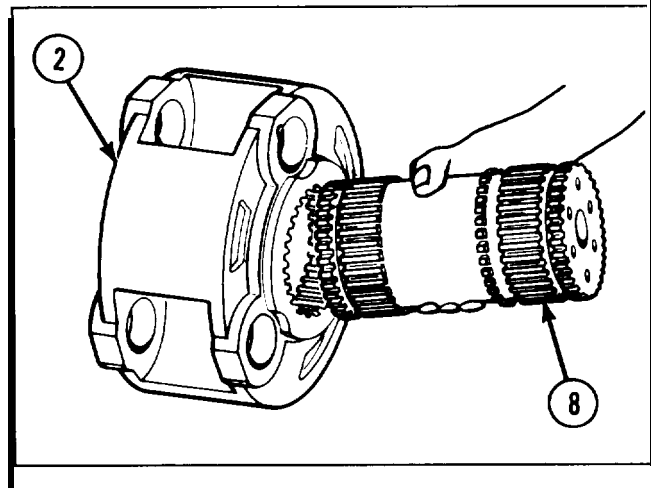
- 3 Remove three planet pinion gears (4) and six planet gear flat washers (5) from carrier (2).



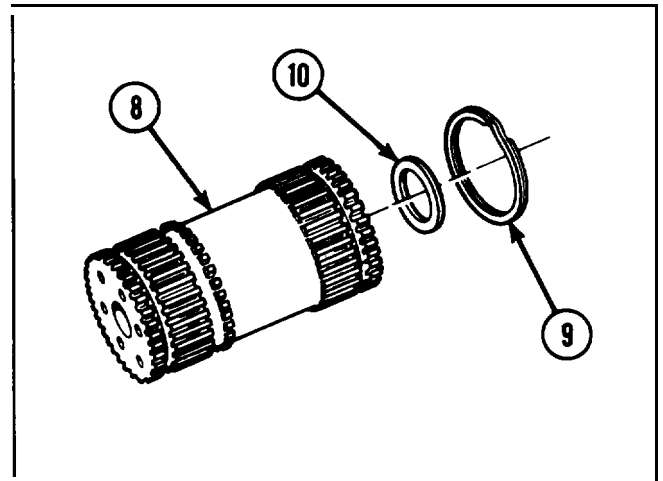
- 4 Remove 141 rollers (6) and four washers (7) from each of three planet pinion gears (4).



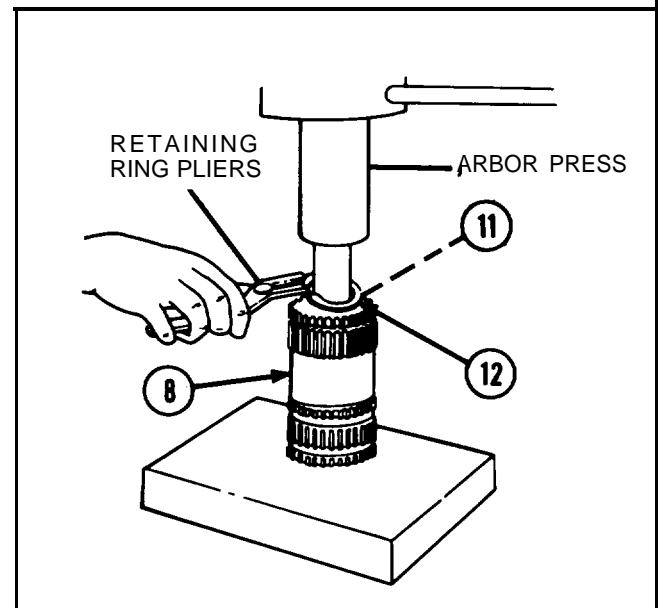
- 5 Remove rigid shaft coupling (8) from carrier (2).



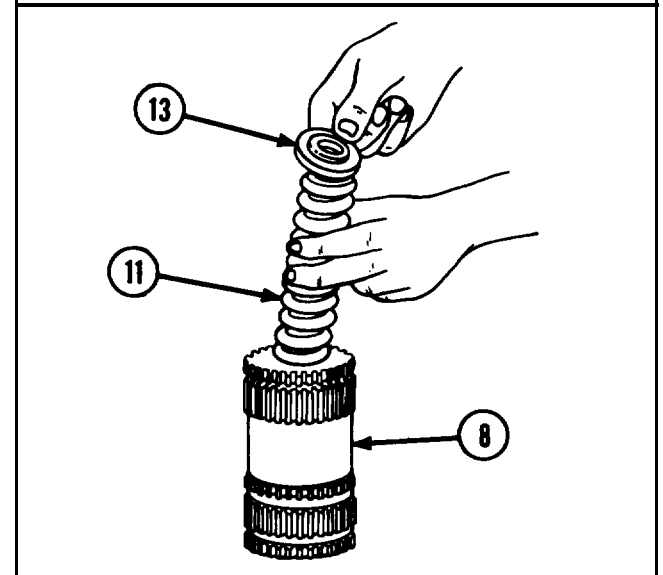
- 6 Remove retaining ring (9) and flat washer (10) from rigid shaft coupling (8).



- 7 Using arbor press, compress helical compression spring (11) inside rigid shaft coupling (8) and, using retaining ring pliers, remove retaining ring (12). Slowly release pressure on rigid shaft coupling.



- 8 Remove winch spring stop (13) and helical compression spring (11) from rigid shaft coupling (8).



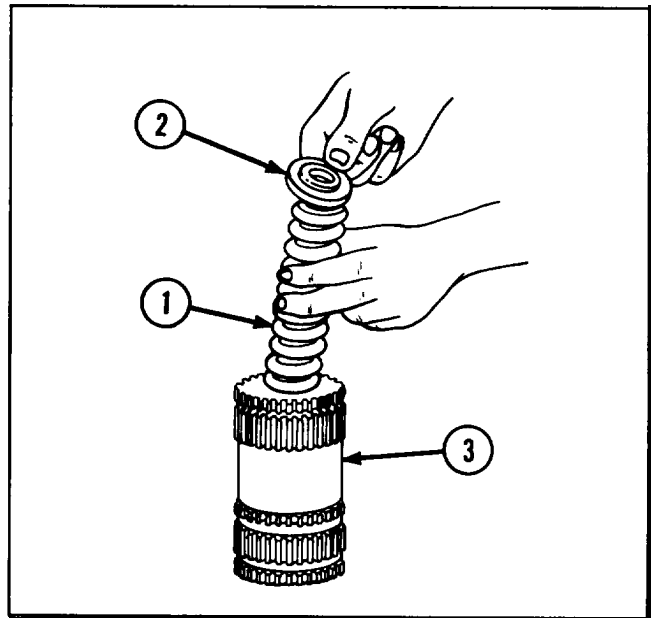
2-34. MAINTENANCE OF STAGE FOUR CARRIER ASSEMBLY (CONT).

INSPECTION/REPAIR

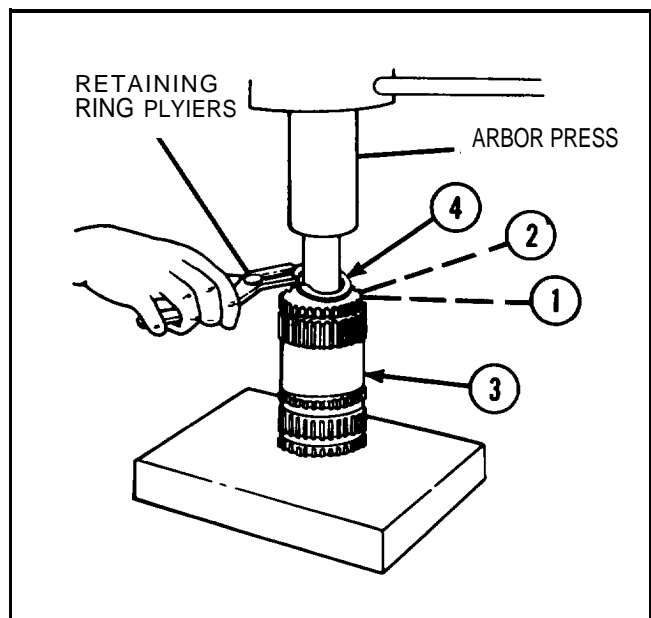
- 1 Inspect for broken, damaged, or missing parts.
- 2 If carrier is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If any kit component is damaged, replace entire winch stage four carrier parts kit.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

RESESSEMBLY

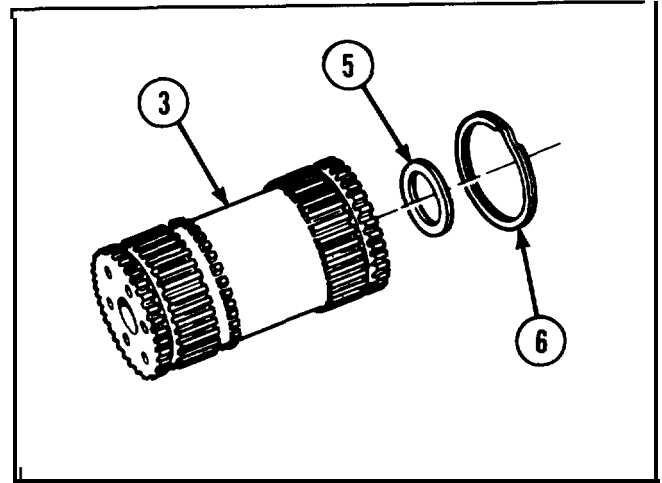
- 1 Install helical compression spring (1) and winch spring stop (2) in rigid shaft coupling (3),



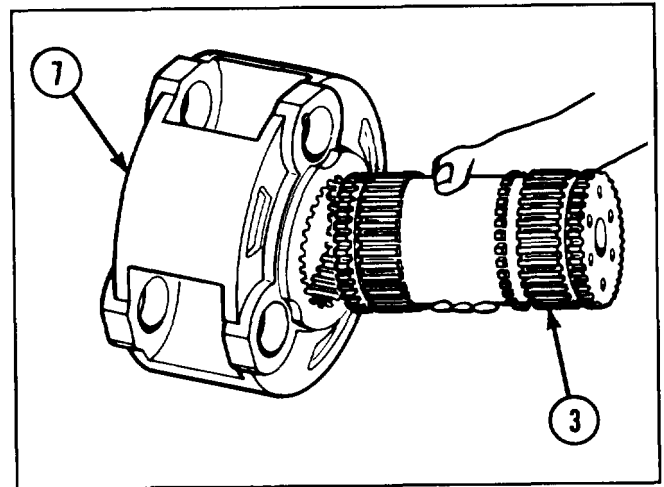
- 2 Using arbor press, compress helical compression spring (1) and winch spring stop (2) inside rigid shaft coupling (3).
- 3 Using retaining ring pliers, install retaining ring (4) in rigid shaft coupling (3). Slowly release pressure and remove rigid shaft coupling from arbor press.



- 4 Install flat washer (5) and retaining ring (6) on rigid shaft coupling (3).

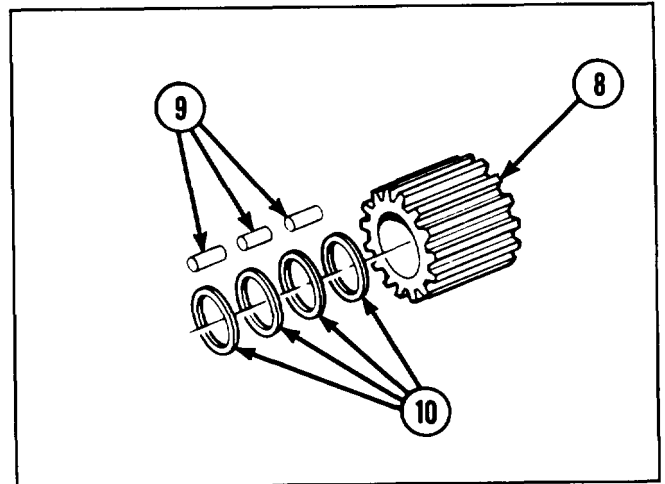


- 5 Install rigid shaft coupling (3) in carrier (7).



- 6 Coat bores of three planet pinion gears (8) with grease (item 9, appx B).

- 7 Install three rows of 47 new rollers (9) separated by four new washers (10) into bores of three planet pinion gears (8).



2-34. MAINTENANCE OF STAGE FOUR CARRIER ASSEMBLY (CONT).

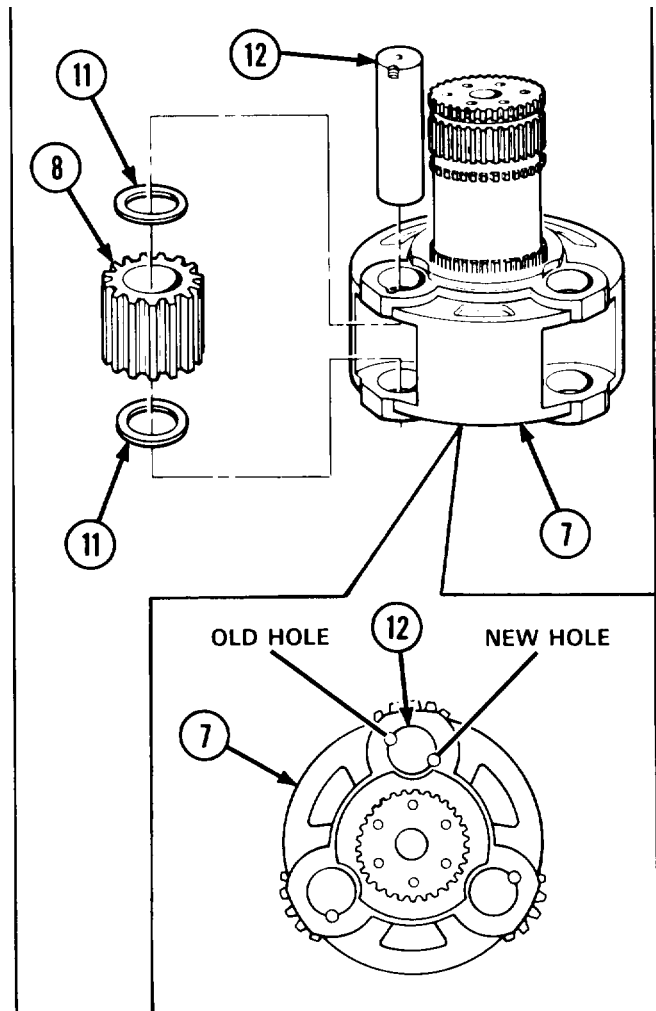
REASSEMBLY (CONT)

8 Install three planet pinion gears (8) with two planet gear flat washers (11) each, in carrier (7).

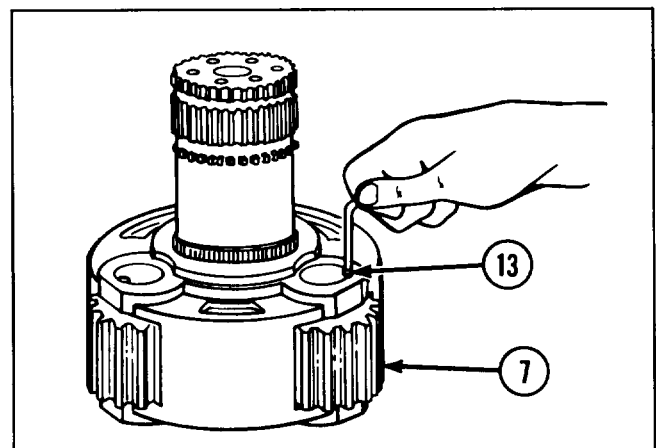
9 Install three new pins (12) in carrier (7).

NOTE

- If a new carrier is used, drill and tap a 0.250-in.(0.635-cm), 28 UNF-2B hole 0.375 in.(0.953 cm) deep between each gear pin and carrier.
- If only new pins are used, drill and tap a new hole between each new pin and carrier. Drill new holes approximately 180 degrees from old holes.



10 Install three new setscrews (13) in carrier (7). Tighten and stake each new setscrew.



2-35. MAINTENANCE OF THREE-SPOOL DIRECTIONAL LINEAR VALVE.

This task covers: a. Removal
 b. Disassembly
 c. Inspection/Repair
 d. Reassembly
 e. Installation

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive
 (SC5180-90-CL-N26)

Materials/Parts

Engine oil (item 15, appx B)
 Lockwasher (3) (MS35338-48)
 Three-spool valve parts kit (5705005)

References

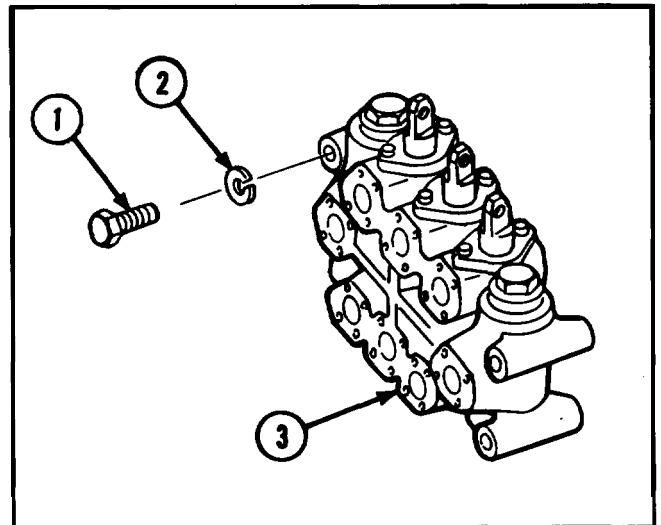
TM 9-2350-238-20-2
 TM 9-2350-238-24P-2

Equipment Conditions

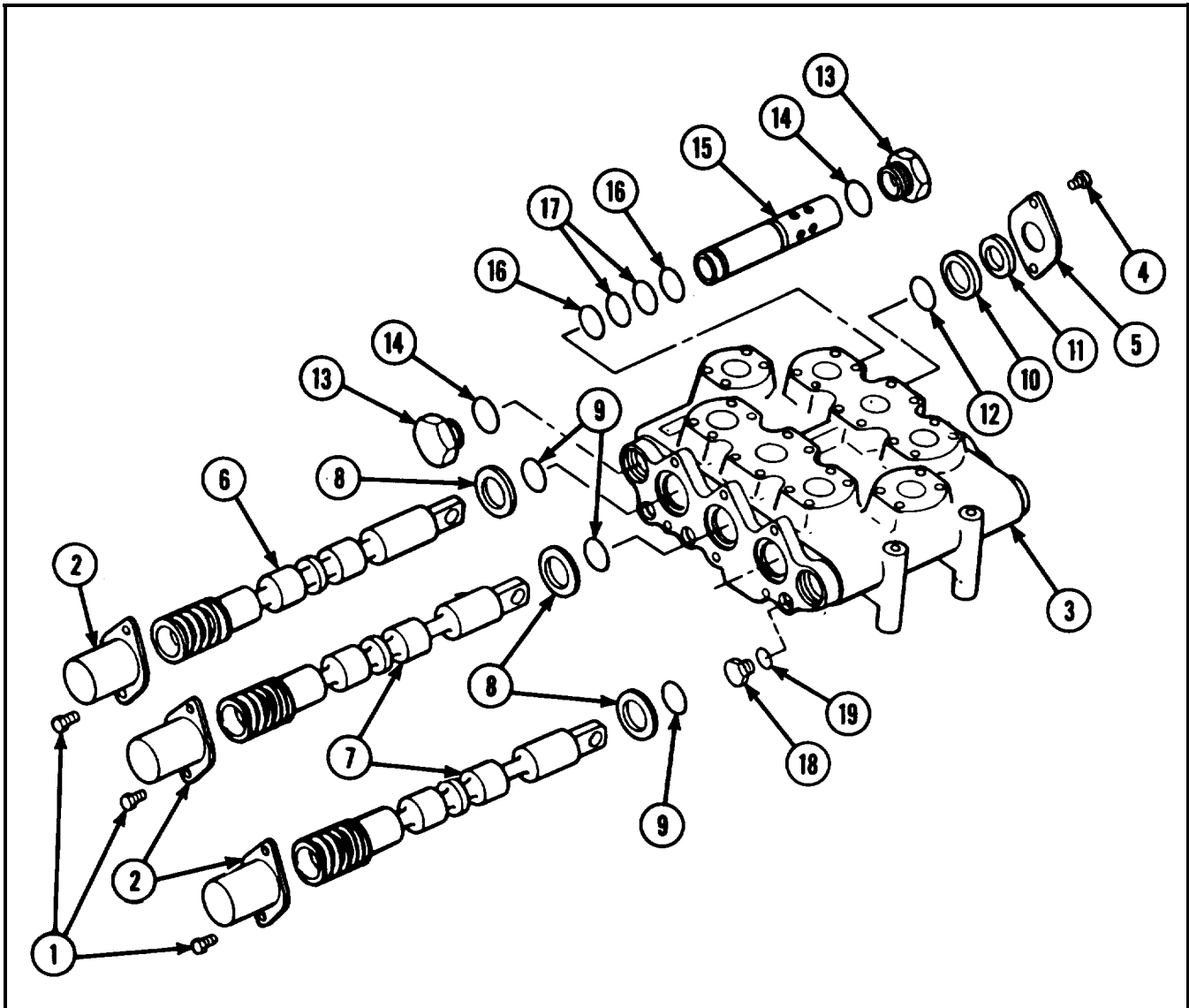
Oil drained from system (TM 9-2350-238-20-2)
 Three-spool valve to motor tube assembly removed (TM 9-2350-238-20-2)
 Boom elevating, boom and tow winch controls and linkage removed (TM 9-2350-238-20-2)
 Access plate removed (TM 9-2350-238-20-2)

REMOVAL

Remove three hexagon head capscrews (1), three lockwashers (2), and three-spool directional linear valve (3).



2-35. MAINTENANCE OF THREE-SPOOL DIRECTIONAL LINEAR VALVE (CONT).



DISASSEMBLY

- 1 Remove six assembled screws (1) and three covers (2) from three-spool directional linear valve housing (3).
- 2 Remove six assembled screws (4) and three retainers (5) from three-spool directional linear valve housing (3).
- 3 Remove spool (6) and two spools (7) from three-spool directional linear valve housing (3).
- 4 Remove three seal retainers (8) and three preformed packings (9) from three-spool directional linear valve housing (3).
- 5 Remove three seal packing retainers (10), three valve spool wipers (11), and three preformed packings (12) from three-spool directional linear valve housing (3).

- 6 Remove four plugs (13) and four preformed packings (14) from three-spool directional linear valve housing (3). Remove four preformed packings from four plugs.
- 7 Remove two plugs (15) with attached parts from three-spool directional linear valve housing (3).
- 8 Remove four retainers (16) and four preformed packings (17) from two plugs (15).
- 9 Remove three plugs (18) and three preformed packings (19) from three-spool directional linear valve housing (3). Remove three preformed packings from three plugs.
- 2 Install three new preformed packings (19) on three plugs (18).
- 3 Install three plugs (18) in three-spool directional linear valve housing (3).
- 4 install four new preformed packings (17) and four new retainers (16) on two plugs (15).
- 5 Install two plugs (15) in three-spool directional linear valve housing (3).
- 6 Install four new preformed packings (14) on four plugs (13).
- 7 Install four plugs (13) in three-spool directional linear valve housing (3).
- 8 Install three new preformed packings (12), three new valve spool wipers (11), and three new seal packing retainers (10) in three-spool directional linear valve housing (3).

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If three-spool directional linear valve housing is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If any kit component is damaged, replace entire three-spool valve parts kit.
- 4 Repair is by replacement of authorized parts (TM9-2350-238-24P-2).
- 9 Install three new preformed packings (9) and three seal retainers (8) in three-spool directional linear valve housing (3).
- 10 Install two spools (7) and spool (6) in three-spool directional linear valve housing (3).
- 11 Install three new retainers (5) and six new assembled screws (4) on three-spool directional linear valve housing (3).

REASSEMBLY

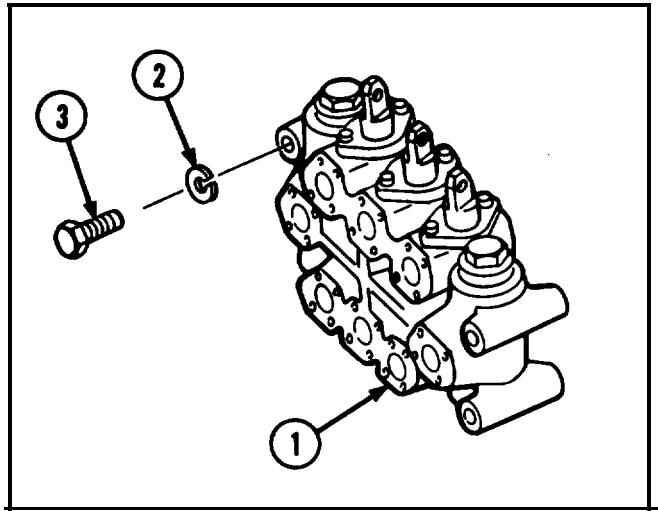
- 1 Apply engine oil (item 15, appx B) to preformed packings (19, 17, 14, 12, and 9), spools (7 and 6), seal retainers (8), retainers (16), and seal packing retainers (10).

- 12 Install three covers (2) and six assembled screws (1) on three-spool directional linear valve housing (31).

2-35. MAINTENANCE OF THREE-SPOOL DIRECTIONAL LINEAR VALVE (CONT).

INSTALLATION

Install three-spool directional linear valve (1), three new lockwashers (2), and three hexagon head capscrews (3).



2-36. MAINTENANCE OF COUNTERBALANCE MANIFOLD ASSEMBLY.

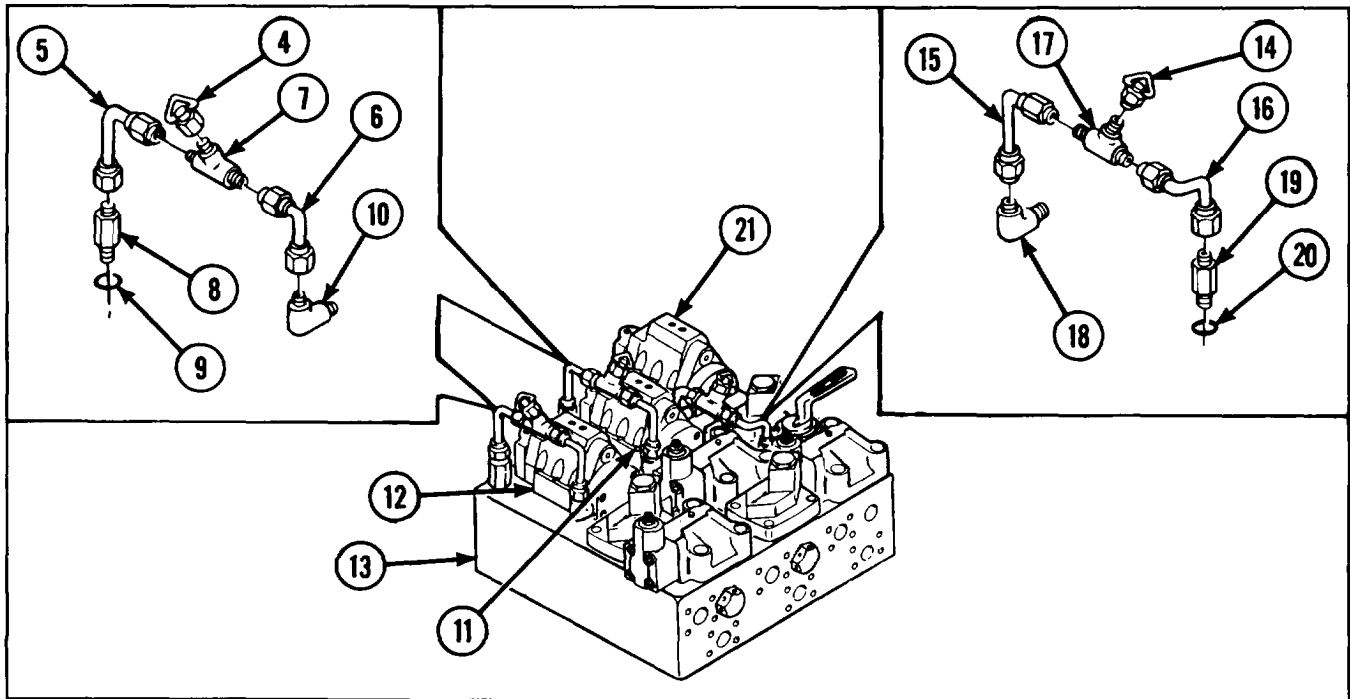
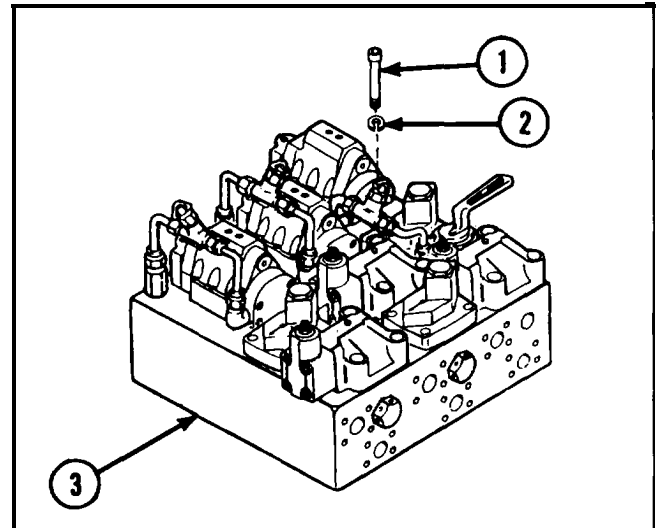
| | |
|--|---|
| This task covers: | |
| a. Removal/Disassembly | c. Reassembly/Installation |
| b. Inspection/Repair | |
| INITIAL SETUP | |
| Tools and Special Tools | References |
| General mechanic's tool kit, automotive (SC5180-90-CL-N26) | TM9-2350-238-20-2 TM9-2350-238-24P-2 |
| Materials/Parts | Equipment Conditions |
| Engine oil (item 15, appx B) | oil drained from svstem (TM 9-2350-238-20-2) |
| Lockwasher (4) (MS35338-48) | Motor drain metal tube assembly removed (TM 9-2350-238-20-2) |
| Preformed packing (6) (MS28775-012) | Boom and tow winch motor drain metal tube assembly removed (TM 9-2350-238-20-2) |
| Preformed packing (3) (MS28775-014) | Equipment stowage accessories box removed (TM 9-2350-238-20-2) |
| Preformed packing (2) (MS28775-115) | Forward left-hand nonskid metallic tread removed (TM 9-2350-238-20-2) |
| Preformed packing (8) (MS28775-216) | |
| Preformed packing (6) (MS28775-218) | |
| Preformed packing (4) (MS28775-220) | |
| Preformed packing (3) (MS28778-4) | |
| Preformed packing (2) (MS28778-12) | |
| Sealing compound (item 18, appx B) | |

REMOVAL/DISASSEMBLY

CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter.

- 1 Remove four counterbalance manifold machine bolts (1), four lockwashers (2), and counterbalance manifold assembly (3).



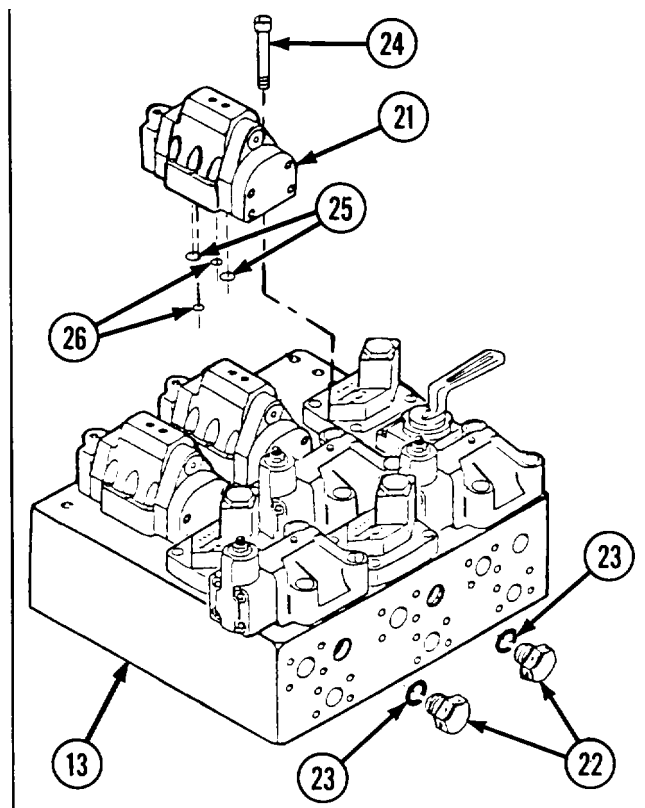
- 2 Remove two manifold tee tube cam (4), two fitting to tee metal tube assemblies (5), two check valve to tee metal tube assemblies (6), two valve tube tees (7), two flow control fluid restrictors (8), two preformed packings (9), and two check valve to tube pipe elbows (10) from pressure relief valve (11), pressure relief valve (12), and multiple connector (13).

- 3 Remove manifold tee tube cap (14), check valve to tee metal tube assembly (15), metal fitting tube assembly (16), valve tube tee (17), check valve to tube pipe elbow (18), flow control fluid restrictor (19), and preformed packing (20) from pressure relief valve (21) and multiple connector (13).

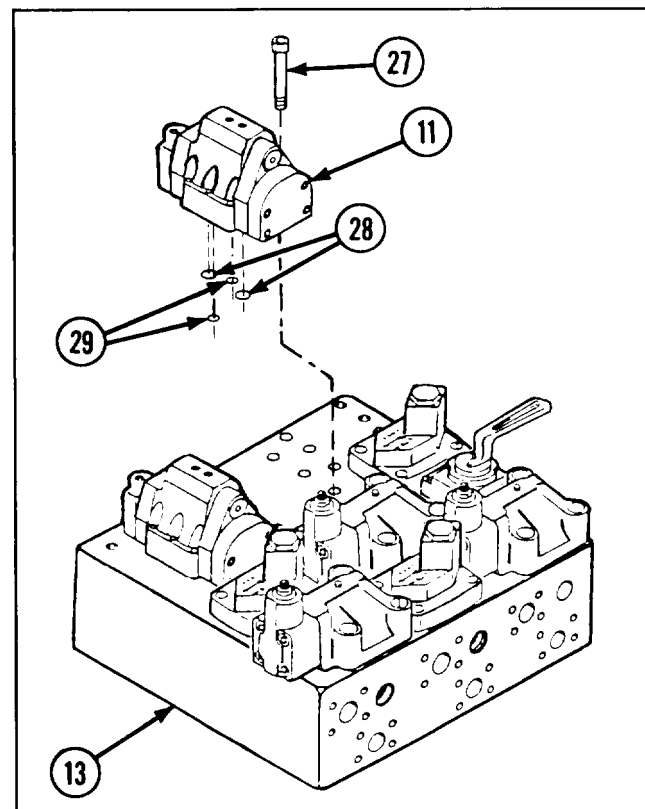
2-36. MAINTENANCE OF COUNTERBALANCE MANIFOLD ASSEMBLY (CONT).

REMOVAL/DISASSEMBLY (CONT)

- 4 Remove two machine thread plugs (22) and two preformed packings (23) from multiple connector (13).
- 5 Remove six socket head capscrews (24), pressure relief valve (21), two preformed packings (25), and two preformed packings (26) from multiple connector (13).

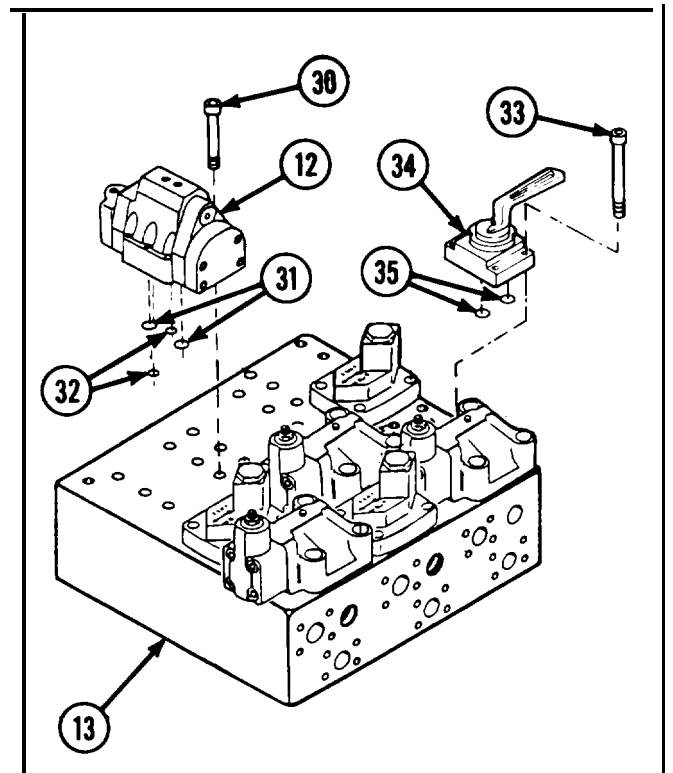


- 6 Remove six socket head capscrews (27), pressure relief valve (11), two preformed packings (28), and two preformed packings (29) from multiple connector (13).



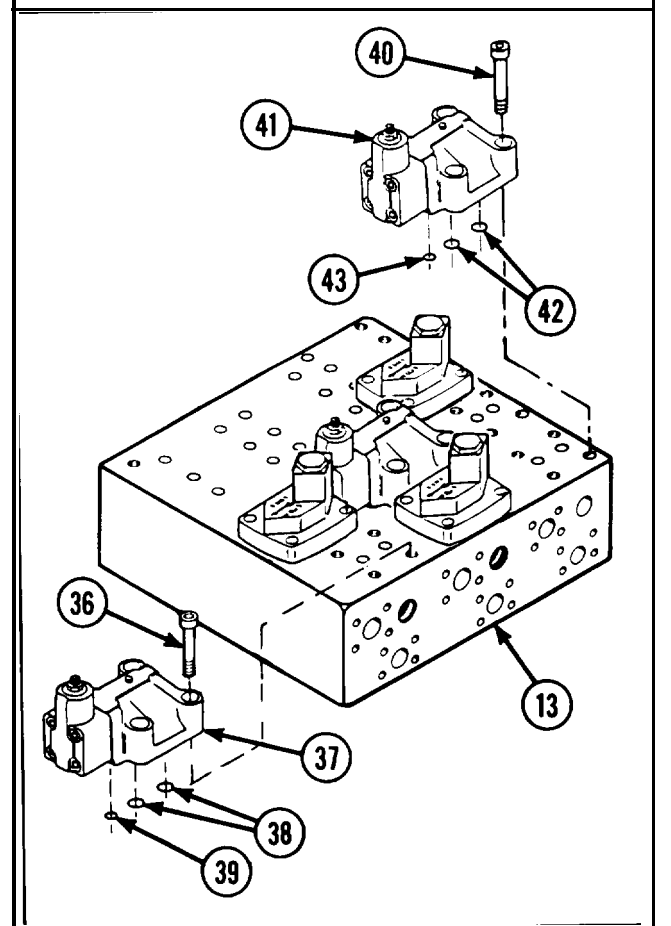
7 Remove six socket head capscrews (30), pressure relief valve (12), two preformed packings (31), and two preformed packings (32) from multiple connector (13).

8 Remove four socket head capscrews (33), boom cylinder hydraulic stopcheck valve (34), and two preformed packings (35) from multiple connector (13).



9 Remove four socket head capscrews (36), pressure relief valve (37), two preformed packings (38), and preformed packing (39) from multiple connector (13).

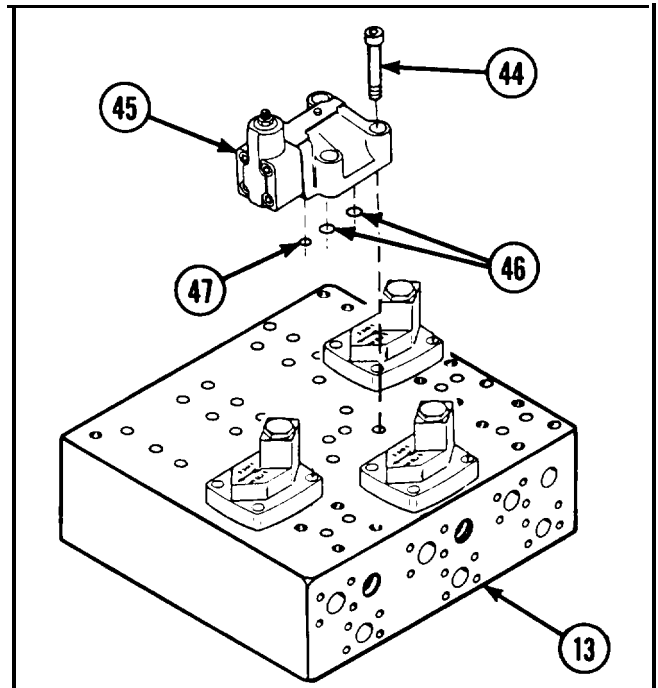
10 Remove four socket head capscrews (40), boom cylinder pressure relief valve (41), two preformed packings (42), and preformed packing (43) from multiple connector (13).



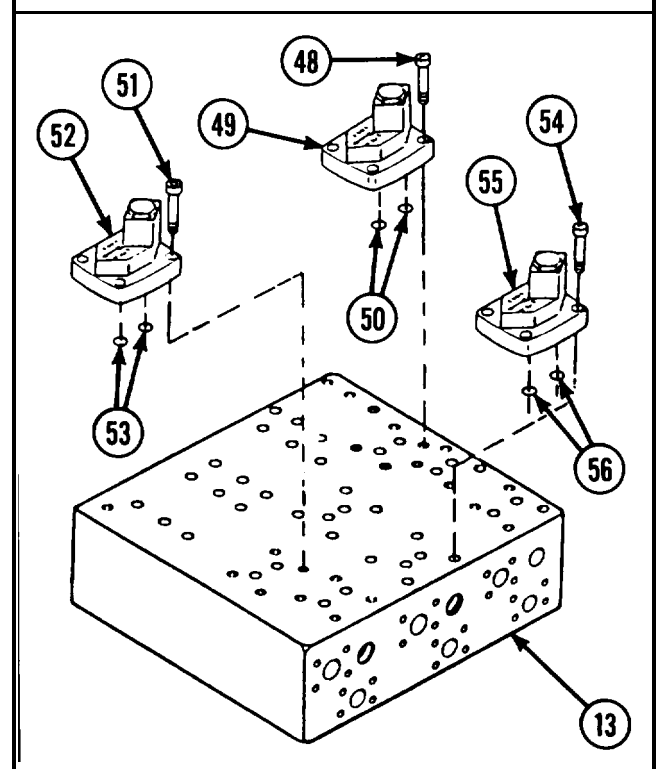
2-36. MAINTENANCE OF COUNTERBALANCE MANIFOLD ASSEMBLY (CONT).

REMOVAL/DISASSEMBLY (CONT)

- 11 Remove four socket head capscrews (44), tow winch pressure relief valve (45), two preformed packings (46), and preformed packing (47) from multiple connector (13).



- 12 Remove four socket head capscrews (48), check valve (49), and two preformed packings (50) from multiple connector (13).
- 13 Remove four socket head capscrews (51), check valve (52), and two preformed packings (53) from multiple connector (13).
- 14 Remove four socket head capscrews (54), check valve (55), and two preformed packings (56) from multiple connector (13).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 Pressure relief valves (12253780) are repairable assemblies. Refer to page 2-163.

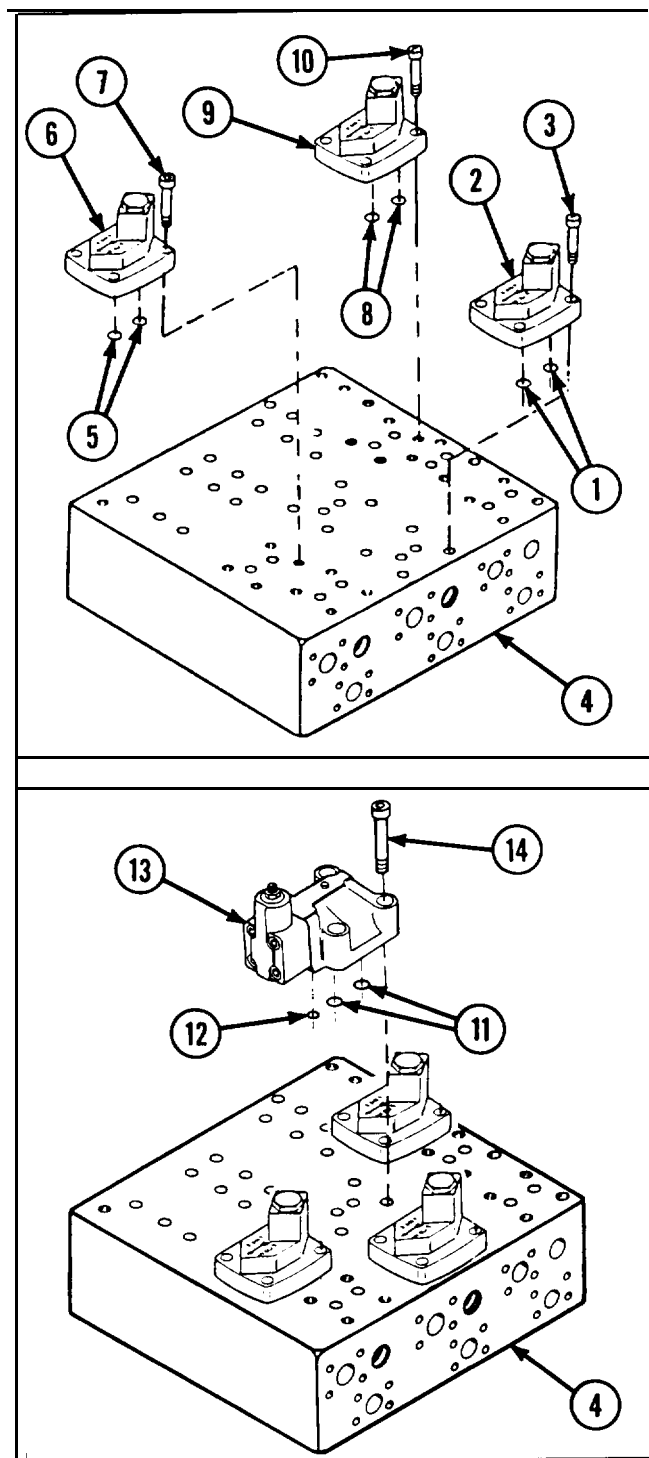
- 3 Check valves (1253779-1 and 12253779-2) are repairable assemblies. Refer to page 2-177.
- 4 Pressure relief valves (12253778-1 and 12253778-2) are repairable assemblies. Refer to page 2-179.
- 5 Repair by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY/INSTALLATION

NOTE

- Apply engine oil (item 15, appx B) to all preformed packings before installation.
- Apply sealing compound (item 18, appx B) to all socket-head cap-screws before installation.

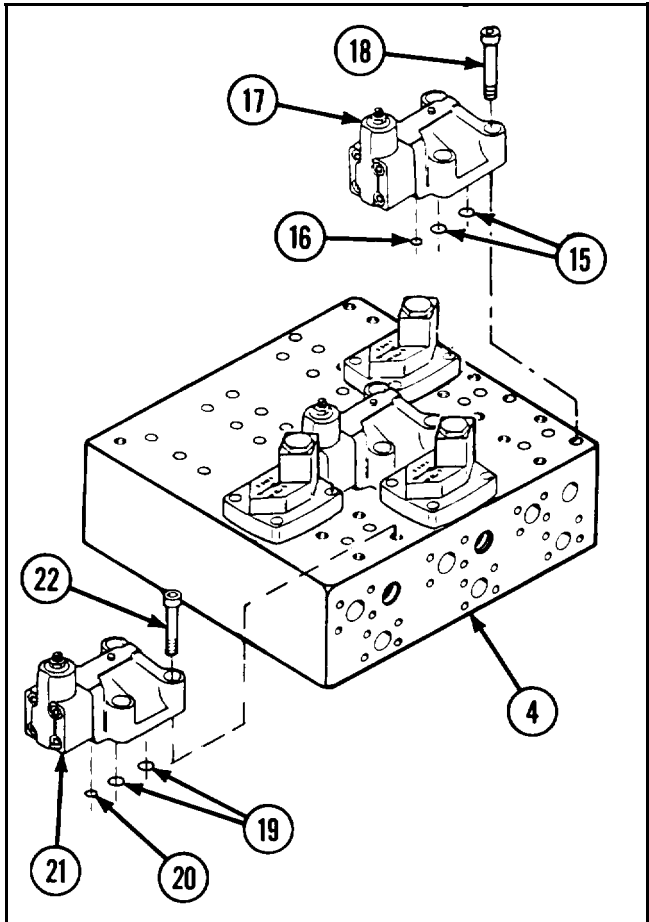
- 1 Install two new preformed packings (1) in check valve (2).
- 2 Install check valve (2) and four socket-head capscrews (3) on multiple connector (4).
- 3 Install two new preformed packings (5) in check valve (6).
- 4 Install check valve (6) and four socket head capscrews (7) on multiple connector (4).
- 5 Install two new preformed packings (8) in check valve (9).
- 6 Install check valve (9) and four socket head capscrews (10) on multiple connector (4).
- 7 Install two new preformed packings (11) and new preformed packing (12) in tow winch pressure relief Valve (13).
8. Install tow winch pressure relief valve (13) and four socket head capscrews (14) on multiple connector (4).



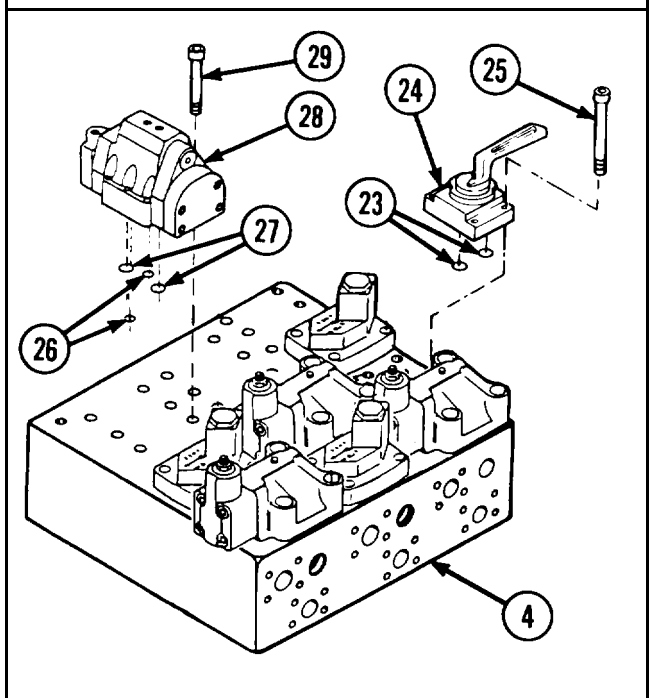
2-36. MAINTENANCE OF COUNTERBALANCE MANIFOLD ASSEMBLY (CONT)

REASSEMBLY/INSTALLATION (CONT)

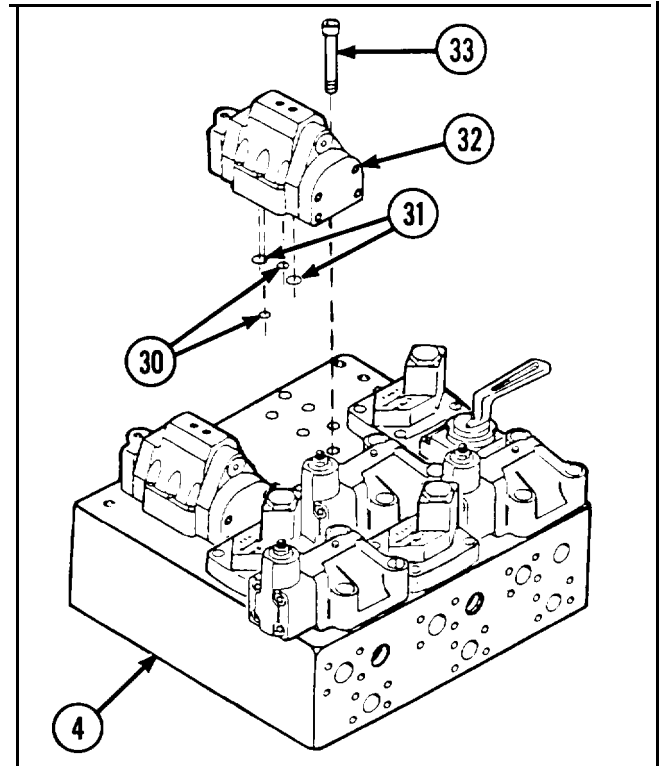
- 9 Install two new preformed packings (15) and new preformed packing (16) in boom cylinder pressure relief valve (17).
- 10 Install boom cylinder pressure relief valve (17) and four socket head capscrews (18) on multiple connector (4).
- 11 Install two new preformed packings (19) and new preformed packing (20) in pressure relief valve (21).
- 12 Install pressure relief valve (21) and four socket head capscrews (22) on multiple connector (4).



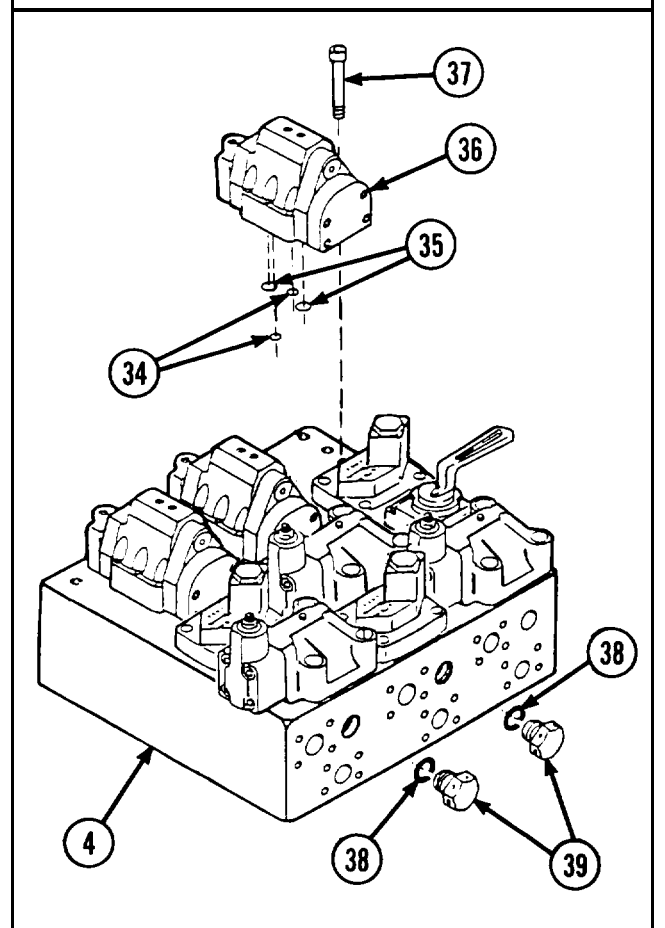
- 13 Install two new preformed packings (23) in boom cylinder hydraulic shut-off valve (24).
- 14 Install boom cylinder hydraulic shut-off valve (24) and four socket head capscrews (25) on multiple connector (4).
- 15 Install two new preformed packings (26) and two new preformed packings (27) in pressure relief valve (28).
- 16 Install pressure relief valve (28) and six socket head capscrews (29) on multiple connector (4).



- 17 Install two new preformed packings (30) and two new preformed packings (31) in pressure relief valve (32).
- 18 Install pressure relief valve (32) and six socket head capscrews (33) on multiple connector (4).

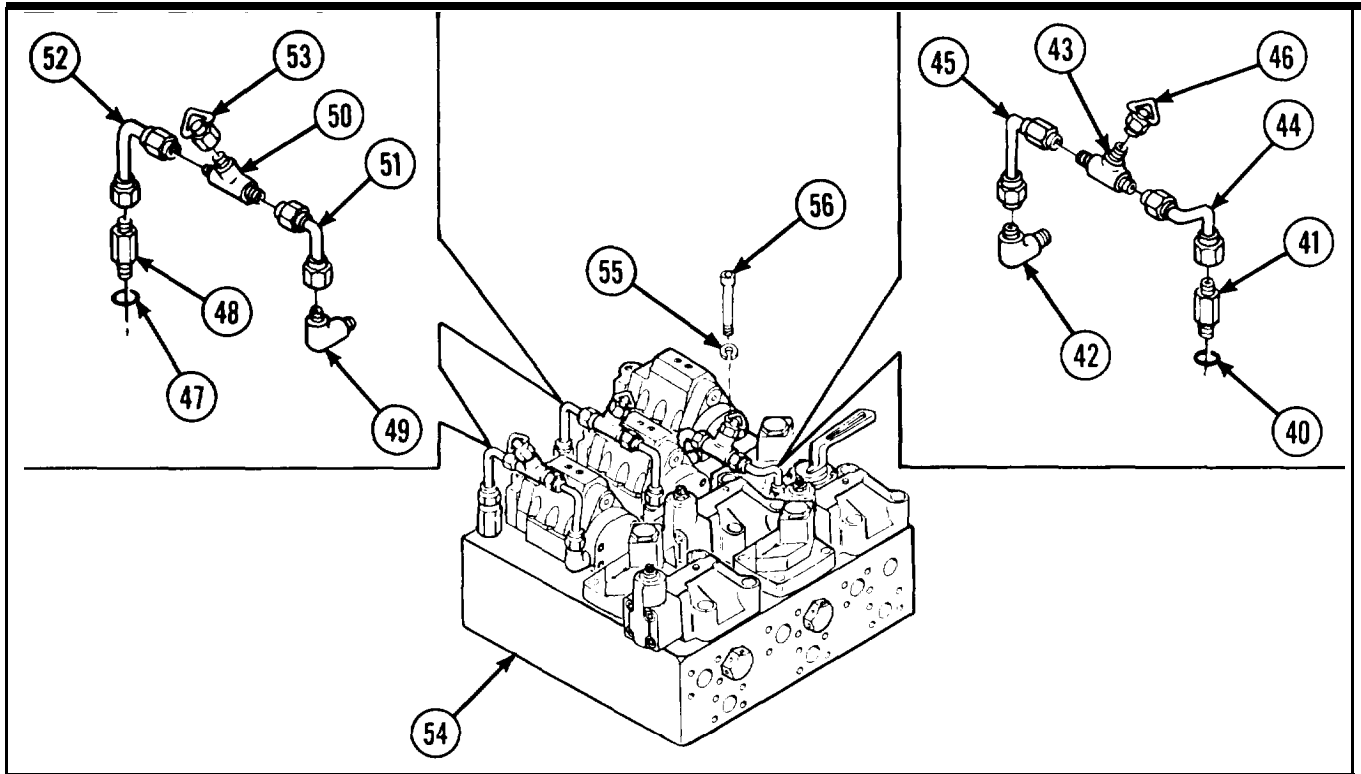


- 19 Install two new preformed packings (34) and two new preformed packings (35) in pressure relief valve (36).
- 20 Install pressure relief valve (36) and six socket head capscrews (37) on multiple connector (4).
- 21 Install two new preformed packings (38) on two machine plugs (39).
- 22 Install two machine plugs (39) on multiple connector (4).



2-36. MAINTENANCE OF COUNTERBALANCE MANIFOLD ASSEMBLY (CONT).

REASSEMBLY/INSTALLATION (CONT)



- | | |
|---|--|
| <p>23 Install new preformed packing (40) on flow control fluid restrictor (41)</p> <p>24 Install flow control fluid restrictor (41), check valve to tube pipe elbow (42), valve tube tee (43), metal fitting tube assembly (44), check valve to tee metal tube assembly (45), and manifold tee tube cap (46).</p> <p>25 Install two new preformed packings (47) on two flow control fluid restrictors (48).</p> <p>26 Install two flow control fluid restrictors (48), two check valve to tube pipe elbows (49), two valve tube tees (50), two check valve to tee metal tube assemblies (51), two fitting to tee metal tube assemblies (52), and two manifold tube caps (53).</p> | <p>27 Install counterbalance manifold (54), four new lockwashers (55), and four counterbalance manifold machine bolts (56).</p> <p>28 Refer to page 2-163 for adjustment of pressure relief valves.</p> <p>29 Refer to page 2-177 for adjustment of check valve.</p> <p>30 Refer to page 2-179 for adjustment of boom cylinder pressure relief valve.</p> <p>31 Refer to page 2-179 for adjustment of tow winch pressure relief valve.</p> <p>32 Refer to page 2-179 for adjustment of boom winch pressure relief valve.</p> |
|---|--|

2-37. MAINTENANCE OF PRESSURE RELIEF VALVE.

This task covers: a. Disassembly
 b. Inspection/Repair
 c. Reassembly
 d. Adjustment

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC5180-90-CL-N26)
 Oil pressure tester (8356176)
 Retaining ring pliers set (PR36)

Materials/Parts

Engine oil (item 15, appx B)
 Packing assortment kit (5705014)

References

TM 9-2350-238-10
 TM 9-2350-238-20-2
 TM 9-2350-238-24P-2

Equipment Conditions

2-154 Pressure relief valve removed from counterbalance manifold

General Safety Instructions

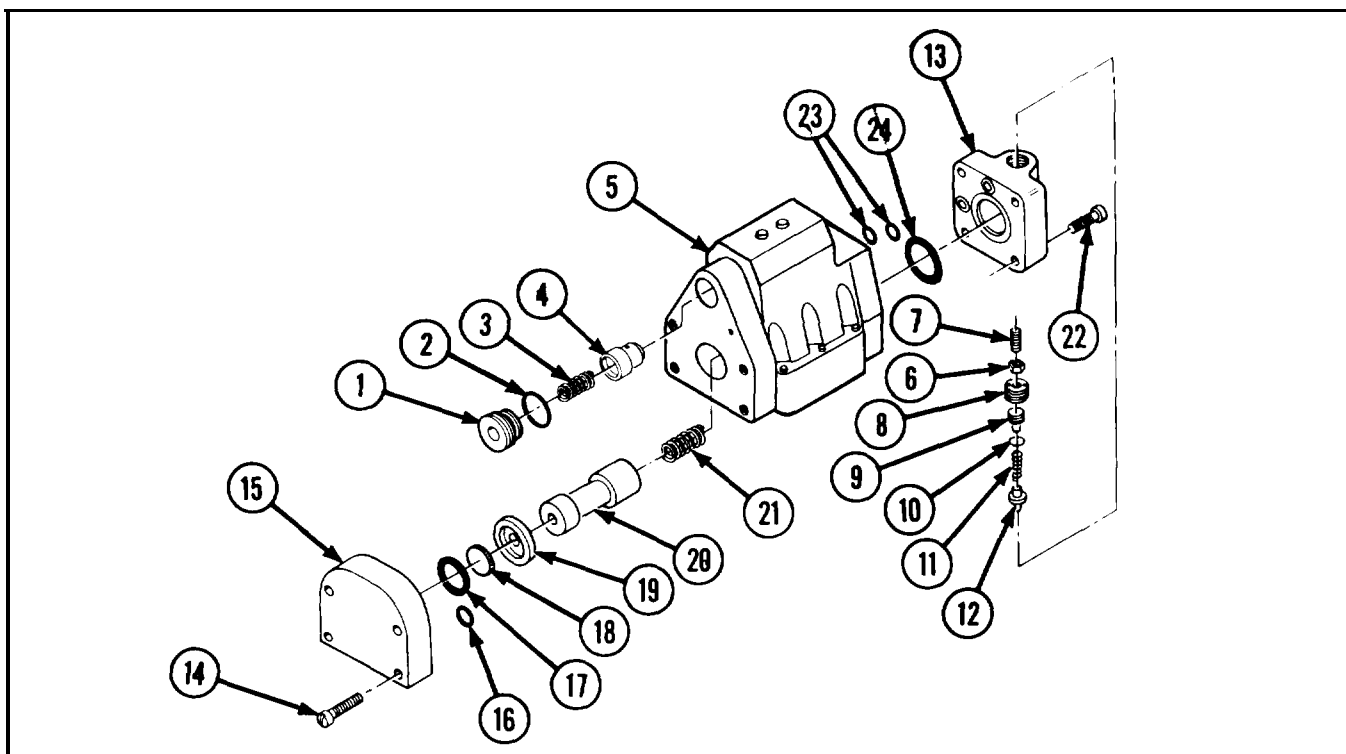


- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid,

- Make sure hydraulic system is re-pressurized before performing any hydraulic maintenance to prevent injury to personnel.
- Always wear leather gloves when handling winch cable, Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.
- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position, as failure of system may result in injury to personnel.

2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

DISASSEMBLY



CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust free area to prevent entry of foreign matter.

NOTE

These procedures are written and illustrated for pressure relief valve (PN12253780). If your unit has a damaged pressure relief valve (PN 10922199), order pressure relief valve (PN12253780) in accordance with TM 9-2350-238-24P-2.

- 1 Remove check spring plug (1), preformed packing (2), valve spring (3), and check valve (4) from pressure relief valve body (5).
- 2 Remove hexagon plain nut (6), adjusting screw (7), and using retaining ring pliers, remove adjusting screw retainer (8).

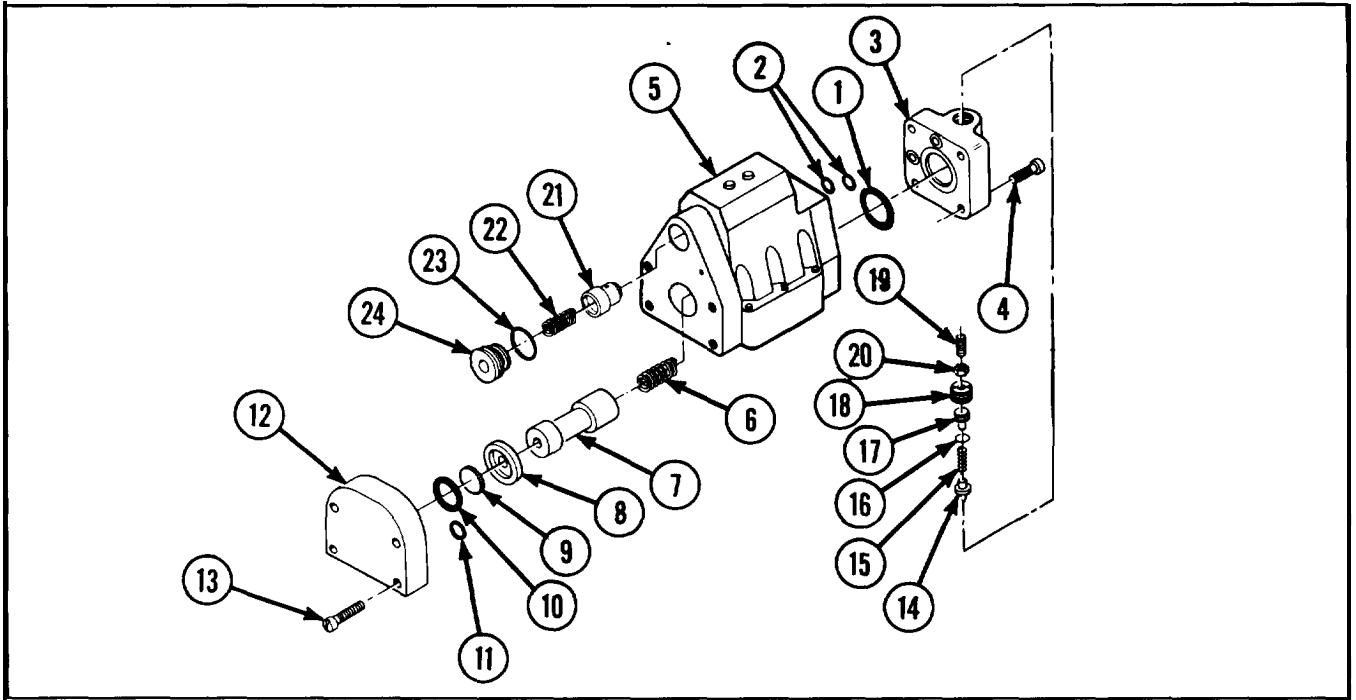
- 3 Remove spring seat (9), preformed packing (10), poppet spring (11), and poppet (12) from pilot cap (13).
- 4 Remove four socket capscrews (14) and cover cap (15) from pressure relief valve body (5).
- 5 Remove preformed packing (16) and preformed packing (17) from cover cap (15).
- 6 Remove filter disc (18), filter disc adapter (19), spool (20), and spool spring (21) from pressure relief valve body (5).
- 7 Remove four socket capscrews (22) and pilot cap (13) from pressure relief valve body (5).
- 8 Remove two preformed packings (23) and preformed packing (24) from pilot cap (13).

| |
|-------------------|
| INSPECTION/REPAIR |
|-------------------|

- | | |
|---|---|
| <ol style="list-style-type: none"> 1 Check for broken, damaged, or missing parts. 2 If check spring plug is broken, damaged, or missing, repair is by replacement of next higher assembly. 3 If valve spring is broken, damaged, or missing, repair is by replacement of next higher assembly. 4 If check valve is broken, damaged, or missing, repair is by replacement of next higher assembly. 5 If socket capscrews are broken, damaged, or missing, repair is by replacement of next higher assembly. 6 If cover cap is broken, damaged, or missing, repair is by replacement of next higher assembly. 7 If filter disc is broken, damaged, or missing, repair is by replacement of next higher assembly. 8 If filter disc adapter is broken, damaged, or missing, repair is by replacement of next higher assembly. 9 If spool is broken, damaged, or missing, repair is by replacement of next higher assembly. 10 If spool spring is broken, damaged, or missing, repair is by replacement of next higher assembly. | <ol style="list-style-type: none"> 11 If pilot cap is broken, damaged, or missing, repair is by replacement of next higher assembly. 12 If adjusting screw is broken, damaged, or missing, repair is by replacement of next higher assembly. 13 If hexagon plain nut is broken, damaged, or missing, repair is by replacement of next higher assembly. 14 If adjusting screw retainer is broken, damaged, or missing, repair is by replacement of next higher assembly. 15 If spring seat is broken, damaged, or missing, repair is by replacement of next higher assembly. 16 If poppet spring is broken, damaged, or missing, repair is by replacement of next higher assembly. 17 If poppet is broken, damaged, or missing, repair is by replacement of next higher assembly. 18 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2). |
|---|---|

2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

REASSEMBLY



NOTE

Apply engine oil (item 15, appx B) to new preformed packings before reassemble.

- 1 Install new preformed packing (1) and two new preformed packings (2) in pilot cap (3).
- 2 Install pilot cap (3) and four socket cap-screws (4) on pressure relief valve body (5).
- 3 Install spool spring (6), spool (7), filter disc adapter (8), and filter disc (9) in pressure relief valve body (5).
- 4 Install new preformed packing (10) and new preformed packing (11) in cover cap (12).
- 5 Install cover cap (12) and four socket cap-screws (13) on pressure relief valve body (5).
- 6 Install poppet (14), poppet spring (15), new preformed packing (16), spring seat (17), and using retaining ring pliers, install justing screw retainer (18).
- 7 Install adjusting screw (19), and hexagon plain nut (20) in pilot cap (3).
- 8 Install check valve (21), valve spring (22), new preformed packing (23), and check suring plug (24).
- 9 Perform installation procedures prior to adjustment of pressure relief valves. Refer to page 2-154.

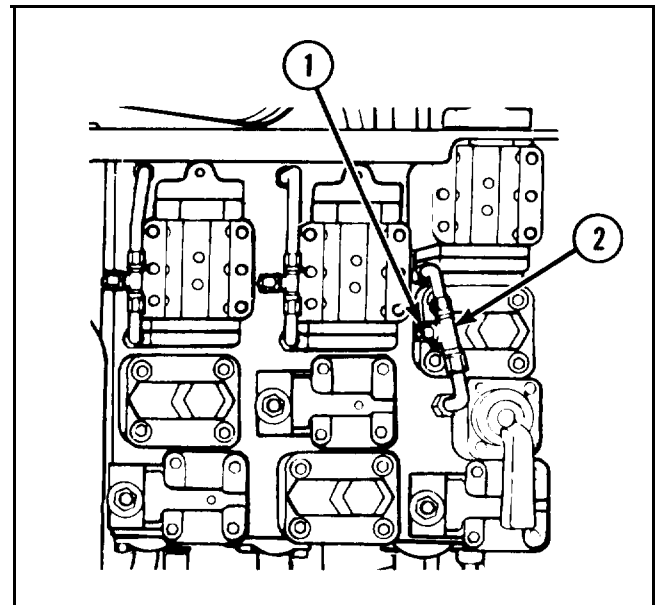
ADJUSTMENT**WARNING**

- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position as failure of system may result in injury to personnel.

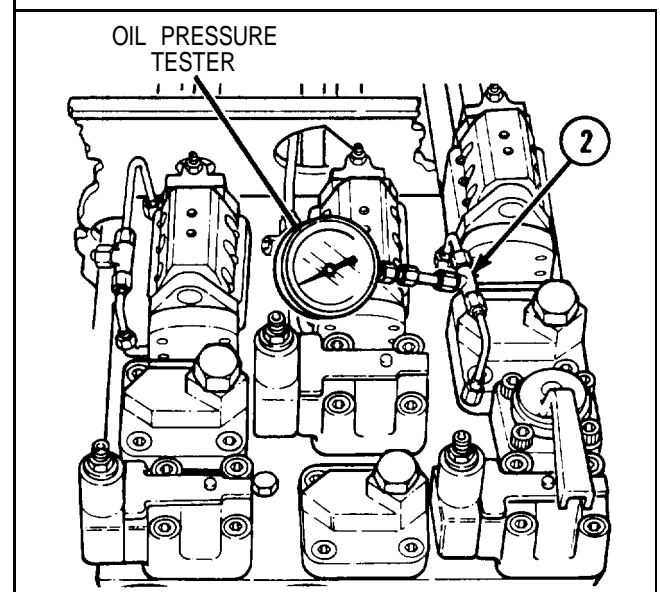
NOTE

Steps 1 thru 5 are written for one pressure relief valve, but apply to all three.

- 1 Adjust check valve. Refer to page 2-179.
- 2 Turn off hydraulic system (TM 9-2350-238-10).
- 3 Remove manifold tee tube cap (1) from valve tube tee (2).



- 4 Install 500 psi (3448 Pa) oil pressure tester on valve tube tee (2).



2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

ADJUSTMENT (CONT)

WARNING

- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-38-20-2). Wipe up spilled hydraulic fluid.
- Make sure hydraulic system is depressurized before performing any hydraulic maintenance to prevent injury to personnel.

5 Turn on hydraulic system. Refer to TM 9-2350-238-10.

WARNING

Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.

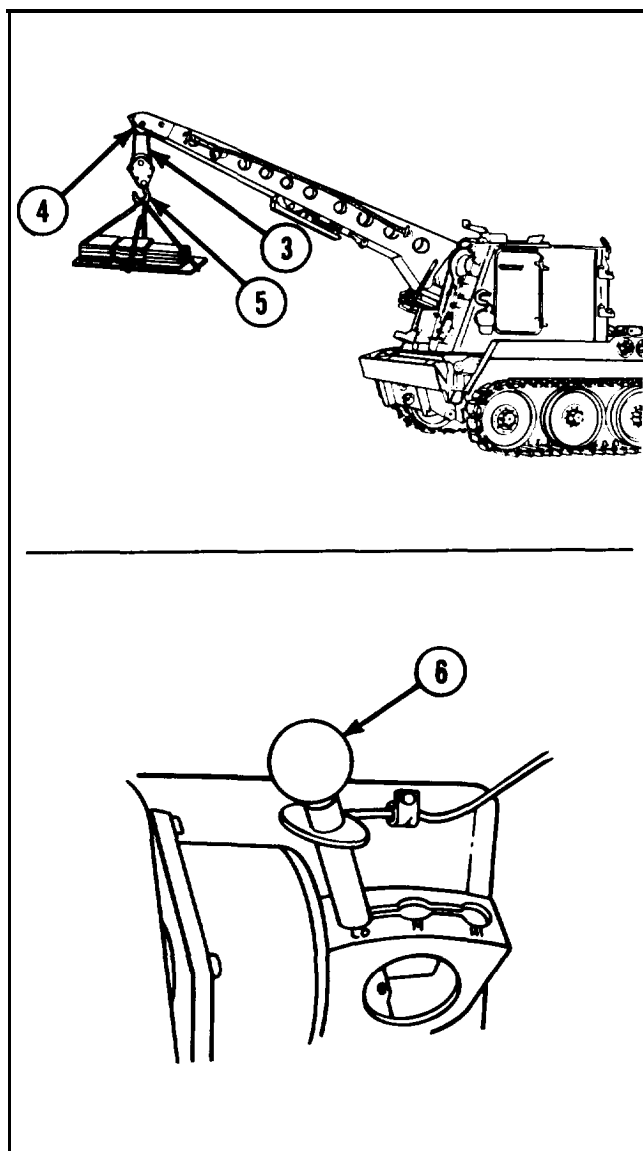
CAUTION

Do not stall boom at fully lowered position. Do not rapidly speed up boom when lowering. Failure to follow instructions may result in damage to oil pressure tester.

NOTE

Steps 6 thru 19 are written for right pressure relief valve.

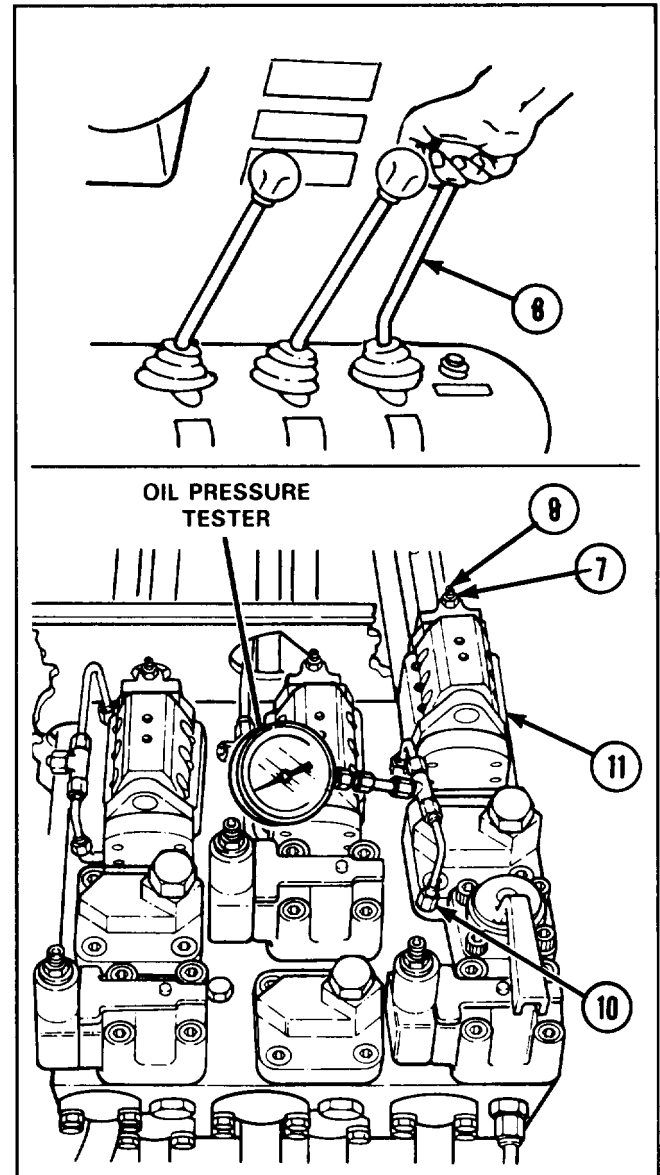
- 6 Pass end of cable (3) through boom pulley (4). Refer to TM 9-2350-238-10.
- 7 Attach 5-ton (4.54-metric ton) load on boom block (5).
- 8 Set boom winch shift control lever (6) to LO.
- 9 Lift load from ground. Refer to TM 9-2350-238-10.



CAUTION

Do not allow pressure to go over 500 psi (3448 kPa). Failure to follow instructions may result in damage to equipment.

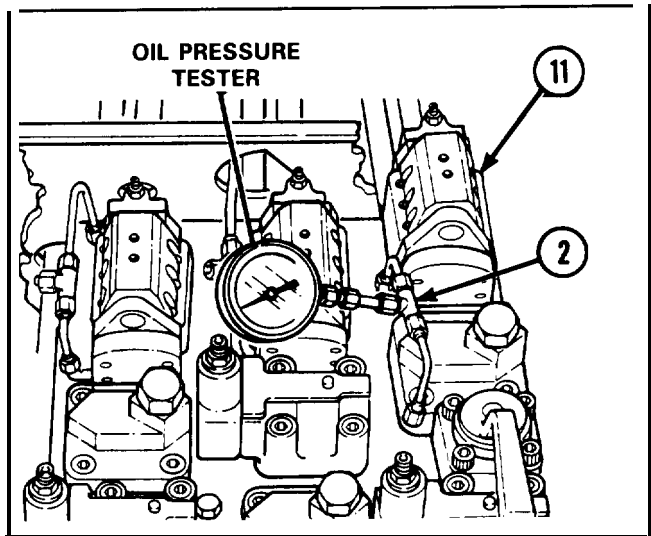
- 10 Loosen nut (7).
- 11 Watching oil pressure tester, push BOOM cylinder control handle (8) slowly to LOWER. If necessary, turn screw (9) counterclockwise to decrease pressure. Needle valve (10) can be adjusted by hand to provide a steady oil pressure tester reading.
- 12 Adjust pressure for pressure relief valve (11) to between 180 and 220 psi (1241 and 1517kPa) by turning screw (9) counterclockwise to decrease pressure or clockwise to increase pressure.
- 13 When correct pressure adjustment is obtained, tighten nut (7).
- 14 If correct pressure adjustment cannot be obtained, replace pressure relief valve. Refer to page 2-163.
- 15 Slowly lower boom to stow position.
- 16 Turn off hydraulic system. Refer to TM 9-2350-238-10.



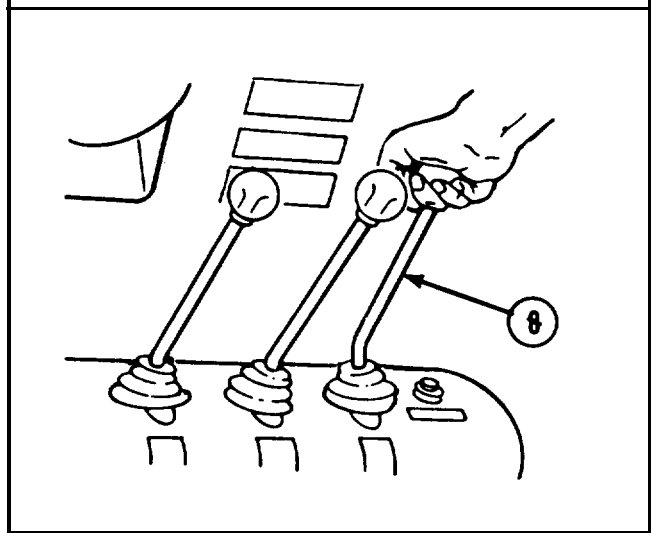
2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

ADJUSTMENT (CONT)

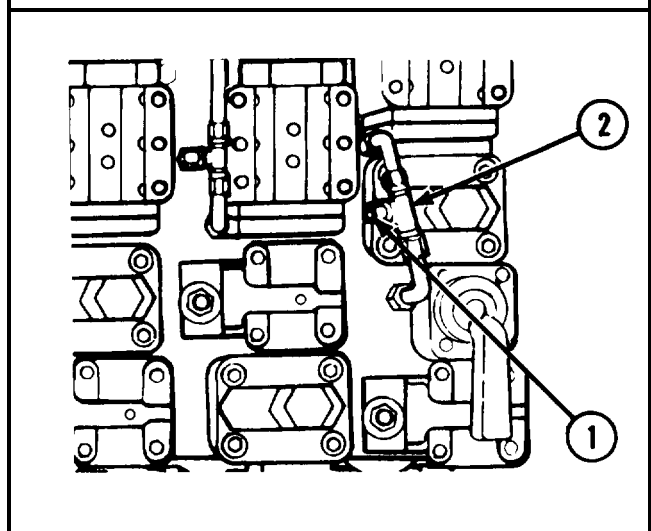
17 Disconnect oil pressure tester from valve tube tee (2).



18 Slowly push BOOM cylinder control handle (8) to LOWER to remove air trapped in pressure relief valve (11).



19 Install manifold tee tube cap (1) on valve tube tee (2).



WARNING

Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries. Do not operate winch/crane with less than four turns of wire rope on drums. Failure to observe these warnings could result in injury to personnel.

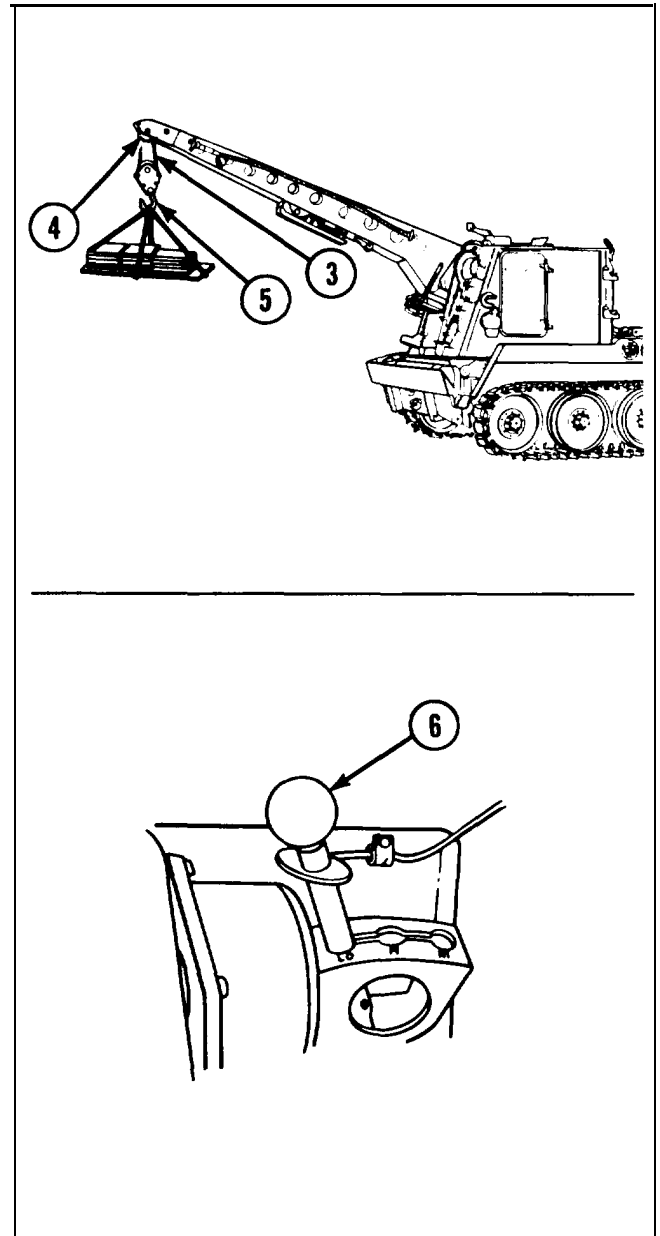
CAUTION

Do not stall boom at fully lowered position. Do not rapidly speed up boom when lowering. Failure to follow instructions may result in damage to oil pressure tester.

NOTE

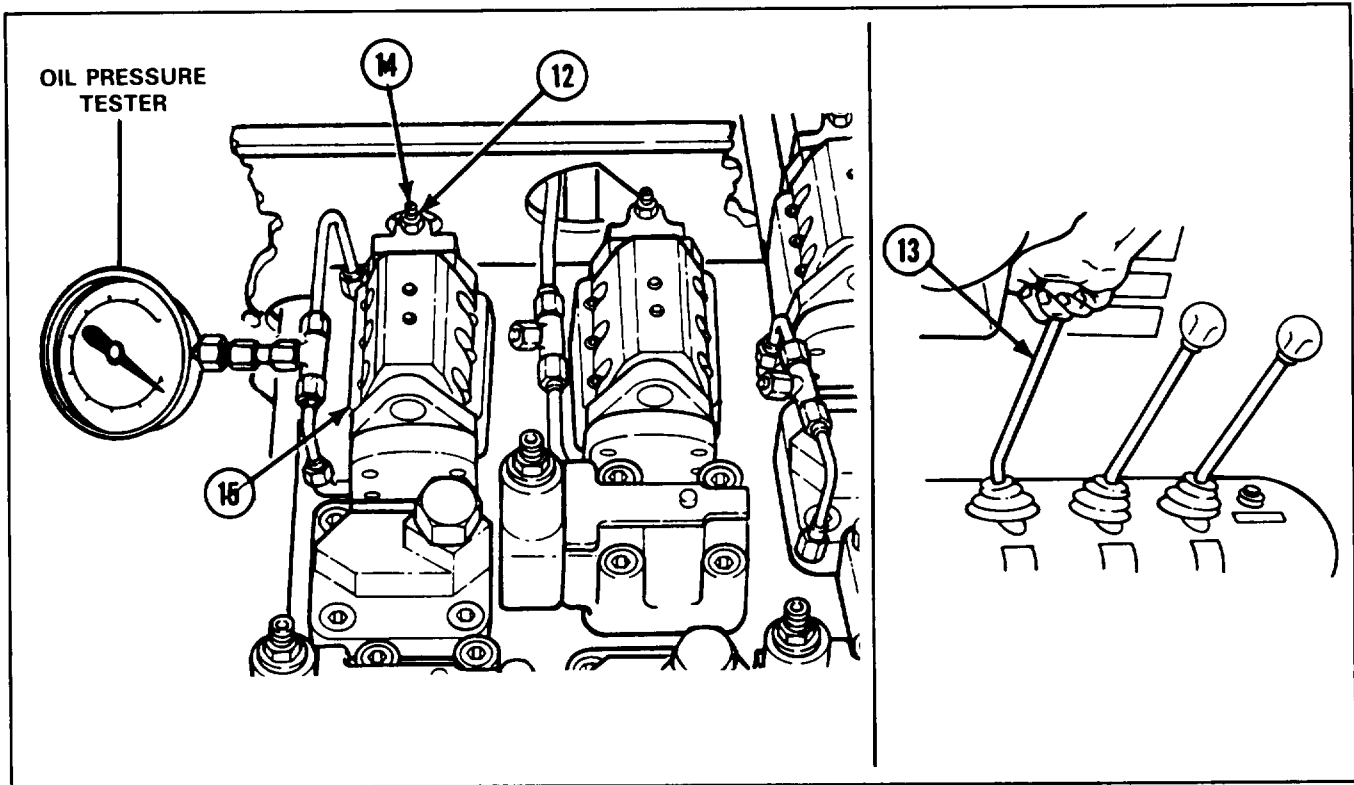
Steps 20 thru 33 are written for left pressure relief valve.

- 20 Pass end of cable (3) through boom pulley (4). Refer to TM 9-2350-238-10.
- 21 Attach 5-ton (4.54 metric ton) load on boom block (5).
- 22 Set boom winch shift control lever (6) to LO.
- 23 Lift load from ground. Refer to TM 9-2350-238-10.



2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

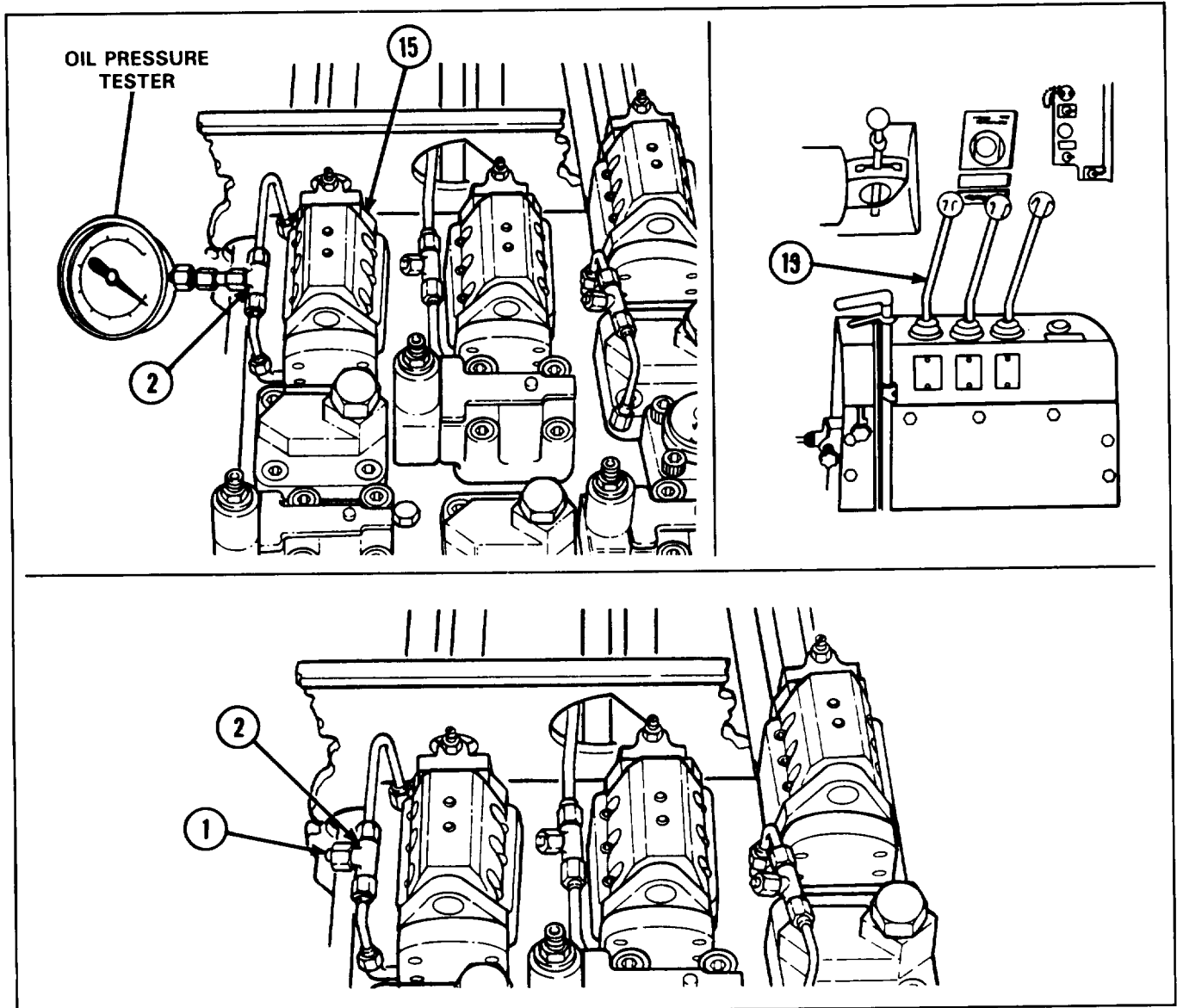
ADJUSTMENT (CONT)



CAUTION

Do not allow pressure to go over 500 psi (3448 kPa). Failure to follow instructions may result in damage to equipment.

- 24 Loosen nut (12).
- 25 Watching oil pressure tester, push BOOM WINCH control handle (13) slowly to LOWER. If pressure is more than 500 psi (3448 kPa) while operating boom winch, turn screw (14) counterclockwise to decrease pressure.
- 26 Adjust pressure for pressure relief valve (15) to between 180 and 220 psi (1241 and 1517 kPa) by turning screw (14) counterclockwise to decrease pressure or clockwise to increase pressure.
- 27 When correct pressure adjustment is obtained, tighten nut (12).
- 28 If correct pressure adjustment cannot be obtained, replace pressure relief valve (15). Refer to page 2-163.



29 Lower load to ground and allow boom winch cable to slacken.

30 Turn off hydraulic system. Refer to TM 9-2350-238-10.

31 Disconnect oil pressure tester from valve tube tee (2).

32 Slowly push BOOM WINCH control handle (13) to LOWER to remove air trapped in pressure relief valve (15).

33 Install manifold tee tube cap (1) on valve tube tee (2).

2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

ADJUSTMENT (CONT)

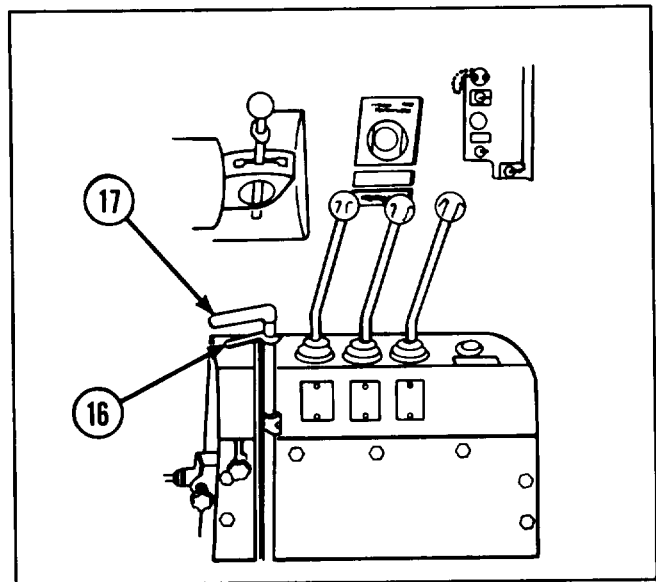
WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

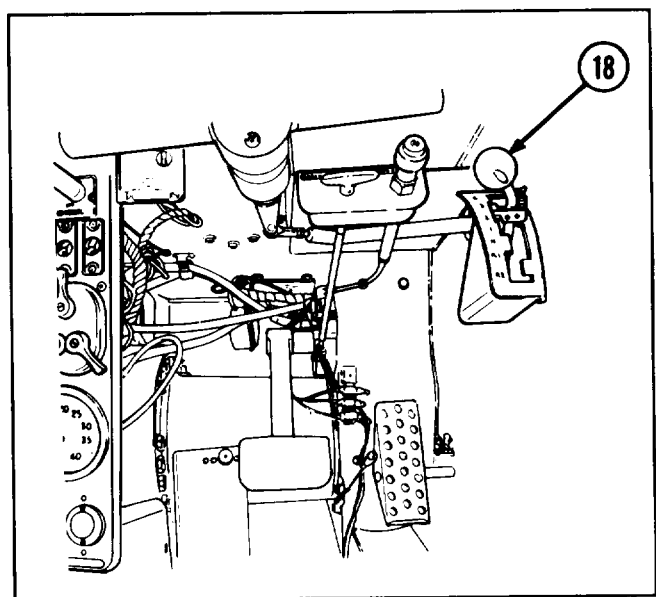
NOTE

Steps 34 thru 52 are written for middle pressure relief valve.

- 34 Turn on hydraulic system. Refer to TM 9-2350-238-10.
- 35 Traverse cab until it faces rear of vehicle. Refer to TM 9-2350-238-10.
- 36 Anchor tow winch cable. Refer to TM 9-2350-238-10.
- 37 Pull up on lock trigger (16).
- 38 Turn tow winch shift control lever (17) to LO.



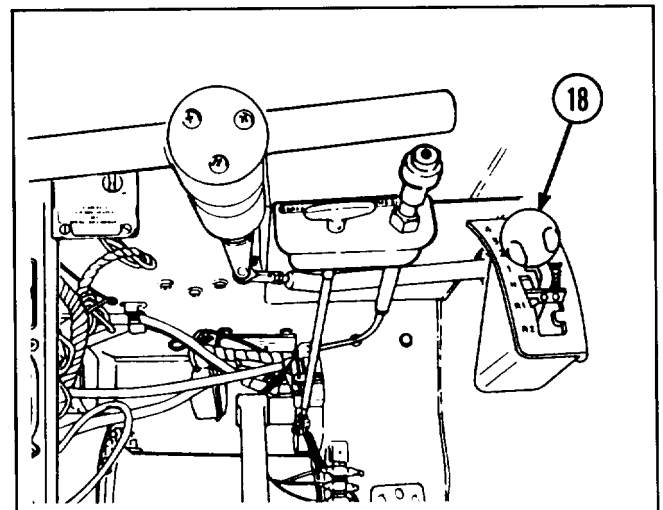
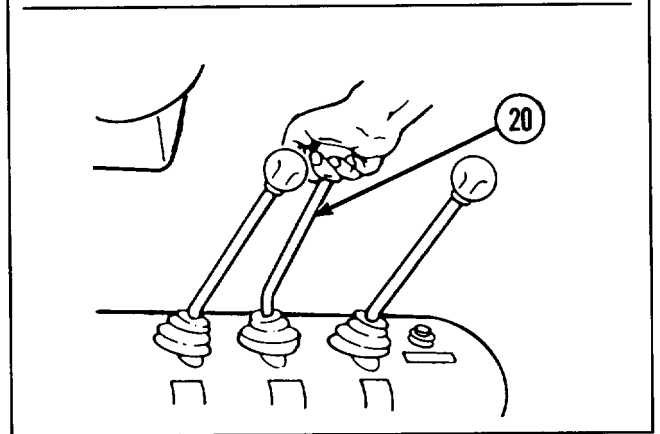
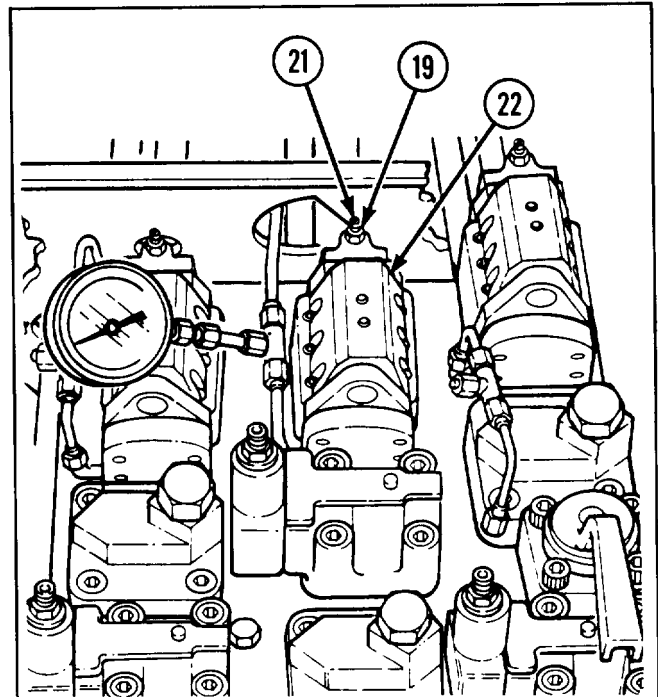
- 39 Set transmission shift control lever (18) to 3.
- 40 Adjust engine speed to take up slack in tow winch cable. Refer to TM 9-2350-238-10.



CAUTION

Do not allow pressure to go over 500 psi (3448 kPa). Failure to follow instructions may result in damage to equipment.

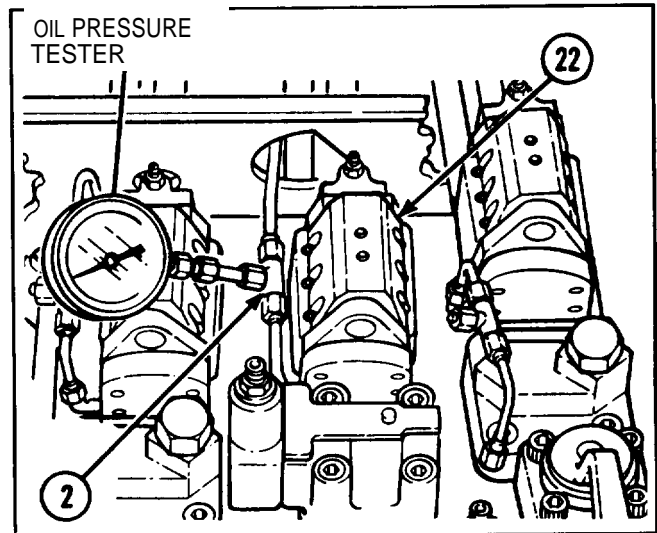
- 41 Loosen nut (19).
- 42 Watching oil pressure tester, push TOW WINCH control handle (20) slowly to OUT. If pressure is more than 500 psi (3448 kPa) while operating tow winch, turn screw (21) counterclockwise to decrease pressure.
- 43 Adjust pressure for pressure relief valve (22) to between 180 and 220 psi (1241 and 1517 kPa) by turning screw (21) counterclockwise to decrease pressure and clockwise to increase pressure.
- 44 When correct pressure adjustment is obtained, tighten nut (19).
- 45 If correct pressure adjustment cannot be obtained, repair pressure relief valve (22). Refer to page 2-163.
- 46 Set transmission shift control lever (18) to N.
- 47 Allow tow winch cable to slacken.



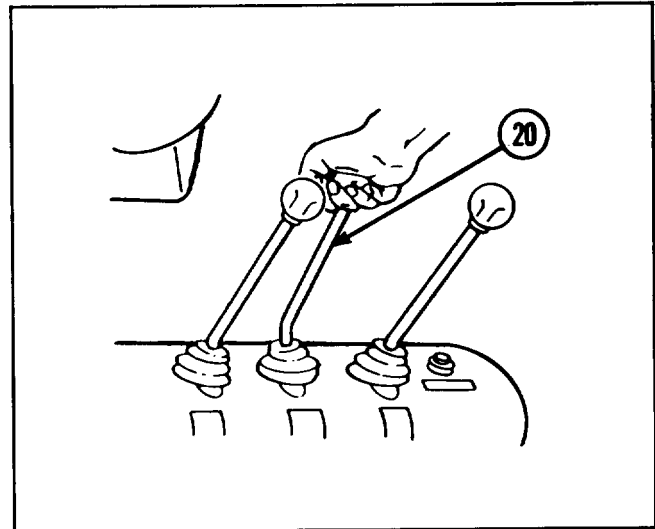
2-37. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).

ADJUSTMENT (CONT)

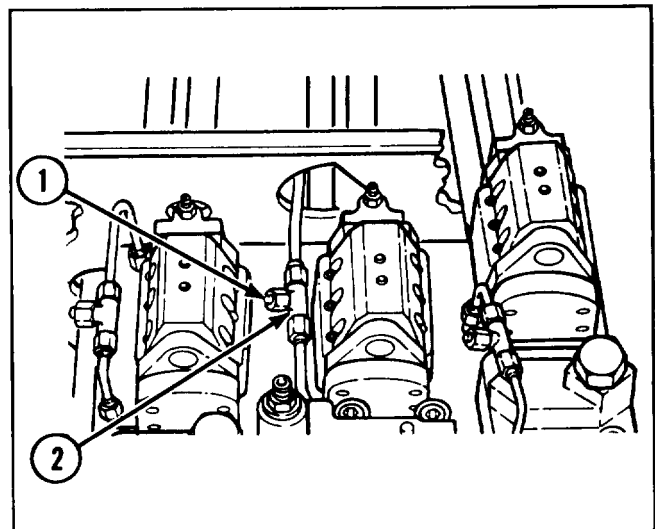
- 48 Remove tow winch cable from anchor. Refer to TM 9-2350-238-10.
- 49 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 50 Disconnect oil pressure tester from valve tube tee (2).



- 51 Slowly push TOW WINCH control handle (20) to OUT to remove air trapped in pressure relief valve (22).



- 52 Install manifold tee tube cap (1) on valve tube tee (2).



2-38. MAINTENANCE OF CHECK VALVE 12253779-1 AND CHECK VALVE 12253779-2.

This task covers: a. *Disassembly*
 b. *Inspection/Repair*

c. *Reassembly*
 d. *Adjustment*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive
 (SC5180-95-C-N26)

Materials/Parts

Engine oil (item 15, appx B)
 Preformed packing (MS8778-14)

References

TM 9-2350-238-10
 TM 9-2350-238-20-2
 TM 9-2350-238-24P-2

Equipment Conditions

2-154 Check valves removed from
 counterbalance manifold

DISASSEMBLY

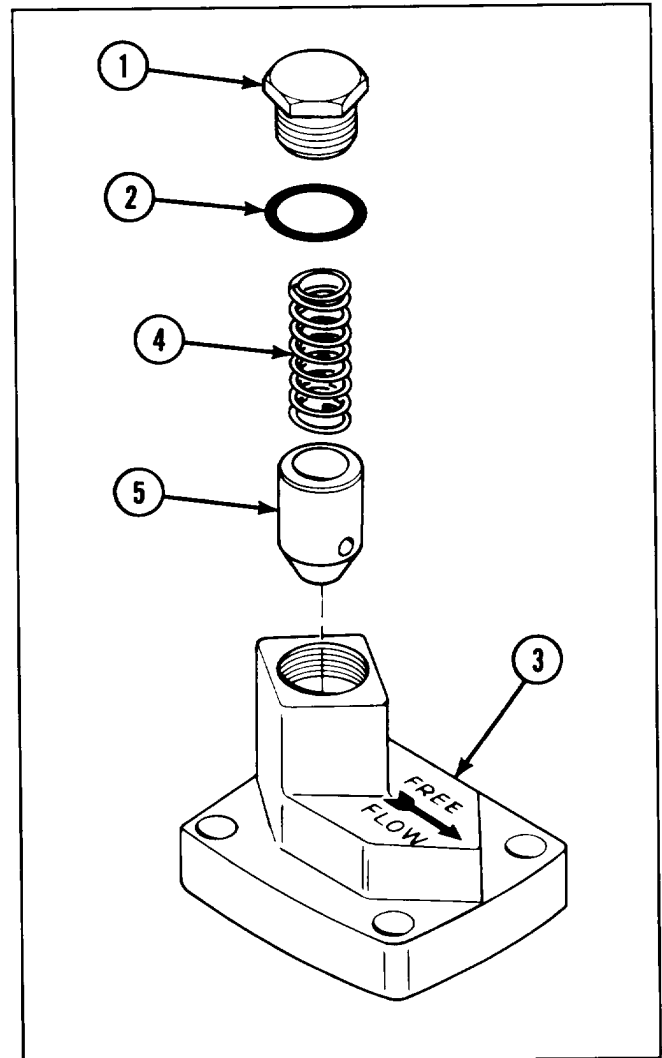
CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter.

NOTE

- Disassembly procedures are written for one pressure relief valve, but apply to both.
- These procedures are written and illustrated for check valves (PN 12253779-1 and 12253779-2). If your unit has damaged check valves (PN 10922198-1 or 10922198-2), order check valves (PN 12253779-1 or 12253779-2) in accordance with TM 9-2350-238-24P-2.

- 1 Remove spring cap (1) and preformed packing (2) from pressure relief valve body (3). Remove preformed packing (2) from spring cap (1).
- 2 Remove helical compression spring (4) and check valve (5) from pressure relief valve body (3).



2-38. MAINTENANCE OF CHECK VALVE 12253779-1 AND CHECK VALVE 12253779-2 (CONT).

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If spring cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If helical compression spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If check valve is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

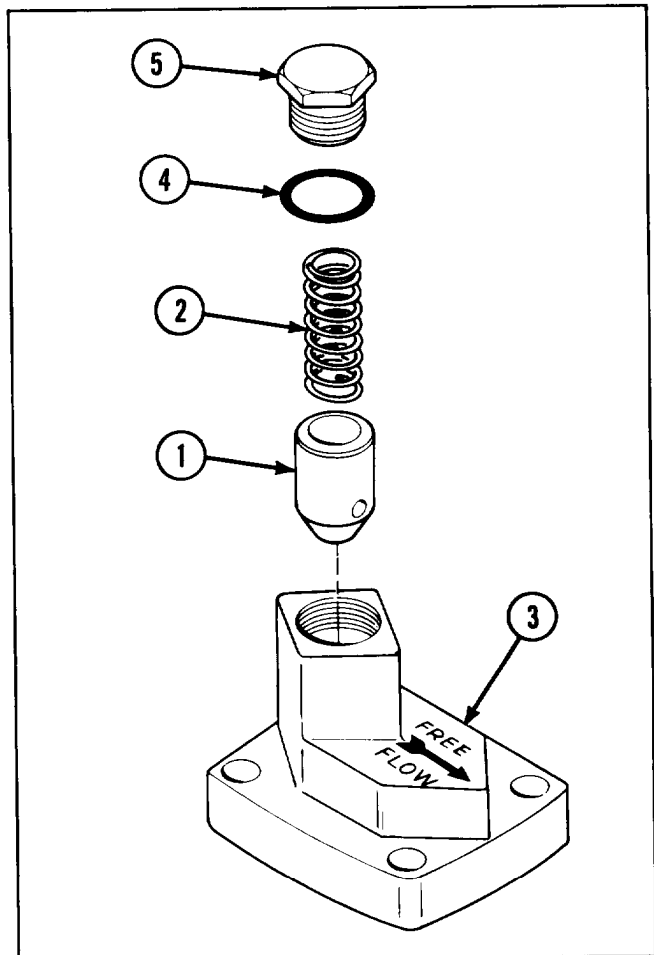
REASSEMBLY

NOTE

- Reassembly procedures are written for one pressure relief valve, but apply to both.
 - Apply engine oil (item 15, appx B) to new preformed packing before reassembly.
- 1 Install check valve (1) and helical compression spring (2) in pressure relief valve body (3).
 - 2 Install new preformed packing (4) on spring cap (5). Install spring cap (5) on pressure relief valve body (3).

ADJUSTMENT

Adjustment procedures are to be performed in conjunction with adjustment of pressure relief valves. Refer to page 2-179.



2-39. MAINTENANCE OF PRESSURE RELIEF VALVE 12253778-1 AND PRESSURE RELIEF VALVE 12253778-2.

This task covers:

| | |
|---|--|
| <p>a. Disassembly b. Inspection/Repair c. Reassembly d. Adjustment of check valve</p> | <p>e. Adjustment of boom cylinder pressure relief valve f. Adjustment of tow winch pressure relief valve g. Adjustment of boom winch pressure relief valve</p> |
|---|--|

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive
(SC 5180-90-CL-N26)
Oil pressure tester (8356176)
Retaining ring pliers set (PR36)

Materials/Parts

Engine oil (item 15, appx B)
Packing assortment kit (5705012)

References

TM 9-2350-238-10
TM 9-2350-238-24P-2

Equipment Conditions

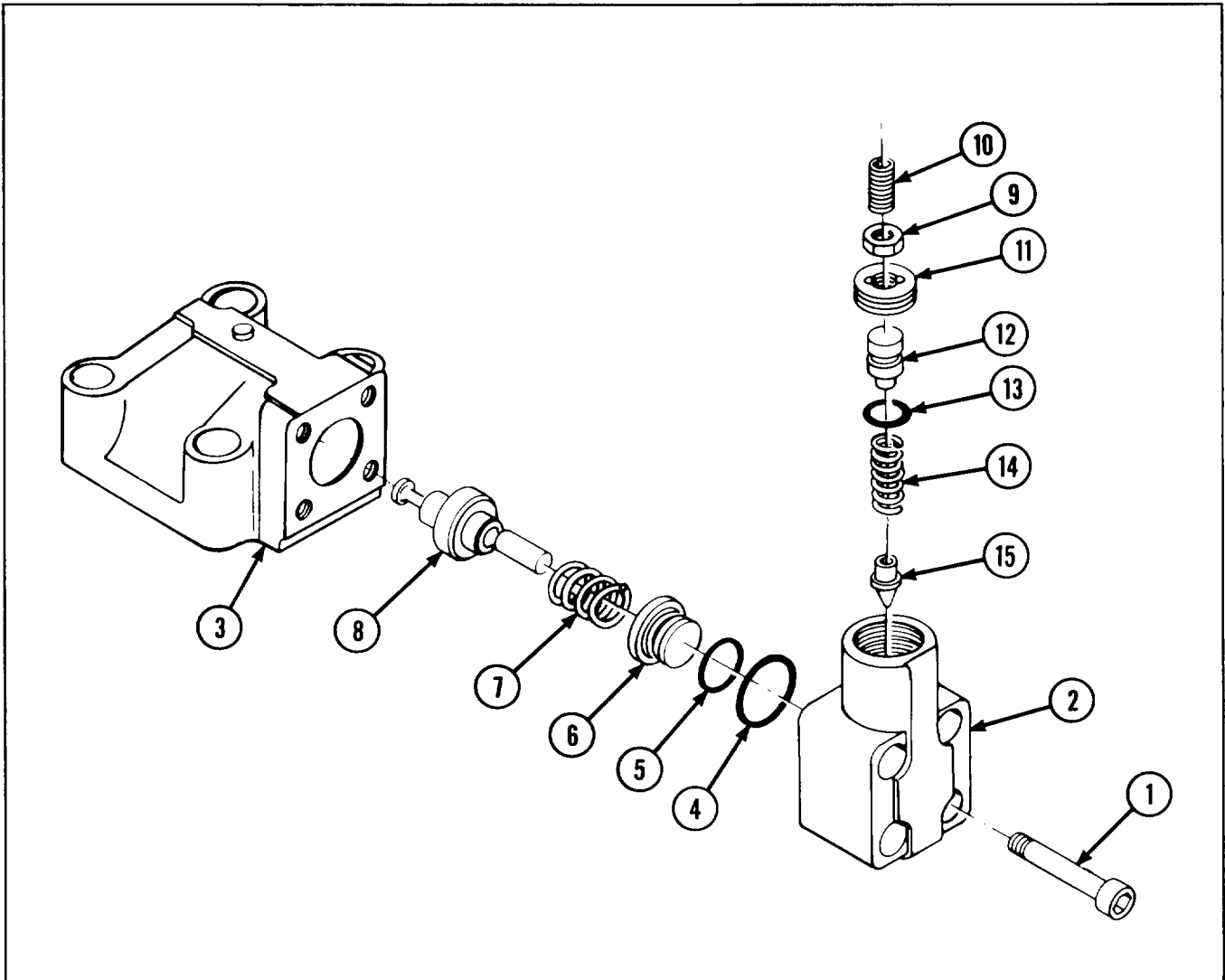
2-154 Pressure relief valves removed
from counterbalance manifold

General Safety Instructions

WARNING

- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position, as failure of system may result in injury to personnel.
- Hydraulic system is under high pressure. Follow system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

2-39. MAINTENANCE OF PRESSURE RELIEF VALVE 12253778-1 AND PRESSURE RELIEF VALVE 12253778-2 (CONT).



DISASSEMBLY

CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter.

NOTE

These procedures are written and illustrated for pressure relief valves (PN 12253778-1 and 12253778-2). If your unit has damaged valves (PN 10922170-2 or 10922170-3),

order pressure relief valves (PN 12253778-1 or 12253778-2), in accordance with TM 9-2350-238. 24P-2.

- Disassembly procedures are written for one pressure relief valve but apply to all three.
- 1 Remove four socket cap screws (1) and pilot cap (2) from pressure relief valve body (3).

- 2 Remove preformed packing (4) from pilot cap (2).
- 3 Remove preformed packing (5), piston guide (6), piston spring (7), and piston (8) from pressure relief valve body (3).
- 4 Remove hexagon plain nut (9), adjusting screw (10), and using retaining ring pliers, remove retainer (11).
- 5 Remove spring seat (12), preformed packing (13), poppet spring (14), and poppet (15) from pilot cap (2).
- 10 If spring seat is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 11 If poppet is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 12 If poppet spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 13 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If piston is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If piston spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If piston guide is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 If pilot cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 6 If socket capscrews are broken, damaged, or missing, repair is by replacement of next higher assembly.
- 7 If adjusting screw is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 8 If hexagon plain nut is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 9 If retainer is broken, damaged, or missing, repair is by replacement of next higher assembly.

REASSEMBLY

NOTE

- Reassembly procedures are written for one pressure relief valve, but apply to all three.
 - Apply engine oil (item 15, appx B) to new preformed packings before reassembly.
- 1 Install poppet (15), poppet spring (14), new preformed packing (13), spring seat (12), and using retaining ring pliers, install retainer (11).
 - 2 Install adjusting screw (10), and hexagon plain nut (9) in pilot cap (2).
 - 3 Install piston (8), piston spring (7), piston guide (6), and new preformed packing (5) in pressure relief valve body (3).
 - 4 Install new preformed packing (4) on pilot cap (2).
 - 5 Install pilot cap (2) and four socket capscrews (1) on pressure relief valve body (3).

2-39. MAINTENANCE OF PRESSURE RELIEF VALVE 12253778-1 AND PRESSURE RELIEF VALVE 12253778-2 (CONT).

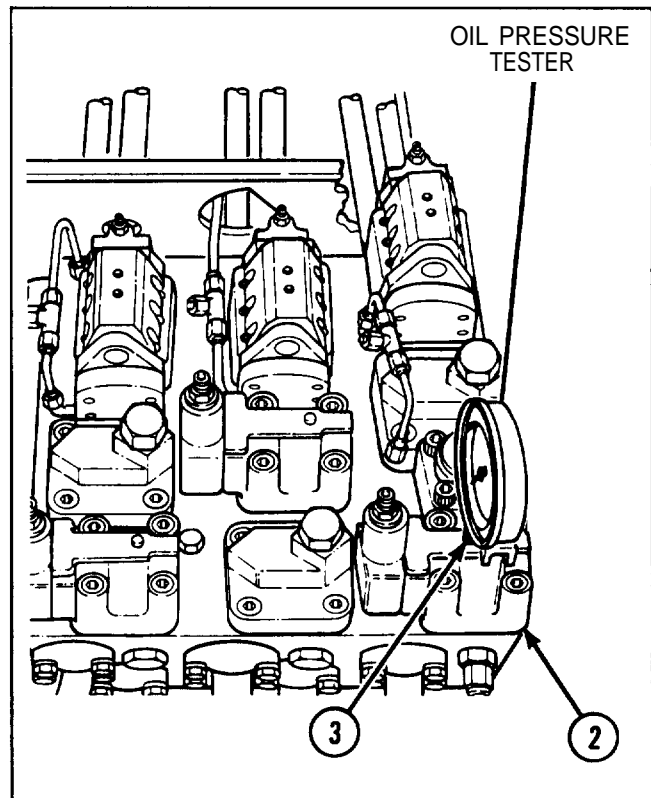
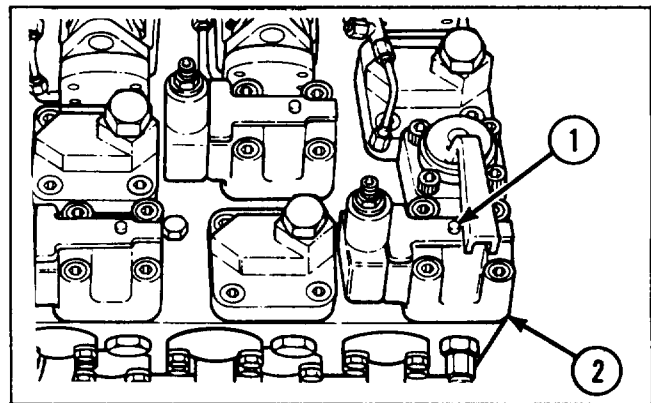
ADJUSTMENT OF CHECK VALVE

WARNING

- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position, as failure of system may result in injury to personnel.

NOTE

- Perform installation procedures prior to adjustment of pressure relief valves. Refer to page 2-154.
 - Steps 1 thru 11 are written for right pressure relief valve, but also apply to left pressure relief valve and middle pressure relief valve.
 - Valve adjustment requires two persons.
- 1 Turn off hydraulic system (TM 9-2350-238-10).
 - 2 Remove spring cap (1) from boom cylinder pressure relief valve (2).
 - 3 Install 3000 psi (20,685 kPa) oil pressure tester in test port (3) on boom cylinder pressure relief valve (2).



- 4 Loosen nut (4) on check valve (5).

NOTE

Turn screw clockwise to increase pressure and counterclockwise to decrease pressure.

- 5 Turn screw (6) fully clockwise to open check valve (5).

WARNING

Hydraulic system is under high pressure. Follow system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

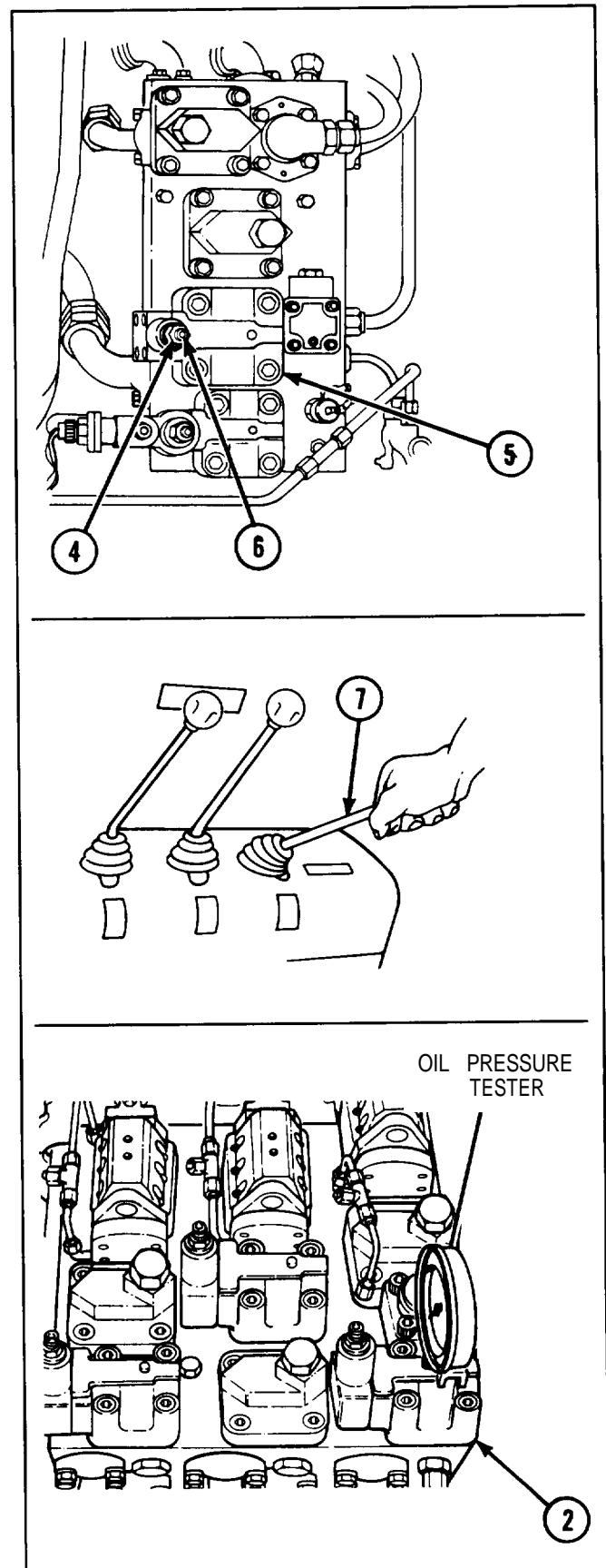
- 6 Turn on hydraulic system. Refer to TM 9-2350-238-10.

CAUTION

Do not allow pressure to go over 2350 psi (16,203 kPa). Failure to follow instructions may result in damage to equipment.

- 7 Watching oil pressure tester on boom cylinder pressure relief valve (2), pull BOOM cylinder control handle (7) slowly to RAISE. If pressure exceeds 2350 psi (16,203 kPa) while raising boom, turn screw (6) counterclockwise to decrease pressure.

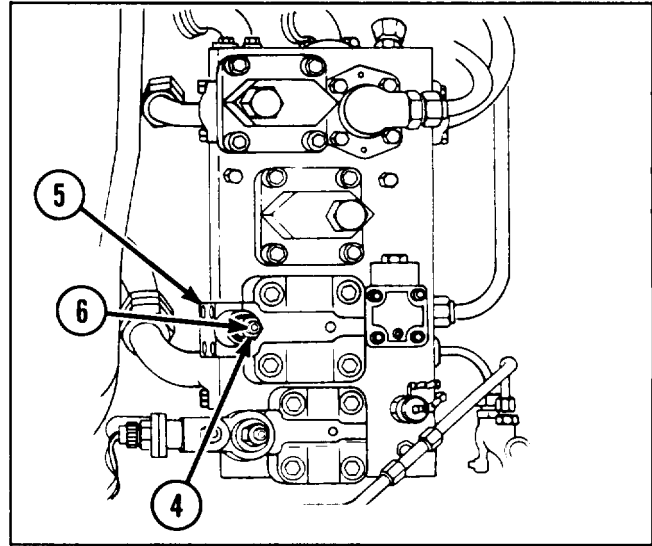
- 8 Hold BOOM cylinder control handle (7) in full RAISE position and read oil pressure tester.



2-39. MAINTENANCE OF PRESSURE RELIEF VALVE 12253778-1 AND PRESSURE RELIEF VALVE 12253778-2 (CONT).

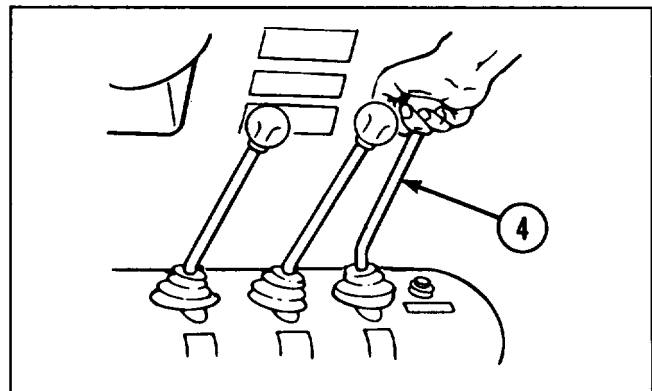
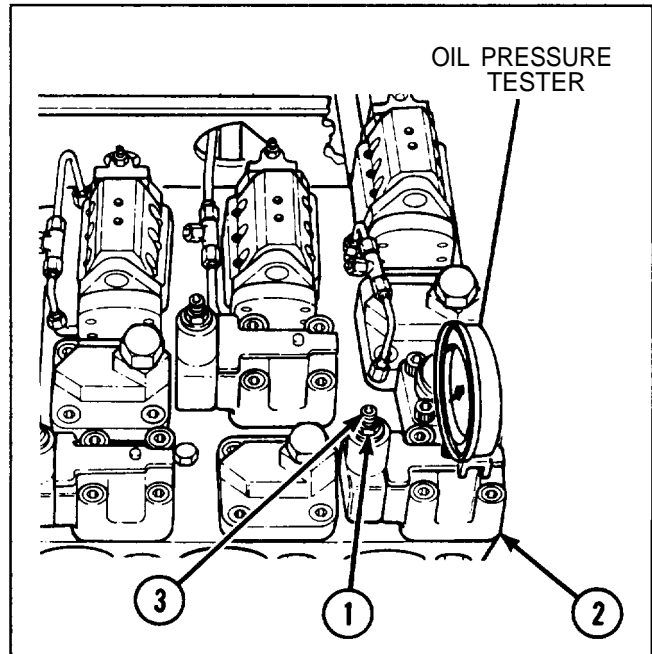
ADJUSTMENT OF CHECK VALVE (CONT)

- 9 Adjust pressure for check valve (5) to between 2100 and 2300 psi (14,480 and 15,859 kPa) by turning screw (6) counterclockwise to decrease pressure or clockwise to increase pressure.
- 10 When correct pressure adjustment is obtained, tighten nut (4).
- 11 If correct pressure adjustment cannot be obtained, replace check valve (5). Refer to page 2-154.

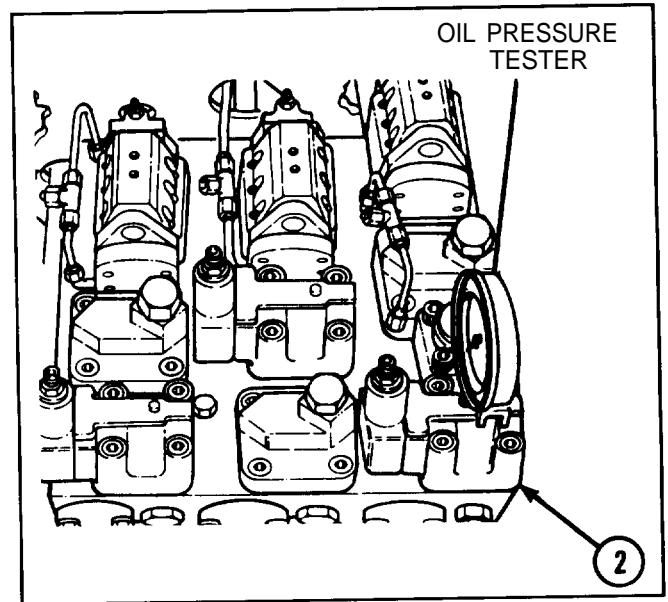


ADJUSTMENT OF BOOM CYLINDER PRESSURE RELIEF VALVE

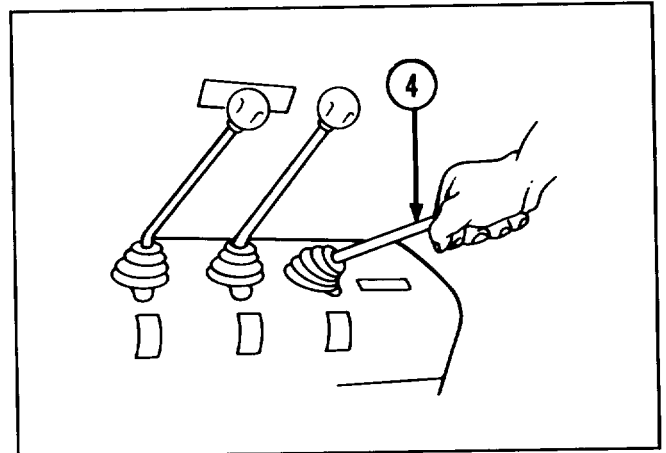
- 1 Perform adjustment of check valve procedure.
- 2 Loosen nut (1) on boom cylinder pressure relief valve (2).
- 3 Adjust pressure for boom cylinder pressure relief valve (2) to between 1950 and 2050 psi (13,445 and 14,135 kPa) by turning screw (3) counterclockwise to decrease pressure or clockwise to increase pressure.
- 4 When correct pressure is obtained, tighten nut (1).
- 5 If correct pressure adjustment cannot be obtained, replace boom cylinder pressure relief valve (2). Refer to page 2-154.
- 6 Push BOOM cylinder control handle (4) to LOWER until boom is in stowed position.
- 7 Turn off hydraulic system. Refer to TM 9-2350-238-10.



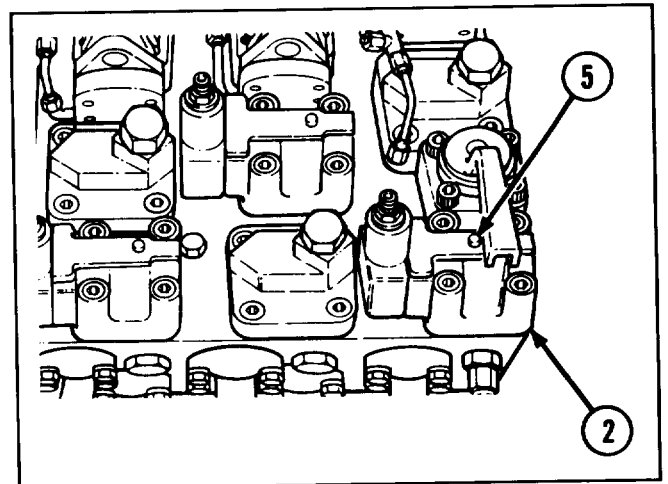
- 8 Disconnect oil pressure tester from boom cylinder pressure relief valve (2).



- 9 Slowly pull BOOM cylinder control handle (4) to RAISE to remove air trapped in boom cylinder pressure relief valve (2).

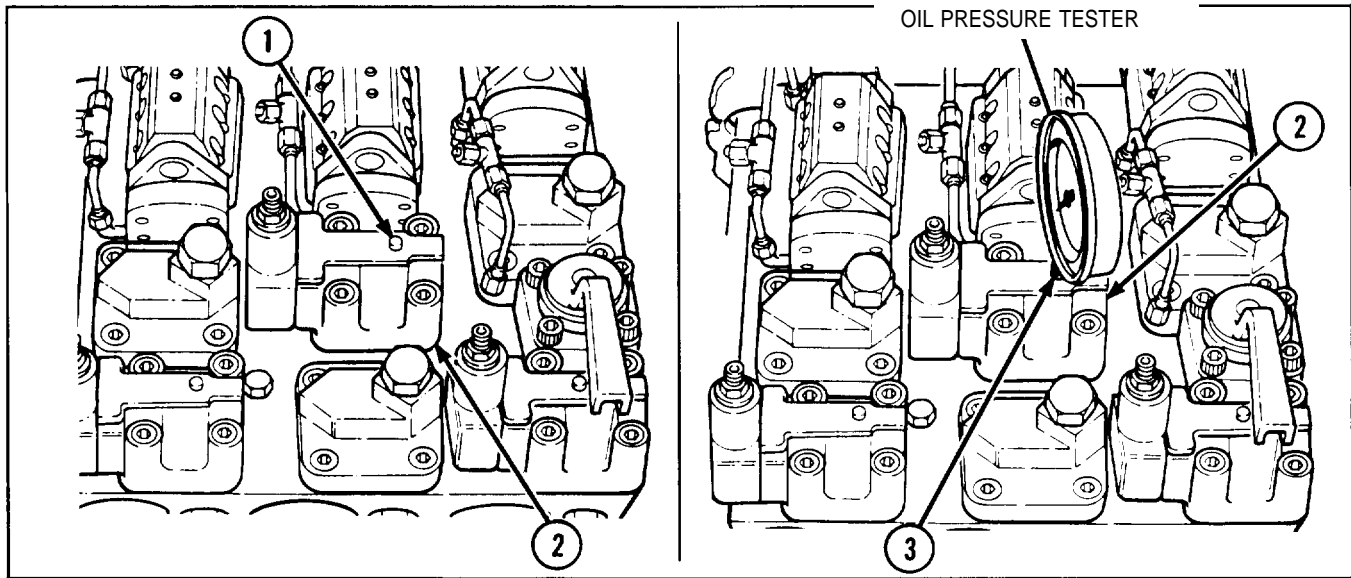


- 10 Install spring cap (5) in boom cylinder pressure relief valve (2).



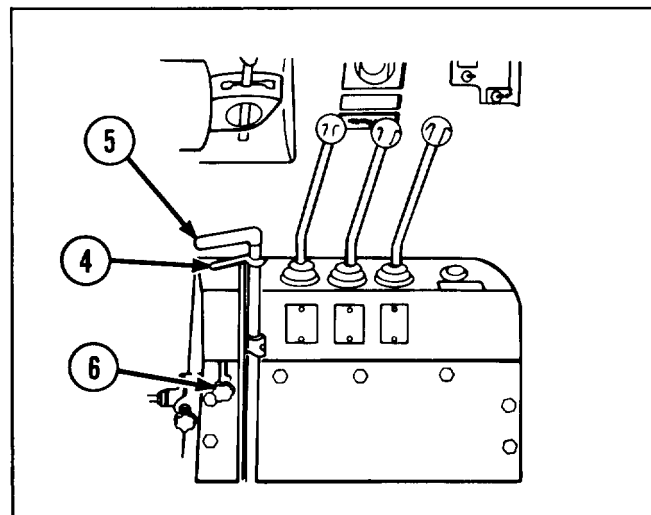
2-39. MAINTENANCE OF PRESSURE RELIEF VALVE 12253778-1 AND PRESSURE RELIEF VALVE 12253778-2 (CONT).

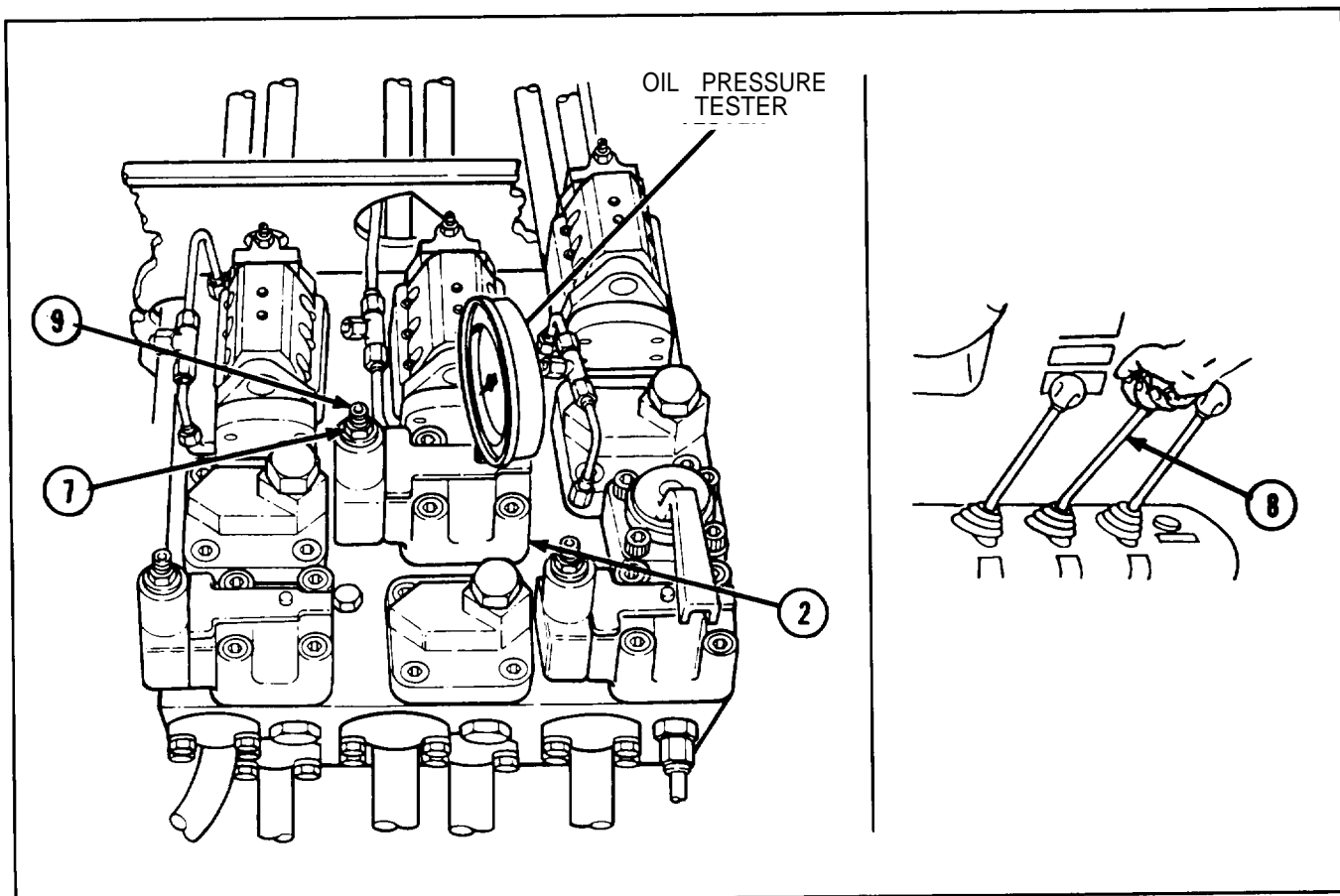
ADJUSTMENT OF TOW WINCH PRESSURE RELIEF VALVE.



- 1 Perform adjustment of check valve procedures.
- 2 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 3 Remove spring cap (1) from tow winch pressure relief valve (2).
- 4 Install 3000 psi (20,685 kPa) oil pressure tester in test port (3).

- 5 Pull up lock trigger (4).
- 6 Set tow winch control lever (5) to HI.
- 7 Pull out TOW WINCH BRAKE PRESSURE SELECTOR knob (6).





WARNING

Hydraulic system is under high pressure. Follow system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

- 8 Turn on hydraulic system. Refer to TM 9-2350-238-10.
- 9 Loosen nut (7) on tow winch pressure relief valve (2).

CAUTION

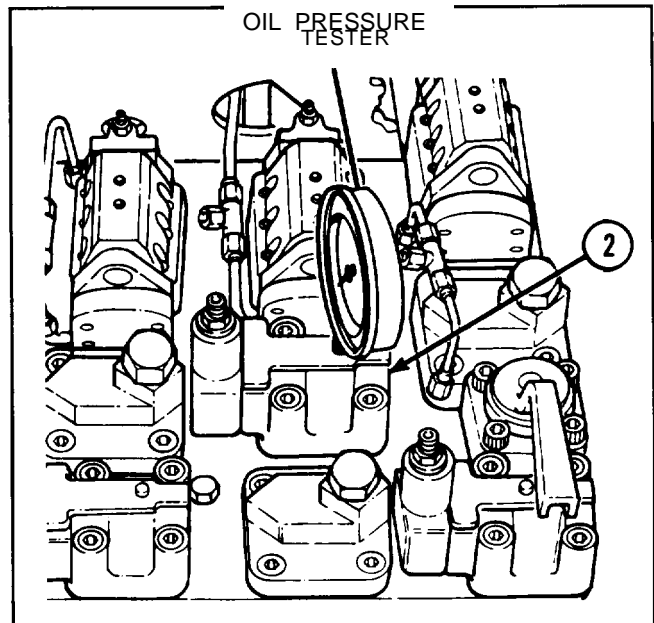
Do not allow pressure to go over 2000 psi (13,790 kPa). Failure to follow instructions may result in damage to equipment.

- 10 Hold TOW WINCH control handle (8) in full IN position and read oil Pressure tester"
- 11 Adjust pressure for tow winch pressure relief valve (2) to between 1625 and 1775 psi (11,204 and 12,229 kPa) by turning screw (9) counterclockwise to decrease pressure or clockwise to increase pressure.
- 12 When correct pressure adjustment is obtained, tighten nut (7).

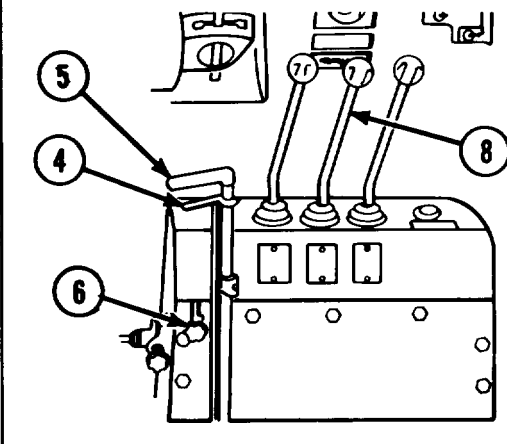
2-39. MAINTENANCE OF PRESSURE RELIEF VALVE F1225378-1 AND PRESSURE RELIEF VALVE 12253778-2 (CONT).

ADJUSTMENT OF TOW WINCH PRESSURE

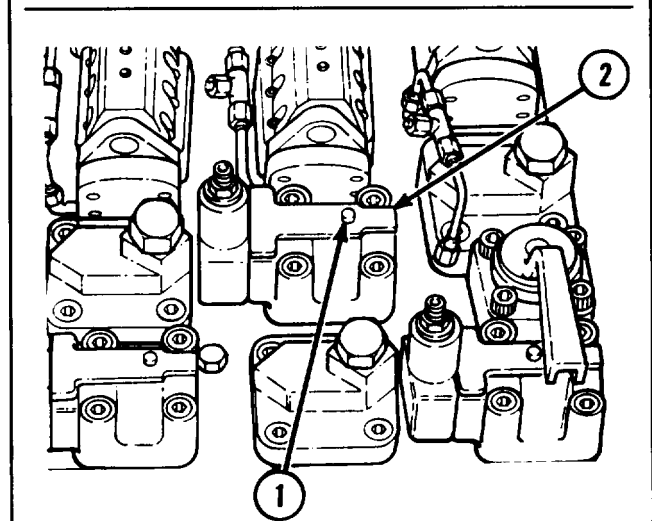
- 13 If correct pressure adjustment cannot be obtained, replace tow winch pressure relief valve (2). Refer to page 2-154.
- 14 Turn off hydraulic system. Refer to TM 9-2350-238-10.



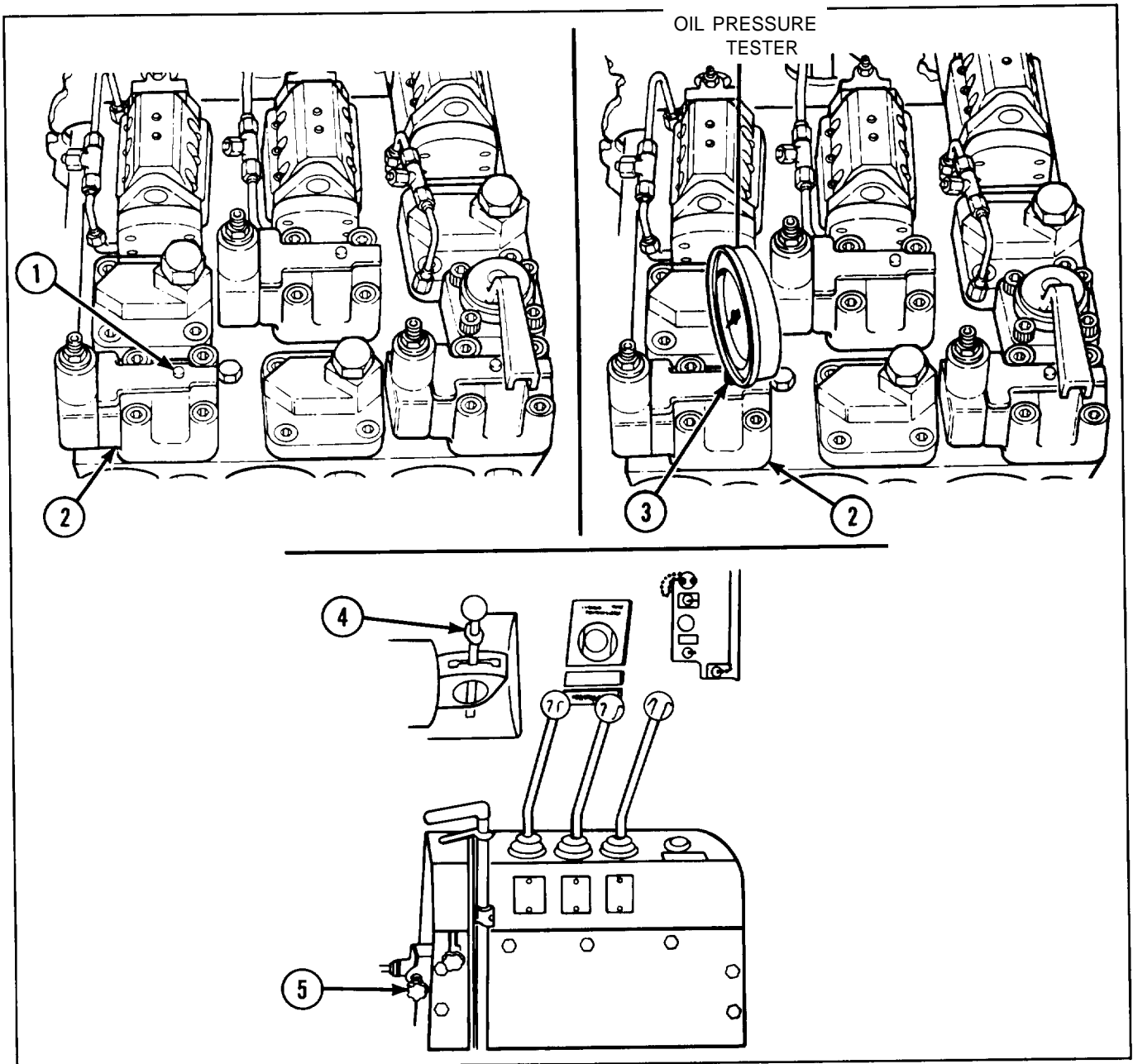
- 15 Pull up lock trigger (4).
- 16 Set tow winch control lever (5) to N.
- 17 Push in TOW WINCH BRAKE PRESSURE SELECTOR knob (6).
- 18 Disconnect oil pressure tester from tow winch pressure relief valve (2).



- 19 Slowly pull TOW WINCH control handle (8) to IN to remove air trapped in tow winch pressure relief valve (2).
- 20 Install spring cap (1).



ADJUSTMENT OF BOOM WINCH PRESSURE RELIEF VALVE



1 Perform adjustment of check valve procedures.

2 Turn off hydraulic system. Refer to TM 9-2350-238-10.

3 Remove spring cap (1) from boom winch pressure relief valve (2).

4 Install 3000 psi (20,685 kpa) oil pressure tester in test port (3).

5 Set boom winch shift control lever (4) to HI.

6 Pull out BOOM WINCH BRAKE PRESSURE SELECTOR knob (5).

2-39. MAINTENANCE OF PRESSURE RELIEF VALVE 12253778-1 AND PRESSURE RELIEF VALVE 12253778-2 (CONT).

ADJUSTMENT OF BOOM WINCH PRESSURE RELIEF VALVE (CONT)

WARNING

Hydraulic system is under high pressure. Follow system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

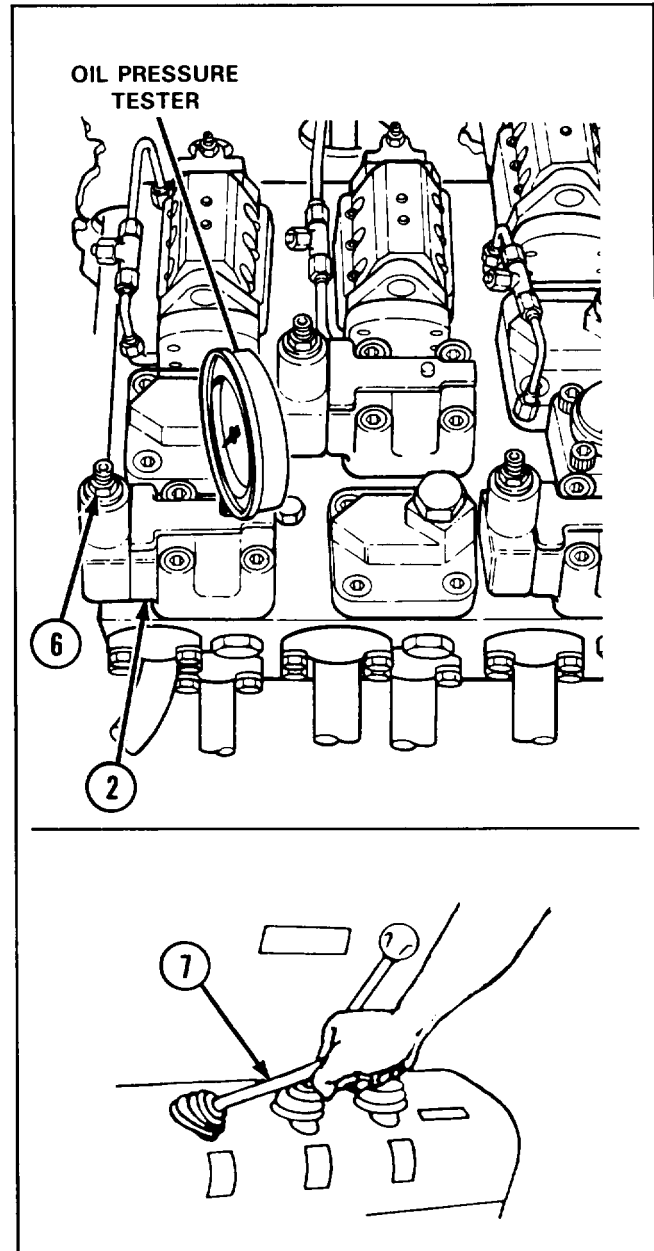
Turn on hydraulic system. Refer to TM 9-2350-238-10.

- 8 Loosen nut (6) on boom winch pressure relief valve (2).

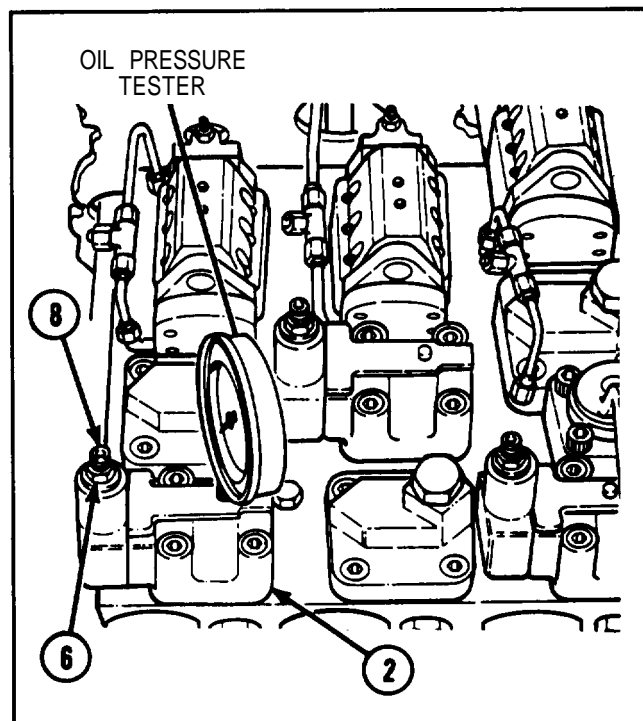
CAUTION

Do not allow pressure to go over 2000 psi (13,790 kPa). Failure to follow instructions may result in damage to equipment.

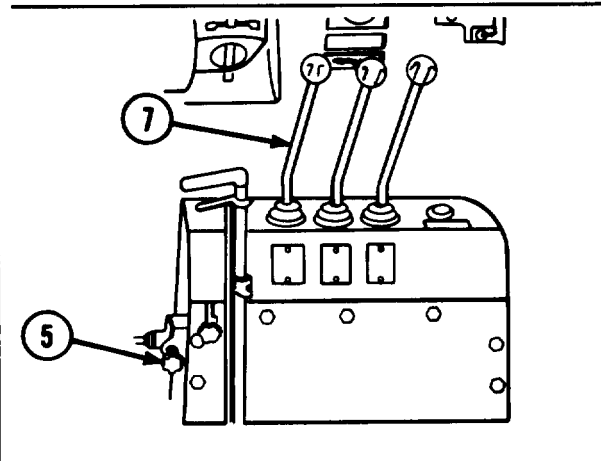
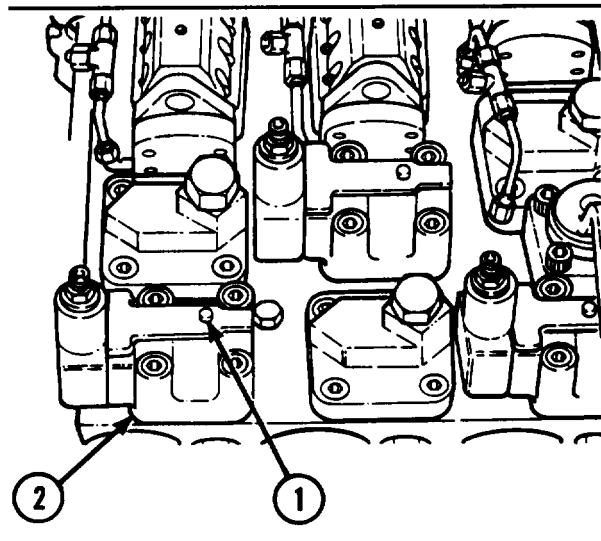
- 9 Watching oil pressure tester, pull BOOM WINCH control handle (7) slowly to RAISE,
- 10 Hold BOOM WINCH control handle (7) in full RAISE position and read oil pressure tester.



- 11 Adjust pressure for boom winch pressure relief valve (2) to between 1525 and 1675 psi (10,515 and 11,549 kPa) by turning screw (8) counterclockwise to decrease pressure or clockwise to increase pressure.
- 12 When correct pressure adjustment is obtained, tighten nut (6).
- 13 If correct pressure adjustment cannot be obtained, replace boom winch pressure relief valve (2). Refer to page 2-154.



- 14 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 15 Push in BOOM WINCH BRAKE PRESSURE SELECTOR knob (5).
- 16 Disconnect oil pressure tester from boom winch pressure relief valve (2).
- 17 Slowly pull BOOM WINCH control handle (7) to RAISE to remove air trapped in boom winch pressure relief valve (2).
- 18 Install spring cap (1).



2-40 MAINTENANCE OF HYDRAULIC FLOW DIVIDER MANIFOLD AND HYDRAULIC FLOW DIVIDER PLUG VALVE.

This task covers: a. *Removal/Disassembly*
b. *Inspection/Repair*

c. *Reassembly/Installation*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive
(SC 5180-90-CL-N26)

Materials/Parts

Engine oil (item 15, appx B)
Lockwasher (4) (MS35338-46)
Lockwasher (2) (MS35338-48)
Preformed packing (MS28775-010)
Preformed packing (2) (MS28775-014)
Preformed packing (MS28775-028)
Preformed packing (4) (MS28775-131)
Preformed packing (MS28775-143)
Preformed packing (MS28775-145)
Preformed packing (MS28775-215)
Preformed packing (2) (MS28775-216)
Preformed packing (MS28775-219)
Preformed packing (2) (MS28775-220)
Preformed packing (MS28778-6)
Preformed packing (MS28778-12)
Sealing compound (item 18, appx B)

References

TM 9-2350-238-20-2
TM 9-2350-238-24P-2

Equipment Conditions

Oil drained from system (TM 9-2350-238-20-2)
Hand pump pressure metal tube assembly removed (TM 9-2350-238-20-2)
Equipment stowage accessories box removed (TM 9-2350-238-20-2)
Rear right-hand nonskid metallic tread removed (TM 9-2350-238-20-2)

General Safety Instructions

WARNING

Do not disconnect fittings or remove retainer caps until hydraulic pumps are shut off and system pressure is relieved. Failure to follow instructions may result in injury to personnel or damage to equipment.

REMOVAL/DISASSEMBLY

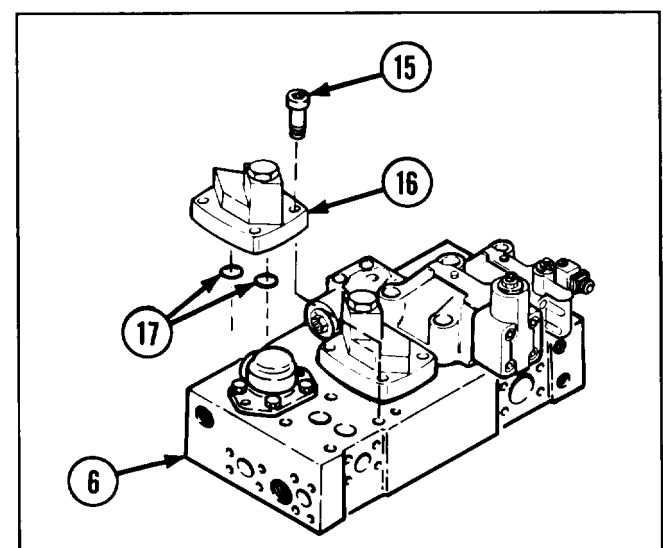
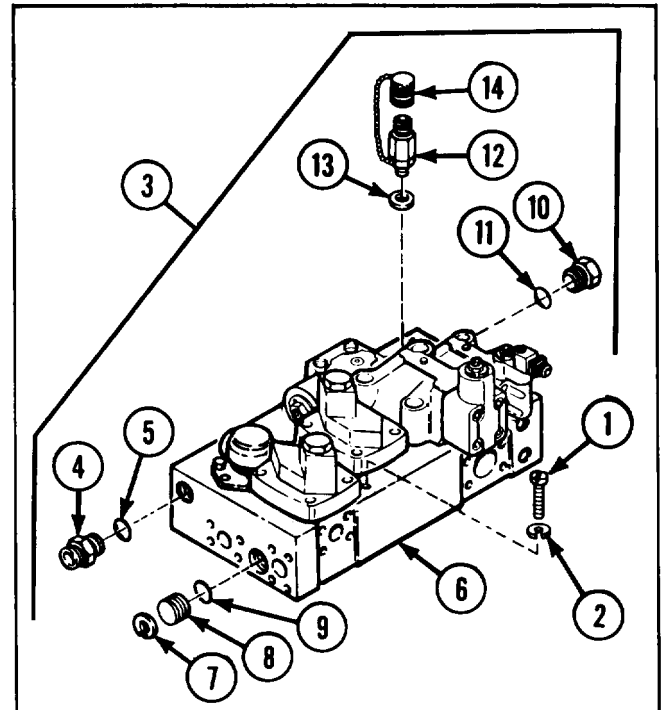
WARNING

Do not disconnect fittings or remove retainer caps until hydraulic pumps are shut off and system pressure is relieved. Failure to follow instructions may result in injury to personnel or damage to equipment.

CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter. Cover valve ports to keep out dirt.

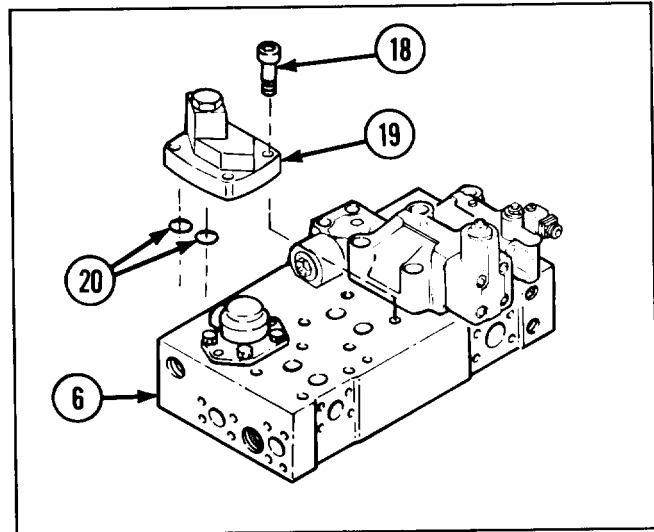
- 1 Remove two hexagon head capscrews (1), two lockwashers (2), and flow divider manifold (3).
- 2 Remove mini check valve (4) and preformed packing (5) from multiple connector (6). Remove preformed packing from mini check valve.
- 3 Remove retaining ring (7) from manifold pipe plug (8).
- 4 Remove manifold pipe plug (8) and preformed packing (9) from multiple connector (6). Remove preformed packing from manifold pipe plug.
- 5 Remove machine thread plug (10) and preformed packing (11) from multiple connector (6). Remove preformed packing from machine thread plug.
- 6 Remove manifold disconnect quick coupling half (12), dust plug chain retaining ring (13), and dust protective cap (14) from multiple connector (6). Remove dust plug chain retaining ring and dust protective cap from manifold disconnect quick coupling half.
- 7 Remove four socket head capscrews (15), check valve (16), and two preformed packings (17) from multiple connector (6). Remove two preformed packings from check valve.



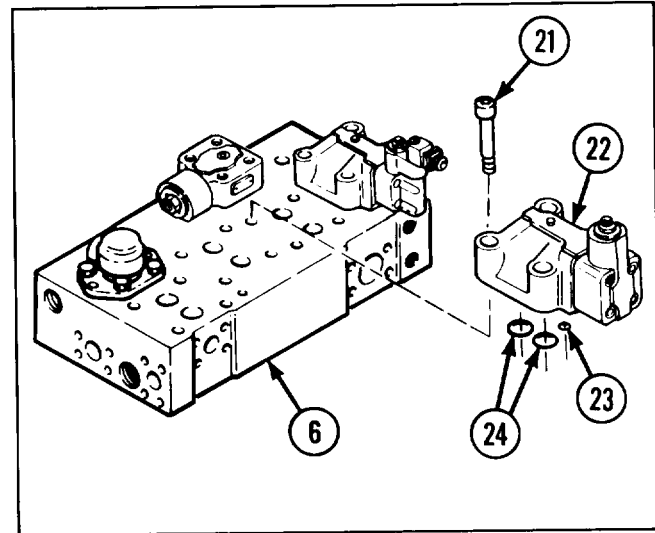
2-40. MAINTENANCE OF HYDRAULIC FLOW DIVIDER MANIFOLD AND HYDRAULIC FLOW DIVIDER PLUG VALVE (CONT).

REMOVAL/DISASSEMBLY (CONT)

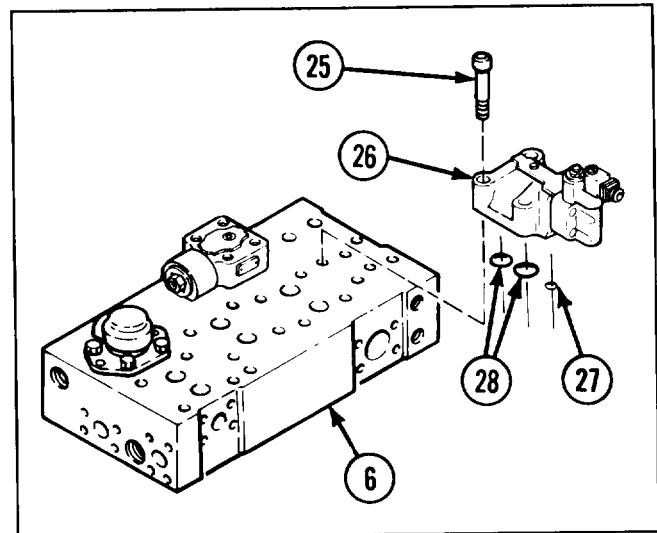
8 Remove four socket head capscrews (18), check valve (19), and two preformed packings (20) from multiple connector (6). Remove two preformed packings from check valve.

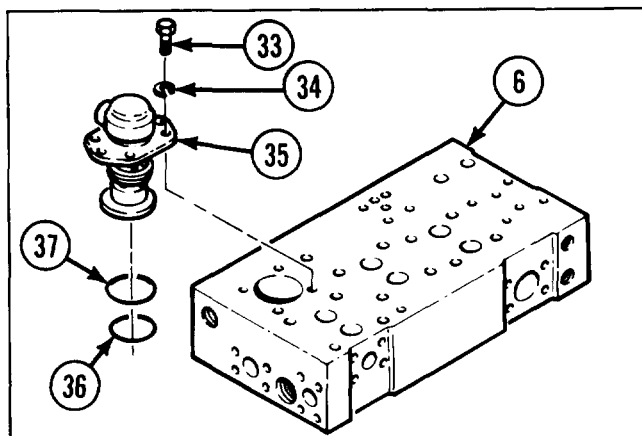
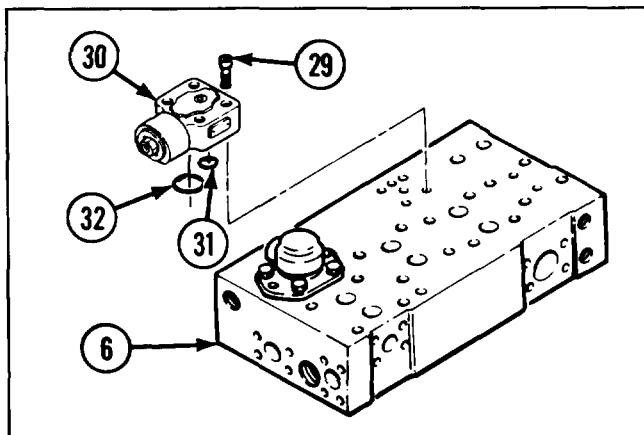


9 Remove four socket head capscrews (21), pressure relief valve (22), preformed packing (23), and two preformed packings (24) from multiple connector (6). Remove preformed packing and two preformed packings from pressure relief valve.

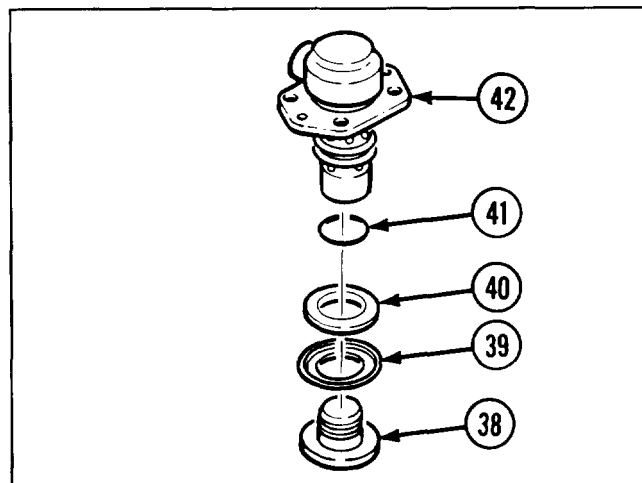


10 Remove four socket head capscrews (25), solenoid valve (26), preformed packing (27), and two preformed packings (28) from multiple connector (6). Remove preformed packing and two preformed packings from solenoid valve.





- 11 Remove four socket head capscrews (29), relief valve (30), preformed packing (31), and preformed packing (32) from multiple connector (6). Remove preformed packing and preformed packing from relief valve.
- 12 Remove four hexagon head capscrews (33), four lockwashers (34), flow divider hydraulic plug valve (35), preformed packing (36), and preformed packing (37) from multiple connector (6). Remove preformed packing and preformed packing from flow divider hydraulic plug valve,



NOTE

Step 13 is written for disassembly of hydraulic flow divider plug valve.

- 13 Remove valve assembly machine thread plug (38), compression cup (39), shouldered washer (40), and preformed packing (41) from flow divider valve (42).

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 Relief valve is a repairable assembly. Refer to Refer to page 2-199.
- 3 Check valves are repairable assemblies. Refer to page 2-204.
- 4 Pressure relief valve is a repairable assembly. Refer to page 2-205.
- 5 Solenoid valve is a repairable assembly. Refer to page 2-208.
- 6 If flow divider valve is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 7 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

2-40. MAINTENANCE OF HYDRAULIC FLOW DIVIDER MANIFOLD AND HYDRAULIC FLOW DIVIDER PLUG VALVE (CONT).

REASSEMBLY/INSTALLATION

NOTE

- Apply engine oil (item 15, appx B) to all preformed packings before installation.

- Apply sealing compound (item 18, appx B) to all screws before installation.

- Step 1 is written for reassembly of hydraulic flow divider plug valve.

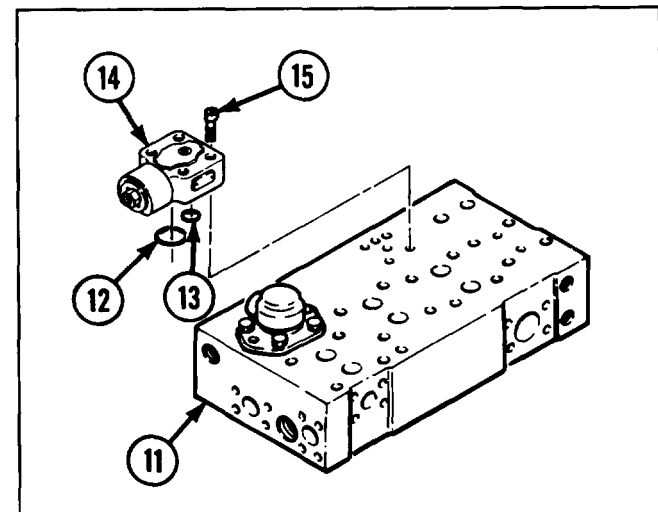
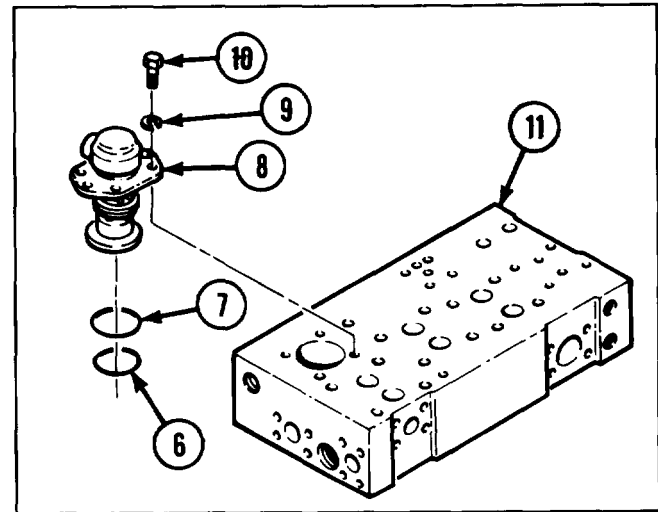
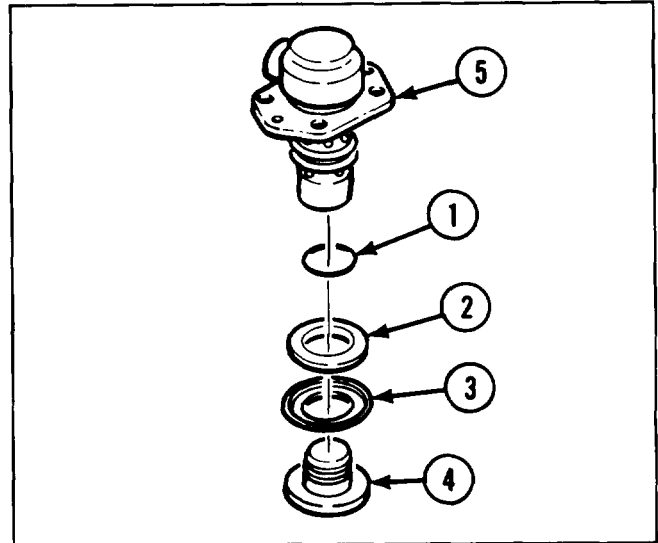
1 Install new preformed packing (1), shouldered washer (2), compression cup (3), and valve assembly machine thread plug (4) in flow divider valve (5).

2 Install new preformed packing (6) and new preformed packing (7) on flow divider hydraulic plug valve (8).

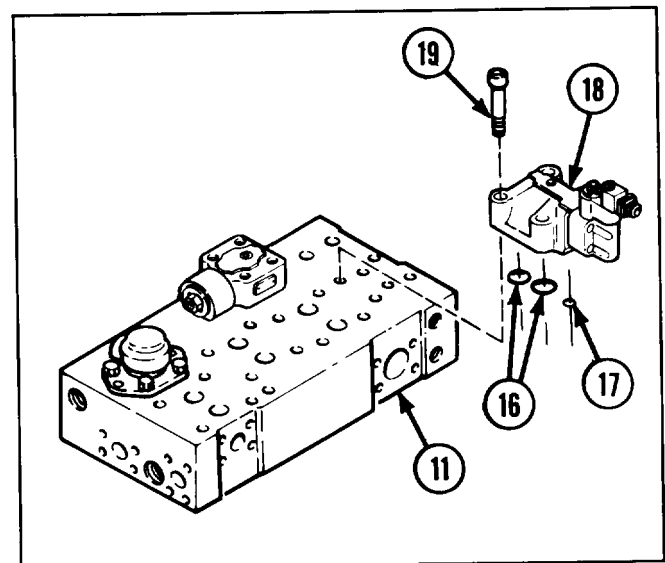
3 Install flow divider hydraulic plug valve (8), four new lockwashers (9), and four hexagon head capscrews (10) on multiple connector (11).

4 Install new preformed packing (12) and new preformed packing (13) in relief valve (14).

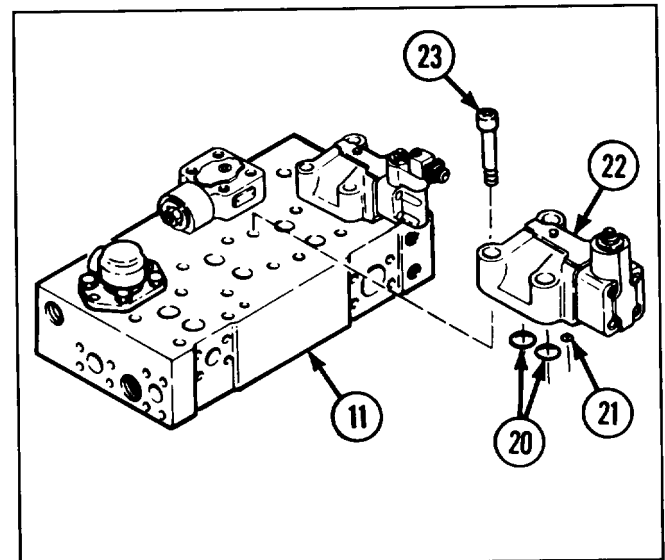
5 Install relief valve (14) and four socket head capscrews (15) on multiple connector (11).



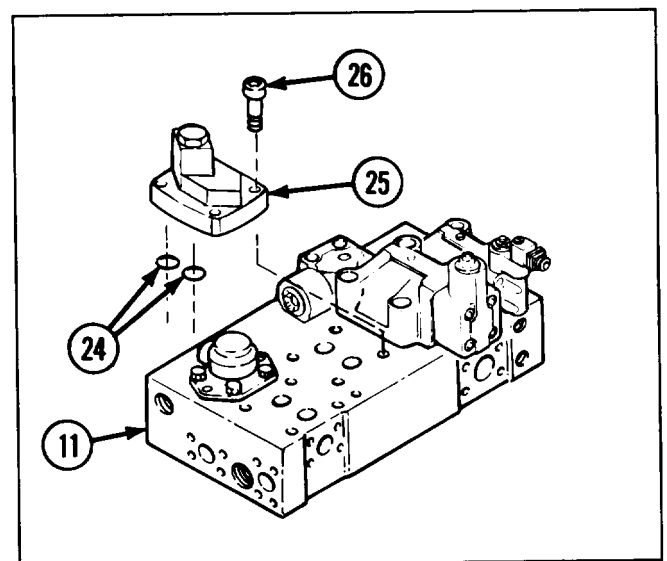
- 6 Install two new preformed packings (16) and new preformed packing (17) in solenoid valve (18).
- 7 Install solenoid valve (18) and four socket head capscrews (19) on multiple connector (11).



- 8 Install two new preformed packings (20) and new preformed packing (21) in pressure relief valve (22).
- 9 Install pressure relief valve (22) and four socket head capscrews (23) on multiple connector (11).



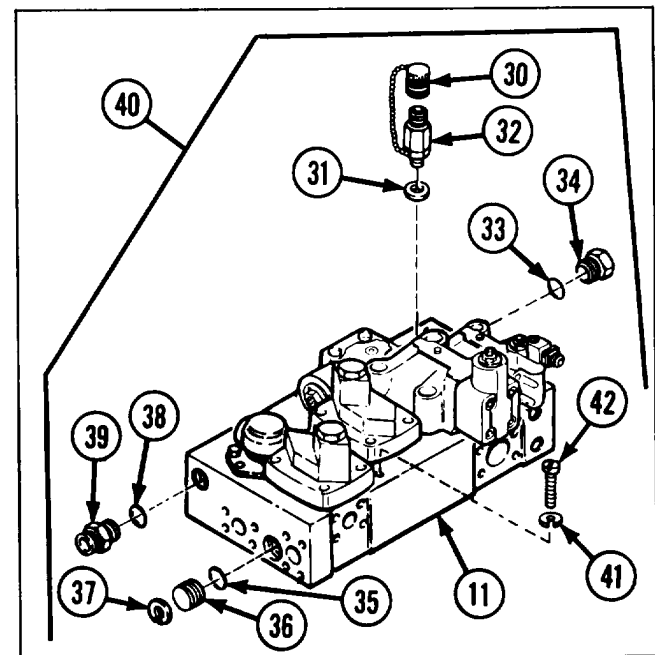
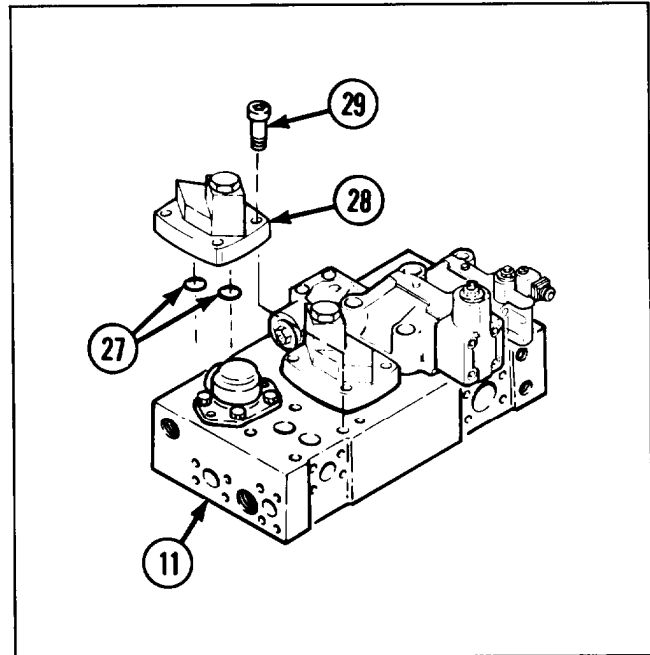
- 10 Install two new preformed packings (24) in check valve (25).
- 11 Install check valve (25) and four socket head capscrews (26) on multiple connector (11).



2-40. MAINTENANCE OF HYDRAULIC FLOW DIVIDER MANIFOLD AND HYDRAULIC FLOW DIVIDER PLUG VALVE (CONT).

REASSEMBLY/INSTALLATION(CONT)

- 12 Install two new preformed packings (27) in check valve (28).
- 13 Install check valve (28) and four socket head capscrews (29) on multiple connector (11).
- 14 Install dust protective cap (30) and dust plug chain retaining ring (31) on manifold disconnect quick coupling half (32).
- 15 Install manifold disconnect quick coupling half (32) on multiple connector (11).
- 16 Install new preformed packing (33) on machine thread plug (34).
- 17 Install machine thread plug (34) on multiple connector (11).
- 18 Install new preformed packing (35) on manifold pipe plug (36).
- 19 Install manifold pipe plug (36) on multiple connector (11).
- 20 Install retaining ring (37) on manifold pipe plug (36).
- 21 Install new preformed packing (38) in mini check valve (39).
- 22 Install mini check valve (39) on multiple connector (11).
- 23 Install flow divider manifold (40), two new lockwashers (41), and two hexagon head capscrews (42).



- 24 Refer to page 2-199 for adjustment of relief valve.
- 25 Refer to page 2-205 for adjustment of pressure relief valve.
- 26 Refer to page 2-208 for adjustment of solenoid valve.

2-41. MAINTENANCE OF RELIEF VALVE.

This task covers: a. *Disassembly*
b. *Inspection/Repair*

c. *Reassembly*
d. *Adjustment*

INITIAL SETUP*Tools and Special Tools*

General mechanic's tool kit, automotive
(SC 5180-95-CL-N26)
Oil pressure tester (8356176)
Retaining ring pliers set (PR36)

Materials/Parts

Engine oil (item 15, appx B)
Preformed packing (MS28775-111)

References

TM 9-2350-238-10
TM 9-2350-238-24P-2

Equipment Conditions

2-192 Relief valve removed from hydraulic flow divider manifold

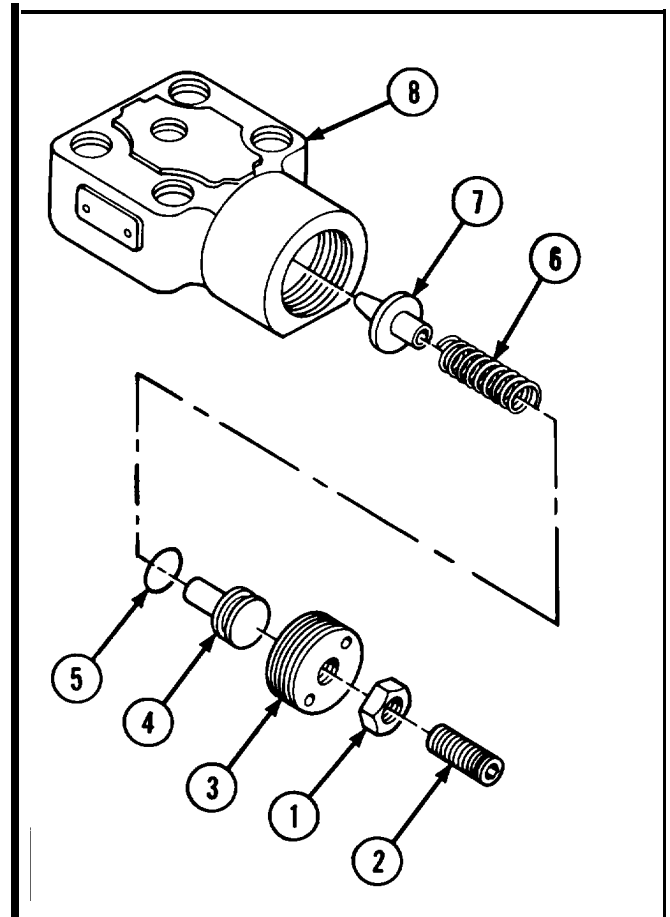
DISASSEMBLY**CAUTION**

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter. Cover valve ports to keep out dirt.

NOTE

These procedures are written and illustrated for relief valve (PN 12253774). If your unit has a damaged relief valve (PN 10922171), order relief valve (PN 12253774), in accordance with TM 9-2350-238-24P-2.

- 1 Remove hexagon plain nut (1) from pressure adjust screw (2).
- 2 Remove pressure adjust screw (2) from retainer cap (3).
- 3 Using retaining ring pliers, remove retainer cap (3), and remove spring seat (4), preformed packing (5), poppet spring (6), and poppet (7) from relief valve (8).

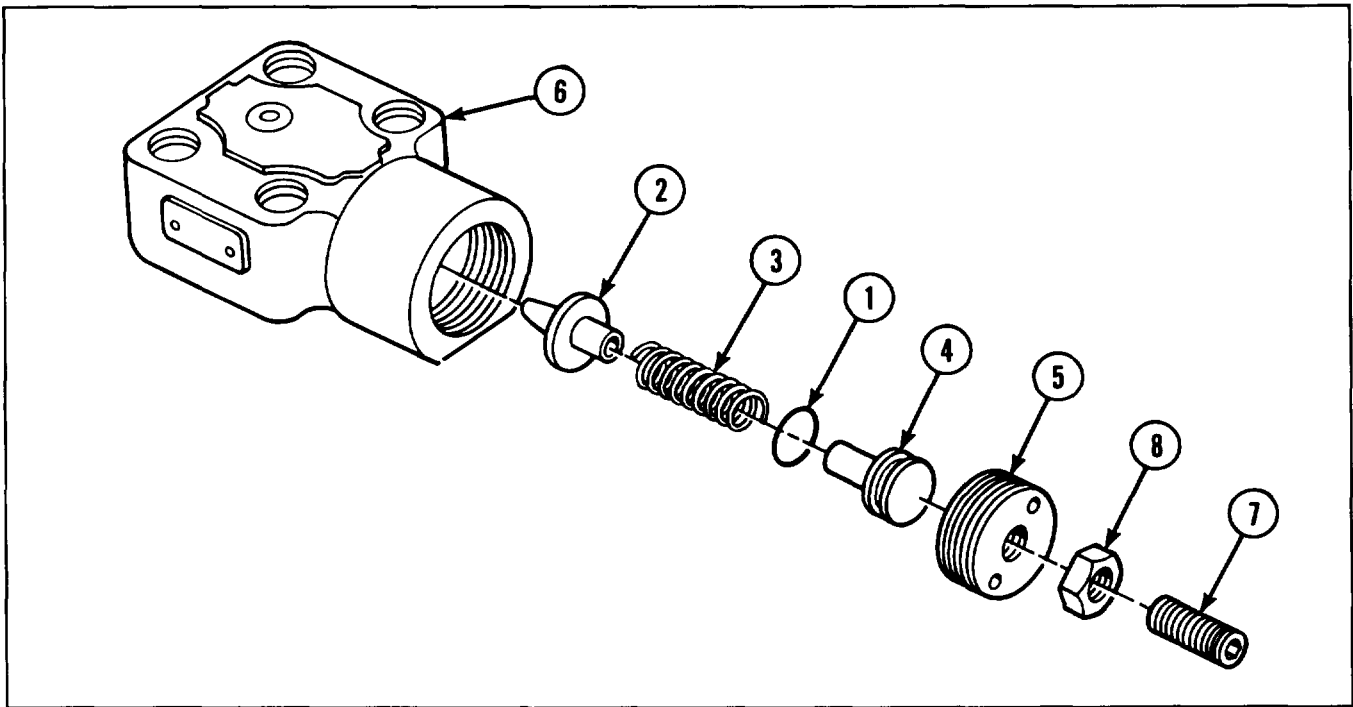


2-41. MAINTENANCE FOF RELIEF VALVE (CONT).

INSPECTION/REPAIR

- | | |
|---|---|
| <ol style="list-style-type: none"> 1 Inspect for broken, damaged, or missing parts. 2 If pressure adjust screw is broken, damaged, or missing, repair is by replacement of next higher assembly. 3 If hexagon plain nut is broken, damaged, or missing, repair is by replacement of next higher assembly. 4 If retainer cap is broken, damaged, or missing, repair is by replacement of next higher assembly. | <ol style="list-style-type: none"> 5. If spring seat is broken, damaged, or missing, repair is by replacement of next higher assembly. 6 If poppet spring is broken, damaged, or missing, repair is by replacement of next higher assembly. 7 If poppet is broken, damaged, or missing, repair is by replacement of next higher assembly. 8 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2). |
|---|---|

REASSEMBLY



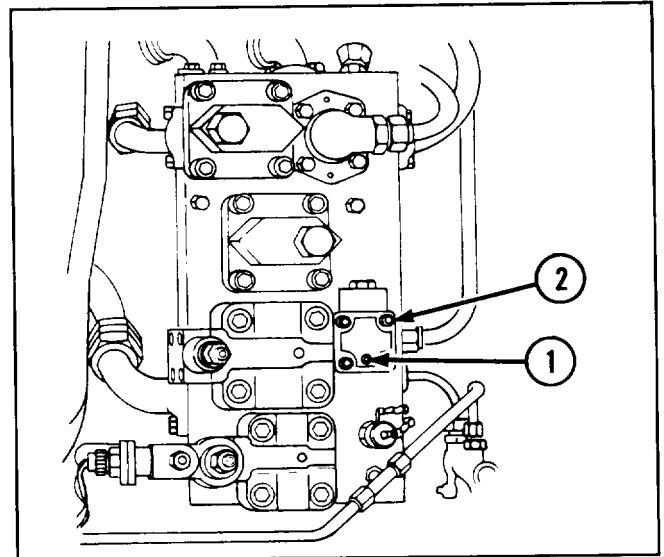
- | | |
|---|---|
| <ol style="list-style-type: none"> 1 Apply engine oil (item 15, appx B) to new preformed packing (1). 2 Install poppet (2), poppet spring (3), new preformed packing (1), spring seat (4), and using retaining ring pliers, install retainer cap (5) in relief valve (6). | <ol style="list-style-type: none"> 3 Install pressure adjust screw (7) in retainer cap (5). 4 Install hexagon plain nut (8) on pressure adjust screw (7). |
|---|---|

ADJUSTMENT

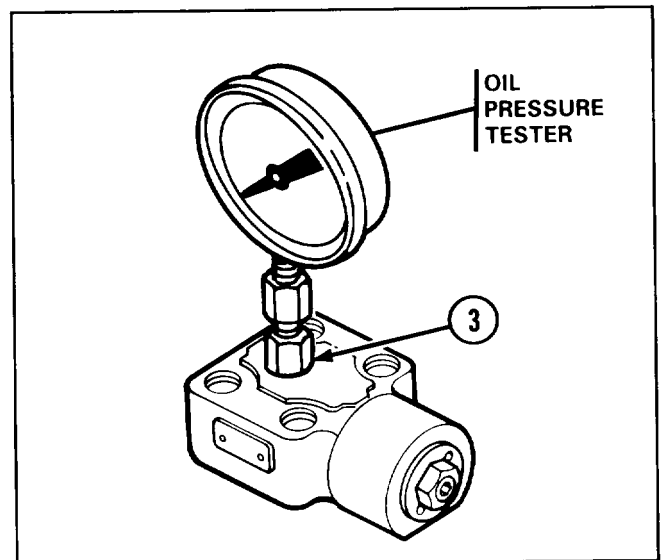
NOTE

Perform installation procedures prior to adjustment of pressure relief valve. Refer to page 2-192.

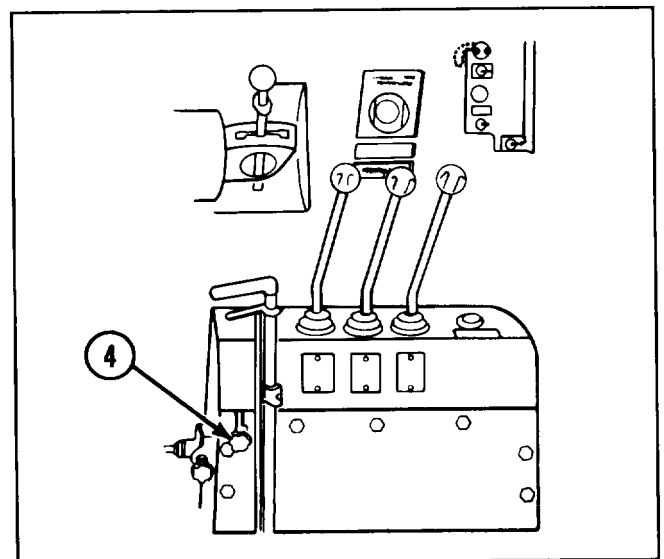
- 1 Perform adjustment of check valve procedures. Refer to page 2-179.
- 2 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 3 Remove retainer cap (1) from relief valve (2).



- 4 Install 3000 psi (20,688 kPa) oil pressure tester in test port (3).



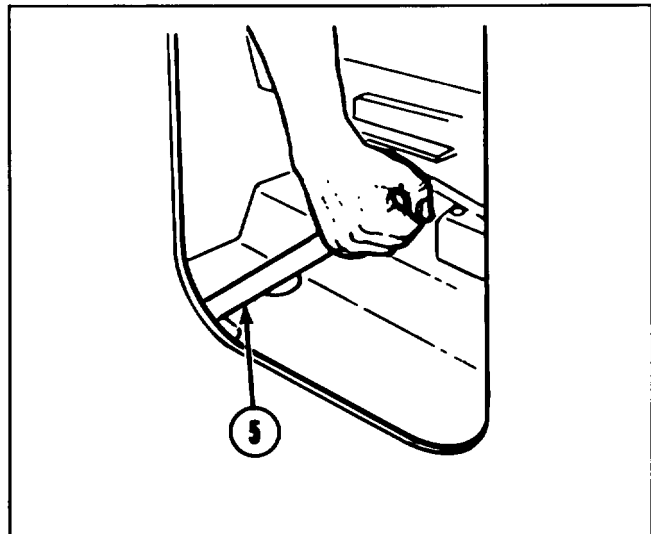
- 5 Pull out TOW WINCH BRAKE PRESSURE SELECTOR knob (4).



2-41. MAINTENANCE OF RELIEF VALVE (CONT).

ADJUSTMENT (CONT)

- 6 Watching oil pressure tester, slowly operate hydraulic ram hand pump (5).

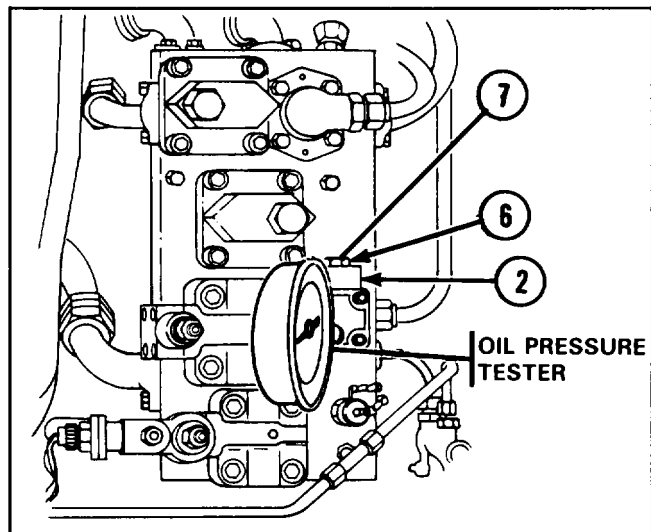


- 7 Loosen nut (6).

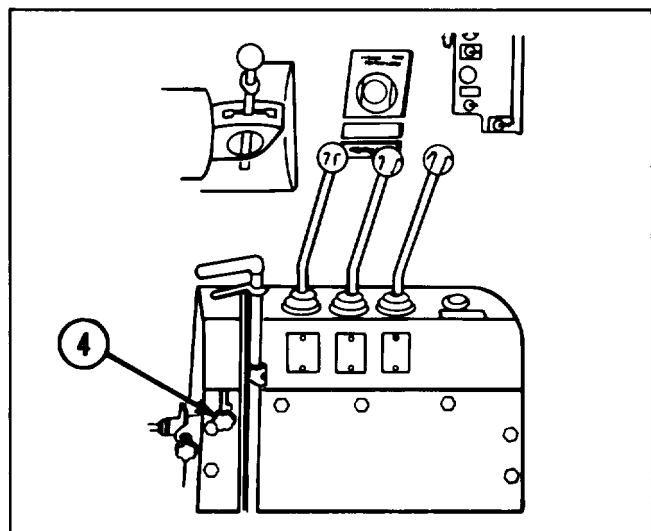
- 8 Adjust pressure for relief valve (2) to between 1850 and 2050 psi (12,756 and 14,134 kPa) by turning screw (7) counterclockwise to decrease pressure or clockwise to increase pressure.

- 9 When correct pressure adjustment is obtained, tighten nut (6).

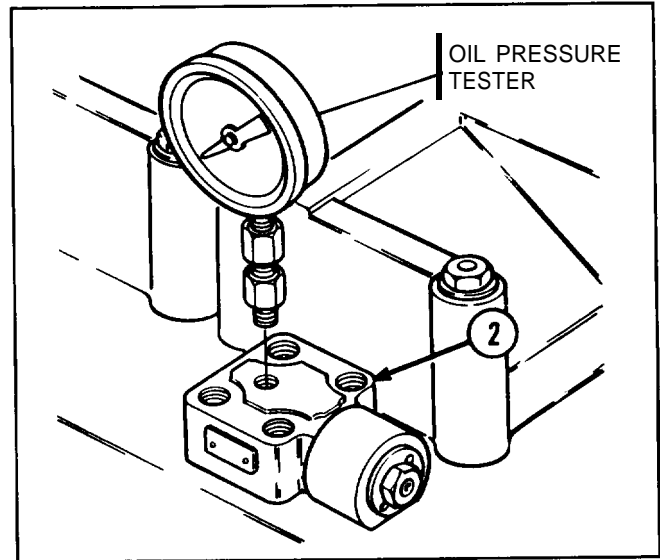
- 10 If correct pressure adjustment cannot be obtained, repair relief valve (2). Refer to page 2-199.



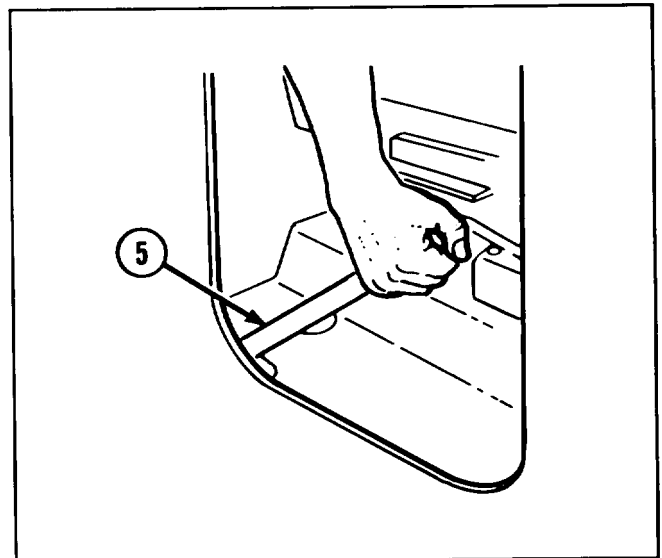
- 11 Push in TOW WINCH BRAKE PRESSURE SELECTOR knob (4).



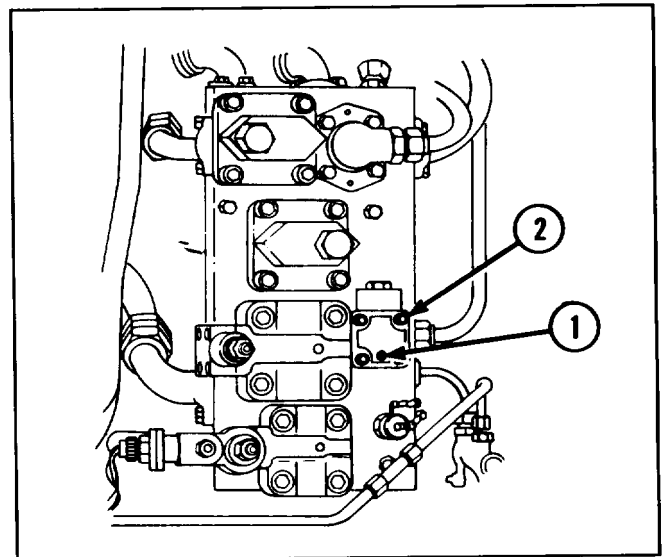
12 Disconnect oil pressure tester from relief valve (2).



13 Slowly operate hydraulic ram hand pump (5) to remove air trapped in relief valve (2).



14 Install retainer cap (1) on relief valve (2).



2-42. MAINTENANCE OF CHECK VALVE.

| | | |
|--|--|--|
| This task covers: a. <i>Disassembly</i> b. <i>Inspection/Repair</i> c. <i>Reassembly</i> | | |
| INITIAL SETUP | | |
| <i>Tools and Special Tools</i> General mechanic's tool kit, automotive (SC 5180-90-CL-N26) | <i>References</i> TM 9-2350-238-24P-2 | |
| <i>Materials/Parts</i> Engine oil (item 15, appx B) Preformed packing (MS28778-20) | <i>Equipment Conditions</i> 2-192 Check valve removed from hydraulic flow divider manifold | |

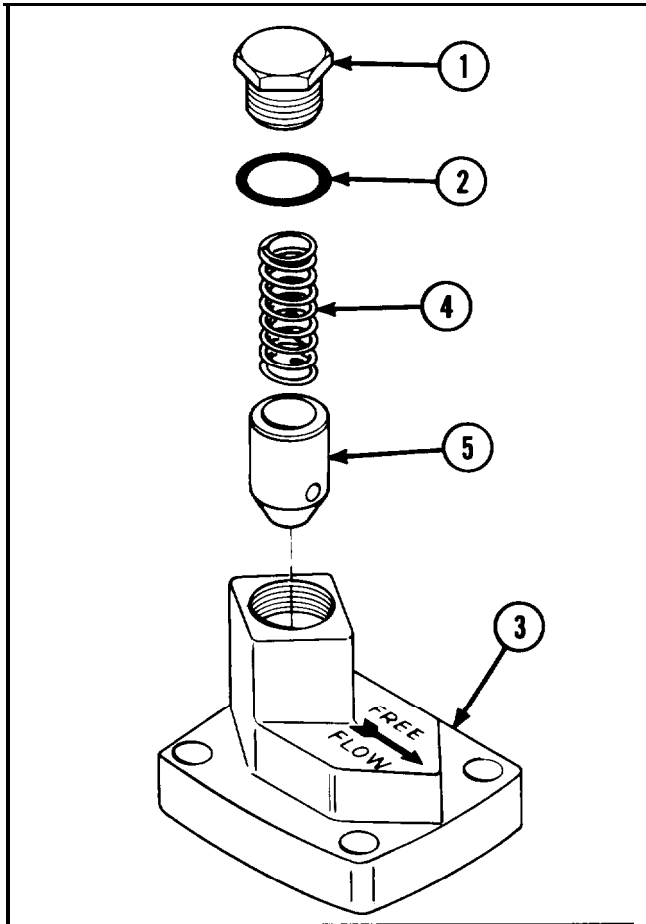
DISASSEMBLY

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter. Cover valve ports to keep out dirt.

NOTE

These procedures are written and illustrated for check valve (PN 12253775). If your unit has a damaged check valve (PN 10922174), order check valve (PN 12253775) in accordance with TM 9-2350-238-24P-2.

- 1 Remove spring cap (1) and preformed packing (2) from valve body (3). Remove preformed packing from spring cap.
- 2 Remove check spring (4) and check valve (5) from valve body (3).

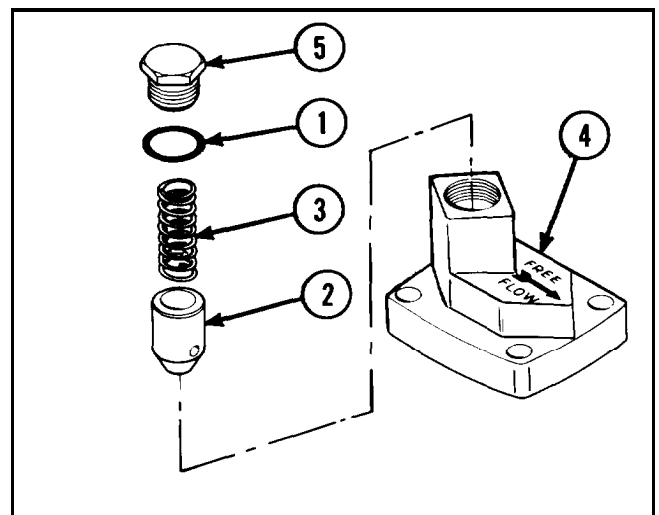


INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If spring cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If check spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If check valve is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

- 1 Apply engine oil (item 15, appx B) to new preformed packing (1).
- 2 Install check valve (2) and check spring (3) in valve body (4).
- 3 Install new preformed packing (1) on spring cap (5).
- 4 Install spring cap (5) on valve body (4).

**2-43. MAINTENANCE OF PRESSURE RELIEF VALVE.**

This task covers: a. *Disassembly*
b. *Inspection/Repair*

c. *Reassembly*
d. *Adjustment*

INITIAL SETUP*Tools and Special Tools*

General mechanic's tool kit, automotive
(SC 5180-90-CL-N26)
Oil pressure tester (8356176)
Retaining ring pliers set (PR36)

Materials/Parts

Engine oil (item 15, appx B)
Flow divider manifold relief valve pack-
ing kit (5705010)

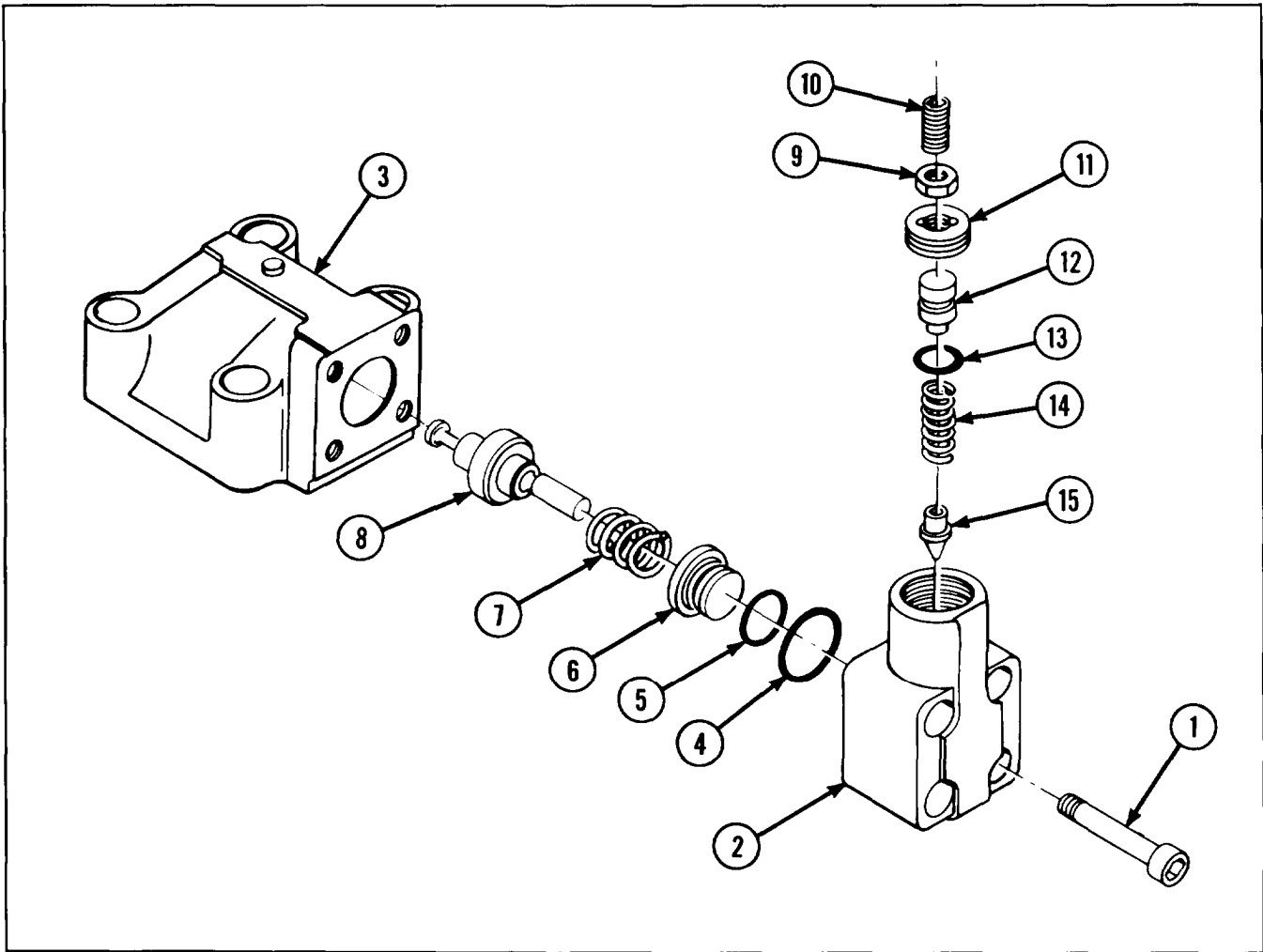
References

TM 9-2350-238-24P-2

Equipment Conditions

2-192 Pressure relief valve removed
from hydraulic flow divider manifold

2-43. MAINTENANCE OF PRESSURE RELIEF VALVE (CONT).



DISASSEMBLY

CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter. Cover valve ports to keep out dirt.

NOTE

These procedures are written and illustrated for pressure relief valve (PN 12253776). If your unit has a damaged pressure relief valve (PN 10922175), order pressure relief valve (PN 12253776) in accordance with TM 9-2350-238-24P-2.

- 1 Remove four pilot capscrews (1) and pilot cap (2) from valve body (3).
- 2 Remove preformed packing (4) from pilot cap (2).
- 3 Remove preformed packing (5), piston guide (6), piston spring (7), and piston (8) from valve body (3).
- 4 Remove hexagon plain nut (9), pressure adjusting screw (10), and using retaining ring pliers, remove retainer cap (11).
- 5 Remove spring seat (12), preformed packing (13), poppet spring (14), and poppet (15) from pilot cap (2).

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If piston is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If piston spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If piston guide is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 If pilot cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 6 If pilot capscrews are broken, damaged, or missing, repair is by replacement of next higher assembly.
- 7 If pressure adjusting screw is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 8 If hexagon plain nut is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 9 If retainer cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 10 If spring seat is broken, damaged, or missing, repair is by replacement of next higher assembly.

- 11 If poppet spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 12 If poppet is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 13 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

- 1 Apply engine oil (item 15, appx B) to new preformed packings (13, 5, and 4) and piston (8).
- 2 Install poppet (15), poppet spring (14), new preformed packing (13), spring seat (12), and using retaining ring pliers, install retainer cap (11).
- 3 Install pressure adjusting screw (10), and hexagon plain nut (9) in pilot Cap (2).
- 4 Install piston (8), piston spring (7), piston guide (6), and new preformed packing (5) in valve body (3).
- 5 Install new preformed packing (4) on pilot cap (2).
- 6 Install pilot cap (2) and four pilot capscrews (1) on valve body (3).

ADJUSTMENT

Refer to page 2-179 for adjustment of pressure relief valve.

2-44. MAINTENANCE OF SOLENOID VALVE.

This task covers: a. *Disassembly* d. *High-pressure Setting Adjustment*
 b. *Inspection/Repair* e. *Low-pressure Setting Check*
 c. *Reassembly*

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive
 (SC 5180-90-CL-N26)
 Oil pressure tester (8356176)
 Retaining ring pliers set (PR36)

Materials/Parts

Engine oil (item 15, appx B)
 Solenoid relief valve repair kit
 (5705011)

References

TM 9-2350-238-24P-2

Equipment Conditions

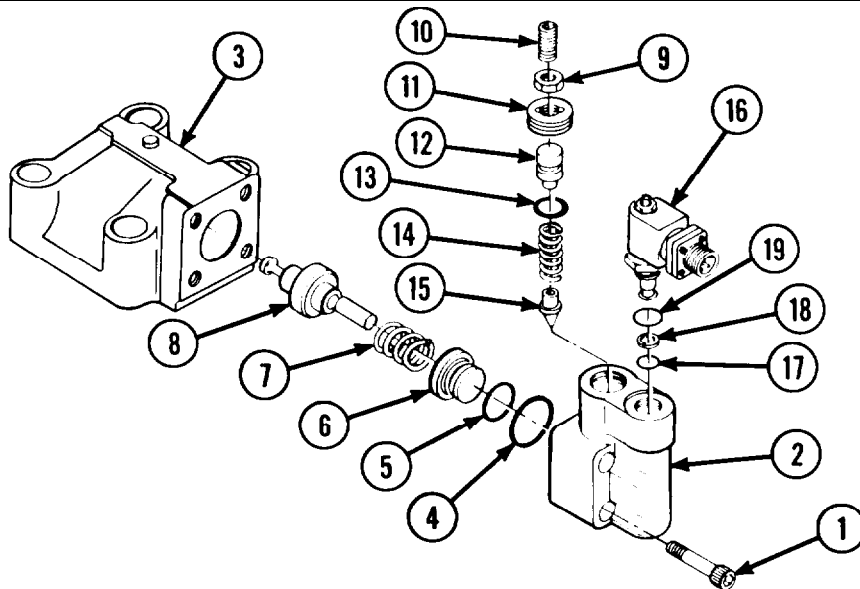
2-192 Solenoid valve removed from
 hydraulic flow divider manifold

General Safety Instructions

WARNING

- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position as failure of system may result in injury to personnel.
- Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

DISASSEMBLY



CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter. Cover open ports to keep out dirt.

NOTE

These procedures are written and illustrated for solenoid valve (PN 12253777). If your unit has a damaged solenoid valve (PN 11592762), order solenoid valve (PN 1253777) in accordance with TM 9-2350-238-24P-2.

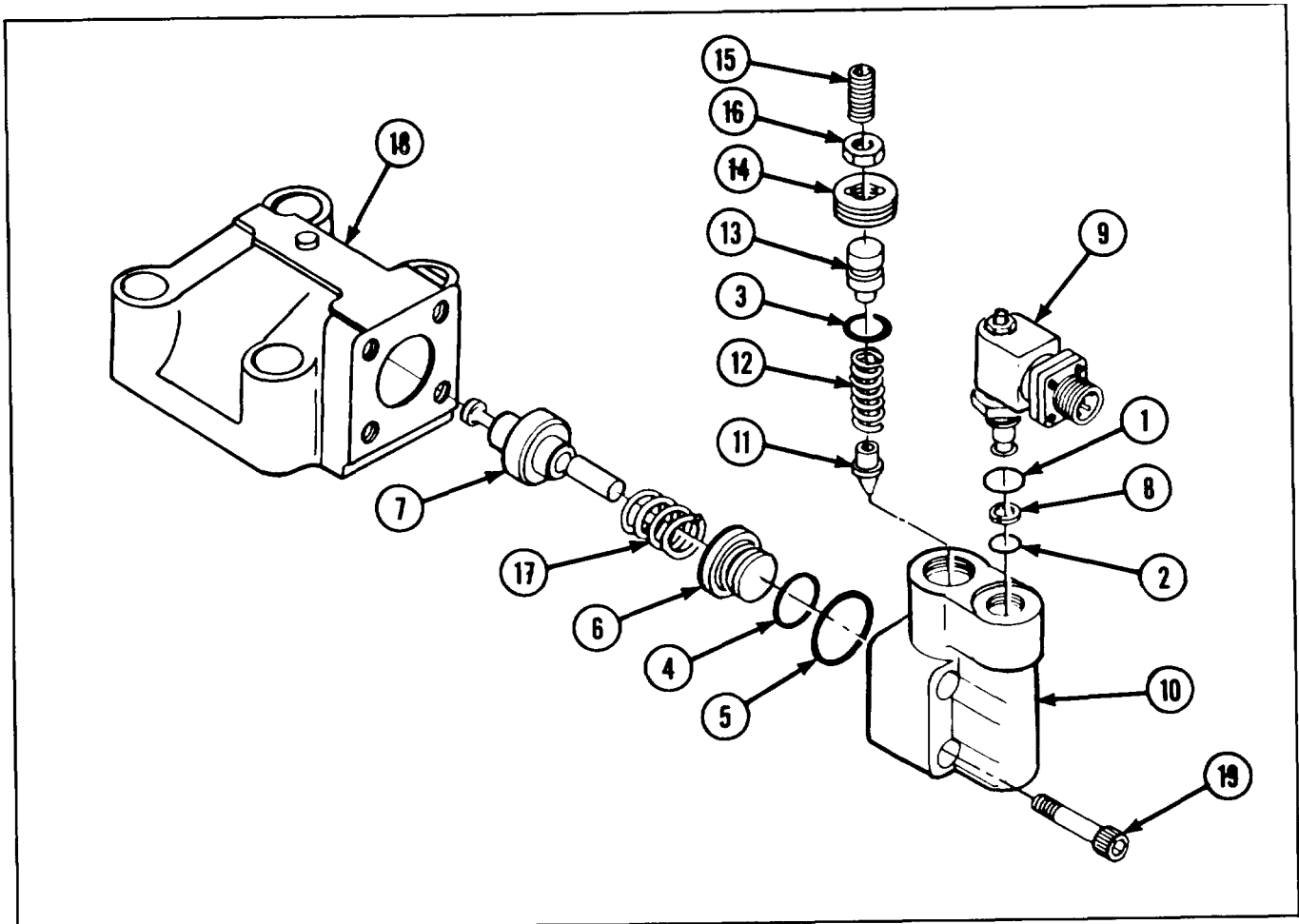
- 1 Remove four pilot capscrews (1) and pilot cap (2) from valve body (3).
- 2 Remove preformed packing (4) from pilot cap (2).
- 3 Remove preformed packing (5), piston guide (6), piston spring (7), and piston (8) from valve body (3).
- 4 Remove adjusting screw hexagon jam nut (9), pressure adjusting screw (10), and using retaining ring pliers, remove retainer cap (11).
- 5 Remove spring seat (12), preformed packing (13), poppet spring (14), and poppet (15) from pilot cap (2).
- 6 Remove solenoid valve (16) from pilot cap (2).
- 7 Remove preformed packing (17), packing retainer (18), and preformed packing (19) from solenoid valve (16).
- 3 If piston spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If piston guide is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 If pilot cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 6 If pilot capscrews are broken, damaged, or missing, repair is by replacement of next higher assembly.
- 7 If pressure adjusting screw is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 8 If adjusting screw hexagon plain jam nut is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 9 If retainer cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 10 If spring seat is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 11 If poppet spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 12 If poppet is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 13 If solenoid valve is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 14 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 If piston is broken, damaged, or missing, repair is by replacement of next higher assembly.

2-44. MAINTENANCE OF SOLENOID VALVE (CONT).

REASSEMBLY



1 Apply engine oil (item 15, appx B) to new preformed packings (1, 2, 3, 4, and 5), piston guide (6), piston (7), and packing retainer (8).

2 Install new preformed packing (1), packing retainer (8), and new preformed packing (2) on solenoid valve (9).

3 Install solenoid valve (9) on pilot cap (10).

4 Install poppet (11), poppet spring (12), new preformed packing (3), spring seat (13), and using retaining ring pliers, install retainer cap (14).

5 Install pressure adjusting screw (15), and adjusting screw hexagon jam nut (16) in pilot cap (10).

6 Install piston (7), piston spring (17), piston guide (6), and new preformed Packing (4) in valve body (18).

7 Install new preformed packing (5) on pilot cap (10).

8 Install pilot cap (10) and four pilot cap-screws (19) on valve body (18).

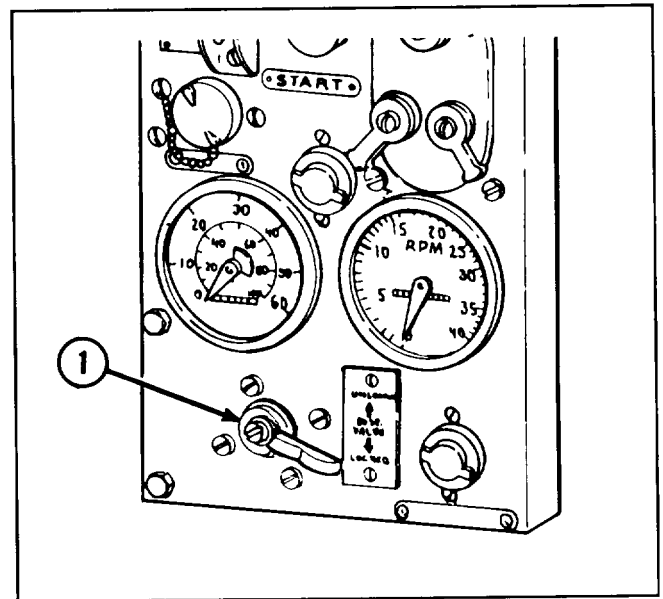
9 Perform installation procedures prior to high-pressure setting adjustment of solenoid valve. Refer to page 2-192.

HIGH-PRESSURE SETTING ADJUSTMENT

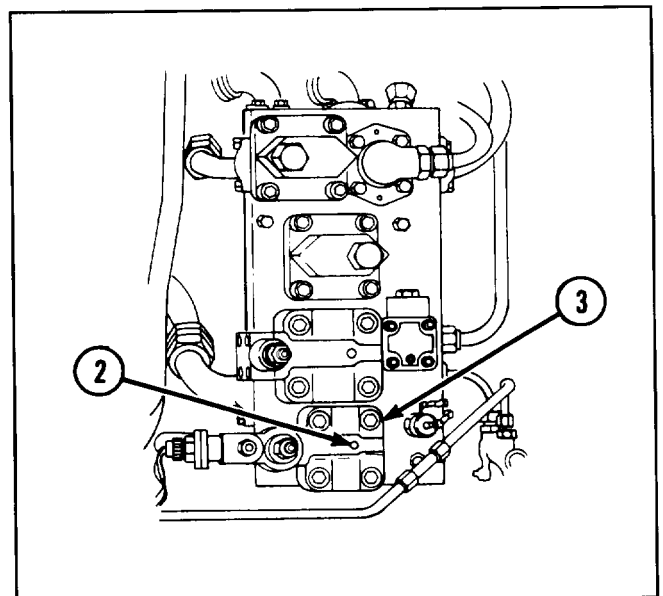
WARNING

- Make sure all personnel stand clear when operating boom to avoid injury to personnel.
- When testing hydraulic system, be sure boom is in stowed position as failure of system may result in injury to personnel.

- 1 Perform adjustment of check valve procedure. Refer to page 2-179.
- 2 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 3 Set SUSP VALVE lever (1) to LOCKED.



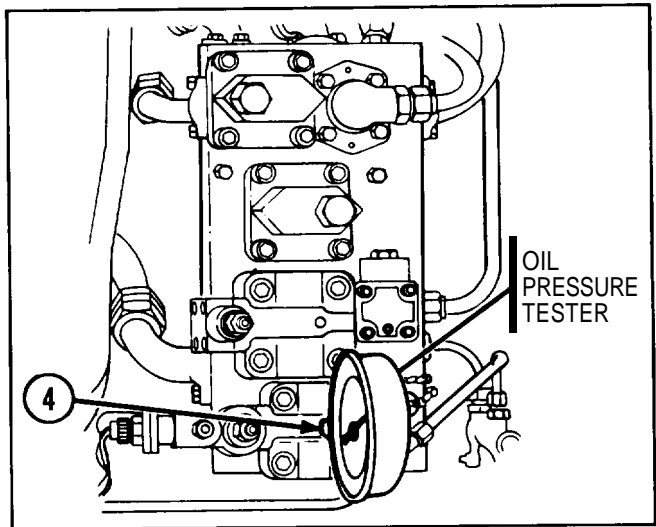
- 4 Remove pilot cap (2) from solenoid valve (3).



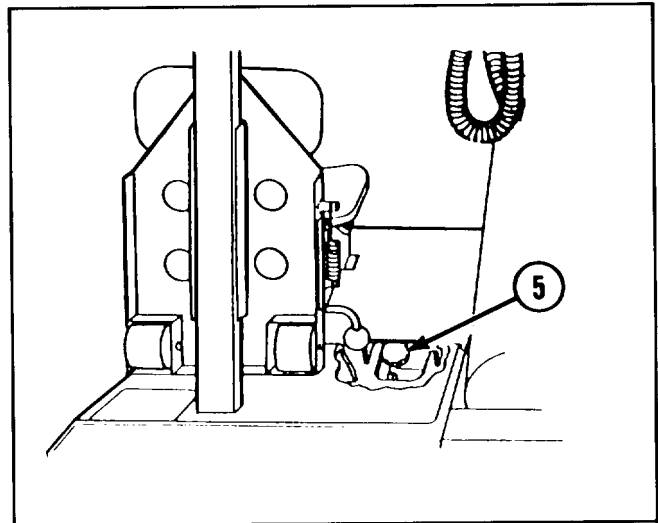
2-44. MAINTENANCE OF SOLENOID VALVE (CONT).

HIGH-PRESSURE SETTING ADJUSTMENT (CONT)

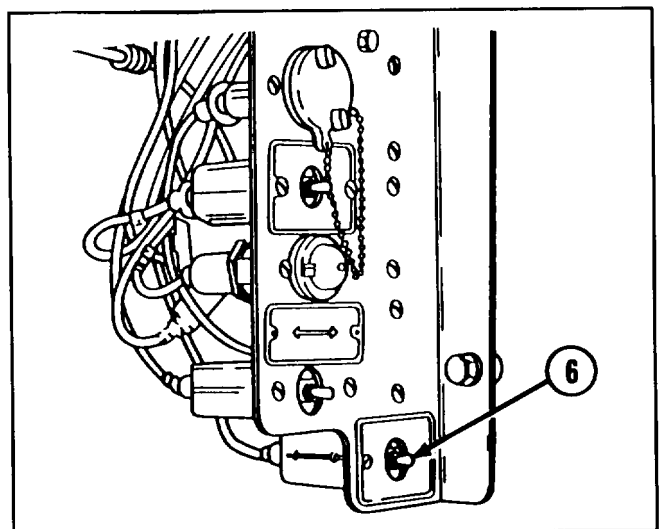
- 5 Install 3000 psi (20,685 kpa) oil pressure tester in test port (4).



- 6 Pull out TRAVERSING BRAKE PRESSURE SELECTOR knob (5) to prevent hydraulic system pressure from releasing traversing brakes.



- 7 Set LEVEL WIND switch (6) to ON.



CAUTION

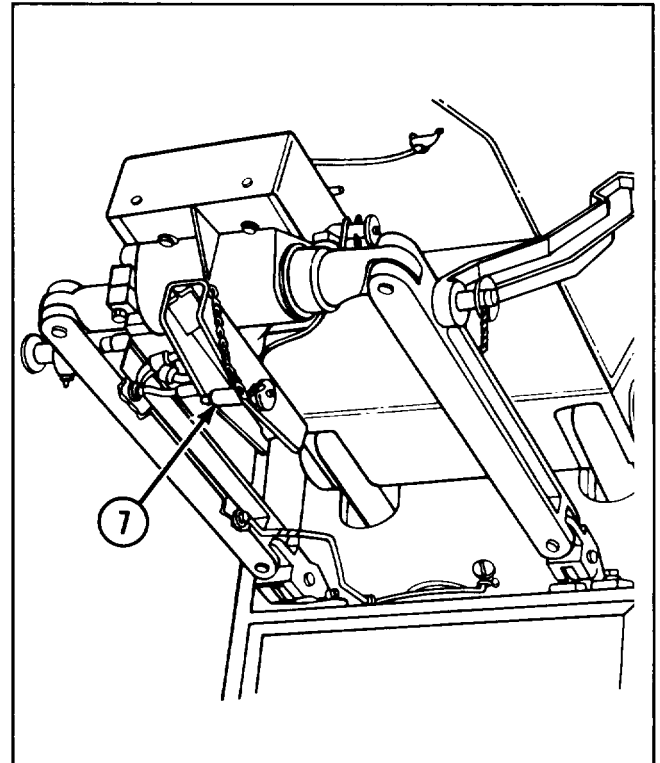
Do not keep solenoid valve energized for longer than 5 minutes during steps 8 thru 13. Failure to follow instructions may result in hot hydraulic fluid,

- 8 Listening for actuation of one of the level wind sensing switches, slowly rotate level wind cable guide (7).

NOTE

As level wind sensing switch actuates, the solenoid valve should click.

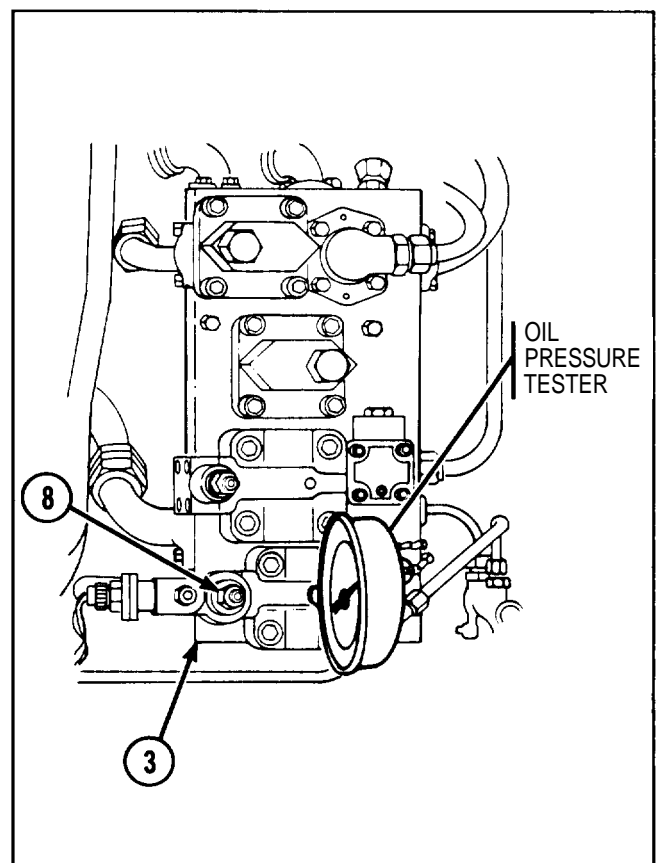
- 9 Secure level wind assembly. Refer to TM 9-2350-238-10.



WARNING

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

- 10 Turn on hydraulic system. Refer to TM 9-2350-238-10.
- 11 Loosen nut (8) on solenoid valve (3).



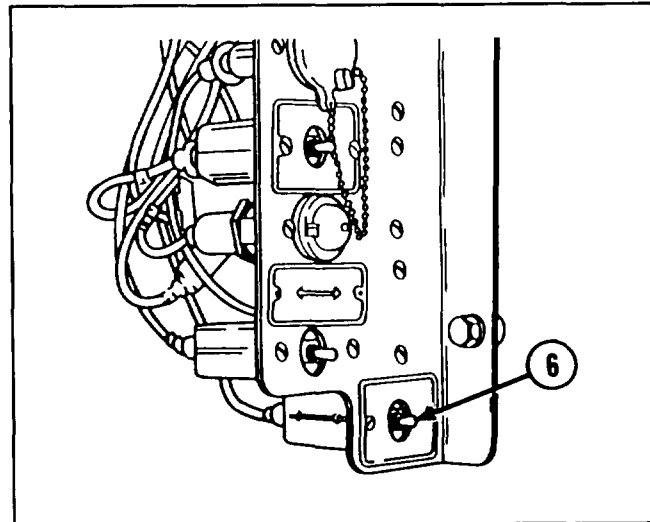
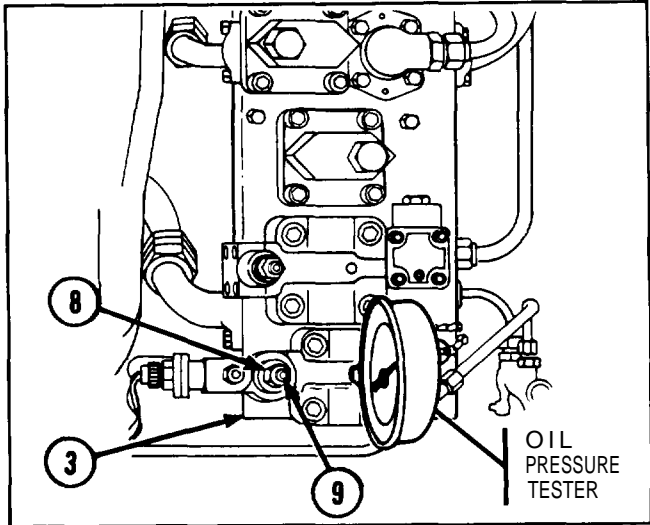
2-44. MAINTENANCE OF SOLENOID VALVE (CONT).

HIGH-PRESSURE SETTING ADJUSTMENT (CONT)

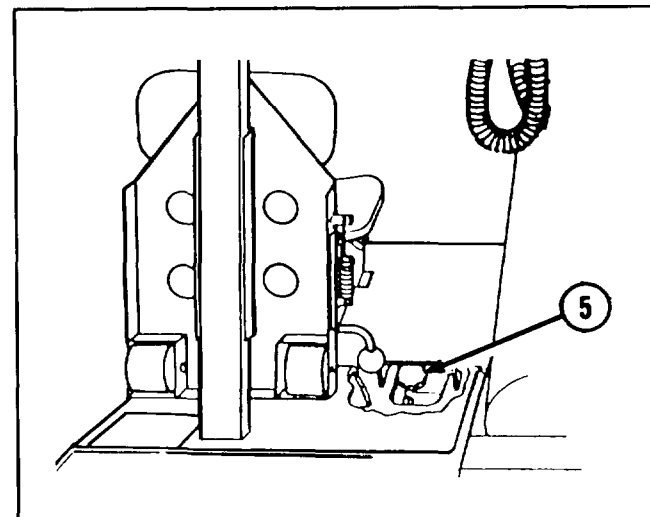
CAUTION

Do not allow pressure to go over 1850 psi (12,756 kPa). Failure to follow instructions may result in damage to equipment.

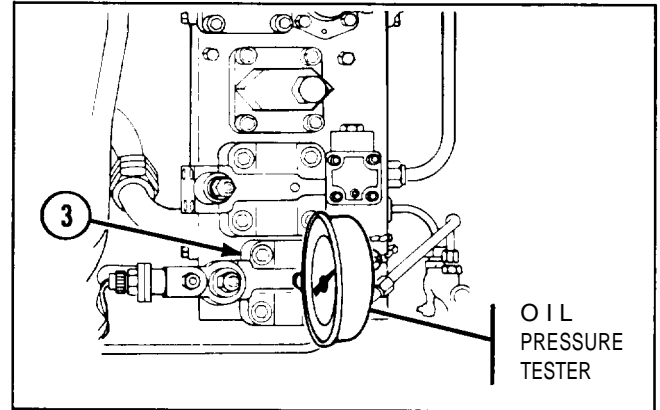
- 12 Adjust pressure for solenoid valve (3) to between 1650 and 1850 psi (11,377 and 12,756 kPa) by turning screw (9) counterclockwise to decrease pressure or clockwise to increase pressure.
- 13 When correct pressure adjustment is obtained, tighten nut (8).
- 14 If correct pressure adjustment cannot be obtained, replace solenoid valve (3). Refer to page 2-192.
- 15 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 16 Set LEVEL WIND switch (6) to OFF.
- 17 Release level wind assembly. Refer to TM 9-2350-238-10.



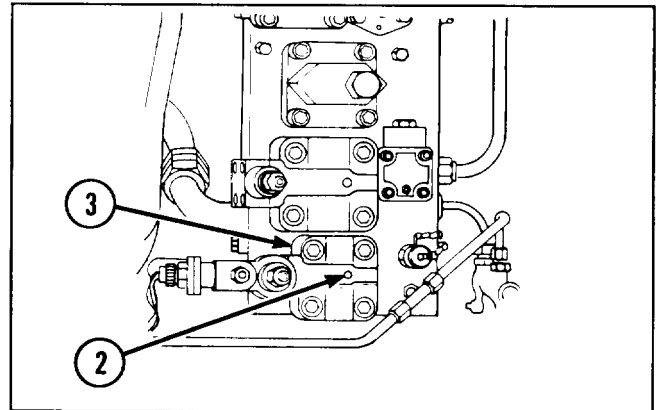
- 18 Push in TRAVERSING BRAKE PRESSURE SELECTOR knob (5).



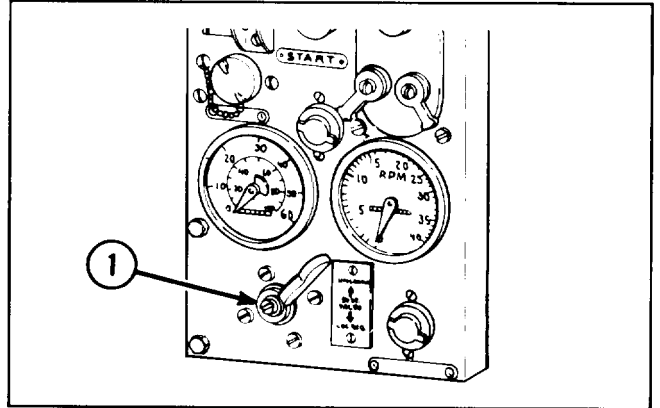
19 Disconnect oil pressure tester from solenoid valve (3).



20 Install pilot cap (2) in solenoid valve (3).

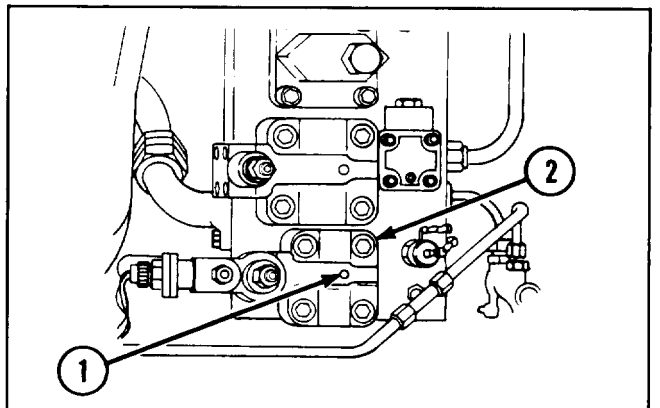


21 Set SUSP LOCKED lever (1) to UN-LOCKED.



LOW PRESSURE SETTING CHECK

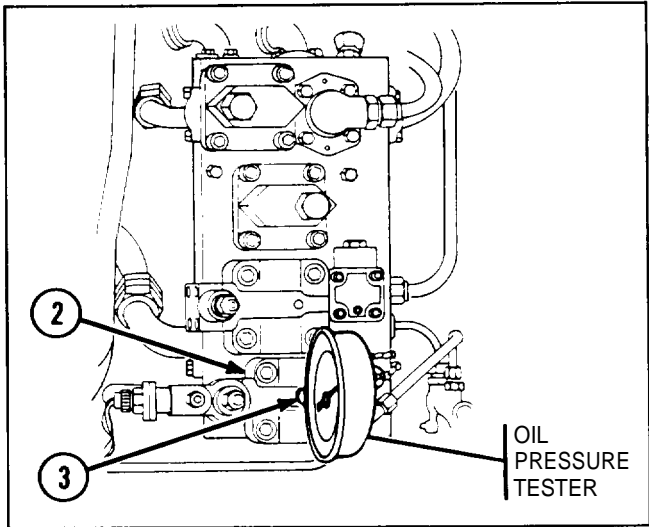
- 1 Perform adjustment of check valve procedure. Refer to page 2-179.
- 2 Turn off hydraulic system. Refer to TM 9-2350-238-10.
- 3 Remove pilot cap (1) from solenoid valve (2).



2-44. MAINTENANCE OF SOLENOID VALVE (CONT).

LOW PRESSURE SETTING CHECK (CONT)

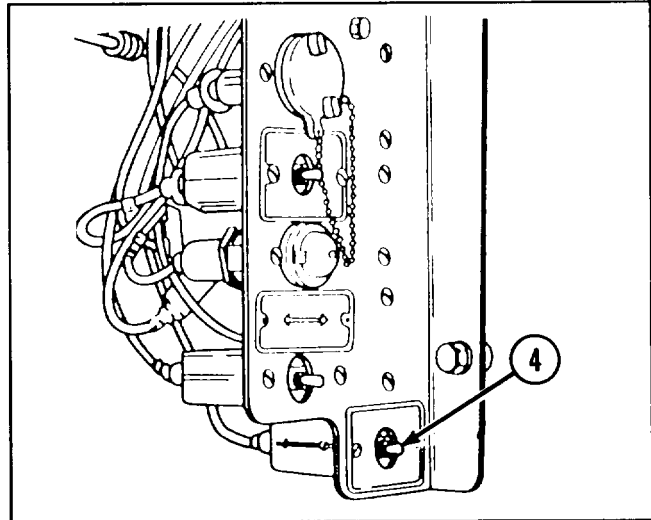
- 4 Install 500 psi (3448 kPa) oil pressure tester in test port (3) of solenoid valve (2).



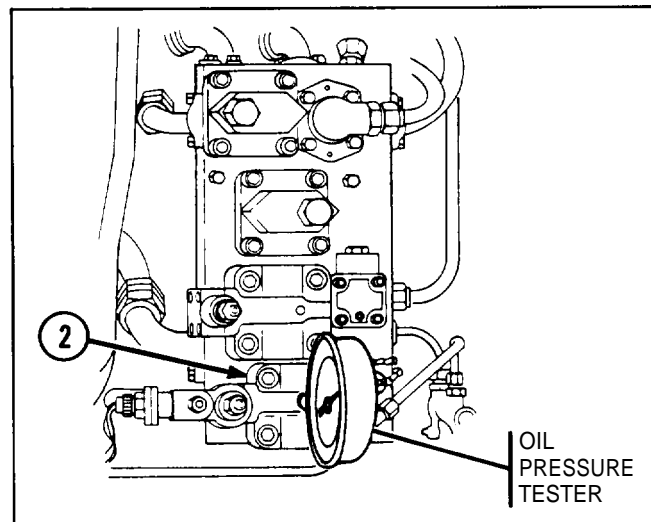
- 5 Set LEVEL WIND switch (4) to OFF.

Hydraulic system is under high pressure. Follow hydraulic system safety procedures to prevent injury (TM 9-2350-238-20-2). Wipe up spilled hydraulic fluid.

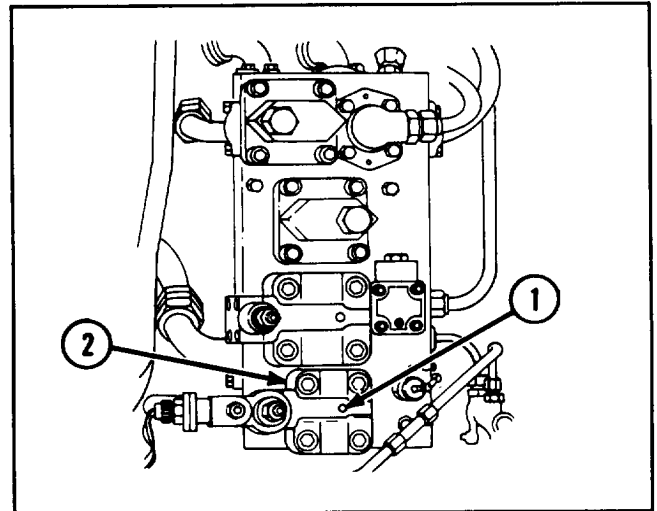
- 6 Turn on hydraulic system. Refer to TM 9-2350-238-10.
- 7 Read oil pressure tester. If pressure is less than 135 psi (931 kPa) or more than 500 psi (3448 kPa), replace solenoid valve (2). Refer to page 2-192.
- 8 Turn off hydraulic system. Refer to TM 9-2350-238-10.



- 9 Disconnect oil pressure tester from solenoid valve (2).



10 Install pilot cap (1) in solenoid valve (2).



2-45. MAINTENANCE OF TURRET TRAVERSE CONTROL DIRECTIONAL LINEAR VALVE AND SPOOL ASSEMBLY.

| | |
|---|--|
| This task covers: a. <i>Removal</i> b. <i>Disassembly</i> c. <i>Inspection/Repair</i> | d. <i>Reassembly</i> e. <i>Installation</i> |
|---|--|

INITIAL SETUP

Tools and Special Tools

General mechanic's tool kit, automotive (SC 5180-90-CL-N26)

Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)

Wrench, torque, 0 to 175 ft-lb
 Wrench, torque, 0 to 600 ft-lb

Materials/Parts

Engine oil (item 15, appx B)
 Lockwasher (3) (MS35338-46)
 Traverse control valve repair kit (5704466)

References

TM 9-2350-238-20-2
 TM 9-2350-238-24P-2

Equipment Conditions

Oil drained from system (TM 9-2350-238-20-2)
 Forward right-hand nonskid metallic tread removed (TM 9-2350-238-20-2)
 Rear right-hand nonskid metallic tread removed (TM 9-2350-238-20-2)
 Traversing hydraulic valve control pedal removed (TM 9-2350-238-20-2)

General Safety Instructions

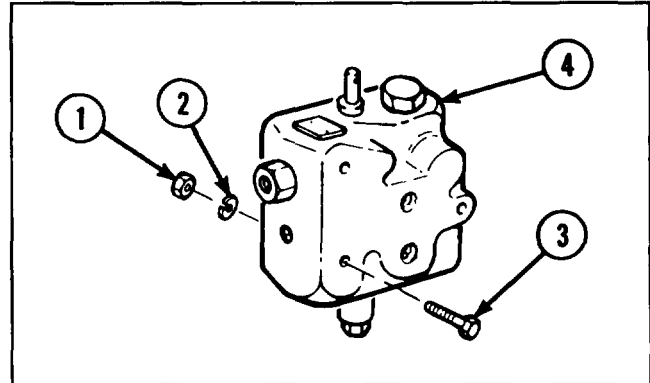
WARNING

Wipe up spilled hydraulic fluid to prevent injury to personnel.

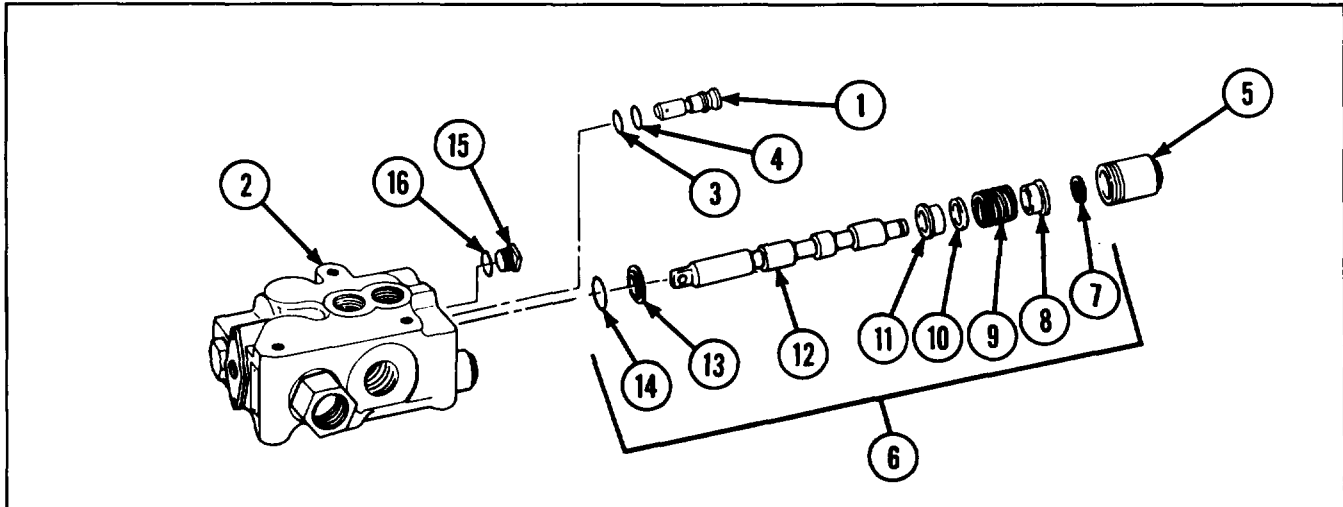
2-45. MAINTENANCE OF TURRET TRAVERSE CONTROL DIRECTIONAL LINEAR VALVE AND SPOOL ASSEMBLY (CONT).

REMOVAL

Remove three hexagon plain nuts (1), three lockwashers (2), three hexagon head capscrews (3), and turret traverse control directional linear valve (4).



DISASSEMBLY



WARNING

Wipe up spilled hydraulic fluid to prevent injury to personnel.

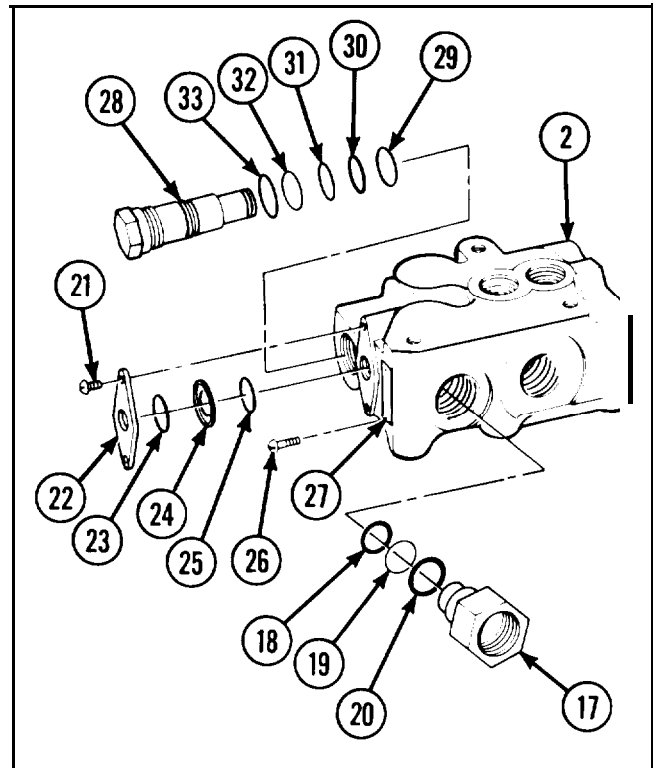
CAUTION

Disassembly and reassembly of valves should be performed in a clean, dry, dust-free area to prevent entry of foreign matter,

- 1 Remove check valve (1) from body (2).
- 2 Remove preformed packing (3) and backup ring (4) from check valve (1).

- Remove spool cap (5) and spool assembly (6) from body (2).
- 4 Remove retaining ring (7), spacer (8), helical spring (9), washer (10), and spacer (11) from spool (12),
- 5 Remove packing retainer (13) and preformed packing (14) from body (2).
- 6 Remove plug valve (15) and preformed packing (16) from body (2).
- 7 Remove preformed packing (16) from plug valve (15).

- 8 Remove port fitting (17) from body (2).
- 9 Remove preformed packing (18), packing retainer (19), and preformed packing (20) from port fitting (17).
- 10 Remove two assembled washer screws (21), spool seal retainer (22), wiper ring (23), seal wiper (24), and preformed packing (25) from body (2).
- 11 If damaged, remove two drive screws (26) and turret traverse control valve body nameplate (27) from body (2).
- 12 Remove assembly plug (28) from body (2).
- 13 Remove backup ring (29), preformed packing (30), preformed packing (31), backup ring (32), and preformed packing (33) from assembly plug (28).



INSPECTION/REPAIR

- 1 Check for broken, damaged, or missing parts.
- 2 If assembly plug is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If body is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 4 If plug valve is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 If check valve is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 6 If spool cap is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 7 If port fitting is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 8 If turret traverse control valve body nameplate is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 9 If drive screws are broken, damaged, or missing, repair is by replacement of next higher assembly.
- 10 If spool seal retainer is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 11 If spacers are broken, damaged, or missing, repair is by replacement of next higher assembly.

2-45. MAINTENANCE OF TURRET TRAVERSE CONTROL DIRECTIONAL LINEAR VALVE AND SPOOL ASSEMBLY (CONT).

INSPECTION/REPAIR (CONT)

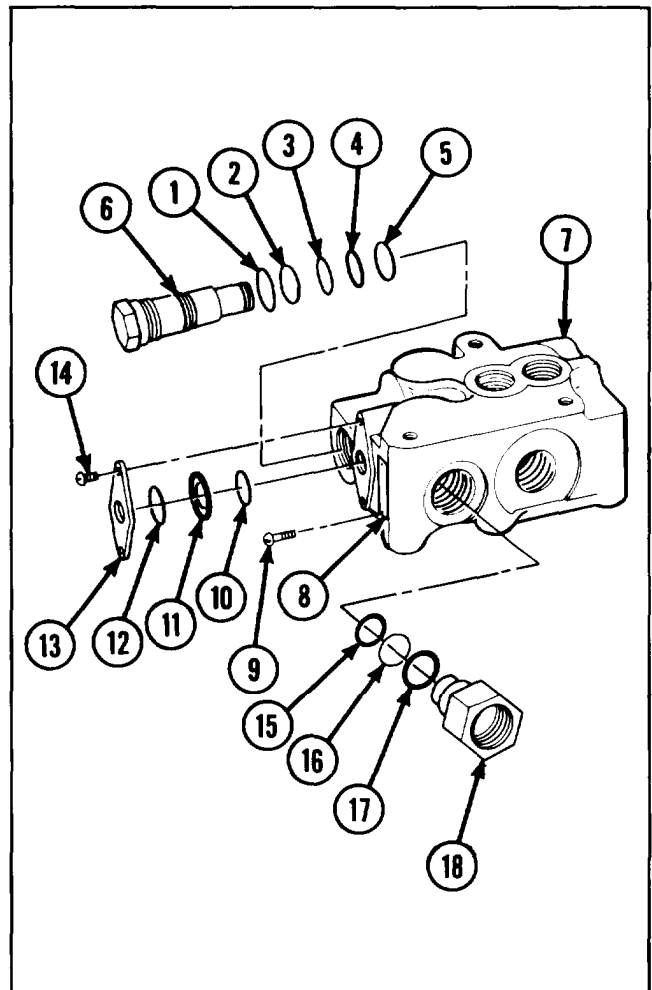
- 12 If spool is broken, damaged, or missing, repair is by replacement of next higher assembly,
- 13 If helical spring is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 14 If any kit component is damaged, replace entire repair parts kit.
- 15 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

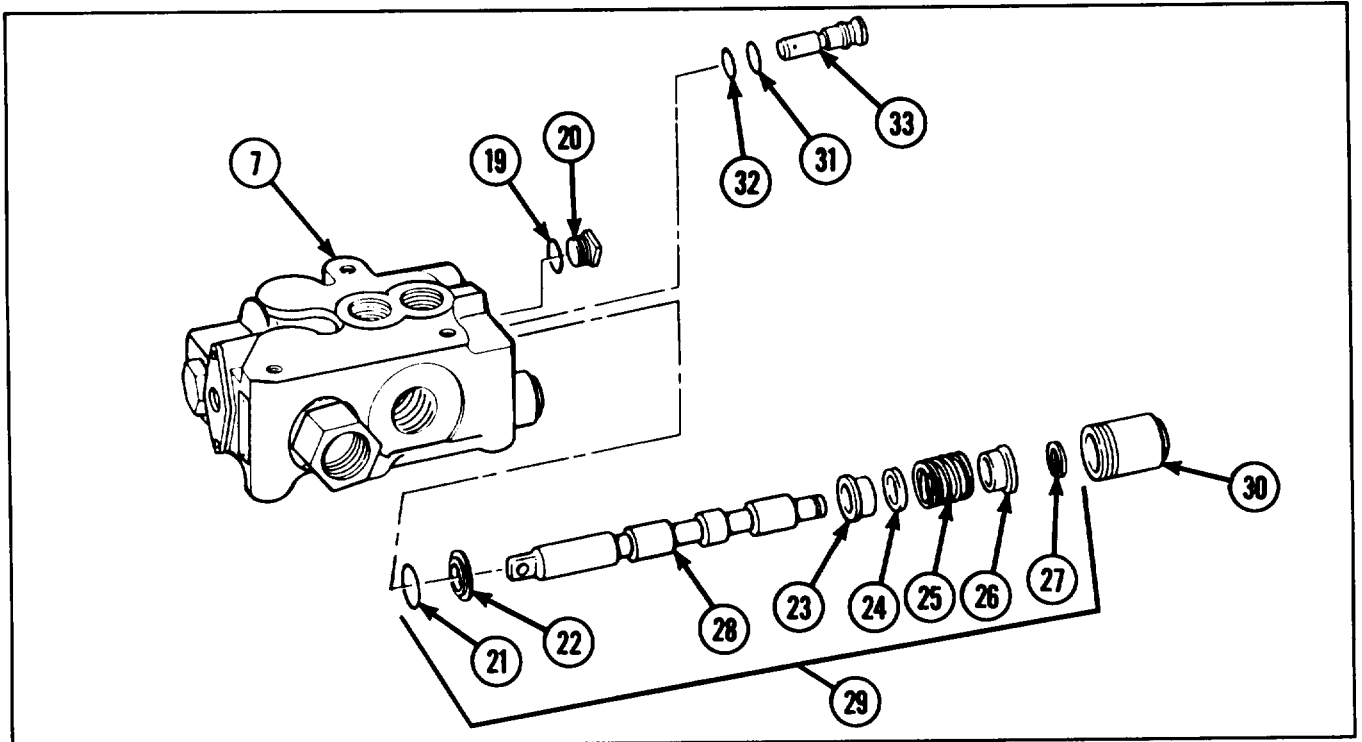
REASSEMBLY

NOTE

Apply engine oil (item 15, appx B) to all new preformed packings and spools.

- 1 Install new preformed packing (1), new backup ring (2), new preformed packing (3), new preformed packing (4), and new backup ring (5) on assembly plug (6).
- 2 Install assembly plug (6) in body (7).
- 3 If removed, install new turret traverse control valve body nameplate (8) and two new drive screws (9) on body (7).
- 4 Install new preformed packing (10), new seal wiper (11), new wiper ring (12), spool seal retainer (13), and two new assembled washer screws (14) in body (7).
- 5 Install new preformed packing (15), new packing retainer (16), and new preformed packing (17) on port fitting (18).
- 6 Install port fitting (18) in body (7).

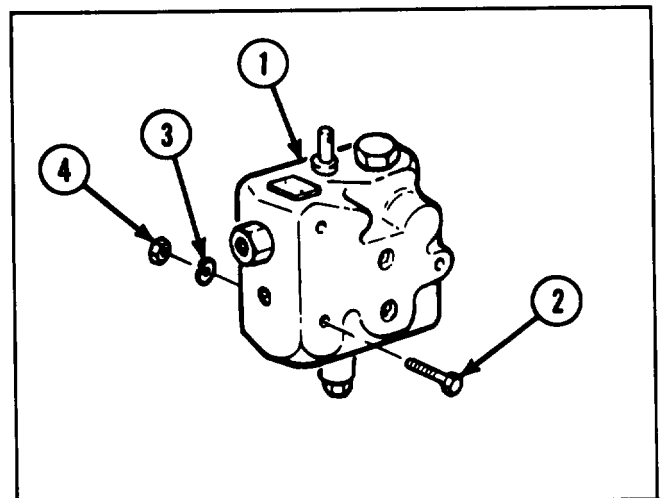




- 7 Install new preformed packing (19) on plug valve (20).
- 8 Install plug valve (20) in body (7).
- 9 Install new preformed packing (21) and new packing retainer (22) in body (7).
- 10 Install spacer (23), washer (24), helical spring (25), spacer (26), and retaining ring (27) on spool (28).
- 11 Install spool assembly (29) and spool cap (30) in body (7).
- 12 Install new backup ring (31) and new preformed packing (32) on check valve (33).
- 13 Install check valve (33) in body (7).

INSTALLATION

Install turret traverse control directional linear valve (1), three hexagon head capscrews (2), three new lockwashers (3), and three hexagon plain nuts (4).



2-46. MAINTENANCE OF TRAVERSING SYSTEM INSTALLATION.

This task covers: a. *Removal*

b. *Inspection/Repair*

c. *Installation*

INITIAL SETUP

Tools and Special Tools

- General mechanic's tool kit, automotive (SC 5180-90-CL-N26)
- Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
- Wrench set, socket, 3/4-in. square drive
- Wrench, torque, 0-600 ft-lb
- Shop equipment, automotive maintenance and repair: supplemental no. 1, less power (SC 4910-95-A62)
- Hoist, chain, 6000 lb (2724 kg)
- Sling (RE1-91-16018)

Materials/Parts

- Lockwasher (MS35333-40)
- Lockwasher (3) (MS35338-51)
- Lockwire (QQW461)
- Self-locking nut (NAS101N17)

Personnel Required

2

References

- TM 9-2350-238-20-2
- TM 9-2350-238-24P-2

Equipment Conditions

- Forward left-hand nonskid metallic tread removed (TM 9-2350-238-20-2)
- Rear left-hand nonskid nonmetallic tread removed (TM 9-2350-238-20-2)
- Equipment stowage accessories box removed (TM 9-2350-238-20-2)
- Oil drained from cab traversing unit (TM 9-2350-238-20-2)

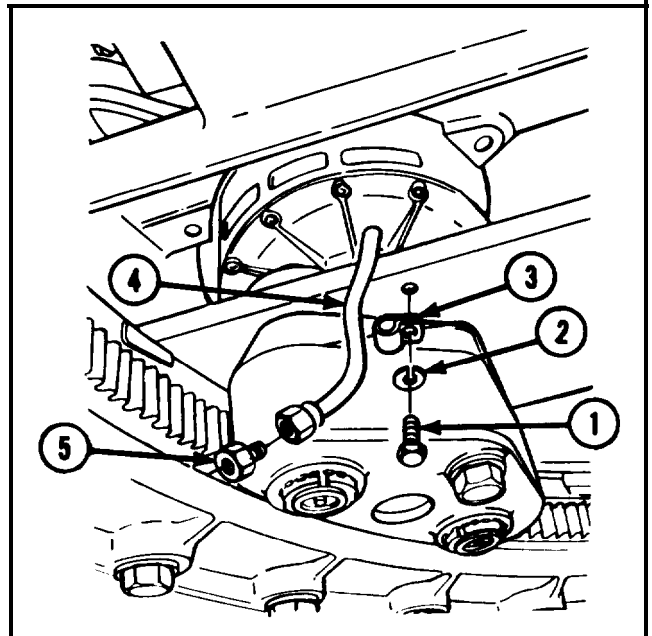
General Safety Instructions

WARNING

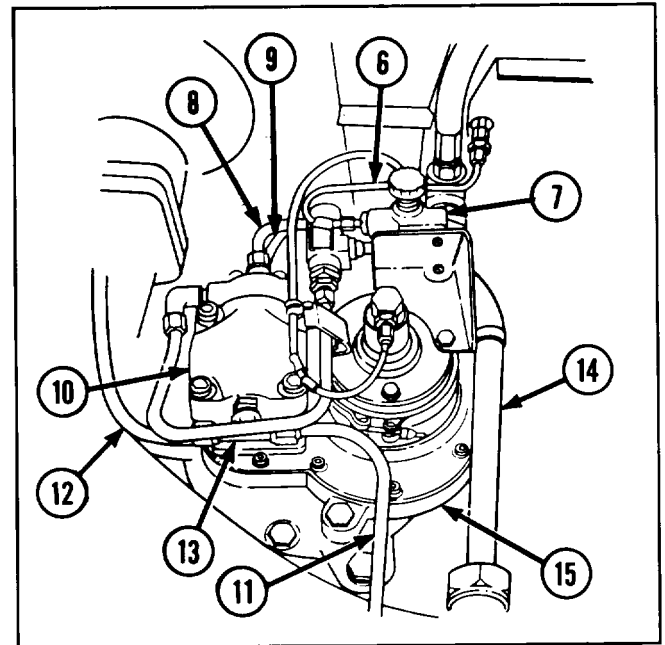
Use hoist of 2000 lb (908 kg) minimum lifting capacity to prevent injury to personnel and damage to equipment.

REMOVAL

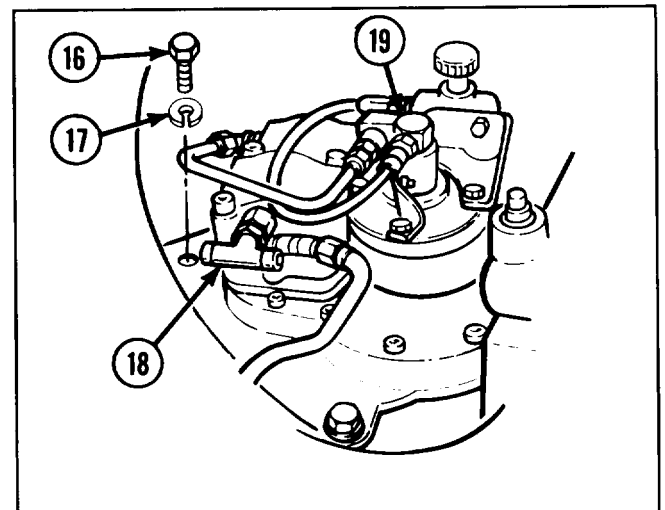
- 1 Remove hexagon capscrew (1), lockwasher (2), loop clamp (3), and oil drain metal tube assembly (4). Remove straight tube adapter (5) from oil drain metal tube assembly (4).



- 2 Remove metal tube assembly (6) from traverse brake selector linear valve (7). Cover metal tube assembly opening.
- 3 Remove two tubes (8 and 9) on traversing hydraulic motor (10). Cover tube openings.
- 4 Remove boom and tow winch motor drain metal tube assembly (11) and tow winch motor drain metal tube assembly (12) at hydraulic drain tee (13) on traversing hydraulic motor (10). Cover tube openings.
- 5 Remove metal tube assembly (14) to clear area for removal of cab traversing unit (15).



- 6 Remove three hexagon capscrews (16) and three lockwashers (17).



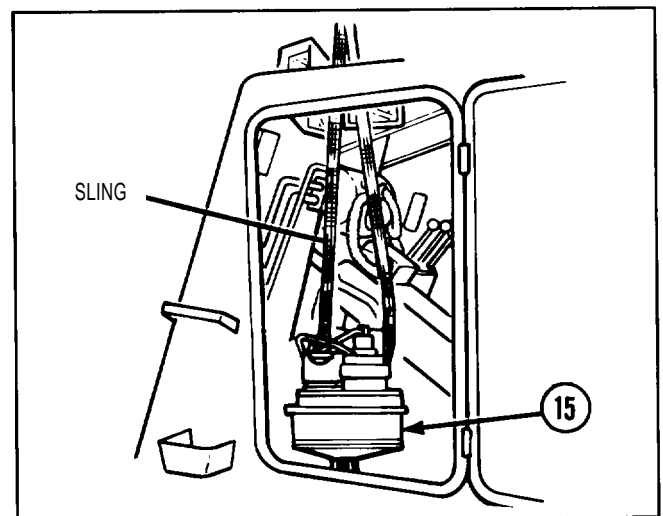
WARNING

Use hoist with lifting capacity of 2000 lb (908 kg) to avoid injury to personnel and damage to equipment.

NOTE

Another M578 Recovery Vehicle or M88A1 Recovery Vehicle may be used, if available, for lifting.

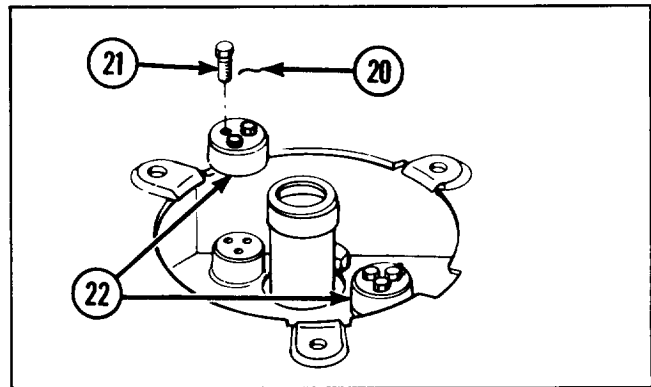
- 7 Rig hoist and sling through rigger's cupola opening. Attach sling to hydraulic drain tee (18) and traverse brake control shuttle valve (19).
- 8 Lift cab traversing unit (15) and remove it through rigger's cupola opening.



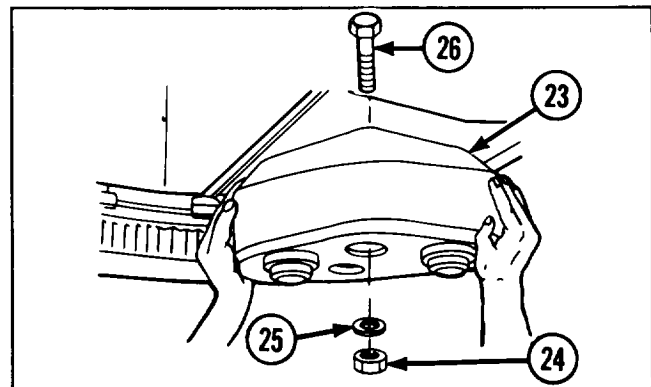
2-46. MAINTENANCE OF TRAVERSING SYSTEM INSTALLATION (CONT).

REMOVAL (CONT)

9 From above cab deck, remove lockwire (20), six hexagon capscrews (21), and two final drive retainer plates (22).



10 With one man inside cab well supporting traversing final drive (23), remove self-locking nut (24) flat washer (25), hexagon capscrew 26, and traversing final drive.

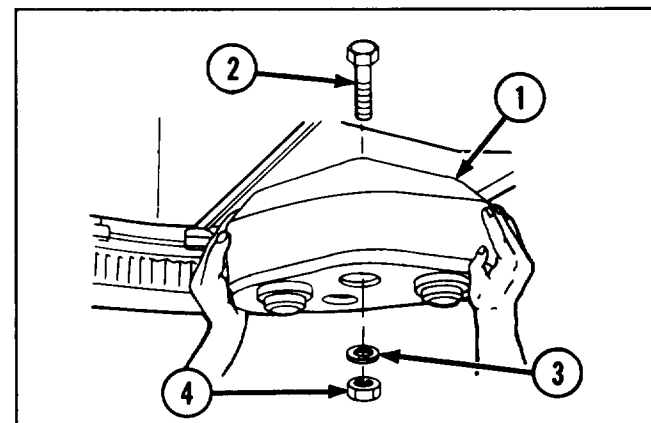


INSPECTION/REPAIR

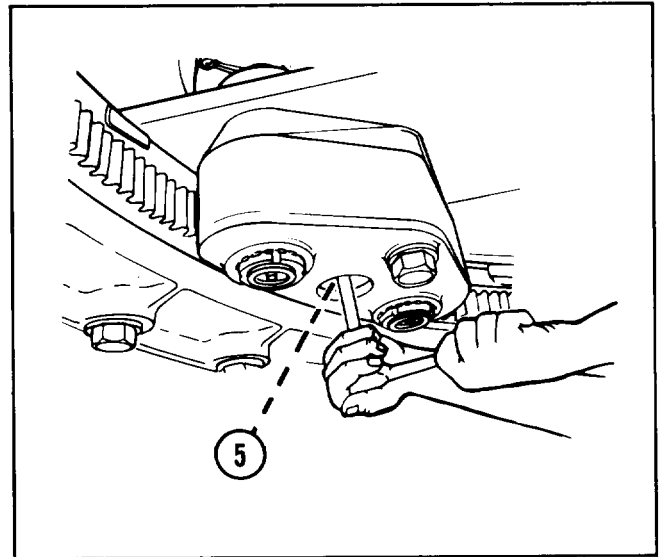
- 1 Inspect for broken, damaged, or missing parts.
- 2 Cab traversing unit is a repairable assembly. Refer to page 2-227.
- 3 Traversing final drive is a repairable assembly. Refer to page 2-253.
- 4 Repair by replacement of authorized parts (TM 9-2350-238-24P-2).

INSTALLATION

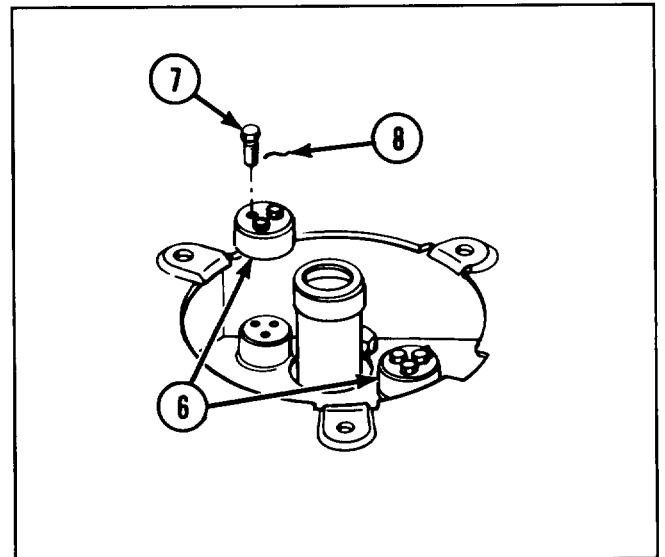
- 1 With one man inside cab well to help support traversing final drive (1), install traversing final drive in cab.
- 2 Secure traversing final drive (1) with hexagon capscrew (2), flat washer (3), and new self-locking nut (4). Torque hexagon capscrew to 200 to 220 ft-lb (271 to 298 N-m).



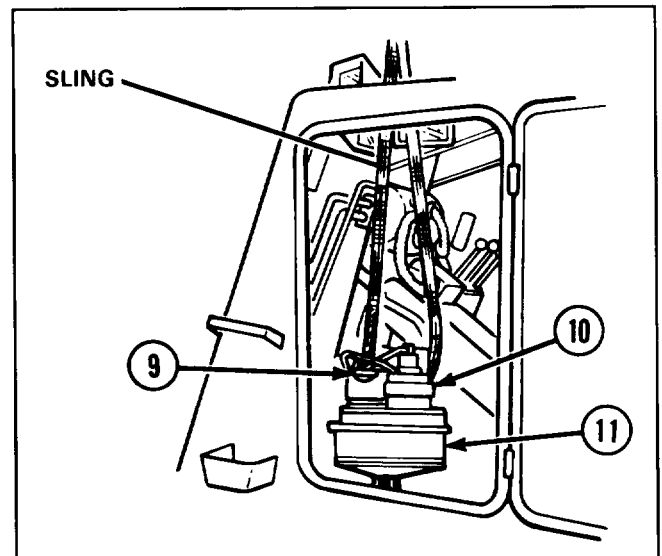
- 3 Adjust gear shaft thrust plug (5) until seated, then back off three full turns.



- 4 From above cab deck, install two final drive retainer plates (6) and six hexagon capscrews (7). Torque six hexagon capscrews to 135 to 150 ft-lb (183 to 203 N-m). Install new lockwire (8) to secure six hexagon capscrews (7).



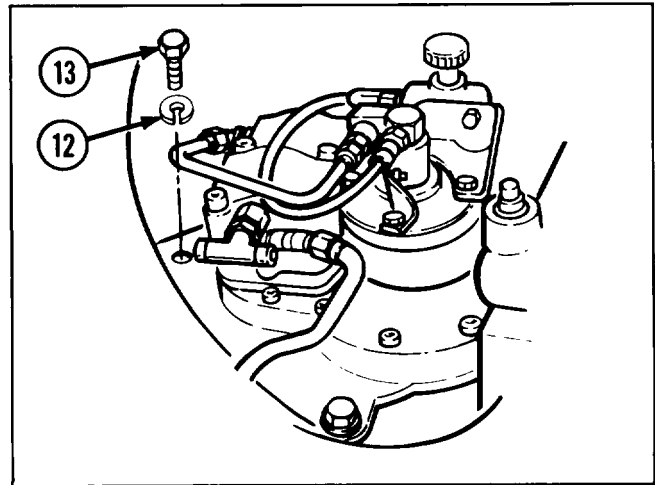
- 5 Rig hoist and sling through rigger's cupola opening. Attach sling to hydraulic drain tee (9) and traverse brake control shuttle valve (10) of cab traversing unit (11).
- 6 Lift cab traversing unit (11) through riggers cupola opening and install in cab.



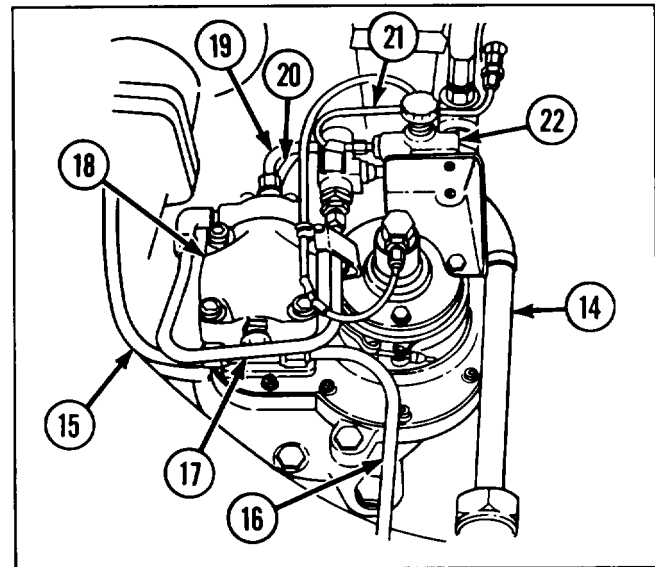
2-46. MAINTENANCE OF TRAVERSING SYSTEM INSTALLATION (CONT).

INSTALLATION (CONT)

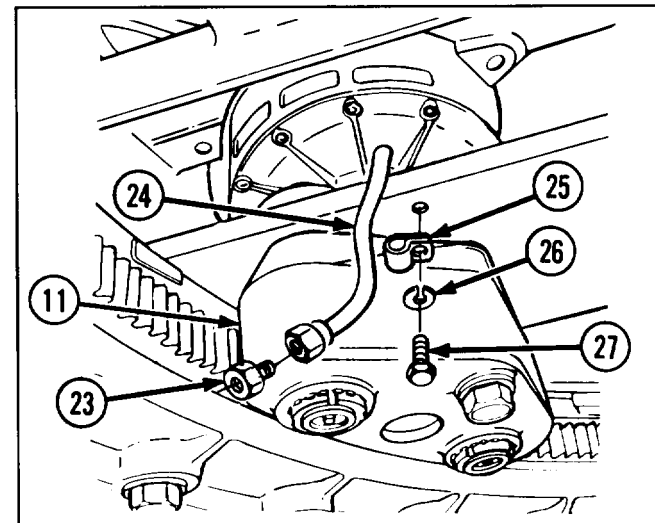
- 7 Install three new lockwashers (12) and three hexagon capscrews (13). Torque three screws to 270 to 300 ft-lb (366 to 407 N-m).



- 8 Install metal tube assembly (14)
- 9 Uncover tube openings and install tow winch motor drain metal tube assembly (15) and boom and tow winch motor drain metal tube assembly (16) at hydraulic drain tee (17) on traversing hydraulic motor (18).
- 10 Uncover tube openings and install two tubes (19 and 20) on traversing hydraulic motor (18).
- 11 Uncover tube opening and install metal tube assembly (21) to traverse brake selector linear valve (22).



- 12 Install straight tube adapter (23) in oil drain metal tube assembly (24).
- 13 Install oil drain metal tube assembly (24) on cab traversing unit (11). Secure oil drain metal tube assembly to cab deck with loop clamp (25), new lockwasher (26), and screw (27). Torque screw to 9 to 10 ft-lb (12 to 14 N-m).



2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY.

This task covers: a. *Disassembly* b. *Inspection/Repair* c. *Reassembly*

INITIAL SETUP

Tools and Special Tools

Adapter (11631430)
 General mechanic's tool kit, automotive
 (SC 5180-90-CL-N26)
 Handle, remover and replacer (7083883)
 Jacking screw (10904195)
 Pipe with cutout (fig. 2, appx C)
 Remover and replacer, bearing and
 clutch (10904175)
 Replacer, bearing (10904194)
 Replacer, bearing (8350230)
 Replacer, oil seal (10904181)
 Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)
 Pliers, retaining ring
 Press, arbor
 Wrench, torque (0 to 175 ft-lb)
 Spanner wrench (GGG-W-665)

References

TM 9-214
 TM 9-2350-238-20-2
 TM 9-2350-238-24P-2

Equipment Conditions

Rigger's vehicular seat removed (TM 9-2350-238-20-2)
 Forward left-hand nonskid metallic tread and rear left-hand nonskid metallic tread removed (TM 9-2350-238-20-2)
 Oil drained from cab traversing unit (TM 9-2350-238-20-2)
 2-222 Cab traversing unit removed from cab assembly

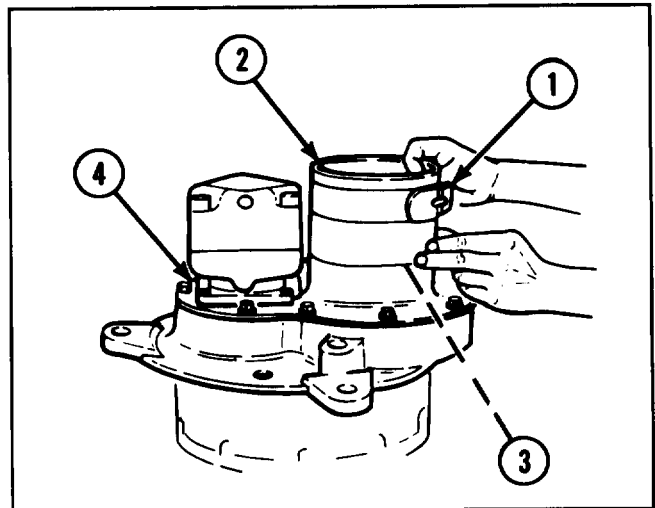
Materials/Parts

Cotter pin (MS24665-357)
 Engine oil (item 15, appx B)
 Key washer (MS19070-072)
 Lockwire (QQW461)
 Retaining ring (7) (MS16624-1075)
 Retaining ring (MS16624-1087)
 Sealing compound (item 20, appx B)
 Traversing system power unit kit
 (5705024)

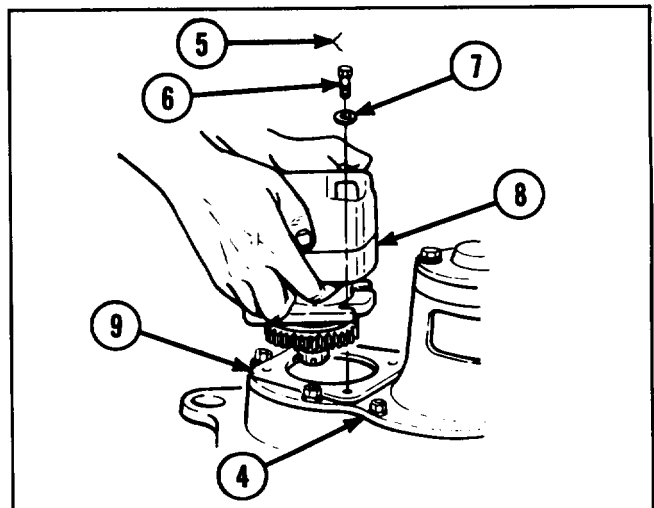
2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

DISASSEMBLY

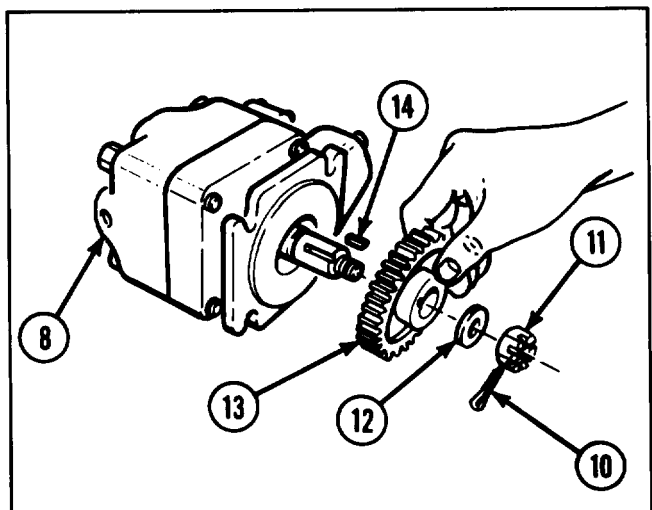
1 Remove hose clamp (1), brake housing gasket sleeve (2), and brake housing gasket (3) from brake clutch traversing housing (4).



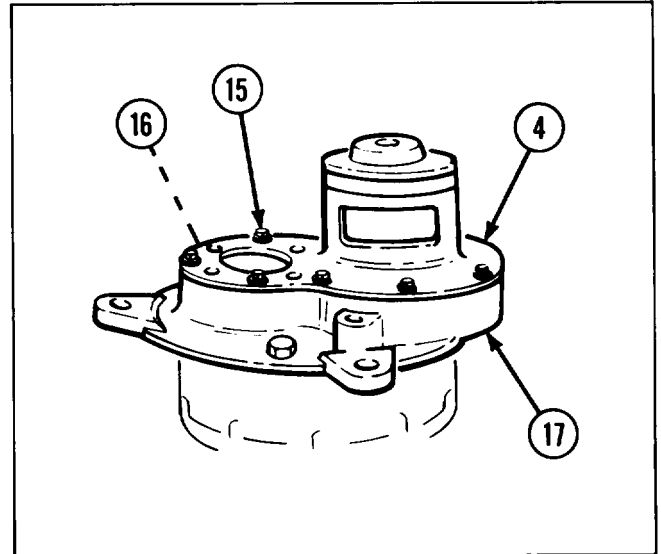
2. Remove lockwire (5), four hexagon head capscrews (6), four flat washers (7), traversing hydraulic motor (8), and motor gasket (9) from brake clutch traversing housing (4).



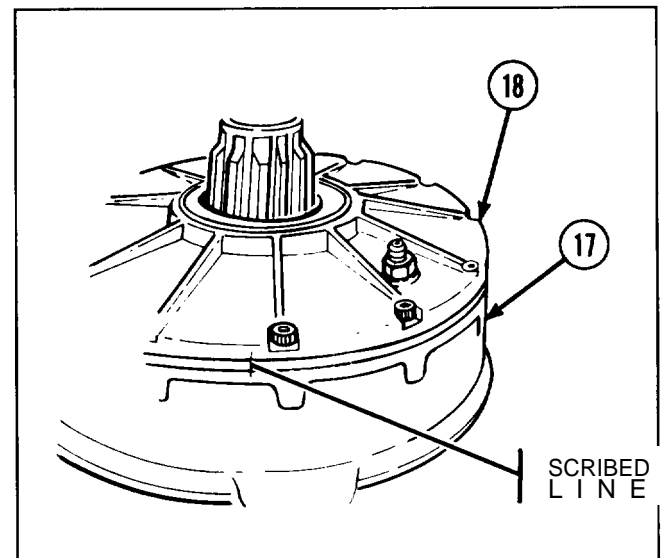
3 Remove cotter pin (10), slotted hexagon nut (11), flat washer (12), drive pinion spur gear (13), and machine key (14) from traversing hydraulic motor (8).



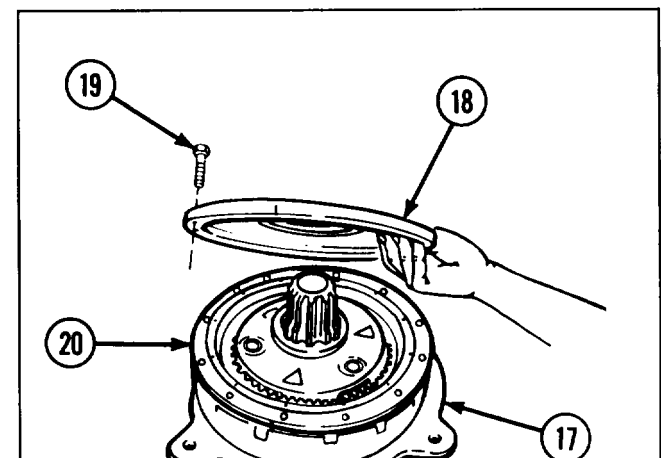
- 4 Remove ten socket-head capscrews (15), brake clutch traversing housing (4), and upper gear housing gasket (16) from mechanical gear housing (17).



- 5 Turn mechanical gear housing (17) over. Scribe a line on oil seal retainer (18) and mechanical gear housing (17) to ensure correct positioning during reassembly.



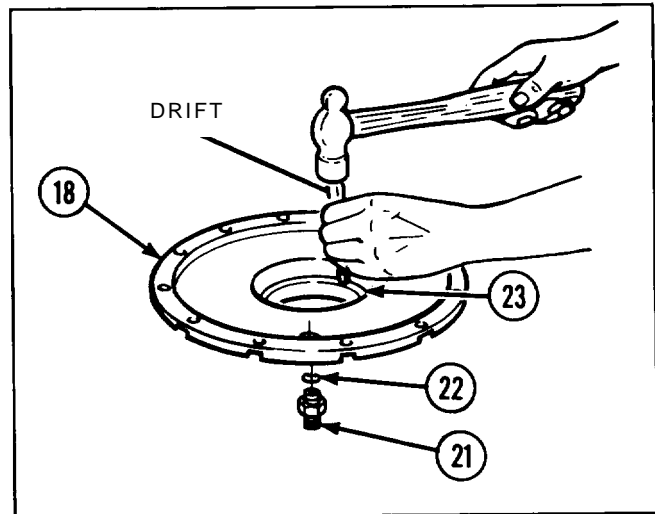
- 6 Remove twelve socket head capscrews (19), oil seal retainer (18), and ring gear gasket (20) from mechanical gear housing (17).



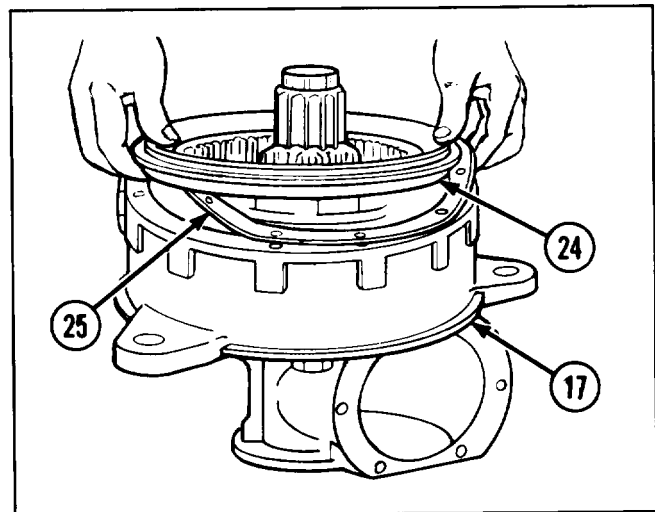
2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

DISASSEMBLY (CONT)

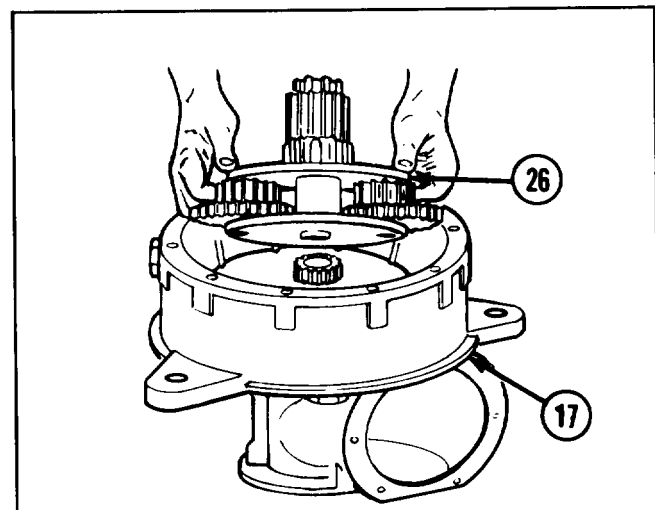
- 7 Remove tube nipple (21) and preformed packing (22) from oil seal retainer (18).
- 8 Using hammer and drift, remove plain encased seal (23) from oil seal retainer (18).



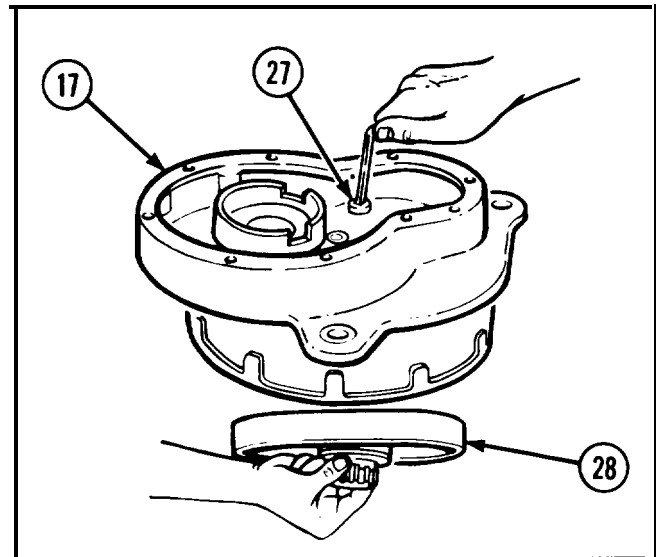
- 9 Scribe a line on internal gear (24) and mechanical gear housing (17) to ensure correct positioning during reassembly. Remove internal gear (24) and ring gear gasket (25) from mechanical gear housing (17).



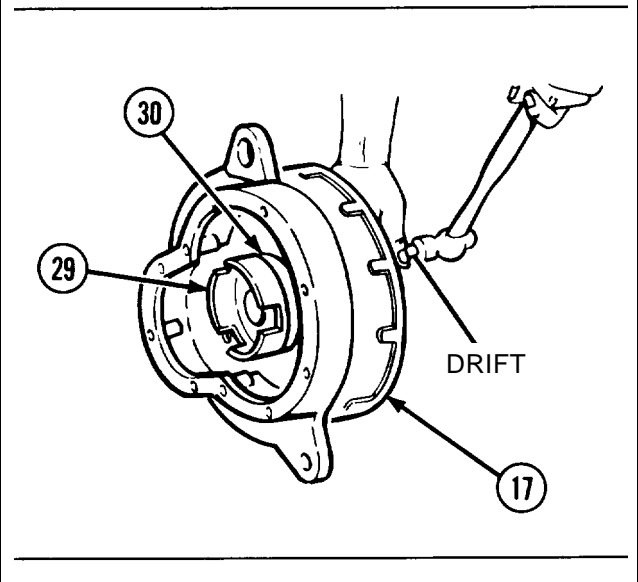
- 10 Remove primary planetary speed gear assembly (26) and attaching parts from mechanical gear housing (17).



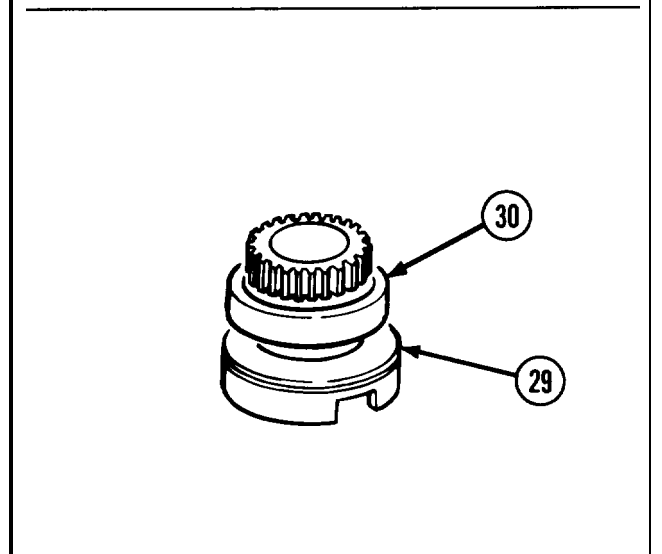
- 11 Turn mechanical gear housing (17). Remove four socket head capscrews (27) and internal gear (28) from mechanical gear housing.



- 12 Using hammer and drift, remove traversing gear-slip clutch (29) and clutch housing ball bearing (30) from mechanical gear housing (17).



- 13 Remove clutch housing ball bearing (30) from traversing gear-slip clutch (29).

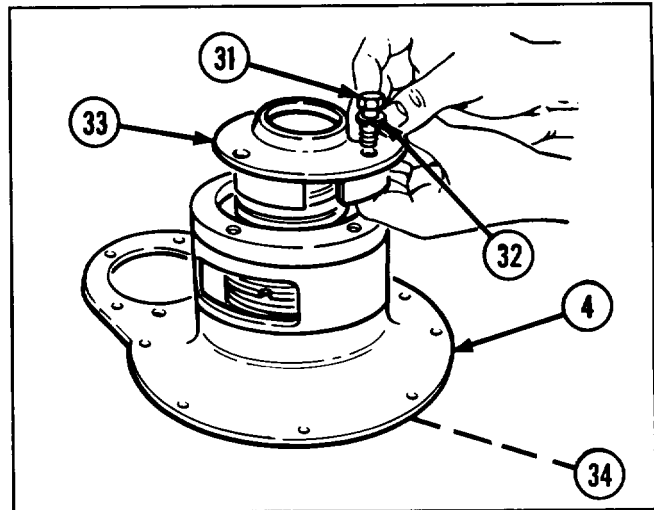


2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

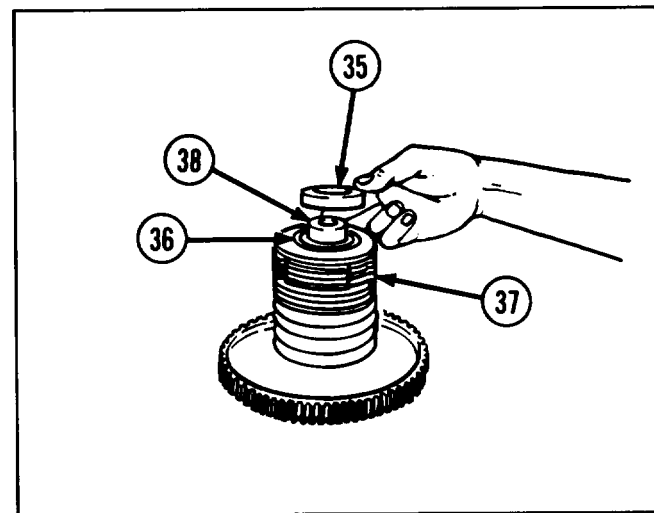
DISASSEMBLY (CONT)

14 Remove four hexagon head capscrews (31), four lockwashers (32), and retaining plate (33) from brake clutch traversing housing (4).

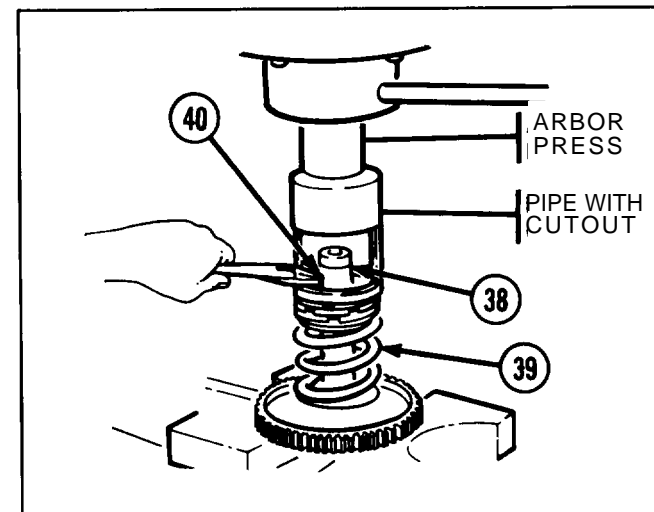
15 Remove brake clutch traversing housing (4) from brake shaft spur gear (34) and attached parts.



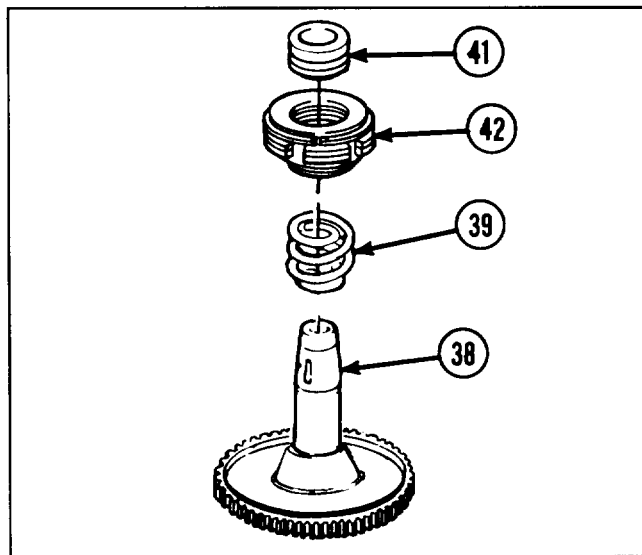
16 Remove ball bearing (35), retaining ring (36), and brake traversing slip clutch (37) from shouldered brake shaft (38).



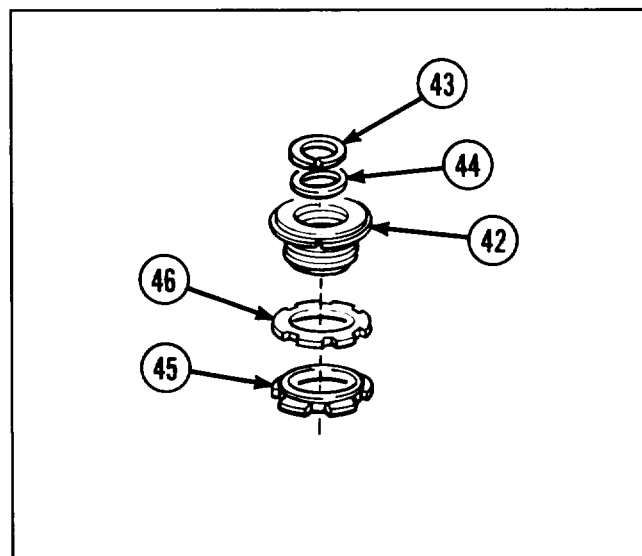
17 Using fabricated pipe with cutout (fig. 2, appx C) and arbor press, compress slip clutch spring (39) and remove machine key (40) from shouldered brake shaft (38).



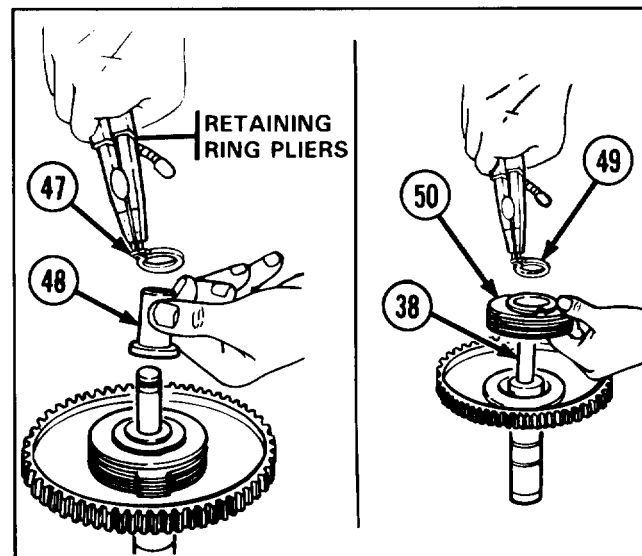
- 18 Remove piston brake bushing (41) and machine brake bushing (42) with attached parts, and slip clutch spring (39) from shouldered brake shaft (38).



- 19 Remove packing retainer (43), preformed packing (44), adjusting nut (45), and jam nut (46) from machine brake bushing (42).



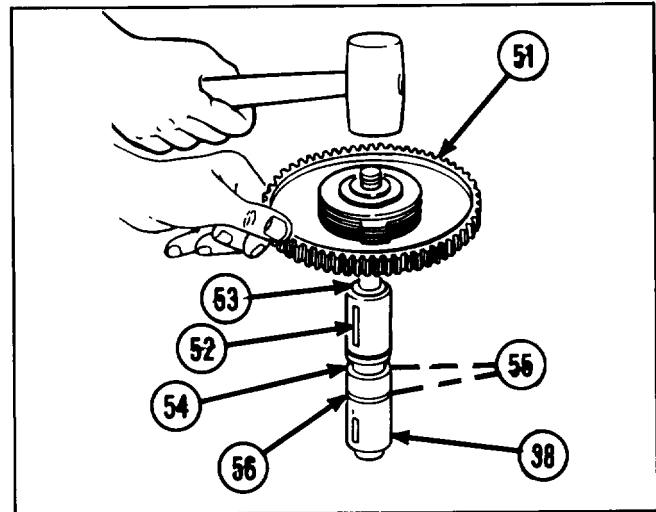
- 20 Using retaining ring pliers, remove retaining ring (47), sleeve bearing (48), retaining ring (49), and clutch assembly (50) from shouldered brake shaft (38).



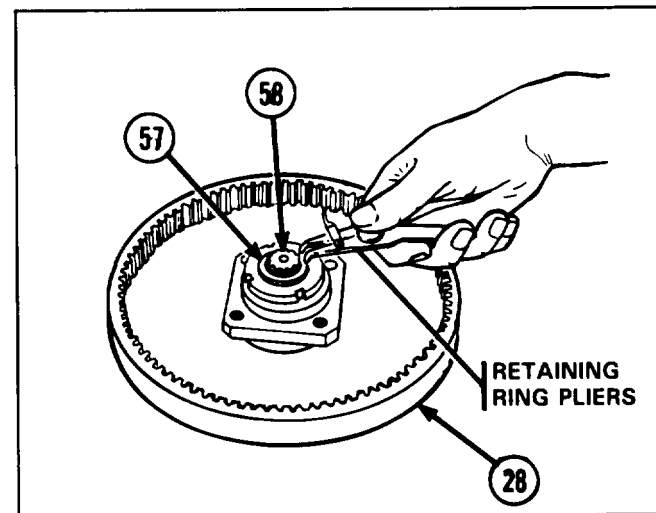
2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

DISASSEMBLY (CONT)

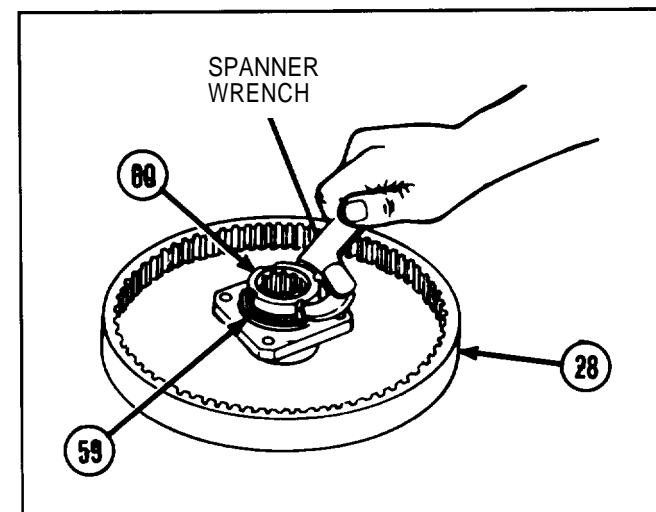
- 21 Using soft-faced hammer, drive shouldered brake shaft (38) from brake shaft spur gear (51). Remove machine key (52), preformed packing (53), packing retainer (54), two preformed packings (55), and packing retainer (56) from shouldered brake shaft (38).



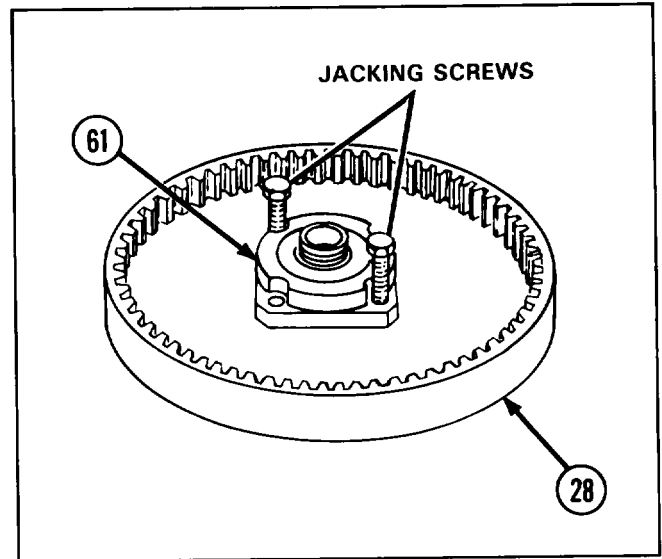
- 22 Using retaining ring pliers, remove retaining ring (57), releasing planet traversing spur gear (58) from internal gear (28).



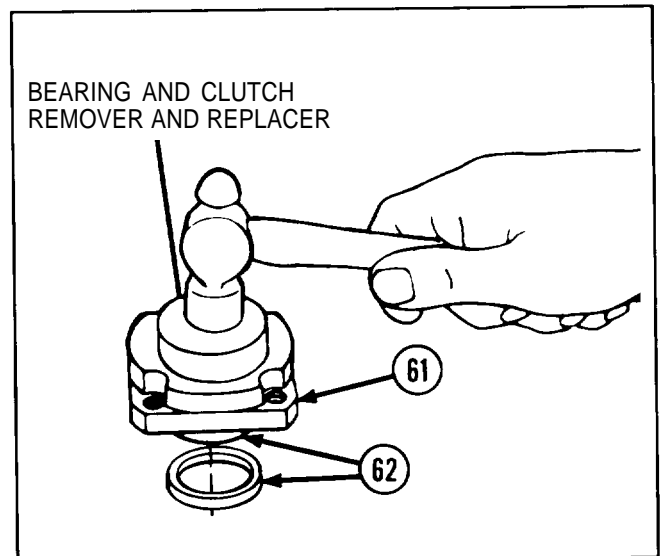
- 23 Bend out key washer (59) tangs.
- 24 Using spanner wrench, remove plain nut (60) and key washer (59) from internal gear (28).



- 25 Using two jacking screws, remove bearing carrier (61) from internal gear (28).



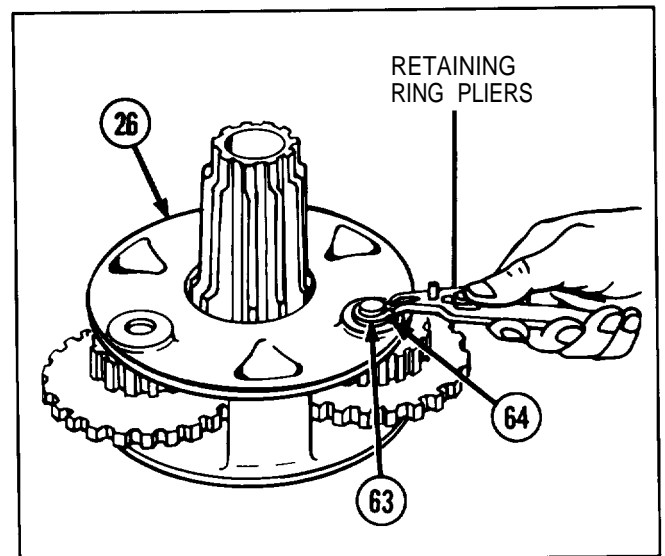
- 26 Using bearing and clutch remover and replacer, remove two internal gear ball bearings (62) from bearing carrier (61).



NOTE

Steps 27 thru 31 are written for disassembly of primary planetary speed gear assembly.

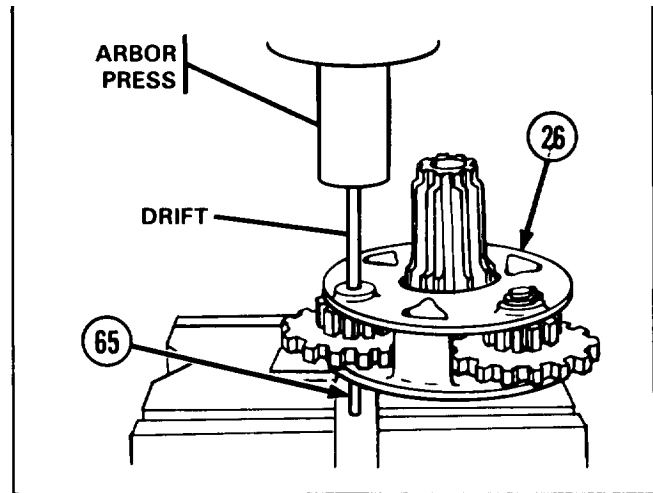
- 27 Using retaining ring pliers, remove six retaining rings (63) and six washer bearings (64) from primary planetary speed gear assembly (26).



2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

DISASSEMBLY (CONT)

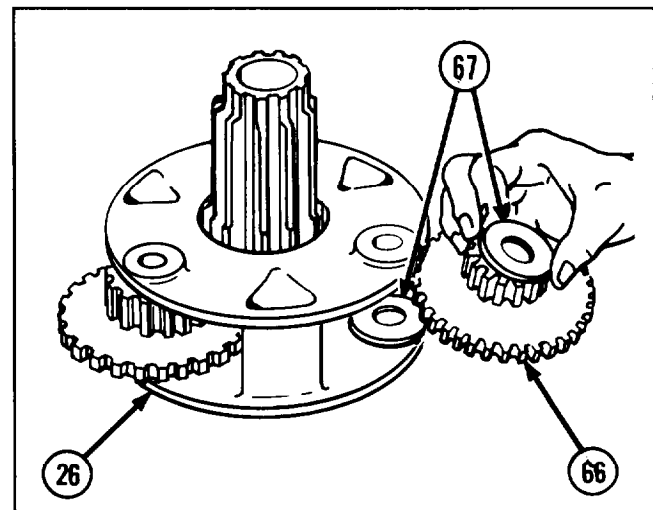
- 28 Using arbor press and drift, remove three grooved pins (65) from primary planetary speed gear assembly (26).



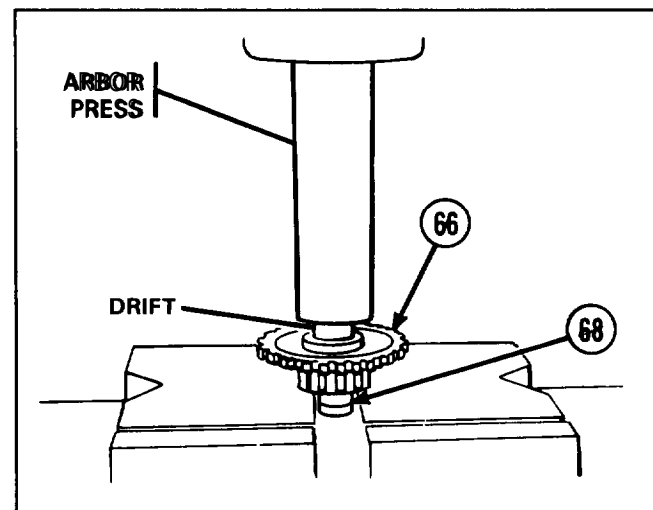
CAUTION

Before removing gear clusters, mark position of gear clusters to primary planetary speed gear assembly. The gear clusters must be reinstalled in the same location.

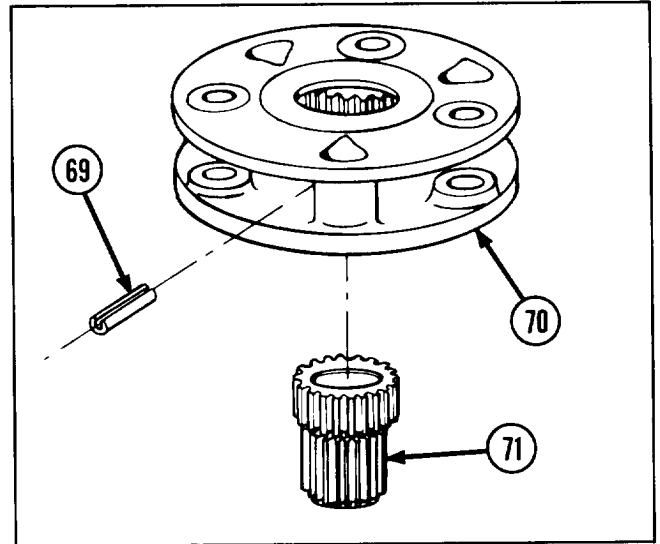
- 29 Remove three gear clusters (66) and six thrust washer bearings (67) from primary planetary speed gear assembly (26).



- 30 Using arbor press and drift, remove two roller bearings (68) from each of three gear clusters (66).



- 31 Using drift, remove spring pin (69) from internal gear (70) and release shouldered shaft (71).

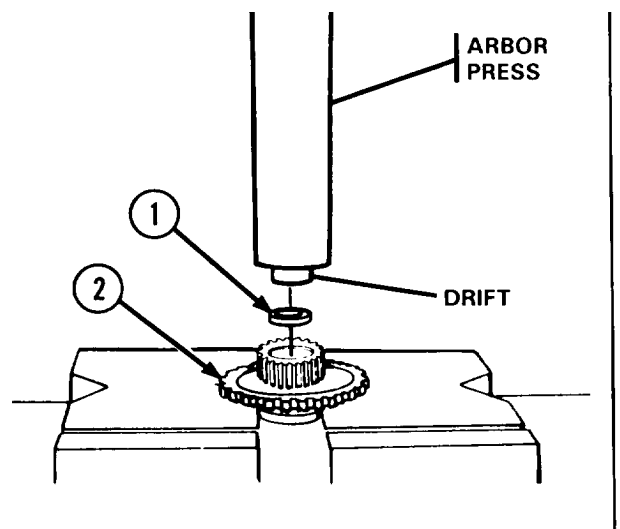


INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 Inspect ball bearings as prescribed in TM 9-214.
- 3 Traversing hydraulic motor is a repairable assembly. Refer to page 2-247.
- 4 If internal gear is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 5 If any kit component is damaged, replace entire traversing system power unit kit.
- 6 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

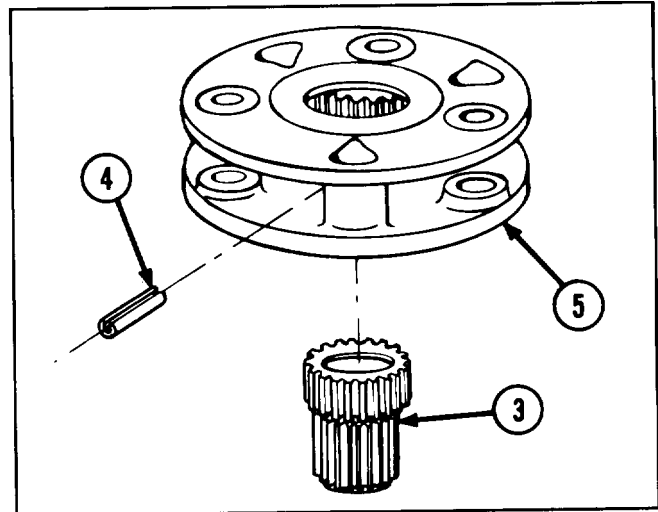
- 1 Using drift and arbor press, install two roller bearings (1) in each of three gear clusters (2).



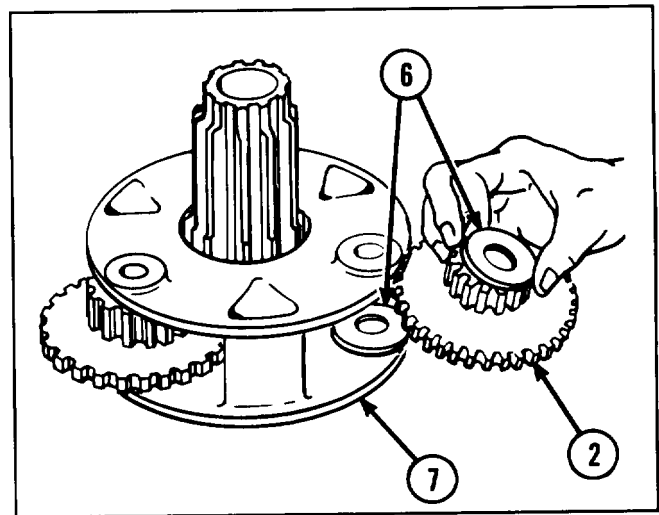
2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

REASSEMBLY (CONT)

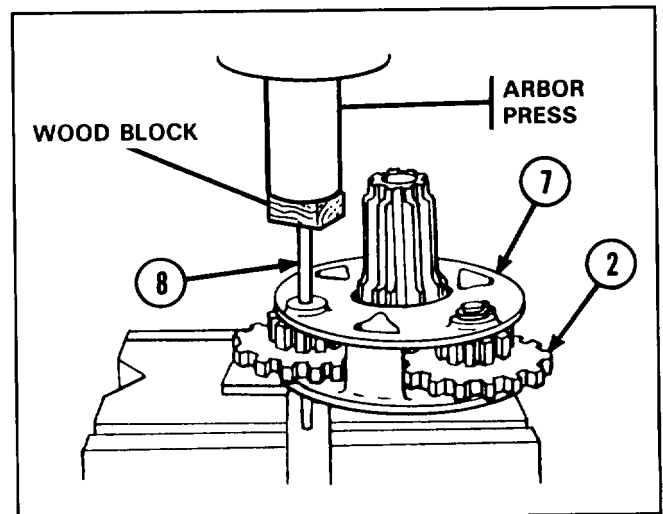
2 Install shouldered shaft (3) and spring pin (4) in internal gear (5).



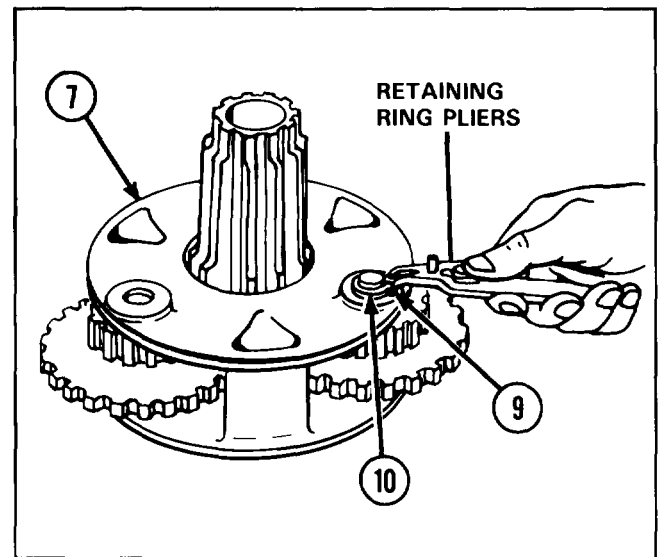
3 Install three gear clusters (2) and six thrust washer bearings (6) in primary planetary speed gear assembly (7).



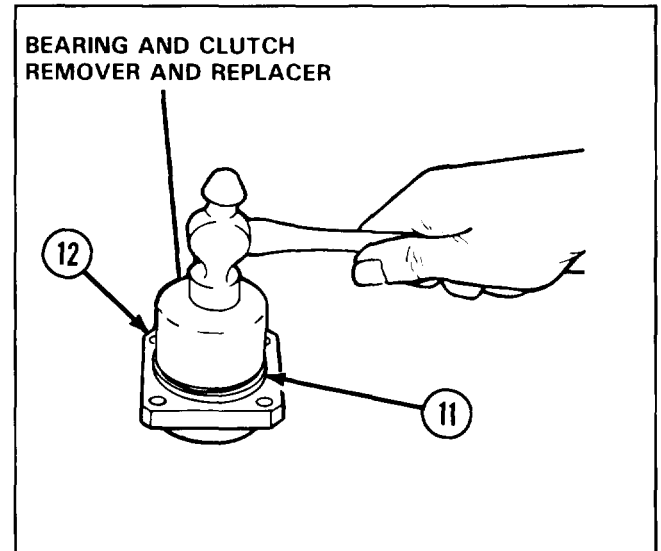
4 Using wood block and arbor press, install three grooved pins (8) to secure three gear clusters (2) in primary planetary speed gear assembly (7).



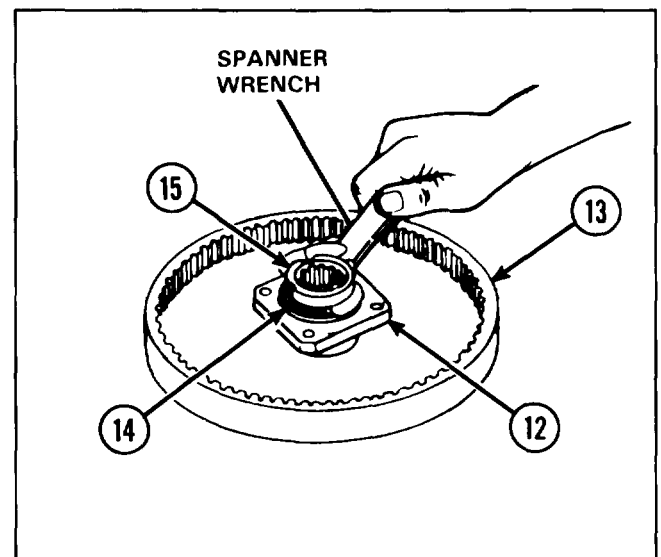
- 5 Install six washer bearings (9) and using retaining ring pliers, install six new retaining rings (10) to primary planetary speed gear assembly (7).



- 6 Using bearing and clutch remover and replacer, install two internal gear ball bearings (11) in bearing carrier (12).
- 7 Apply engine oil (item 15, appx B) to all gear teeth.



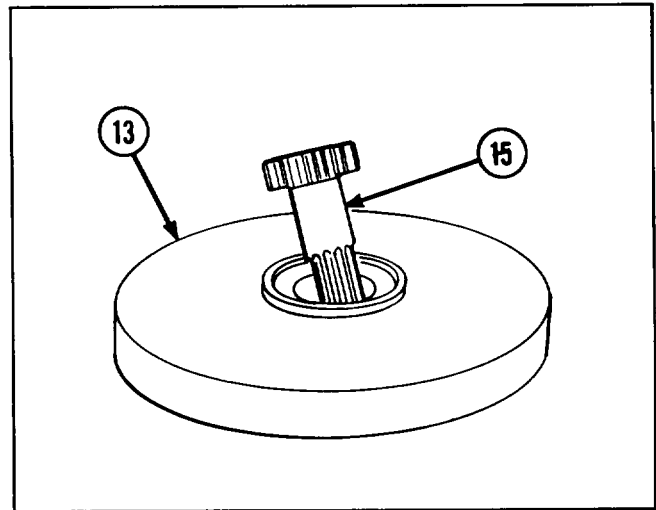
- 8 Install bearing carrier (12) in internal gear (13).
- 9 Using spanner wrench, install new key washer (14) and plain nut (15). Tighten until bearing carrier (12) is seated, Bend up tangs of key washer (14).



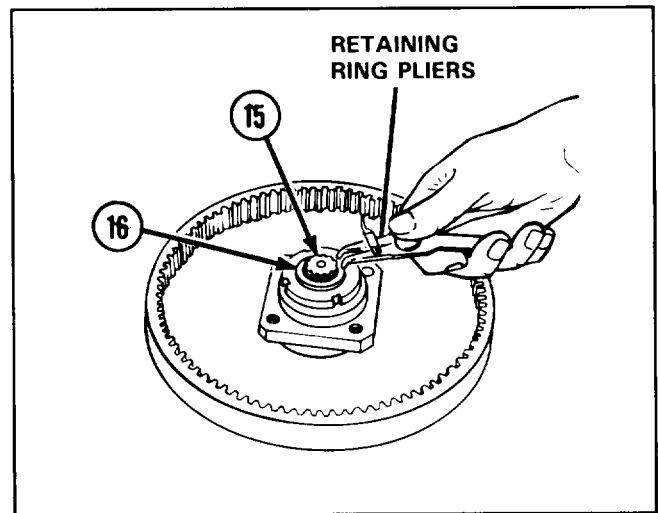
2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

REASSEMBLY (CONT)

- 10 Install splined end of planet traversing spur gear (15) in internal gear (13).

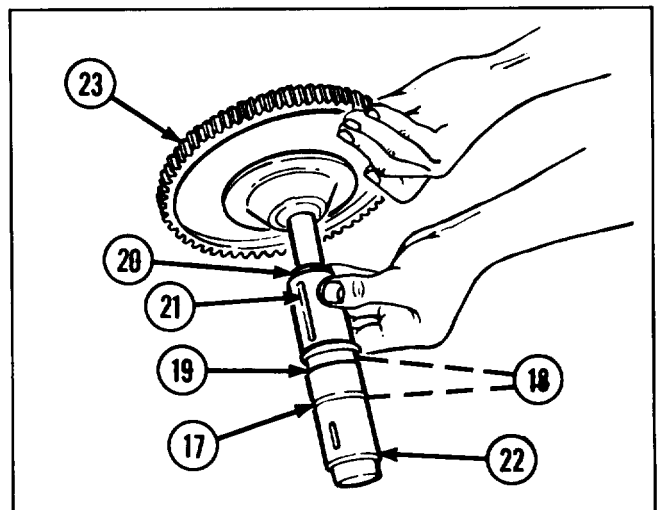


- 11 Using retaining ring pliers, install new retaining ring (16) on planet traversing spur gear (15) to secure.

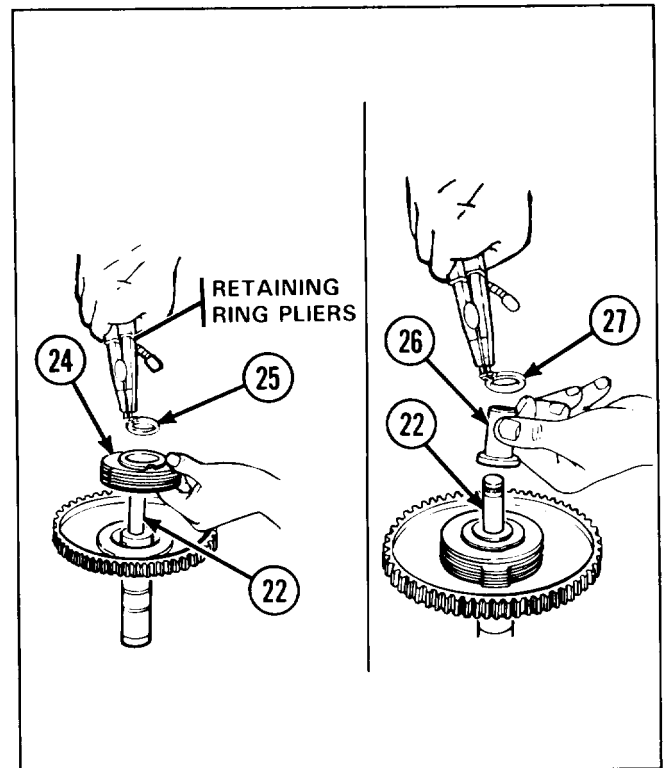


- 12 Install new packing retainer (17), two new preformed packings (18), new packing retainer (19), preformed packing (20), and machine key (21) on shouldered brake shaft (22).

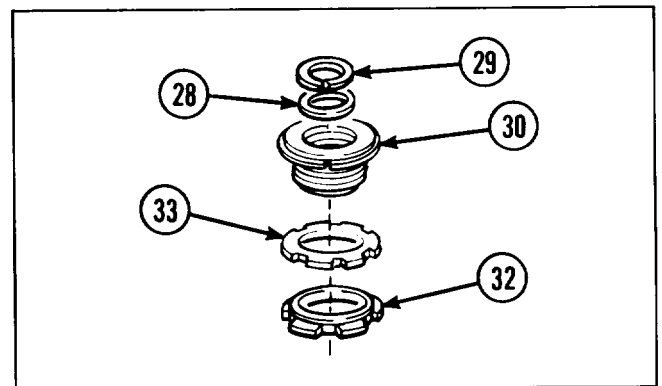
- 13 Install shouldered brake shaft (22) in brake shaft spur gear (23).



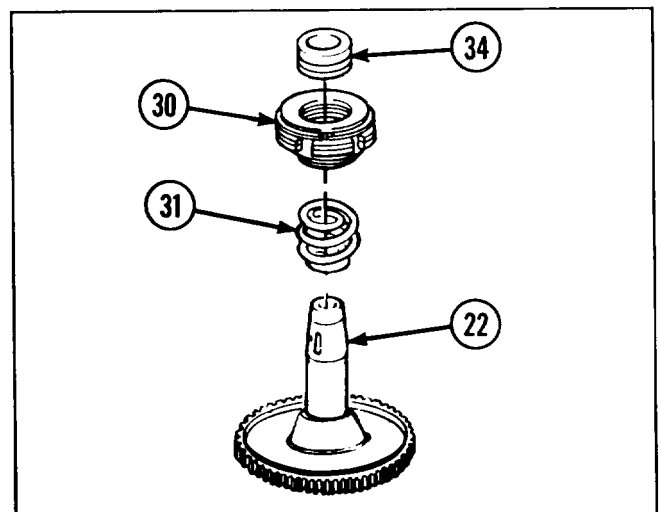
- 14 Install clutch assembly (24) on shouldered brake shaft (22) and using retaining ring pliers, secure with new retaining ring (25).
- 15 Install sleeve bearing (26) on shouldered brake shaft (22) and using retaining ring pliers, secure with new retaining ring (27).



- 16 Install new preformed packing (28) and new packing retainer (29) in machine brake bushing (30).



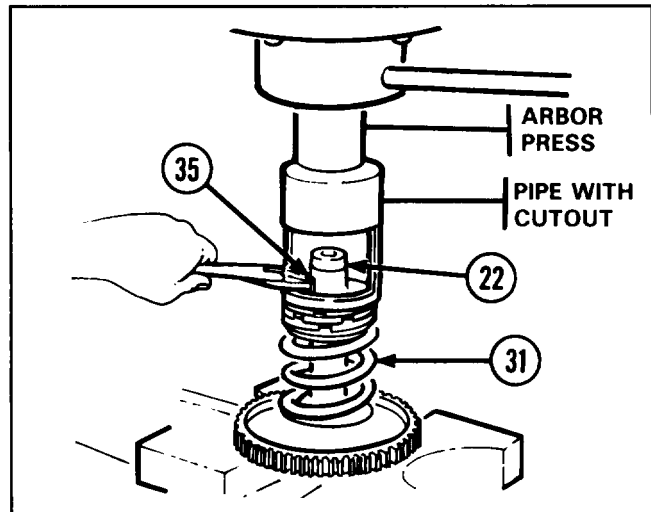
- 17 Install slip clutch spring (31), adjusting nut (32), jam nut (33), piston break bushing (34), and machine break bushing (30) with attached parts on shouldered brake shaft (22).



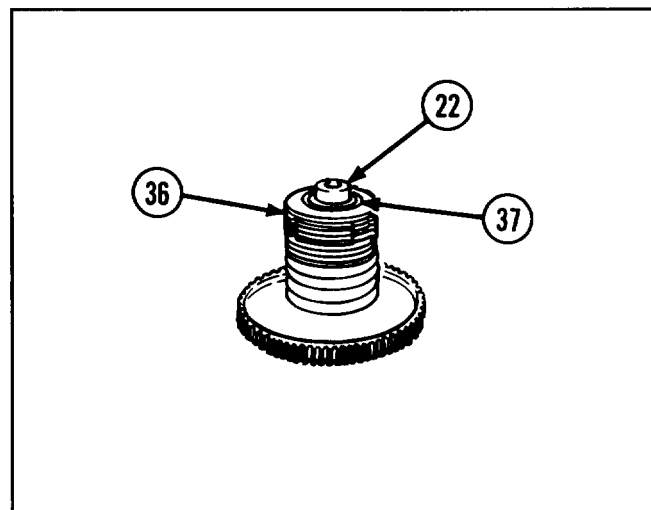
2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

REASSEMBLY(CONT)

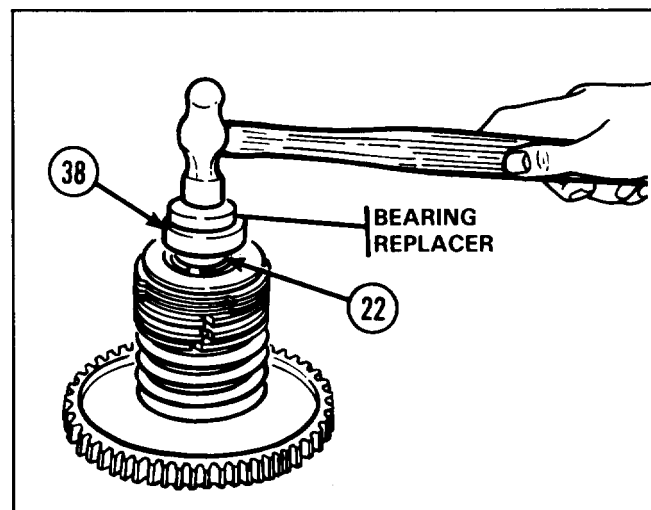
18 Using fabricated pipe with cutout item 2, appx C) and arbor press, compress slip clutch spring (31) and install machine key (35) in shouldered brake shaft (22). Slowly release tension on slip clutch spring (31).



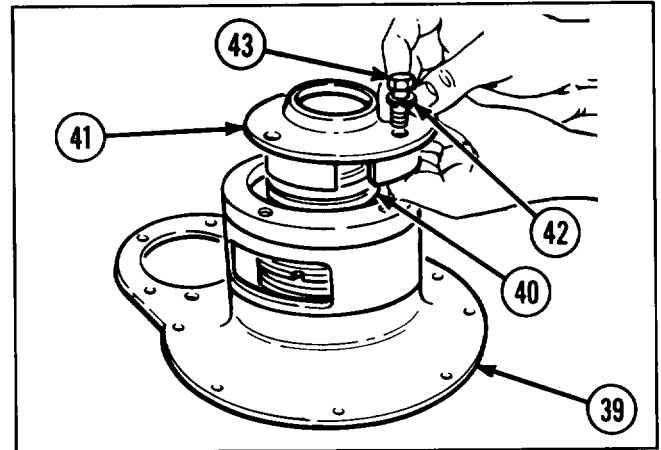
19 Install brake traversing slip clutch (36) on shouldered brake shaft (22) and secure with new retaining ring (37).



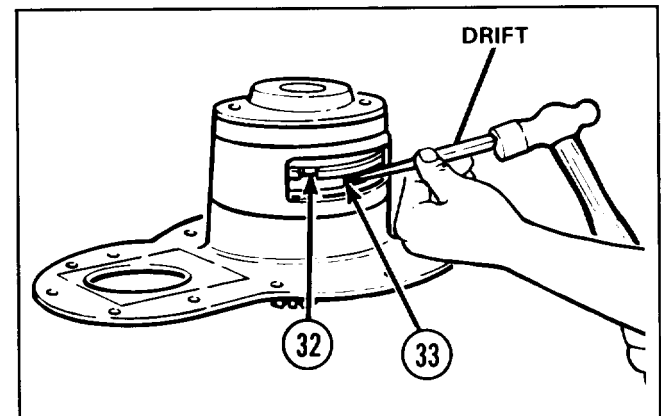
20 Using bearing replacer, install ball bearing (38) on shouldered brake shaft (22).



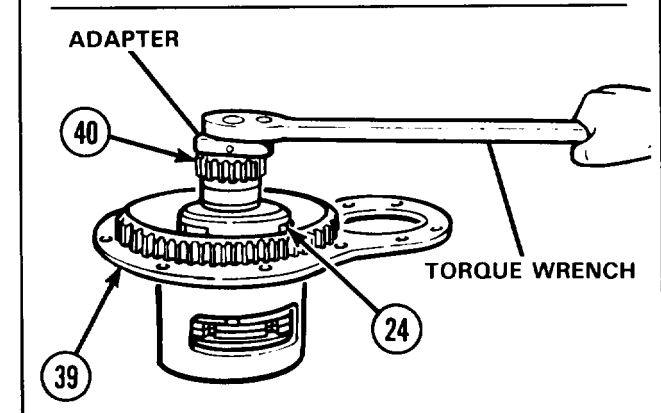
- 21 Install brake clutch traversing housing (39) over brake shaft spur gear (40). Aline tabs in housing (39) with slots in brake traversing slip clutch on brake shaft spur gear (40).
- 22 Install retaining plate (41) on brake clutch traversing housing (39) and secure with four new lockwashers (42) and four hexagon head capscrews (43). Torque screws to 28 to 30 ft-lb (38 to 41 N-m).



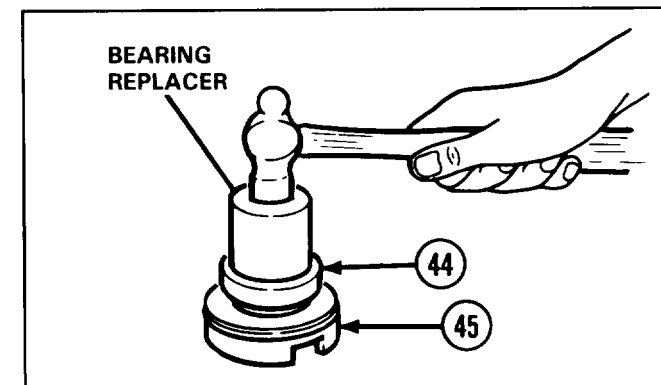
- 23 Secure brake shaft spur gear (40) to prevent rotation. Using hammer and drift, adjust adjusting nut (32) and jam nut (33) to produce a maximum holding torque of 1060 in.-lb (120 N-m). When holding torque is obtained, a torque of 525 in.-lb (59 N-m) is applied at the same time to clutch assembly (24).



- 24 Using adapter and torque wrench, measure torque between brake clutch traversing housing (39) and brake shaft spur gear (40).



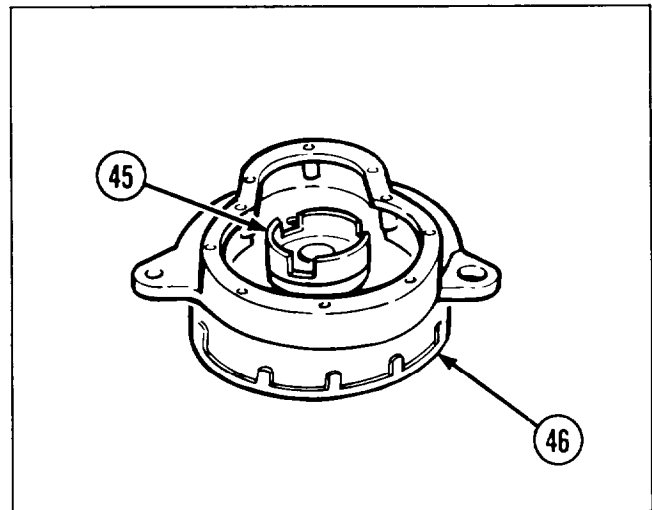
- 25 Using bearing replacer, install clutch housing ball bearing (44) on traversing gear-slip clutch (45).



2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

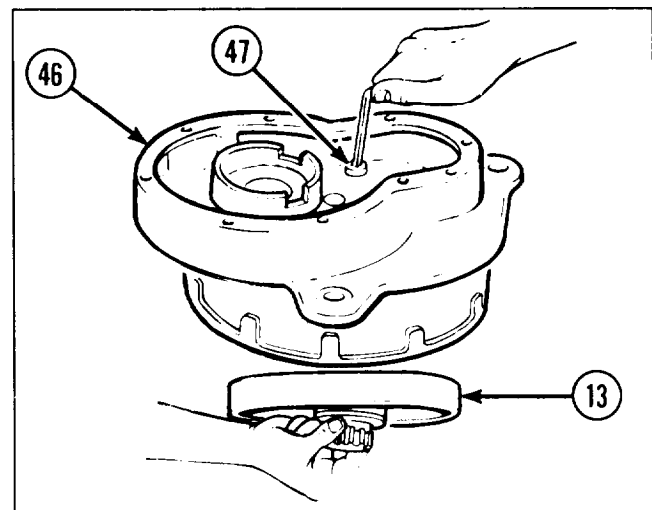
REASSEMBLY(CONT)

26 Install traversing gear-slip clutch (45) in mechanical gear housing (46).

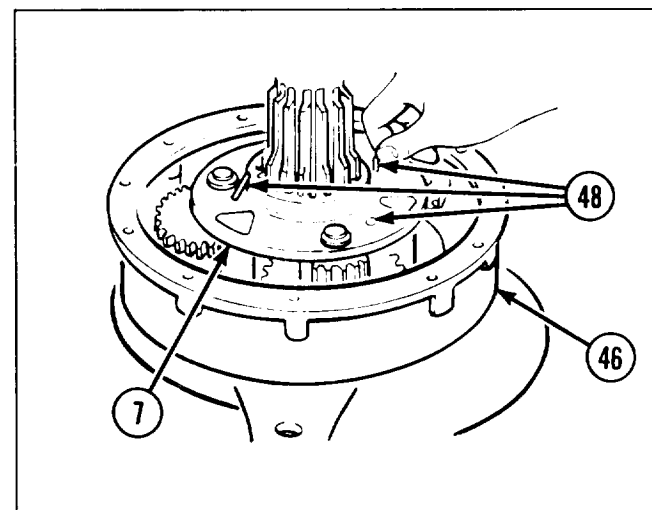


27 Apply sealing compound (item 20, appx B) to threads of four socket head cap-screws (47).

28 Install Internal gear (13) in mechanical gear housing (46) and secure with four socket head capscrews (47) Torque screws to 23 to 25 ft-lb (31 to 34 N-m)



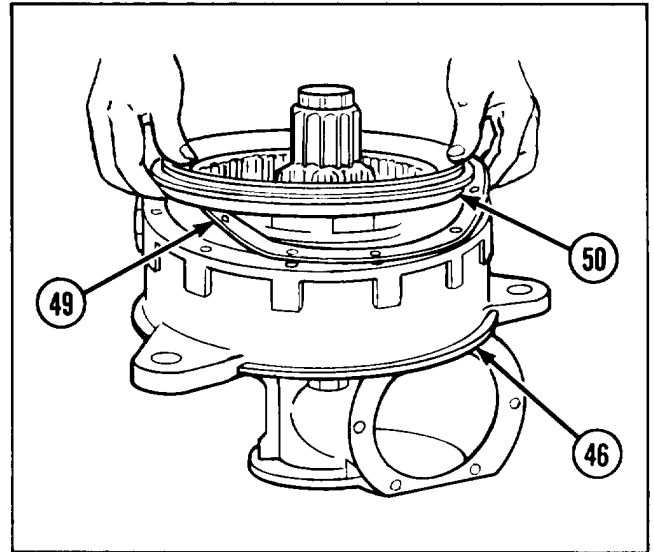
29 Install primary planetary speed gear assembly (7) in mechanical gear housing (46). Aline gears using 3/16-in. rods (48) placed through index holes in primary planetary speed gear assembly.



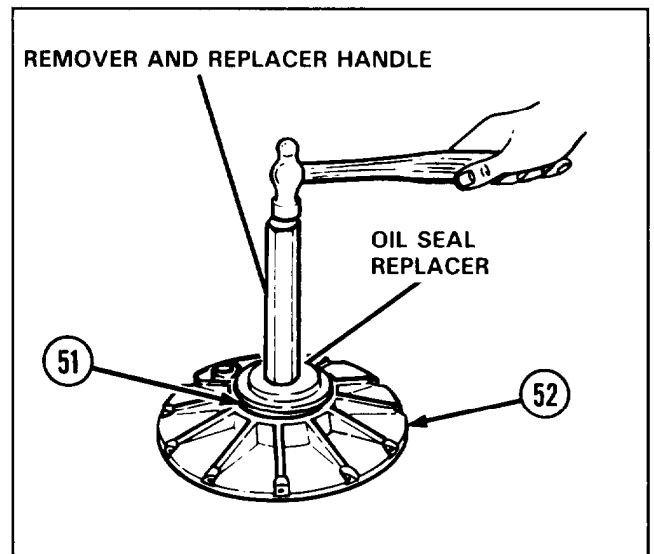
CAUTION

Align scribe mark on internal gear with scribe mark on mechanical gear housing. Remove alignment rods.

- 30 Install new ring gear gasket (49) and internal gear (50) in mechanical gear housing (46). Align mounting holes in gasket, gear, and housing.



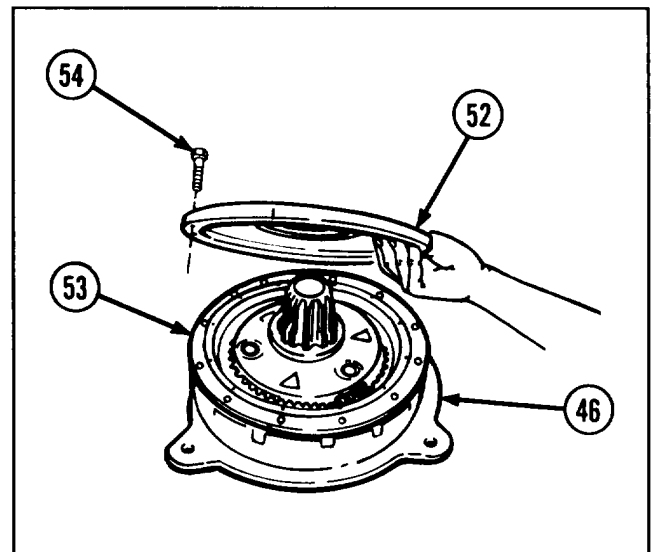
- 31 Using oil seal replacer and remover and replacer handle, install new plain encased seal (51) in oil seal retainer (52).



- 32 Install new ring gear gasket (53) and oil seal retainer (52). Align scribe line on oil seal retainer and mechanical gear housing (46).

- 33 Apply sealing compound (item 20, appx B) to twelve socket head capscrews (54).

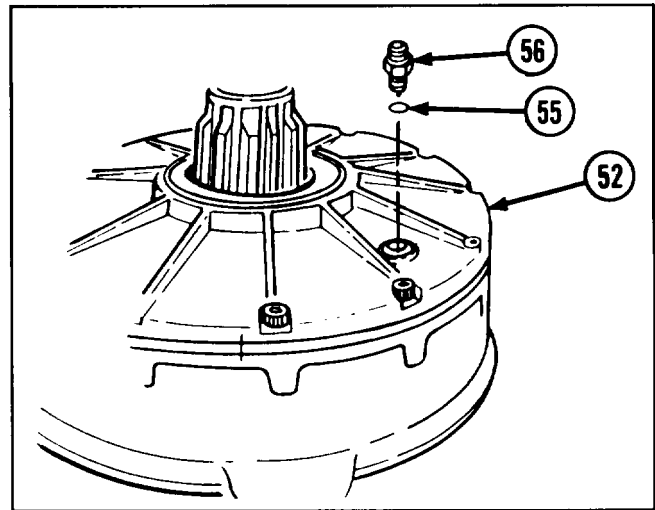
- 34 Install twelve socket head capscrews (54) to secure oil seal retainer (52) to mechanical gear housing (46). Torque screws to 23 to 25 ft-lb (31 to 34 N-m).



2-47. MAINTENANCE OF CAB TRAVERSING UNIT AND PRIMARY PLANETARY SPEED GEAR ASSEMBLY (CONT).

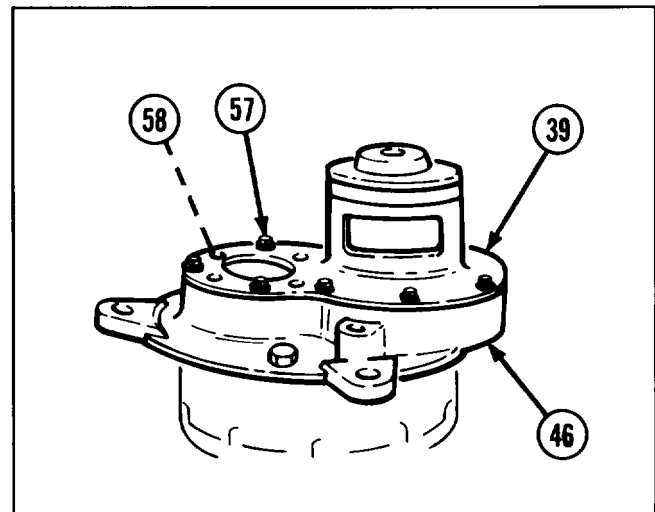
REASSEMBLY(CONT)

35 Install new preformed packing (55) and tube nipple (56) in oil seal retainer (52),

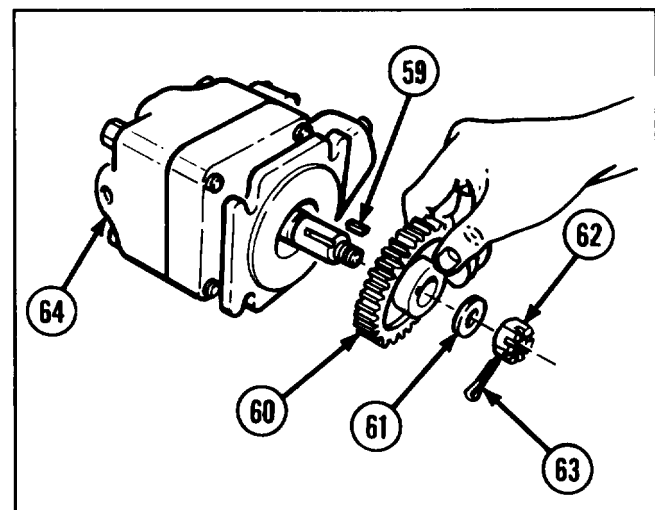


36 Apply sealing compound (item 20, appx B) to ten socket head capscrews (57).

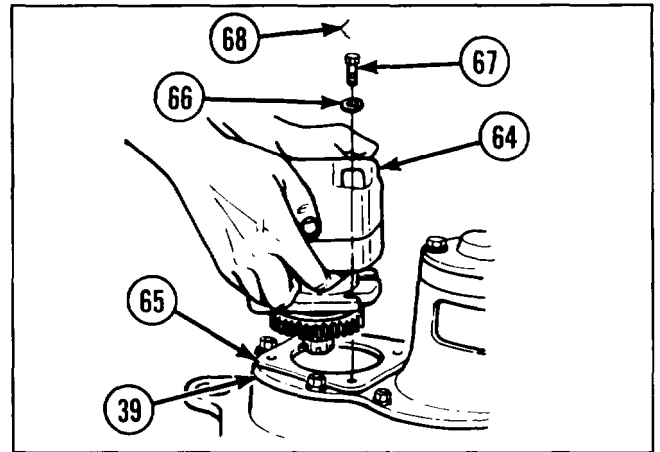
37 Install new upper gear housing gasket (58) and brake clutch traversing housing (39) to mechanical gear housing (46). Secure with ten socket head capscrews (57). Torque screws to 23 to 25 ft-lb (31 to 34 N-m).



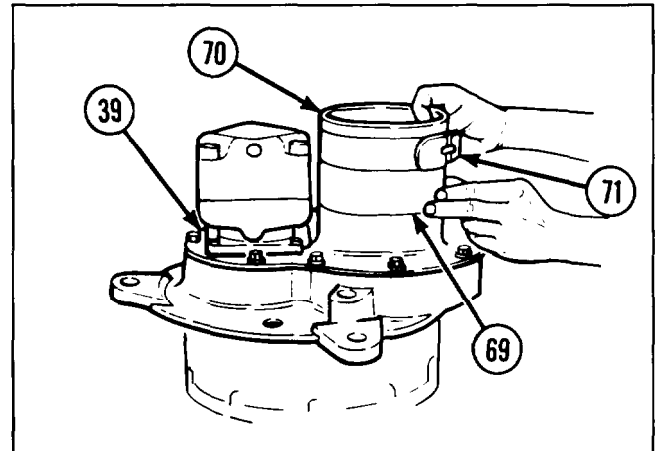
38 Install machine key (59), drive pinion spur gear (60), flat washer (61), slotted hexagon nut (62), and new cotter pin (63) to traversing hydraulic motor (64).



39 Install new motor gasket (65) and traversing hydraulic motor (64) to brake clutch traversing housing (39). Secure with four flat washers (66) and four hexagon head capscrews (67). Secure hexagon head capscrews with new lockwire (68),



40 Install new brake housing gasket (69), brake housing gasket sleeve (70), and hose clamp (71) to brake clutch traversing housing (39). Tighten hose clamp to secure.



2-48. MAINTENANCE OF TRAVERSING HYDRAULIC MOTOR.

| | | |
|---|---|--|
| This task covers: a. <i>Disassembly</i> b. <i>Inspection/Repair</i> c. <i>Reassembly</i> | | |
| INITIAL SETUP | | |
| <p><i>Tools and Special Tools</i></p> <p>General mechanic's tool kit, automotive (SC 5180-90-CL-N26)</p> <p>Shop equipment, automotive maintenance and repair: field maintenance, basic, less power (SC 4910-95-A31)</p> <p>Key set, socket head, screw</p> <p>Pliers, retaining ring</p> <p>Wrench, torque, (0 to 175 ft-lb)</p> | <p><i>Materials/Parts</i></p> <p>Engine oil (item 15, appx B)</p> <p>Power unit traversing clutch parts kit (5705024)</p> | <p><i>References</i></p> <p>TM 9-2350238-24P-2</p> |
| | <p><i>Equipment Conditions</i></p> <p>2-227 Traversing hydraulic motor removed from cab traversing unit</p> | |

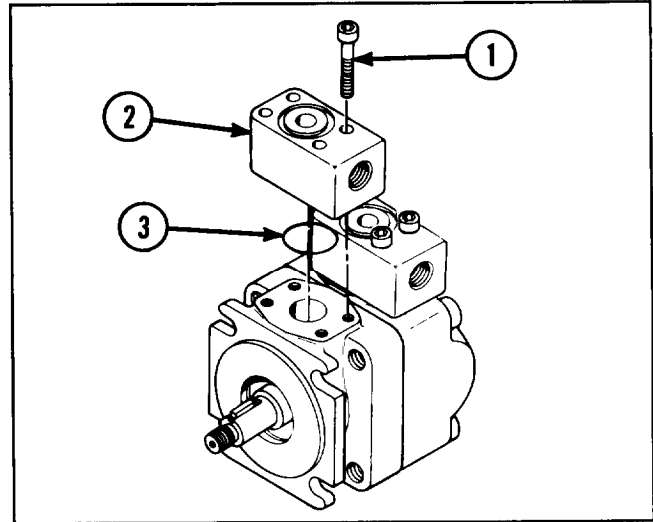
2-48. MAINTENANCE OF TRAVERSING HYDRAULIC MOTOR (CONT).

DISASSEMBLY

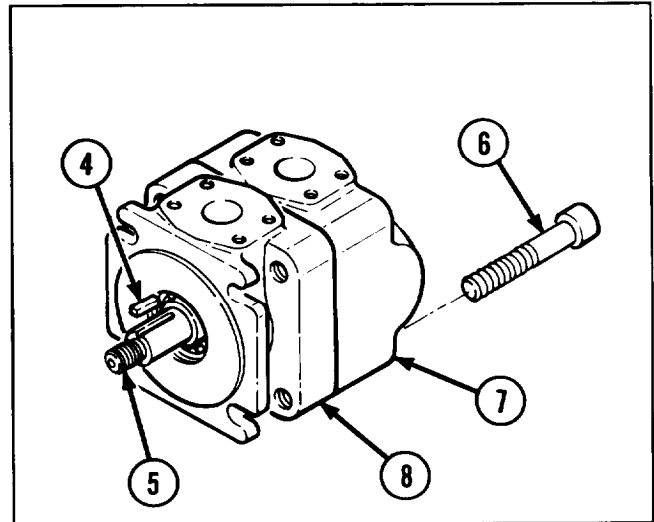
CAUTION

Disassembly and reassembly of traversing hydraulic motor should be performed in clean, dry, dust-free area to keep dirt out of components.

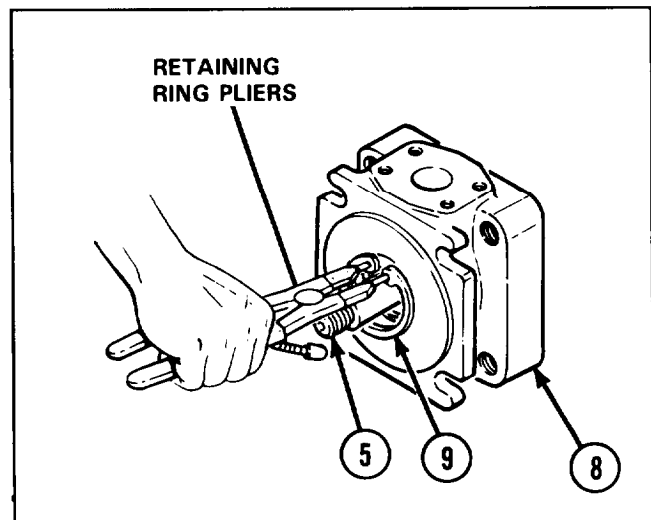
- 1 Remove eight capscrews (1), two motor control line multiple connectors (2), and two preformed packings (3).



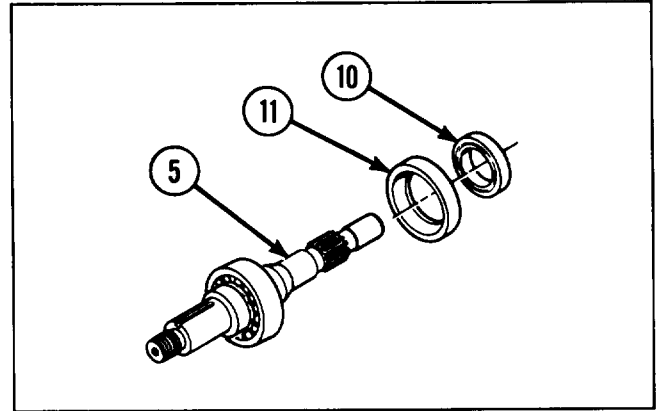
- 2 Remove key (4) from shaft (5).
- 3 Remove four screws (6) and remove rear housing (7) from front housing (8).



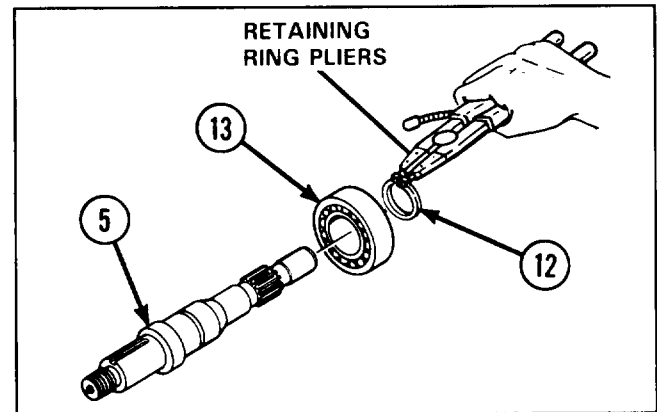
- 4 Using retaining ring pliers, remove retaining ring (9) and remove shaft (5) from front housing (8).



5 Remove seal (10) and spacer (11) from shaft (5).



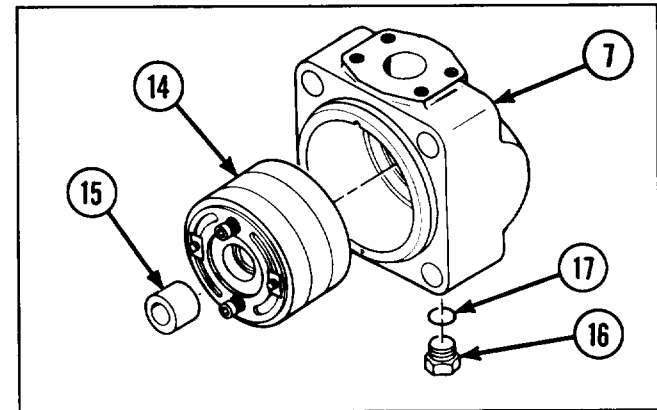
6 Using retaining ring pliers, remove retaining ring (12) and ball bearing (13) from shaft (5).



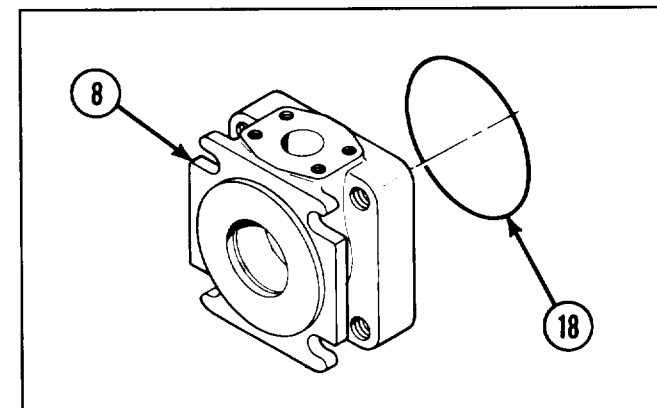
7 Remove rotor assembly (14) from rear housing (7).

8 Using hammer and drift, remove bushing (15) from rear housing (7).

9 Remove plug (16) and preformed packing (17) from rear housing (7).



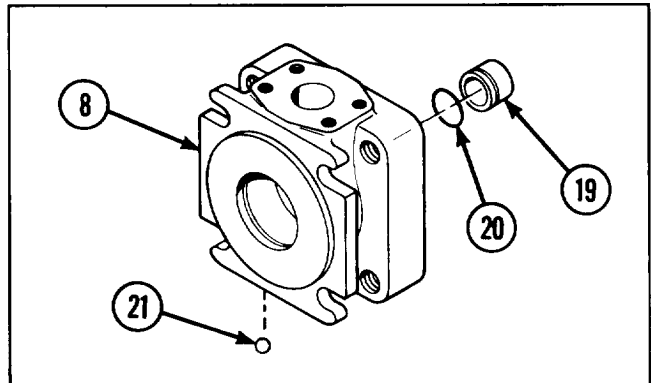
10 Remove preformed packing (18) from backside of front housing (8).



2-48. MAINTENANCE OF TRAVERSING HYDRAULIC MOTOR (CONT).

DISASSEMBLY(CONT)

- 11 Using hammer and drift, remove bushing (19) from backside of front housing (8).
- 12 Remove preformed packing (20) from bushing (19).
- 13 Only if damaged, remove ball (21) from underside of front housing (8).

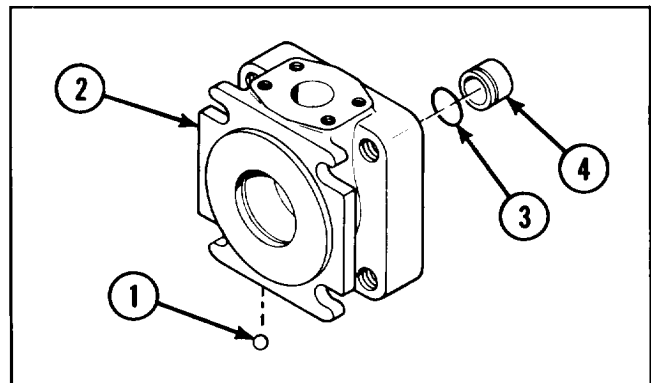


INSPECTION/REPAIR

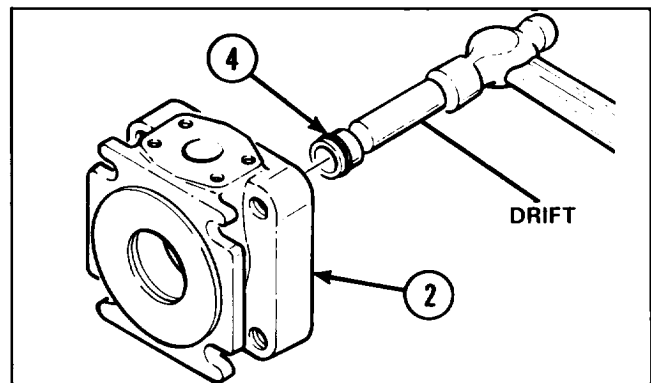
- 1 Inspect for broken, damaged, or missing parts.
- 2 If front housing is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 3 If shaft is broken, damaged, or missing, repair is by replacement of next higher assembly,
- 4 Repair by replacement of authorized parts (TM 9-2350-238-24P-2).

REASSEMBLY

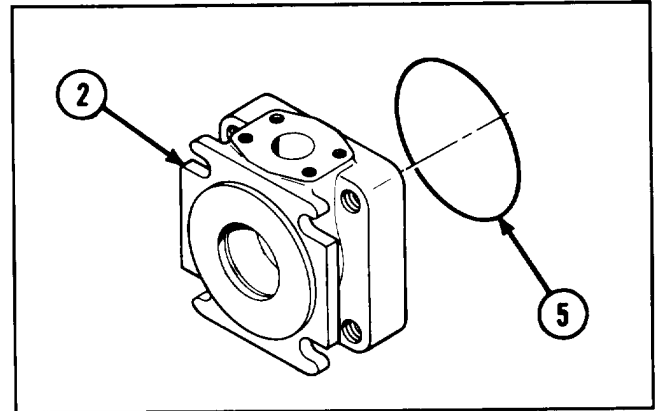
- 1 If removed, install ball (1) in underside of front housing (2).
- 2 Apply engine oil (item 15, appx B) on new preformed packing (3).
- 3 Install new preformed packing (3) in groove of new bushing (4).



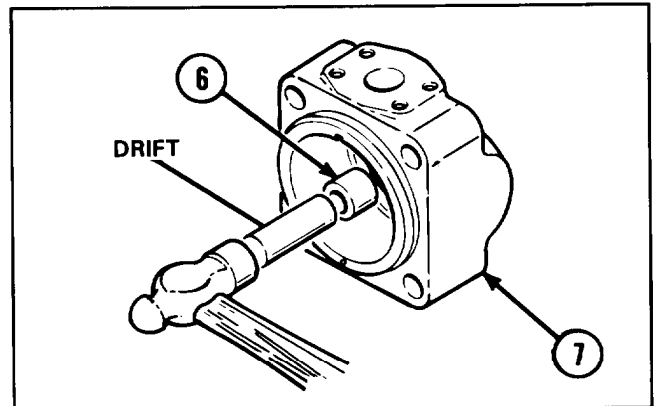
- 4 Using hammer and drift, install new bushing (4) into backside of front housing (2).



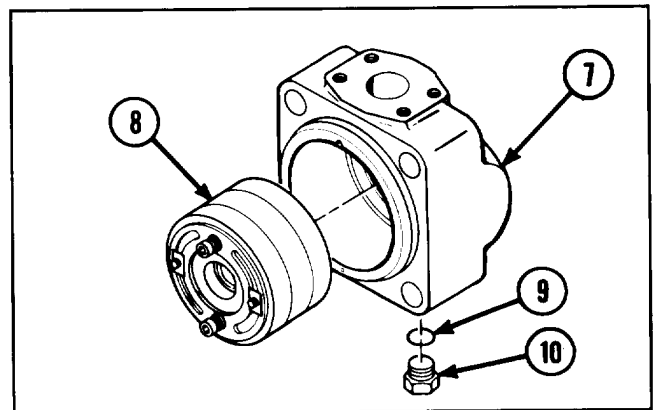
- 5 Apply engine oil (item 15, appx B) on new preformed packing (5).
- 6 Install new preformed packing (5) into backside of front housing (2).



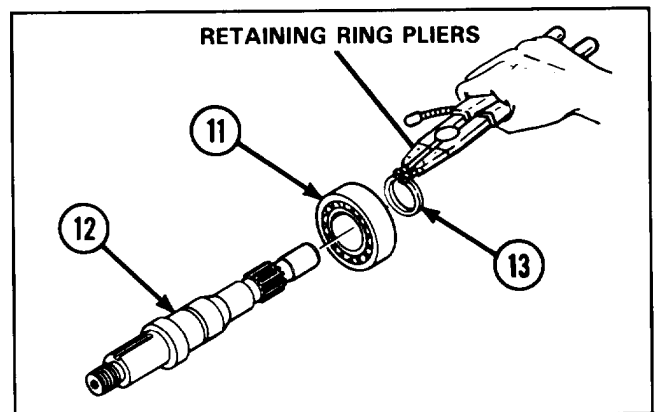
- 7 Using hammer and drift, install new bushing (6) into rear housing (7).



- 8 Install rotor assembly (8) into rear housing (7).
- 9 Install new preformed packing (9) and plug (10) in rear housing (7).



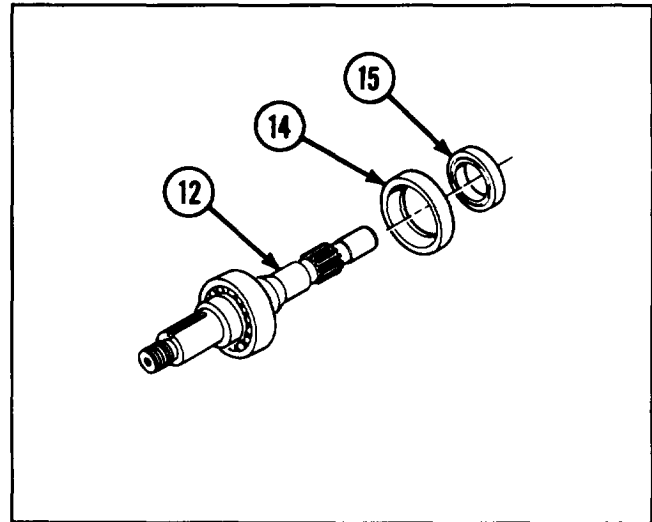
- 10 Install new ball bearing (11) on shaft (12) and using retaining ring pliers, secure with new retaining ring (13).



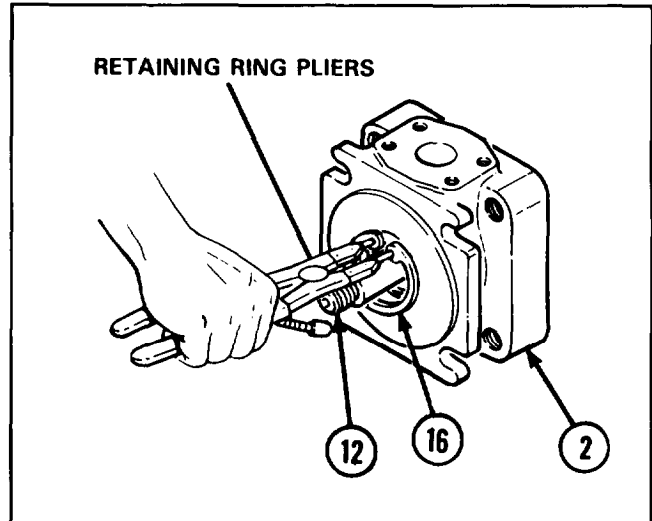
2-48. MAINTENANCE OF TRAVERSING HYDRAULIC MOTOR (CONT).

REASSEMBLY (CONT)

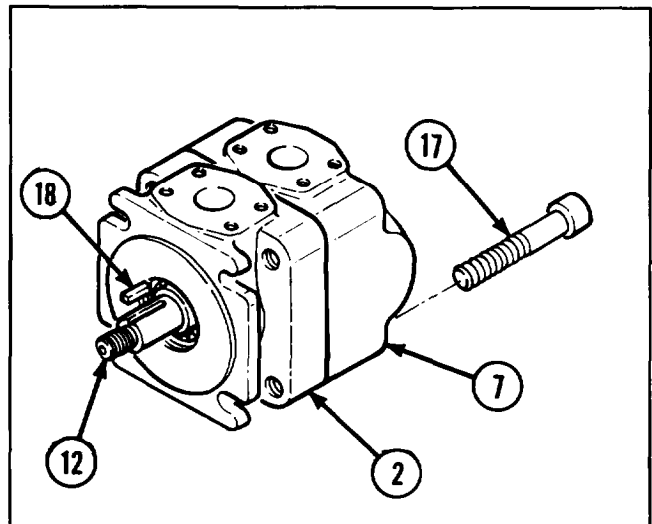
- 11 Install spacer (14) on shaft (12).
- 12 Using soft hammer, install seal (15) on shaft (12).



- 13 Install shaft (12) with attached parts into front housing (2). Using retaining ring pliers, secure with new retaining ring (16).



- 14 Install front housing (2) on rear housing (7). Secure with four screws (17). Torque screws to 65 to 70 ft-lb (88-95 N-m).
- 15 Install key (18) in shaft (12).

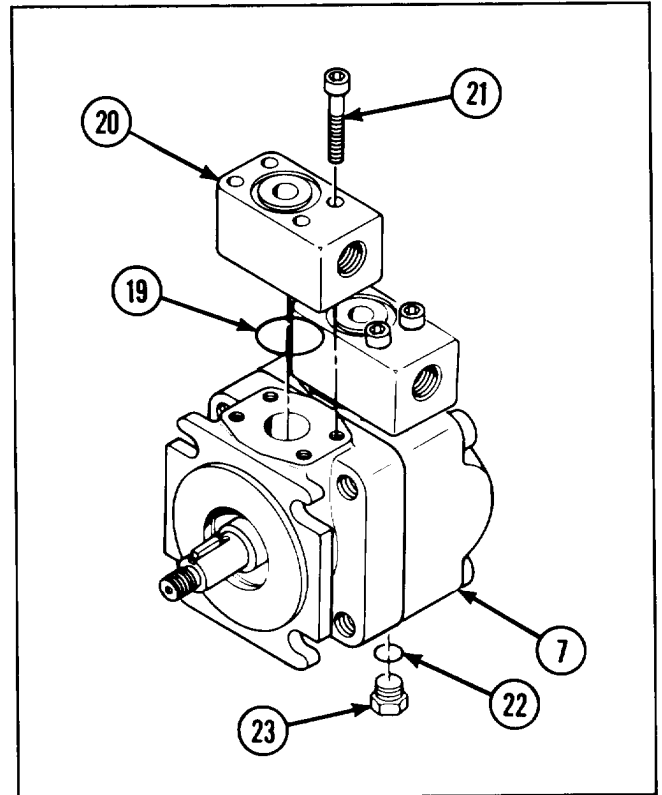


- 16 Apply engine oil (item 15, appx B) on two new preformed packings (19).
- 17 Install two new preformed packings (19) and two motor control line multiple connectors (20) on housings. Secure motor control line multiple connectors with eight screws (21).
- 18 Cover port openings on traversing hydraulic motor to keep dirt out.

NOTE

Perform step 19 only if motor is being prepared for storage or shipment. Motor is filled with oil and plug is installed to retain oil during storage or shipment.

- 19 If necessary, apply engine oil (item 15, appx B) on new preformed packing (22) and install new preformed packing and plug (23) to underside of rear housing (7).



2-49. MAINTENANCE OF TRAVERSING FINAL DRIVE.

This task covers: a. *Disassembly* b. *Inspection/Repair* c. *Reassembly*

INITIAL SETUP

Tools and Special Tools

- General mechanic's tool kit, automotive (SC 5180-90-CL-N26)
- Handle, remover and replacer (7950864)
- Remover and replacer, bearing (10902750)
- Replacer (10904173)
- Spanner wrench (GGG-W-665)

References

- TM 9-2350-238-20-2
- TM 9-2350-238-24P-2

Equipment Conditions

- Lubrication fittings removed (TM 9-2350-238-20-2)
- 2-222 Traversing final drive removed from cab well

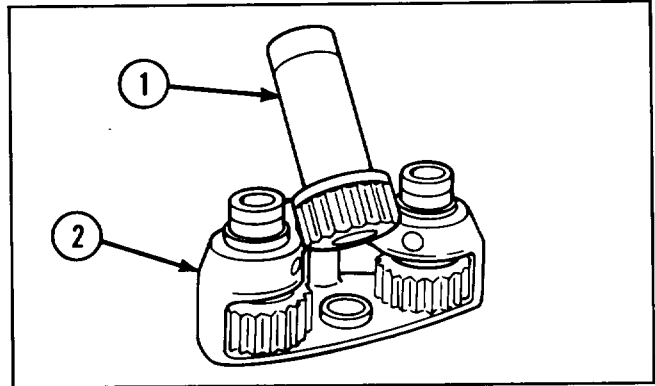
Materials/Parts

- Engine oil (item 15, appx B)
- Grease (item 9, appx B)
- Key washer (2) (MS19070-092)
- Plain encased seal (4) (MS51001-36-2)
- Preformed packing (MS28775-228)
- Retaining ring (4) (10900407)
- Spur gear plug insert (10892086)

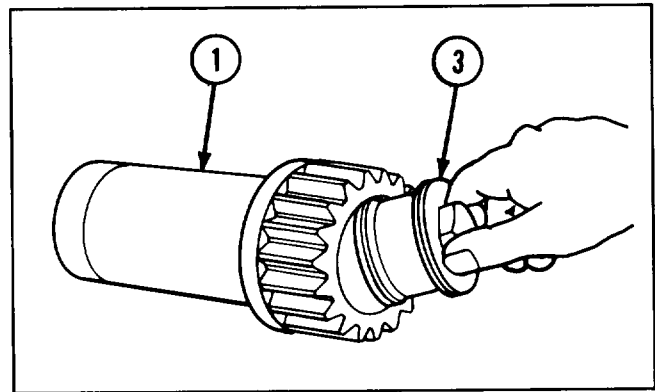
2-49. MAINTENANCE OF TRAVERSING FINAL DRIVE (CONT).

DISASSEMBLY

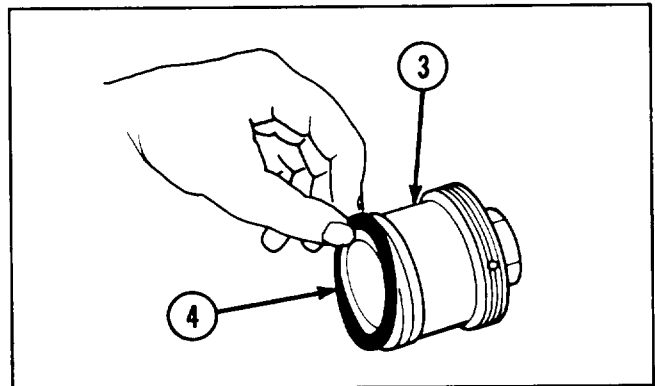
1 Remove traversing drive pinion spur gearshaft (1) from mechanical housing (2).



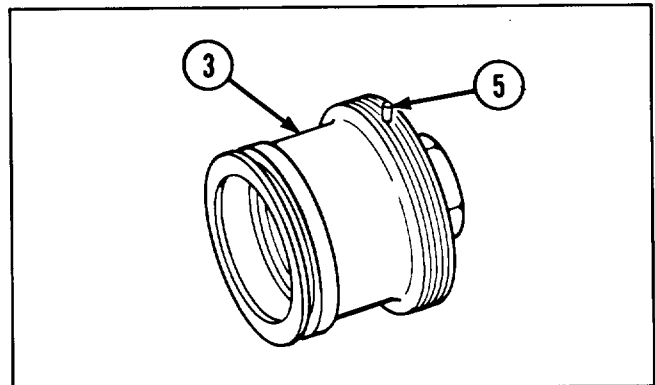
2 Unscrew and remove gear shaft thrust plug (3) from traversing drive pinion spur gearshaft (1).



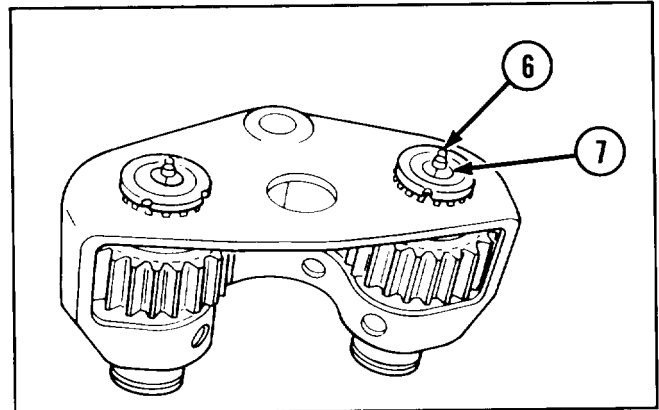
3 Remove preformed packing (4) from gear shaft thrust plug (3).



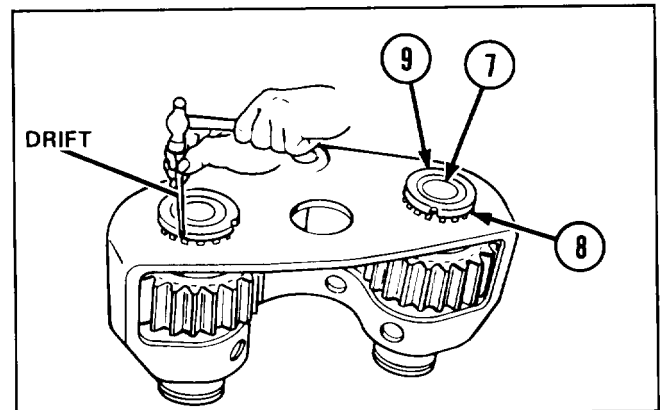
4 Remove spur gear plug insert (5) from gear shaft thrust plug (3).



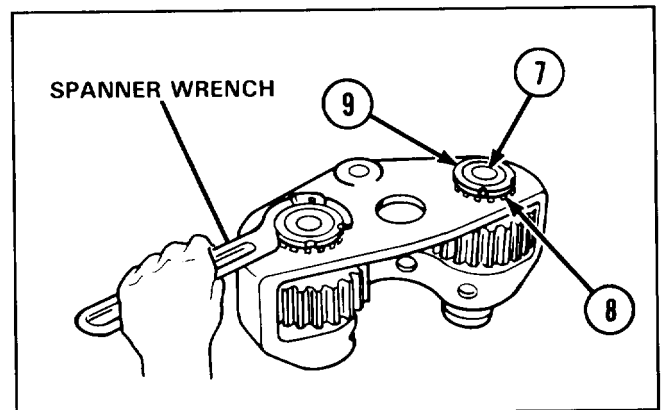
- 5 Remove lubrication fittings (6) from each of two idler gear shouldered shafts (7).



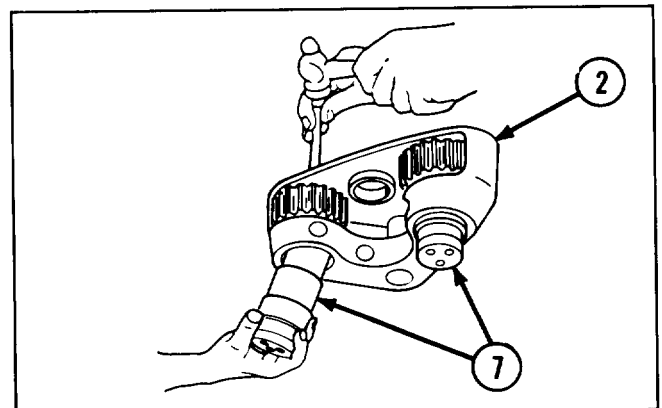
- 6 Using hammer and drift, bend tags of key washer (8) out of slots of plain round nut (9) on each of two idler gear shouldered shafts (7).



- 7 Using spanner wrench, remove plain round nut (9), and key washer (8) from each of two idler gear shouldered shafts (7).



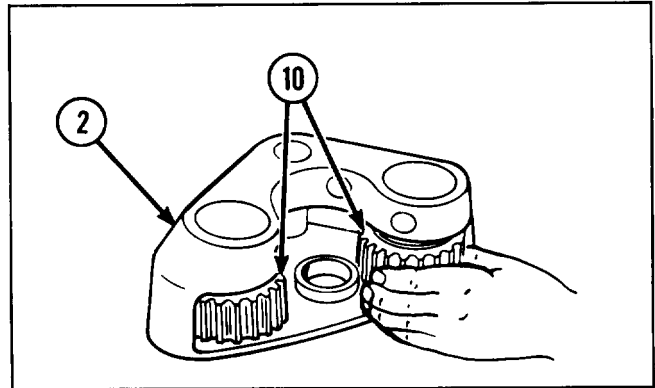
- 8 Using hammer and drift, remove two idler gear shouldered shafts (7) from mechanical housing (2).



2-49. MAINTENANCE OF TRAVERSING FINAL DRIVE (CONT).

DISASSEMBLY (CONT)

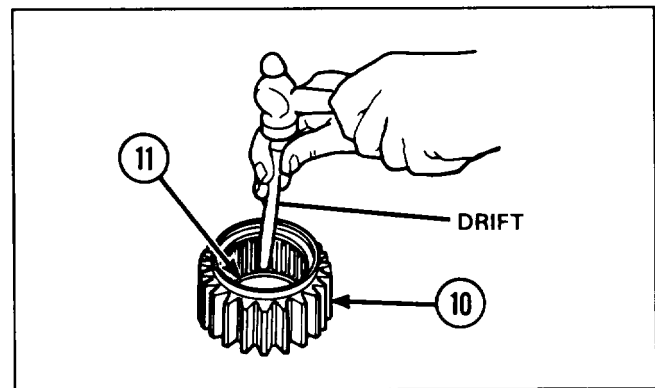
- 9 Remove two idler spur gears (10) from mechanical housing (2).



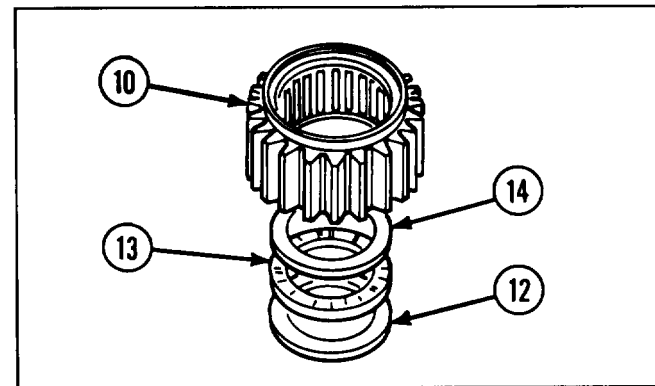
NOTE

Steps 10 thru 15 are written and illustrated for one idler spur gear, but apply to both.

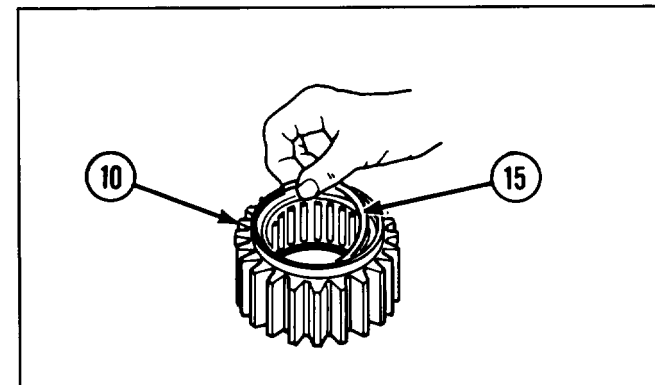
- 10 Using hammer and drift, remove plain encased seal (11) from idler spur gear (10).



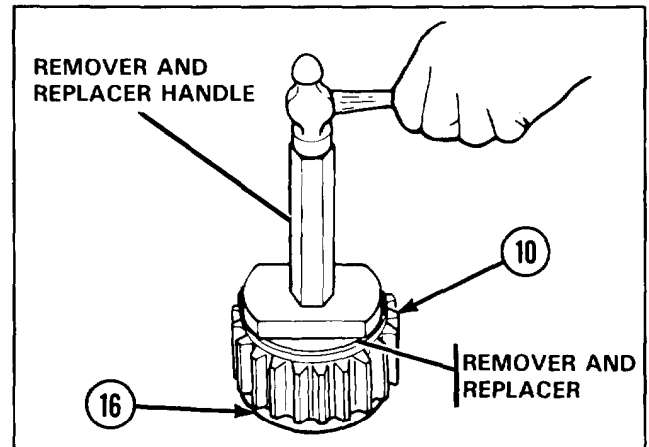
- 11 Remove lower idler gear outer bearing ring (12), retainer and roller bearing (13) and upper idler gear outer bearing ring (14) from idler spur gear (10).



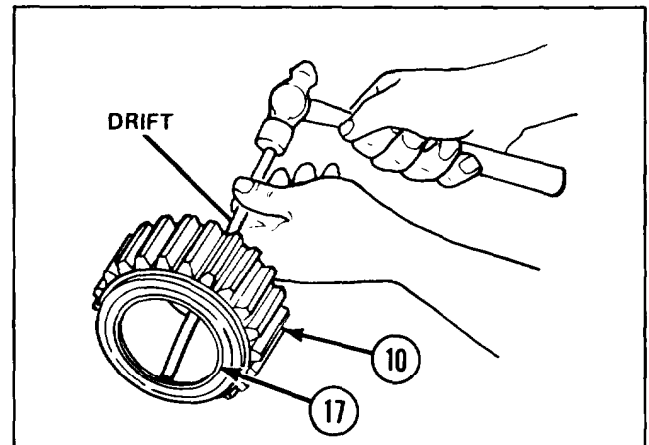
- 12 Remove retaining ring (15) from idler spur gear (10).



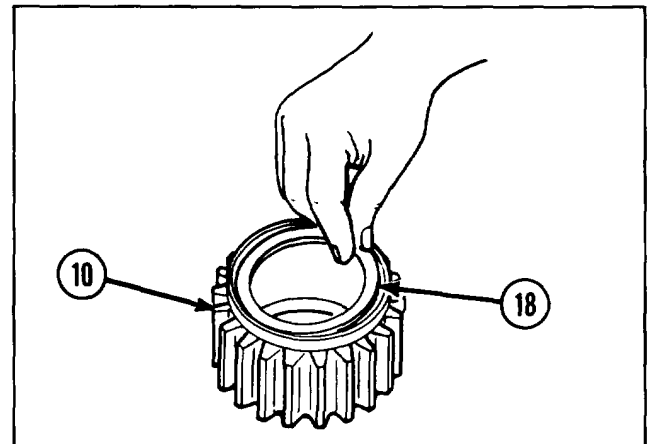
- 13 Using remover and replacer and remover and replacer handle, remove roller bearing (16) from idler spur gear (10).



- 14 Using hammer and drift, remove plain encased seal (17) from idler spur gear (10).



- 15 Remove retaining spur gear (10).



INSPECTION/REPAIR

- 1 Inspect for broken, damaged, or missing parts.
- 2 Inspect traversing drive pinion spur gear-shaft and idler spur gears for cracks, worn teeth, and damage.
- 3 If mechanical housing is broken, damaged, or missing repair is by replacement of next higher assembly.
- 4 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

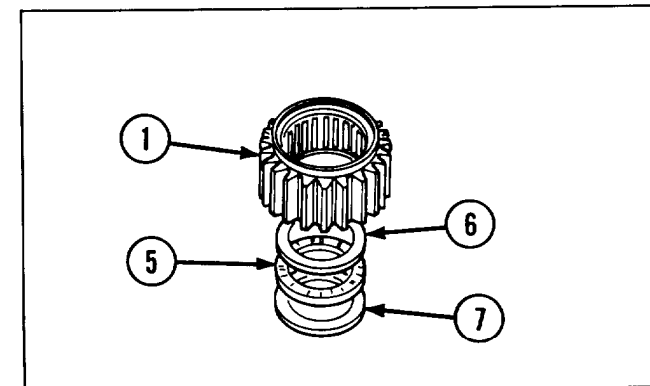
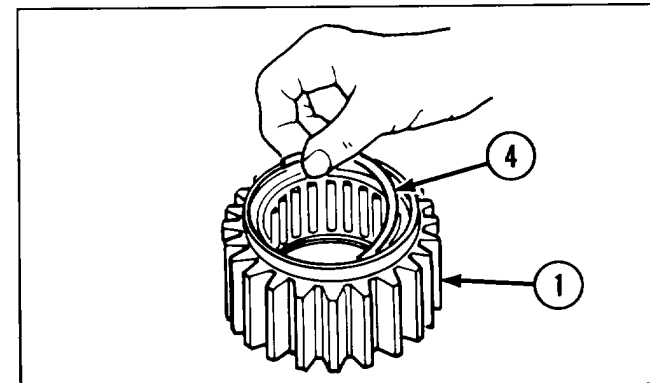
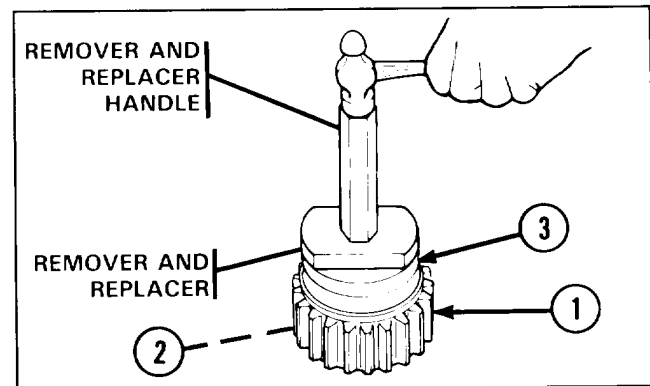
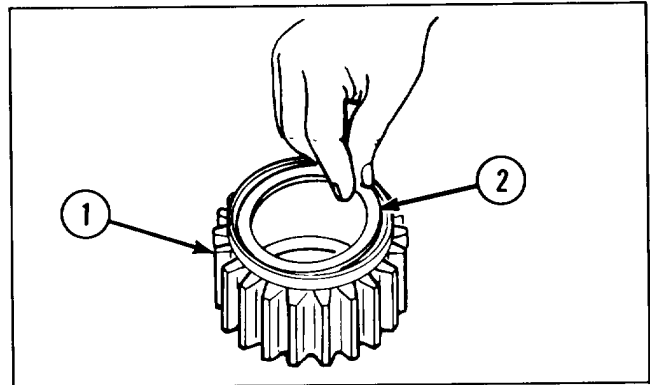
2-49. MAINTENANCE OF TRAVERSING FINAL DRIVE (CONT).

REASSEMBLY

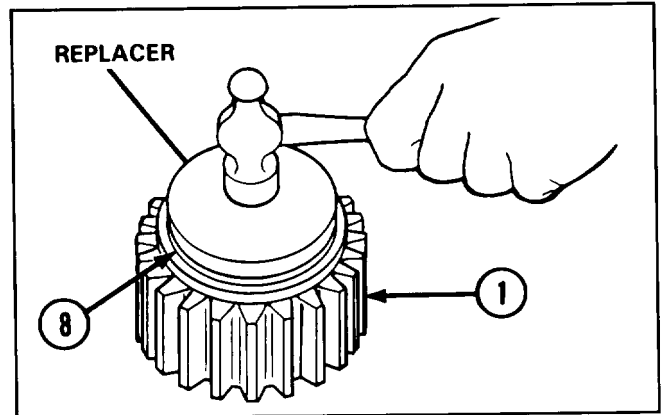
NOTE

Steps 1 thru 8 are written and illustrated for one idler spur gear, but apply to both.

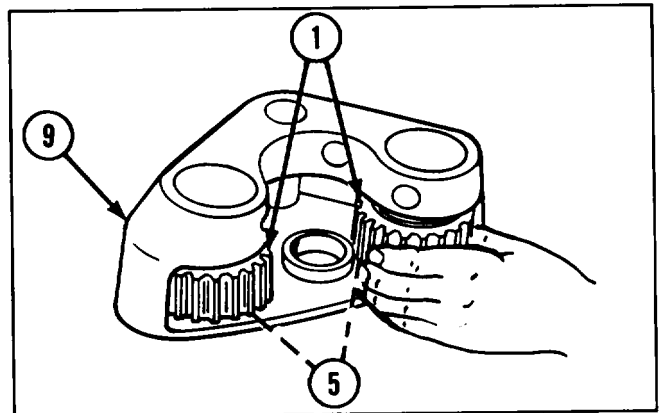
- 1 Coat idler spur gear (1) teeth with grease (item 9, appx B).
- 2 Install new retaining ring (2) in outermost groove of idler spur-gear.
- 3 Pack two roller bearings (3) with grease (item 9, appx B).
- 4 Using remover and replacer and remover and replacer handle, install roller bearing (3) in idler spur gear (1). Seat roller bearing (3) against retaining ring (2).
- 5 Install new inner retaining ring (4) in idler spur gear (1).
- 6 Pack retainer and roller bearing (5) with grease (item 9, appx B).
- 7 Install upper idler gear outer bearing (6), retainer and roller bearing (5), and lower idler gear outer bearing ring (7) in idler spur gear (1).



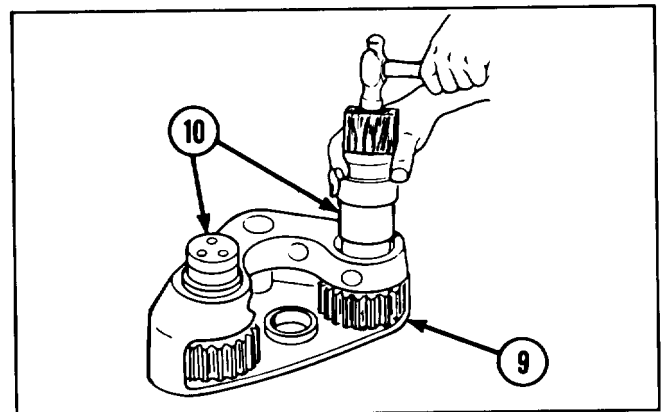
- 8 Using replacer, install two new plain enclosed seals (8) in idler spur gear (1).



- 9 Install two idler spur gears (1) in mechanical housing (9). Retainer and roller bearings (5) must face lower side of mechanical housing (9).



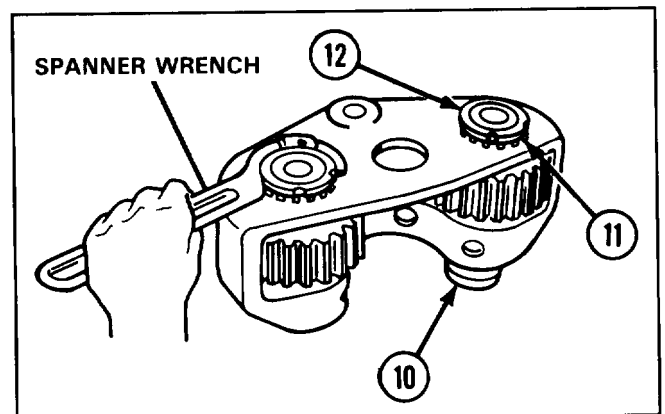
- 10 Using wood block and hammer, install two idler gear shouldered shafts (10) in mechanical housing (9) with shouldered end up.



NOTE

If key washer is damaged, new key washer must be installed.

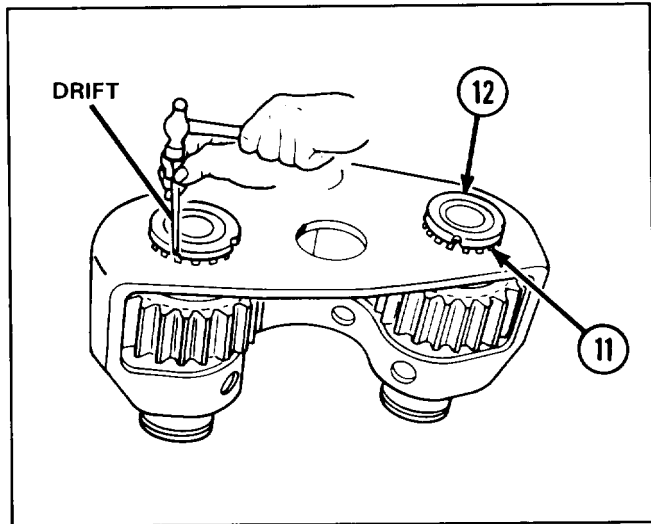
- 11 Using spanner wrench, install new key washer (11) and plain round nut (12) on each of two idler gear shouldered shafts (10). Tighten plain round nut (12).



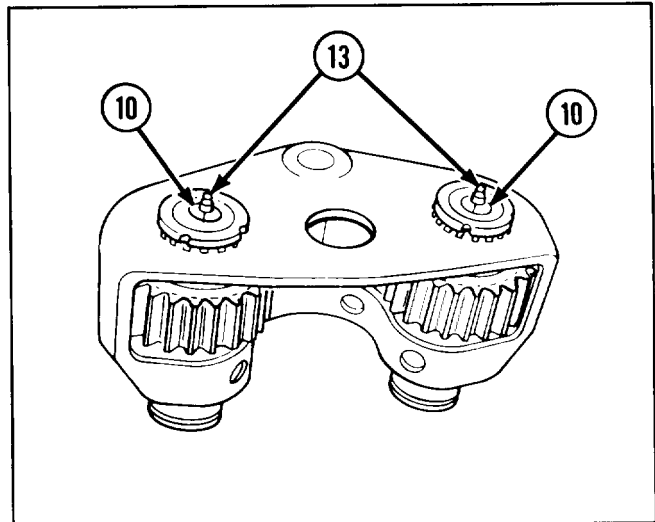
2-49. MAINTENANCE OF TRAVERSING FINAL DRIVE (CONT).

REASSEMBLY (CONT)

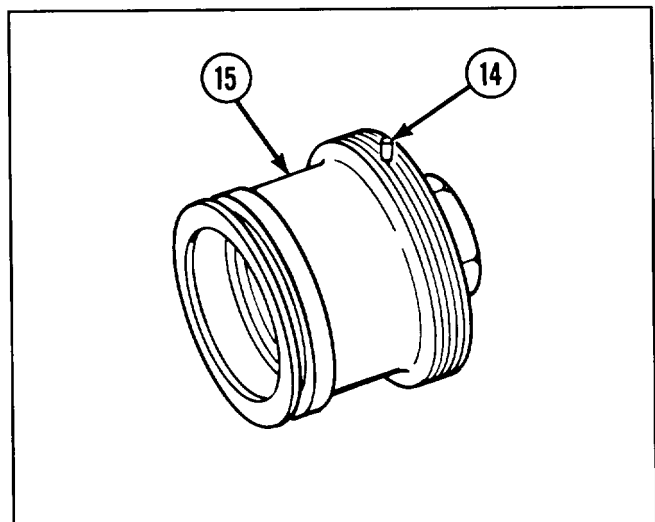
12 Using hammer and drift, bend tags on new key washers (11) in plain round nuts (12).



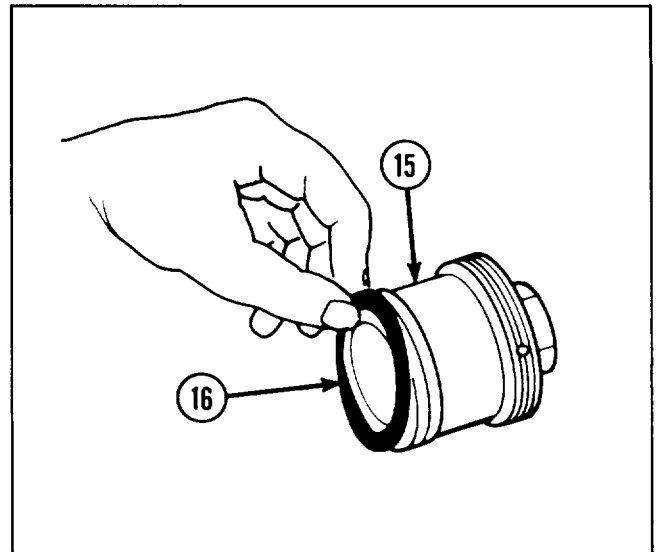
13 Install lubrication fittings (13) in each of two idler gear shouldered shafts (10).



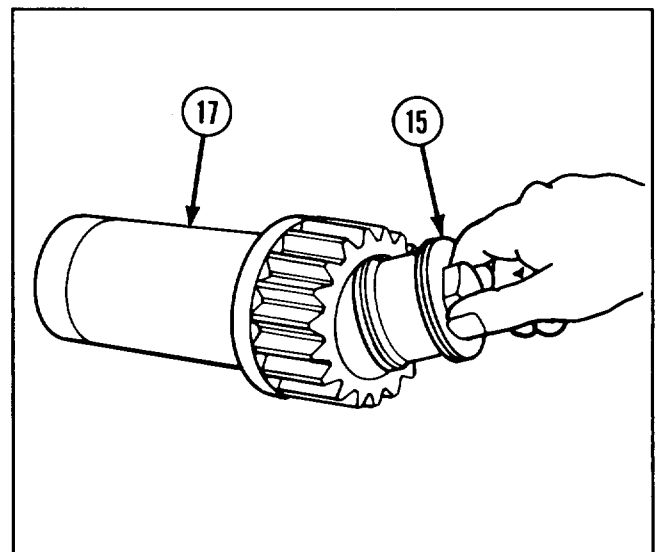
14 Install spur gear plug insert (14) in threaded end of gear shaft thrust plug (15).



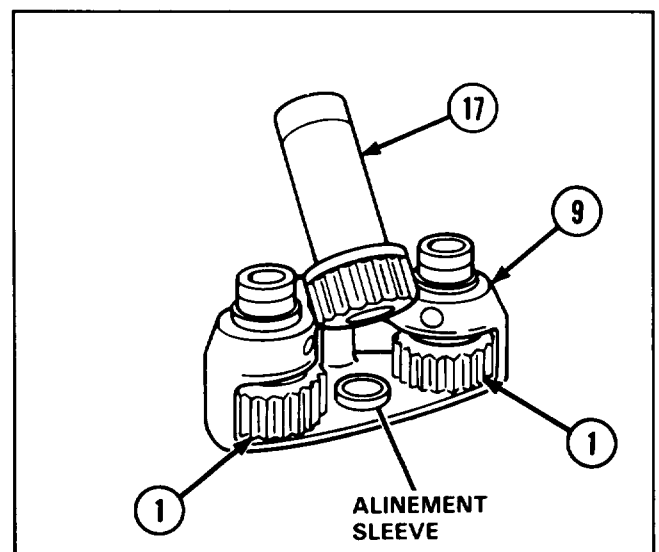
- 15 Lubricate new preformed packing (16) with engine oil (item 15, appx B) and install into groove on gear shaft thrust plug (15).



- 16 Install gear shaft thrust plug (15) into traversing drive pinion spur gearshaft (17).



- 17 Install traversing drive pinion spur gearshaft (17) into mechanical housing (9) Aline idler spur gear (1) teeth and seat traversing drive pinion spur gearshaft (17) over raised alinement sleeve on mechanical housing (9).



2-50. MAINTENANCE OF CAB ASSEMBLY.

This task covers: a. *Service*
b. *Removal*

c. *Inspection/Repair*
d. *Installation*

INITIAL SETUP

Tools and Special Tools

- Alinement pin (3) (fig. 1, appx C)
- General mechanic's tool kit, automotive (SC 5180-90-CL-N26)
- Hoist, 30,000 lb (13,620 kg) minimum lifting capacity
- Sling, chain, 30,000 lb (13,620 kg) minimum lifting capacity
- Wood blocks, 12-in. x 12-in. (30.48 cm x 30.48 cm) (8)

Materials/Parts

- Kit (5703765)
- Lockwasher (MS35338-46)
- Lockwasher (8) (MS35338-47)
- Lockwasher (2) (MS35338-48)
- Lockwasher (28) (MS35338-53)
- Preformed packing (2) (MS28775-222)

Personnel Required

5

References

TM 9-2350-238-24P-2

Equipment Conditions

- Boom removed from cab assembly (TM 9-2350-238-20-2)
- Hydraulic reservoir drained (TM 9-2350-238-20-2)

General Safety Instructions

WARNING

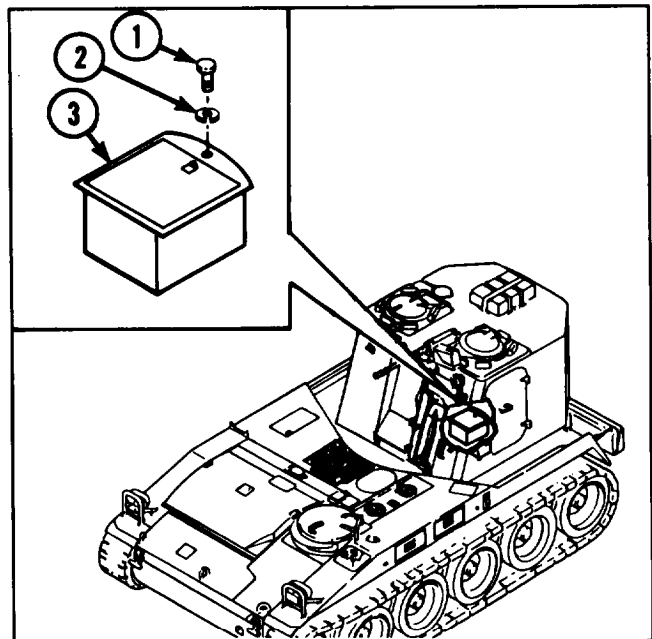
- Use hoist and chain slings of 30,000 lb (13,620 kg) minimum lifting capacity to avoid injury to personnel or damage to equipment.
- Make sure MASTER switch is OFF before repairing electrical components. Failure to observe this warning could result in injury to personnel.

SERVICE

When removing the cab assembly for any reason, perform a turret bearing service IAW pages 2-269 thru 2-282 if the turret bearing service has not performed within the past 18 months.

REMOVAL

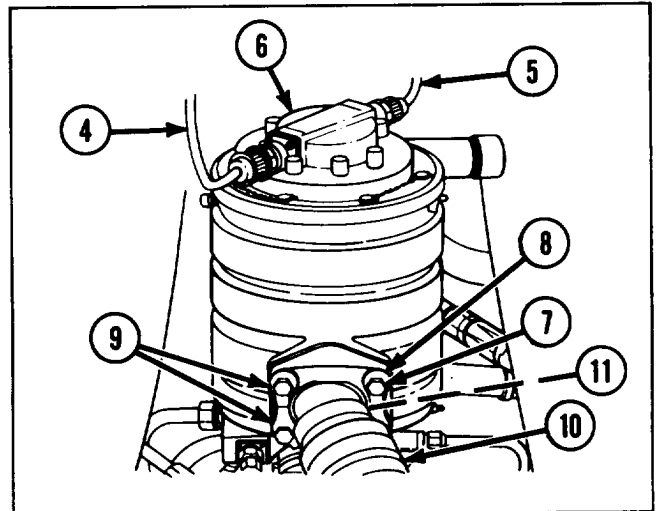
- 1 Remove screw (1) and lockwasher (2) and lift equipment stowage accessories box (3) from cab floor to gain access to cab well.



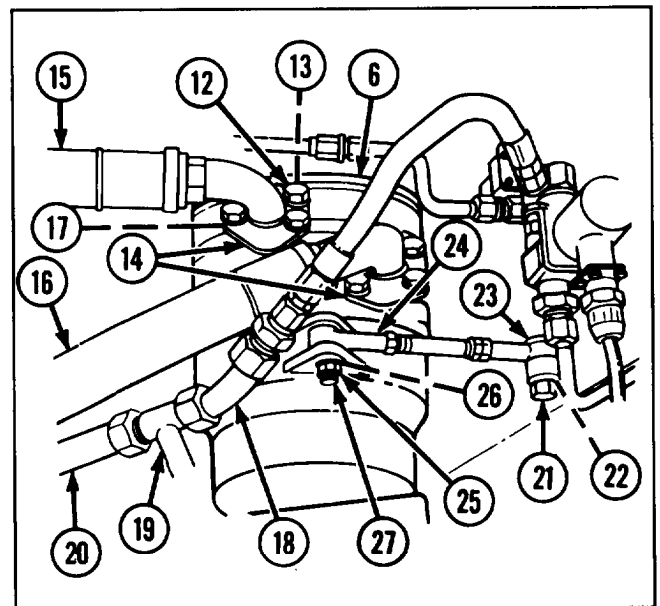
WARNING

Make sure MASTER switch is OFF before repairing electrical components. Failure to observe this warning could result in injury to personnel.

- 2 Disconnect two electrical leads (4 and 5) from top of pump and slip ring assembly (6).
- 3 Remove four hexagon capscrews (7), four lockwashers (8), and two split clamps (9).
- 4 Remove metal hose assembly (10) and preformed packing (11) from pump and slip ring assembly (6). Cover metal hose assembly opening.



- 5 Remove eight hexagon head capscrews (12), eight lockwashers (13), and four split flange clamp halves (14) from pump and slip ring assembly (6).
- 6 Remove two nonmetallic hose assemblies (15 and 16) and two preformed packings (17) from pump and slip ring assembly (6). Cover hose openings.
- 7 Disconnect metal tube assembly (18) from tube tee (19) on pump and slip ring assembly (6). Cover metal tube assembly opening.



- 8 Disconnect hull return line nonmetallic hose assembly (20) from tube tee (19) on pump and slip ring assembly (6). Cover hose assembly opening.
- 9 Remove hex nut (21), lockwasher (22), and screw (23) and disconnect bearing rod end (24) from cab wall.
- 10 Remove hex nut (25), lockwasher (26), and screw (27) and disconnect bearing rod end (24) from welded bracket on pump and slip ring assembly (6).

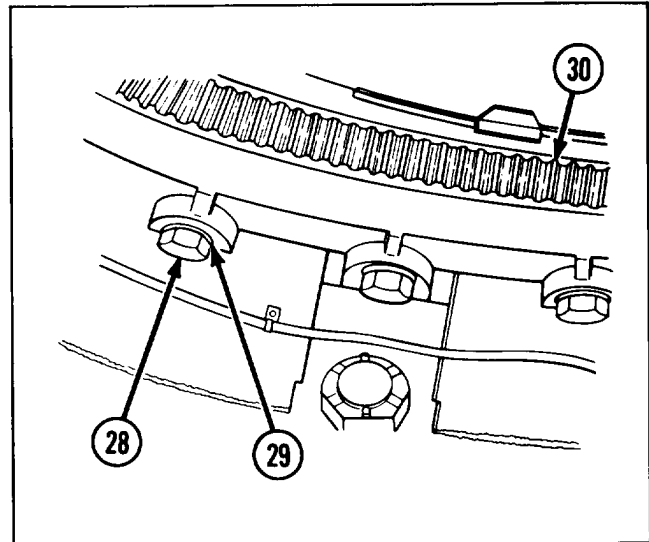
2-50. MAINTENANCE OF CAB ASSEMBLY (CONT).

REMOVAL (CONT)

NOTE

To remove 28 screws and lockwashers in step 11, turret must be traversed to make approximately four screws and lockwashers accessible at a time.

- 11 Remove 28 hexagon head capscrews (28) and 28 lockwashers (29) securing plain bearing unit (30) to vehicle hull.



- 12 Insert crowbar in boom hinge pin upper sockets (31).

WARNING

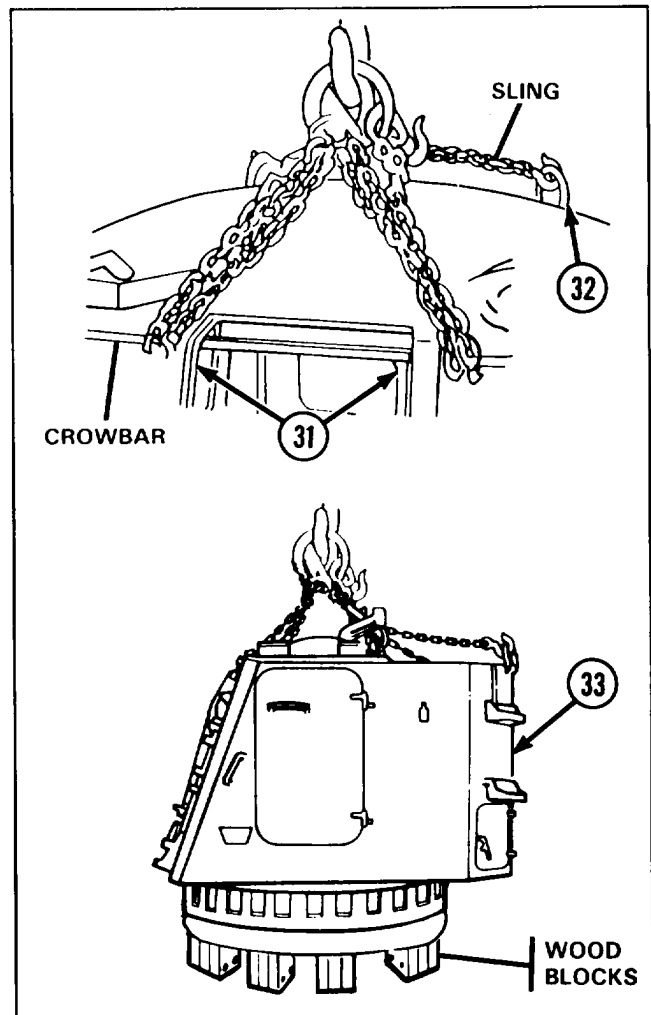
Use hoist and chain slings of 30,000 lb (13,620 kg) minimum lifting capacity to avoid injury to personnel or damage to equipment.

- 13 Using a sling and hoist of 30,000 lb (13,620 kg) minimum lifting capacity, connect sling to crowbar and lifting eyes (32) on top of cab assembly (33).

NOTE

Ensure center of gravity is obtained when positioning sling and hoist. Approximate center of gravity can be obtained by aligning the hoist with the center of left side cab swinging metal door and right side cab vehicle hatch door.

- 14 Attach sling to hoist and take up slack to make sure lift is equal at all pressure points.



NOTE

- When cab assembly is removed or installed in a maintenance shop, position vehicle in an area with minimum ceiling clearance of 20 ft (6 m).
- Removal of the cab assembly can be performed using a second M578 Recovery Vehicle or an M88A1 Recovery Vehicle. Both vehicles must be positioned on a hard surface with spade down to remove or install the cab assembly.

15 Lift cab assembly (33) straight up and free of hull. Place cab on wood blocks.

INSPECTION/REPAIR

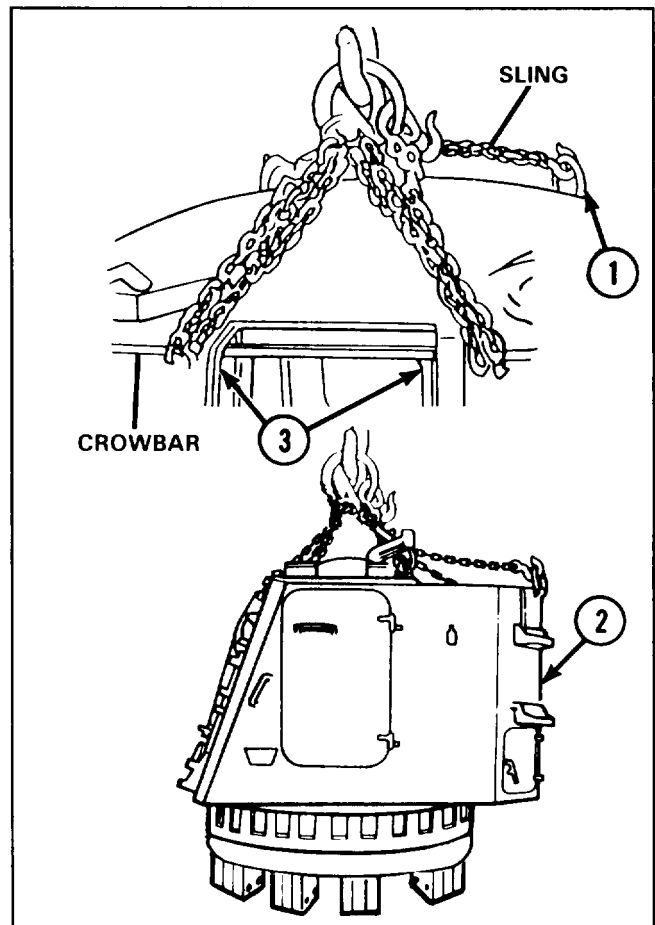
- 1 Inspect for broken, damaged, or missing parts.
- 2 If plain bearing unit or outer race assembly are broken or damaged, refer to page 2-269.
- 3 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2).

INSTALLATION**WARNING**

Use hoist and chain slings of 30,000 lb (13,620 kg) minimum lifting capacity to avoid injury to personnel or damage to equipment.

NOTE

- Prior to installing cab assembly, refer to page 2-269 for servicing the plain bearing unit and outer race assembly.
 - Ensure center of gravity is obtained when positioning sling and hoist. Approximate center of gravity can be obtained by aligning the hoist with the center of left side cab swinging metal door and right side cab vehicle hatch door.
- 1 Attach sling to hoist and take up slack to make sure lift is equal at all pressure points.

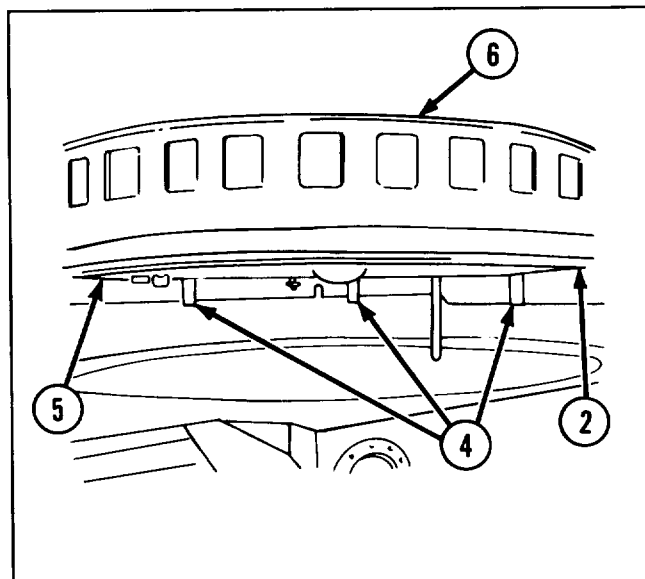


- 2 Using a sling and hoist of 30,000 lb (13,620 kg) minimum lifting capacity, connect sling to crowbar and lifting eyes (1) on top of cab assembly (2).
- 3 Insert crowbar in boom hinge pin upper sockets (3).

2-50. MAINTENANCE OF CAB ASSEMBLY (CONT).

INSTALLATION (CONT)

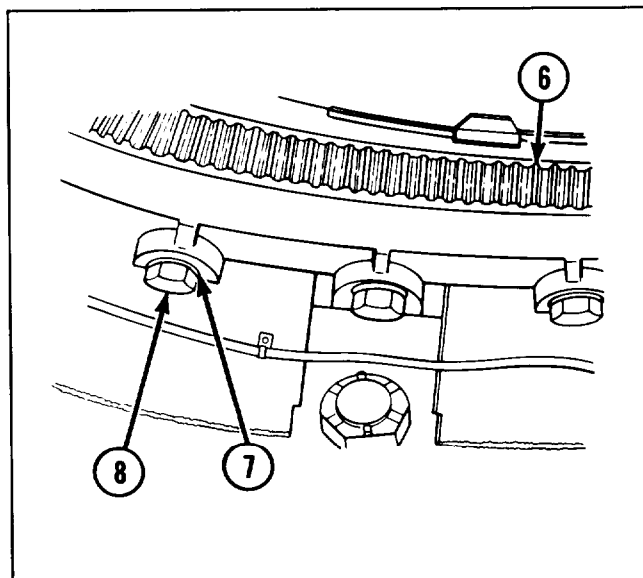
- 4 Install three alinement pins (4) (fig. 1, appx C) in threaded holes in turret bearing outer race assembly (5). Alinement pins should be 120 degrees apart.
- 5 Install FRONT marking on turret bearing (6) toward front centerline of hull.
- 6 Hoist cab assembly (2) off wood blocks and install on hull using alinement pins (4) as a guide.

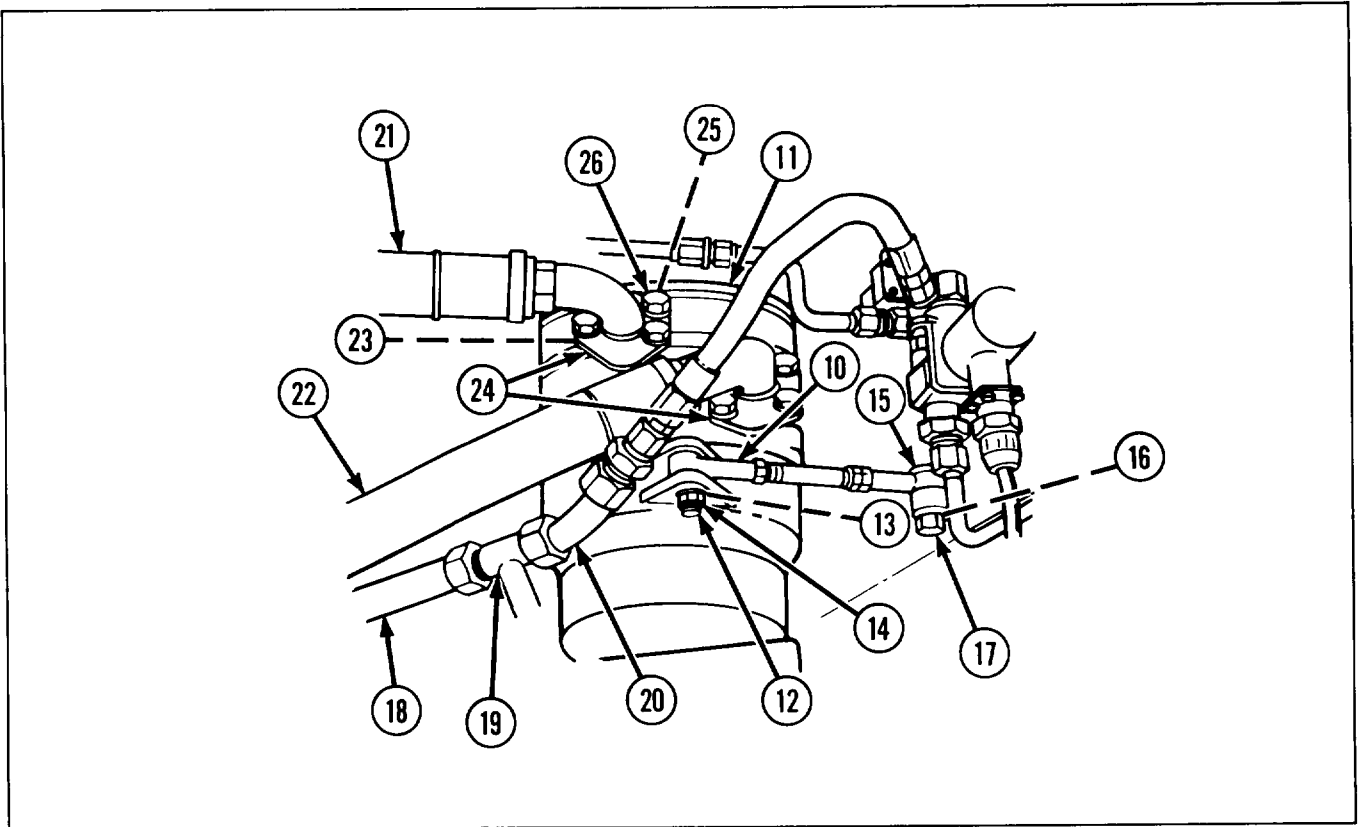


NOTE

- Remove three alinement pins from turret bearing when installing screws and lockwashers in step 7.
- To install 28 hexagon head capscrews and lockwashers in step 7, turret must be traversed to make approximately four capscrews and lockwashers accessible at a time.

- 7 Install 28 new lockwashers (7) and 28 hexagon head capscrews (8) securing turret bearing (6) to hull.



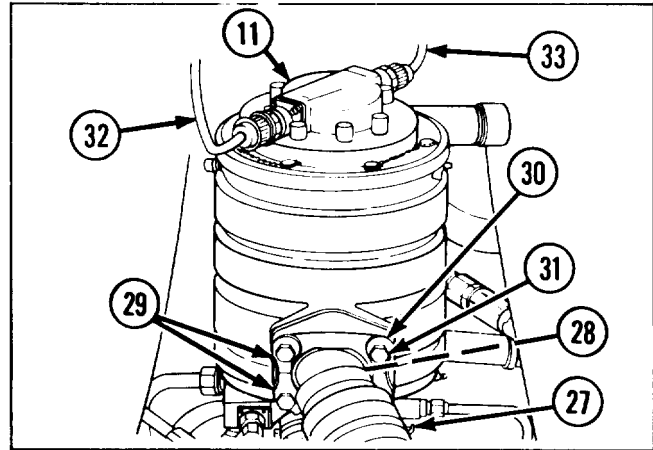


- 8 Connect bearing rod end (10) to welded bracket on pump and slip ring assembly (11) and secure with screw (12), new lockwasher (13) and hex nut (14).
- 9 Connect bearing rod end (10) to cab wall and secure with screw (15), new lockwasher (16), and hexagon nut (17).
- 10 Uncover hull return line nonmetallic hose assembly (18) opening and reconnect to tube tee (19) on pump and slip ring assembly (11).
- 11 Uncover metal tube assembly (20) opening and reconnect to tube tee (19) on pump and slip ring assembly (11).
- 12 Uncover openings of two nonmetallic hose assemblies (21 and 22). Install two new preformed packings (23) and two nonmetallic hose assemblies (21 and 22) to Pump and slip ring assembly (11). Secure with four split flange clamp halves (24), eight new lockwashers (25), and eight hexagon head capscrews (26).

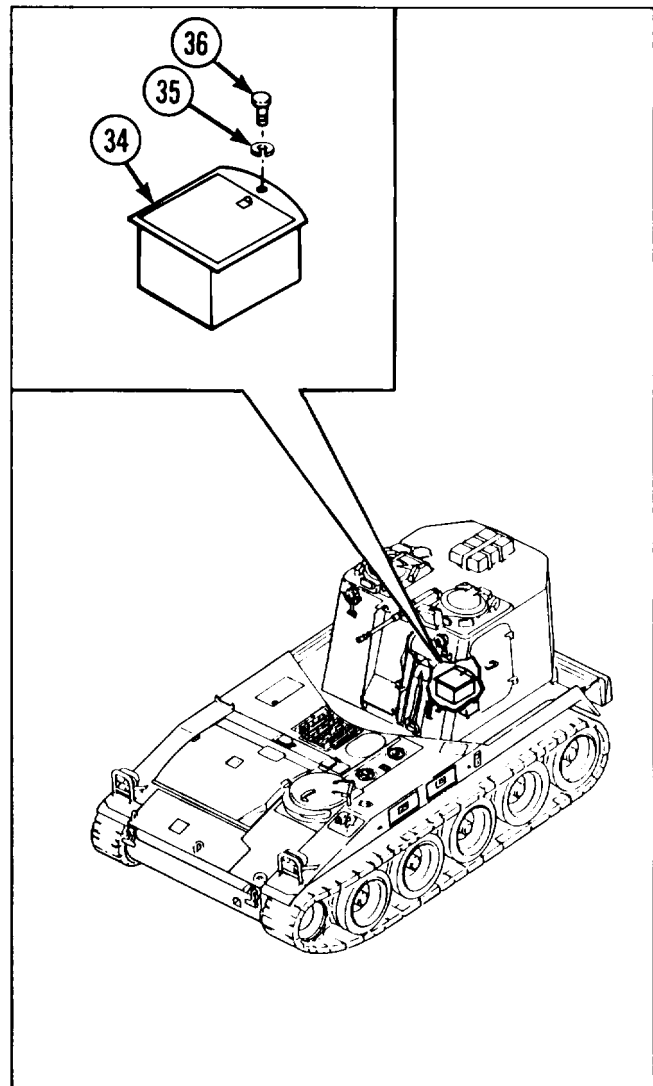
2-50. MAINTENANCE OF CAB ASSEMBLY (CONT).

INSTALLATION (CONT)

- 13 Uncover metal hose assembly (27) opening and install new preformed packing (28) and metal hose assembly to pump and slip ring assembly (11). Secure with two split clamps (29), four new lockwashers (30), and four hexagon capscrews (31).
- 14 Connect two electrical leads (32 and 33) to top of pump and slip ring assembly (11).



- 15 Fill hydraulic reservoir with oil. Refer to LO 9-2350-238-12.
- 16 Install equipment stowage accessories box (34) in cab floor and secure with new lockwasher (35) and screw (36).



2-51. MAINTENANCE OF TURRET BEARING INSTALLATION—PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY.

| | | |
|-------------------|-----------------------|-----------------------------|
| This task covers: | a. <i>Service</i> | d. <i>Inspection/Repair</i> |
| | b. <i>Removal</i> | e. <i>Reassembly</i> |
| | c. <i>Disassembly</i> | f. <i>Installation</i> |

INITIAL SETUP

Tools and Special Tools

Alinement pin (2) (fig. 1, appx C)
 Eye lifting bolt (3) (5222910)
 General mechanic's tool kit, automotive
 (SC 5180-90-CL-N26)
 Hoist, 30,000-lb (13,620 kg) minimum
 lifting capacity
 Retainer adapter (11643222)
 Shop equipment, automotive maintenance
 and repair: field maintenance,
 basic, less power (SC 4910-95-A31)
 Hammer, hand: soft-head
 Wrench set, socket, 3/4-in. square
 drive
 Wrench, torque, 0 to 600 ft-lb
 Sling, chain, 30,000 lb (13,620 kg)
 minimum lifting capacity
 Socket wrench (6105331)
 Spring scale (AAA-S-133)
 Wood blocks, 12-in. x 12-in. (30.48 cm
 x 30.48 cm) (8)

Materials/Parts

Adhesive (item 1, appx B)
 Adhesive silicone (item 2, appx B)
 Drive screw (3) (MS21318-3)
 Dry cleaning solvent (item 5, appx B)
 Grease (item 9, appx B)
 Lockwasher (MS35333-46)
 Lockwasher (26) (MS35338-44)
 Lockwasher (28) (MS35338-53)
 Seal assembly (2) (11592868)
 Sealing compound (item 18, appx B)

Personnel Required

3

References

TM 9-2350-238-24P-2

Equipment Conditions

Boom assembly removed (TM
 9-2350-238-20-2)
 2-262 Cab assembly removed

General Safety Instructions

WARNING

- Dry cleaning solvent (SD2) is toxic and flammable. Wear protective goggles and gloves and use only in well-ventilated area.
- Use a hoist and sling of 30,000 lb (13,620 kg) minimum lifting capacity to prevent injury to personnel and damage to equipment.

2-51. MAINTENANCE OF TURRET BEARING INSTALLATION-PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

SERVICE

Upon removal of plain bearing unit from cab, check service record. If previous service was not conducted within previous 18 months, conduct service of turret bearing.

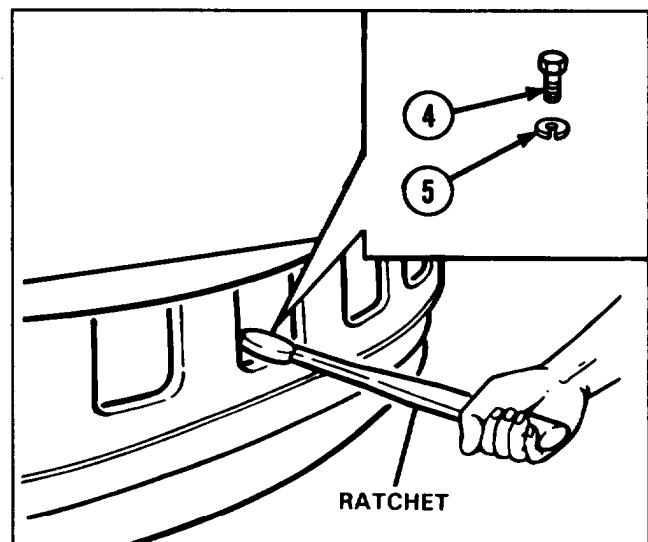
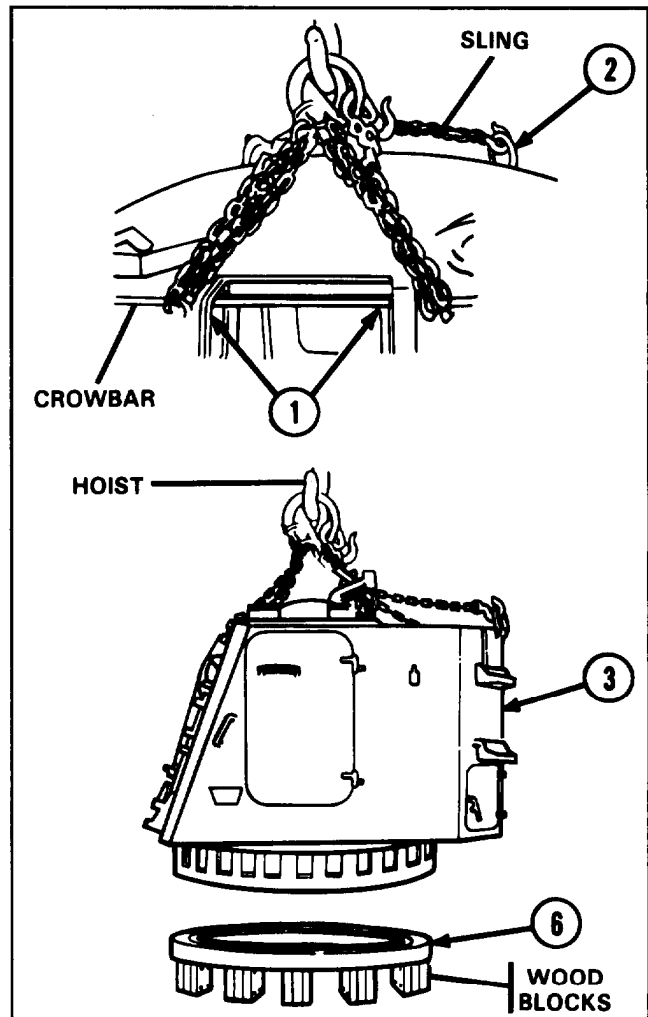
REMOVAL

Use a hoist and slings of 30,000 lb (13,620 kg) minimum lifting capacity to prevent injury to personnel and damage to equipment.

NOTE

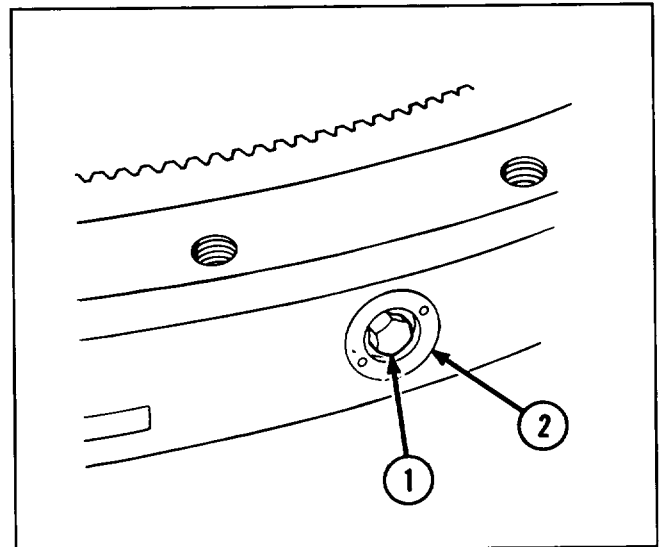
Check the position of the plain bearing unit before removing it from the cab assembly. The plain bearing unit should be rotated 180 degrees from the original position after scheduled maintenance has been performed to prevent uneven wear.

- 1 Scribe a reference line between the plain bearing unit and hull before removal.
- 2 Insert crowbar in boom hinge pin upper sockets (1).
- 3 Provide hoist and chain slings of 30,000 lb (13,620 kg) minimum lifting capacity.
- 4 Attach chain slings to crowbar and lifting eyes (2) on cab (3).
- 5 Using ratchet, remove 28 hexagon head capscrews (4) and 28 lockwashers (5).
- 6 Using hoist and chain sling, lift cab (3) from plain bearing unit (6) and place on wood blocks.

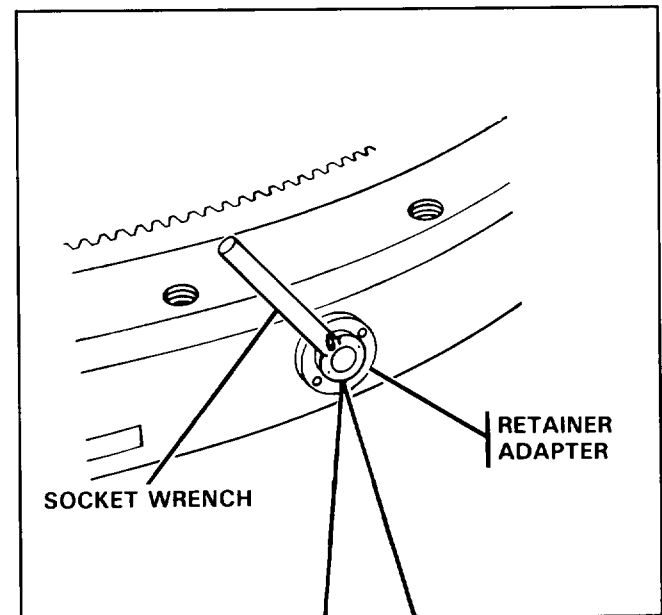


DISASSEMBLY

- 1 Loosen hexagon head capscrew (1) securing turret bearing assembly turret plug retainer (2) 0.5 in. (1.3 cm).



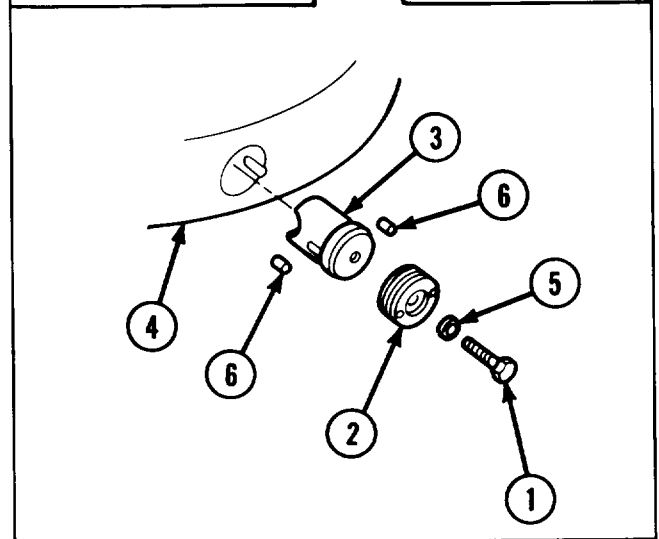
- 2 Using retainer adapter and socket wrench, unscrew turret bearing assembly turret plug retainer (2) until it contacts head of hexagon head capscrew (1).
- 3 Tighten hexagon head capscrew (1) to pull turret filler plug (3) out from outer race (4).



CAUTION

Use care not to lose or damage turret filler plug during removal.

- 4 Repeat steps 1 thru 3 until turret filler plug (3) is free of outer race (4).
- 5 Remove hexagon head capscrew (1), lockwasher (5), turret bearing assembly turret plug retainer (2), turret filler plug (3), and two filler plug headless straight pins (6).

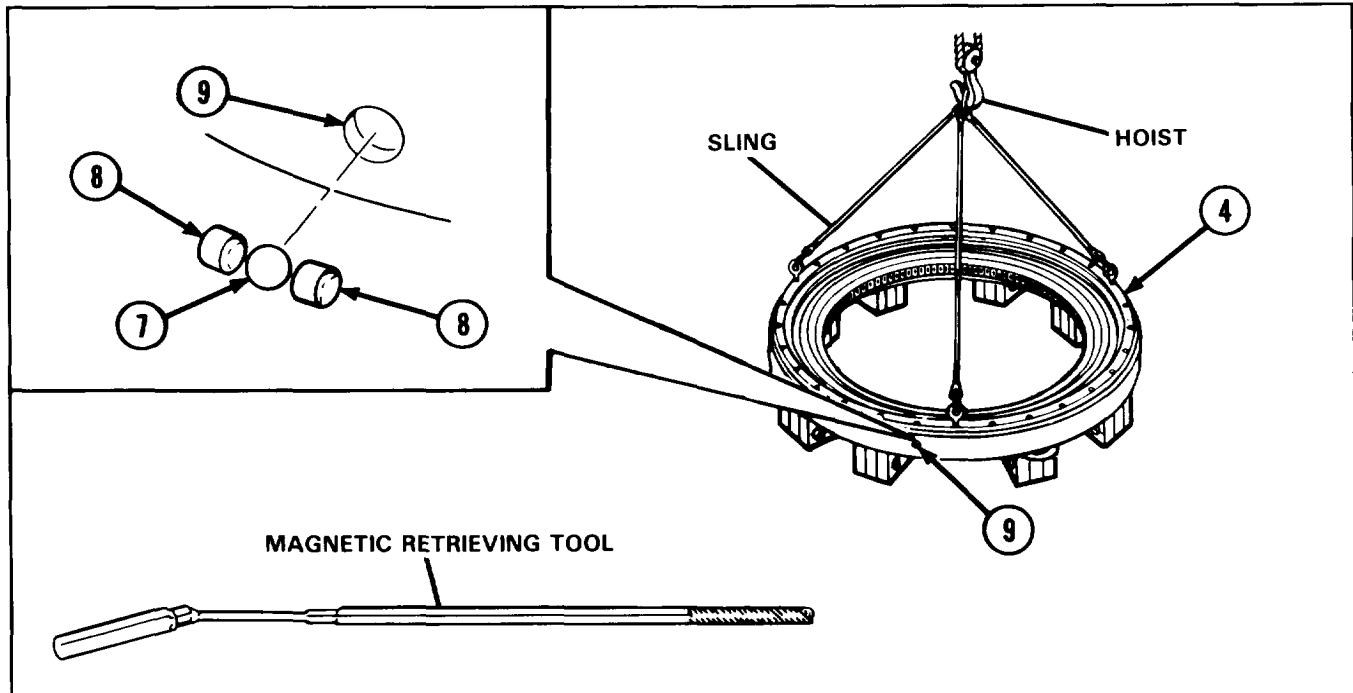
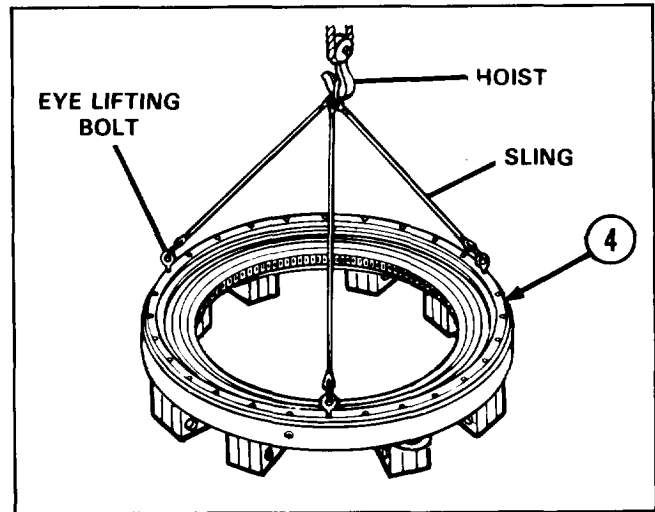


2-51. MAINTENANCE OF TURRET BEARING INSTALLATION-PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

DISASSEMBLY(CONT)

6 Install three eye lifting bolts in threaded holes of outer race (4) equal distances apart.

7 Attach sling to eye lifting bolts and hoist.



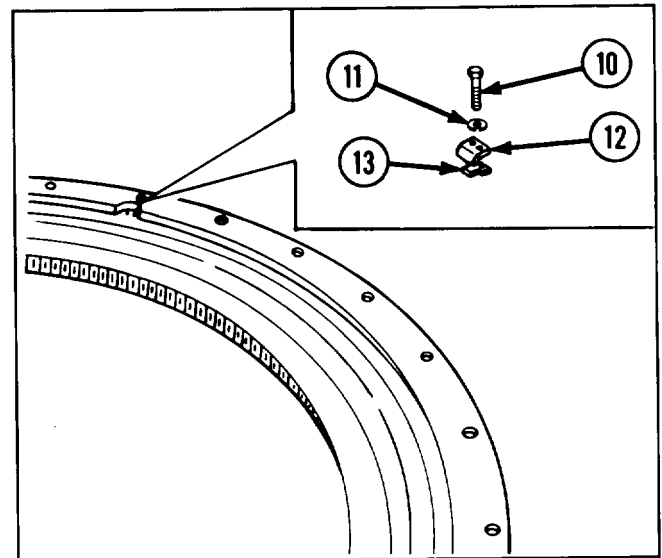
8 Using hoist and sling, raise outer race (4) slightly to remove weight from ball bearings (7).

NOTE

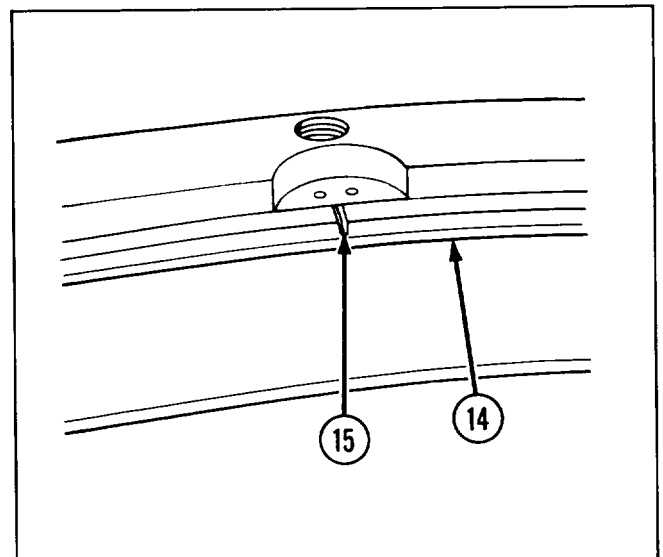
It may be necessary to rotate outer race two or more complete turns to locate and remove all ball bearings and retainers.

9 Using magnetic retrieving tool for ball bearings (7) and tweezers for retainers (8), remove 100 to 103 ball bearings and 100 to 103 retainers through turret filler plug opening (9).

- 10 Remove two hexagon head capscrews (10), two lockwashers (11), outer seal retaining strap (12), and turret keeper plate (13).



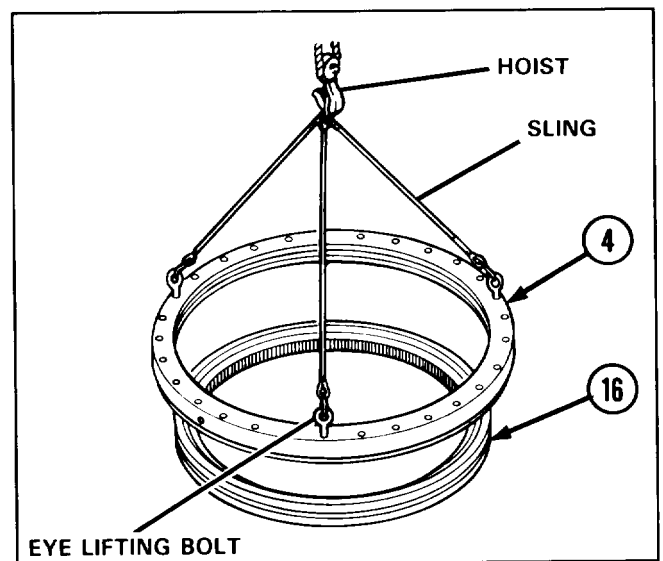
- 11 Remove seal retaining ring (14) and seal assembly (15).
- 12 If damaged, peel seal assembly (15) from seal retaining ring (14).



CAUTION

Make sure that bearing surfaces are not damaged while lifting outer race.

- 13 Using hoist, carefully lift outer race (4) from inner race (16).
- 14 Place outer race (4) on level surface and remove sling and eye lifting bolts.
- 15 Using suitable sling, turn outer race (4) over with threaded holes down.



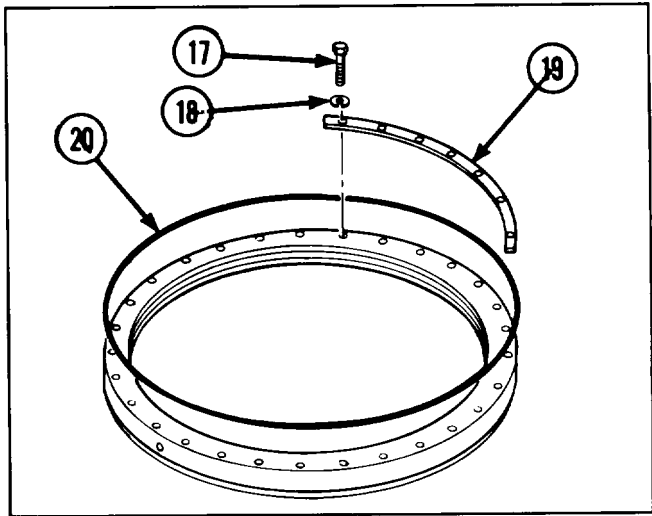
2-51. MAINTENANCE OF TURRET BEARING INSTALLATION—PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

DISASSEMBLY (CONT)

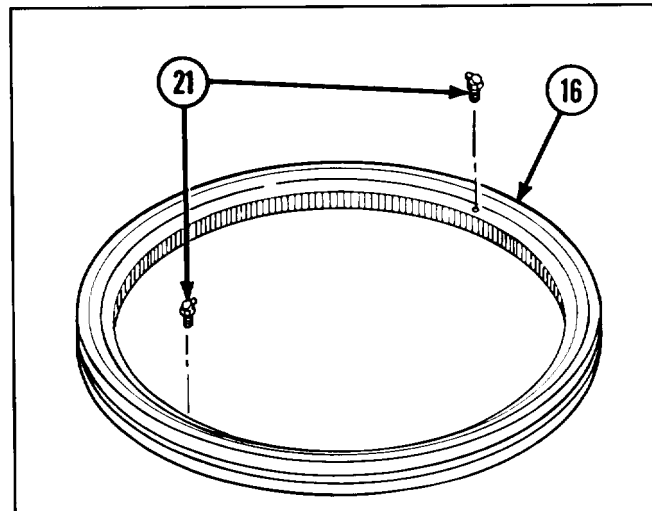
16 Remove 24 hexagon capscrews (17) and 24 lockwashers (18).

17 Remove four seal retaining plates (19).

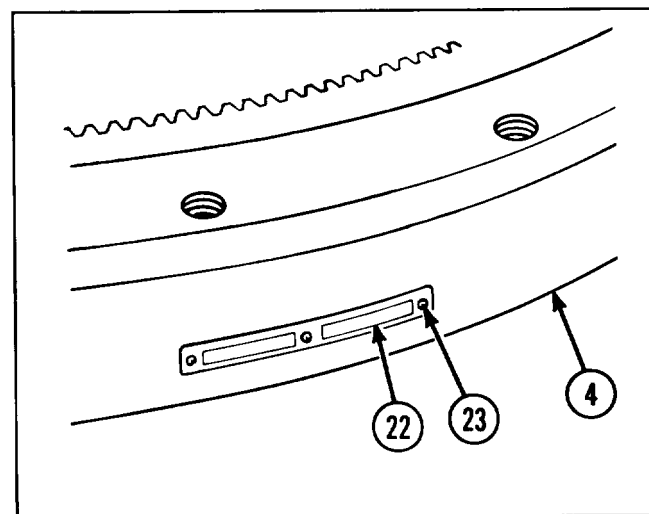
18 Remove seal assembly (20).



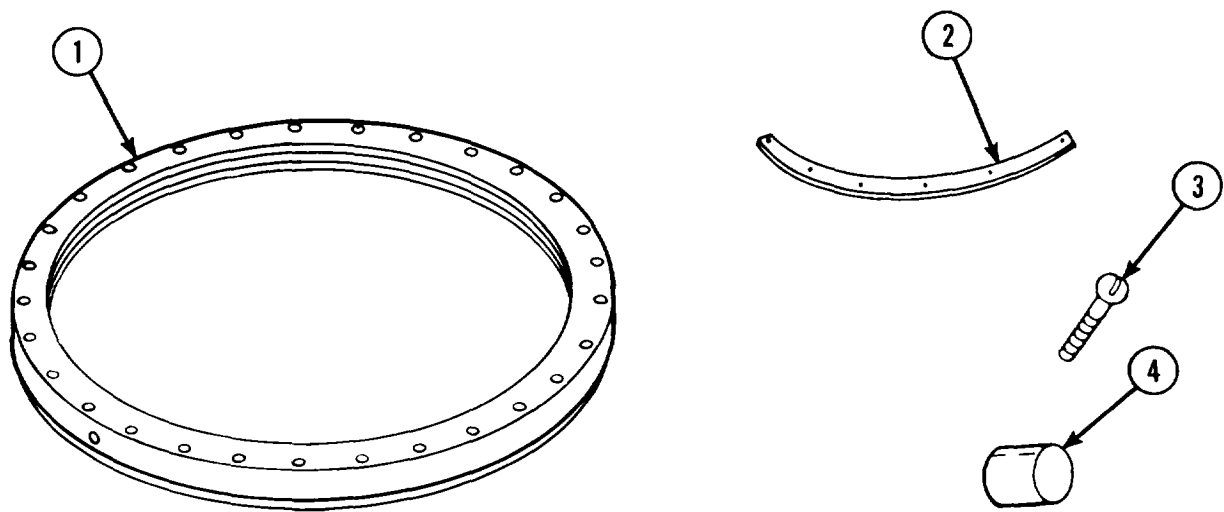
19 Remove six lubrication fittings (21) from inner race (16).



20 If turret bearing identification plate (22) is damaged, use chisel to cut off heads of three drive screws (23), and remove turret bearing identification plate from outer race (4).



INSPECTION/REPAIR



- 1 Inspect for broken, damaged, or missing parts.

WARNING

Dry cleaning solvent (SD2) is toxic and flammable. Wear protective goggles and gloves and use only in well-ventilated area.

- 2 Remove adhesive from upper and lower surfaces of outer race (1) with wire brush and dry cleaning solvent (item 5, appx B).
- 3 Remove sealing compound from seal retaining plates (2) and hexagon head capscrews (3) with wire brush and dry cleaning solvent (item 5, appx B).
- 4 Clean retainers (4) with soft brush and mild soap solution.
- 5 If turret filler plug is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 6 Outer race is unserviceable if there are five or more pits within a 12.00 in. (30.48 cm) distance, or any pit is more than 1.00 in. (2.54 cm) long, 0.06 in. (0.16 cm) wide, or 0.03 in. (0.08 cm) deep.
- 7 If inner race is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 8 If outer race is broken, damaged, or missing, repair is by replacement of next higher assembly.
- 9 Repair is by replacement of authorized parts (TM 9-2350-238-24P-2) which do not meet inspection criteria.

2-51. MAINTENANCE OF TURRET BEARING INSTALLATION -PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

REASSEMBLY

CAUTION

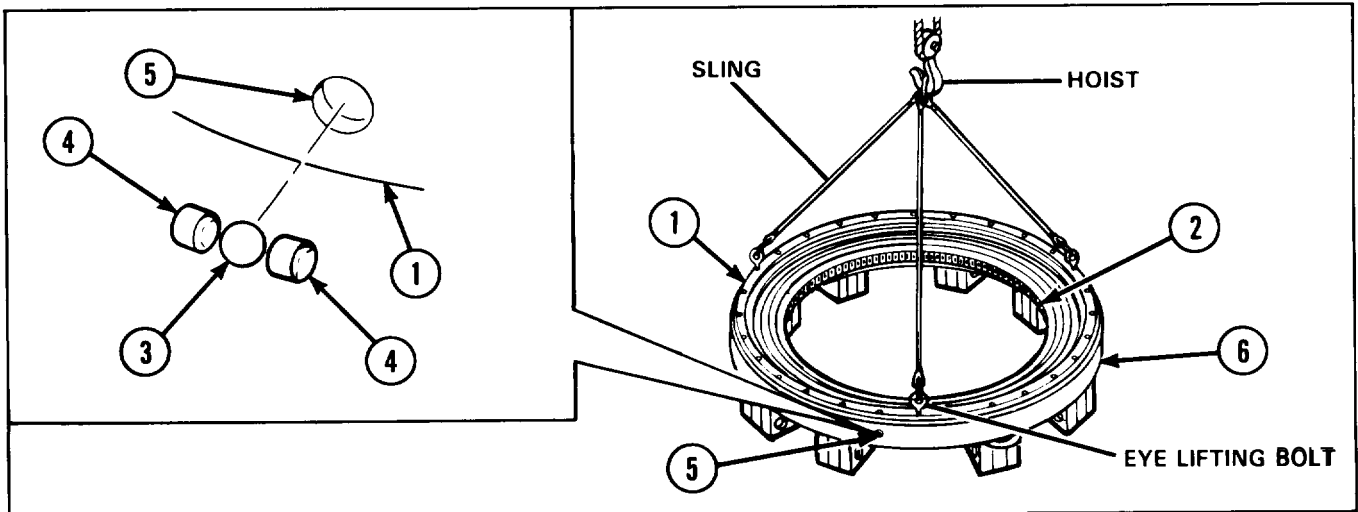
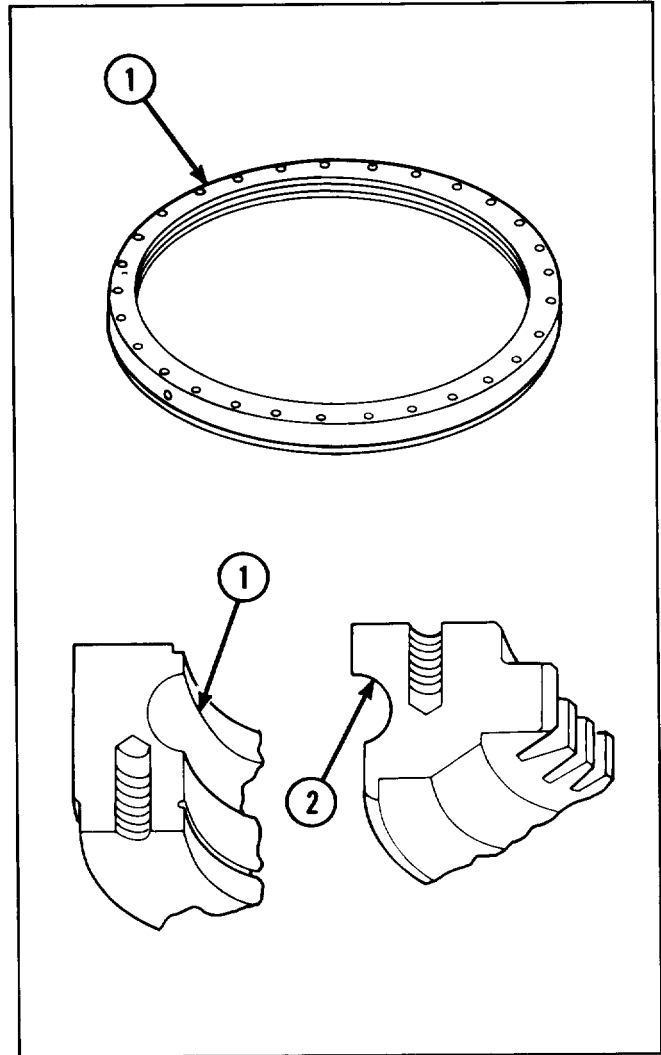
Outer race and inner race must have the same class letters stamped after part number.

- 1 Position outer race (1) on clean level surface with threaded holes down.

NOTE

Make sure grease (item 9, appx B) is not applied to seal surfaces of outer race.

- 2 Apply a light coating of grease (item 9, appx B) to ball bearing surfaces of outer race (1) and inner race (2).



- 3 Install three eye lifting bolts in threaded holes of inner race (2) an equal distance apart.
- 4 Attach sling to eye lifting bolts and hoist.
- 5 Lift and center inner race (2) over outer race (1).
- 6 Carefully lower inner race (2) into outer race (1) and aline ball bearing grooves.

NOTE

Alinement is correct when ball bearings can be installed without difficulty.

- 7 Support weight of inner race (2) with hoist so it can be turned easily during installation of ball bearings (3) and retainers (4).

NOTE

Prior to installation, lubricate ball bearings using grease (item 9, appx B).

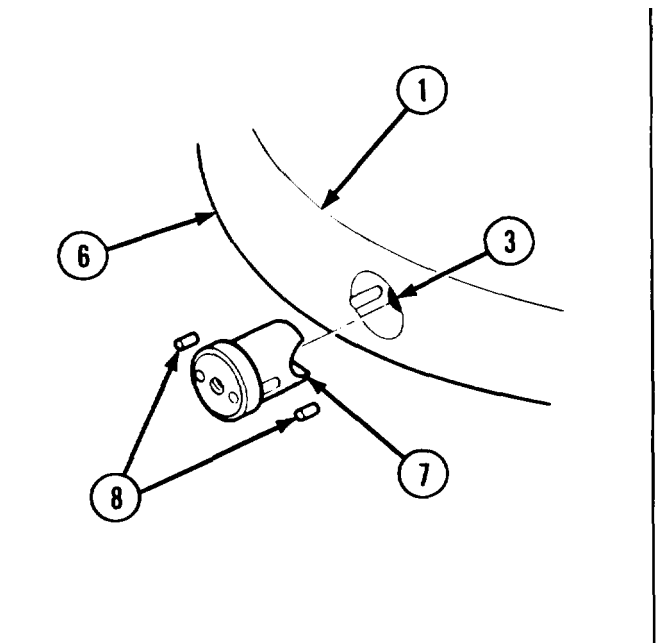
- 8 Install ball bearing (3) through filler plug hole (5) in outer race (1) and push ball bearing (3) to one side in groove.

CAUTION

Ball bearings must fit into curved-in surfaces of retainers.

- 9 Install retainers (4) through filler plug hole (5) in outer race (1) and fit ball bearings (3) in groove.
- 10 Turn inner race (2) and continue installing one ball bearing (3) and one retainer (4) until turret bearing (6) is filled with 100 to 103 ball bearings and 100 to 103 retainers. The last item installed must be a ball bearing fitted between two retainers.
- 11 Lower inner race (2) and remove sling and three eye lifting bolts.

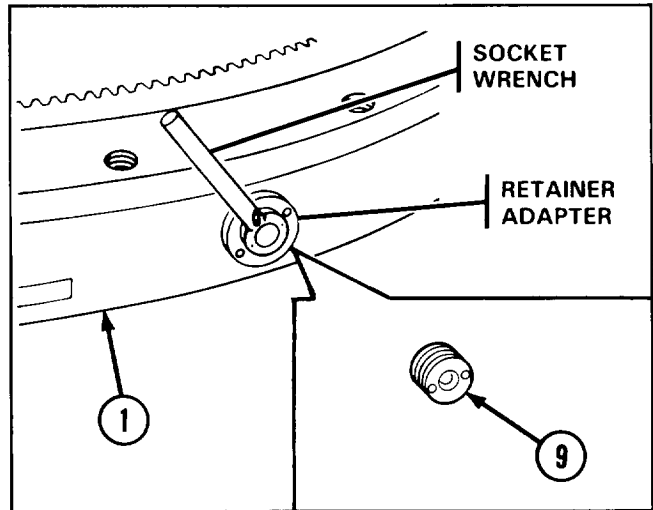
- 12 Aline dowel pin holes in turret filler plug (7) and outer race (1) and insert turret filler plug into outer race (1).
- 13 Using a soft-faced hammer, tap turret filler plug (7) into outer race (1) until it seats against last ball bearing (3) installed in turret bearing (6).
- 14 Using soft-faced hammer and drift, tap into place two filler plug headless straight pins (8) through turret filler plug (7) into outer race (1).



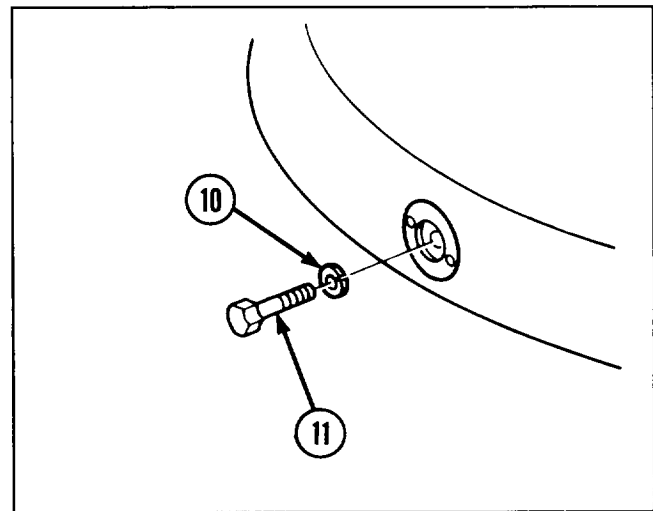
2-51. MAINTENANCE OF TURRET BEARING INSTALLATION-PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

REASSEMBLY (CONT)

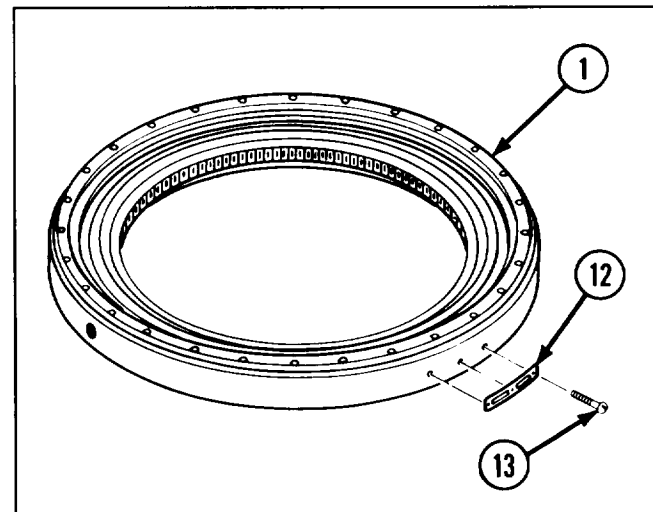
- 15 Using retainer adapter and socket wrench, install turret bearing assembly plug retainer (9) in outer race (1). Torque turret bearing assembly plug retainer to 150 ft-lb (203 N-m).



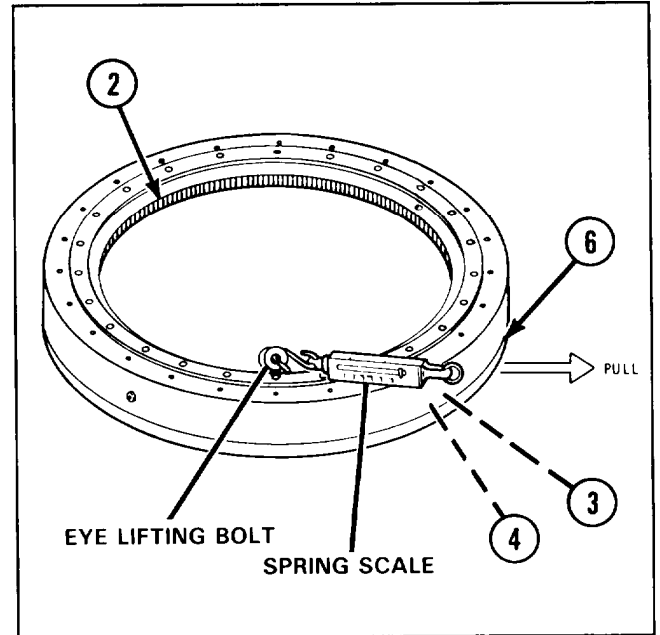
- 16 Install new lockwasher (10) and hexagon head capscrew (11). Torque hexagon head capscrew to 150 ft-lb (203 N-m).



- 17 If removed, install new turret bearing identification plate (12) by drilling three holes, 0.052 in. (0.132 cm) in diameter and 0.32 in. (0.813 cm) deep, next to identification plate on the outer race (1) and securing with three new drive screws (13).



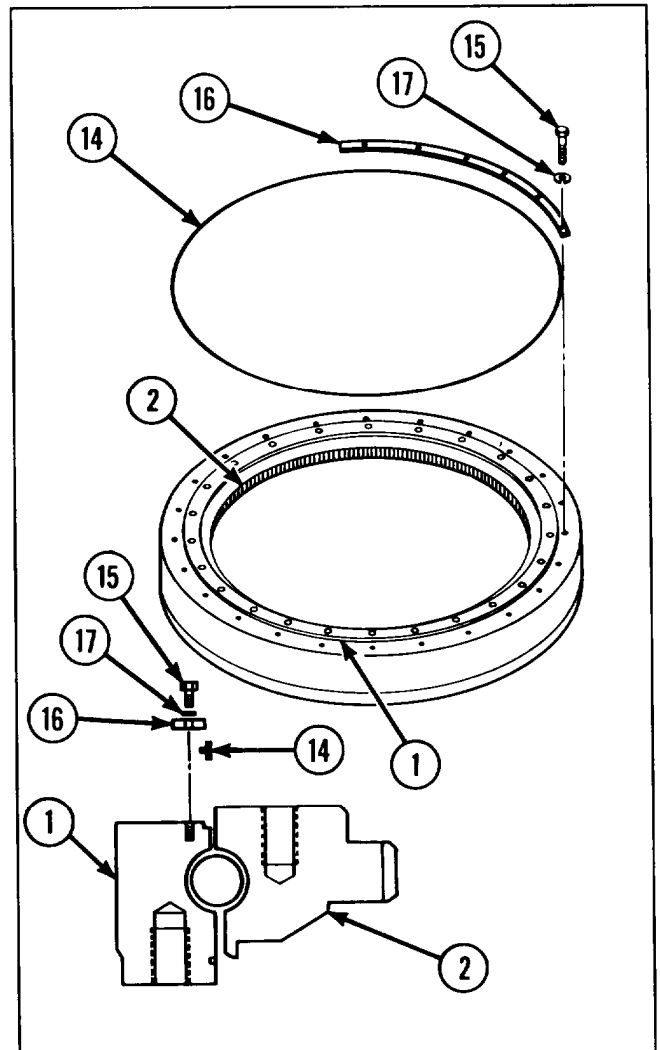
- 18 Install one eye lifting bolt in threaded hole of inner race (2).
- 19 Install spring scale to eye lifting bolt. Pull spring scale until inner race (2) moves and reads scale measurement. Scale must read 75 lb (34 kg) or less for proper bearing load before lubrication.
- 20 If spring scale reading exceeds 75 lb (34 kg) disassemble turret bearing. Inspect all ball bearings (3) for damage. Inspect retainer (4) and bolts for proper placement in turret bearing (6).
- 21 If spring scale reading indicates proper bearing load, remove spring scale and eye lifting bolt.



CAUTION

New lower seal assembly must slide on inner race. Make sure no adhesive is applied to surface of inner race, or surface of new lower seal assembly that contacts inner race.

- 22 Coat seal groove of outer race (1) with adhesive (item 1, appx B).
- 23 Coat mounting edges of new lower seal assembly (1 4) with adhesive (item 1, appx B).
- 24 Install new lower seal assembly (14) in groove of outer race (1). Trim new lower seal assembly to length during installation.
- 25 Coat threads of 24 hexagon head cap-screws (15) with sealing compound (item 18, appx B).
- 26 Install four seal retaining plates (16) over new lower seal (14) and secure to outer race (1) with 24 new lockwashers (17) and 24 hexagon head capscrews (15).
- 27 Using sling, turn bearing assembly to rest on inner race (2).



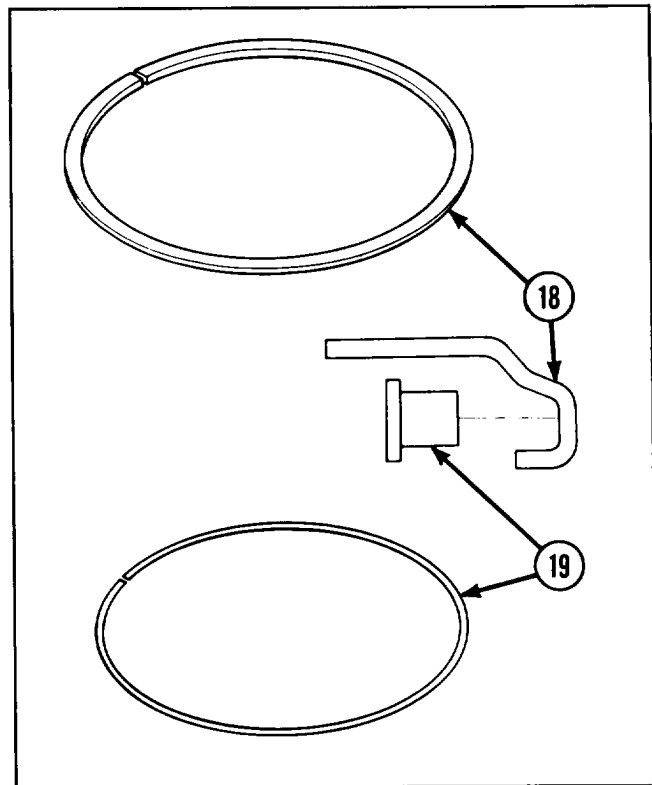
2-51. MAINTENANCE OF TURRET BEARING INSTALLATION –PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

REASSEMBLY (CONT)

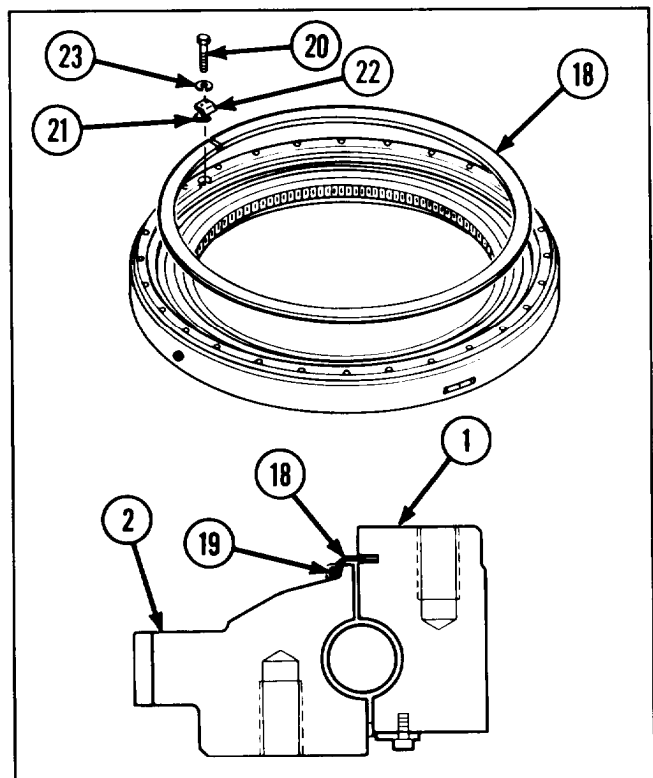
CAUTION

New upper seal must slide on inner race. Make sure no adhesive is applied to surface of seal that contacts inner race.

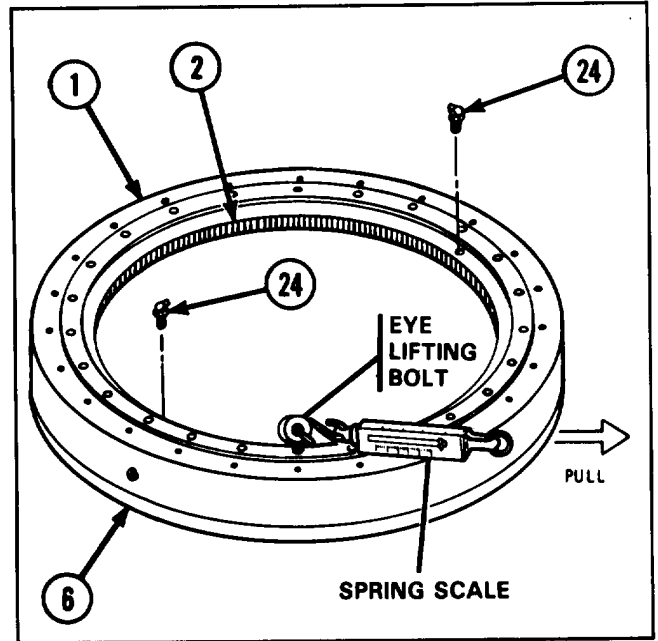
- 28 Coat seal mounting surface of seal retaining ring (18) with adhesive (item 1, appx B).
- 29 Coat mounting edges of new upper seal assembly (19) with adhesive (item 1, appx B).
- 30 Beginning at one end of seal retaining ring (18), install new upper seal assembly around seal retaining ring and trim to length.



- 31 Install seal retaining ring (18) with ends centered on clip mounting surface of outer race (1). Fit edge of seal retaining ring into groove in outer race with upper seal assembly (19) fitted against surface of inner race (2).
- 32 Coat threads of two hexagon head capscrews (20) with sealing compound (item 18, appx B).
- 33 Install turret keeper plate (21) and outer seal retaining strap (22) over ends of seal retaining ring (18) and secure with two new lockwashers (23) and two hexagon head capscrews (20).
- 34 Apply adhesive" silicone (item 2, appx B) around turret keeper plate (21), outer seal retaining strap (22), and retaining ring (18) where it contacts outer race (1).



- 35 Install six lubrication fittings (24) in inner race (2).
- 36 Lubricate turret bearing (6) with grease (item 9, appx B). During lubrication, rotate outer race (1) at least two complete turns to be sure turret bearing (6) is packed with grease.
- 37 Install one eye lifting bolt in threaded hole in outer race (1).
- 38 Attach spring scale on eye lifting bolt and pull on spring scale until outer race (1) moves. Observe reading. Reading must be 95 lb (43 kg) or less for proper bearing load after assembly and lubrication.



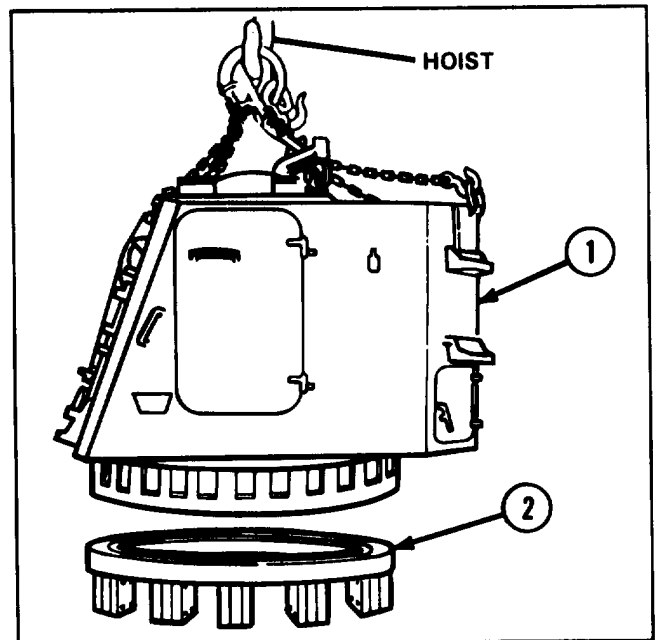
INSTALLATION

WARNING

Use a hoist and sling of 30,000 lb (13,620 kg) minimum lifting capacity to prevent injury to personnel or damage to equipment.

NOTE

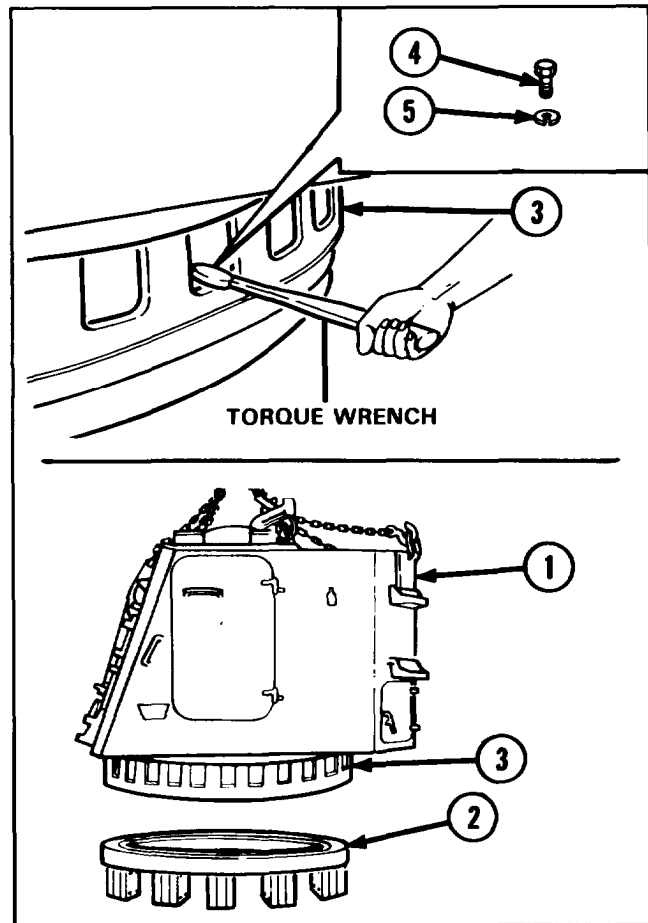
- When cab assembly is lifted within a maintenance shop, position vehicle in an area with minimum ceiling clearance of 20 ft (6 m).
 - Another M578 Recovery Vehicle or M88A 1 Recovery Vehicle may be used, if available, for lifting.
- 1 Using hoist, lift cab (1) and position over plain bearing unit (2).



2-51. MAINTENANCE OF TURRET BEARING INSTALLATION—PLAIN BEARING UNIT AND OUTER RACE ASSEMBLY (CONT).

INSTALLATION (CONT)

- 2 Install two fabricated alinement pins (fig. 1, appx C) in threaded holes in outer race (3). Alinement pins should be 180 degrees apart.
- 3 Aline scribe mark and install cab (1) on plain bearing unit (2).
- 4 Position cab assembly (1) over plain bearing unit (2) and lower cab assembly into place.
- 5 Coat threads of 28 hexagon head capscrews (4) with sealing compound (item 18, appx B) and, using torque wrench, install 28 new lockwashers (5), and 28 hexagon head capscrews (4) securing plain bearing (2) to cab (1). Torque hexagon head capscrews (4) to 200-215 ft-lb (270-290 N-m) dry or 140-150 ft-lb (189-203 N-m) lubricated.
- 6 Remove alinement pins.



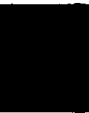
Section V. PREPARATION FOR STORAGE OR SHIPMENT

Refer to TM 9-2350 -238-20-2 for detailed preparation for storage or shipment.

CHAPTER 3

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

There are no general support maintenance procedures at this time.



APPENDIX A

REFERENCES

A-1. SCOPE. This appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS.

| | |
|--------------------------|---|
| DA Form 2028 | Recommended Changes to Publications and Blank Forms |
| DA Form 2028-2 | Recommended Changes to Equipment Technical Publications |
| SF Form 368 | Product Quality Deficiency Report |

A-3. FIELD MANUALS.

| | |
|--------------------|----------------------------|
| FM 5-25 | Explosives and Demolitions |
| FM 21-11 | First Aid for Soldiers |

A-4. TECHNICAL MANUALS.

| | |
|-------------------------------|---|
| TM 3-4240-276-30&P | Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Purifier, Air M2A1 (4240-00-307-7805), Purifier, Air M2A2 (4240-00-868-7906), and Precleaned and Particulate Filter Assembly M1A1-19(4240-01-026-3112). |
| TM 9-214 | Inspection, Care, and Maintenance of Antifriction Bearings |
| TM 9-237 | Operator's Manual for Welding Theory and Application |
| TM 9-2350-238-10 | Operator's Manual for Recovery Vehicle, Full-Tracked: Light, Armored, M578 (2350-00-439-6242) |
| TM 9-2350-238-20-2 | Unit Maintenance Manual for Recovery Vehicle, Full-Tracked: Light, Armored, M578 (2350-00-439-6242) Crane (Cab) Components |
| TM 9-2350-238-24P-2 | Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Recovery Vehicle, Full-Tracked, Light, Armored, M578 (2350-00-439-6242) Crane (Cab) Components |

A-4. TECHNICAL MANUALS (CONT).

- TM 9-2350-238-34-1 Direct Support and General Support Maintenance Manual for Recovery Vehicle, Full-Tracked: Light, Armored, M578 (2350-00-439-6242) Hull and Related Components

- TM 9-2350-274-BD Operator's, Organizational, Direct Support and General Support Maintenance for Battlefield Damage Assessment and Repair: for MI 09/M110/M578 Vehicles

- TM 9-4940-468-14 Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Tool Outfit, Hydraulic Systems Test and Repair (HSTRU) (4940-01-036-5784)

- TM 43-0139 Painting Instructions for Field Use

- TM 750-244-5-1 Destruction of Conventional Ammunition and Improved Conventional Munitions to Prevent Enemy Use

- TM 750-244-6 Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use

- TM 750-244-7 Procedures for Destruction of Equipment in Federal Supply Classification 1000, 1005, 1010, 1015, 1020, 1025, 1030, 1055, 1090, and 1095 to Prevent Enemy Use

A-5. MISCELLANEOUS PUBLICATIONS.

- CTA8-100 Army Medical Department Expendable/Durable Items

- CTA 50-970 Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items)

- DA PAM 738-750 , The Army Maintenance Management Systems (TAMMS)

- MIL-STD-1261C(MR) Arc Welding Procedures for Constructional Steels

APPENDIX B

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section 1. INTRODUCTION

B-1. SCOPE. This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M578 Armored, Light, Full-Track Recovery Vehicle. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

B-2. EXPLANATION OF COLUMNS.

a. *Column (1)–Item Number.* This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., adhesive (item 1, appx B).

b. *Column (2)–Level.* This column identifies the lowest level of maintenance that requires the listed item,

F–Direct Support Maintenance
H–General Support Maintenance

c. *Column (3)–National Stock Number,* This is the national stock number assigned to the item; use it to request or requisition the item.

d. *Column (4)–Description.* Indicates the Federal item name and, if required, a description to identify the item, The last line for each item indicates the Contractor and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. *Column (5)–Unit of Measure (U/M).* Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER | (4) DESCRIPTION | (5) U/M |
|-----------------------|--------------|--|---|----------------|
| 1 | F | 8040-00-204-5841 8040-00-264-5840 8040-00-543-7170 | ADHESIVE MM-A-189 402 can 1 gal. container 1 pint can | OZ GL PT |

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CONT)

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER | (4) DESCRIPTION | (5) U/M |
|-----------------------|--------------|--|---|----------------|
| 2 | F | 8040-00-118-2695 | ADHESIVE SILICONE: RTV MIL-A-46146 one tube | TB |
| 3 | F | 5350-00-221-0872 | CLOTH, CROCUS: 9 x 11 sheet (81348)P-C-458 | EA |
| 4 | F | 8305-01-152-3587 | CLOTH, LINT-FREE (81349)MIL-C-40129 45 in. (114.30 cm) wide | SH |
| 5 | F | 6850-00-281-3061 6850-00-281-1985 | DRY CLEANING SOLVENT: liquid, white, 140 degree flash point (SD-2) (81348) P-D-680 4 oz can 1 gal. can | OZ GL |
| 6 | F | 8010-01-229-9561 | ENAMEL, olive drab (8134 Mil-C-22750, Type 1 (chg 2) 1 gal. can | GL |
| 7 | F | 8010-01-154-2334 | ENAMEL, white (81348) MIL-C-22750, Type 1 (chg 2) 1 pint can | PT |
| 8 | F | 5350-00-598-5537 | FLINT ABRASIVE PAPER (58536) A-A-1202 | SH |
| 9 | F | 9150-01-197-7693 9150-01-197-7689 9150-01-197-7691 | GREASE, AUTOMOTIVE AND ARTILLERY: (GAA) (81349) MIL-G-10924 14 oz carton 1.75 lb can 6.5 lb can | OZ LB LB |
| 10 | F | 9150-00-935-9807 9150-00-935-5808 | HYDRAULIC FLUID, PETROLEUM BASE: (OHT) (81349) MIL-G-6083 1 qt can 1 gal. can | QT GL |
| 11 | F | 5350-00-193-7227 | LAPPING GRINDING COMPOUND (58536) A-A-1203 | TB |

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CONT)

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER | (4) DESCRIPTION | (5) U/M |
|-----------------------|--------------|--|--|----------------------------|
| 12 | | Deleted | | |
| 13 | F | 9150-00-231-2350 | LUBRICATING OIL (8.349)MIL-L-3150 | GL |
| 14 | F | 9150-00-402-2372 | LUBRICATING OIL, ENGINE (15445) CONOCO 600 fluid 1 qt can | QT |
| 15 | F | 9150-00-189-6727 9150-00-186-6668 9150-00-191-2772 9150-01-152-4114 9150-01-152-4118 | OIL, LUBRICATING, INTERNAL COMBUSTION ENGINE: (OE/HDO) (81349)MIL-L-2104B 1 qt can OE/HDO 10 1 gal can OE/HDO 10 55 gal drum OE-10 1 qt can 15W40 1 qt 1 gal can 15W40 1 gallon | QT GL DR QT GL |
| 16 | F | 5610-00-141-7838 | PAINT, NONSLIP (81349)MIL-W-5044 | GL |
| 17 | F | 8010-00-142-9279 | PRIMER, RUST INHIBITOR [81349)MIL-P-2337, Type 1 (chg 2) | QT |
| 18 | F | 8030-00-081-2339 8030-00-900-4412 | SEALING COMPOUND: blue, liquid, C or CV (80244)MIL-S-22473 10 cc bottle 250 cc bottle | C C C C |
| 19 | F | 8030-00-081-2325 | SEALING COMPOUND, class 20 or 21 (81349)MIL-S-40083 50 cc bottle | BT |
| 20 | F | 8030-01-069-3046 | SEALING COMPOUND: type 11 grade M (81349)MIL-S-46163 50 cc bottle | BT |

APPENDIX C

ILLUSTRATED LIST OF MANUFACTURED ITEMS

C-1. INTRODUCTION. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at direct support and general support maintenance.

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

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

C-2. MANUFACTURED ITEMS PART NUMBER INDEX.

| Part Number | Figure Number |
|--------------------------|---------------|
| 595552 | 1 |
| Non applicable | 2 |

C-3. MANUFACTURED ITEMS ILLUSTRATIONS.

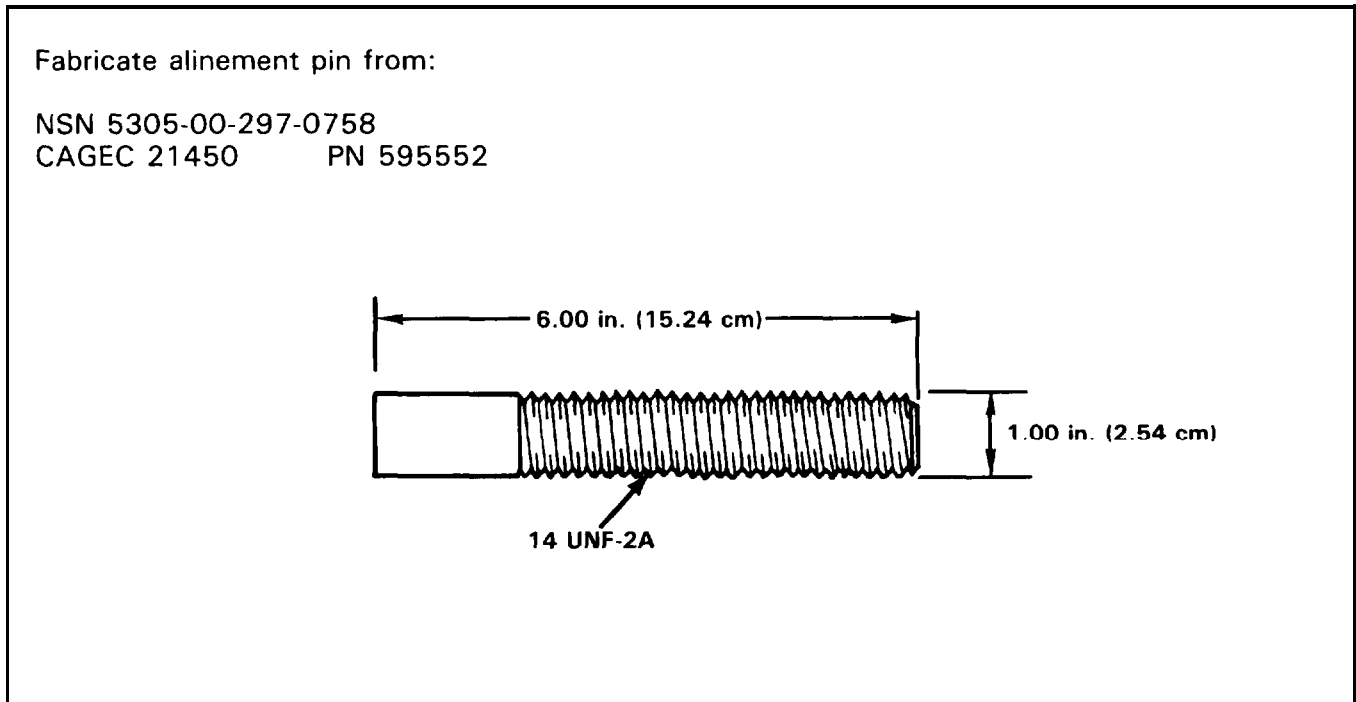


Figure 1. Alinement Pin (595552).

C-3. MANUFACTURED ITEMS ILLUSTRATIONS (CONT).

Fabricate pipe with cutout from: Use steel pipe with a wall at least $\frac{3}{16}$ -in. (0.48 cm) thick. Inside diameter can be from 2- $\frac{3}{4}$ to 3- $\frac{1}{8}$ -in. (6.99 to 7.94 cm).

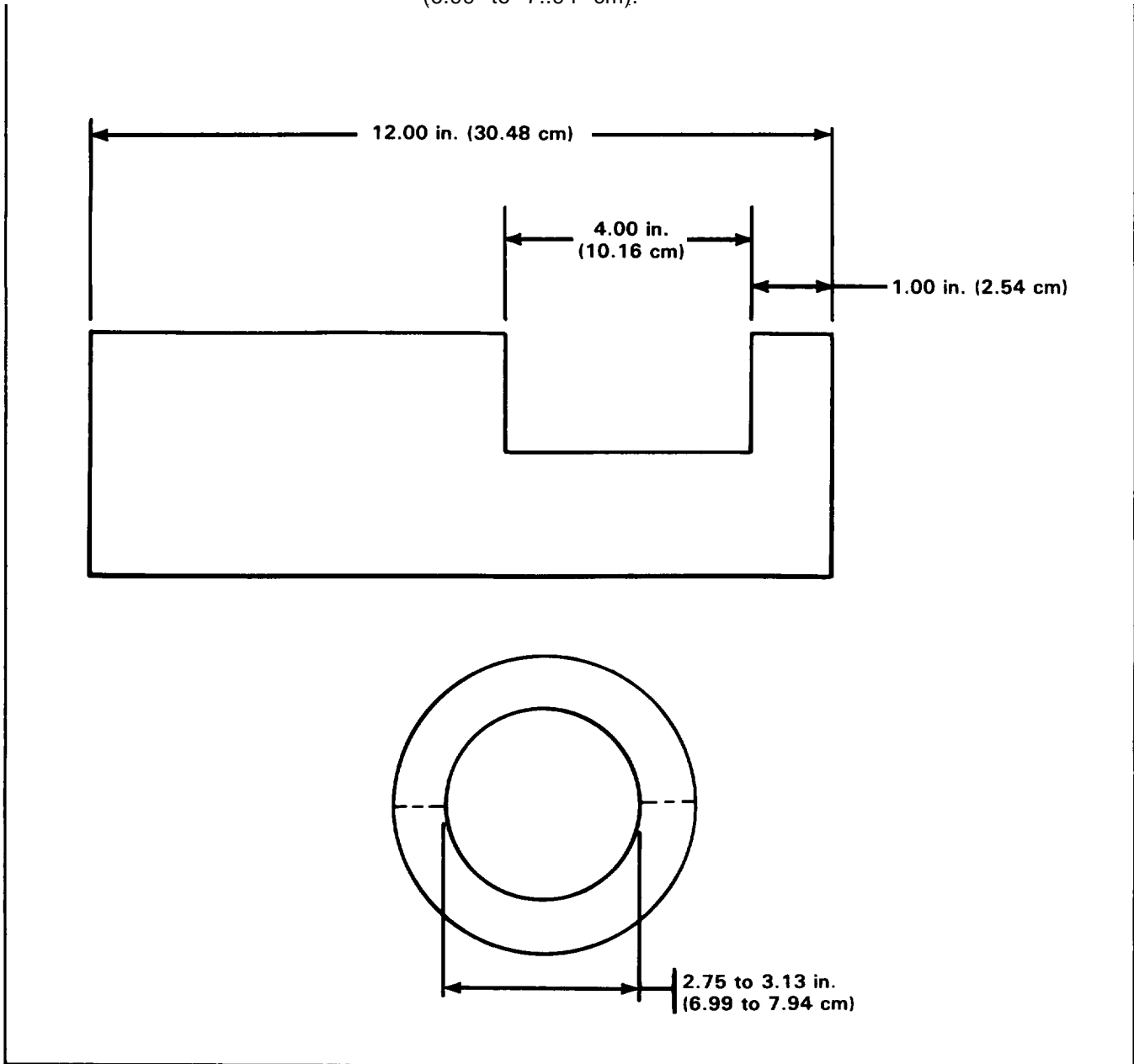


Figure 2. Pipe With Cutout.

APPENDIX D TORQUE VALUES

D-1. Follow torque values given throughout this manual. When no torque value is given, follow the guide to prevent damaging parts.

D-2. The guide is based on using clean, dry threads.

TORQUE VALUE GUIDE

| SCREW DIAMETER | TORQUE NO DASHES (SAE GRADE 2) | TORQUE 3 DASHES (SAE GRADE 5) | TORQUE 6 DASHES (SAE GRADE 8) | SOCKET SIZE |
|-------------------|--------------------------------------|-------------------------------------|-------------------------------------|----------------|
| 1/4-20 UNC | 3-5 ft-lb (4-7 N-m) | 6-8 ft-lb (8-11 N-m) | 10-12 ft-lb (14-16 N-m) | 7/16 |
| 1/4-28 UNF | 4-6 ft-lb (5-8 N-m) | 8-10 ft-lb (11-14 N-m) | 9-14 ft-lb (12-19 N-m) | 7/16 |
| 5/16-18 UNC | 7-11 ft-lb (9-15 N-m) | 13-17 ft-lb (18-23 N-m) | 19-24 ft-lb (26-33 N-m) | 1/2 |
| 5/16-24 UNF | 7-11 ft-lb (9-15 N-m) | 14-19 ft-lb (19-26 N-m) | 23-28 ft-lb (31-38 N-m) | 1/2 |
| 3/8-16 UNC | 14-18 ft-lb (19-24 N-m) | 26-31 ft-lb (35-42 N-m) | 39-44 ft-lb (53-60 N-m) | 9/16 |
| 3/8-24 UNF | 15-19 ft-lb (20-26 N-m) | 30-35 ft-lb (41-47 N-m) | 46-51 ft-lb (62-69 N-m) | 9/16 |
| 7/16-14 UNC | 23-28 ft-lb (31-38 N-m) | 44-49 ft-lb (60-66 N-m) | 65-70 ft-lb (88-95 N-m) | 5/8 |
| 7/16-20 UNF | 23-28 ft-lb (31-38 N-m) | 44-54 ft-lb (60-73 N-m) | 69-79 ft-lb (94-107 N-m) | 5/8 |
| 1/2-13 UNC | 32-37 ft-lb (43-50 N-m) | 65-75 ft-lb (88-102 N-m) | 95-105 ft-lb (129-142 N-m) | 3/4 |
| 1/2-20 UNF | 34-41 ft-lb (46-56 N-m) | 73-83 ft-lb (99-113 N-m) | 113-123 ft-lb (153-167 N-m) | 3/4 |
| 9/16-12 UNC | 46-56 ft-lb (62-76 N-m) | 100-110 ft-lb (136-149 N-m) | 145-155 ft-lb (197-210 N-m) | 13/16 |
| 9/16-18 UNF | 47-57 ft-lb (64-77 N-m) | 107-117 ft-lb (145-159 N-m) | 165-175 ft-lb (224-237 N-m) | 13/16 |
| 5/8-11 UNC | 62-72 ft-lb (84-98 N-m) | 140-150 ft-lb (190-203 N-m) | 200-210 ft-lb (271-285 N-m) | 15/16 |
| 5/8-18 UNF | 67-77 ft-lb (91-104 N-m) | 153-163 ft-lb (207-221 N-m) | 235-245 ft-lb (319-332 N-m) | 15/16 |
| 3/4-10 UNC | 106-116 ft-lb (144-157 N-m) | 260-270 ft-lb (353-366 N-m) | 365-375 ft-lb (495-508 N-m) | 1-1/4 |
| 3/4-16 UNF | 115-125 ft-lb (156-169 N-m) | 268-278 ft-lb (363-377 N-m) | 417-427 ft-lb (565-579 N-m) | 1-1/4 |
| 7/8-9 UNC | 165-175 ft-lb (224-237 N-m) | 385-395 ft-lb (522-536 N-m) | 595-605 ft-lb (807-820 N-m) | 1-5/16 |

TORQUE VALUE GUIDE (CONT)

| SCREW DIAMETER | TORQUE NO DASHES (SAE GRADE 2) | TORQUE 3 DASHES (SAE GRADE 5) | TORQUE 6 DASHES (SAE GRADE 8) | SOCKET SIZE |
|----------------|----------------------------------|------------------------------------|------------------------------------|-------------|
| 7/8-14 UNF | 178-188 ft-lb (241-255 N-m) | 424-434 ft-lb (575-588 N-m) | 663-673 ft-lb (899-912 N-m) | 1-5/16 |
| 1-8 UNC | 251-261 ft-lb (340-354 N-m) | 580-590 ft-lb (786-800 N-m) | 900-910 ft-lb (1220-1234 N-m) | 1-1/2 |
| 1-14 UNF | 255-265 ft-lb (346-359 N-m) | 585-634 ft-lb (793-860 N-m) | 943-993 ft-lb (1279-1346 N-m) | 1-1/2 |
| 1-1/4-7 UNC | 451-461 ft-lb (611-625 N-m) | 1070-1120 ft-lb (1451-1518 N-m) | 1767-1817 ft-lb (2396-2463 N-m) | 1-7/8 |
| 1-1/4-12 UNF | 488-498 ft-lb (662-675 N-m) | 1211-1261 ft-lb (1642-1710 N-m) | 1963-2013 ft-lb (2661-2729 N-m) | 1-7/8 |
| 1-1/2-6 UNC | 727-737 ft-lb (986-999 N-m) | 1899-1949 ft-lb (2575-2642 N-m) | 3111-3161 ft-lb (4218-4286 N-m) | 2-1/4 |
| 1-1/2-12 UNF | 816-826 ft-lb (1106-1120 N-m) | 2144-2194 ft-lb (2907-2975 N-m) | 3506-3556 ft-lb (4753-4821 N-m) | 2-1/4 |

APPENDIX E

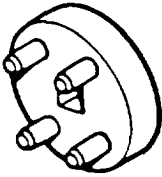
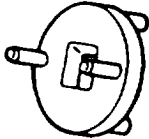
SPECIAL TOOLS AND EQUIPMENT

E-1. GENERAL. Repair parts, special tools, and support equipment are issued for maintaining the vehicle. Tools and equipment should not be used for purposes other than those prescribed. When not in use, they should be properly stowed.

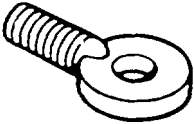
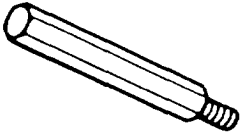
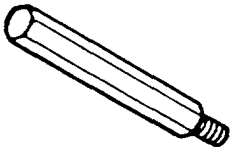
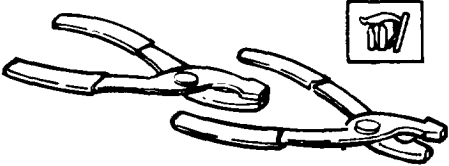
E-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT. Special tools and equipment necessary to perform the maintenance described in this manual are listed for your information. Special tools and support equipment are listed in TM 9-2350-238-24P-2 which is the authority for requisitioning replacements.

E-3. REPAIR PARTS. Repair parts are issued for the replacement of parts that have become worn, broken, or otherwise unserviceable. Repair parts are listed in TM 9-2350-238-24P-2 which is the authority for requisitioning replacements,

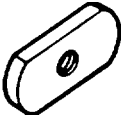
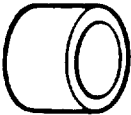
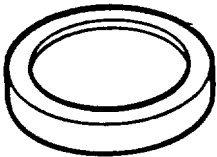

SPECIAL TOOLS AND EQUIPMENT

| ITEM | NUMBER | USE |
|---|--------------------------------|--|
|  ADAPTER | 4910-00-842-3063 (11631430) | Top adjust traversing power unit slip clutch. Used with torque wrench. |
|  ADAPTER, RETAINER | 5120-00-472-2731 (11643222) | Used to remove turret bearing plug retainer. |

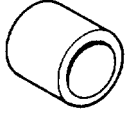
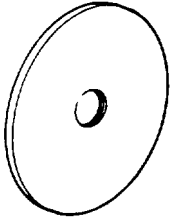
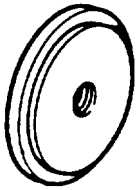
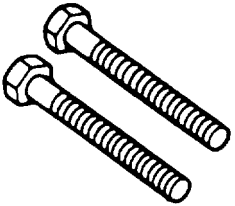
SPECIAL TOOLS AND EQUIPMENT (CONT)

| ITEM | NUMBER | USE |
|---|---------------------------------------|--|
|  <p>BOLT, EYE LIFTING</p> | <p>5306-00-522-2910 (5222910)</p> | <p>To lift turret bearing (three required).</p> |
|  <p>HANDLE, REMOVER AND REPLACER</p> | <p>5120-00-316-9182 (7950864)</p> | <p>Used with 5120-00-722-4063 and 5120-00-722-4071, remover and replacer.</p> |
|  <p>HANDLE, REPLACER</p> | <p>5120-00-708-3883 (7083883)</p> | <p>To install encased oil seal in oil seal retainer.</p> |
|  <p>PLIERS SET, RETAINING RING</p> | <p>5120-01-080-8378 (PR36)</p> | <p>Used to remove retainer caps from relief valve (12253774), pressure relief valve (12253776), and solenoid valve (12253777).</p> |

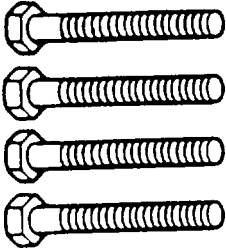
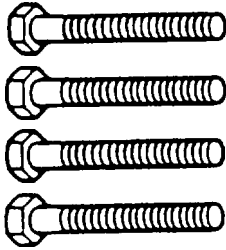
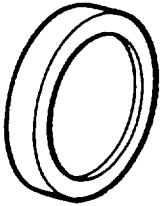
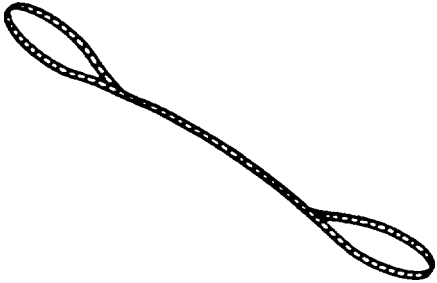
SPECIAL TOOLS AND EQUIPMENT (CONT)

| ITEM | NUMBER | USE |
|---|--|---|
|  <p>REMOVER AND REPLACER, BEARING</p> | <p>5120-00-722-4063 (10902750)</p> | <p>Used with handle 5120-00-316-9182 to replace idler gear bearings, pinion bearing, or planetary gear.</p> |
|  <p>REMOVER AND REPLACER, BEARING AND CLUTCH</p> | <p>5120-00-733-8932 (10904175)</p> | <p>To replace traversing internal gear bearing or remove slip clutch cup from bevel pinion.</p> |
|  <p>REPLACER</p> | <p>5120-00-733-8915 (10904173)</p> | <p>To replace lower traversing unit seals. Used with handle (5120-00-316-9182).</p> |
|  <p>REPLACER, BEARING</p> | <p>5120-00-733-8962 (10904194)</p> | <p>To replace elevating or traversing power unit miter gear bearings.</p> |

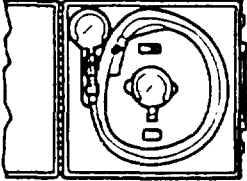

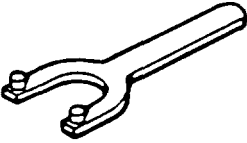
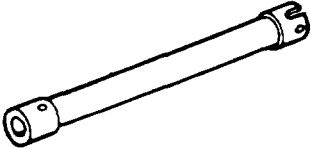
SPECIAL TOOLS AND EQUIPMENT (CONT)

| ITEM | NUMBER | USE |
|--|--|---|
|  <p>REPLACER, BEARING</p> | <p>5120-00-602-4855 (8350230)</p> | <p>To replace elevating or traversing power unit differential gear bearings.</p> |
|  <p>REPLACER, BEARING CUP</p> | <p>5120-00-722-4071 (10902752)</p> | <p>To replace boom pulley bearing cup, Used with handle (5120-00-708-3883).</p> |
|  <p>REPLACER, OIL SEAL</p> | <p>5120-00-733-8451 (10904181)</p> | <p>To replace traversing power unit lower oil seal. Use with handle (5120-00-708-3883).</p> |
|  <p>SCREW, JACKING</p> | <p>4910-00-722-3915 (10904195)</p> | <p>To remove traversing internal gear bearing (two required per operation).</p> |

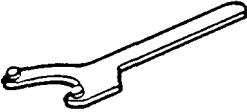
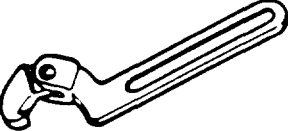
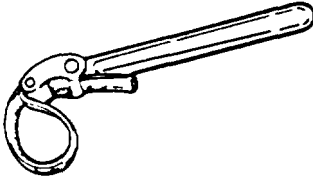
SPECIAL TOOLS AND EQUIPMENT (CONT)

| ITEM | NUMBER | USE |
|--|--|---|
|  <p>SCREW, JACKING</p> | <p>5305-00-017-9843 (MS90728-64)</p> | <p>Used to remove boom winch bearing winch housing from planetary (boom) winch.</p> |
|  <p>SCREW, JACKING</p> | <p>5305-00-719-5270 (MS90727-123)</p> | <p>Used to remove winch brake housing from the tow winch assembly.</p> |
|  <p>SEAL INSERTER</p> | <p>5120-00-733-8915 (10904173)</p> | <p>To replace traversing final drive seals.</p> |
|  <p>SLING</p> | <p>4933-00-389-0349 (RE1-91-16018)</p> | <p>To lift winches, boom cylinders, and other assemblies.</p> |

SPECIAL TOOLS AND EQUIPMENT (CONT)

| ITEM | NUMBER | USE |
|--|--|--|
|  <p>TESTER, OIL PRESSURE</p> | <p>4910-00-572-8612 (8356176)</p> | <p>Used to check/adjust hydraulic valves.</p> |
|  <p>THERMOMETER, SELF-INDICATING, 12 in. LONG, 0-220°F</p> | <p>6685-00526-8122 (1797)</p> | <p>Used to check temperature of oil in hydraulic reservoir during boom drop rate test.</p> |
|  <p>WRENCH, LOCKOUT CYLINDER LOCKNUT</p> | <p>5120-00-733-8982 (10904219)</p> | <p>To remove winch control cylinder head.</p> |
|  <p>WRENCH, SOCKET</p> | <p>5120-00-610-5331 (6105331)</p> | <p>To remove or install counter-recoil rod nut</p> |

SPECIAL TOOLS AND EQUIPMENT (CONT)

| ITEM | NUMBER | USE |
|--|---|---|
|  <p data-bbox="294 668 574 697">WRENCH, SPANNER</p> | <p data-bbox="728 485 987 549">5120-00-062-9477 (10909066)</p> | <p data-bbox="1063 485 1493 549">To remove boom cylinder head locknut.</p> |
|  <p data-bbox="294 1059 574 1089">WRENCH, SPANNER</p> | <p data-bbox="728 874 987 938">5120-00-277-9075 (GGG-W-665)</p> | <p data-bbox="1063 874 1427 938">To remove power unit traversing gear locknut.</p> |
|  <p data-bbox="315 1449 558 1478">WRENCH, STRAP</p> | <p data-bbox="728 1264 987 1327">5120-00-262-8491 (GGG-W-651)</p> | <p data-bbox="1063 1264 1443 1327">To assemble boom cylinder eye to piston rod.</p> |

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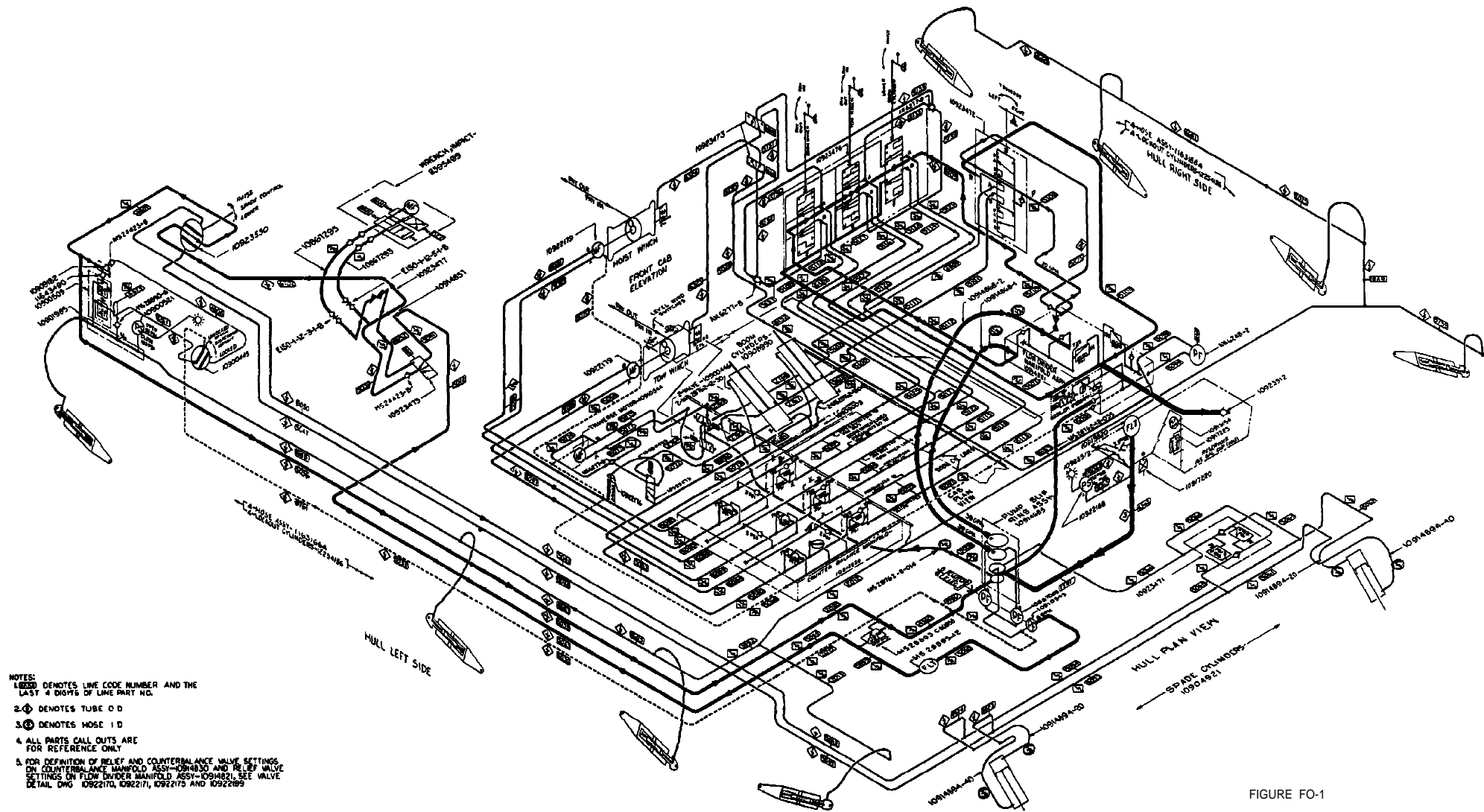
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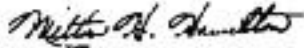
- NOTES:
1. E235 DENOTES LINE CODE NUMBER AND THE LAST 4 DIGITS OF LINE PART NO.
 2. Ⓣ DENOTES TUBE O D
 3. Ⓜ DENOTES HOSE I D
 4. ALL PARTS CALL OUTS ARE FOR REFERENCE ONLY
 5. FOR DEFINITION OF RELIEF AND COUNTERBALANCE VALVE SETTINGS ON COUNTERBALANCE MANIFOLD ASSY-1094830 AND RELIEF VALVE SETTINGS ON FLOW DIVIDER MANIFOLD ASSY-1094821, SEE VALVE DETAIL DWG 10922170, 10922171, 10922175 AND 10922189

FIGURE FO-1

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
01038

DISTRIBUTION:

To be distributed in accordance with DA Form 37-E, (Block 1443),
Direct and General Support Maintenance requirements for TM 9-2350-34-2.

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 THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

Your mailing address

DATE SENT Date you filled out this form

PUBLICATION NUMBER
TM 9-2350-238-34-2

PUBLICATION DATE

PUBLICATION TITLE DS & GS Maint.
Manual for Recovery Vehicle, Full
Tracked, Light, Armored, M578

BE EXACT PIN-POINT WHERE IT IS

| PAGE NO | PARA-GRAPH | FIGURE NO | TABLE NO |
|---------|------------|-----------|----------|
| 2-III | 2-30 | | |

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Illustration should show two heptagon plain nuts instead of three.

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

Your name

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UNIT'S ADDRESS



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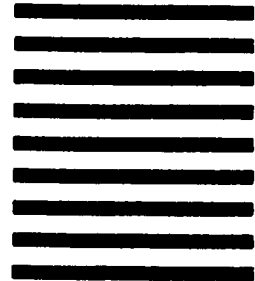
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TEAR ALONG PERFORATED LINE



METRIC CHART

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 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

WEIGHTS

1 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

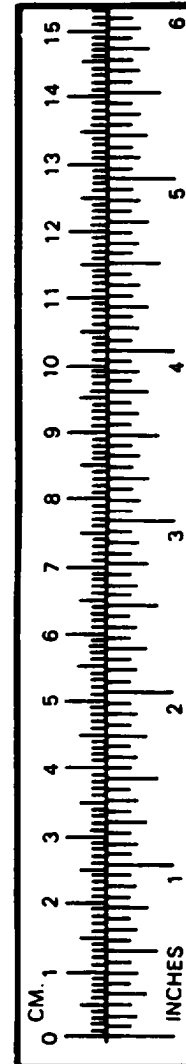
TEMPERATURE

$5/9 (°F - 32) = °C$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5 C° + 32 = F°$

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 |
| Pints | Liters | 0.473 |
| Quarts | Liters | 0.946 |
| Gallons | 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 |
| Liters | Gallons | 0.264 |
| Grams | Ounces | 0.035 |
| Kilograms | Pounds | 2.205 |
| Metric Tons | Short Tons | 1.102 |
| Newton-Meters | Pound-Feet | 0.738 |
| Kilopascals | Pounds per Square Inch | 0.145 |
| Kilometers per Liter | Miles per Gallon | 2.354 |
| Kilometers per Hour | Miles per Hour | 0.621 |



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