

Service Manual

Power Controlled
Skidder Winch

W3C

OIL BRAKE

SCH

2300481W

A Product of
Allied Systems
COMPANY
Sherwood, Oregon USA

Safety Precautions

Observe the following precautions to prevent injury to personnel and damage to equipment.

- Do not operate winch unless skidder is equipped with a rear screen for operator protection against cable breakage.
- Authorized operators only!
- Report damage or erratic operation of the winch immediately.
- Do not stand while operating the skidder or the winch.
- Make sure that instruments and controls are operative before working the unit.
- Do not use control levers or handles as machine mounting assists.
- Do not use control levers or handles as hangers for clothes, water bags, grease guns, lunch pails, etc.
- Do not permit personnel in the control area when working or making checks on the machine.
- Do not allow riders on the machine or load.
- Use extreme care when operating close to other machines.
- Avoid operating near anyone working or standing.
- Do not stand or permit others to stand in the bight (loop) of the cable.
- Do not stand or permit others to stand near the winch or cable when it is under tension.
- Do not work a damaged cable (broken wire or strands, or a decrease in the diameter of a cable, are warning signs).
- Do not leave the skidder while the winch line is under tension.
- Avoid pulling the hook over the drum and through the throat of the winch.
- Do not anchor a double or two-part line to the winch.
- When not operating the winch, always leave it in neutral with the brake on.
- Never attempt to clean, oil or adjust a machine while it is in motion.
- Use extreme care when removing cable and ferrule from the drum. When the ferrule is released, the cable may spring out with force.

Winch serial number _____

Date put into service _____

Warning



WARNING

Failure to follow these instructions can cause serious injury or death.

Authorized, trained operator only.

Know the equipment:

know the operating, inspection, and maintenance instructions in the skidder operating manual. Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the cable breaks.

Inspect the winch before use:

Make sure that the controls and instruments operate correctly. Report the need for repairs immediately. Do not work with a damaged or worn cable. Do not use a winch that needs repairs. If the ferrule and cable must be removed from the drum, make sure the end of the cable and ferrule are controlled when the cable is released. The end of the cable can suddenly move from the drum like a compressed spring when the ferrule is released, causing an injury.

Protect yourself:

Do not use the control levers for hand holds when entering or leaving the vehicle. Do not permit other people near the control area when you inspect or repair a machine. Never inspect, repair, or do maintenance on a machine that is in motion. Stay in the operator's seat. Do not stand on the vehicle when operating the winch.

Keep a clear work area:

Avoid winch operation near people or other machines.

Never stand or permit others to stand in the bight (loop) of a cable. Do not stand nor permit others to be near the winch or cable when there is tension on the cable. Observe jobsite rules. Be in complete control at all times.

Use common sense:

Do not use the control levers as hangers for clothes, water bags, grease guns, lunch pails, etc. Do not leave the vehicle when the winch cable is under tension. Do not permit riders on the vehicle or load. Do not use the winch as an anchor for a double or two-part line. Do not pull the hook through the throat or over the drum and cause damage. When the winch is not in use, make sure the control lever is in brake on position so that the winch brake is applied.



WARNING

Indicates a condition that can cause personal injury!



CAUTION

Indicates a condition that can cause property damage!



Lined area for notes, consisting of multiple horizontal lines.

Contents

Description	1-1	Repairs	4-1
Introduction	1-1	General	4-1
Description	1-1	Winch removal	4-1
Unit Identification	1-2	Winch installation	4-1
Serial Number Codes	1-3	Disassembly of the winch	4-2
Operation and Control	1-3	Front cover Removal	4-4
Power Operation	1-3	Clutch and Pinion Drive Gear Removal	4-7
Freespool Operation	1-4	Ring Gear Drum, Drum Shaft and Freespool Assembly Removal	4-9
Gear Train	1-4	Disassembly of the Clutch	4-13
Hydraulic Control	1-5	Assembly of the Winch	4-16
Oil clutch	1-6	Repair of hydraulic system components	4-16
Oil Brake	1-6	Visual Inspection	4-16
Control Valve	1-7	Assembly if Frame	4-18
Sequence of Operation - BRAKE ON	1-8	Ring Gear, Pinion and Drum Shaft	4-20
Sequence of Operation - LINE IN	1-9	Drum Assembly and Installation	4-25
Sequence of Operation - BRAKE OFF	1-10	Clutch Assembly	4-31
Sequence of Operation - FREESPOOL	1-11	Brake Shaft and Hub Assembly	4-37
Troubleshooting	2-1	Front Cover Assembly	4-38
Service	3-1	Brake Assembly	4-40
General	3-1	Control Valve	4-42
Maintenance	3-1	Removal	4-42
Checks and adjustments	3-1	Disassembly	4-42
Hydraulic system	3-1	Inspection	4-43
Preparation	3-1	Assembly	4-43
Pressure gauges	3-1	Specifications	4-44
Pressure check of the clutch	3-2	Torque Specifications	4-44
Pressure check of the brake	3-2	Hydraulic Pressure Specifications	4-44
Relief valve adjustment	3-2	Setup Dimensions	4-45
Freespool adjustment	3-2		
Coarse adjustment (bearing preload)	3-2		
Fine adjustment ("drag" shoe adjustment)	3-2		



Lined area for notes, consisting of numerous horizontal lines.

General

Introduction

This service manual is for the W3C skidder winch. The following information is included in this manual:

Section 1. General Includes operation and the assemblies are given as an aid for troubleshooting and repair.

Section 2. Troubleshooting gives a list of some common problems and the possible causes.

Section 3. Service gives a guide for periodic Maintenance, checks and adjustments.

Section 4. Repairs describes the removal, disassembly, assembly, and installation of the winch.

Description

The W3C winch has line in, brake off and freespool function. The brake off and freespool functions permit the cable to be pulled from the drum.

The W3C skidder winch is hydraulically controlled. The hydraulic oil is externally supplied by the skidder's hydraulic system. A remote mounted hydraulic valve controls the hydraulic flow to the clutch, brake, and freespool.

The W3C winch has a maximum line pull capacity of 183,250 n (41,200 lb.), Rated at 133,44 n (30,000 lb.), when there is one layer or less of cable on the drum. When there is more than one layer of cable on the drum, the maximum line pull is reduced.

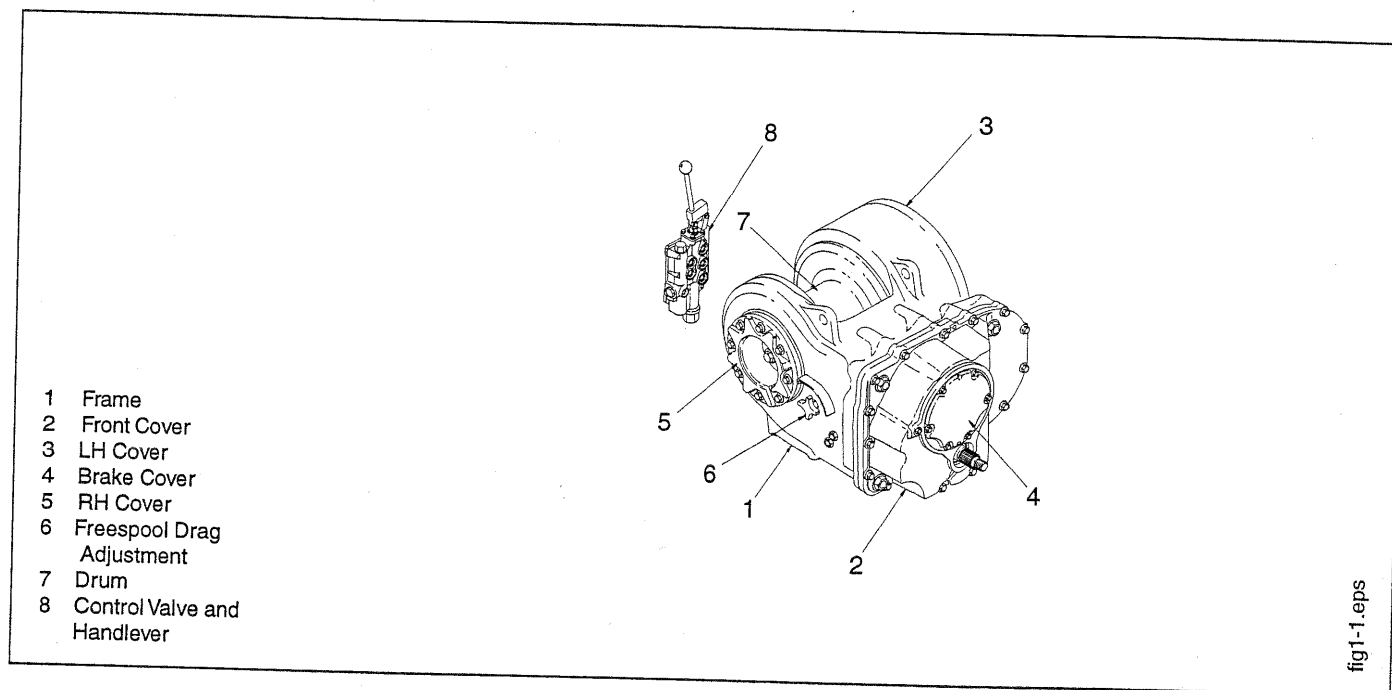
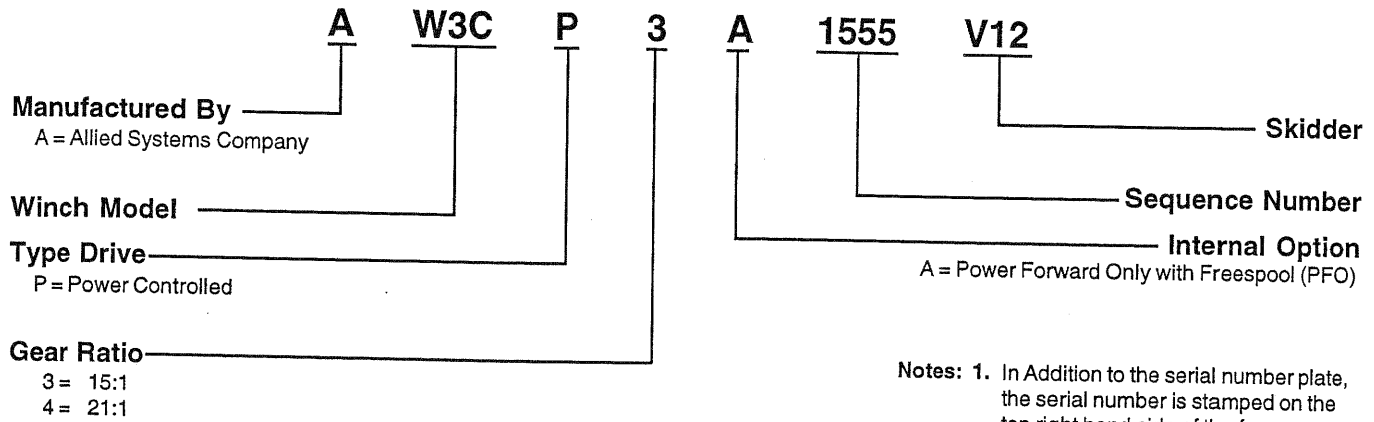


Figure 1-1 W3C Skidder Winch

Unit Identification



Notes: 1. In Addition to the serial number plate, the serial number is stamped on the top right hand side of the frame

Serial Number Codes

The nameplate with the serial number code is found below the drum shaft on the right side of the winch frame. The serial number code is also stamped on the top of the winch frame on the right side. The serial number codes are described on page 1-2 of this manual.

Operation and Control

A single control lever is used for winch control (See Fig. 1-5). The control lever is used to select one of the following operations:

- FREESPOOL
- BRAKE OFF
- BRAKE ON
- LINE IN

From the line in position the control lever will return to the brake on position when the control lever is released. A spring arrangement on the spool of the control valve returns the spool and control lever to the brake on position. A ball and detent will hold the spool and control lever in the brake off and freespool positions. The operator must pull the control lever from the brake off and freespool positions to return the control lever to the brake on position.

Power Operation

The brake on position is the neutral position. The clutch is not applied. Conical washer springs (also called belleville springs) in the brake apply the brake. The winch drum will not turn.

The LINE IN position engages the clutch and releases the brake. The winch will wind in the cable at a speed controlled by the rpm of the engine or the output rpm of the torque converter of the skidder.

The BRAKE OFF position releases the brake as the control lever is moved toward the detented brake off position (no hydraulic pressure is directed to the clutch). The brake friction is decreased as the operator pushes the control lever toward the brake off position. The skidder engine must be at low idle for best control. If there is a load on the cable, this position will permit the cable to unwind from the drum against the friction of the clutch, brake, and gear train. The speed that the cable unwinds is not controlled by the operator, but by the movement of the load or the travel speed of the vehicle.

Note: It is important that sufficient engine rpm be maintained in order to ensure that the hydraulic system sends 11 liters/min. (3 gpm) to the control valve for best control of brake off. The engine speed of most skidders must be approximately 1000 rpm.

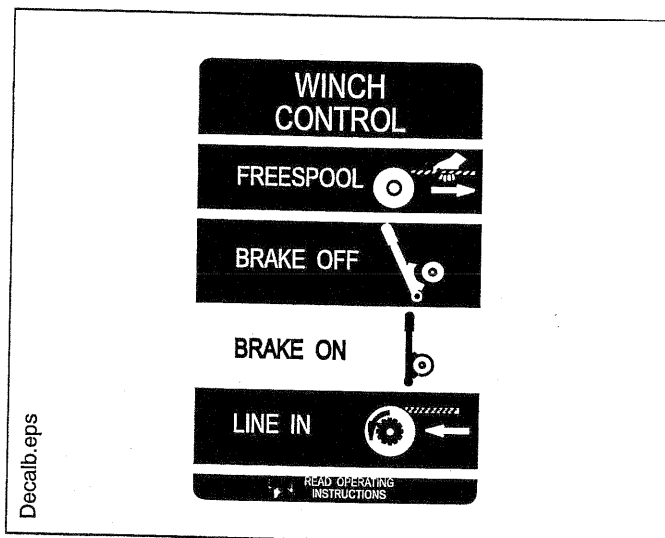


Figure 1-2 Operator Control Decal

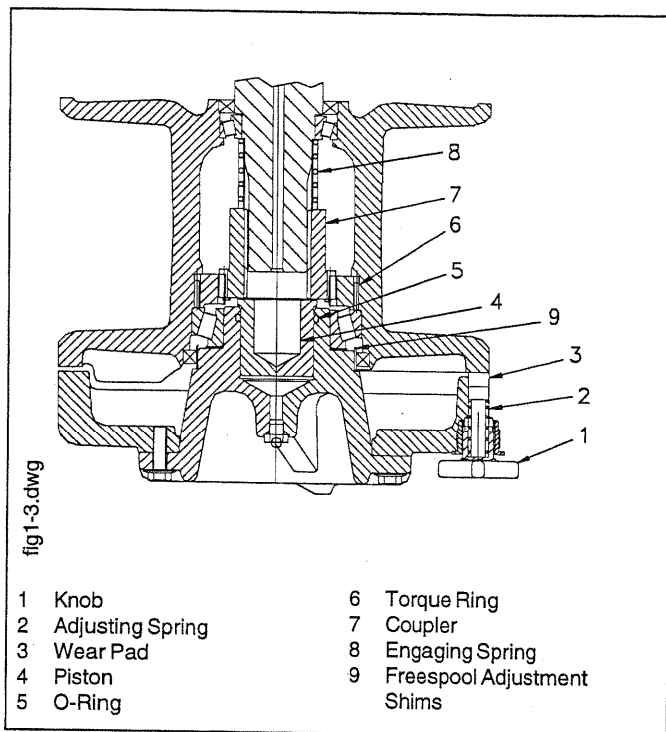


Figure 1-3 Freespool Operation

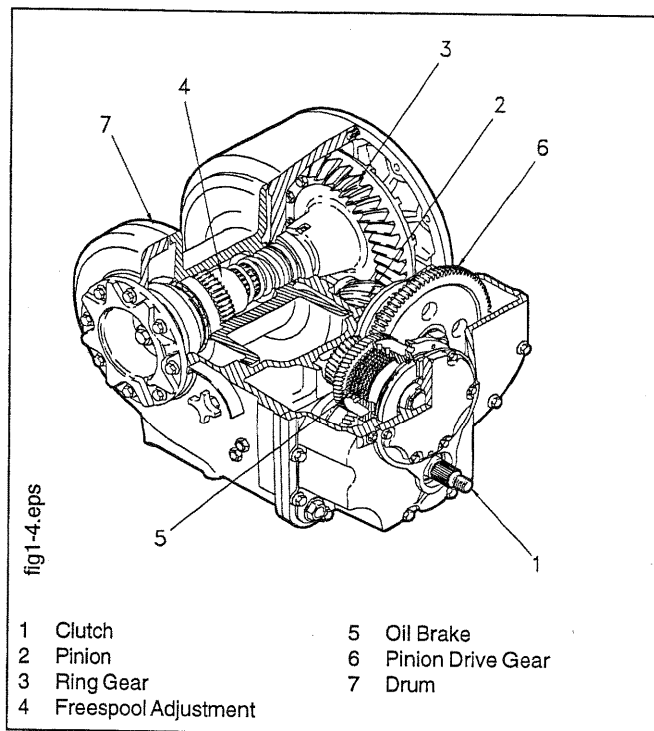


Figure 1-4 Gear Train

Freeseel Operation (See Fig. 1-3)



WARNING

Warning. When the control lever is moved to the freespool position, it always release the gear train and any load that may be on the cable. An uncontrolled release of the load may occur. Loss of the load can result in injury and damage.

When the control lever is moved to the freespool position, the winch drum is disengaged from the gear train. The freespool operation permits the cable to be pulled from the winch drum by hand. The amount of drag when in freespool is manually adjustable. See section 3, Service.

Gear Train (See Fig. 1-4)

The pto is connected to the input shaft of the winch. The input shaft turns the clutch housing. See Figs. 1-4 and 1-6. When the clutch is engaged and the brake released, power is transmitted by the gears to the drum. As the drum rotates, cable is pulled onto the winch drum.

The brake assembly is located on the forward end of the brake shaft. The brake hub is connected to the clutch hub by gears.

The brake hub, which is driven by the clutch hub, drives the pinion drive gear. The pinion drive gear drives the pinion, which in turn drives the ring gear, which is bolted to the drum shaft.

The drum shaft is connected to the drum by a freespool coupler. This hydraulically engages and disengages the shaft and drum.

Activating freespool disengages the drum from the geartrain as well as the brake and clutch so that cable can be pulled from the drum by hand.

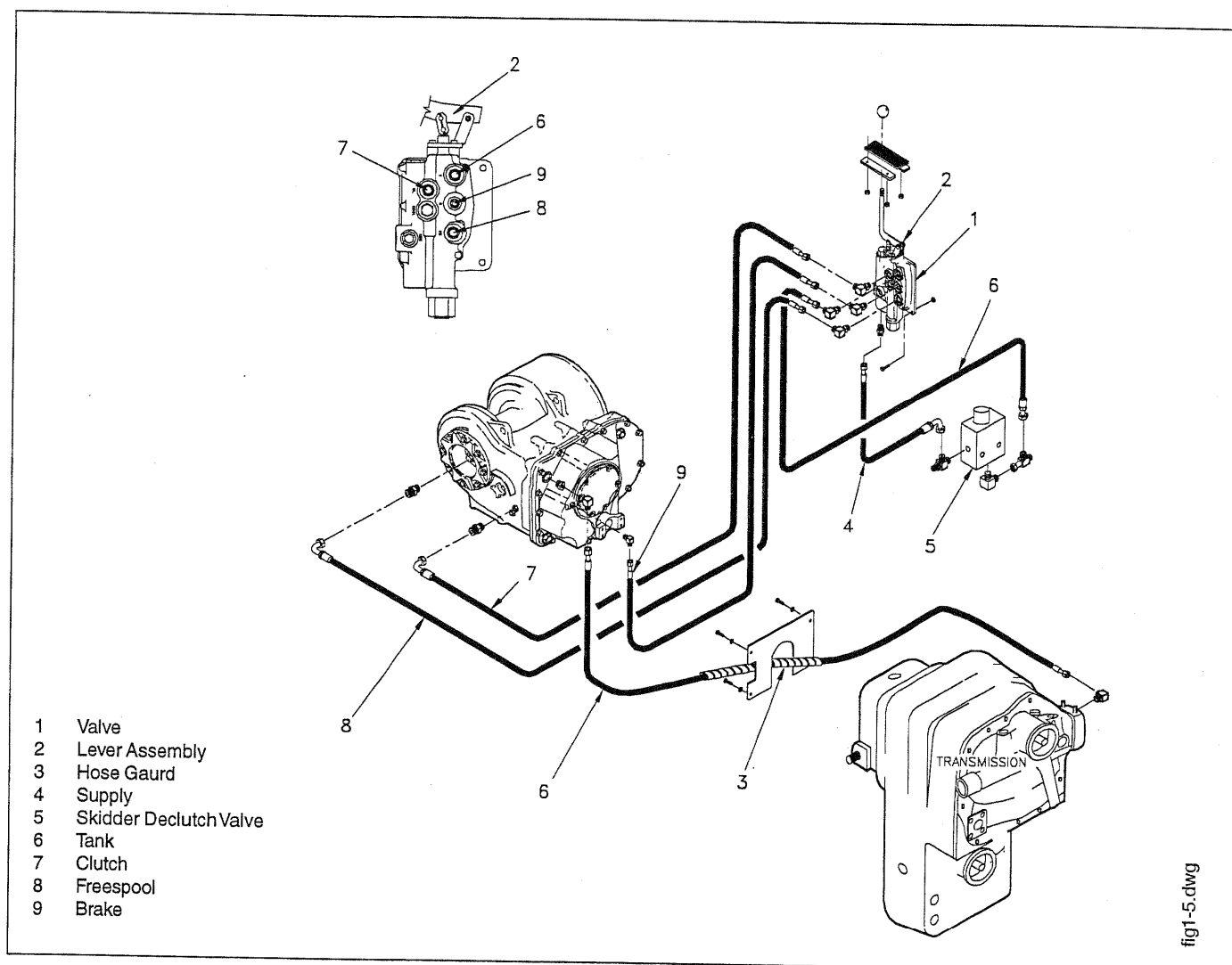


Figure 1-5 Hydraulic Control

Hydraulic Control (See Fig.1-5)

The operation of the winch is controlled by a hydraulic circuit. The skidder's hydraulic system directs the flow of oil for winch control functions. The control valve meters the flow and pressure of the hydraulic oil to the clutch, brake, and freespool when the hand lever is moved.

When the skidder's engine is operating, its hydraulic system provides pressure and flow. The hydraulic flow path of the various functions is depicted in Fig. 1-9 through Fig. 1-12.

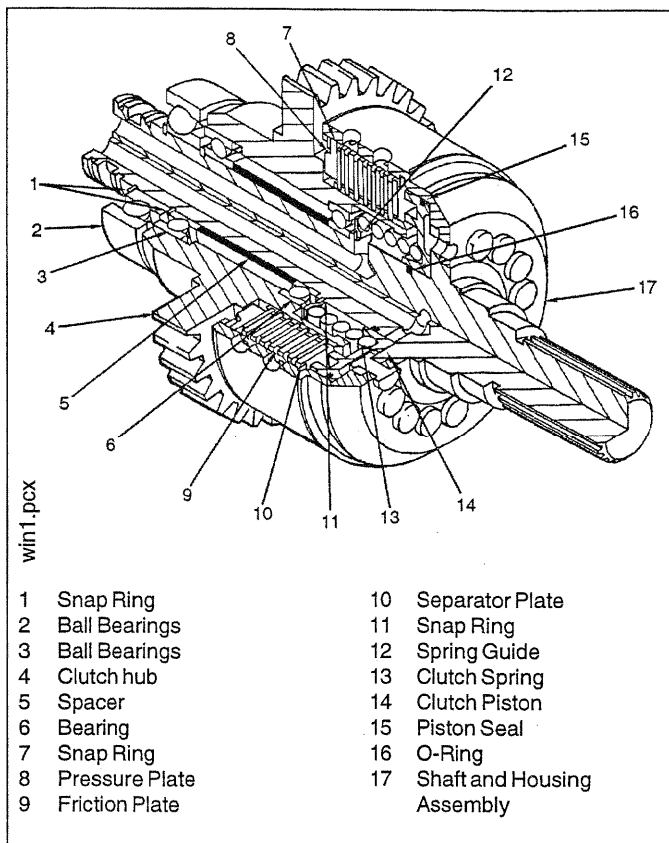


Figure 1-6 Oil Clutch

Oil clutch (See Fig. 1-6)

The clutch assembly has seven friction discs, seven separator plates, a clutch housing, piston assembly, and hub. The friction discs of the clutch are internally splined to the clutch hub. The separator plates have external teeth that fit the splines in the housing. The separator plates rotate with the housing. The piston and clutch housing rotate on the input shaft. Oil passages in the clutch shaft supply the oil pressure from the control valve to the piston. Hydraulic oil also cools and lubricates the bearings and internal components of the clutch. When the oil pressure pushes the piston against the separator plates and friction discs, the clutch is applied. The torque from the input shaft is transferred through the clutch and causes the winch to operate.

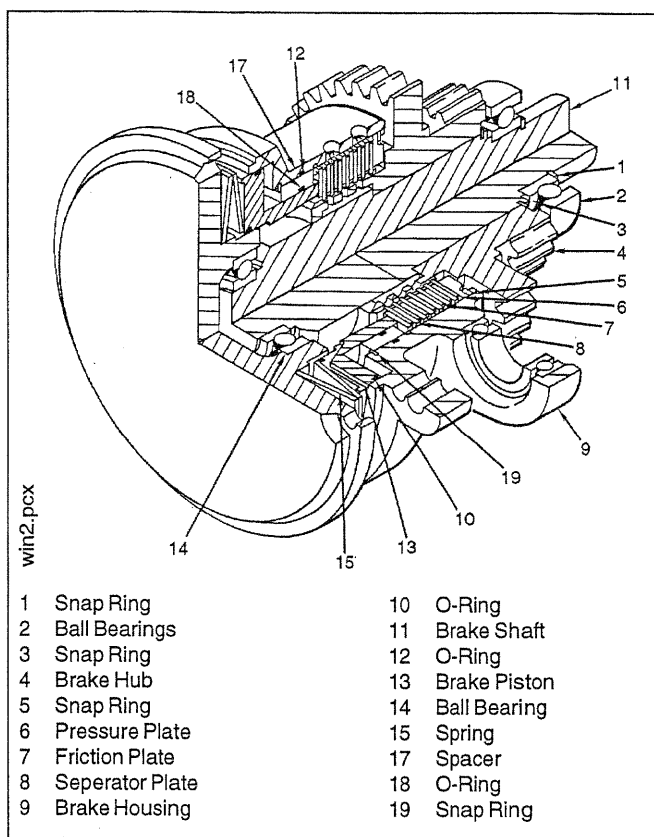


Figure 1-7 Oil Brake

Oil Brake (See Fig. 1-7)

The oil brake has seven friction discs and seven separator plates. The gear on the brake hub engages the gear on the clutch hub so that the clutch hub and brake hub rotate together. The separator plates have teeth that engage the splines inside the brake housing and are held stationary. Teeth in the friction discs engage the splines in the hub and rotate with the hub. The brake is applied by spring pressure from two conical washer springs in the brake housing. The conical washer springs push against a piston and the pressure is applied to the friction discs and the separator plates. When the brake is applied, the drum and gear train cannot rotate.

When the control valve sends hydraulic pressure to apply the clutch, the hydraulic pressure also releases the brake. The hydraulic pressure causes the piston to compress the conical washer springs and release the brake. The brake is released in the line in, freespool, and brake off positions of the control lever. The brake off function applies hydraulic pressure to release the brake, but no hydraulic pressure is sent to apply the clutch.

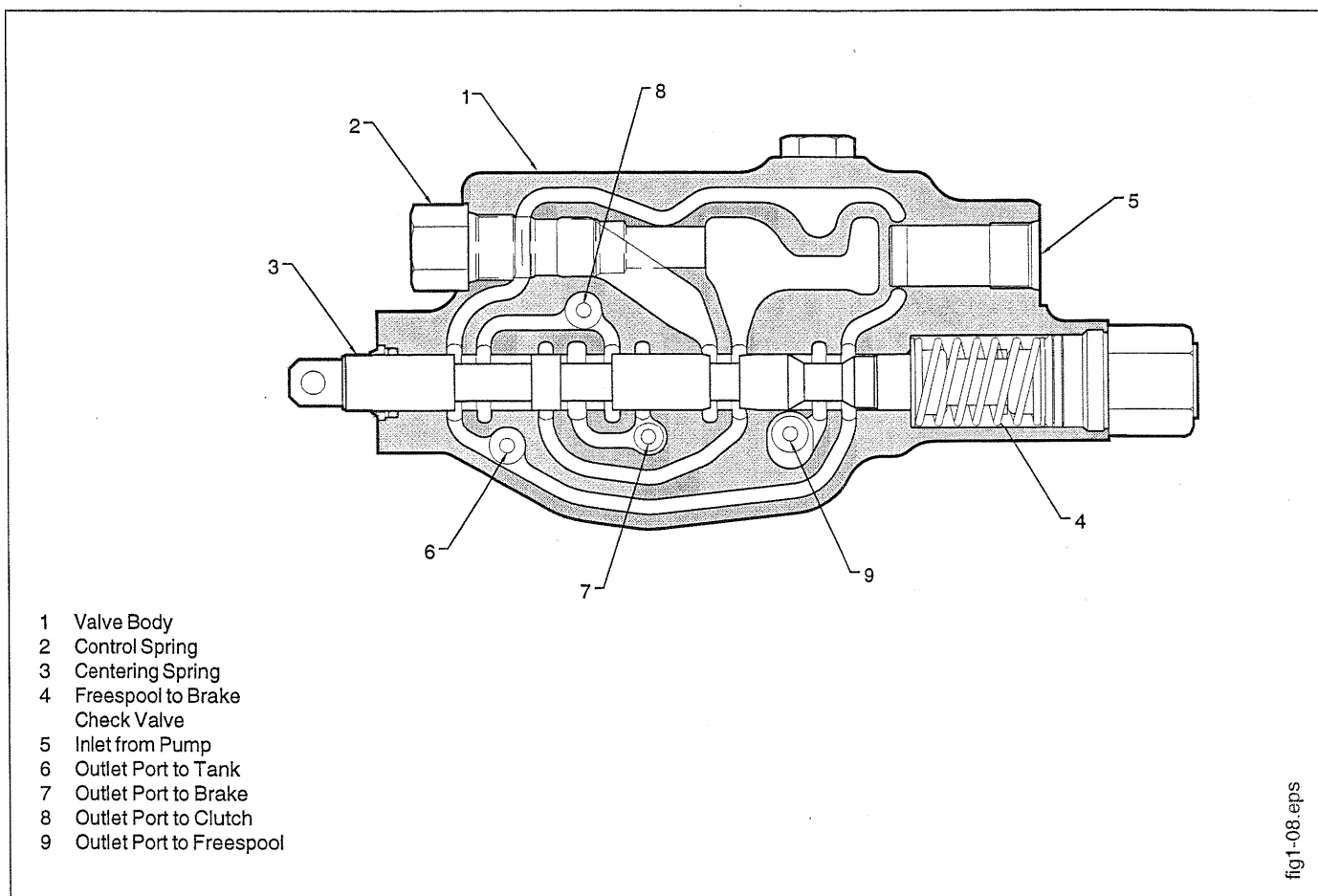


Figure 1-8 Control Valve

Ranger Skidder Control Valve (See Fig. 1-8)

The flow of hydraulic oil to and from the clutch, brake, and freespool is controlled by the control valve. The control valve is an closed center type hydraulic valve. Passages inside the valve body connect the oil flow and pressure with the functions that control the winch. The control valve spool opens and closes passages to apply and release the clutch, brake, and freespool.

The line in position of the control spool sends hydraulic oil to release the brake and apply the clutch. When the control spool is in the brake on position, the clutch is not applied, and conical washer springs apply the brake

A detent built into the valve assembly will hold the control spool in the brake off and freespool positions.

Sequence of Operation - BRAKE ON

- The conical washer springs have applied the brake. The brake shaft cannot rotate.
- The clutch is not applied. The PTO shaft cannot power the gear train.
- Only the input shaft/clutch has rotation.

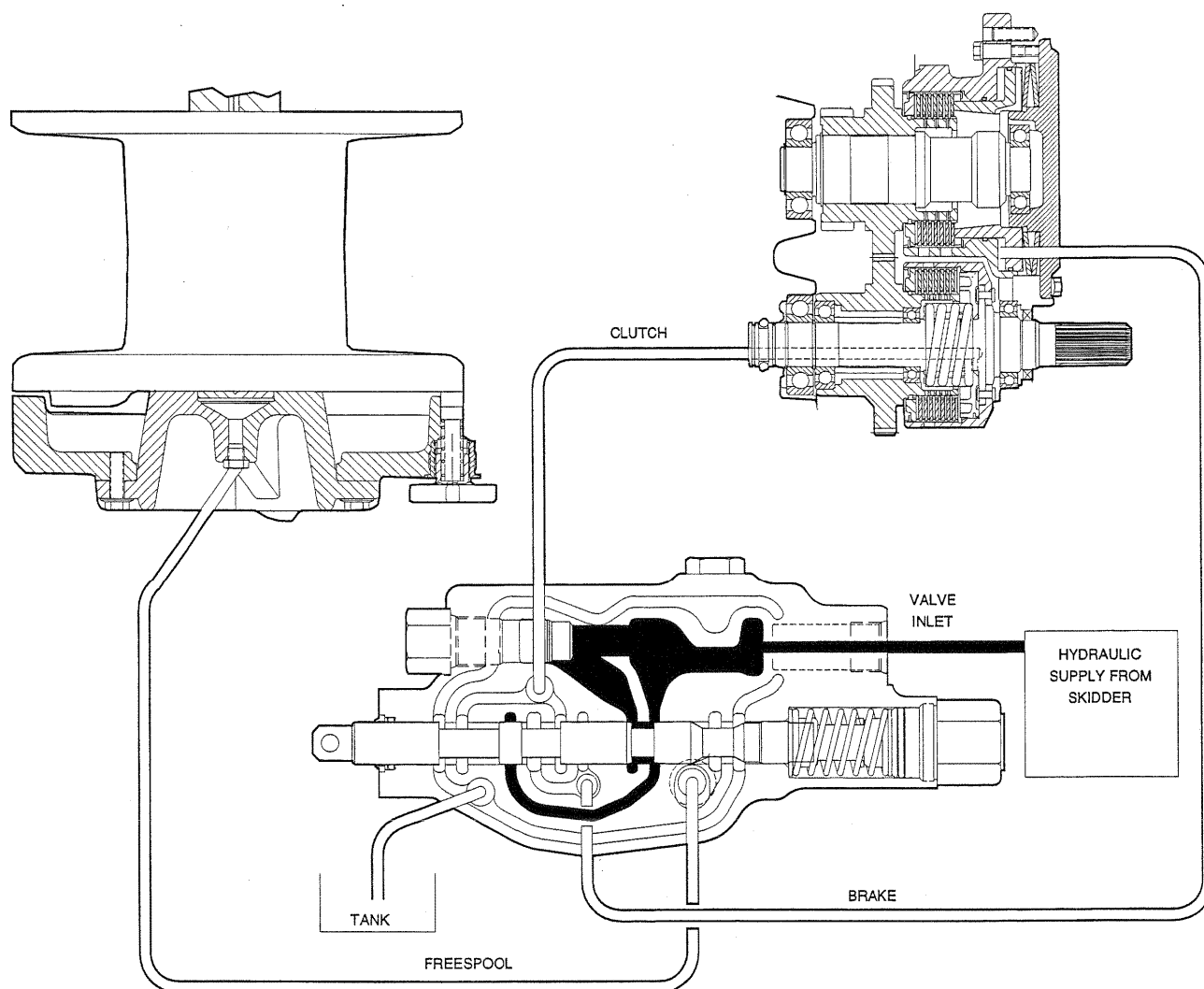
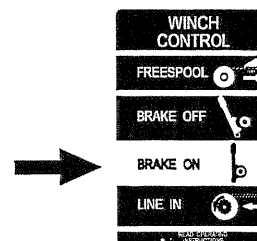


fig1-09.eps

PRESSURE

Figure 1-9 Hydraulic System - BRAKE ON

Sequence of Operation - LINE IN

- When the control valve spool moves toward the LINE IN position, some of the oil flow goes to the clutch. The oil flow increases oil pressure to apply the clutch. The PTO shaft turns the gear.
- Oil Flow also goes to the brake, where it compresses the conical washer springs, releasing the brake. The brake shaft can now rotate.

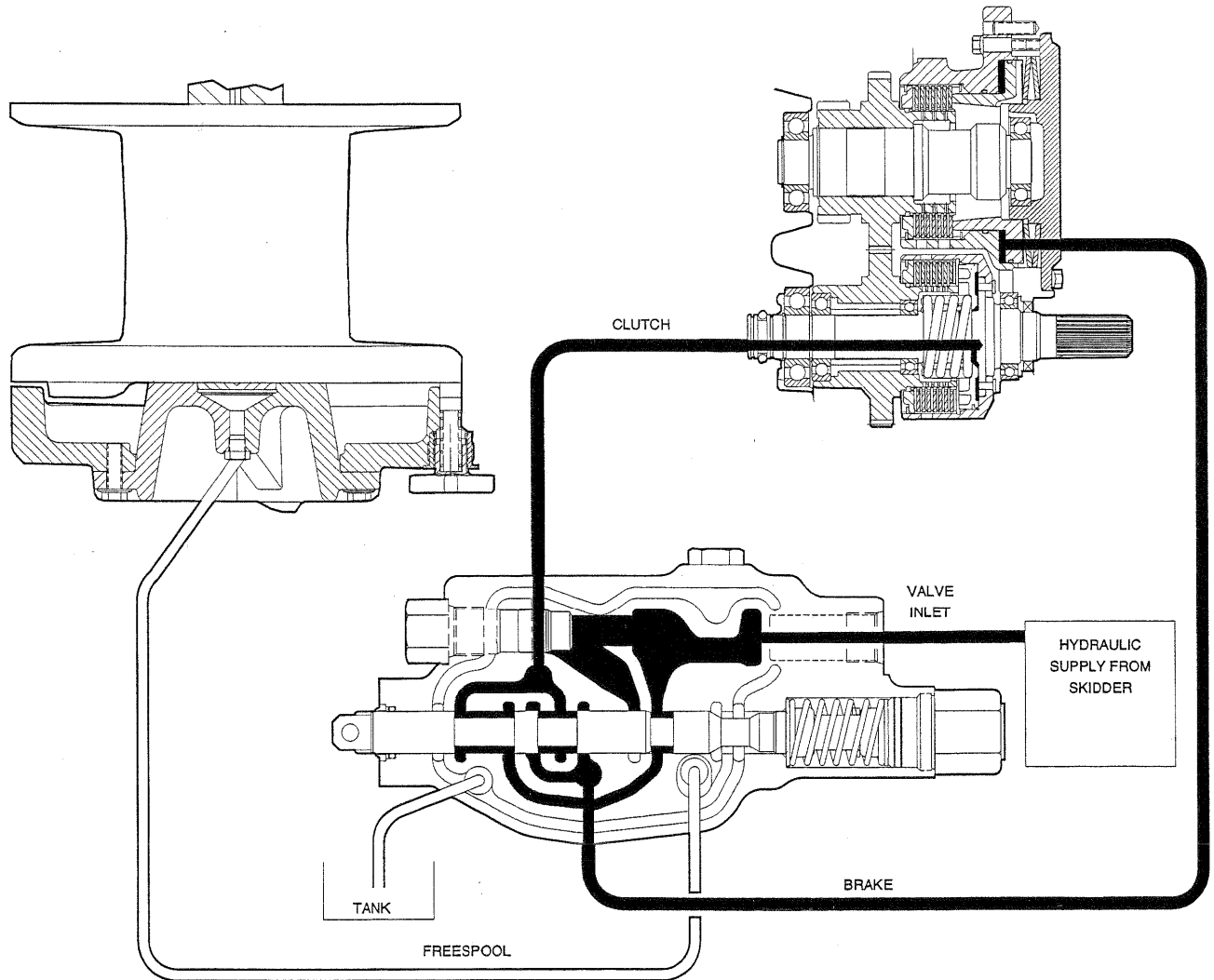
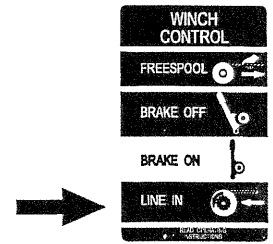


fig1-10.eps

Figure 1-10 Hydraulic System - LINE IN

Sequence of Operation - BRAKE OFF

- The control valve increases pressure to the brake, where it compresses the conical washer springs, releasing the brake.
- The clutch is not applied. The PTO shaft cannot power the gear train. But a load on the drum can rotate.

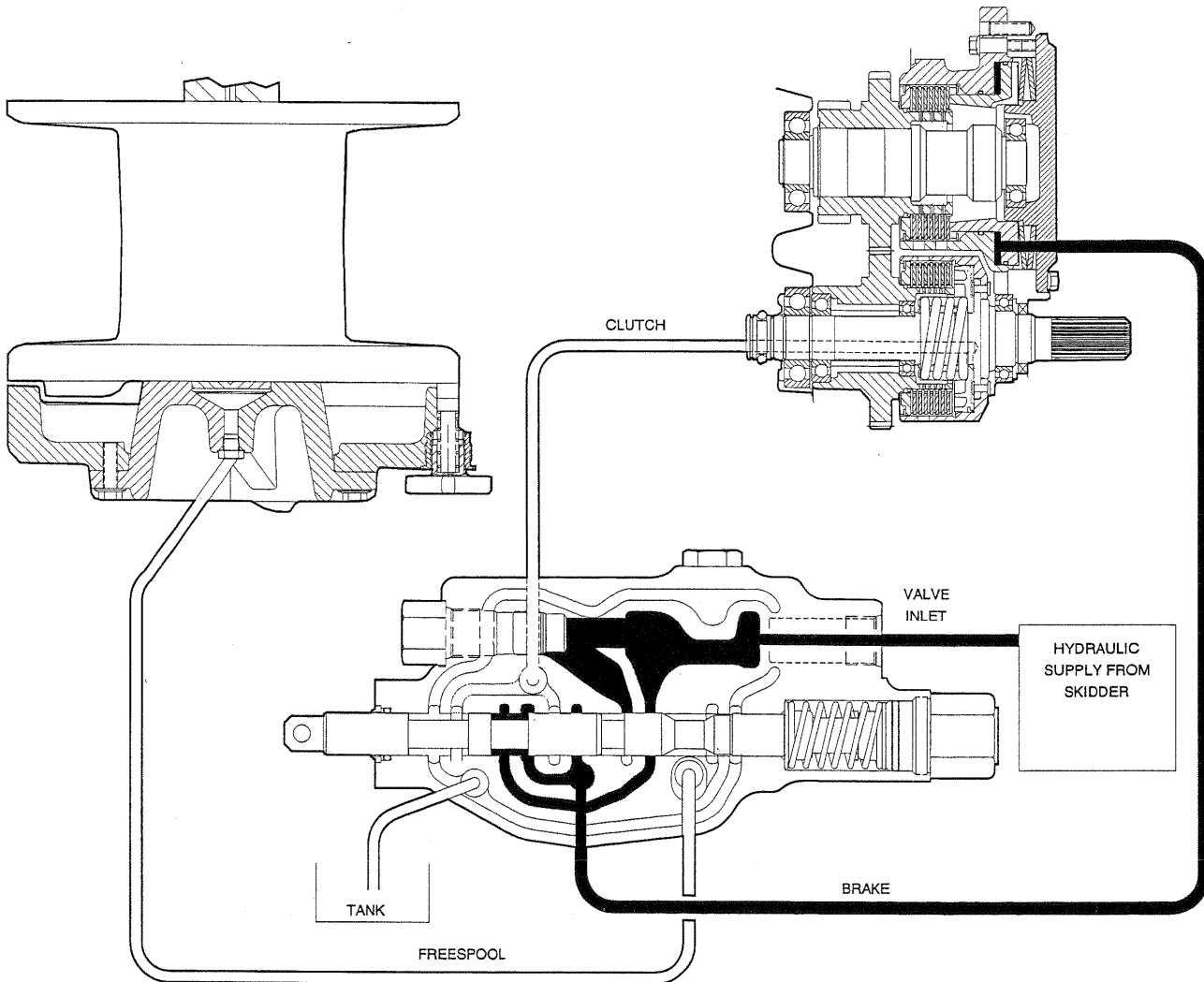
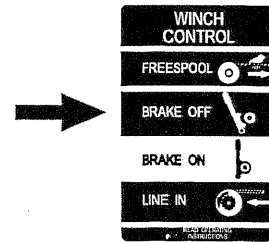


fig1-11.eps

Figure 1-11 Hydraulic System - BRAKE OFF

Sequence of Operation - FREESPOOL

- The clutch is not applied. The PTO shaft cannot power the gear train.
- The control valve sends hydraulic oil to the FREESPOOL piston, which disengages the drum from the gear train.
- Pressure is sent to Brake to compress the springs.

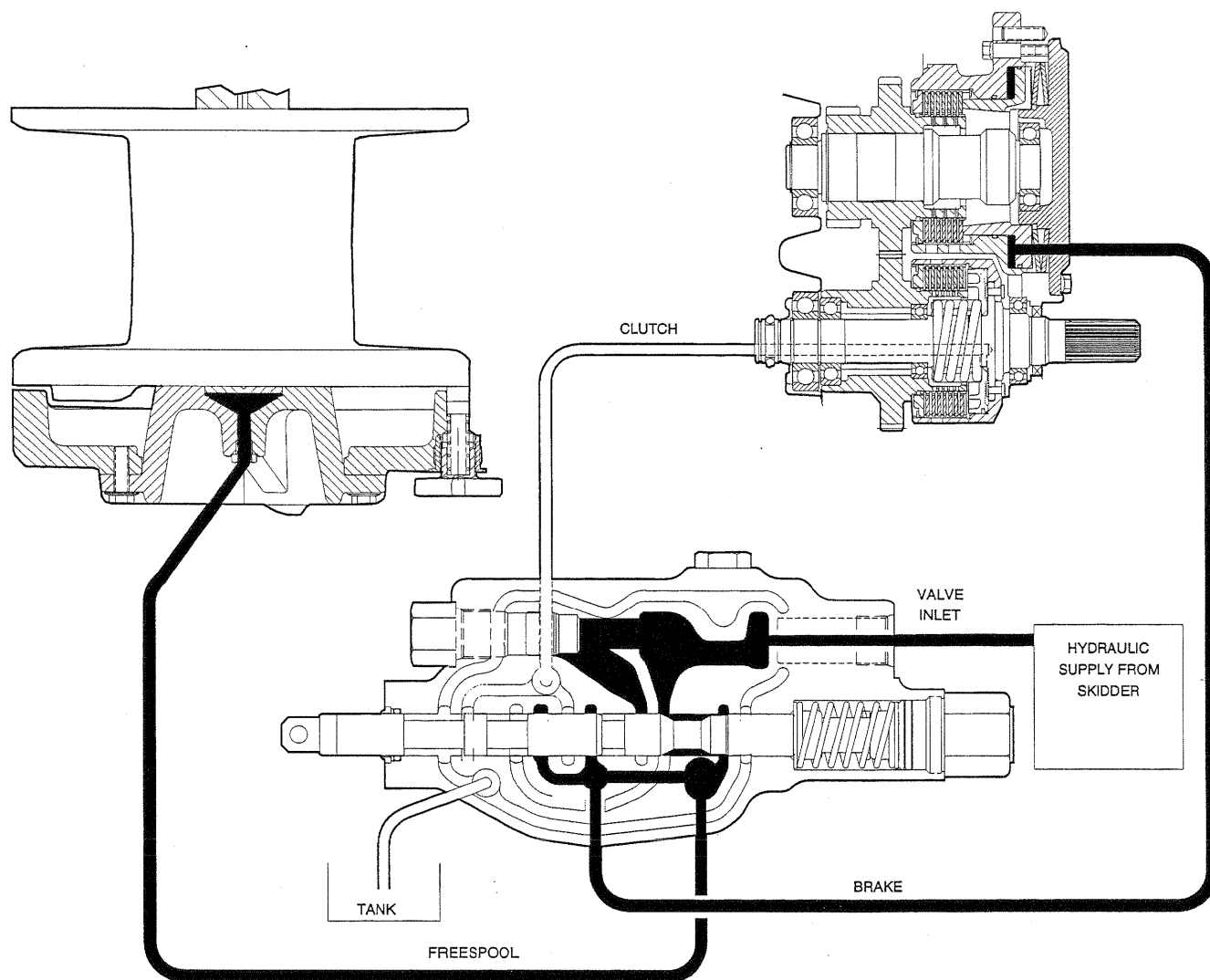
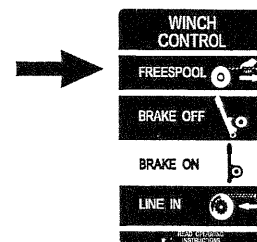


fig1-12.eps

Figure 1-12 Hydraulic System - FREESPOOL



Lined area for notes, consisting of multiple horizontal lines.

Troubleshooting

Problem	Possible Cause	Correction
Operation is Rough or irregular.	Hydraulic oil is too cold.	Put the control lever in FREESPOOL position. Run the engine at 1000 rpm to warm the oil before operating the winch.
	Low oil level	Add Hydraulic oil to the correct level.
	Low oil pressure.	See the Troubleshooting for "Low oil Pressure".
	Wrong oil.	Drain oil and replace with correct grade.
	Skidder engine idle speed too slow.	Increase skidder engine idle speed.
Winch stops during shift when engine speed drops.	Skidder engine speed too slow.	Increase skidder engine speed.
	Leak in brake or clutch.	Replace piston seals.
	Insufficient hydraulic system supply.	Check skidder hydraulic system.
	Relief valve stuck.	Repair or Replace.
Low oil pressure	Loose connections in the skidder hydraulic system.	Tighten loose connections.
	Clogged suction screen.	Check skidder hydraulic system.
	Defective relief valve.	Adjust, repair or replace.
	Oil brake leaking internally (indicated by low brake pressure.)	Repair as required.
	Leak in clutch	Repair as required.
	Insufficient hydraulic system supply.	Check skidder hydraulic system.
Brake does not hold.	Worn friction discs in brake.	Repair or Replace.
	Weak brake spring.	Repair or Replace.
Brake does not release.	Low oil pressure.	See the Troubleshooting for "Low oil Pressure".
	Leaking piston seals.	Repair or Replace.
Winch drum allowed to unwind before clutch is applied (brake begins to release before the clutch is applied.)	Worn friction discs in brake.	Repair or Replace.
	Clutch burned.	Repair or Replace.
Clutch slips or does not apply completely.	Low oil pressure.	See the Troubleshooting for "Low oil Pressure".
	Worn friction discs in clutch.	Repair or Replace.
	Worn clutch piston seals.	Repair or Replace.

Problem	Possible Cause	Correction
Hydraulic oil becomes too hot during operation. (See transmission system temperature)	Winch is operated in the BRAKE OFF or FREESPOOL position for long periods. When the BRAKE OFF or FREESPOOL position is used, the hydraulic oil continuously flows through the relief valve.	Use the BRAKE OFF and FREESPOOL position less.
	Restricted suction strainer.	Check skidder hydraulic system.
	Low oil level.	Add hydraulic oil to the correct level.
Wont shift into or out of freespool	Coupler stuck on drum shaft	Spring weak or broken, Replace spring.
	Shaft twisted	Replace shaft and coupler.

Service

General

This section provides the instructions for performing maintenance and making checks and adjustments. Standard shop tools are used in doing the work described in this section.

Maintenance

Maintenance on the W3C skidder winch is limited to visual inspection, checks and adjustments, and hydraulic system maintenance of the skidder itself. The hydraulic oil and filter(s) should be maintained as indicated in the skidder's operating manual. Periodically check the winch, control valve, and connecting hoses for damage or hydraulic oil leakage. If any problems are found, they should be corrected before operating the winch.

Checks and adjustments

The checks and adjustments for the winch have the following descriptions:

- Hydraulic system checks
- Freespool "drag adjustment"

Hydraulic system

Preparation

- A. These tests should be performed with a bare drum (no cable) since the drum will rotate during the tests.



WARNING

Be careful when you remove the cable from the drum. The end of the cable can move like a compressed spring, causing an injury when the ferrule is released from the drum.

- B. The oil temperature in the winch must be at least 2°C (70°F). The oil can be heated by operating the winch Line-in. When the oil is warm, stop the skidder engine.
- C. Remove any dirt from the right side of the winch. Install the pressure gauges as described in the following section.

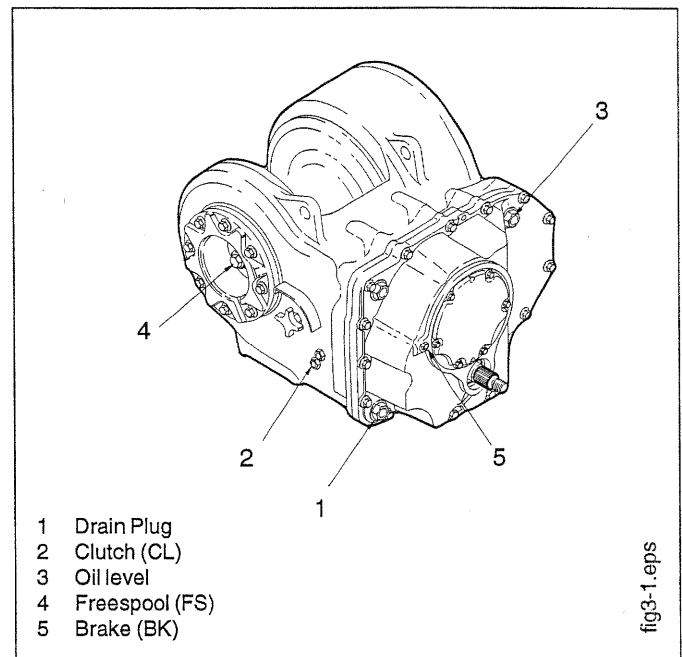


Figure 3-1 Maintenance Points

Pressure gauges

The pressure checks can be performed with three 2000 kpa (300 psi) gauges.

Pressure check for the line in clutch (CL port, See Fig. 3-1)

Note: To perform this test, it will be necessary to remove the cable from the drum, because the drum will be turning during the test.

- A. Install a 2000 kpa (300 psi) gauge in check port cl. Start and run the skidder engine at 1000 rpm.
- B. Hold the control lever in the line in position. Check that the pressure is 240-300 psi.
- C. If the pressure is incorrect, check for the following causes:
- Relief valve poppet stuck
 - Valve spool not traveling full stroke
 - Leaking hydraulic fitting or hose
 - Damaged seals in the clutch or brake.
 - Dirty strainer
 - Worn pump

Make repairs as required to obtain the correct hydraulic pressure.

Pressure check of the brake (BK port, See Fig. 3-1)

There are no adjustments to the W3C winch brake. However, to be sure that the brake will hold a load correctly and release at the correct hydraulic pressure, perform the following checks:

- A. Install a 2000 kpa (300 psi) gauge in check port BK (see fig. 3-1). Run the skidder engine at low idle.
- B. While watching the pressure gauge, slowly move the control lever toward the brake off position.
- C. When the drum begins to move, the brake is released. The correct brake release pressure with new discs is 793 kpa (125 psi).

Relief valve adjustment

Note: Ranger Skidders use a non-adjustable relief valve. On these winches no adjustment is necessary.

Freespool adjustment

There are two adjustments for the drag that controls the resistance to rotation of the drum during freespool operation.

Coarse adjustment (bearing preload)

The addition or removal of shims for the preload on the bearings for the drum adapter requires removal of the right side cover. This adjustment is normally only necessary if the "drag" shoe adjustment is not effective. This adjustment must be done by a trained service person. See figs. 4-6 and 4-11 in the repairs section of this manual.

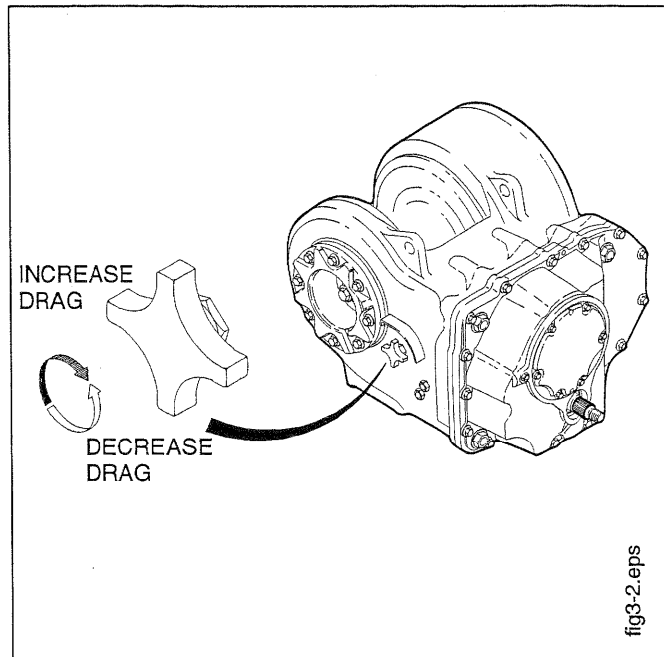


Figure 3-2 "Drag" Shoe Adjustment

Fine adjustment ("Drag" shoe adjustment) (See Fig. 3-2)

Turn the knob to the right (clockwise) to increase the "drag" or turn the knob to the left (counter-clockwise) to decrease the "drag." Test the "drag" on the drum. Make additional adjustments as necessary.

Repairs

General

This section provides the instructions for disassembly and assembly of the winch for repairs. For most major repair jobs the winch must be removed from the skidder prior to disassembly. The instructions for the removal and installation of the winch on the vehicle are also included in this section.

Winch removal



WARNING

Be careful when you remove the cable from the drum. The end of the cable can move like a compressed spring, causing an injury when the ferrule is released from the drum.



WARNING

The slings and crane used to lift the winch must have a minimum lifting capacity of 1000 kg (2000 lb.).

- A. Remove the cable from the drum. Clean the outside of the winch and the area where the winch contacts the skidder.
- B. Disconnect the hydraulic lines from the winch. Cap the ends of the lines and plug open ports to prevent dirt and contaminants from entering the hydraulic system. Secure the hoses out of the way to prevent damage when removing the winch.
- C. Connect slings and a crane or lifting device to the winch. Install lifting eyes into the lifting holes provided in the frame.
- D. Remove the winch mounting nuts and bolts, and slide the winch straight back until it's free from the pto shaft. Secure the pto shaft out of the way. Lift the winch with the hoist and move it to a clean work area so that you can make repairs.
- E. Drain the oil from the winch.

Winch installation

- A. Thoroughly clean the mounting surfaces on the winch and the skidder. Clean the mounting holes and hardware of dirt, grit and oil.
- B. Lubricate the pto shaft splines with grease, where applicable. Install the pto attaching hardware required for your particular skidder.
- C. Connect the lifting slings in the same manner as for winch removal.
- D. Install the winch by slipping the pto shaft onto the winch pto shaft. Align the bolt holes on the bottom of the winch with the mounting holes on the skidder frame.
- E. Apply thread locking compound (P/N 318702) to the threads of the mounting bolts. Install the bolts or nuts and tighten to 200-220 lb/ft.

Disassembly of the winch

Most repairs require disassembly of the winch. This procedure describes the complete disassembly of the Winch with it removed from the skidder. Disassemble the winch as necessary to make repairs.

Fig. 4-1 shows the gears and components contained within the winch housing.

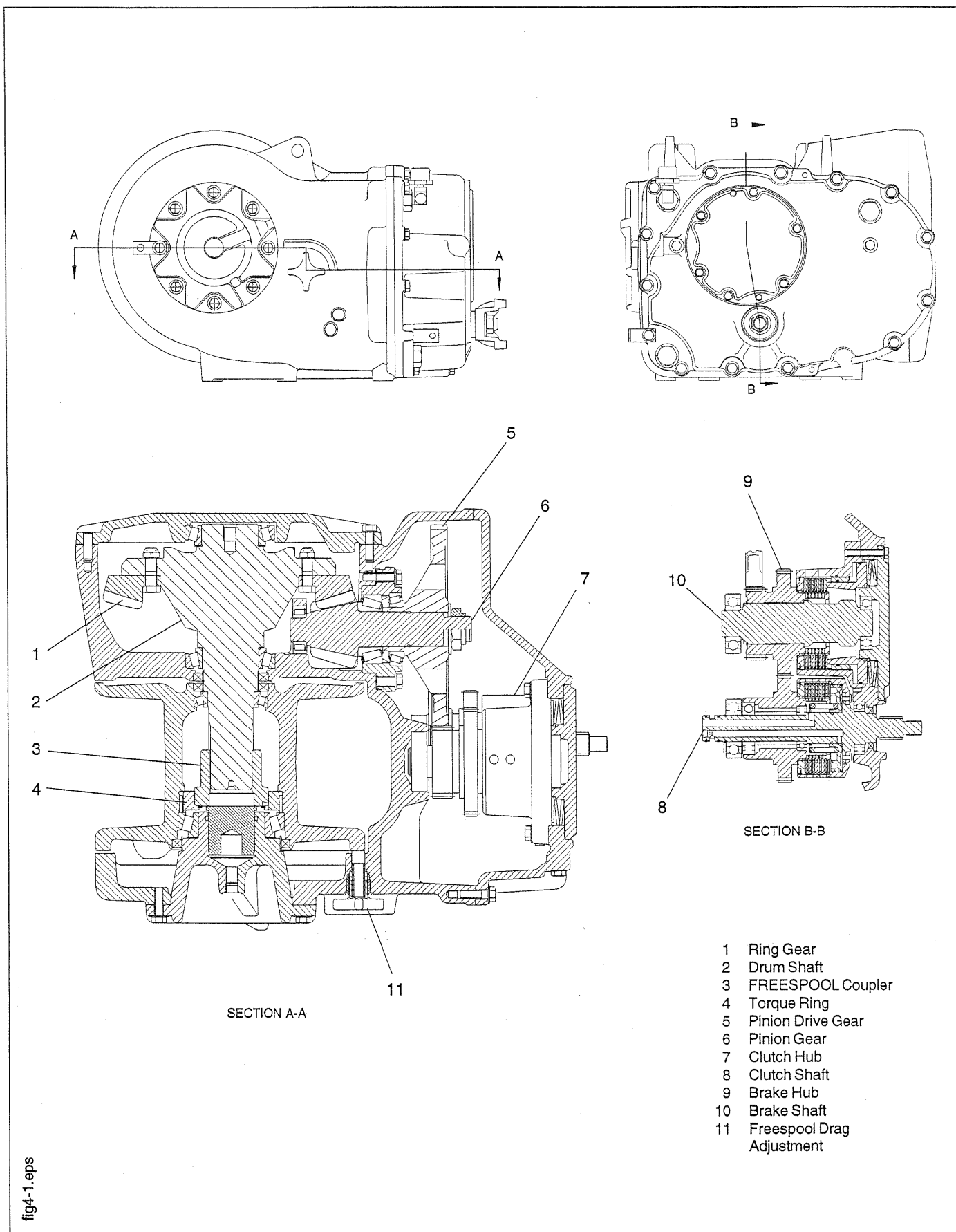


fig4-1.eps

Figure 4 -1 W3C Skidder Winch Gear Arrangement

Front Cover Removal

NOTE: The winch must be removed from the skidder for repairs.

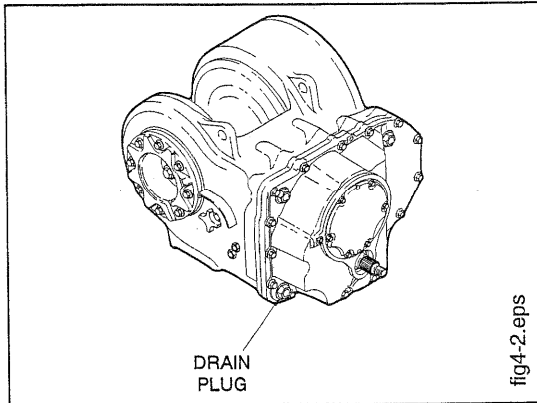
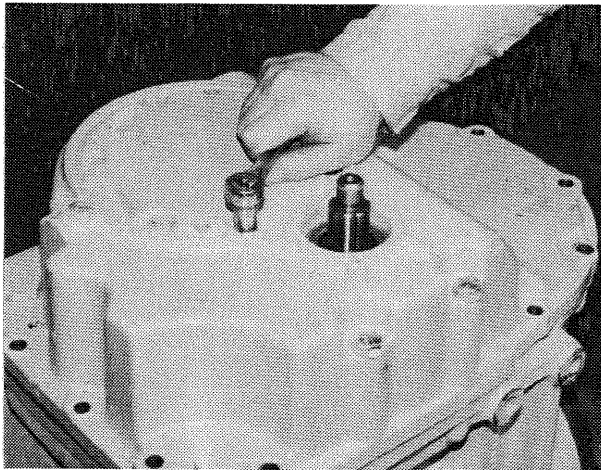
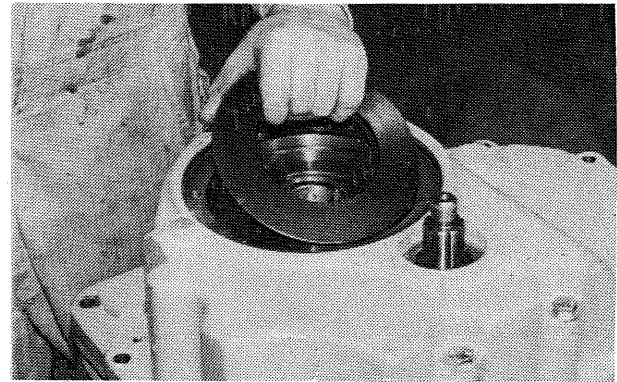


Figure 4 -2 Drain Plug Location

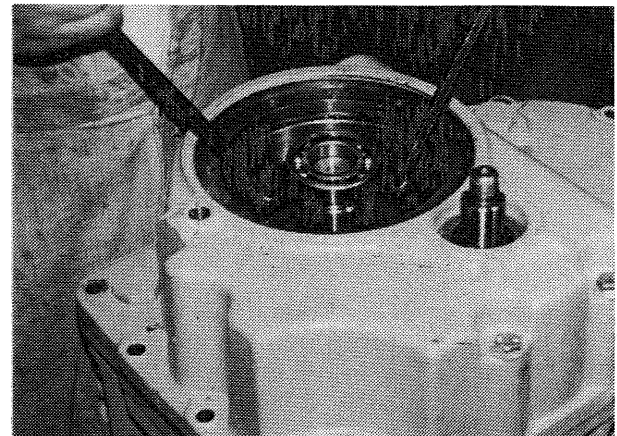
1. There may be additional hydraulic oil remaining after draining the winch in the normal manner. To drain this oil, remove the plug shown above.



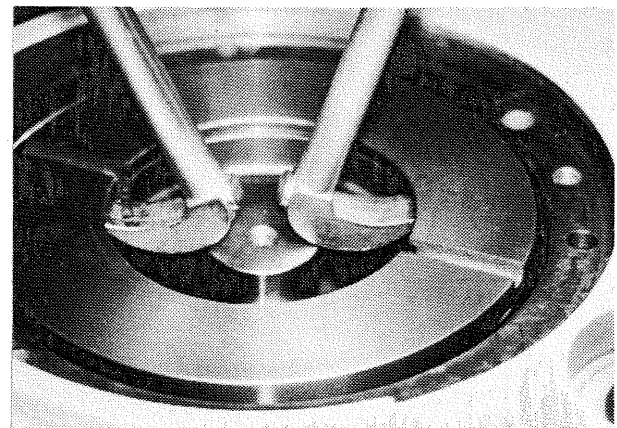
2. Position the winch with the clutch shaft (PTO) straight up. Block the winch securely. Remove the six cap screws holding the brake cover to the winch case and remove the cover.



3. Remove the conical springs.

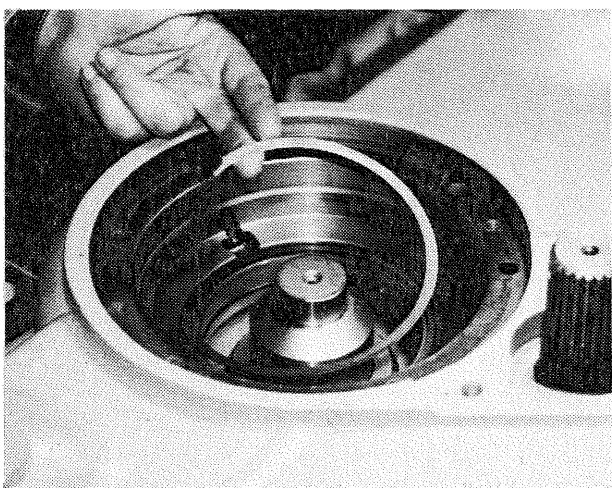


4. Remove the bearing from the brake cover or shaft.

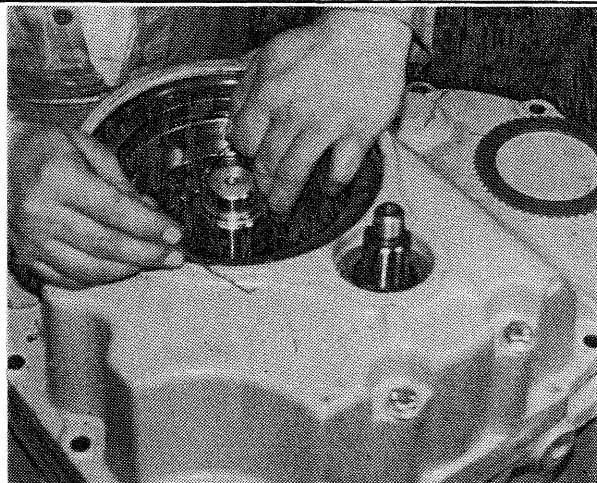


5. Pull the brake piston from the housing. The brake pressure port plug may need to be loosened to prevent a vacuum from holding the piston in the housing.

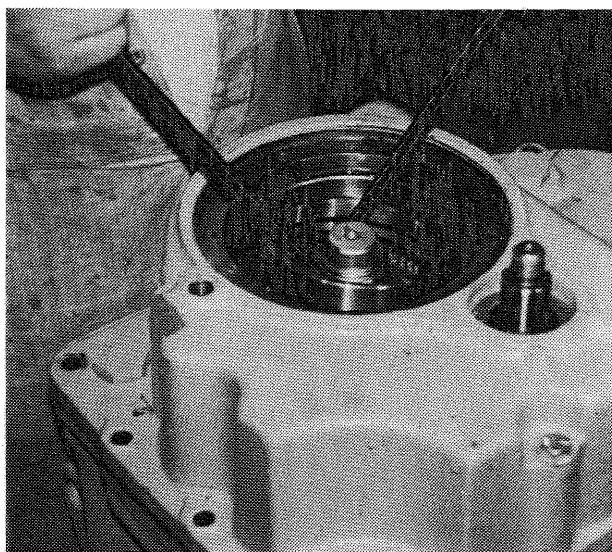
Fig. 4-4 Front Cover & Brake Removal & Disassembly(1 of 3)



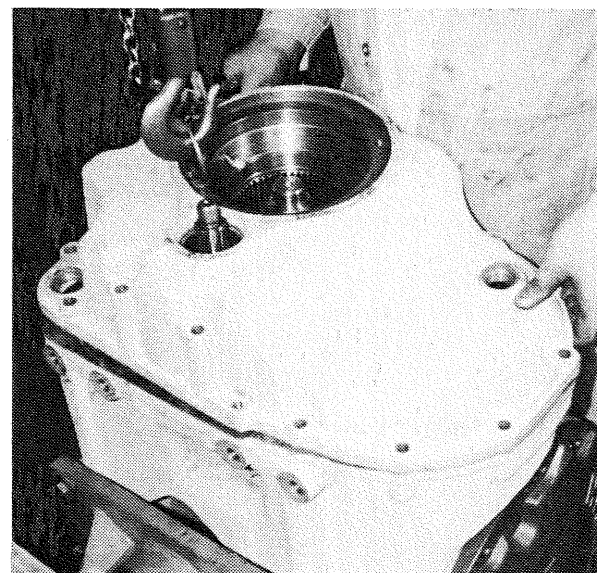
6. Remove the snap ring from the bore of the brake housing.



8. Remove the friction discs, separator plates, and pressure plate from the brake housing. A small hooked wire helps to pull the disks out of the brake housing.



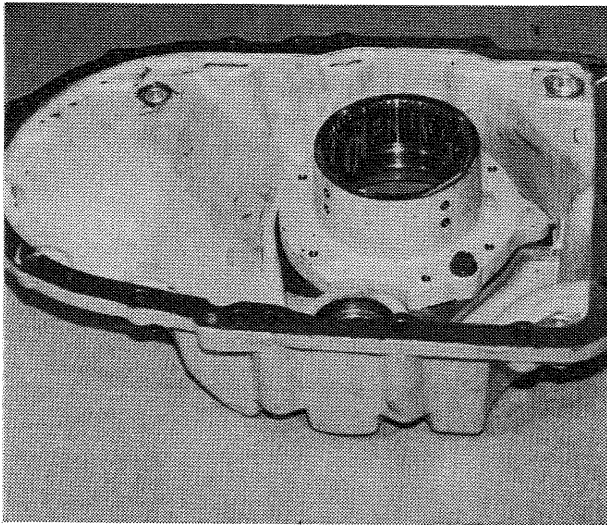
7. Remove the spacer and o-ring from the bore.



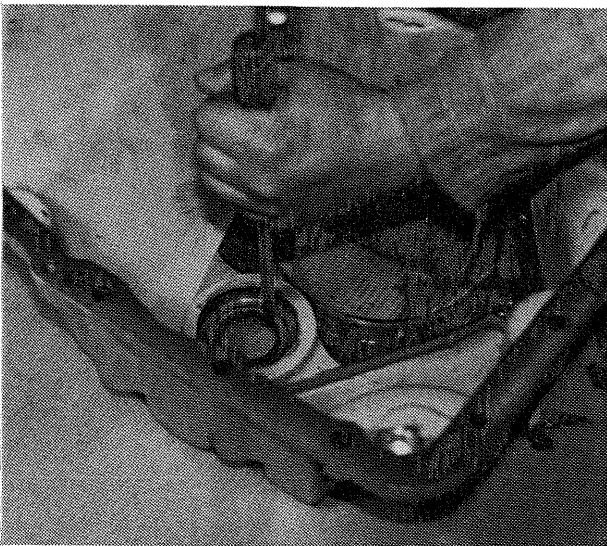
9. Remove the thirteen cap screws securing the front cover to the frame. Attach a lifting eye to the front cover, and using a suitable lifting device, remove the front cover. The shaft seal will be damaged when the cover is removed.

**NOTE: USE SACKING SCREWS TO
PUSH PAST DOWELS**

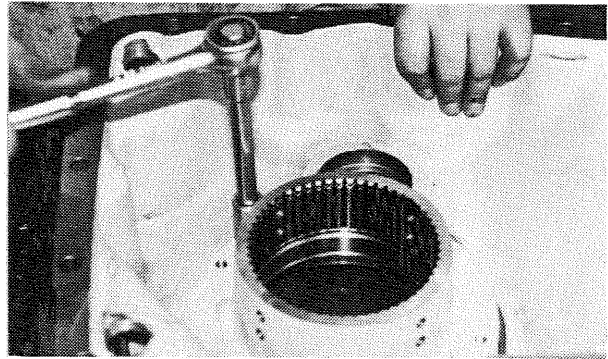
Fig. 4-4 Front Cover & Brake Removal & Disassembly (2 of 3)



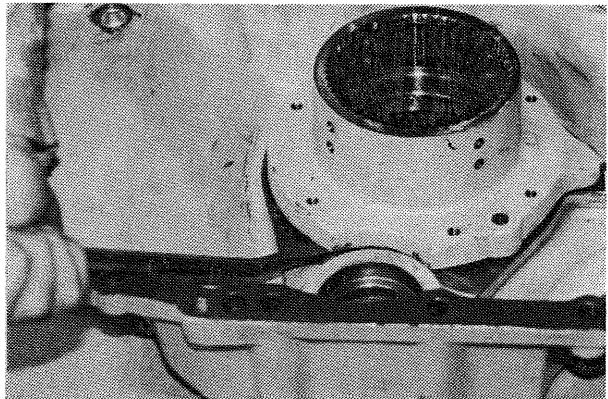
10. Place the front cover up side down on a flat surface.



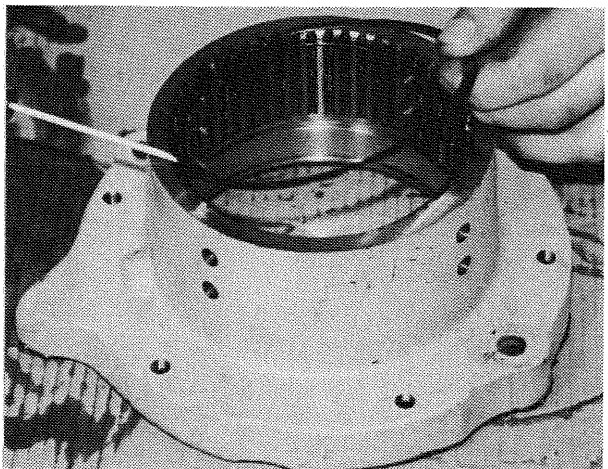
11. Remove the clutch shaft seal from the cover using a suitable driver.



12. Remove the two flange screws securing the brake housing to the front cover. Install them in the lifting holes provided in the housing flange.



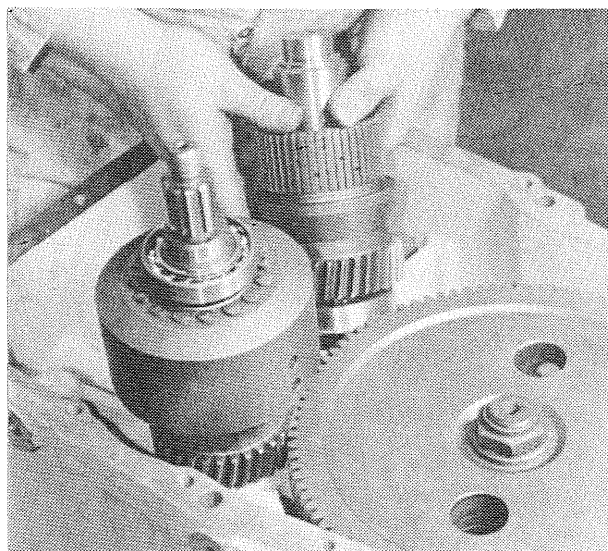
13. Using a suitable pry bar, remove the brake housing.



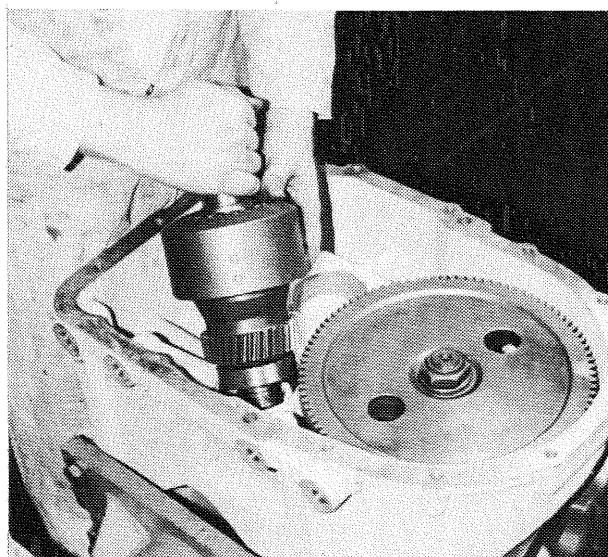
14. Remove the snap ring from inside the brake housing.

Fig. 4-4 Front Cover & Brake Removal & Disassembly (3 of 3)

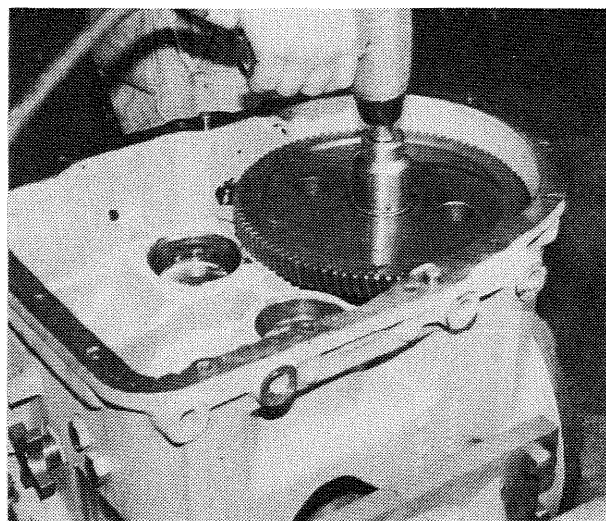
Removal of Clutch Assembly, and Pinion Drive Gear and Bearing.



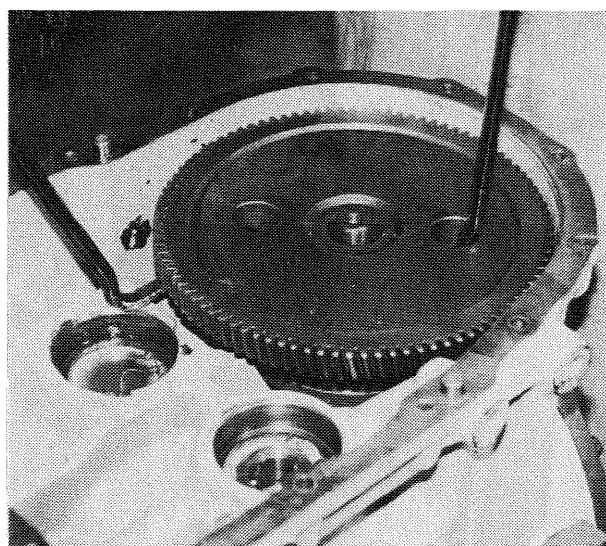
1. Lift the brake shaft assembly from the winch housing.



2. Lift the clutch assembly from the winch housing and set it aside for later disassembly. Use care not to damage the sealing rings.

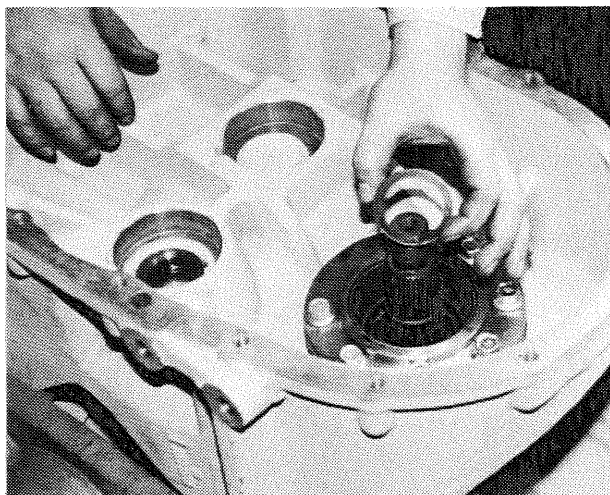


3. Remove the nut that secures the pinion drive gear to the pinion shaft. This nut is tightened to 678 N/m (500 ft./lb.).

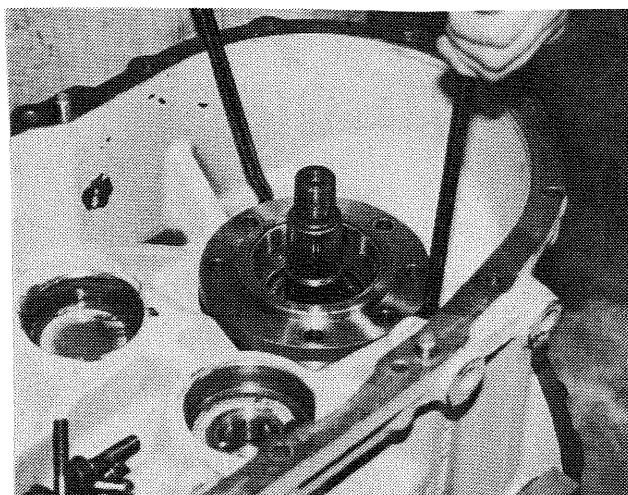


4. Use a suitable pry bar to remove the pinion drive gear from the pinion shaft.

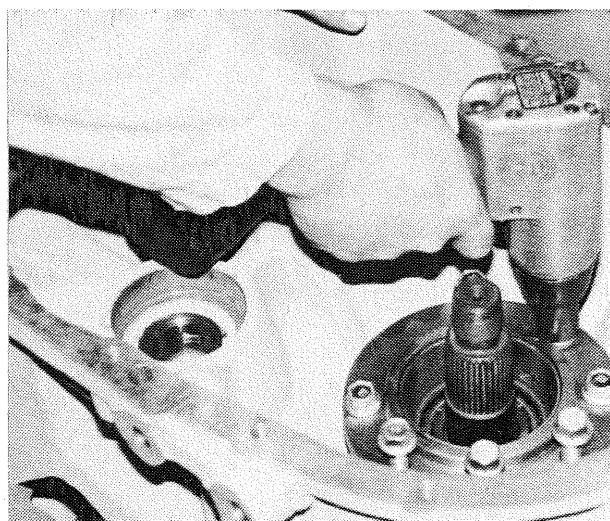
Fig. 4-5 Disassembly of the Gear Train (1 of 2)



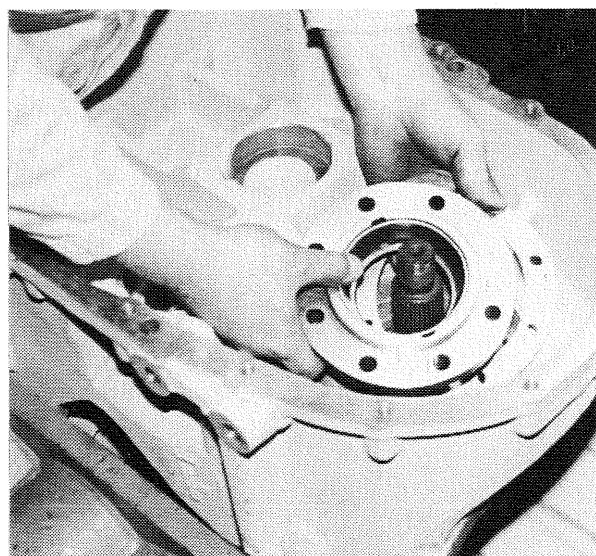
5. Remove the tapered roller bearing and shim pack from the pinion carrier.



7. Use suitable pry bars to remove the pinion carrier from the winch housing.



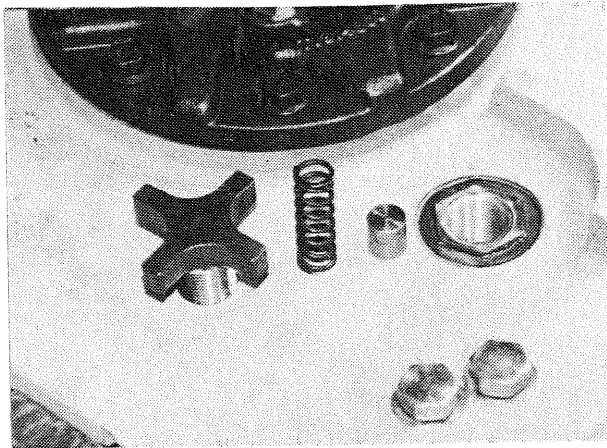
6. Remove the seven capscrews securing the pinion carrier to the winch housing.



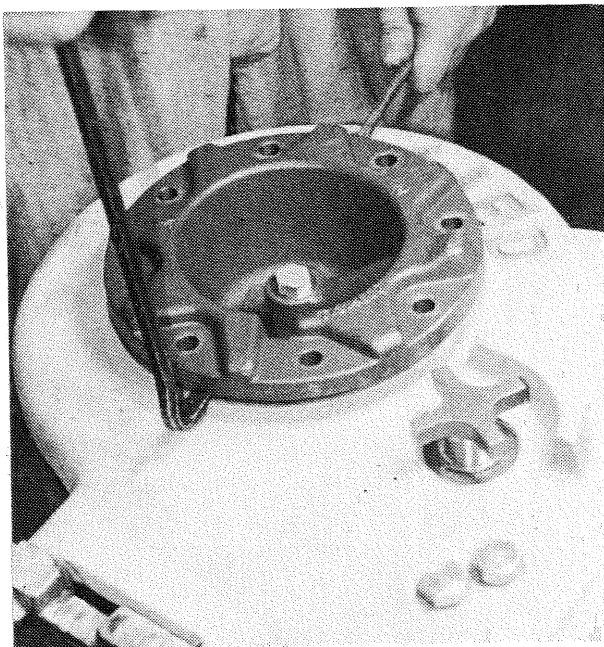
8. Remove the pinion carrier and shim pack.

Fig. 4-5 Disassembly of the Gear Train (2 of 2)

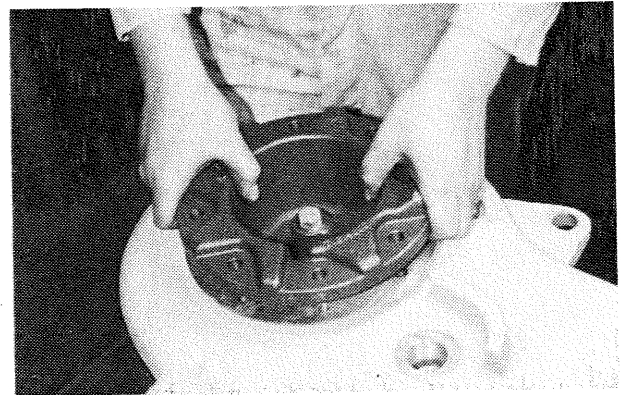
Removal of Ring Gear, Drum, Drum Shaft, and Freespool Assembly



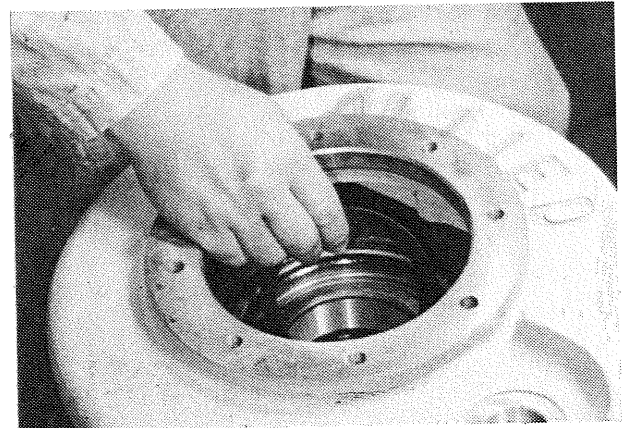
1. Remove FREESPOOL Drag adjustment Knob, Spring, and Pad.



2. Remove the eight capscrews securing the right hand cover to the winch housing. Use a pry bar under the cover to remove it from the winch housing.



3. Lift the cover from the housing.

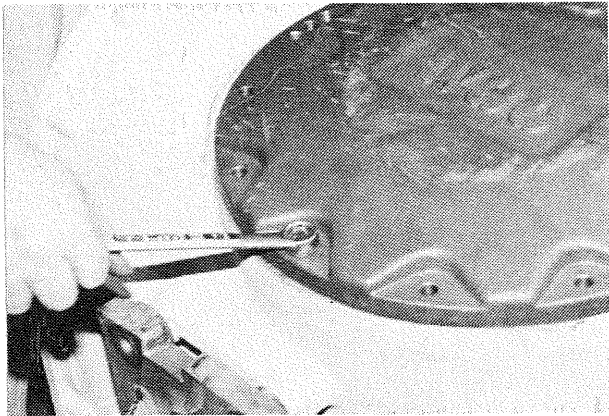


4. Remove the shim pack and save for later re-use.

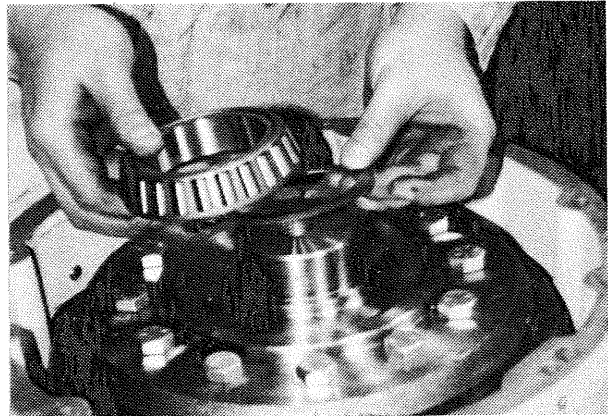


5. Remove the tapered roller bearing from the drum.

Fig. 4-6 Removal of Drum & Shaft, & Ring Gear (1 of 4)



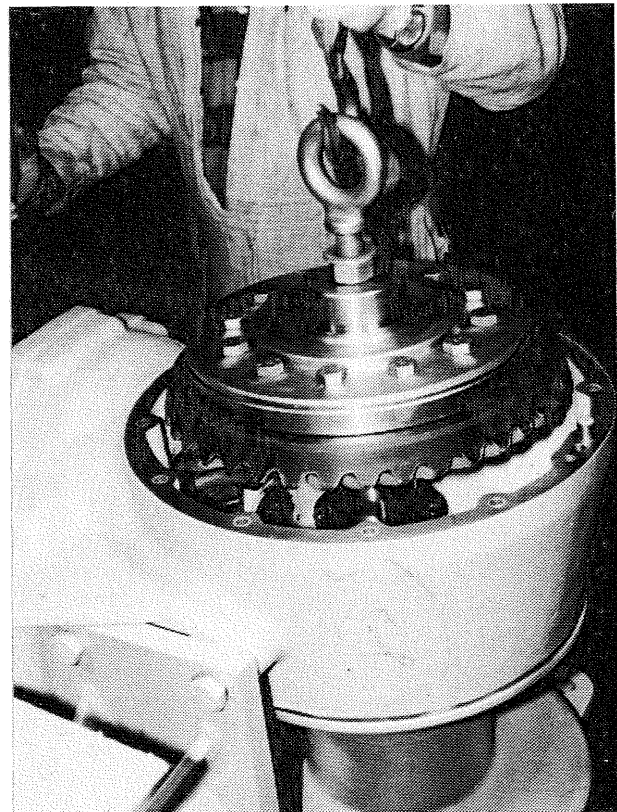
7. Turn the winch on the other side and remove the twelve capscrews securing the left hand cover to the winch housing



9. Remove the tapered roller bearing and shim pack from the drum shaft.



8. Lift the cover from the housing. Use the jacking bolt locations.

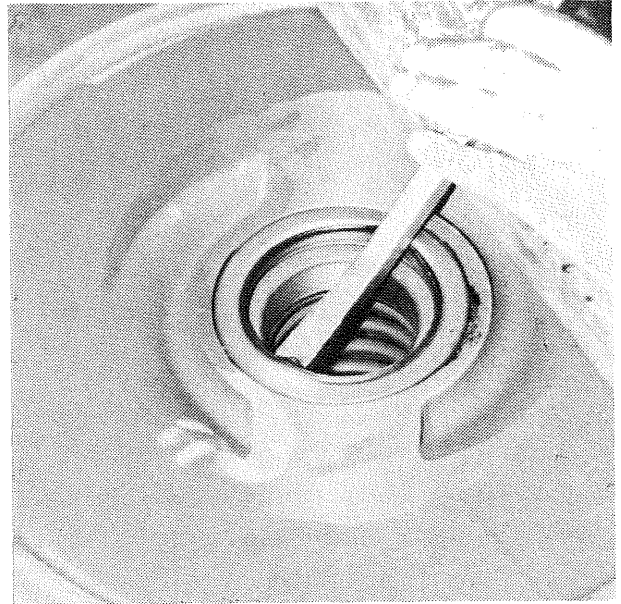


10. Attach a 1"NC lifting eye in the end of the drum shaft, and use a suitable lifting device to pull the drum shaft from the housing.

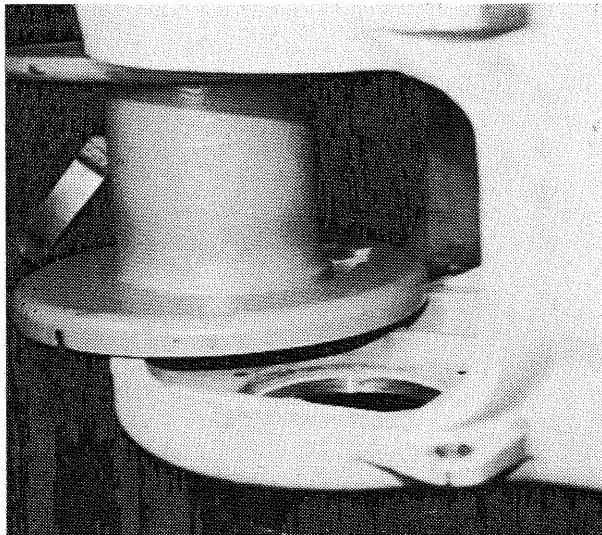
Fig. 4-6 Removal of Drum, Shaft, & Ring Gear (2 of 4)



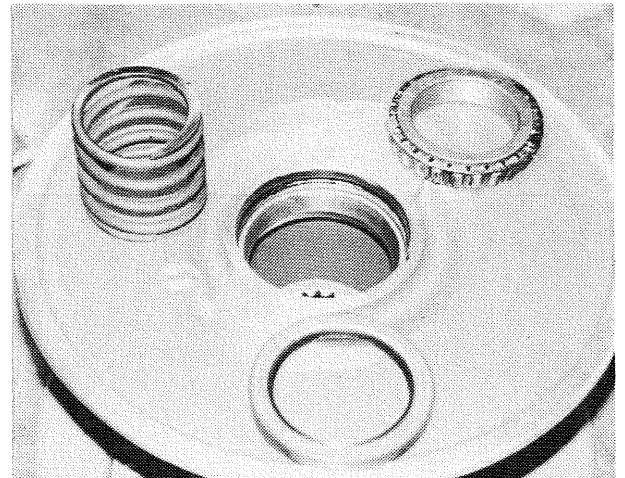
11. Remove the shim pack and bearing from under the drum shaft as it is withdrawn. Be aware that the bearing and shims may remain on the bottom of the drum shaft and fall off.



13. Use a pry bar to remove the oil seal from the inside of the drum.

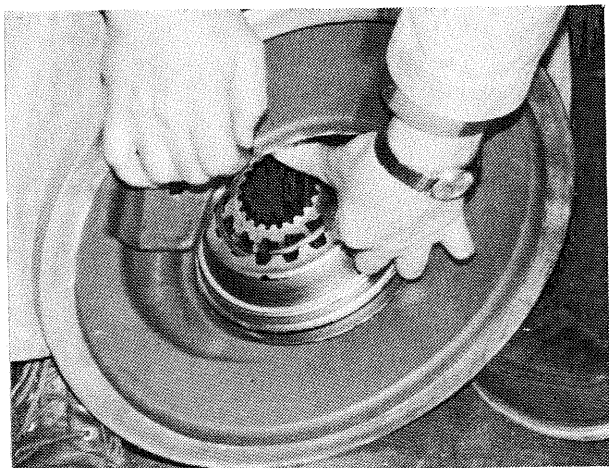


12. Remove the Drum from the Winch Housing by lining up the slot in the frame with the ferrule pocket in the drum.



14. Remove the bearing and freespool return spring from the inside bore of the drum.

Fig. 4-6 Removal of Drum, Shaft, & Ring Gear (3 of 4)



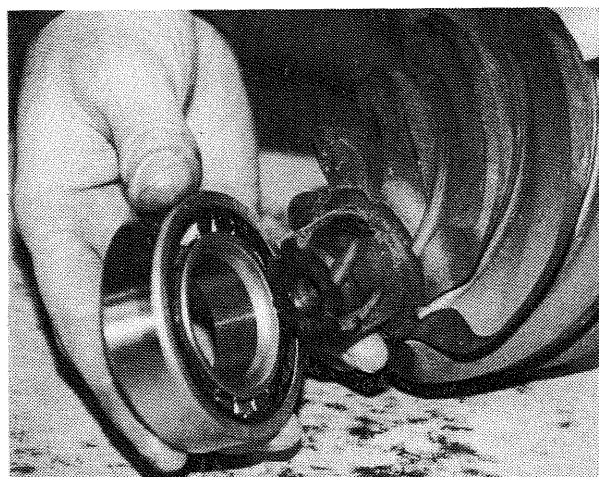
15. Turn the drum over and remove the internal snap ring and the freespool coupler.



16. If necessary, use suitable drivers to remove the drum shaft bearing cup and the torque ring from the drum.



17. Remove the pinion gear shaft and nose bearing from the winch housing.

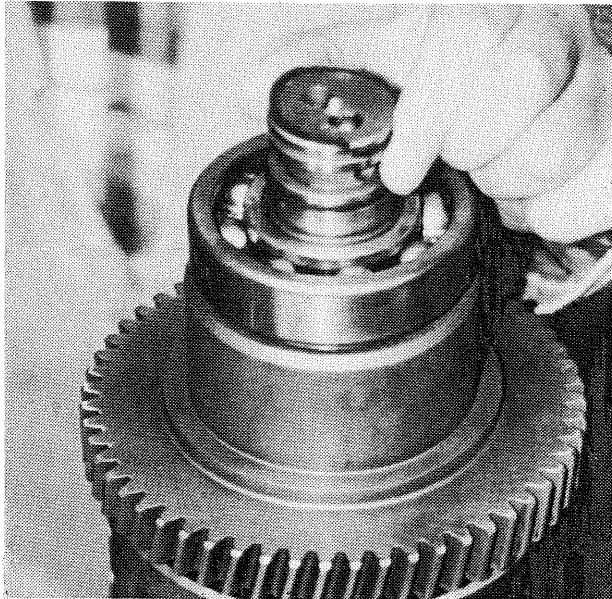


18. Remove the snap ring nose bearing and the pinion gear shaft. A press is required for this operation.

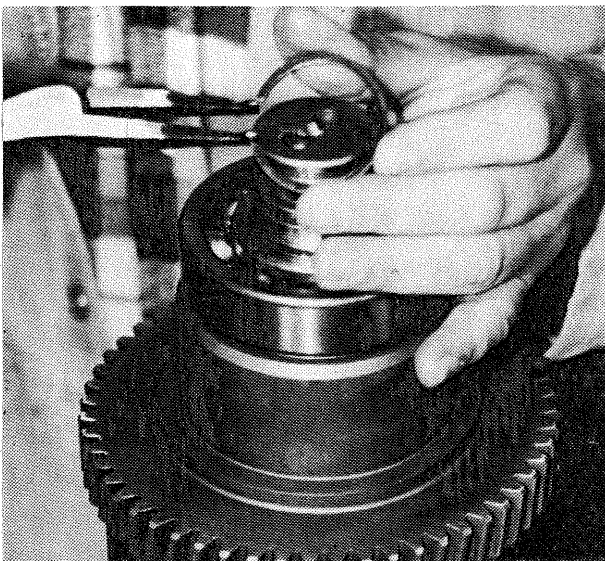
NOTE:
Inspect all gears and bearings for excessive wear, pitting, or other damage.

Fig. 4-6 Removal of Drum, Shaft, & Ring Gear (4 of 4)

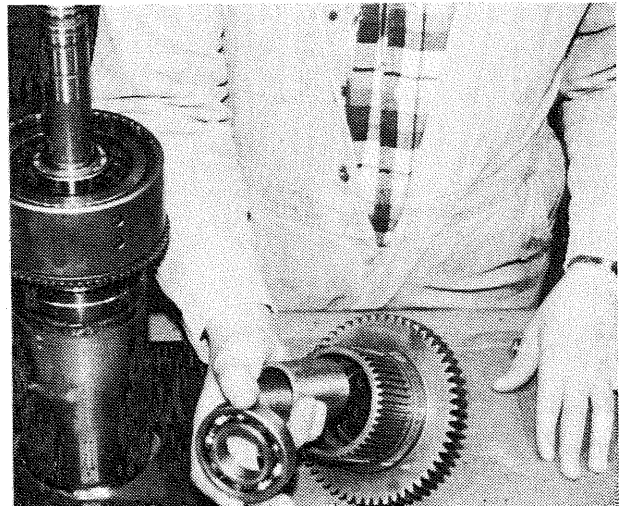
Disassembly of the Clutch (See Fig. 4-8)



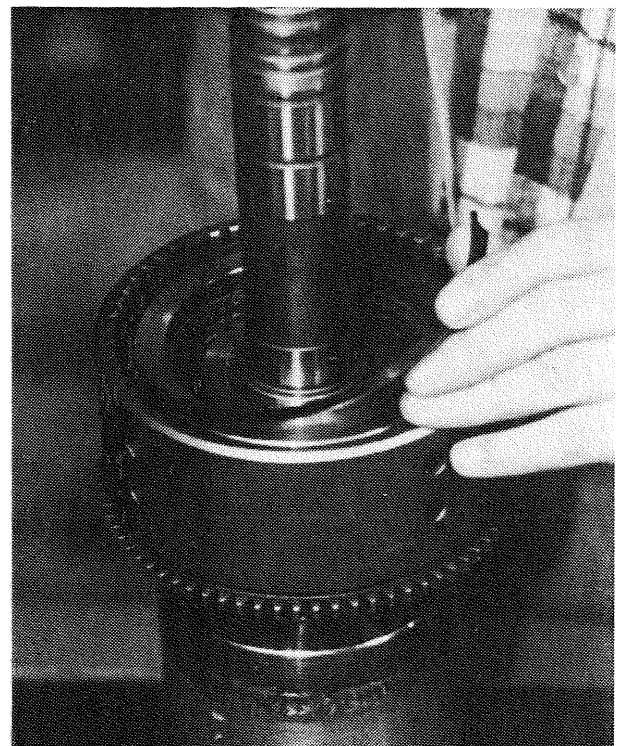
1. Remove the two seal rings from the end of the clutch shaft.



2. Remove the snap ring that secures the ball bearing to the clutch shaft. Remove the bearing and the second snap ring.

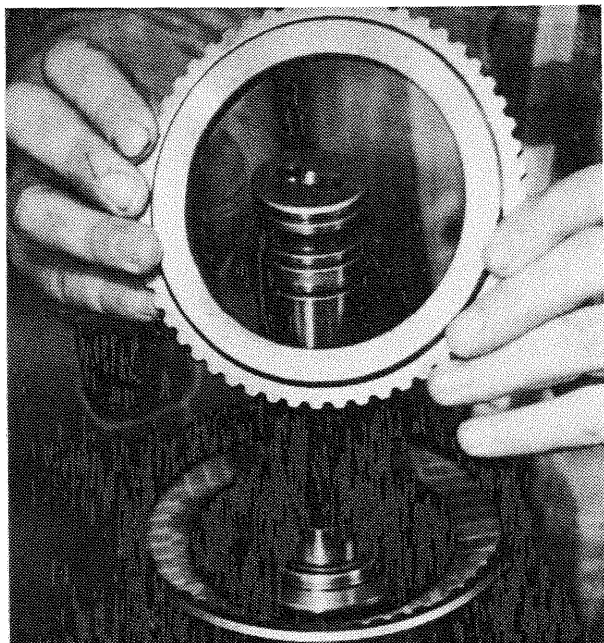


3. Withdraw the clutch hub. Remove the spacer and roller bearing that are located inside the clutch hub.

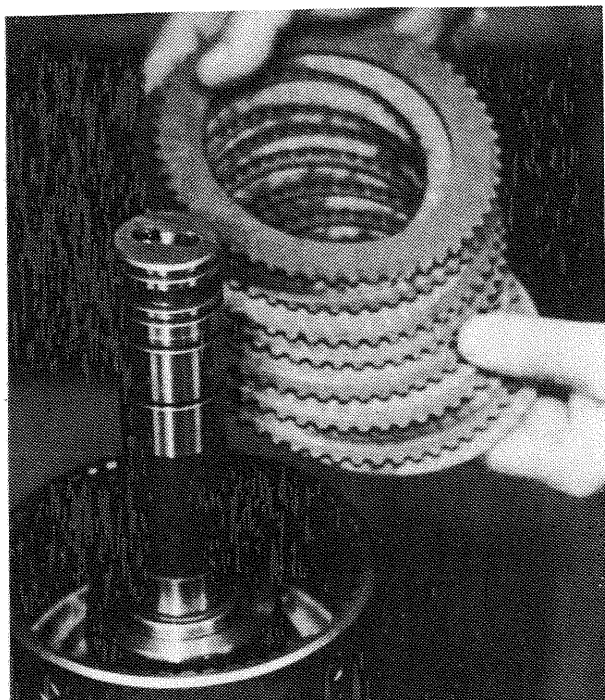


4. Remove the snap ring from the inside of the clutch cover.

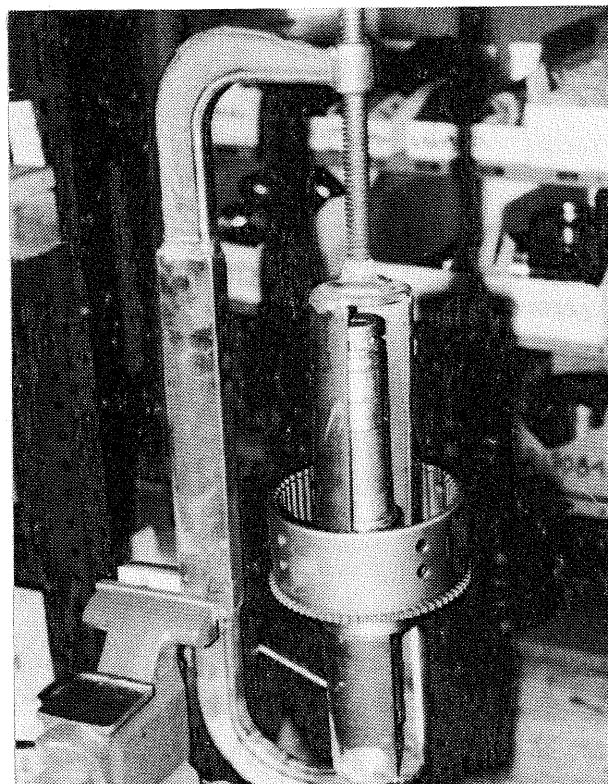
Fig. 4-7 Disassembly of the Clutch (1 of 3)



5. Remove the pressure plate.



6. Remove the separator plates and friction discs from the clutch housing.

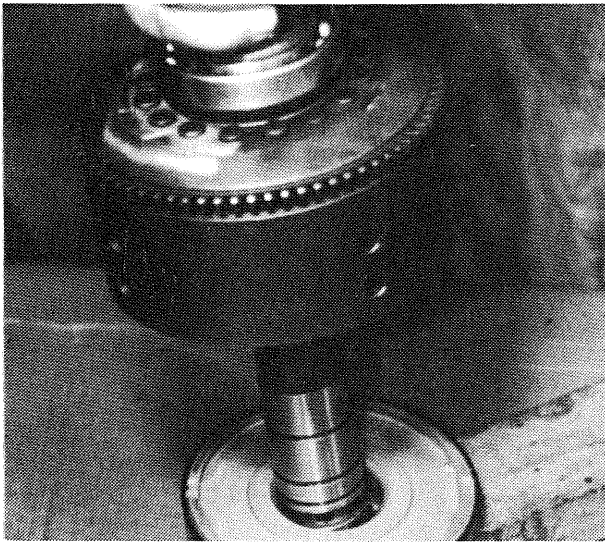


7. Use a spring compressor as shown to compress the clutch spring and guide.

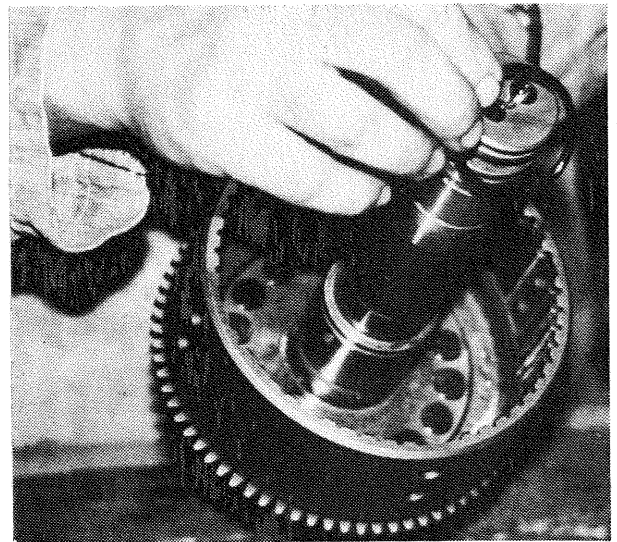


8. Remove the snap ring from the clutch shaft and withdraw the spring guide and spring.

Fig. 4-7 Disassembly of the Clutch (2 of 3)



9. Invert the clutch housing and shaft assembly and gently tap the end of the shaft on a soft board to remove the clutch piston.



10. Remove the o-ring that is located on the clutch shaft at the bottom of the housing.

Fig. 4-7 Disassembly of the Clutch (3 of 3)

- 1 Snap Ring
- 2 Ball Bearing
- 3 Ball Bearing
- 4 Hub-Clutch
- 5 Spacer
- 6 Bearing
- 7 Snap Ring
- 8 Plate-Pressure
- 9 Plate-Friction
- 10 Plate-Separator
- 11 Snap Ring
- 12 Guide-Spring
- 13 Spring-Clutch
- 14 Piston-Clutch
- 15 Seal-Clutch Pack
- 16 O-Ring
- 17 Shaft & Housing Assembly
- 18 Bearing
- 19 Seal
- 20 Seal Ring
- 21 Yoke
- 22 Washer
- 23 Nut

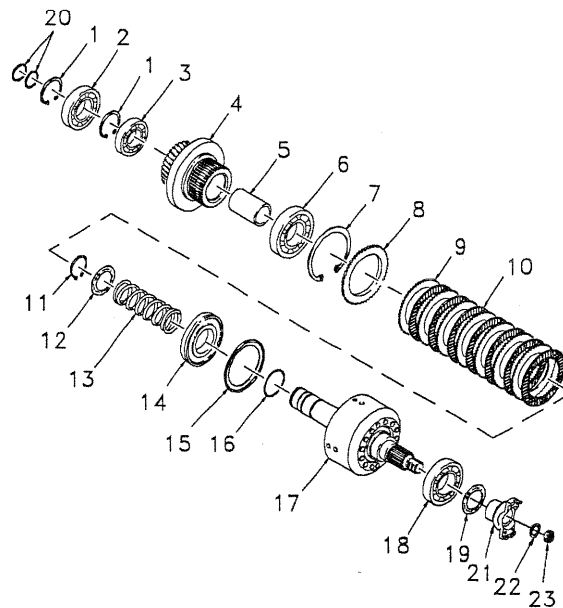


fig4-4.dwg

Fig. 4-8 Clutch Assembly

Assembly of the Winch

All components should be inspected for wear or damage as they are removed. Refer to table 4-1, visual inspection. All seals that were removed should be replaced during assembly. Any component that indicates excessive wear or damage should be replaced. The following procedures are in the sequence that assumes a complete winch overhaul.

Repair of Hydraulic System Components

Most of the parts of the control valve can be replaced. If the bore for the valve spool is damaged so that the winch's performance has changed, the entire valve must be replaced.

ITEM	INSPECTION	ACTION
Ring and Pinion Gear	Check for an even wear pattern. Backlash = .008-.018	Check clearance between the pinion gear and the ring gear. These gears are matched and must be replaced as a unit.
Pinion Shaft Bearings	Inspect bearings for wear or damage.	Replace defective bearings.
PTO shaft	Check for grooves or other damage on the machines surfaces.	Repair the surface or replace the shaft.
	Check the snap rings.	Replace any snap ring that will not hold a bearing in position on the shaft.
Clutch Assembly	Make sure that the oil passages are clean.	Clean oil passages with a small brush. Blow passages clear with compressed air.
	Check that the friction discs for wear, distortion, or damage. Minimum thickness of wear surface per side: 0.5 mm (.010 in.). Maximum thickness of friction disc: 2.13mm (.084 in).	Replace the friction discs if the oil grooves are worn away, or the discs are burned, damaged, or warped. If the discs are being replaced due to overheating, the clutch return spring should also be replaced.
	Check the separator plates are flat, free of large blue areas (caused by overheating) or damaged surfaces.	Replace damaged separator plates.
	Inspect the piston housing and piston for cracks and damage. Make sure that the O-Ring grooves and sealing surfaces are in good condition.	Replace a damaged piston or piston housing.
	Inspect clutch shaft bearings for wear or damage.	Replace worn or damaged bearings.
Control Valve	Check for damaged or worn parts if the performance of the valve is not correct.	Repair or replace control valve.

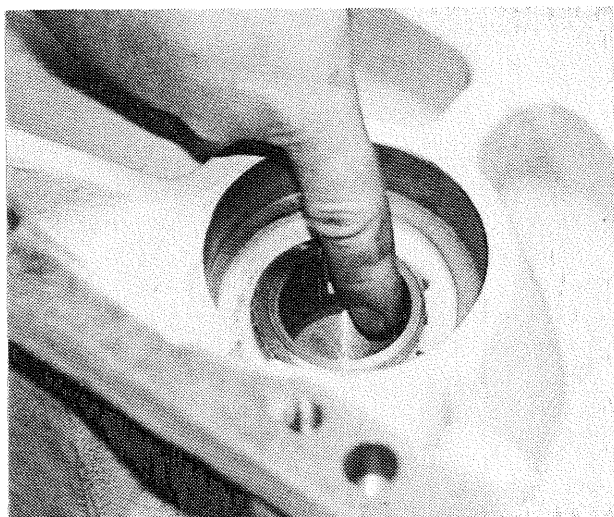
Table 4 -1 Visual Inspection

ITEM	INSPECTION	ACTION
Oil Brake Assembly	Check for a cracked, broken or overheated conical washer spring.	Replace a damaged spring.
	Inspect the oil brake cover for leakage or damage.	Repair or replace the cover if the sealing surfaces are damaged.
	Check that the friction discs for wear, distortion, or damage. Minimum thickness of wear surface per side: 0.5 mm (.010 in.). Maximum thickness of friction disc: 2.13mm (.084 in).	Replace the friction discs if the oil grooves are worn away, or the discs are burned, damaged, or warped.
	Check the separator plates are flat, free of large blue areas (caused by overheating) or damaged surfaces.	Replace damaged separator plates.
	Inspect the piston housing and piston for cracks and damage. Make sure that the O-Ring grooves and sealing surfaces are in good condition.	Replace a damaged piston or piston housing.
	Inspect the brake hub and shaft for wear or damage.	Replace a damaged hub or shaft.
	Inspect brake shaft bearings for wear or damage.	Replace worn or damaged bearings.
Drum Shaft	Check for worn or damaged sealing surfaces.	Polish a lightly scoured shaft. Replace the shaft if damage is serious.
Freespool Assembly	Inspect parts for freedom of movement. Inspect splines for wear, twist or damage. Inspect freespool piston for scoring	Replace any worn or damaged parts. Remove light scoring on freespool piston with abrasive paper.
Drum	Inspect for cracks and excessive cable wear. Inspect inner surfaces of drum for scoring or damage. Inspect bearing races for damage or wear.	Replace a damaged drum. Remove light scoring on inner drum with abrasive paper. Replace worn or damaged bearings.
Frame	Inspect frame for cracks, distortion and other damage. Inspect the clutch and brake shaft bores for excessive wear.	Replace a distorted or cracked frame. Remove sealing surface blemishes. A kit is available to repair worn clutch shaft bore.

Table 4 -1 Visual Inspection

Assembly of the Frame

1. Clean the winch frame thoroughly. Blow any dirt or contamination from the frame and oil passages.

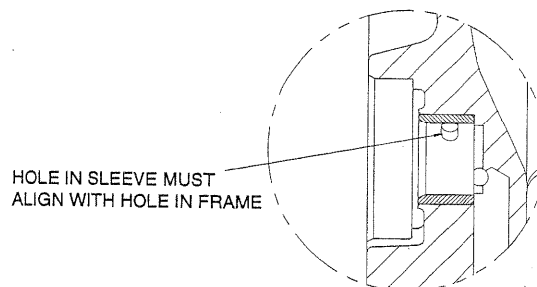


2. Inspect the clutch shaft bore in the case. If you can see or feel grooves or scratches in the bore, it should be repaired.

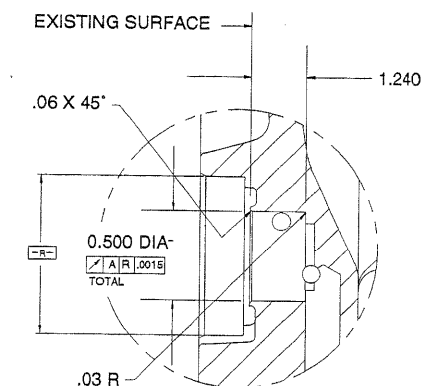
3. To repair the clutch shaft bore, obtain a repair sleeve. See the Parts Book.

4. The frame must be machined to accept the repair sleeve. The machining must meet the tolerances shown in the drawings to the right. De-burr all intersecting holes.

5. After machining the case, clean the area thoroughly, making sure to remove all metal chips. Clean the bore with solvent and blow it dry.



MACHINING
DETAIL



DEBURR ALL INTERSECTING HOLES

INSTALLATION
DETAIL

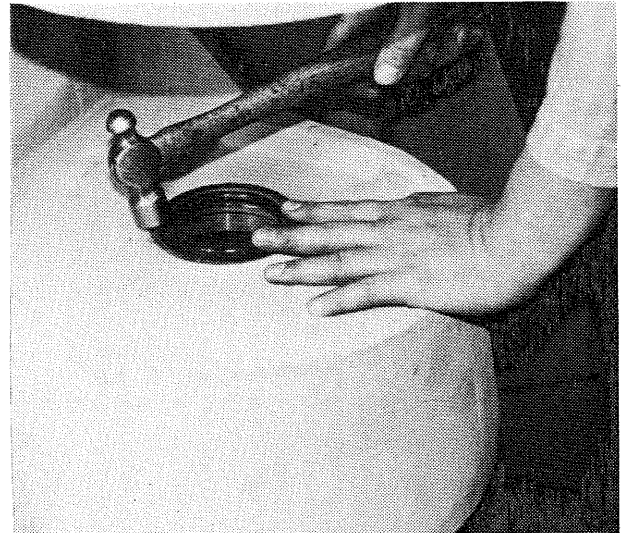
fig4-9.eps

Fig. 4-9 Assembly of the Frame (1 of 2)



6. Using a suitable driver, install the sleeve into its bore in the frame. Before driving, put a bead of bearing lock compound (included with kit) in the sleeve bore in the case, below the hole that enters the bore from the side. Also, put a bead of bearing lock compound around the outer diameter of the sleeve on the end without the external chamfer. It is very important that the hole in the sleeve aligns with the oil passage in the case.

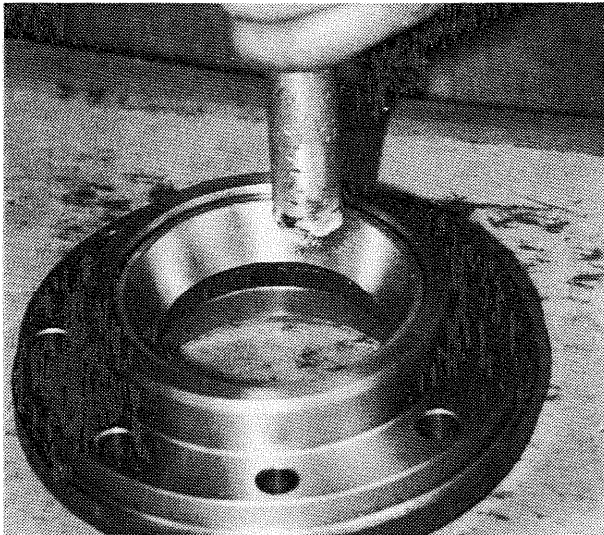
7. Install any pipe plugs that were removed from the case during disassembly. Use "PST" sealant (HCE 83) on the plug threads. Replace any o-ring fittings that were removed from drilling passages.



8. Install a new drum shaft seal. Coat the outer surface of the seal with Permatex Aviation Form-a-Gasket 3D and install in the frame using an appropriate size seal driver.

Fig. 4-9 Assembly of the Frame (2 of 2)

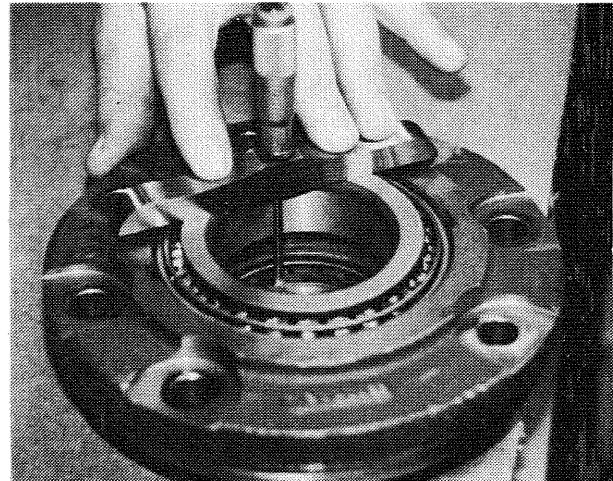
Ring Gear, Pinion & Drum Shaft



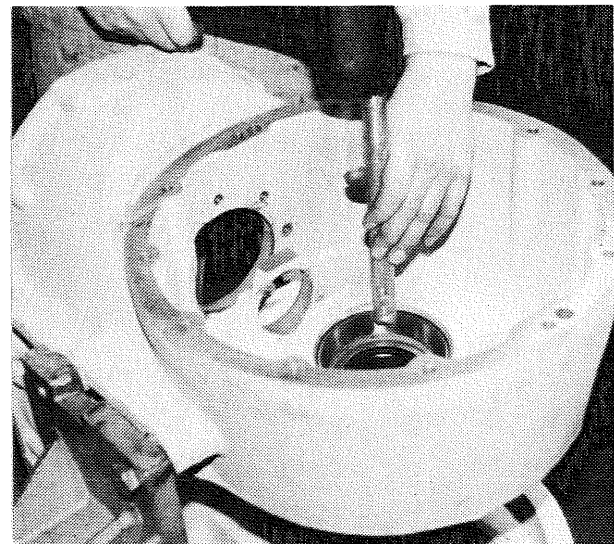
1. If required, install the roller bearing cups into the pinion carrier, using an appropriate driver.



2. Place the matching roller bearing cones into the cups and place the assembly on the workbench. Measure the distance from the outer face of the larger bearing cone to the mounting face of the bearing carrier. Record this measurement as dimension "K".



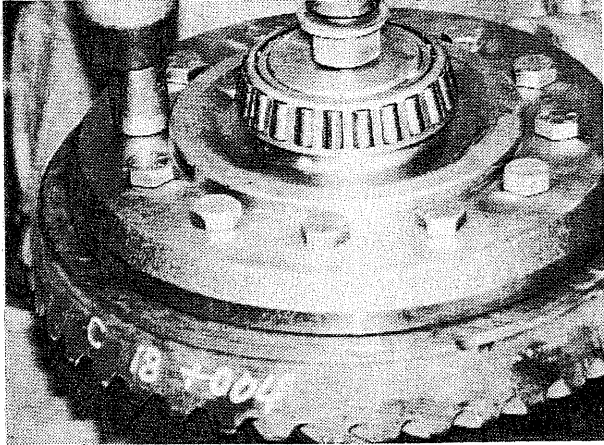
3. Turn the assembly over. Measure the distance from the outer face of the smaller bearing cone to the inner face of the larger bearing cone. Record this measurement as dimension "R".



4. Install the drum shaft bearing cups in the frame, using an appropriate bearing driver. Place the matching bearing cone into the cup.

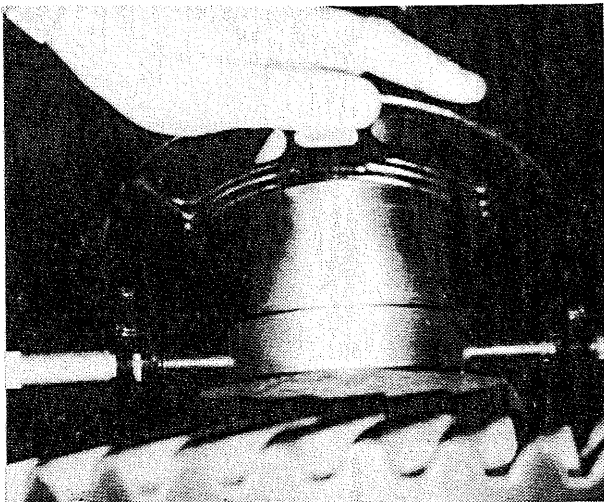
Fig. 4-10 Ring Gear, Pinion & Drum Shaft (1 of 5)

NOTE: Bolts are shown correct for early ring & pinion. Upside down for current production.

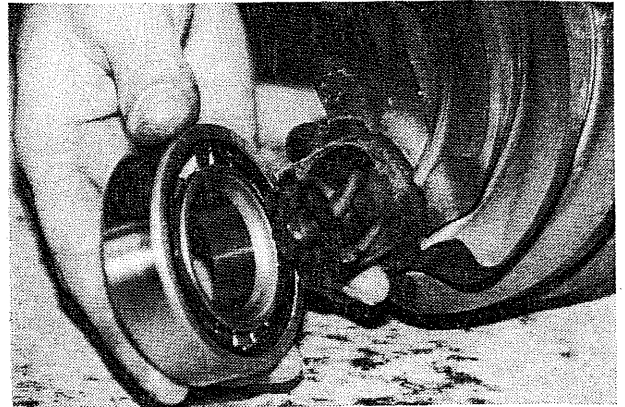


5. Attach the ring gear to the drum shaft using 12 capscrews and nuts. Tighten the nuts to 165 lb./ft (220 N/m).

NOTE: The ring gear must be heated to 180° F (82° C) to allow for assembly.

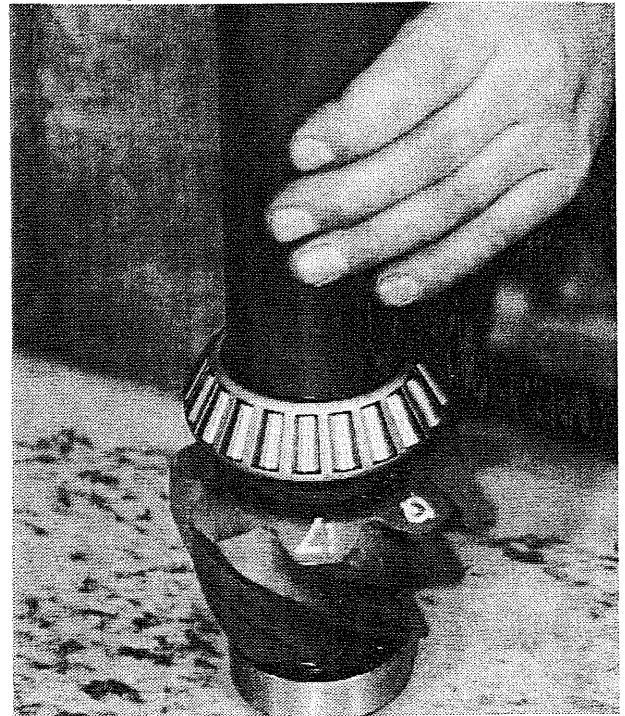


6. After the ring gear has cooled, measure the diameter of the drum shaft at the surface above the bearing shoulder. Record this measurement as dimension "M".



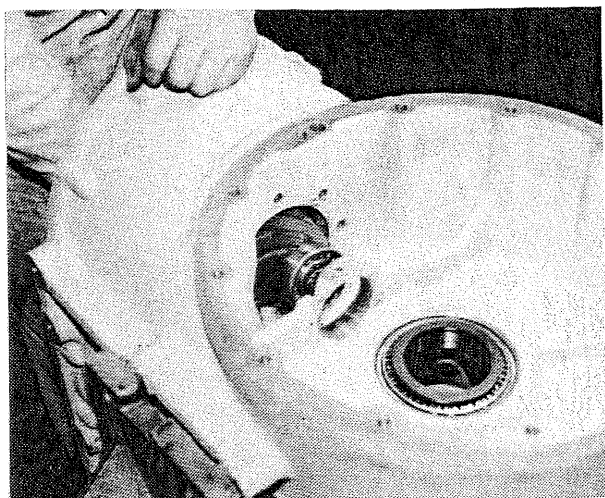
7. Fit the roller bearing onto the end of the pinion shaft, and secure with the snap ring.

NOTE: The tapered end of the inner race must face toward the shaftspline.

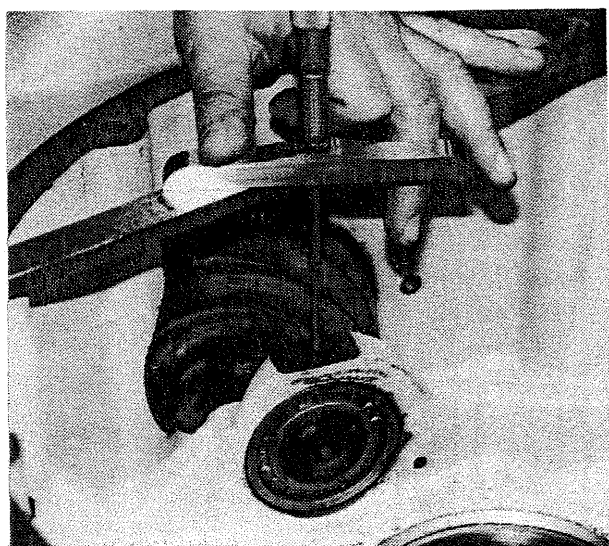


8. Install the pinion shaft bearing cone onto the other end of the shaft, using an appropriate driver.

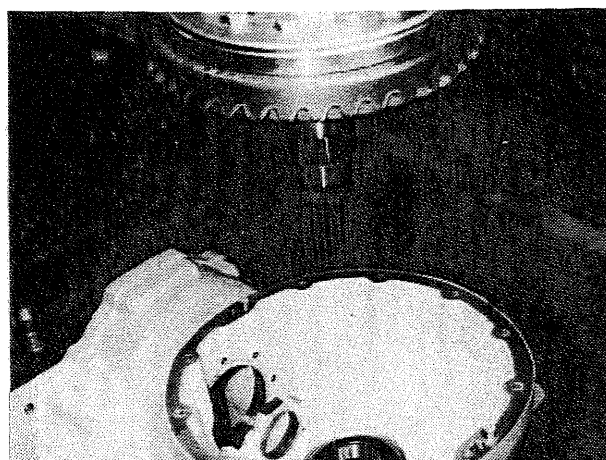
Fig. 4-10 Ring Gear, Pinion & Drum Shaft (2 of 5)



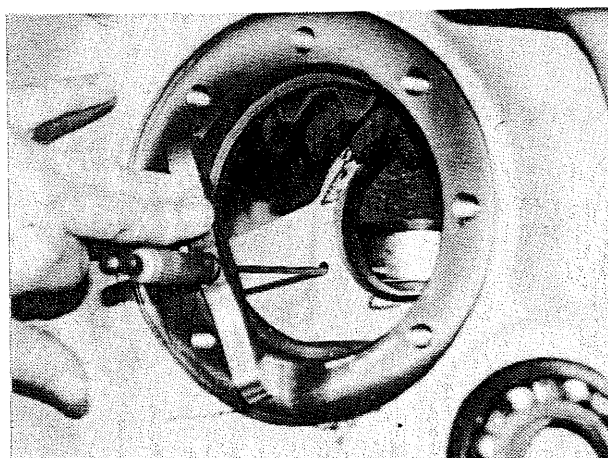
1. Fit the pinion into the case. Install so that the nose bearing fits into its bore in the case.



2. Using the access hole in the nose bearing housing, measure the distance from the LH side cover mounting surface to the outer race of the nose bearing. Record this measurement as dimension "W". Add 1.414" (3.59 cm) to dimension "W" and record as dimension "X".

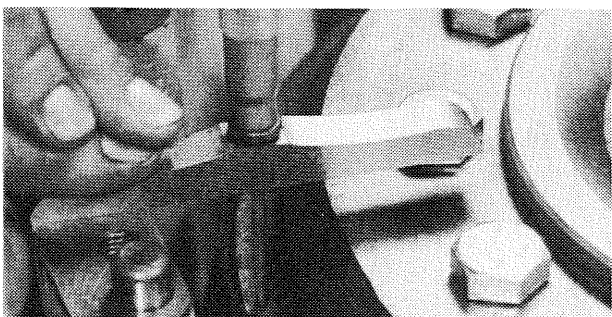


3. Remove the pinion shaft and bearing assembly. Fit the drum shaft and gear assembly into the frame, and seat it into its bearing.

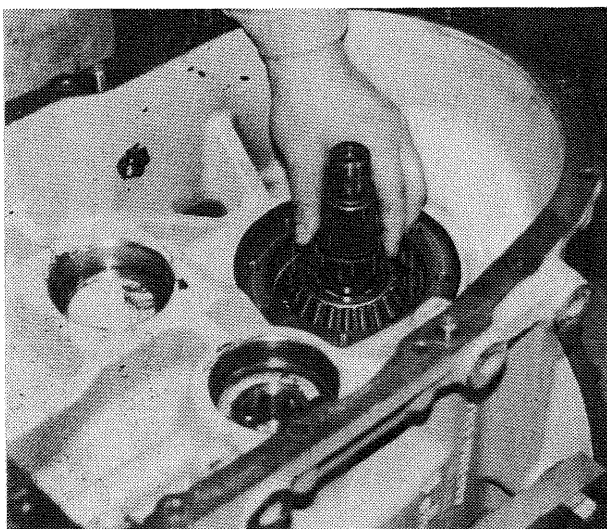


4. Using the access hole in the housing, measure the distance from the pinion carrier mounting surface to the shoulder on the drum shaft. Record this as dimension "L". Divide dimension "M" by 2 and add to dimension "L". Record this as dimension "P". Subtract dimension "K" from dimension "P". Record this as dimension "N". Subtract dimension "N" from 7.688" (19.53 cm). This is the correct shim pack thickness between the pinion carrier and the frame. Use shims to create the correct thickness.

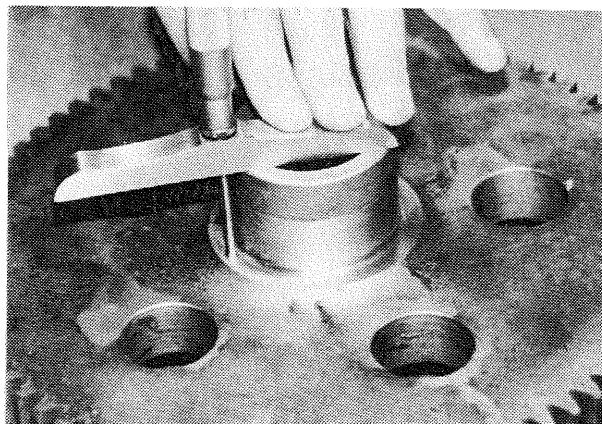
Fig. 4-10 Ring Gear, Pinion & Drum Shaft (3 of 5)



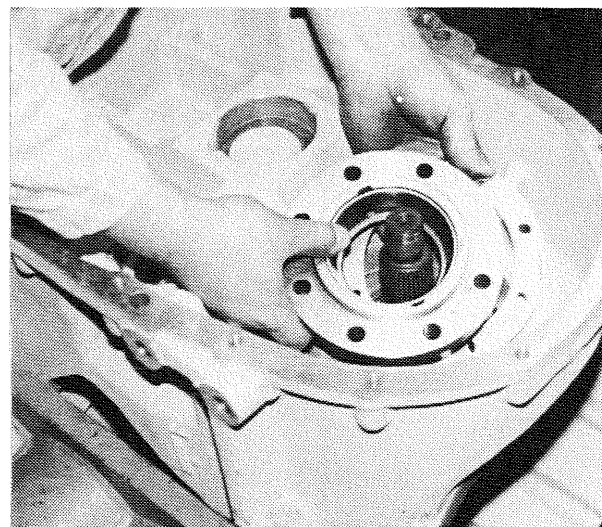
5. In three equidistant places, measure the distance from the LH cover mounting surface to the flat surface of the ring gear. Record these dimensions a "Y1", "Y2" and "Y3". Add "Y1", "Y2" and "Y3" together and divide the total by 3. Record this as dimension "Y". Subtract dimension "Y" from dimension "X". Record this as dimension "Z". Subtract dimension "Z" from 3.228" (8.20 mm). This is the correct shim pack thickness between the drum shaft shoulder and the drum shaft frame bearing. Use shims to create the correct shim pack thickness.



6. Install shim packs as measured. Fit the pinion shaft and secure with 7 flange screws. Tighten the flange screws to 80lb/ft (110 N/m).

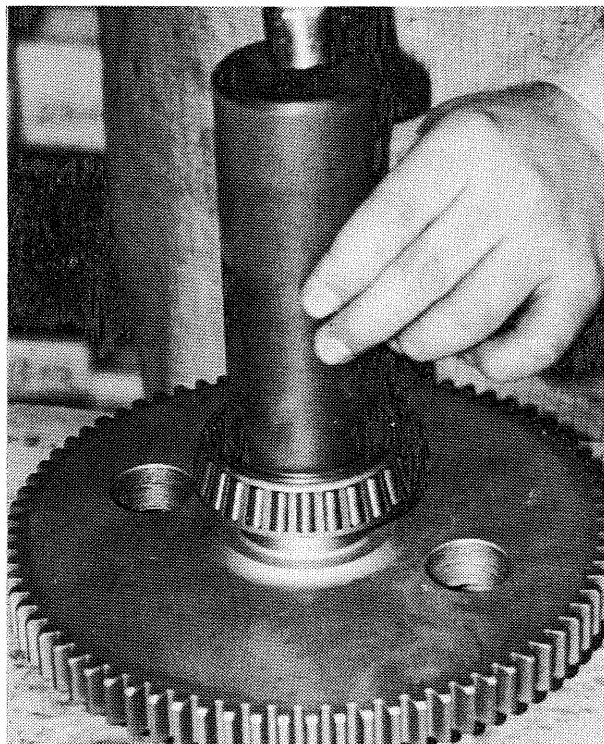


7. Place the pinion shaft driver gear on the workbench with its hub facing up. Measure the distance from the face of the hub to the bearing seat shoulder on the gear. Record this as dimension "S". Subtract dimension "S" from dimension "R". This is the correct shim pack thickness between the inner pinion bearing and the face of the gear hub. Use shims to create the correct thickness.

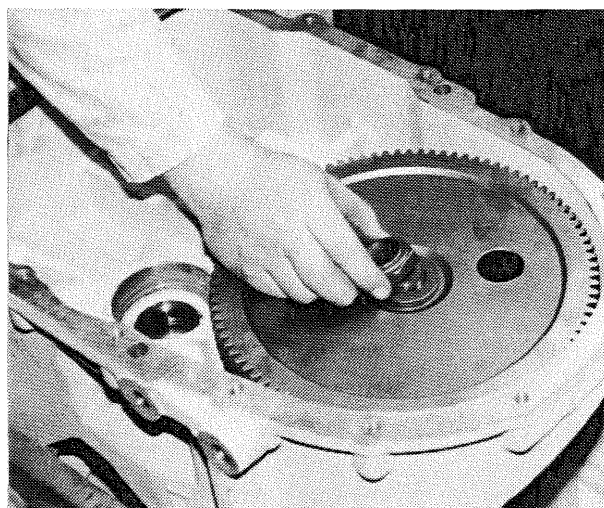


8. Install the shim pack as measured.

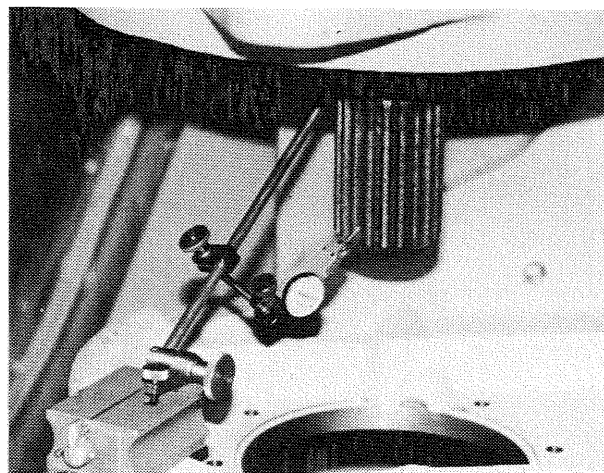
Fig. 4-10 Ring Gear, Pinion & Drum Shaft (4 of 5)



10. Press the outer bearing cone onto the gear hub using an appropriate driver.



11. Fit the pinion drive gear onto the pinion shaft and secure with the nut and washer. Tighten the nut to 500 lb/ft (678 N/m).

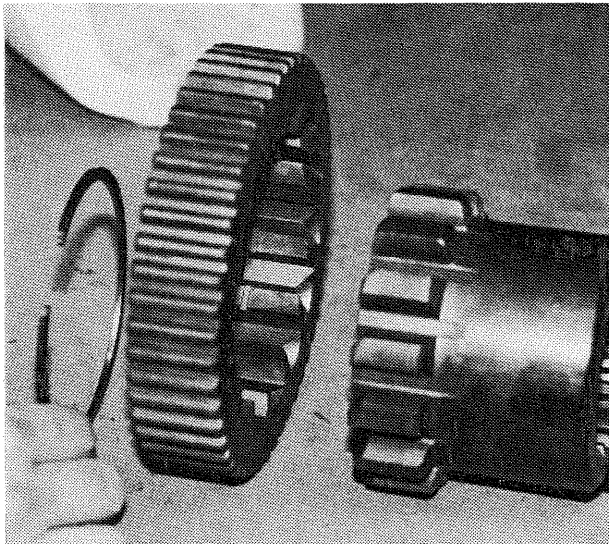


12. Using a dial indicator, measure the backlash at the splined end of the drum shaft. Adjust the drum shaft shim pack to achieve .002 - .003" (.051 - .076 mm) at this point.

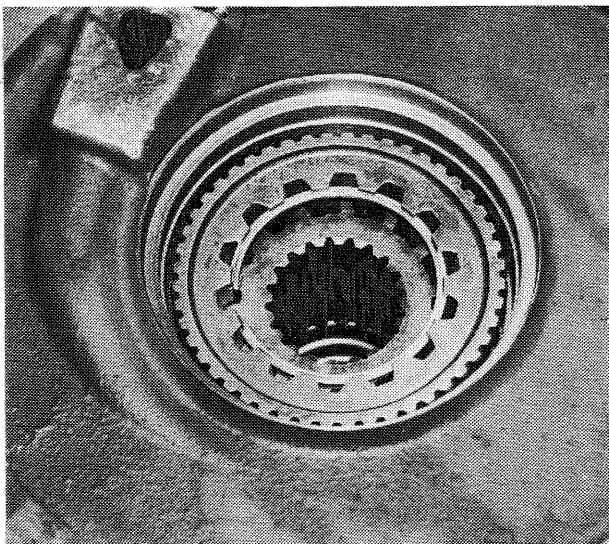
NOTE: This translates to .018" (0.457 mm) at the gear mesh point.

Fig. 4-10 Ring Gear, Pinion & Drum Shaft (5 of 5)

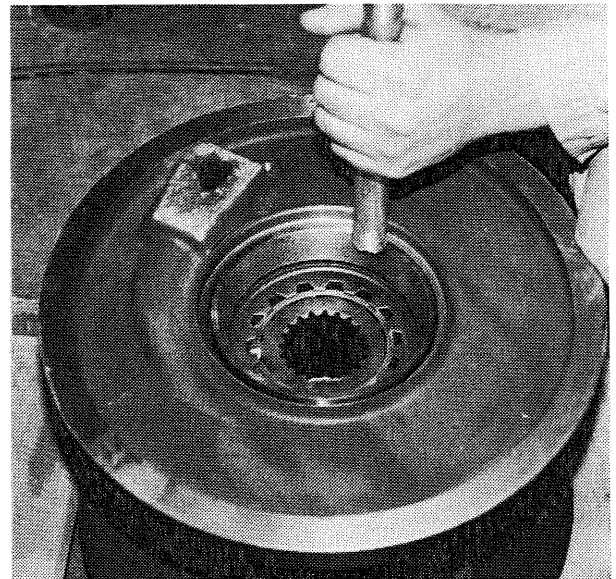
Drum Assembly & Installation



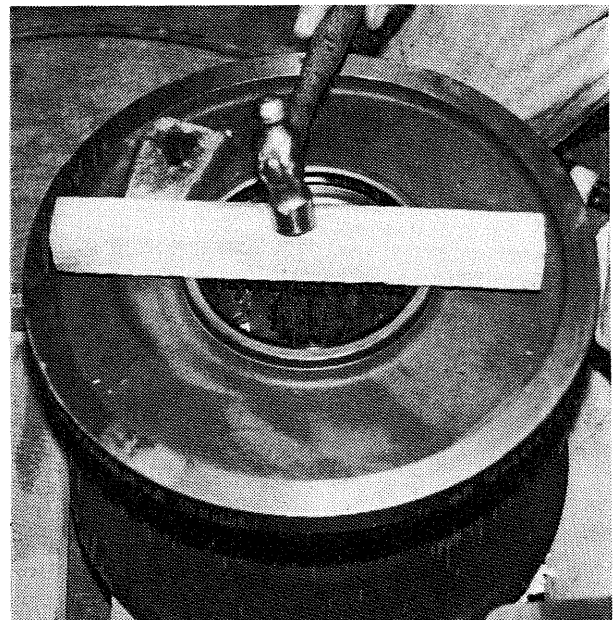
1. Fit the coupler and snap ring into the torque ring.



2. Fit the torque ring assembly into the drum with the snap ring facing outward.

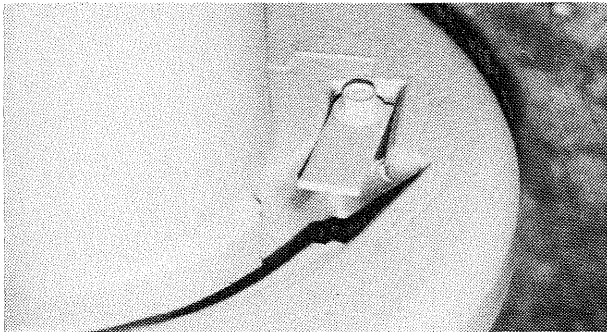


3. Install the bearing cup using an appropriate driver.

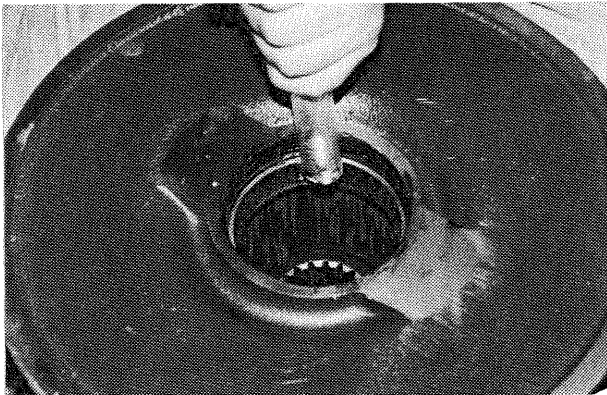


4. Coat the oil seal bore with Permatex Aviation Form-a-Gasket. Install the seal with an appropriate seal driver. The excleder lip must be outside and seal lip inside.

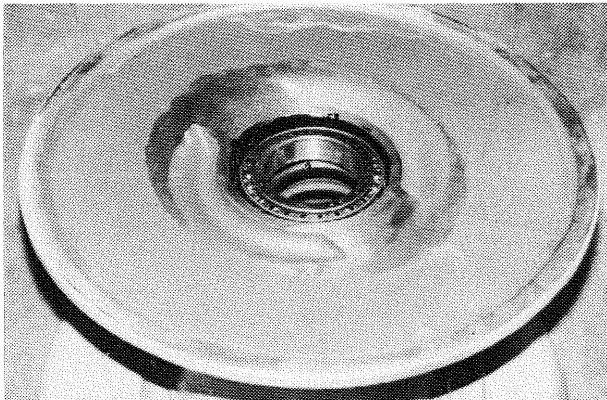
Fig. 4-11 Drum Assembly & Installation (1 of 6)



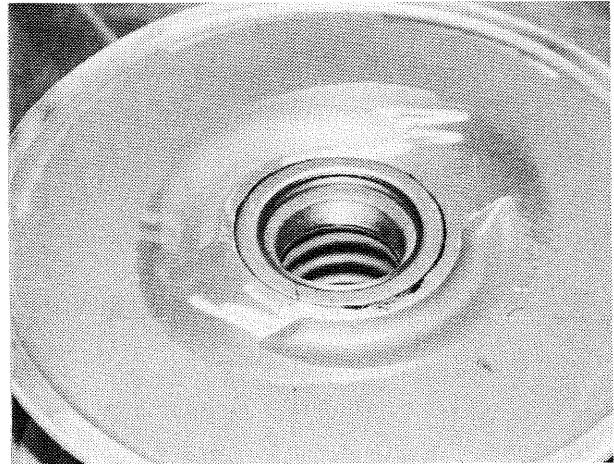
5. Turn the drum over (small end up). Fit the ferrule keeper and install the retaining cap screw finger tight.



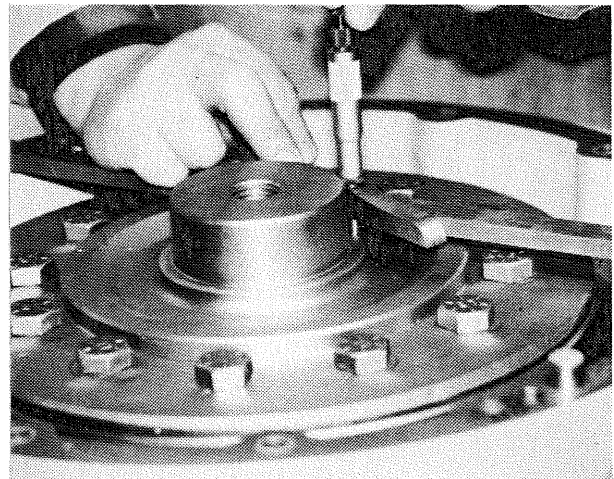
6. Press the bearing cup into its bore using an appropriate driver.



7. Fit the spring and bearing cone. Coat the seal bore with Permatex Aviation Form-a-Gasket.

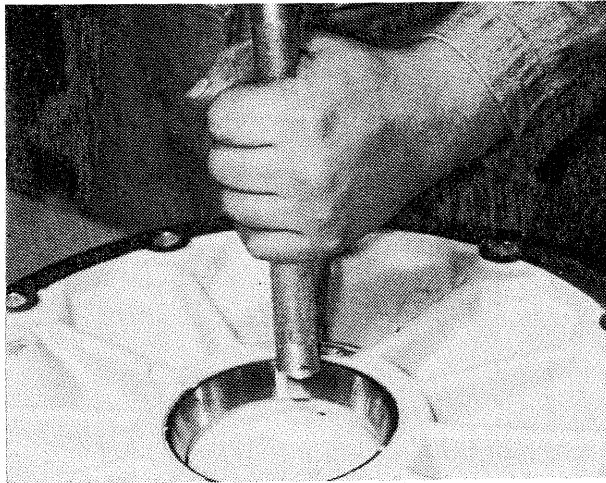


8. Press the seal into its bore using an appropriate driver. The dirt exclusion lip must face outward.

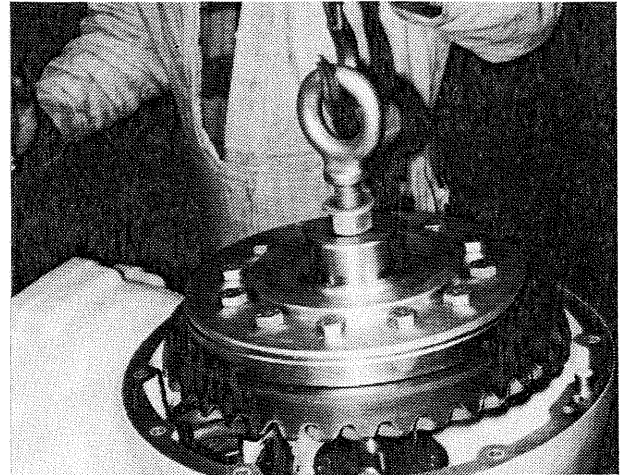


9. With the drum shaft in place and the ring and pinion gears properly shimmed, measure the distance from the L.H. cover mounting face on the frame to the bearing seat shoulder on the drum shaft. Record this measurement as dimension "B".

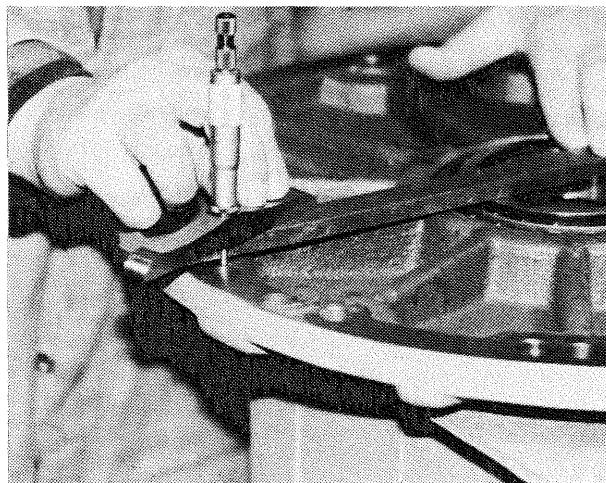
Fig. 4-11 Drum Assembly & Installation (2 of 6)



10. Place the L.H. cover on the workbench with the mounting face up. Install the bearing cup with an appropriate driver.

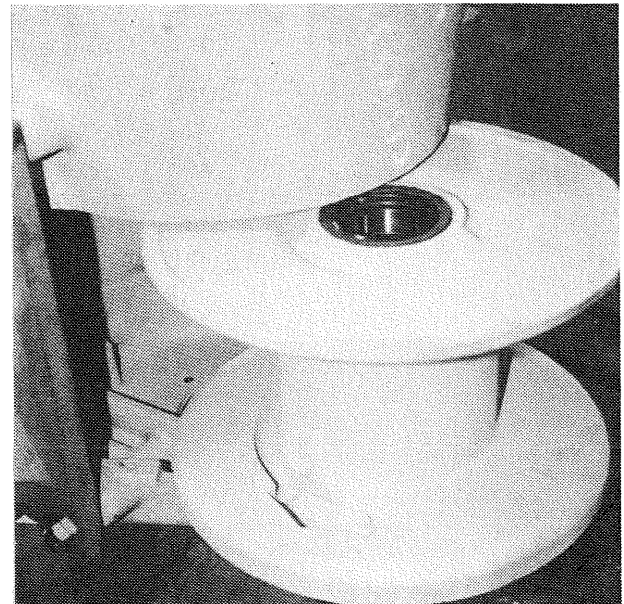


12. Remove drum shaft assembly, using care not to dislodge the shim pack.



11. Place the drum shaft bearing cone into its cup in the bearing carrier. Measure the distance from the face of the bearing cone to the mounting face of the LH cover. Record this measurement as dimension "C".

NOTE: "B" - "C" + .002" (0.051 mm) = Shim Pack. Use shims to create required thickness.



13. Fit the drum assembly into the frame. When installing the drum, align the ferrule pocket with the cut-out in the frame

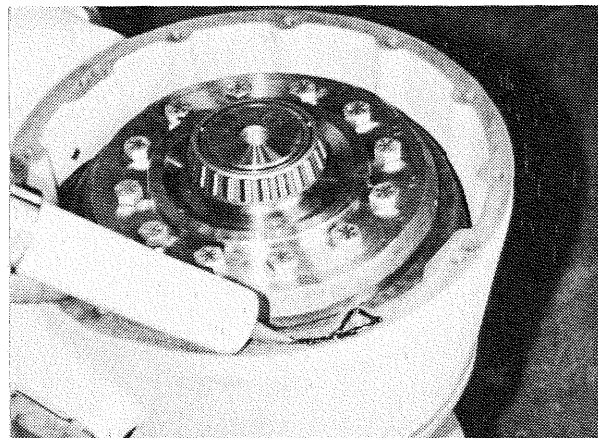
Fig. 4-11 Drum Assembly & Installation (3 of 6)



14. Lubricate the drum shaft seal in the frame. Re-install the drum shaft assembly, aligning the splines on the drum shaft with the splines inside of the freespool coupler in the drum. Drive the shaft down until the bearing is seated.



15. Use shims from step 11, to produce the required shim pack. Place the shim pack and bearing cone on the drum shaft.

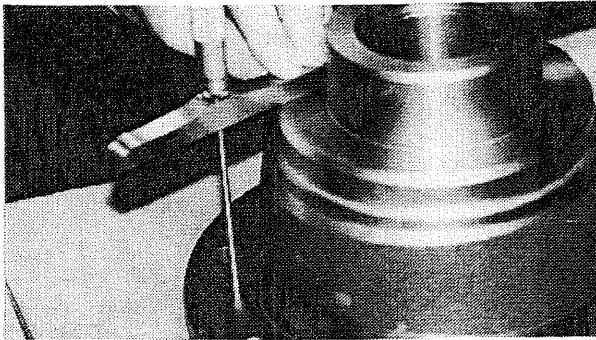


16. Apply Loctite 515 sealant (HCE-98) to the sealing surface of the housing.

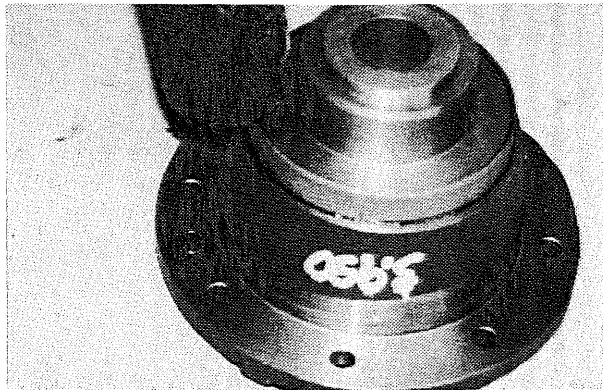


17. Place the the L.H. cover onto the housing, taking care to align the dowel pins with their holes. Install and tighten the 12 retaining cap-screws to 80 lb/ft (110 N/m).

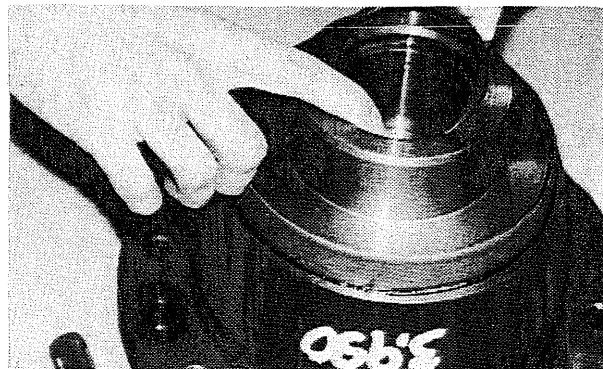
Fig. 4-11 Drum Assembly & Installation (4 of 6)



19. Place the RH cover on the workbench with the mounting flange facing up. Measure the distance from the bearing seat shoulder to the mounting face. Record this measurement as dimension "E".



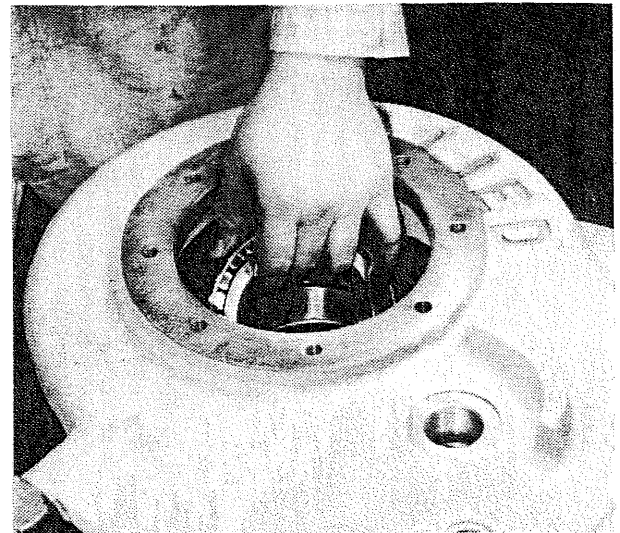
20. Install the seal sleeve into the RH cover using an appropriate driver and loctite 515.



21. Fit the o-ring into the internal groove in the cover.

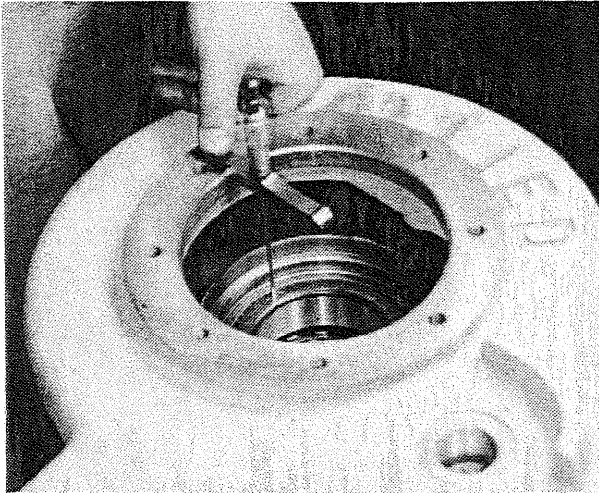


22. Lubricate and install the freespool piston into the cover.

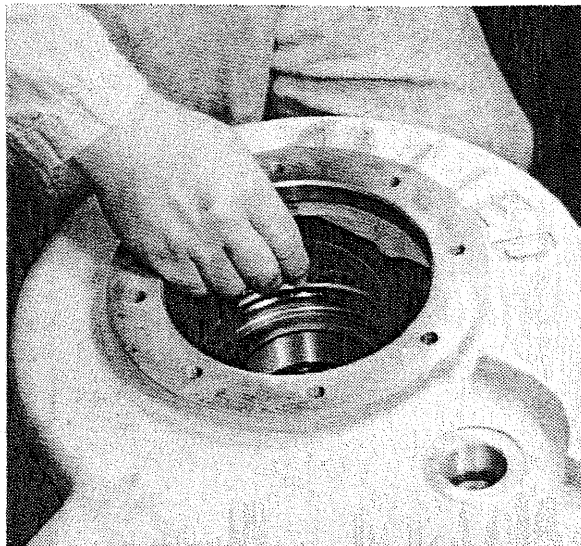


23. With the drum and shaft installed and properly pre-loaded, and the ring and pinion gears properly shimmed, turn the winch housing so that the RH side is facing up. Fit the bearing cone into the drum assembly.

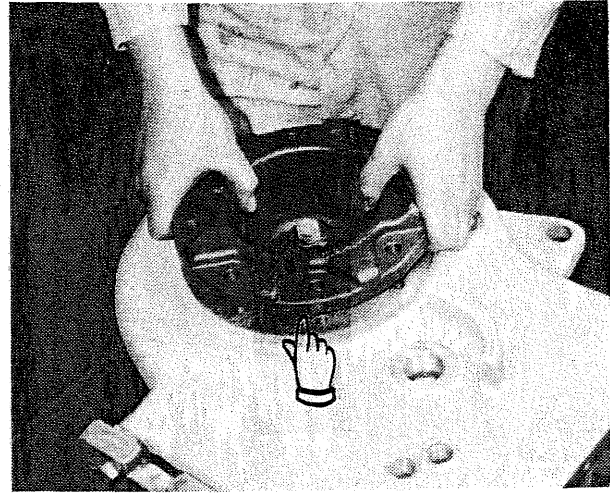
Fig. 4-11 Drum Assembly & Installation (5 of 6)



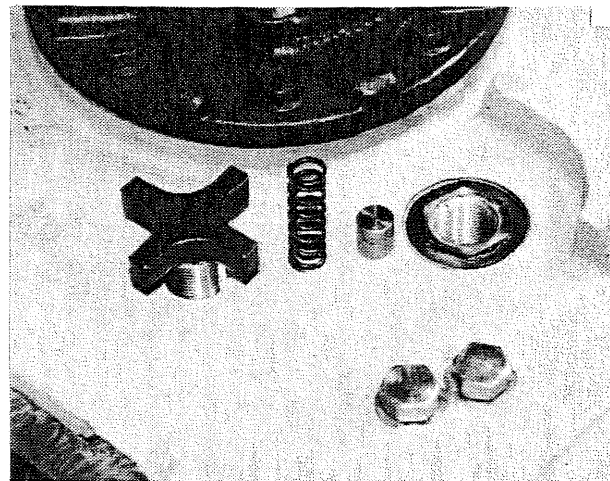
24. Measure the distance from the RH cover mounting face to the outer face of the drum bearing cone. Record this measurement as dimension "F". Subtract "E" from "F", and then subtract $.002" \pm .002"$ ($.051 \text{ mm.} \pm .051 \text{ mm}$). This will be the correct shim pack thickness beneath the RH cover.



25. Install the shim pack on the bearing.



26. Install the RH cover and secure with 8 flange screws. Tighten to 80 lb/ft (110 N/m). The gap in the cover must be oriented as shown.



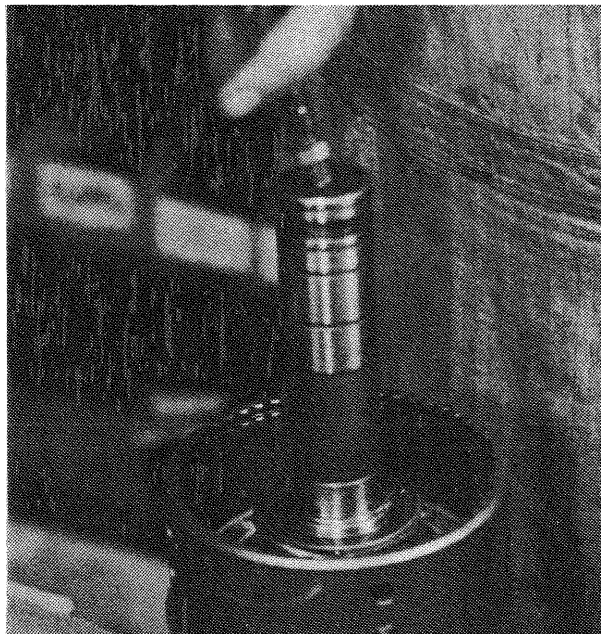
27. Install the drag shoe and spring. Screw the knob in "hand" tight.

Fig. 4-11 Drum Assembly & Installation (6 of 6)

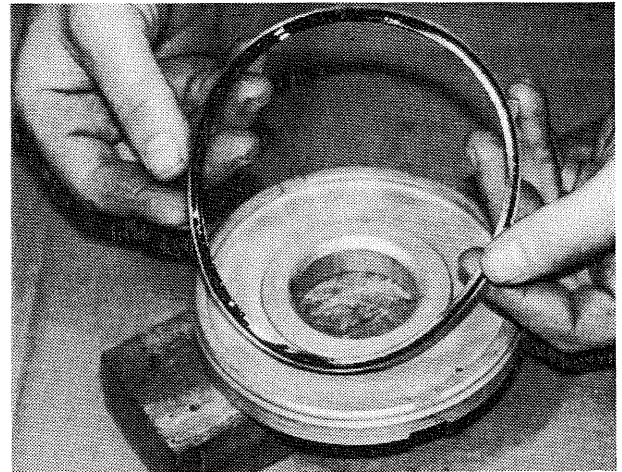
Clutch Assembly



1. Inspect the piston to ensure that the oil bleed hole is clear.



2. Place the clutch shaft and housing in a suitable assembly stand. Blow any contaminants from housing and shaft oil passages.

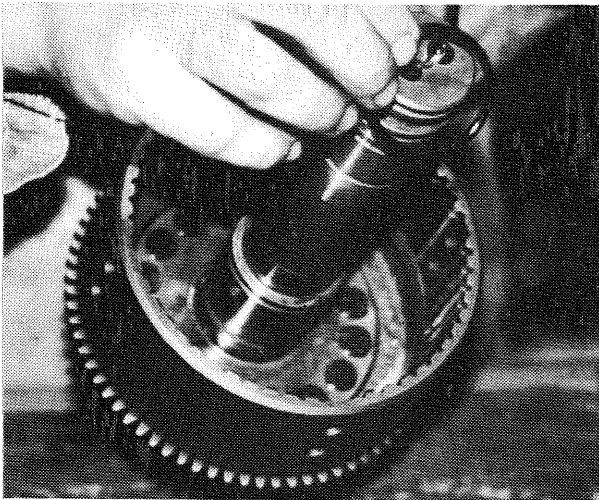


3. Fit the piston seal onto the piston so that the seal lip will be facing away from the clutch plates when installed.

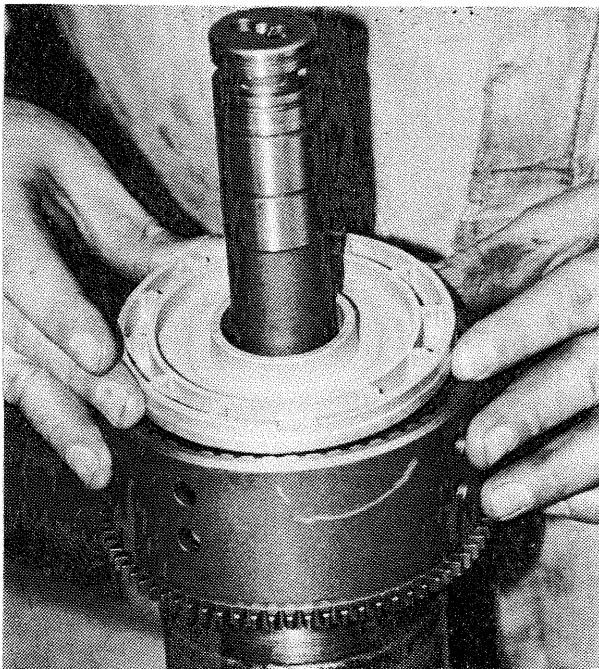


4. Stretch a rubber band or o-ring over the installed seal, compressing the seal flat. Leave it in place for at least five minutes to allow the seal to set to size. This is to make the seal lip lie flat long enough to allow you to insert the piston into its bore in the clutch.

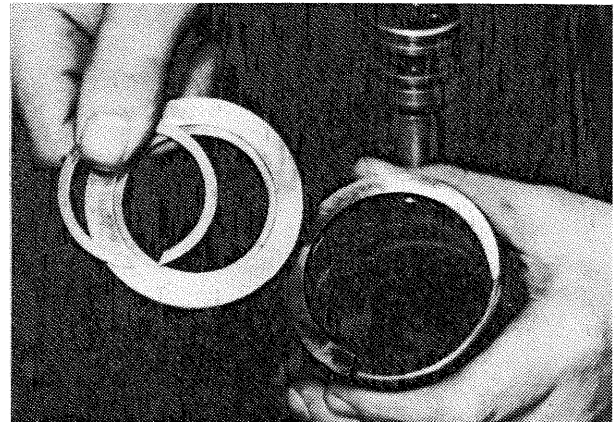
Fig. 4-12 Clutch Assembly (1 of 6)



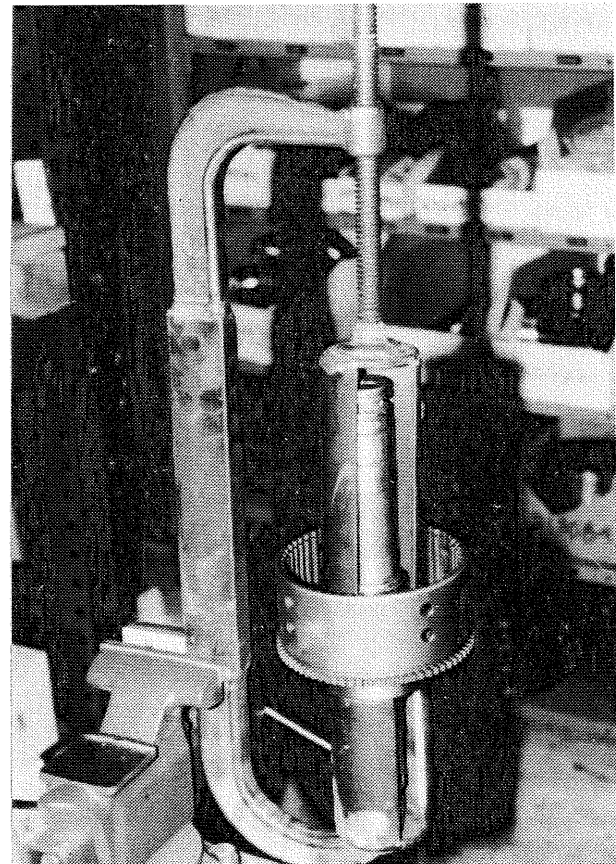
5. Fit the o-ring onto the shaft. Lubricate the o-ring and the piston seal surface in the clutch housing.



6. Remove the rubber band from the piston and IMMEDIATELY insert it into the clutch housing, seal end first.

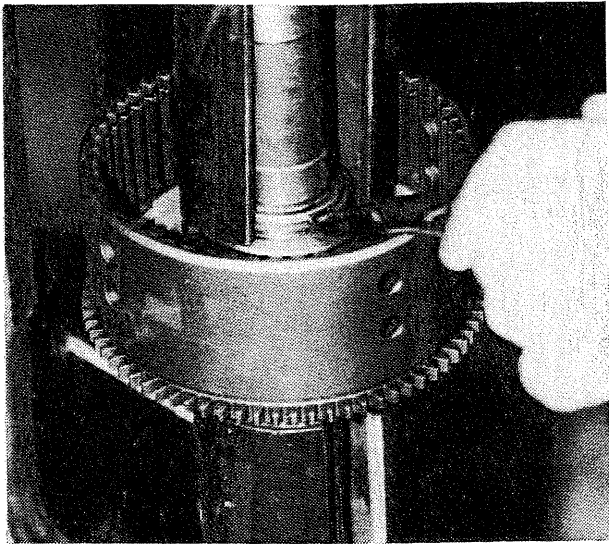


7. Install the spring, spring guide, and snap ring loosely onto the clutch shaft.

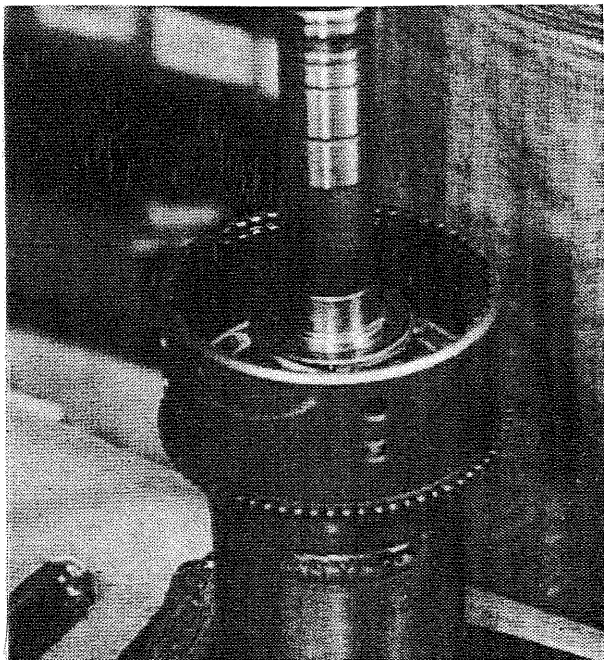


8. Place the entire assembly into a suitable spring compressor.

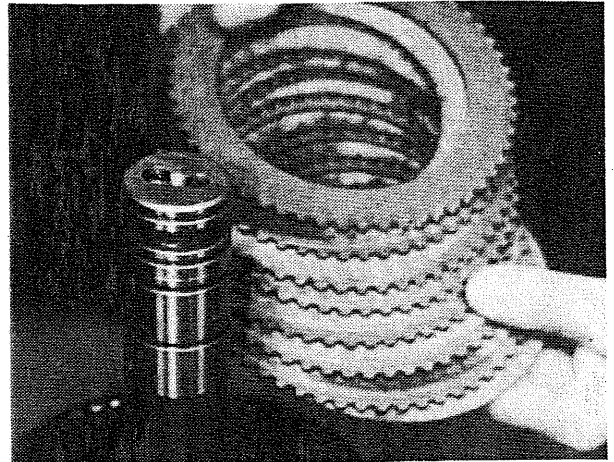
Fig. 4-12 Clutch Assembly (2 of 6)



9. Compress the spring and spring guide, and install the snap ring in its groove on the shaft.

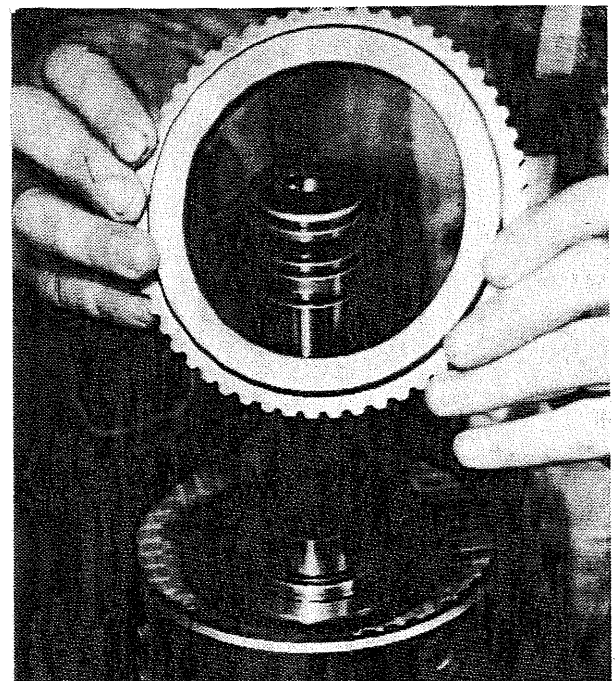


10. Return the clutch assembly to the assembly stand, and press the bearing onto the shaft using a suitable driver. The position of the shield on the bearing is not important.



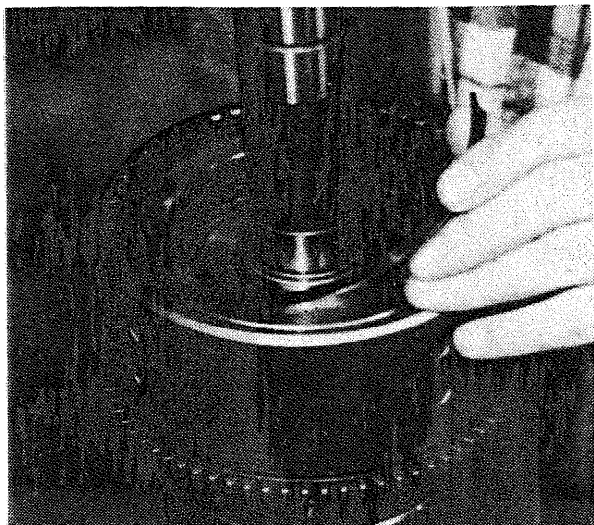
11. Beginning with a separator plate, fit 7 separator plates and 7 friction discs alternately into the clutch housing.

NOTE: The position of the missing teeth in the friction discs is not important.

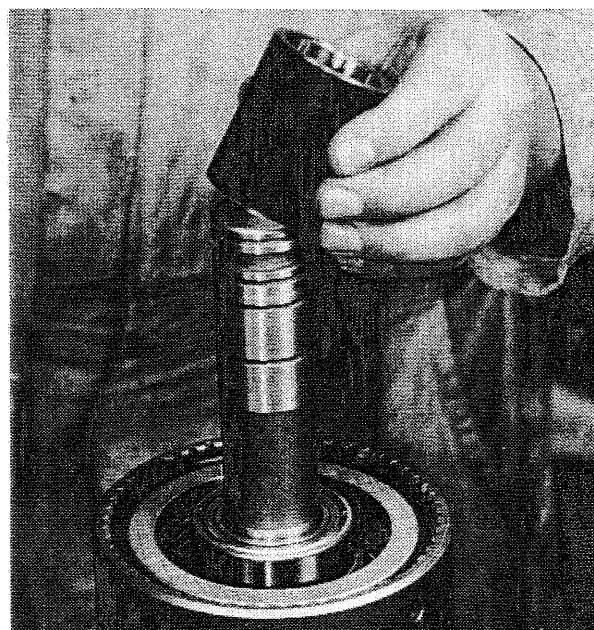


12. Fit the pressure plate. The step faces up.

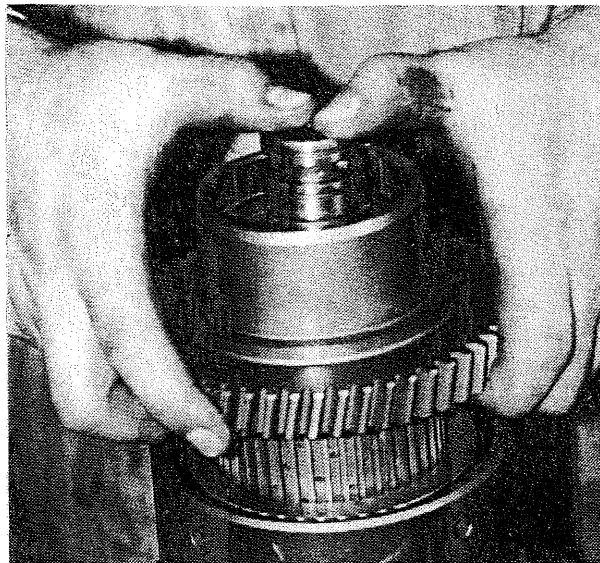
Fig. 4-12 Clutch Assembly (3 of 6)



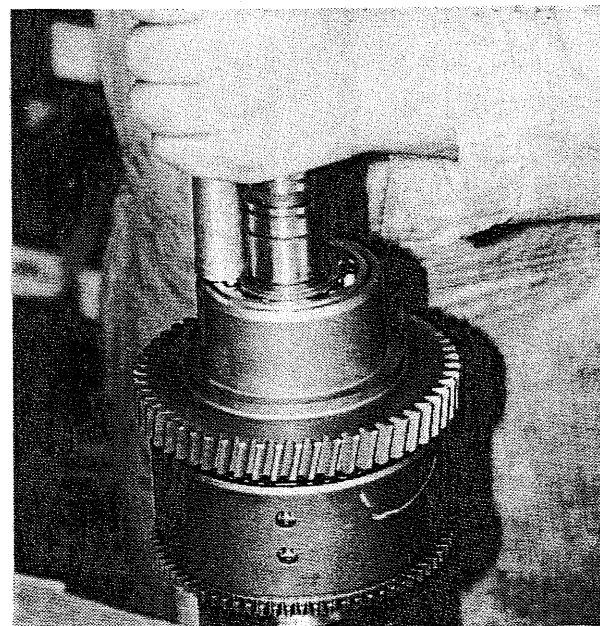
13. Install the snap ring in its groove.



14. Fit the spacer onto the clutch shaft.

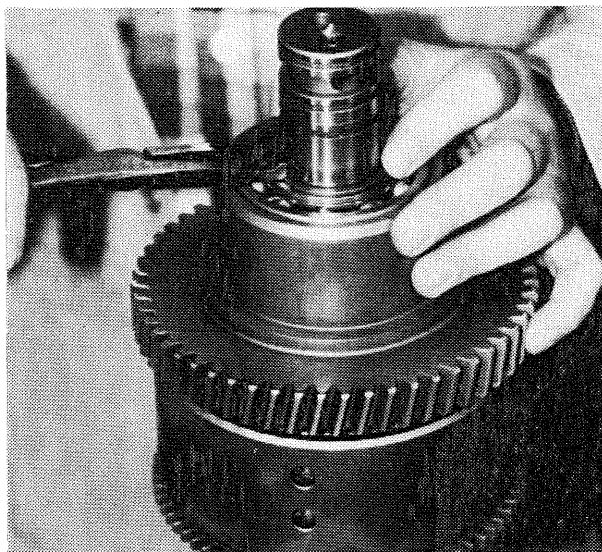


15. Insert the clutch hub into the clutch housing, using care not to damage the internal teeth on the friction discs. Wiggle the hub gently to help the teeth engage the splines.

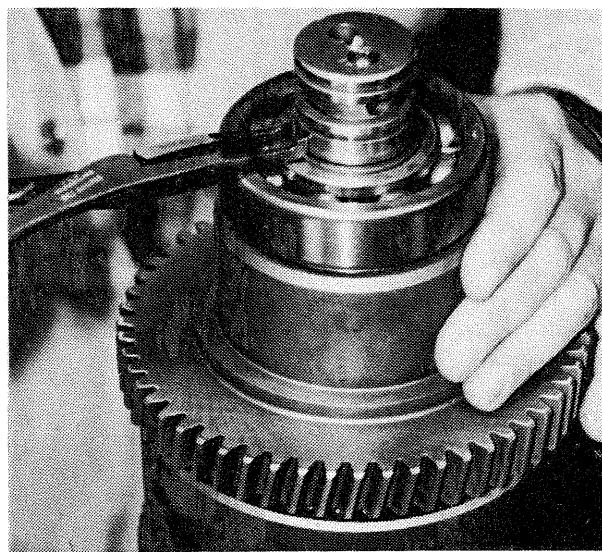


16. Press the bearing into the clutch hub, using a suitable driver.

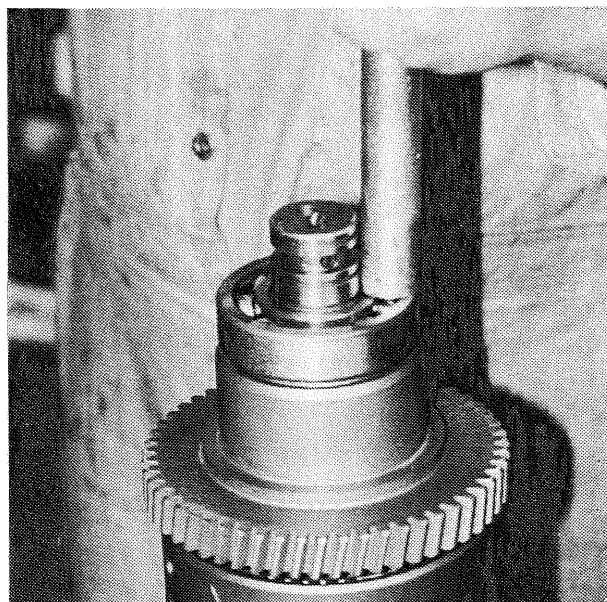
Fig. 4-12 Clutch Assembly (4 of 6)



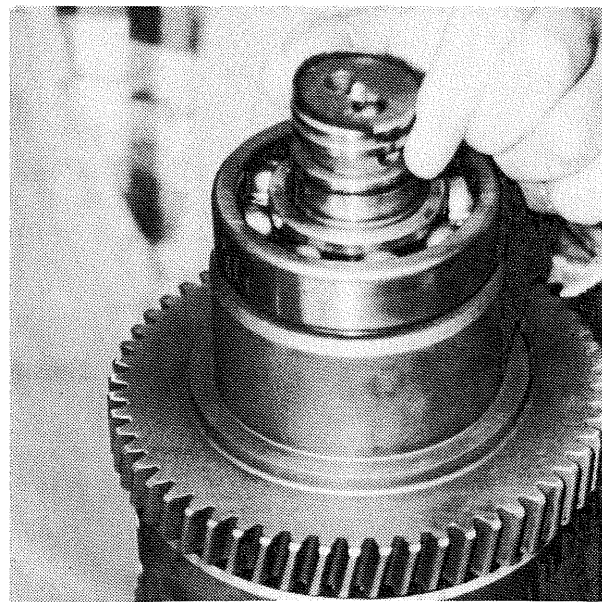
17. Install the snap ring.



19. Install the snap ring.

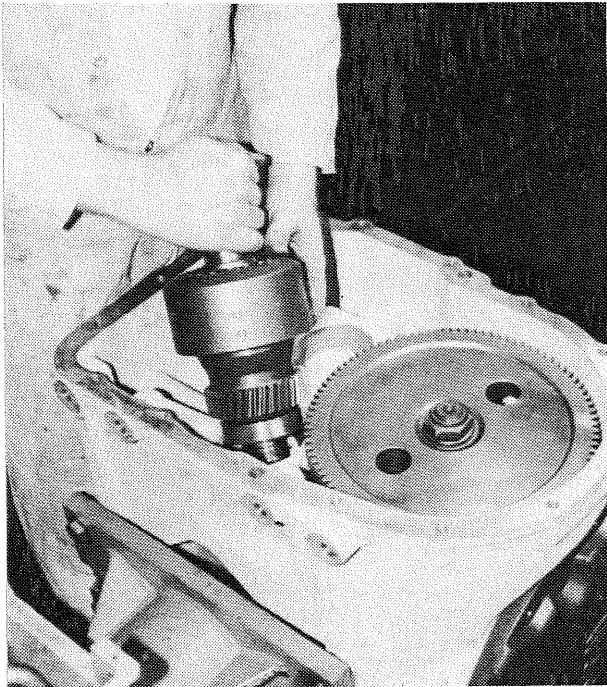


18. Press the bearing onto the clutch shaft using a suitable driver.

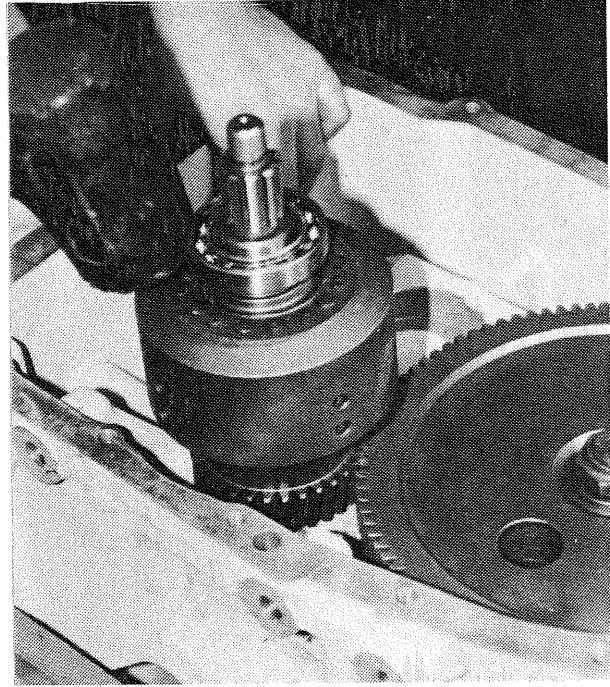


20. Install the seal rings into the grooves in the clutch shaft.

Fig. 4-12 Clutch Assembly (5 of 6)



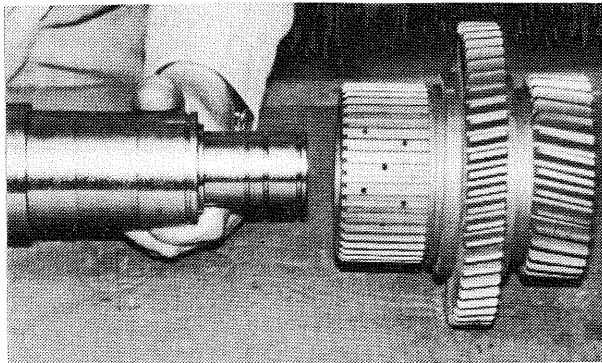
21. Install the clutch assembly into its bore in the frame. Use care to avoid damaging the sealing rings.



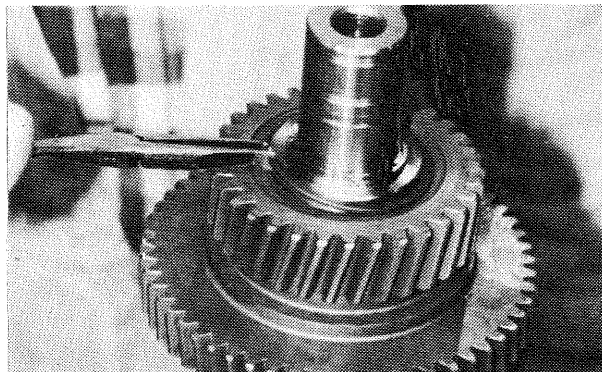
22. Press the bearing onto the clutch shaft using a suitable driver.

Fig. 4-12 Clutch Assembly (6 of 6)

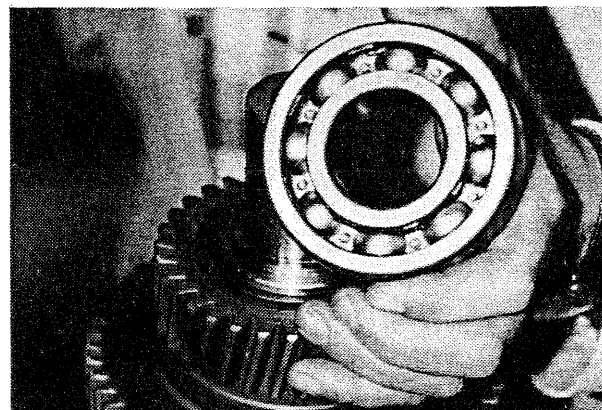
Brake Shaft & Hub Assembly



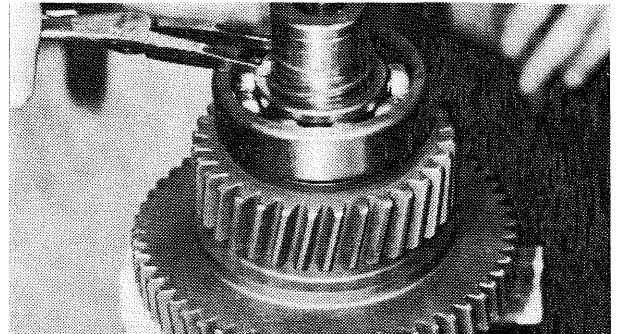
1. Press the brake hub onto the brake shaft using a suitable driver.



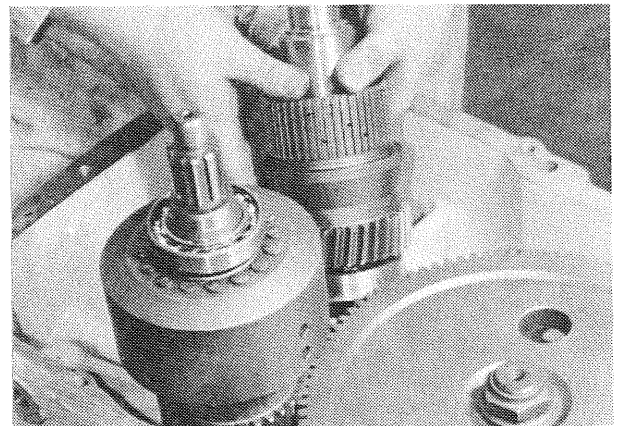
2. Install hub retaining snap ring.



3. Press the bearing onto the brake shaft using an appropriate driver.



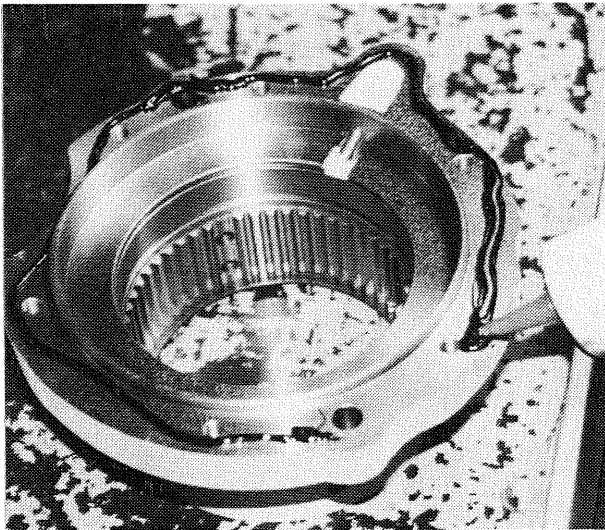
4. Install the bearing retaining snap ring.



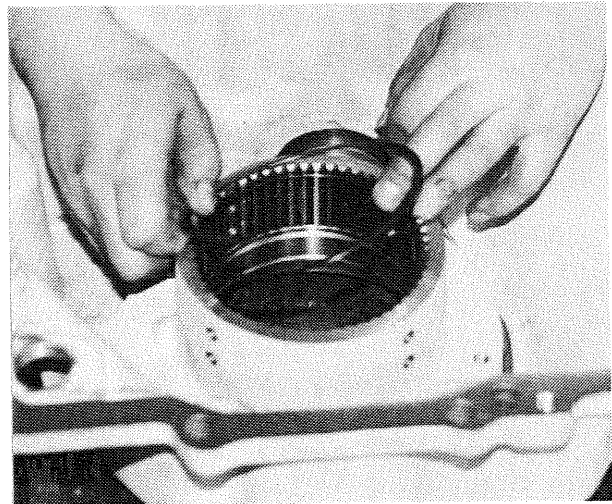
5. Install the brake shaft assembly into its bore in the frame.

Fig. 4-13 Brake Shaft & Hub Assembly (1 of 1)

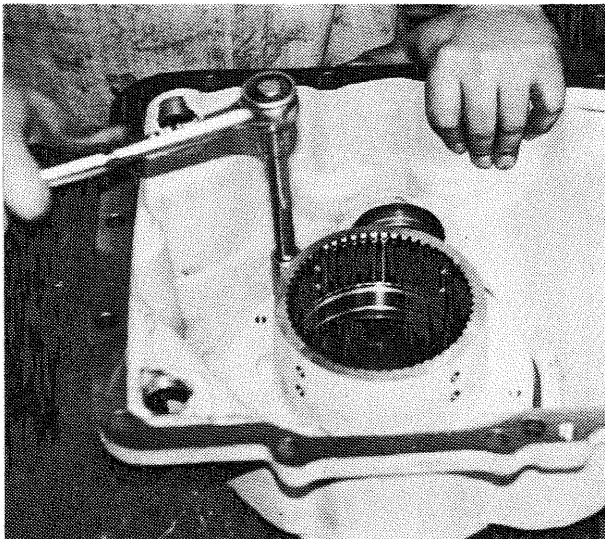
Front Cover Assembly



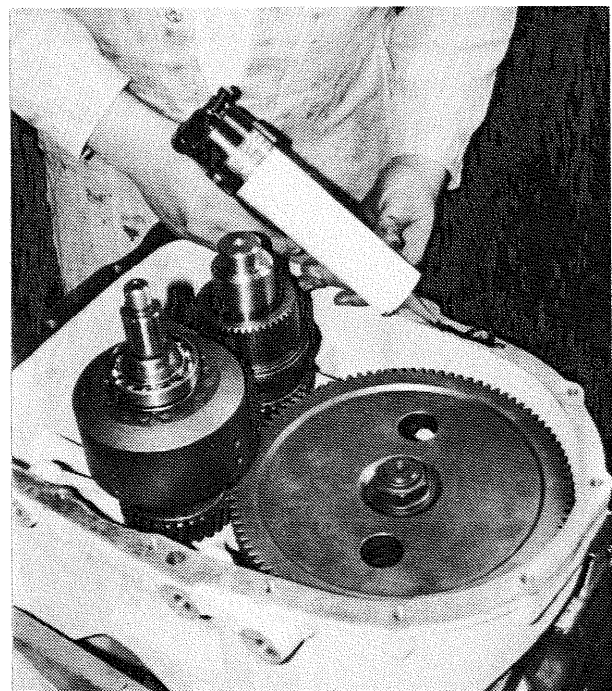
1. Apply liquid gasket sealant to the brake housing mounting surface.



3. Install the snap ring in the groove in the brake housing.

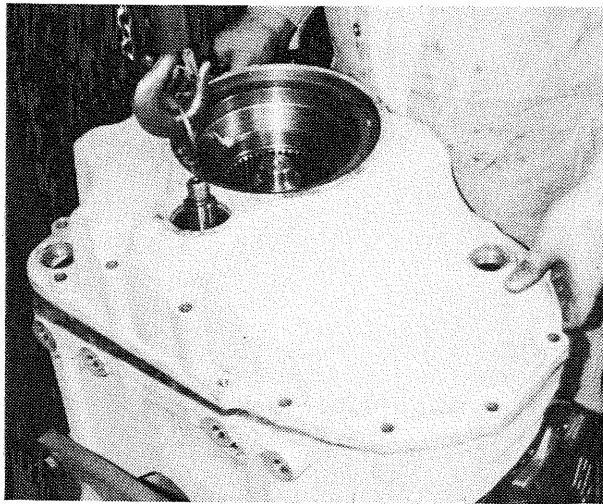


2. Fit the brake housing to the front cover, secure with two flange screws and tighten to 23 lb/ft (31 N/m).

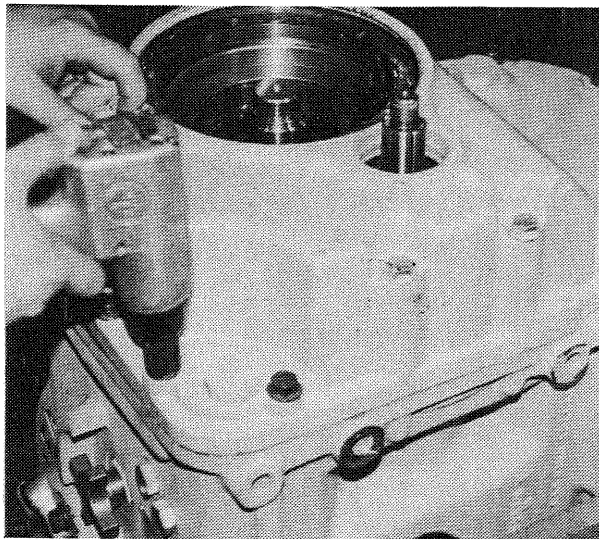


4. Coat the front sealing surface of the frame with loctite 515 sealant. Spread the sealant evenly.

Fig. 4-14 Front Cover Assembly (1 of 2)

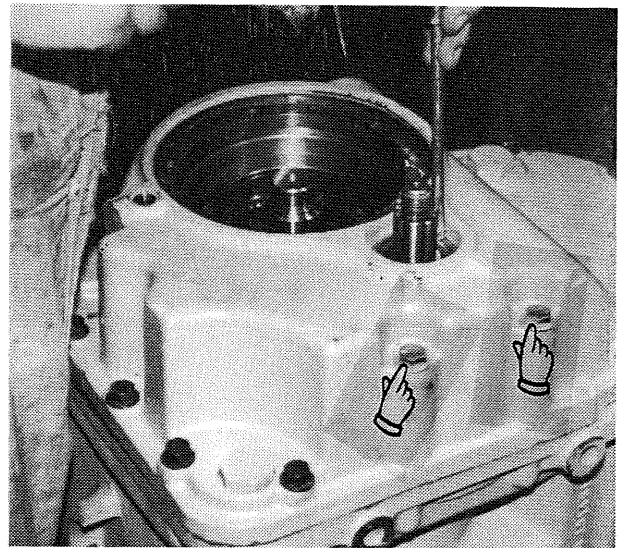


4. Lower the front cover onto the frame. Guide the cover onto the alignment pins, and fit it flush with the main housing.



5. Secure the cover to the frame with fifteen 1 3/4" (44.5 mm) long flange screws, and two 5" (127.0mm) long flange screws. Tighten to 80 lb/ft (108 N/m).

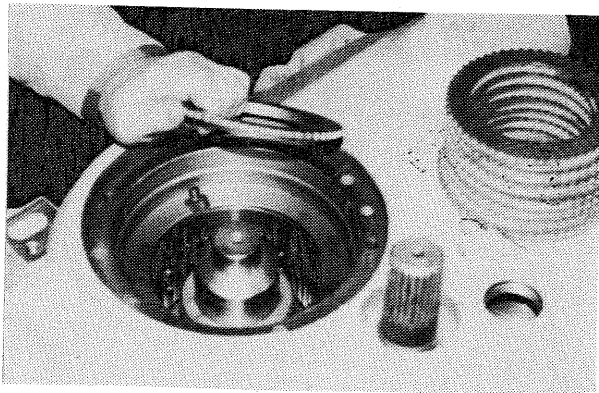
NOTE: The two longer screws go into specific holes in the frame and cover. See arrows in photo.



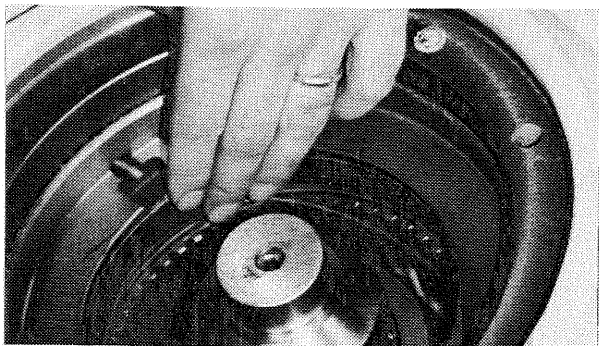
6. Install the PTO shaft seal into the front cover using a suitable driver. Coat the seal outer diameter with Permatex Aviation Form-a Gasket before installation.

Fig. 4-14 Front Cover Assembly (2 of 2)

Brake Assembly



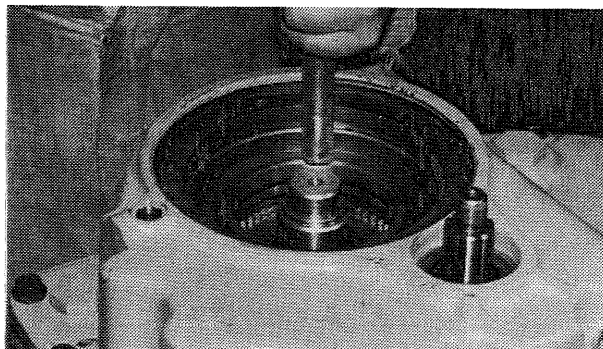
1. Fit the brake pressure plate into the brake housing in the front cover. The step on the plate must face in. Beginning with a friction disc, fit seven friction discs and seven separator plates alternately into the brake housing.



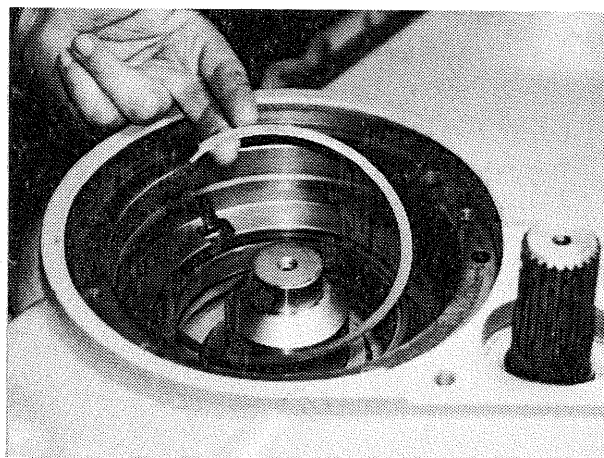
2. Fit a new o-ring into the brake housing.



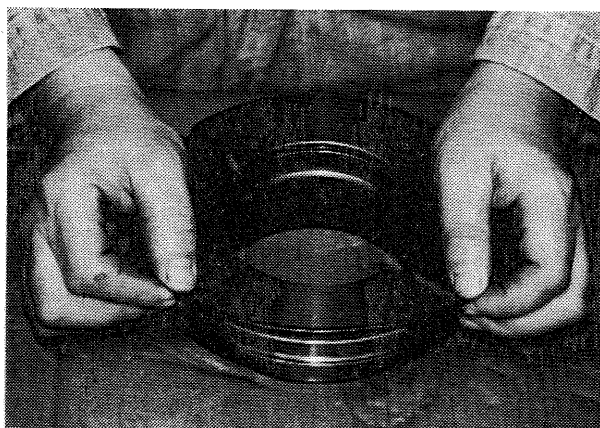
3. Fit a new o-ring into the the spacer.



4. Using a suitable driver, install the spacer into the front cover.



5. Fit the snap ring into the brake housing.

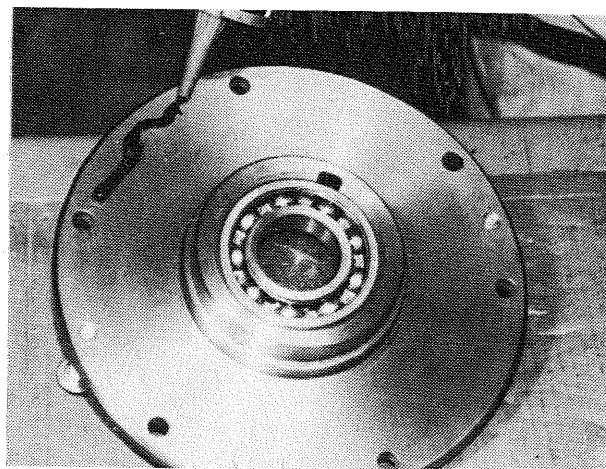


6. Fit a new o-ring to the brake piston.

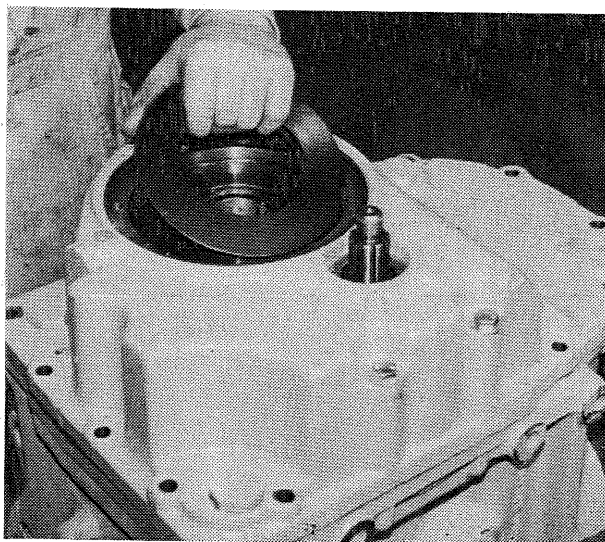
Fig. 4-16 Brake Assembly (1 of 2)



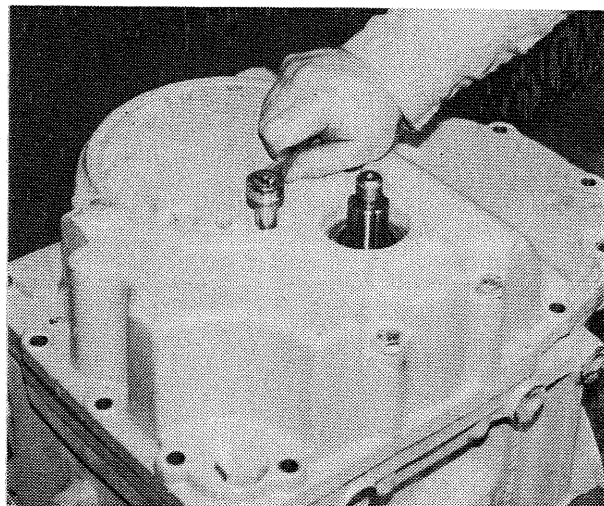
6. Install the piston into the brake housing.



8. Using a suitable driver, press the shaft bearing into the brake cover. Coat the brake cover sealing surface with Loctite 515 sealant.



7. Install the two spring washers in the brake housing. (not nested)



9. Fit the brake cover to the front cover and secure with six flange screws. Tighten to 33 lb/ft (44.7 N/m).

Fig. 4-16 Brake Assembly (2 of 2)

Control Valve

Removal

1. Disconnect all hydraulic lines to the control valve. Cap off hose ends and open ports to prevent contamination.
2. Remove the capscrews securing the control valve to the skidder. Remove the valve assembly.

Disassembly

1. Place the valve in a clean work area.
2. Remove the plug (6). Carefully remove the external O-Rings and backup-rings (7) from the plug (6). A seal kit is available for external seals.
3. Unscrew and remove the plug (26) and remove the internal plug (24) and O-Rings (25 & 26).
4. With the steel cover plate (3) held in a vise, unscrew the spool detent assembly (11 thru 22) and carefully pull the spool assembly from the valve body. Use care not to damage the spool surfaces. Do not disassemble the spool assembly (items 11 through 22) unless required for repairs.
5. Unscrew the valve cover plate capscrews (13) and remove the cover plate (12). Carefully remove the gasket (14) from the valve body (1) or plate. Remove all traces of gasket, but use care not to scratch the sealing surfaces.
6. Carefully remove the wiper ring (9) and spool seal (10) from the grooves in the valve body (1). Use care not to scratch the sealing surfaces in the valve body.

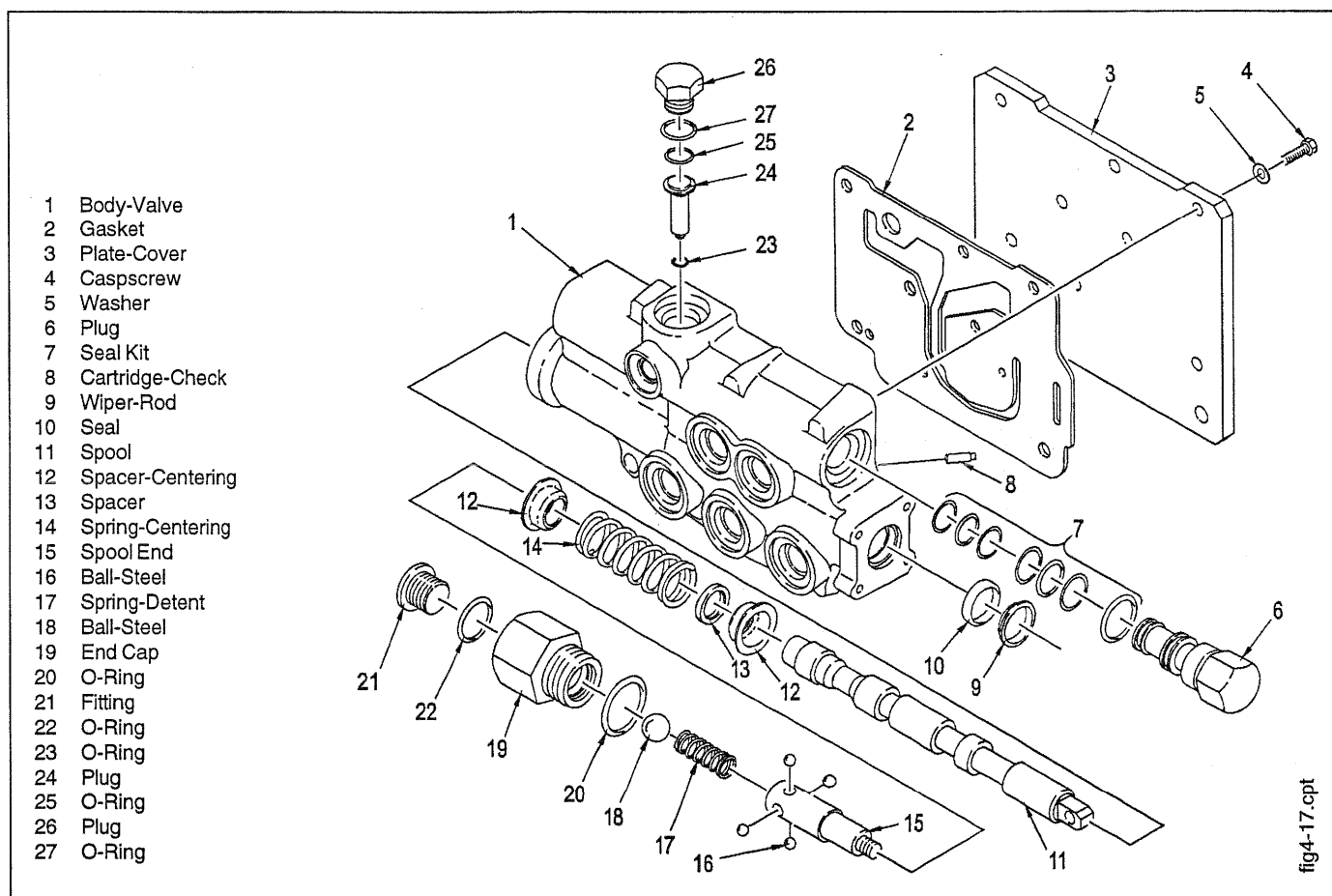


Figure 4 -17 Hydraulic Control Valve

Inspection

1. Clean all metal parts in a suitable cleaning solvent or kerosene. Dry carefully with a lint-free cloth.
2. Blow all passages clear with compressed air. Lubricate parts with clean hydraulic oil during assembly.
3. Inspect all parts for wear or damage. Replace any defective parts.
4. Replace all O-Rings, backup-rings and gaskets.

Assembly

1. Carefully install a new spool seal (10) and wiper ring (9) in the valve body (1). Use care not to damage the sealing surfaces in the body or the seal.
2. Lubricate the spool assembly (11 thru 22) and carefully insert it into the valve body. Use care not to damage the spool. Screw the spool assembly into the valve body and tighten.
3. Install a new O-Ring (23) on the end of the internal plug (24). Install the plug in its bore in the valve body (1). Install a new O-Ring (25) on the top of the plug (24), and install external plug (26). Do not overtighten.
4. Install O-Rings and backup-rings (3) into the grooves in the relief valve cartridge (2). There must be a backup-ring on either side of each O-Ring. Lubricate the cartridge and screw it into its bore. Tighten the cartridge.
5. Install the cover plate gasket (2) and the cover plate (3) onto the valve body (1). Clean any oil from the capscrew (4) threads and coat them with Loctite 262. Install the capscrews (4) and lockwashers (5) and tighten to 70 lb/in (7.9 N/m).

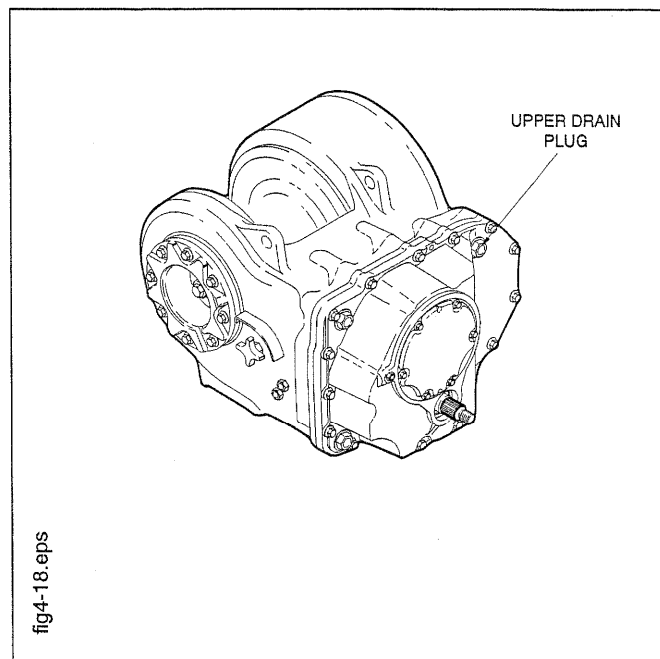


Figure 4-18 Hydraulic Fluid Bleed Port

Installation

1. The Installation procedure is the reverse of the removal procedure.
2. Before starting the skidder's engine, check the hydraulic oil level, and add oil if required. Remove the upper plug on the winch front cover to allow air to escape while the system is filling. See Fig. 4-18.
3. Start the engine and allow it to idle for 5 minutes. Move the winch hand lever to BRAKE OFF, hold for 20 seconds, and then move back to BRAKE ON. Repeat 8 to 10 times to work air out of the system. Repeat this procedure for LINE IN and FREESPOOL.

Torque Specifications	
Ring Gear to Drum Shaft Mounting Bolts	165 lb/ft (220 N/m)
Pinion Dive Gear Nut	500 lb/ft (678 N/m)
LH & RH Cover Capscrews	80 lb/ft (110 N/m)
Brake Housing Mounting Capscrews	23 lb/ft (31 N/m)
Brake Cover Capscrews	33 lb/ft (45 N/m)
Front Cover Capscrews	80 lb/ft (110 N/m)

Table 4 -2 Torque Specifications

Hydraulic Pressure Specifications, psi			
Fuction	Clutch	Brake	Freespool
Line In	240-300	240-300	0
Brake On	0	0	0
Brake Off	0	240-300	0
Freespool	0	240-300	240-300

Table 4 - 3 Hydraulic Pressure Specifications

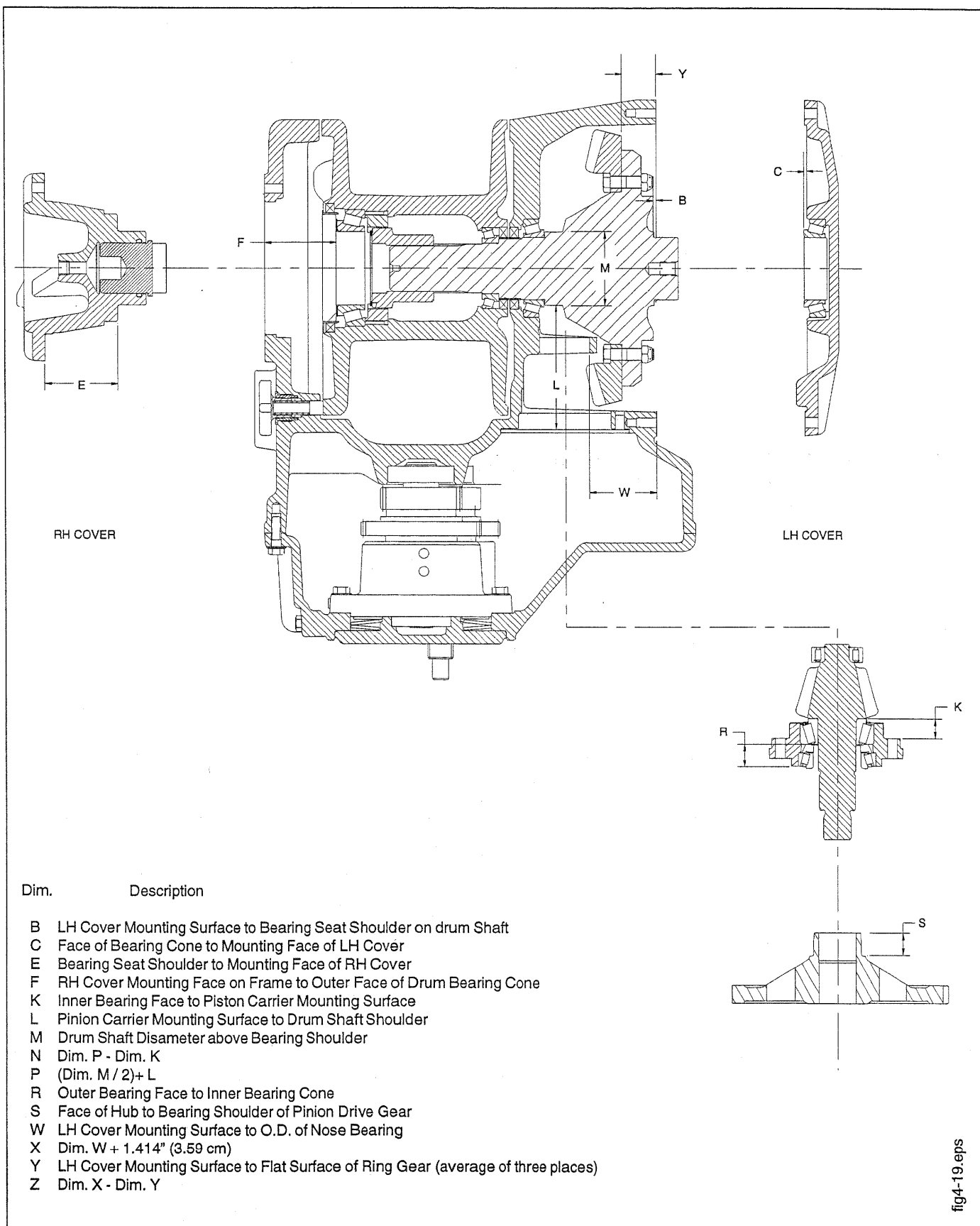


Figure 4 -19 Setup Dimensions



Lined area for notes, consisting of multiple horizontal lines.

INTENTIONALLY BLANK

