HYSTER

Allied Systems COMPANY
WINCH DIVISION

SERVICE MANUAL

FOR DIRECT DRIVE WINCH

W6F

599753W

Manufactured by Allied Systems Company
Trademark under license from Hyster Company

INTENTIONALLY BLANK

TABLE OF CONTENTS

PAGE PAGE

Sections 1 thru 5 do not apply to the W6F Direct Drive winch and have been deleted.

LIST OF TABLES

TABLE PAGE

LIST OF ILLUSTRATIONS

SPECIFICATIONS AND DESCRIPTIONS
DIRECT DRIVE WINCH

6-1. GENERAL.

6-2. This section contains descriptions that will aid the repairman in understanding the construction and operation of the Direct Drive Towing Winches and its subassemblies.

TABLE 6-1. DRUM LINE CAPACITIES

ITEM	STANDARD DIAMETER DRUM	SMALL DIAMETER DRUM
Cable Capacity (Allow for loose or unevenly spooled cable) ⅝-inch (15.88 mm) cable	580 Ft. (177 m)	665 Ft. (203 m)
¾-inch (19.1 mm) cable	400 Ft. (122 m)	460 Ft. (141 m)
⅞-inch 22.23 mm) cable	295 Ft. (90 m)	340 Ft. (103 m)

TABLE 6-2. TORQUE SPECIFICATIONS

ITEM	DESIGN DATA	REFERENCE FIGURE
NOTE All torque values given with threads lubricated.		
PTO SHAFT ASSEMBLY		
Bearing Carrier Capscrews	75 FT.-LBS. (10.37 kg-m)	
CLUTCH SHAFT ASSEMBLY		
Bearing Retainer Capscrews	75 FT.-LBS. (10.37 kg-m)	
Bearing Locknut	None	
BRAKE SHAFT ASSEMBLY		
Bearing Retainer Capscrews	75 FT.-LBS. (10.37 kg-m)	
INTERMEDIATE SHAFT ASSEMBLY		
Bearing Retainer Capscrews	75 FT.-LBS. (10.37 kg-m)	
DRUM SHAFT ASSEMBLY		
RH Bearing Retainer Capscrews	75 FT.-LBS. (10.37 kg-m)	
Internal Bearing Retainer Capscrews	75 FT.-LBS. (10.37 kg-m)	
Drum To Adapter Capscrews	200 (27.66 kg-m)	
Drum Shaft Nuts	Approx. 400 FT.-LBS. (55.32 kg-m)	
HOUSING COVERS, MISCELLANEOUS	75 FT.-LBS. (10.37 kg-m)	
CLUTCH ASSEMBLY		
Dental Clutch Shifter Crank Bracket Capscrews	88 FT.-LBS. (12.17 kg-m)	

6-3. SERIAL NUMBER DATA. (See Figure 6-1.)

6-4. The nameplate is located on the left-hand side of the winch frame and contains the Serial Number, Model Number and special application data. The serial number is also stamped on the winch frame near the nameplate. A typical serial number designates the following:

Example: W6F X 1 F 1555 K41
(1) (2) (3) (4) (5) (6)

(1) Winch Model Designation

(2) Type Of Winch Drive:
P – Power Controlled
X – Direct Drive

(3) Gear Ratio: 1 – 45.1 to 1
2 – 56.4 to 1
3 – 64.9 to 1
4 – 81.0 to 1

(4) Internal Options:
F – Freespool
N – Non-Freespool
G – Freespool With Automatic Brake
H – Non-Freespool With Automatic Brake

(5) Serial Number

(6) Tractor Make And Model/Serial Number Code Designation:

TABLE 6-3. SERIAL NUMBER DATA.

CODE LETTER	TRACTOR MAKE	CODE NUMBERS▲				
		41	42	43	44	45
A	Fiat-Allis Model:		11B(DD)	NOT USED ON DIRECT DRIVE		14B(DD)
C	Caterpillar Model:		D5(DD) 81H, 82H 93J, 94J		D6(DD) 74A, 99J	
H	International Model:		TD-15C(DD) 501 & Up			
K	Komatsu Model:	D60A/E6				

▲(Code number applies to all tractor serial numbers shown unless otherwise noted)

6-5. DESCRIPTION.

6-6. Towing Winch. (See Figure 6-1.)

6-7. The Direct Drive Towing Winch is designed for use on direct drive tractors. They are not recommended for use on torque converter tractors unless equipped with an interruptable power-take-off (PTO).

6-8. Direct Drive winches use a band-type dry brake and employ mechanically operated dental clutches to shift the gear train. All major components for the Direct Drive winches are mounted inside the frame. Control levers located in the operator's compartment of the tractor actuate the brake and dental clutches through push-pull cables.

6-9. GEAR TRAIN.

6-10. The direct drive gear train consists of five shaft assemblies: (1) a PTO shaft assembly, (2) clutch shaft assembly, (3) brake shaft assembly, (4) intermediate shaft assembly and (5) a drum shaft assembly. The shaft assemblies are shown in Figure 6-2 and torque transfer during operation is shown in Figure 6-3.

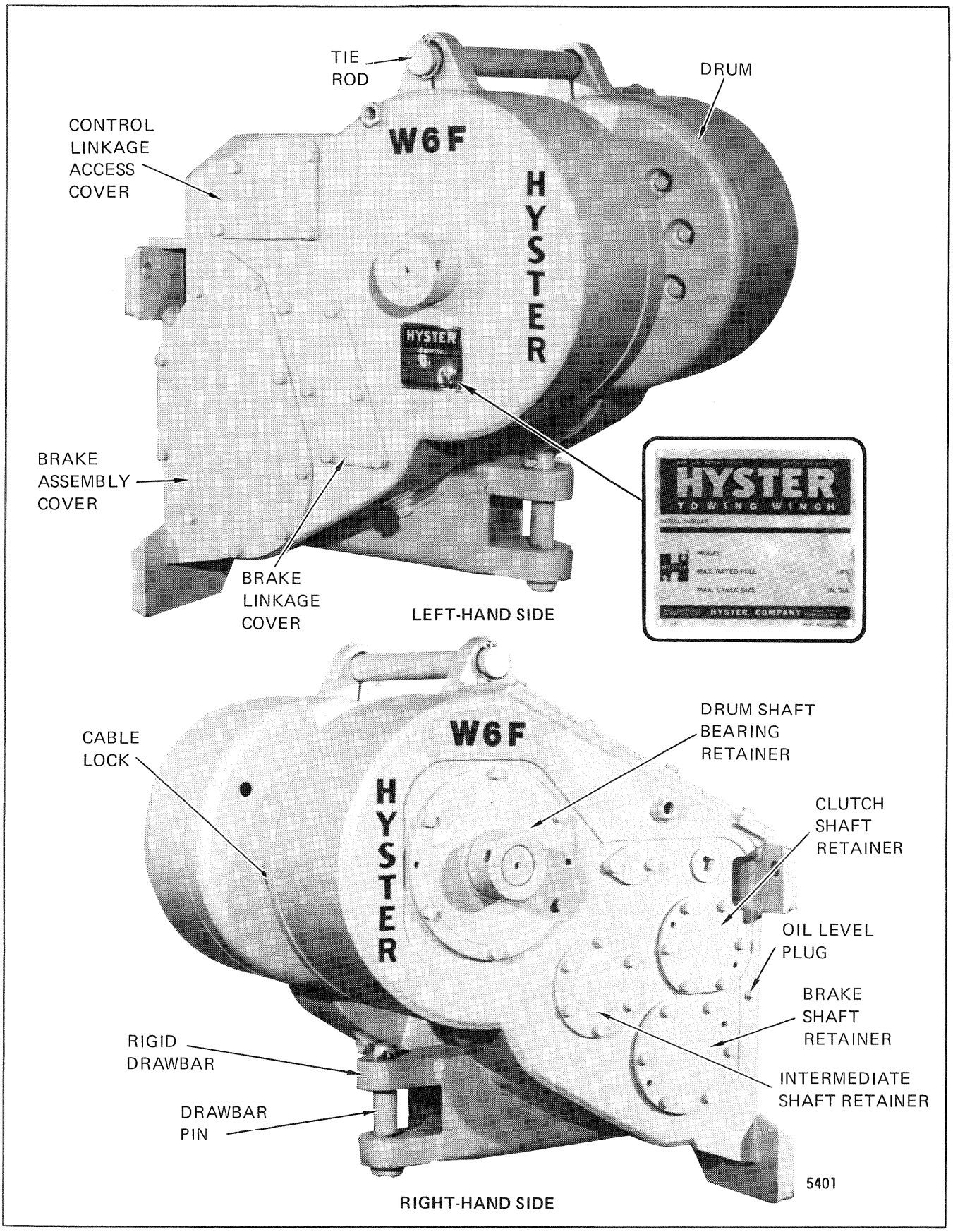


FIGURE 6-1. DIRECT DRIVE TOWING WINCH

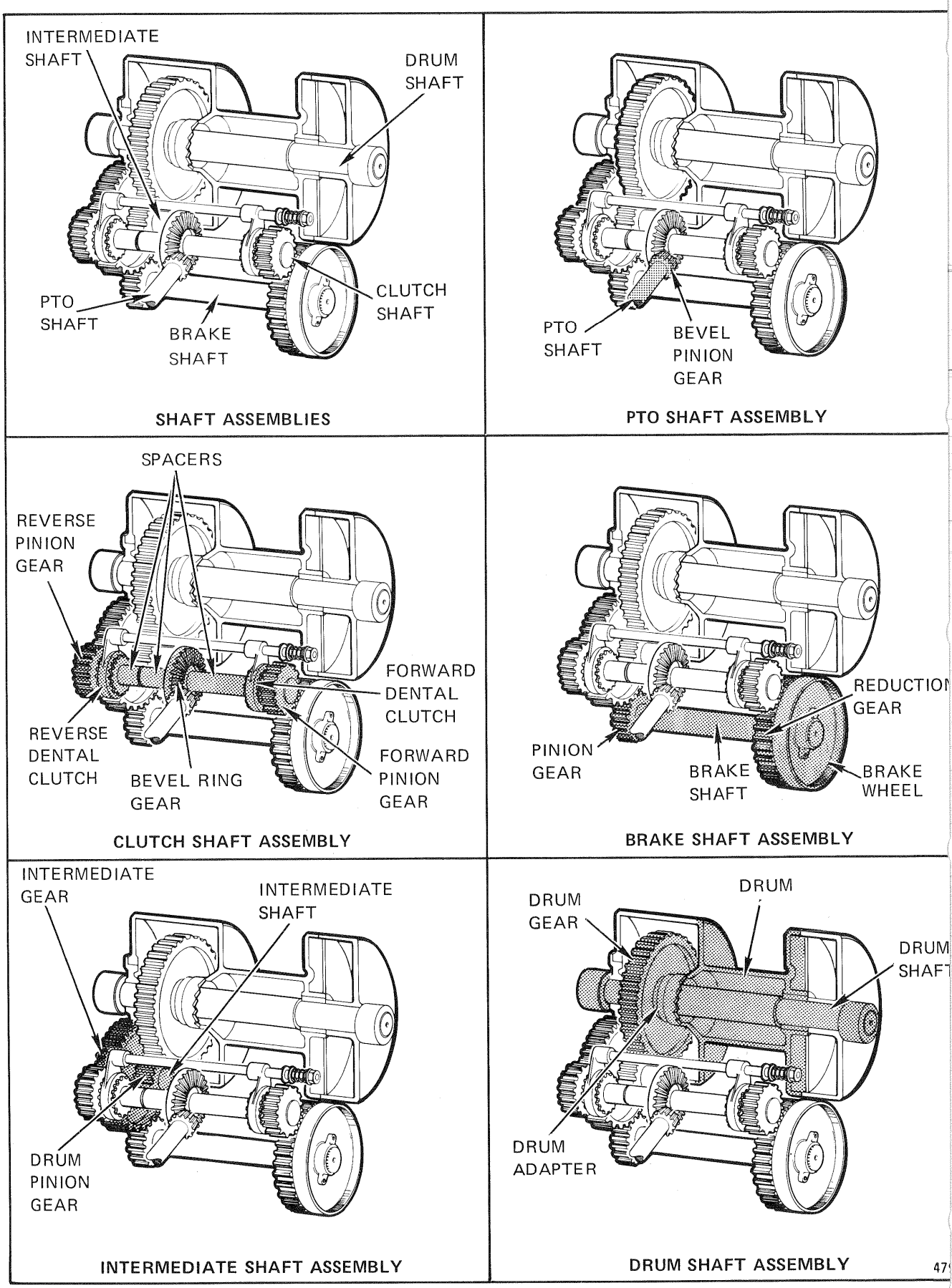


FIGURE 6-2. DIRECT DRIVE GEAR TRAIN, LOCATION OF COMPONENTS

6-11. OPTIONAL FREE-SPOOL ARRANGEMENT. (See Figure 6-4.)

6-12. The free-spool arrangement allows mechanical disengagement of the drum gear from the remainder of the gear train. Moving the FREE-SPOOL control lever actuates the shift linkage, moving the dental clutch which disengages or engages the drum pinion gear and intermediate gear.

6-13. DRY BRAKE ASSEMBLY. (See Figure 6-5.)

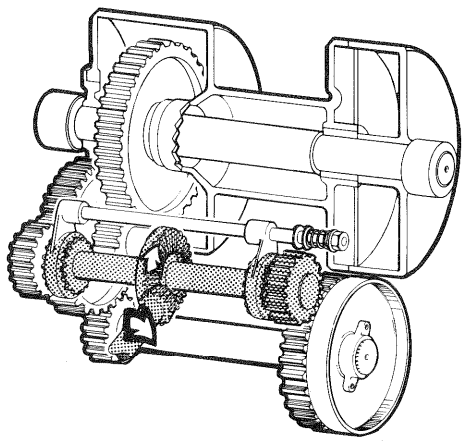
6-14. The dry brake assembly has a brake wheel which is splined to the left-hand end of the brake shaft. The band and lining is mounted over the brake wheel and attached to the lever assembly. The lever assembly is attached to the connecting linkage and band. When the control cable is pulled, the crank assembly rotates and forces the lever assembly to pull the brake band, thereby applying the brake.

6-15. OPTIONAL AUTOMATIC BRAKE. (See Figure 6-6.)

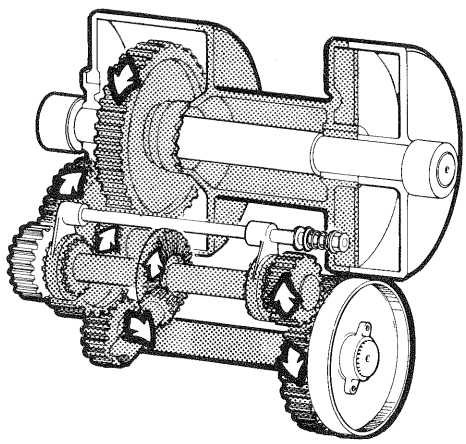
6-16. The automatic brake assembly is an optional brake unit that is installed on the left-hand end of the brake shaft in place of the standard dry brake wheel. This brake wheel has an internal ratchet ring and revolves around the hub except when the pawl assembly engages the ratchet ring and locks up the hub and wheel. The pawl assembly and drag rings are attached to the hub and the position of the pawl is such that it will retract and not engage the ratchet ring when the winch gear train rotation is forward (line in). When rotation is stopped or reversed (line out) and the pawl engages the ratchet teeth, the brake will lock up and stop any line pay out provided the brake handlever is set.

6-17. DIRECT DRIVE CLUTCH ASSEMBLY. (See Figure 6-7.)

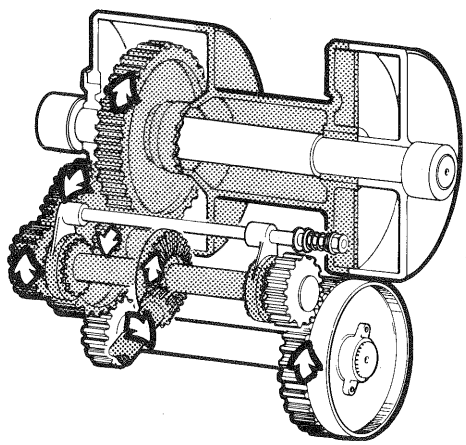
6-18. The clutch assembly used in the Direct Drive winch has a forward clutch assembly on the left-hand side of the clutch shaft and a reverse clutch assembly on the right-hand side of the clutch shaft. Each clutch has a pinion gear and a matching hub. When the hub and pinion teeth are aligned the dental clutch can be mechanically moved onto the dental teeth of that pinion gear to lock up the clutch.



NEUTRAL – DIRECT DRIVE



FORWARD – DIRECT DRIVE



REVERSE – DIRECT DRIVE

4794

FIGURE 6-3. TORQUE TRANSFER, DIRECT DRIVE WINCH

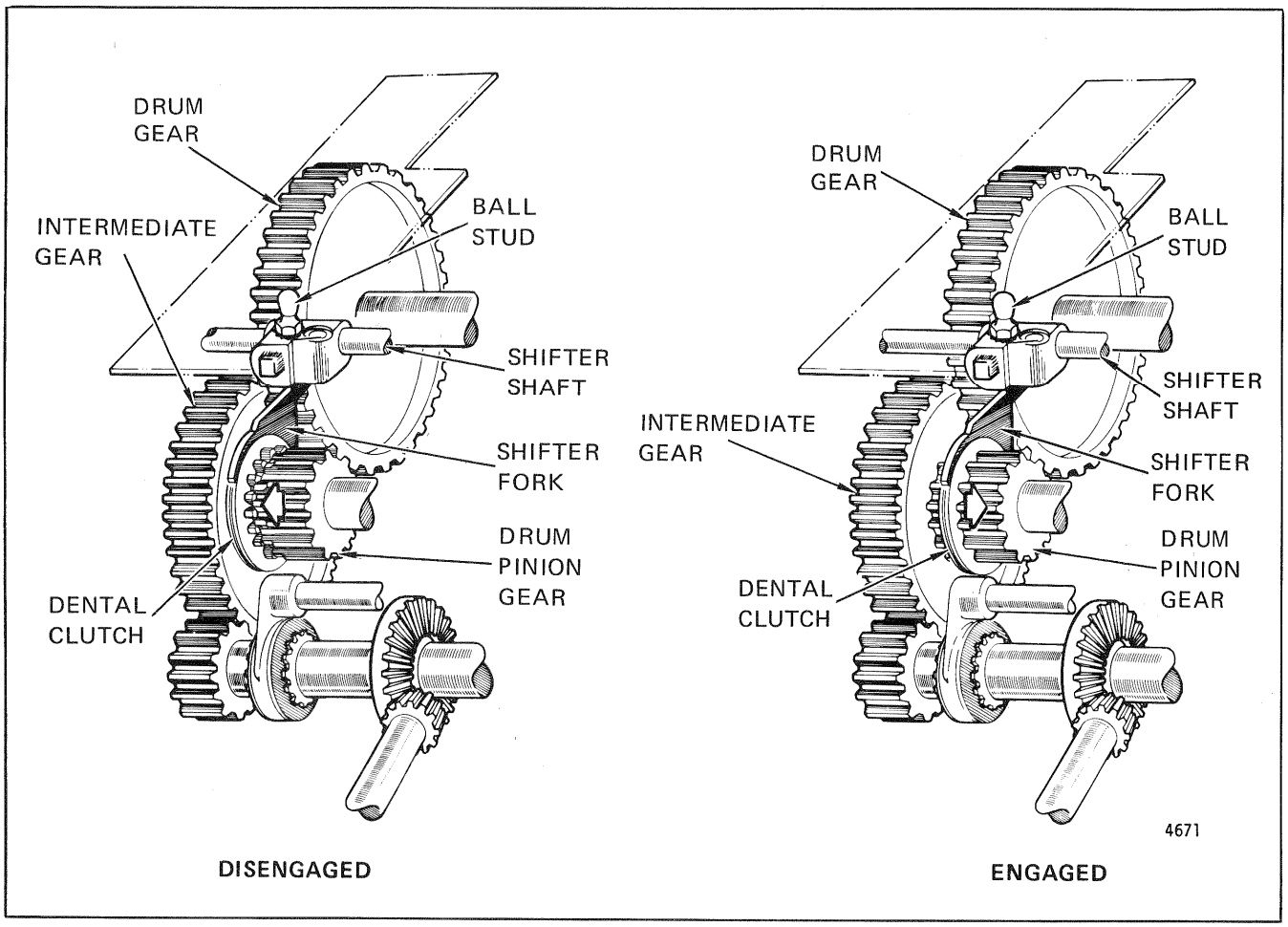


FIGURE 6-4. OPTIONAL FREE-SPOOL ARRANGEMENT

6-19. Controls. (See Figure 6-8.)

6-20. The clutch and brake handlevers control the two dental clutches and the dry brake through mechanical push-pull cables attached to the bottom of the handlevers. A release button on the end of the brake handlever locks the handlever in any desired position to control the degree of braking effort. The button must be depressed before the handlever can be moved.

6-21. OPTIONAL FREE-SPOOL CONTROL LEVER.

6-22. Control for the free-spool arrangement (see Figure 6-9) used on Direct Drive winches is provided by a control assembly with a single control lever. A mechanical push-pull cable links the control lever to the winch gear train to engage or disengage the drum gear.

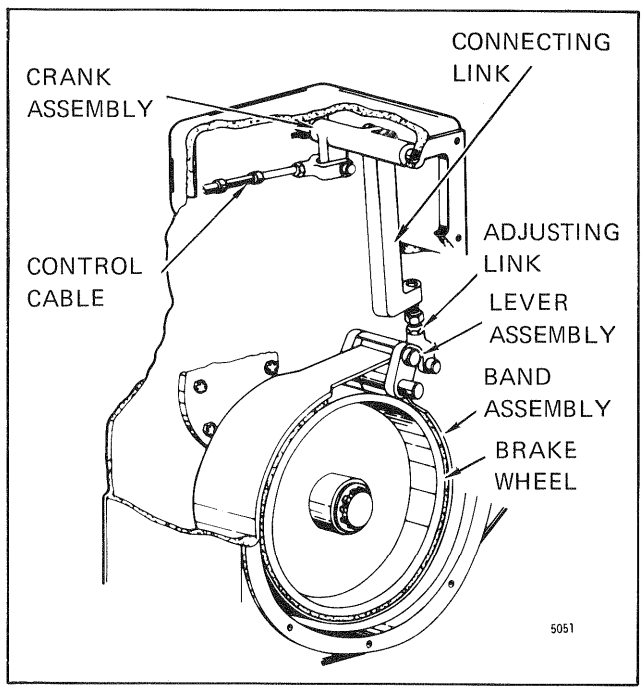


FIGURE 6-5. DRY BRAKE ASSEMBLY

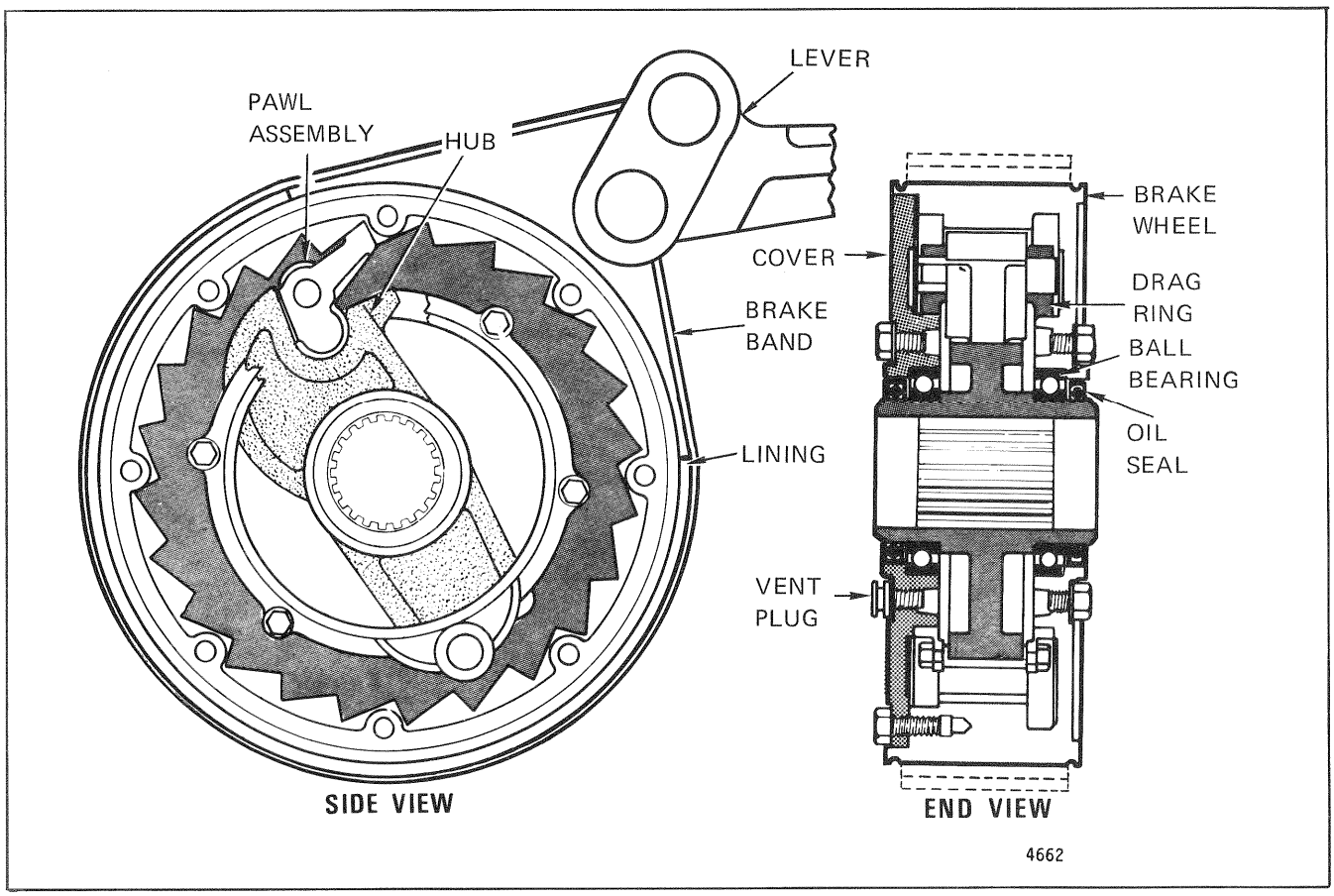


FIGURE 6-6. OPTIONAL AUTOMATIC BRAKE ASSEMBLY

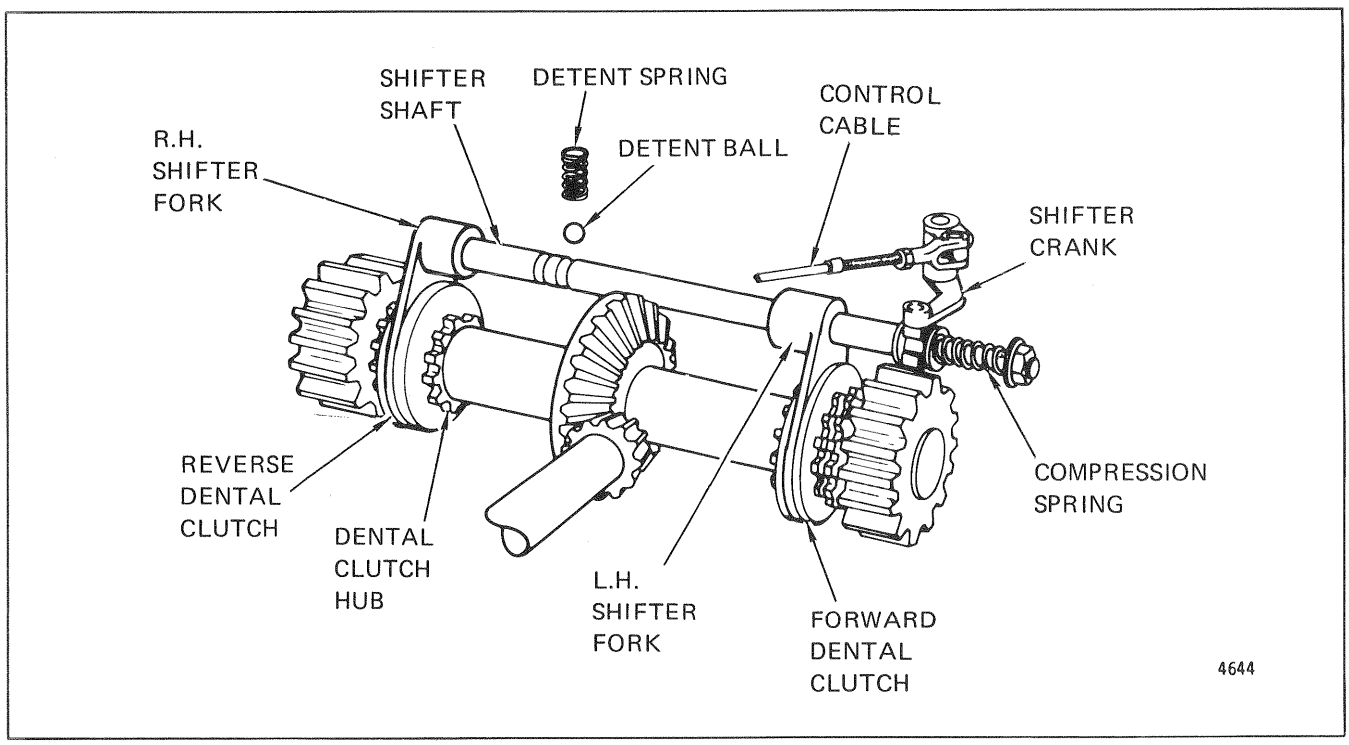


FIGURE 6-7. DIRECT DRIVE CLUTCH ASSEMBLY

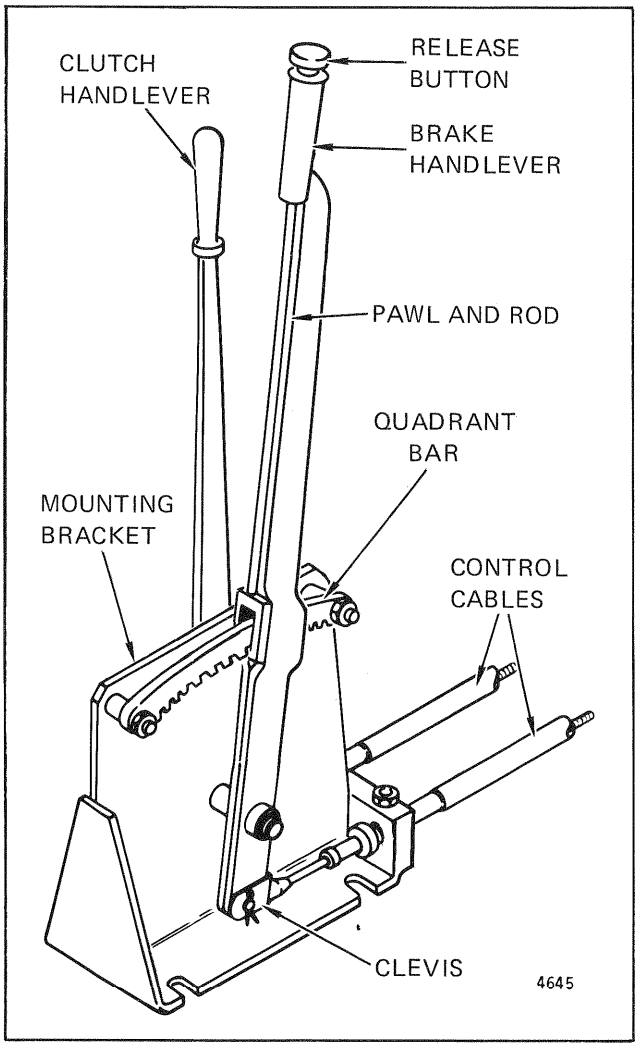


FIGURE 6-8. CONTROL ASSEMBLY, DIRECT DRIVE WINCH

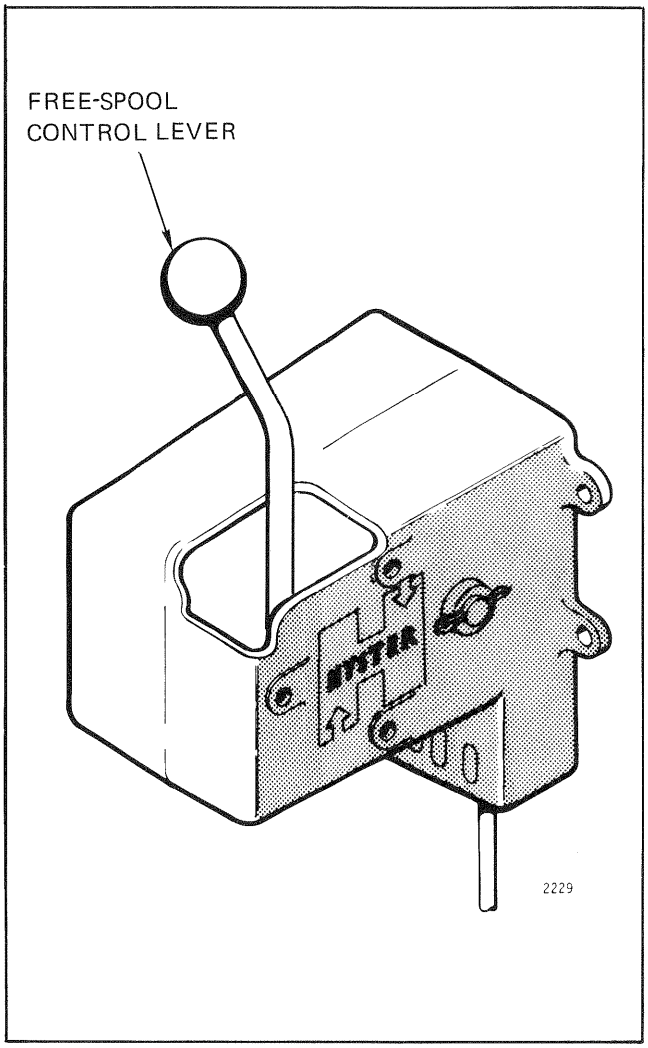


FIGURE 6-9. OPTIONAL FREE-SPOOL CONTROL ASSEMBLY, DIRECT DRIVE WINCH

Section 7
OPERATION
DIRECT DRIVE WINCH

7-1. GENERAL.

7-2. The Direct Drive winches are operated from the seat on the tractor by the operator while the tractor is in use. Every operator must know the exact operating procedure of these controls prior to operating the winch.

7-3. OPERATIONAL PRECAUTIONS.

7-4. Observe the following PRECAUTIONS to prevent injury to personnel and damage to equipment.

a. Do not operate winch unless tractor is equipped with a rear screen for operator protection against cable breakage.

b. Authorized operators only!

c. Report damage or erratic operation of winch immediately. DO NOT OPERATE WINCH UNTIL CORRECTED.

d. Do not stand while operating the tractor or the winch.

e. Make sure that instruments and controls are working before operating the unit.

f. Do not use control levers or handles as machine mounting assists.

g. Do not use control levers or handles as hangers for clothing, water bags, grease guns, lunch pails, etc.

h. Do not permit personnel in the control area when working or making checks on the machine.

i. Do not allow riders on the machine or load.

j. Use extreme care when operating close to other machines.

k. Avoid operating near anyone working or standing.

l. Do not stand or permit others to stand in the bight (loop) of a cable.

m. Do not stand or permit others to stand near the winch or cable when it is under tension.

n. Do not work a damaged cable (broken wire or strands or a decrease in the diameter of the cable, are warning signs).

o. Do not leave the tractor while the winch line is under tension.

p. Avoid pulling the hook over the drum and through the throat of the winch.

q. Do not anchor a double or two-part line to the winch.

r. When not operating the winch, always leave it in neutral with the brake on.

s. Never attempt to clean, oil, or adjust a machine while it is in motion.

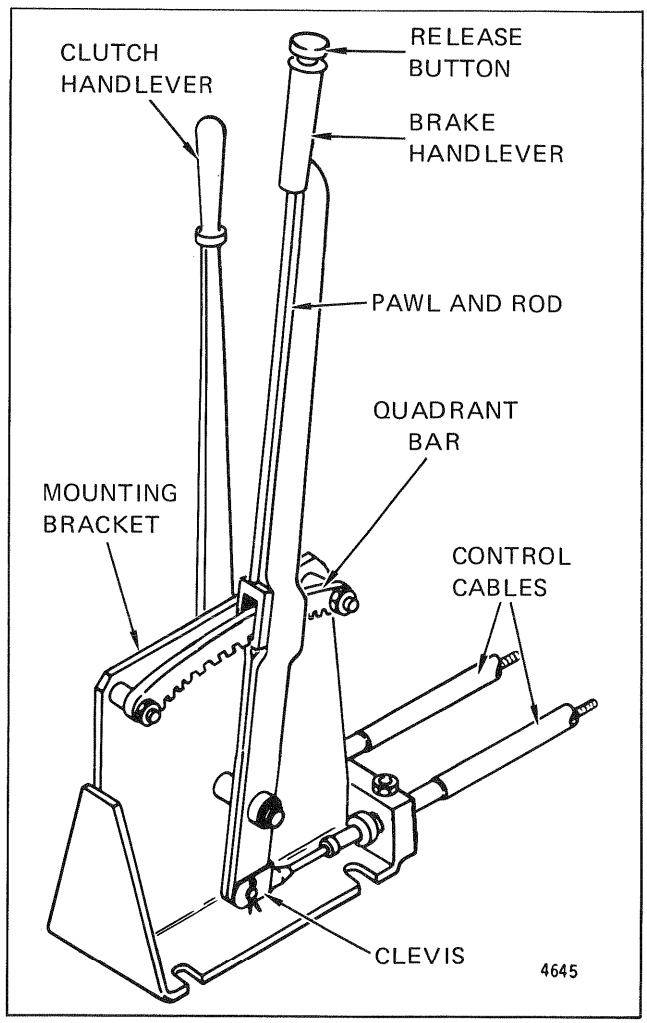


FIGURE 7-1. OPERATING CONTROLS FOR DIRECT DRIVE WINCH

7-5. OPERATING CONTROLS. (See Figure 7-1.)

7-6. The operating controls for Direct Drive Winches consist primarily of a clutch handlever and a brake handlever. The clutch handlever allows selection of Forward, Neutral or Reverse operation of the winch gear train. The brake handlever controls the degree of braking effort from fully Applied to Released.

7-7. SETTING THE BRAKE. To set the brake, pull back on the Brake Handlever and release the button. The brake will remain in BRAKE APPLIED until manually moved.

7-8. RELEASING THE BRAKE. To release the brake, pull back slightly on the Brake Handlever. Depress the release button and push the Brake Handlever forward.

NOTE If the winch is equipped with the optional automatic brake (See Figure 6-6), the winch may haul-in line with the brake lever set, but the brake must be released to pay-out line.

7-9. HAULING-IN-LINE.

a. Disengage the tractor master clutch.

b. Place the tractor transmission in NEUTRAL.

c. Pull the Clutch Handlever all the way back to the FORWARD position.

d. Release the Brake Handlever.

e. Engage the tractor master clutch.

NOTE Line speed is varied by throttling the tractor engine AND varying the Brake Handlever position.

7-10. STOPPING THE WINCH.

a. Throttle down the engine.

b. Disengage the tractor master clutch and apply the Brake Handlever at the same time.

NOTE The brake may be set before the tractor master clutch is disengaged if the winch is equipped with an automatic brake.

7-11. PAYING-OUT LINE UNDER POWER.

a. Disengage the tractor master clutch.

b. Push the winch Clutch Handlever past NEUTRAL and into REVERSE.

c. Release the Brake Handlever.

d. Engage the tractor master clutch.

NOTE Line speed is varied by throttling the engine and Brake Handlever position.

7-12. SHIFTING TO NEUTRAL.

a. Disengage the tractor master clutch.

b. Move the Clutch Handlever to NEUTRAL (straight up).

c. Move the Brake Handlever to APPLIED (pull back).

7-13. OPERATING PROCEDURES. (See Figure 7-2.)

7-14. The two handlevers are used to select any one of the six modes of operation: NEUTRAL, FORWARD INCHING (gradual brake release), FORWARD (line in), REVERSE INCHING (gradual brake release), REVERSE (line out) and BRAKE OFF. The various handlever positions are shown in Figure 7-2.

7-15. Optional Free-Spooling.

7-16. The optional FREE-SPOOL arrangement allows cable to be payed-out by hand. Direct Drive winches use a separate, single-lever control assembly (see Figure 7-3) to control FREE-SPOOL operation. The winch is placed in FREE-SPOOL by removing tension from the winch line and pushing the FREE-SPOOL lever forward. This disengages the drum pinion gear from the winch gear train. To return to normal operation, remove tension from the winch line and pull the FREE-SPOOL control lever back toward the operator's seat.

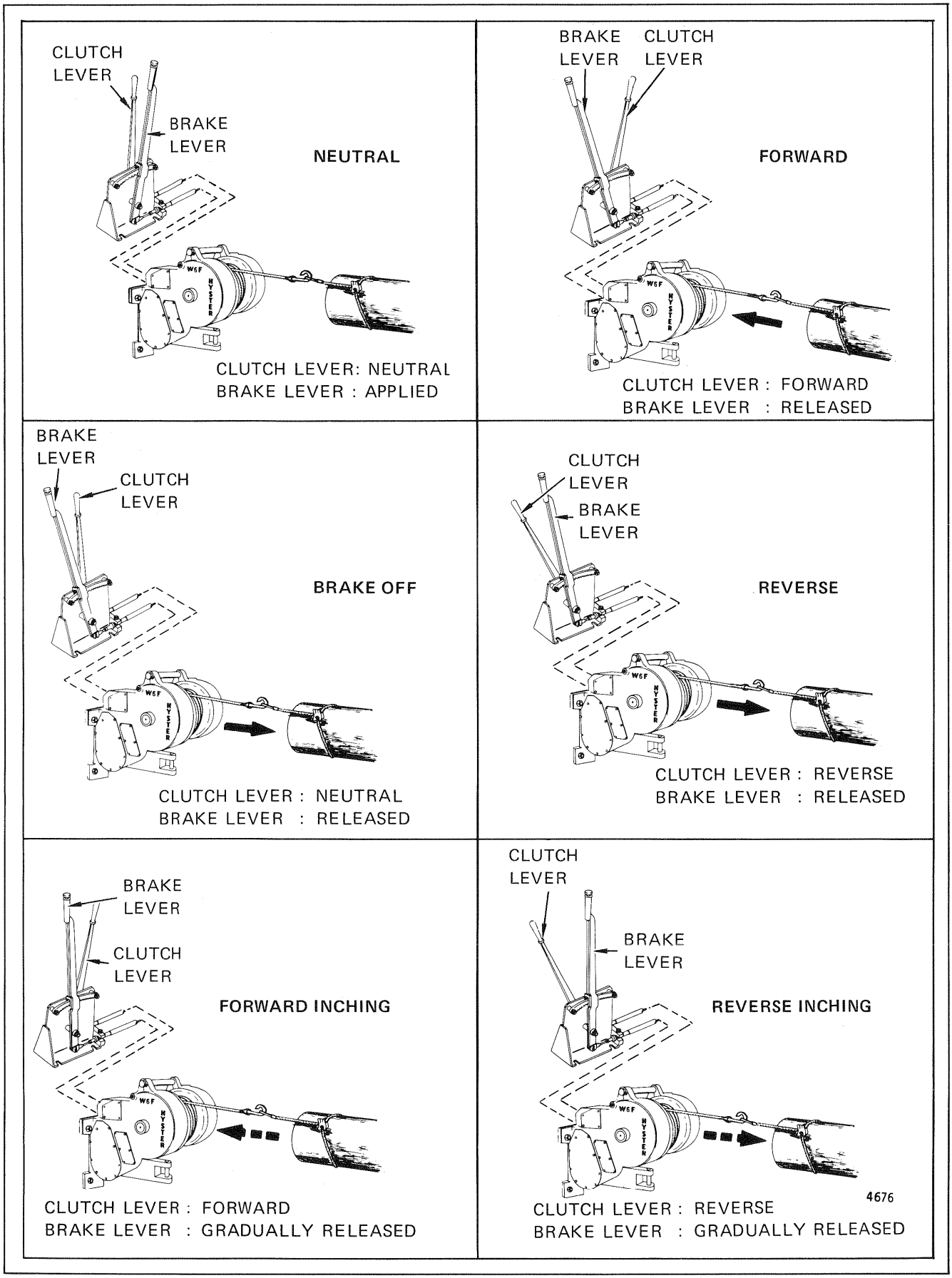


FIGURE 7-2. OPERATING PROCEDURES (Sheet 1 of 2)

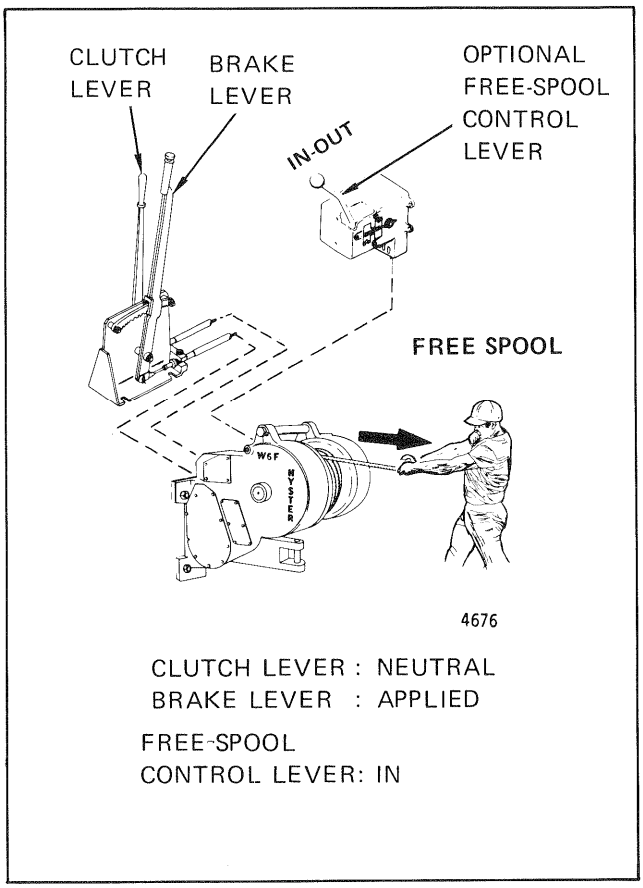


FIGURE 7-2. OPERATING PROCEDURES
(Sheet 2 of 2)

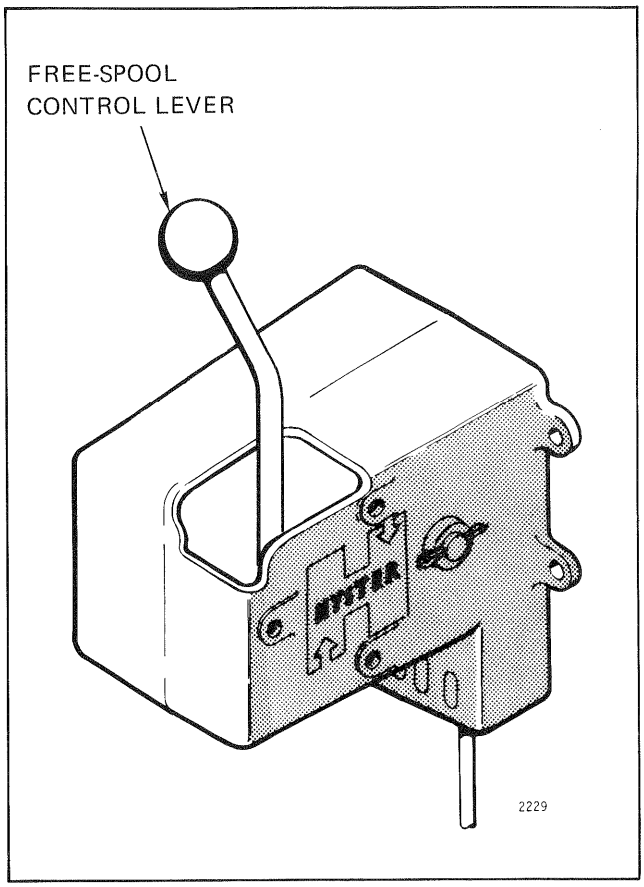


FIGURE 7-3. OPTIONAL FREE-SPOOL CONTROL FOR DIRECT DRIVE WINCH

TROUBLESHOOTING DIRECT DRIVE WINCH

8-1. GENERAL

8-2. Tables 8-1 and 8-2 are trouble analysis check charts that include the most common troubles that may be encountered, the probable cause of the trouble, and the corrective action that should be taken to restore the winch to normal operating condition. The information contained in Table 8-1 applies to the Direct Drive winch. The information contained in Table 8-2 applies to the Direct Drive winches equipped with optional free-spool.

TABLE 8-1. TROUBLE ANALYSIS CHECK CHART (Sheet 1 of 2)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hard to Shift into Forward or Reverse	Control cable damaged.	Check for pinched, rusted, or broken cable housing. Replace if found defective.
	Control cable improperly adjusted.	Check and adjust as necessary. Refer to Section 9.
	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Dental clutch too tight on hub teeth or teeth rough.	Remove dental clutch, dress teeth with fine stone, and replace parts if necessary.
Will not Stay in NEUTRAL Position	Detent ball and spring damaged or sticking.	Replace spring if broken. Check that ball is free in the bore. Lubricate ball, spring and bore.
	Annular groove on shifter shaft elongated.	Replace shifter shaft.
	Dental clutches installed backwards.	Install the dental clutch so chamfered ramp will face pinion gear.
Jumps Out of Gear	Dental teeth worn.	Check for dental teeth wear on: a. Dental Clutch. b. Dental Clutch hub. c. Forward pinion gear. d. Reverse pinion gear. Replace above components if teeth are rounded.
	Shifter Fork improperly positioned on the shifter shaft.	Check for loose anchor screw on: a. Forward shifter fork. b. Reverse shifter fork. Tighten securely and lock with lockwire.
	Dental clutches installed backwards.	Install the dental clutch so chamfered ramp will face pinion gear.
	Shifter forks installed backwards.	Install the shifter forks so anchored ends face toward the center of the winch.

TABLE 8-1. TROUBLE ANALYSIS CHECK CHART (Sheet 2 of 2)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Brake Not Holding or Hard to Apply	Water in brake compartment resulting from condensation or marine use.	Drain water from brake compartment.
	Brake lining saturated with oil.	Replace lining, clean brake wheel and adjacent surfaces. Locate and eliminate source of oil leak.
	Improper clearance between brake band assembly and brake wheel.	Check that clearance is approximately 1/32-inch (0.7937 mm). Refer to Section 9.
	Worn brake lining.	Replace with new lining.
	Brake cable improperly adjusted.	Adjust cable ends so Brake Handlever applies brake before it reaches end of travel. Refer to Section 9.
	Brake control cable assembly not anchored securely.	Check for loose connection of control cable housing to the: a. Control lever mounting bracket. b. Winch control housing bracket. Tighten securely and lock with jam nut.
	Control cable damaged.	Check for pinched, rusted, or broken cable housing. Replace if found defective.
	Brake linkage set incorrectly.	Change linkage for proper operation. Refer to Section 9.
	Optional Automatic brake pawl or ratchet teeth worn.	Replace worn parts if necessary.
External Oil Leaks	Cut or damaged O-ring seal.	Replace the seal.
	Improperly sealed bearing retainers.	Remove and reseal.

TABLE 8-2. TROUBLE ANALYSIS CHECK CHART FOR FREE-SPOOL OPTION (Sheet 1 of 1)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hard to shift	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Dental clutch too tight on hub teeth or teeth rough.	Remove dental clutch, dress teeth with fine stone, and replace parts if necessary.
	Dental clutch installed backwards.	Install clutch so that chamfered ramp will face drum pinion gear.
Jumps Out of Gear	Control linkage improperly adjusted.	Check and adjust as necessary.
	Worn shifter fork.	Replace shifter fork and related parts as necessary.
	Detent ball and spring loose, damaged, or sticking.	Clean or replace as necessary.
	Annular groove on shifter shaft elongated.	Replace shifter shaft.
Winch will Not Free-Spool	Linkage improperly adjusted.	Check and adjust as necessary.
	Intermediate shaft assembly damaged, rusted or improperly adjusted.	Adjust or repair as necessary.
	Drum shaft assembly damaged, rusted, or binding.	Adjust or repair as necessary.
Winch Free-Spools too easily.	Insufficient preload on intermediate shaft.	Remove shims as required on the intermediate shaft to preload shaft. Refer to Section 5.
Winch Free-Spools too hard.	Too much preload on intermediate shaft.	Add shims as required on the intermediate shaft to reduce the preload on the shaft. Refer to Section 5. **NOTE** It may be necessary to use a slide hammer on the shaft to unload the bearing race because of the fit in the bore.

INTENTIONALLY BLANK

SERVICE INSTRUCTIONS

9-1. GENERAL.

9-2. This section contains instructions for performing the necessary maintenance and adjustment of control linkage. All instructions given in this section may be performed using standard shop tools. No special tools are required.

9-3. MAINTENANCE.

9-4. A planned maintenance program which includes periodic inspection and lubrication should be developed. The operating hours recorded on the tractor SERVICE METER should be used to determine the maintenance interval.

9-5. MAINTENANCE AND SERVICE INSPECTION SCHEDULE. (Refer to Table 9-1.)

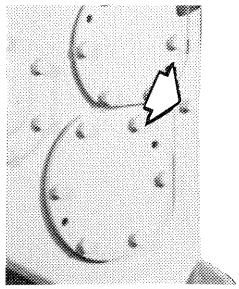
9-6. The following table is outlined in two schedules: the hourly schedule and the periodic schedule. If the unit is operated more than eight hours per day, the hourly schedule should be followed. If the unit is operated eight hours or less per day, the periodic schedule should be followed.

TABLE 9-1. MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 1 of 2)

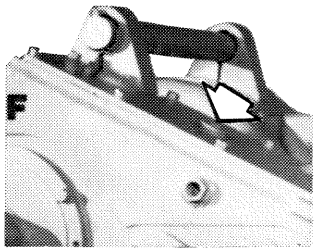
REFER TO FIG. NO./ ITEM	SCHEDULE (Hour/Period)				QUAN.	TYPE	PROCEDURE
	8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo			
7-1	√				Few drops	SAE 30.	Lubricate fulcrum pin connections and other moving parts at end of each eight hour shift.
9-1/G	√				As required	Multi-purpose Grease	Lubricate two grease fittings.
9-1/H	√				As required	Multi-purpose Grease	Lubricate six grease fittings.
9-1/A		√		CHANGE	10 Gals. (37.85 lts.)	SAE 90, MIL-L 2105B, for temperatures above +10°F. SAE 10, MIL-L-2104B, or MIL-L-45199 Series 3, for temperatures +10°F and lower.	Check winch oil level at plug (A) on right side of winch. Add oil as required at plug (B). Drain oil at plug (C).
9-1/F				CLEAN	None	None	Wash breather with solvent.

TABLE 9-1. MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 2 of 2)

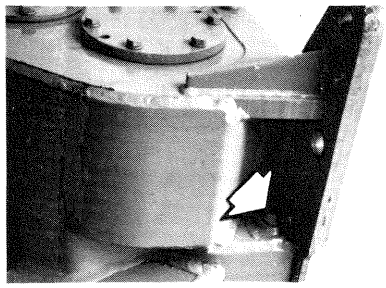
REFER TO FIG. NO./ ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	QUAN.	TYPE	PROCEDURE
9-1/C		✓			None	**NOTE** Water and/or oil may accumulate in transmission compartments.	Loosen plug (C) and drain any accumulation of water in transmission compartment. Tighten plug (C) when oil appears.
9-1/D		✓			None	None	Loosen plug (D) and drain any accumulation.
7-1 10-1		✓			None	None	Check both ends of each cable housing to see that they are securely anchored. Retighten set screw, U-bolt, or bracket bolt as applicable.
9-1/E				SERVICE	As required	High Temperature grease as follows: Atlantic Richfield (Thermo grease) Mobil Oil (Mobil-temp Grease #1) Shell Oil (Darina Grease 1) Standard Oil (Chevron Industrial grease) Texaco (Thermatex EP #1) Union Oil (Strona HT-1) Sun Oil (Sunaplex 991 EP) BP Australia (Energrease HTB2)	Remove automatic brake assembly. Disassemble and clean automatic brake assembly components (E) Pack the two bearings with a high temperature grease. Put a heavy film of high temperature grease on ratchet ring, pawl assembly, and hub. DO NOT completely fill automatic brake assembly with grease or attempt to grease brake through the vent plug. **CAUTION** Always install oil seals so that lips of both seals are pointing inward.



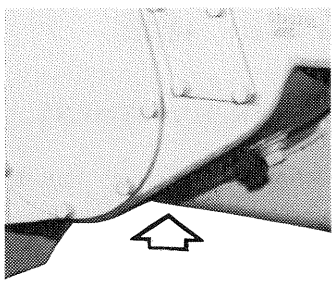
A OIL LEVEL PLUG



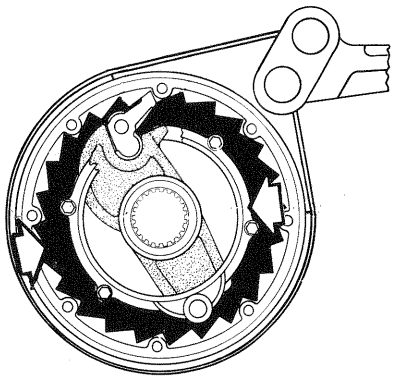
B FILL PLUG



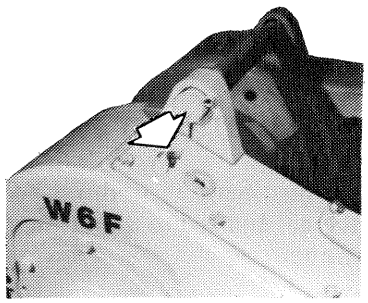
C TRANSMISSION DRAIN PLUG



D BRAKE COMPARTMENT DRAIN PLUG



E AUTOMATIC BRAKE (OPTIONAL)



F BREATHER

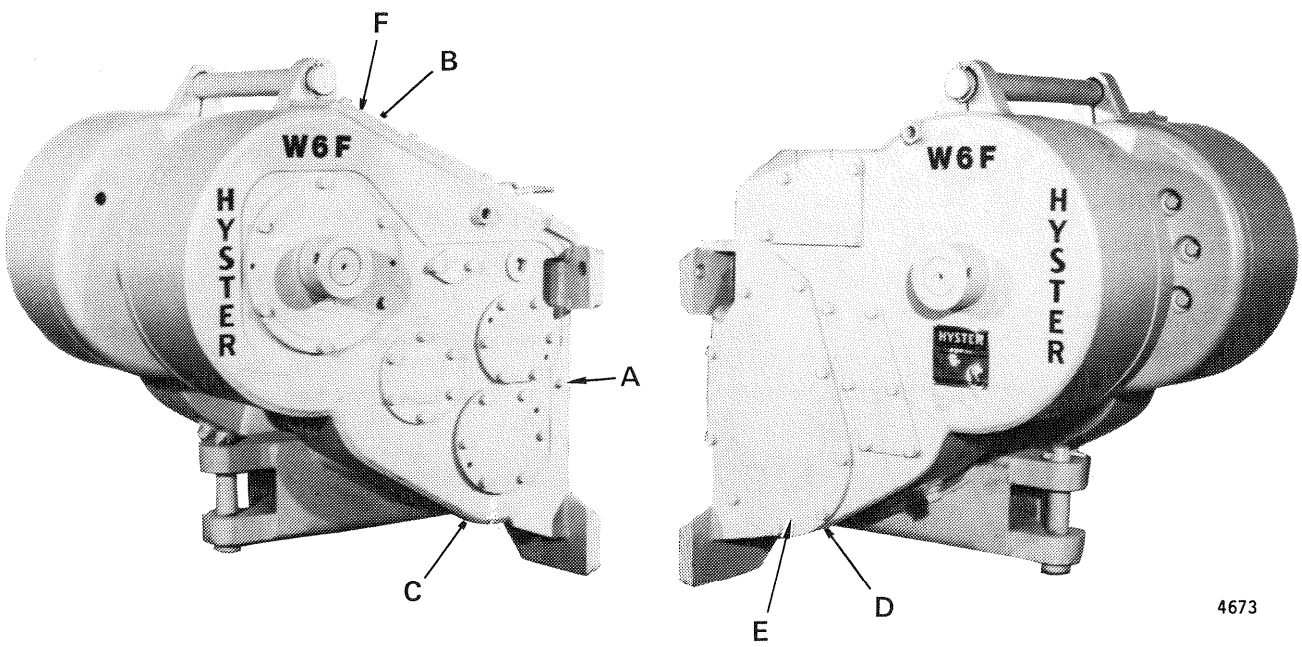


FIGURE 9-1. LUBRICATION MAINTENANCE DIAGRAM (Sheet 1 of 2)

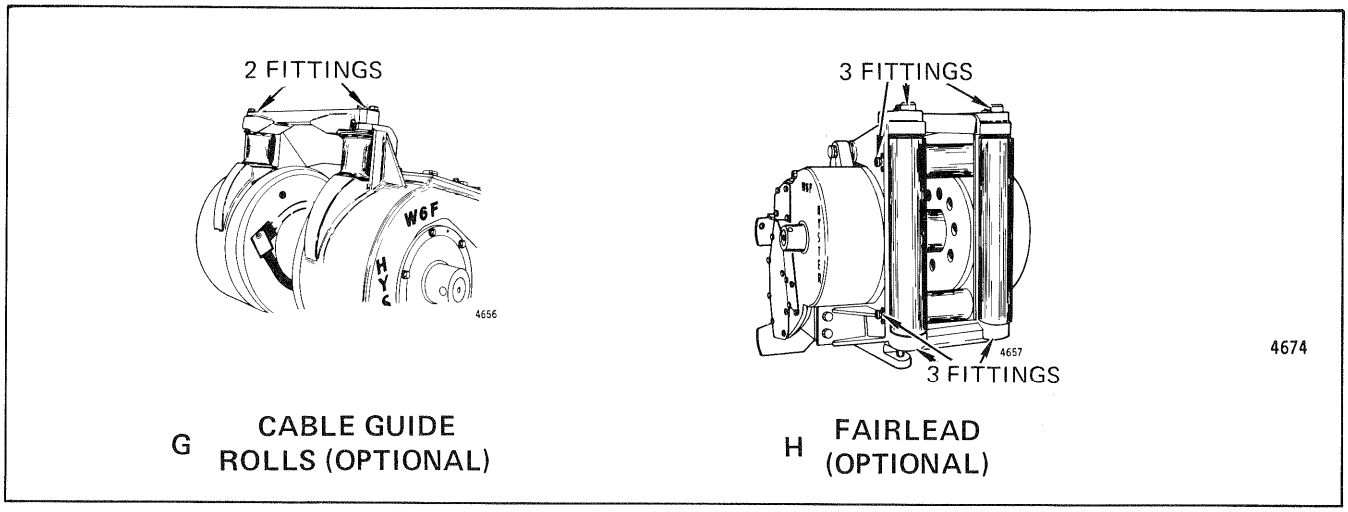


FIGURE 9-1. LUBRICATION MAINTENANCE DIAGRAM (Sheet 2 of 2)

9-7. ADJUSTMENT PROCEDURES.

9-8. Adjustment procedures for the Direct Drive Winch are limited to minor mechanical linkage adjustments.

9-9. Direct Drive Winch Adjustments.

9-10. Periodically, minor adjustments must be made to the linkage connecting the handlevers to the clutches and brake.

9-11. CLUTCH HANDLEVER ADJUSTMENT.

9-12. To adjust the position of the clutch handlever, proceed as follows:

a. Remove the transmission cover and the control access cover.

b. Place the shifter assembly in Neutral. The shifter linkage will positively detent to this position.

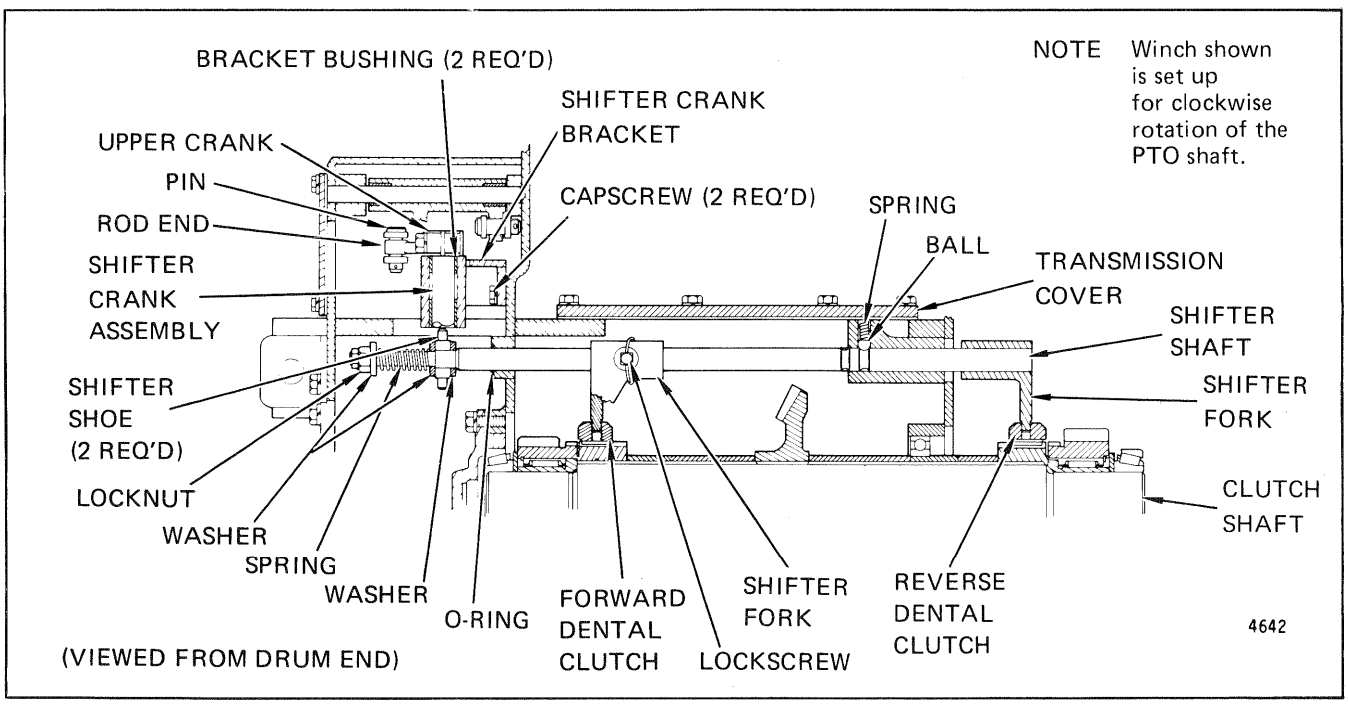


FIGURE 9-2. SHIFTER ARRANGEMENT, DIRECT DRIVE WINCH

c. Adjust each control cable rod end as necessary to place the Clutch Handlever vertical and in the center of travel when shifter assembly is in Neutral. Tighten all nuts securely.

d. Make sure that Forward, Neutral and Reverse can be selected by moving the Clutch Handlever to the corresponding position. Replace access covers.

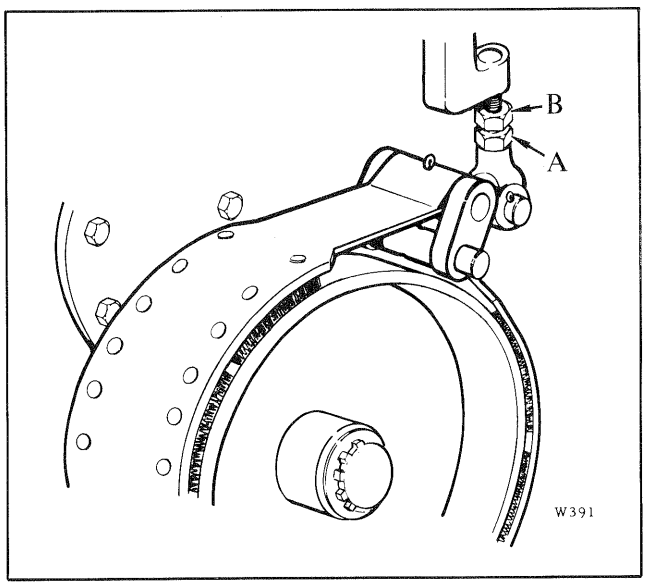


FIGURE 9-3. BRAKE BAND ADJUSTMENT DIAGRAM, DIRECT DRIVE WINCH

9-13. BRAKE BAND ADJUSTMENT. (See Figure 9-3.)

9-14. To adjust the brake band:

a. Remove the covers from the left-hand side of the winch.

b. Push the brake handlever to its full release position.

c. Loosen jam nut (A).

d. Turn adjusting link (B) until there is approximately 1/32-inch (0.8 mm) clearance between the brake band and brake wheel or until there is just enough clearance to prevent "brake drag."

e. Tighten jam nut (A).

f. Replace the covers.

9-15. BRAKE HANDLEVER ADJUSTMENT. (See Figure 9-4.)

9-16. To adjust the positioning of the Brake Handlever:

a. Adjust the brake band. (Refer to Paragraph 9-13.)

b. Loosen cable rod end jam nut.

c. Adjust the control cable at the winch control housing end until dimension (A) is obtained (distance between the cable end and the surface of the connecting link).

d. Tighten the jam nut.

e. Push the Brake Handlever to the full release position.

f. Adjust the push-pull cable at the Brake Handlever end (see Figure 7-1) until dimension (A), Figure 9-4 is obtained.

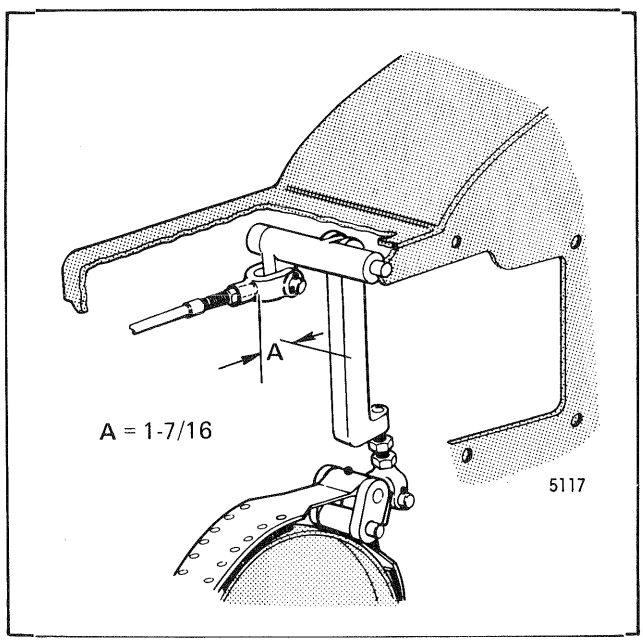


FIGURE 9-4. ADJUSTMENT OF BRAKE LINKAGE, DIRECT DRIVE WINCH

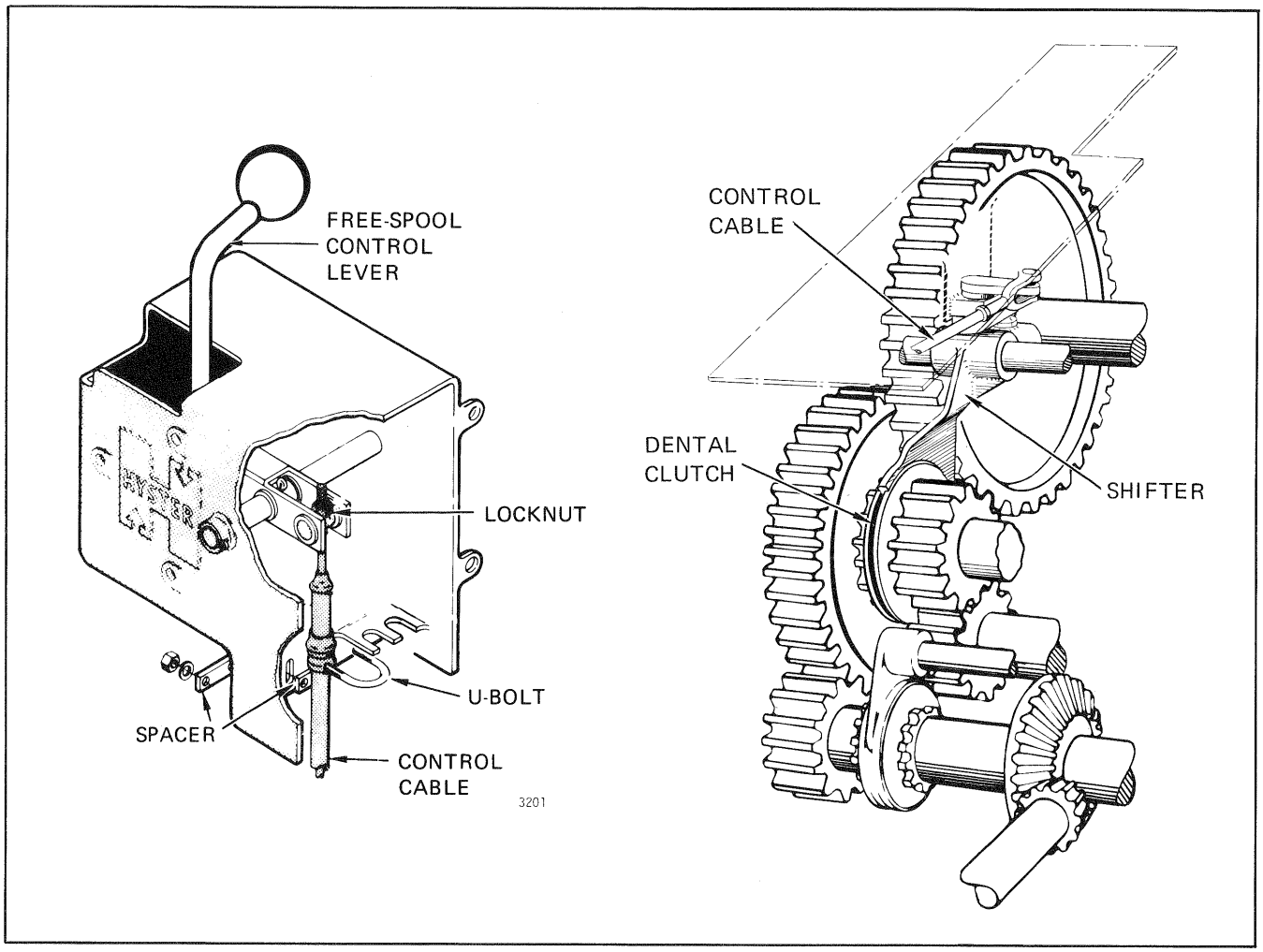


FIGURE 9-5. FREE-SPOOL CONTROL LINKAGE

9-17. Free-Spool Adjustments. (See Figure 9-5).

9-18. Adjust cable rod ends as required to position the handlever so that it allows the linkage to shift the free-spool mechanism into normal and free-spool positions (both positions detented).

9-19. UNIT PAINTING.

9-20. The exterior of the unit should be painted using HYSTER YELLOW enamel. Touch-up paint (Part No. 168810) may be ordered from your Hyster Dealer. Nameplates and decals should be installed as shown in Figure 9-6.

9-21. DECAL, NAMEPLATE, AND SERVICE PLATE INSTALLATION.

9-22. The unit nameplate is located on the left-hand side of the winch housing near the drum shaft nut as shown in Figure 9-6. Data contained on the nameplate is given in Paragraph 6-4. If the nameplate has been damaged, obtain a new one from your HYSTER DEALER and install the new nameplate in the location shown in Figure 9-6. Use drive screws for nameplate installation.

9-23. The W6F model decals and HYSTER letter decals are used on both sides of the winch housing as shown in Figure 9-6. Replace as necessary.

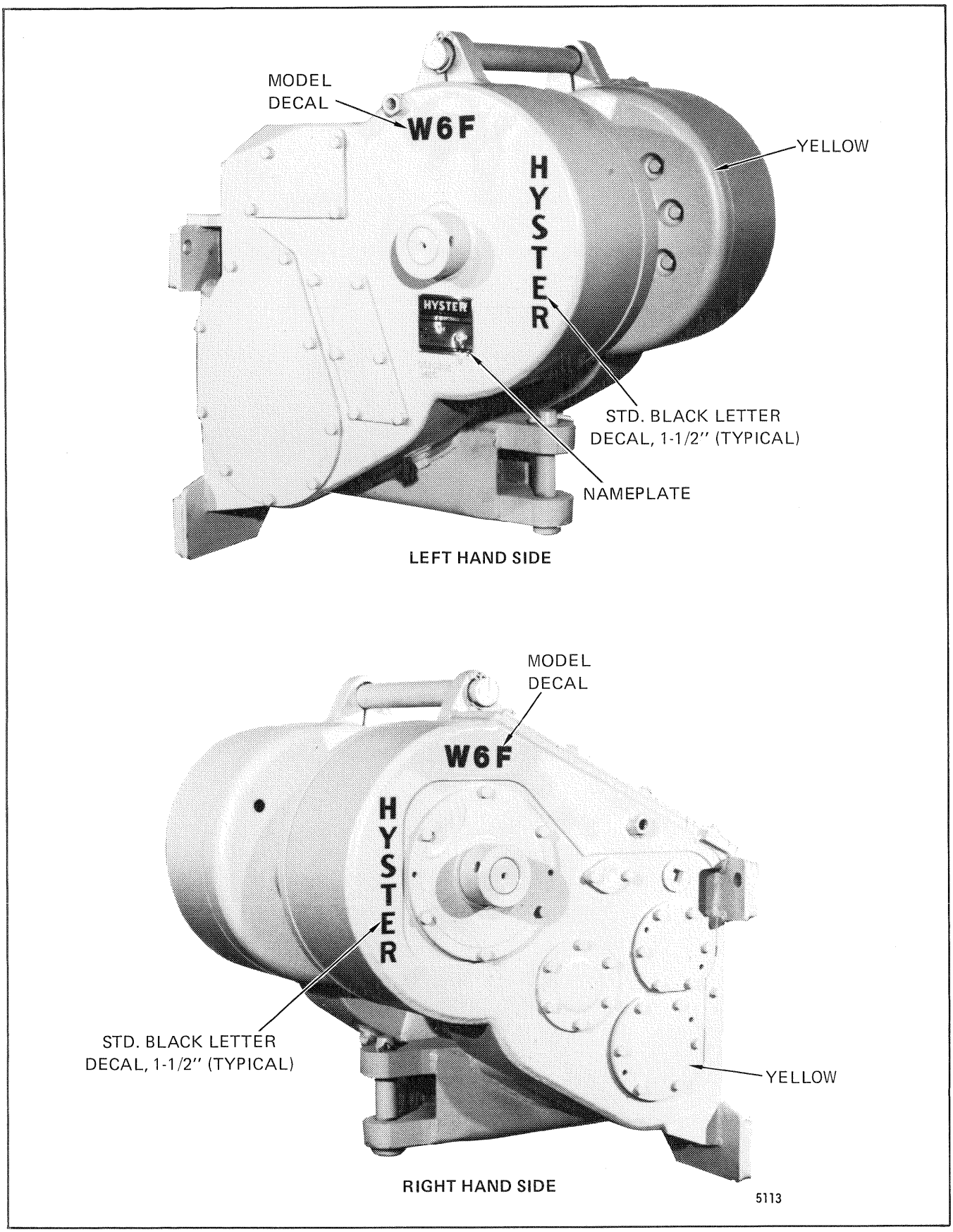


FIGURE 9-6. PAINTING AND DECAL INSTALLATION

INTENTIONALLY BLANK

Section 10
OVERHAUL INSTRUCTIONS DIRECT DRIVE WINCH

10-1. GENERAL.

10-2. This section contains overhaul instructions for the Direct Drive Winches. Overhaul instructions include removal and disassembly of all major shaft assemblies, inspection of components, reassembly, and installation. Micrometer symbols have been added to the disassembly illustrations to indicate critical wear points. It is recommended that these points be inspected, as described in Table 10-1, at the time of disassembly so that defective parts may be ordered and replaced prior to reassembly. If the winch is to be completely overhauled, perform the removal and disassembly, inspection, and reassembly procedures in the sequence of the following paragraphs. Always use the troubleshooting procedures given in Section 8 to locate a malfunction before performing major overhaul of the unit. Make all checks in a systematic manner. Haphazard checking wastes time and can cause further damage. Review and perform any adjustments that may be the cause of a malfunction (refer to Section 9).

10-3. This section includes instructions for removal and installation of the winch for repairs. Initial installation procedures and controls of the winch are given in a separate Mounting Instructions manual.

10-4. WINCH REMOVAL. (See Figure 10-1.)

10-5. Prior to disassembly of the winch, the cable must be removed from the drum.

WARNING Use extreme care when removing the cable end ferrule from the drum. When the cable lock is removed, the cable may spring out with extreme force.

10-6. Remove the winch as shown in Figure 10-1. Observe the following during removal:

a. Clean external surfaces of winch to remove accumulated grease and dirt.

b. Remove transmission cover and control access cover.

c. Remove control cables from winch.

WARNING Make sure that the lifting device has a minimum capacity of 5,000 pounds (2268 kg) before lifting the winch off the mounting pad.

d. Drain oil from the winch (see Figure 9-1).

10-7. COMPONENT REMOVAL AND DISASSEMBLY.

10-8. All major assemblies except the brake shaft and PTO shaft can be removed with the winch mounted on the tractor. The sequence of operations given in this section is for a complete unit overhaul, but is not necessary for removal of individual shaft assemblies.

10-9. Removal and Disassembly of PTO Shaft Assembly.

10-10. Removal and disassembly of the PTO shaft is shown in Figure 10-2. Before removing the PTO shaft assembly, the winch must be removed from the tractor as shown in Figure 10-1.

10-11. Removal of Dry Brake and Automatic Brake.

10-12. Removal of the dry brake (or optional automatic brake) used in the Direct Drive winch is shown in Figure 10-3. Removal of the dry brake can be accomplished with the winch mounted on the tractor. During disassembly, inspect all parts for damage and wear as specified in Table 10-1.

10-13. Removal and Disassembly of Clutch Shaft Assembly.

10-14. Figure 10-4 shows the location of clutch shaft and shift linkage components. Removal and disassembly of the clutch shaft assembly is shown in Figure 10-5. Removal of the clutch shaft and associated components can be accomplished with the winch mounted on the tractor.

NOTE Figure 10-5 shows the winch removed from the tractor with the PTO shaft removed. This is the normal sequence for complete unit overhaul but is not necessary for removal of the clutch shaft only.

10-15. Removal of Brake Shaft Assembly.

10-16. Removal of the brake shaft assembly is shown in Figure 10-6. The brake shaft cannot be removed when the winch is mounted on the tractor. Prior to removal of the brake shaft assembly, perform the following:

a. Remove the winch from the tractor as shown in Figure 10-1.

b. Drain oil from winch (see Figure 9-1).

c. Remove the PTO shaft as shown in Figure 10-2.

d. Remove all brake components as shown in Figure 10-3.

e. Remove the clutch shaft as shown in Figure 10-5.

NOTE If removal of the brake shaft reduction gear is not necessary the brake shaft can be removed with the PTO and clutch shafts installed. To remove the brake shaft reduction gear, the clutch shaft assembly must be removed as shown in Figure 10-5.

10-17. Removal of Intermediate Shaft Assembly.

10-18. Removal of the intermediate shaft and associated components is shown in Figure 10-7. The intermediate shaft assembly can be removed with the winch mounted on the tractor and all other shaft assemblies still in place. To accomplish this, sufficient clearance must be obtained by removing the drum shaft bearing retainer as shown in Figure 10-9, step 3.

NOTE Figure 10-7 shows the winch removed from the tractor with the clutch shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but is not necessary for removal of the intermediate shaft only.

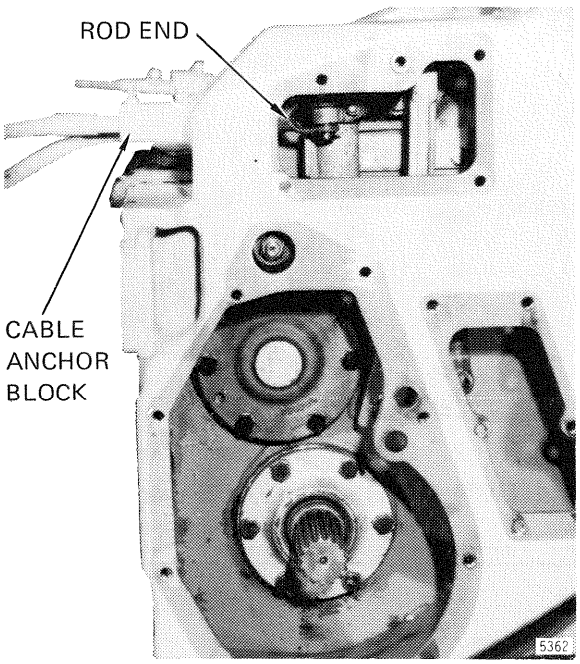
10-19. Removal of Drum Shaft and Drum.

10-20. Figure 10-8 shows the location of drum and drum shaft components. Removal of the drum shaft and drum is shown in Figure 10-9. Do not attempt to remove heavy components (such as the drum or drum gear) by hand. Always use a lifting device and the recommended attachments whenever possible. Removal of the drum and drum shaft can be accomplished with winch on the tractor. To remove the drum gear it will be necessary to first remove the intermediate shaft (see Figure 10-7) and the reverse clutch assembly (see Figure 10-5).

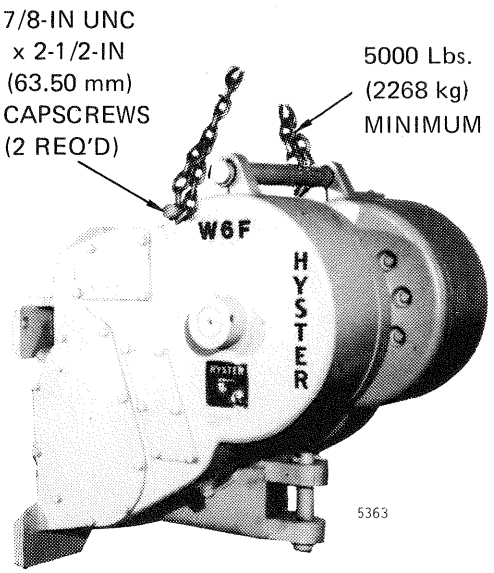
10-21. CLEANING.

10-22. Wash all parts in a petroleum base solvent to remove accumulated grease and dirt. Blow dry with compressed air, then place in a clean container until reassembled. Never attempt to inspect parts coated with excessive amounts of grease or dirt. Damage to a part may not be obvious unless thoroughly cleaned. Steam clean all external surfaces of the winch prior to reassembly.

CAUTION Do not use mineral base solvents to remove grease or oil from the brake lining.

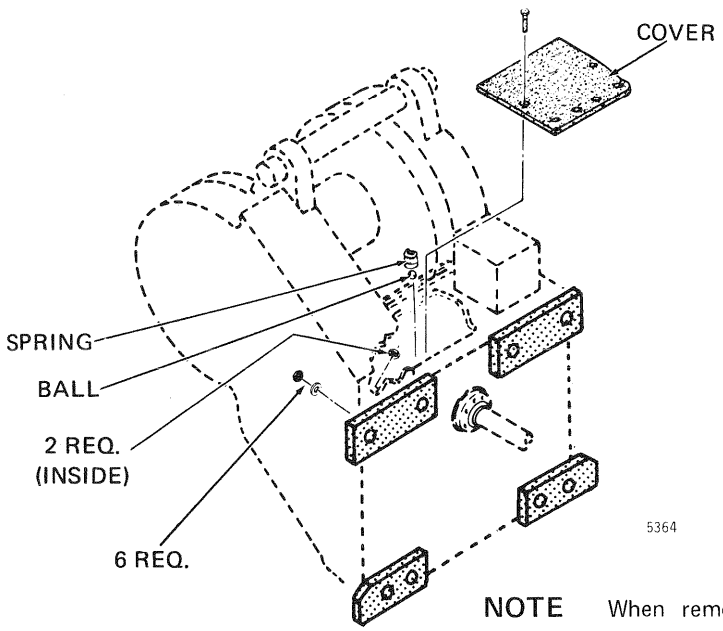


STEP 1. Loosen the two setscrews on the cable anchor block. Remove the control housing cover then disconnect the rod end at the end of each cable.



STEP 2. Connect lifting device to winch. Winch will be balanced when connected as shown.

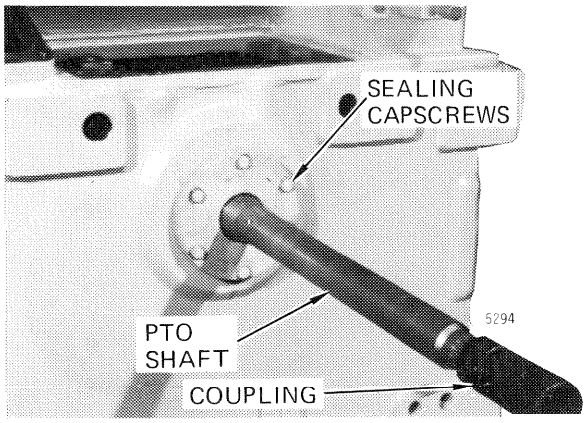
WARNING Make sure that the lifting device has a minimum capacity of 5,000 pounds (2268 kg) before lifting the winch off of the mounting pads.



STEP 3. Remove transmission cover. Remove mounting nuts (or capscrews) and lockwashers securing winch to tractor. ing pad.

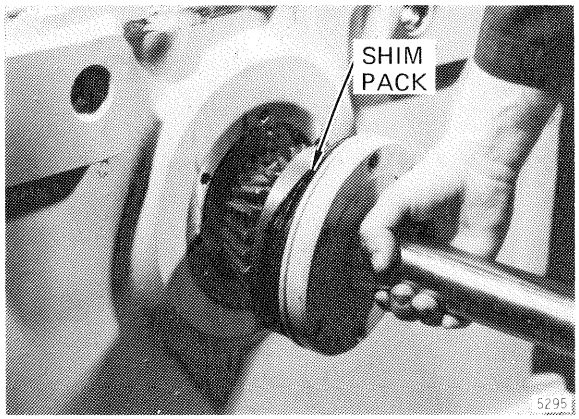
NOTE When removing the mounting nuts (or capscrews) loosen all nuts slightly, then pry winch away from mounting pad. Loosen all nuts again and pry winch again. Continue this sequence until winch can be removed.

FIGURE 10-1. REMOVAL OF WINCH



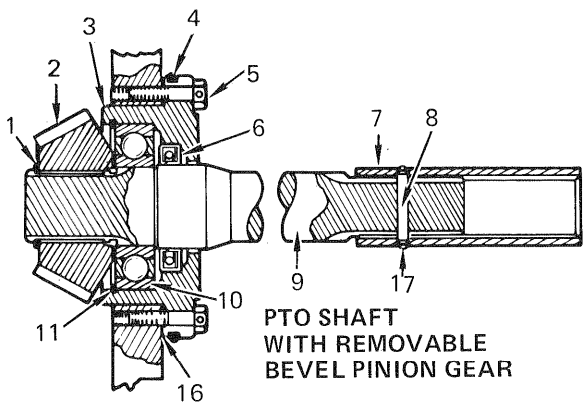
STEP 1. Remove the six sealing capscrews.

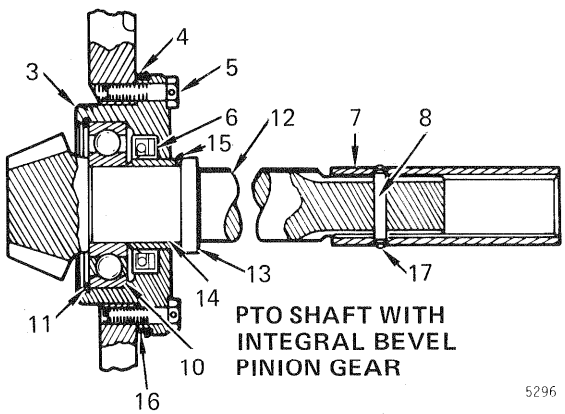
NOTE If winch is equipped with a drive adapter refer to Step 4.



STEP 2. Pull PTO shaft assembly straight out.

CAUTION Tag the shim pack so that exact number of shims are re-installed.



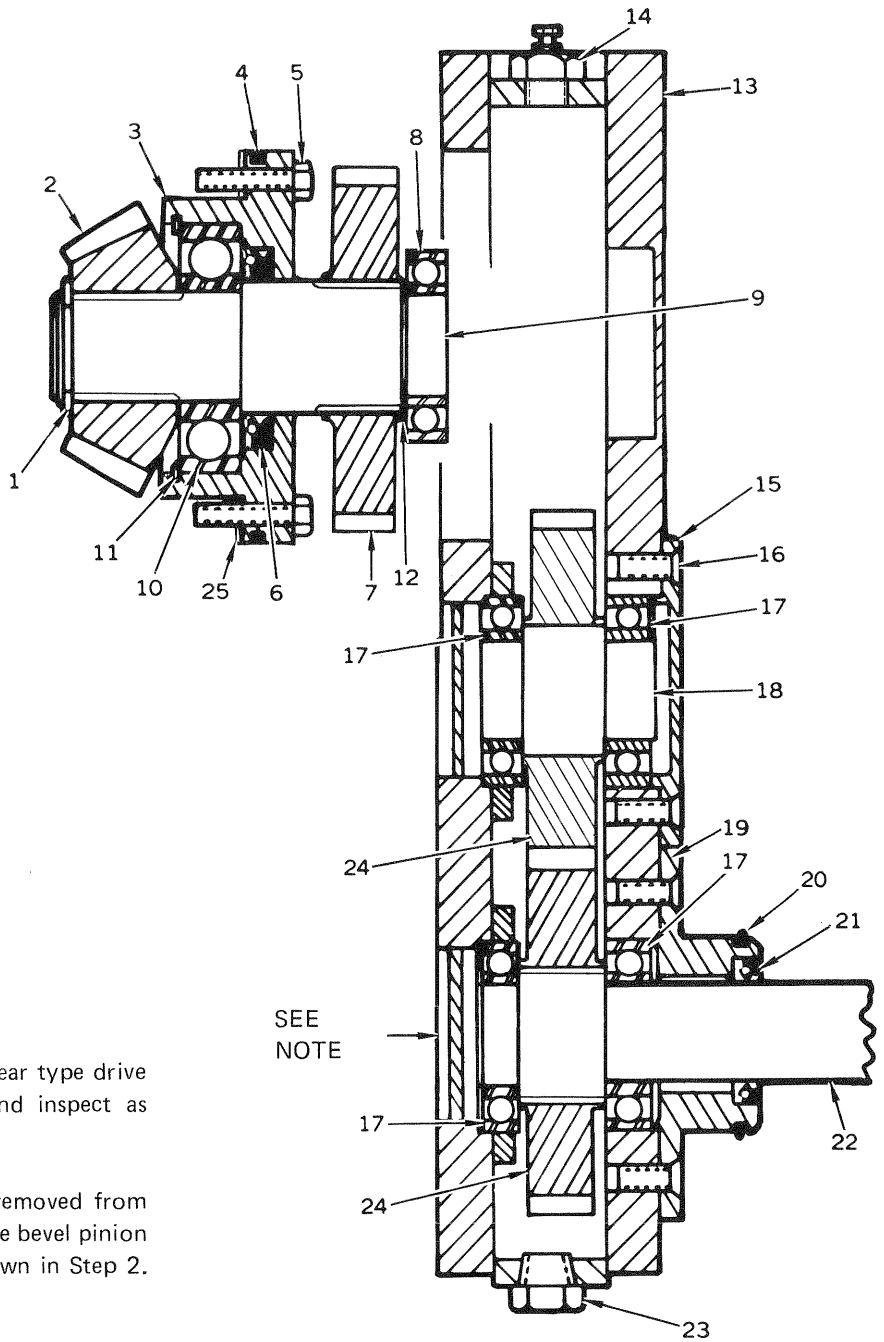


1. SNAP RING
2. BEVEL PINION GEAR
3. BEARING CARRIER
4. O-RING
5. DRILLED HEAD CAPSCREW
6. OIL SEAL
7. COUPLING
8. PIN
9. SHAFT
10. BALL BEARING
11. SNAP RING
12. SHAFT AND INTEGRAL PINION GEAR
13. LOCK NUT
14. SEAL SPACER
15. LOCK RING
16. SHIM PACK
17. LOCK RING

STEP 3. Disassemble and inspect PTO shaft as required.

FIGURE 10-2. REMOVAL AND DISASSEMBLY OF PTO SHAFT ASSEMBLY (Sheet 1 of 2)

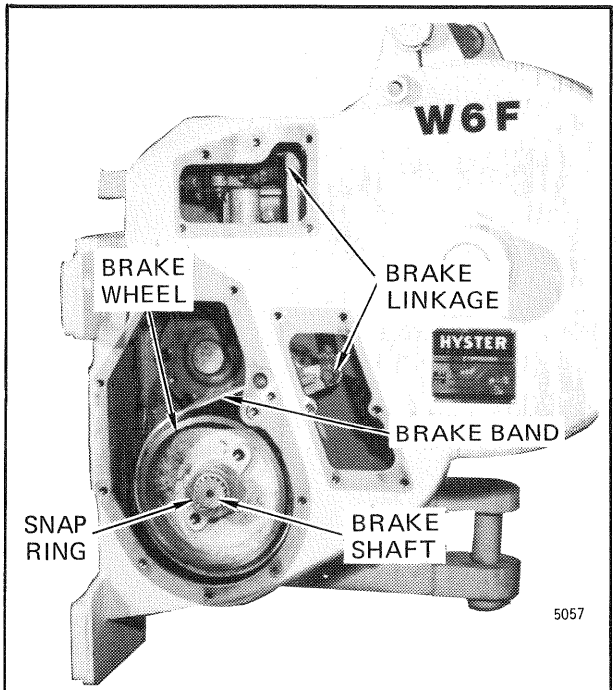
1. SNAP RING
2. BEVEL PINION GEAR
3. BEARING CARRIER
4. O-RING
5. DRILLED HEAD CAPSCREW
6. OIL SEAL
7. DRIVEN GEAR
8. BEARING
9. SHAFT
10. BEARING
11. SNAP RING
12. BEARING RETAINER
13. HOUSING
14. VENT/PLUG
15. RETAINER
16. CAPSCREW
17. BEARING
18. SHAFT
19. RETAINER
20. O-RING
21. OIL SEAL
22. SHAFT
23. PLUG
24. GEAR
25. SHIM(S)



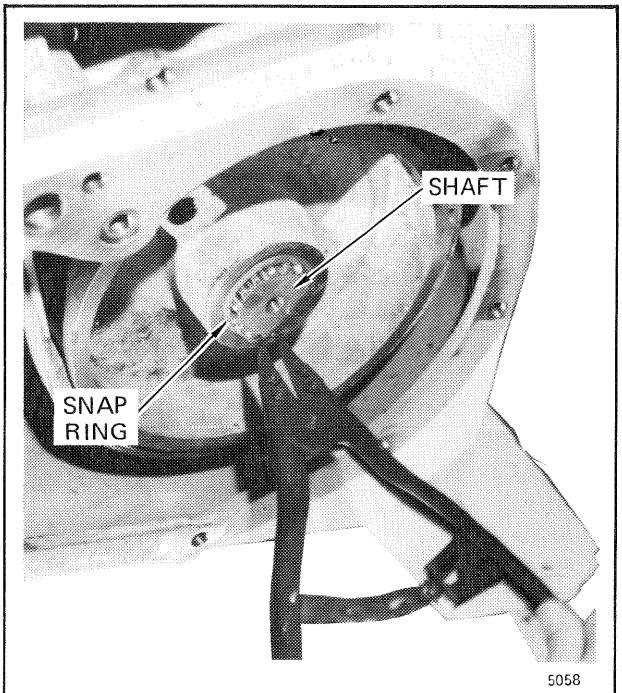
STEP 4. If equipped with a 3-gear type drive adapter, disassemble and inspect as required.

NOTE
- The drive adapter is removed from the winch first, then the bevel pinion gear and carrier as shown in Step 2.
- Oil check plug has been omitted for clarity.

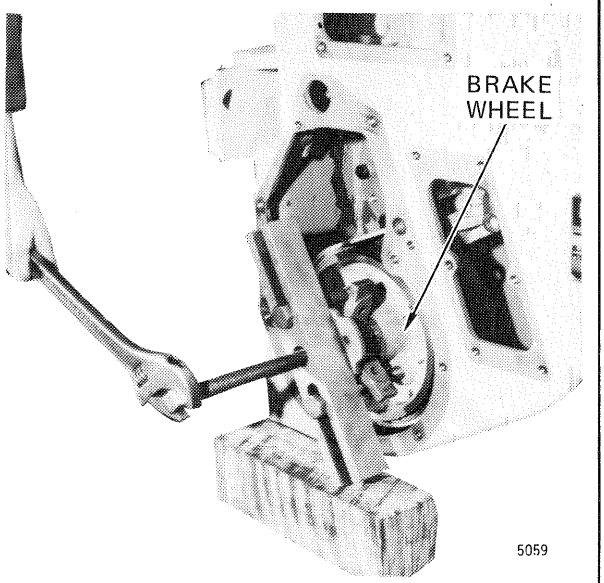
FIGURE 10-2. REMOVAL AND DISASSEMBLY OF PTO SHAFT ASSEMBLY (Sheet 2 of 2)



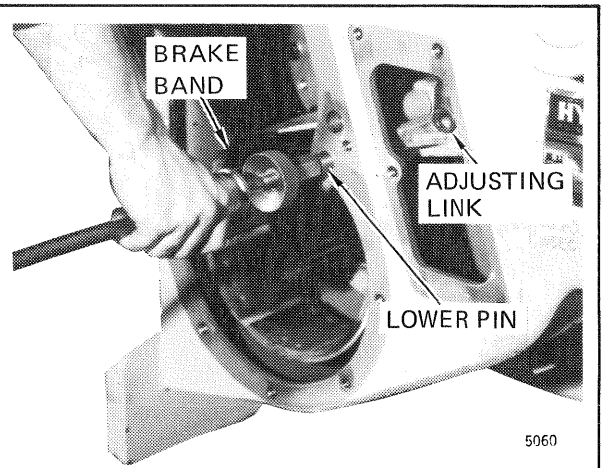
STEP 1. Remove brake access covers if not previously removed.



STEP 2. Remove snap ring from brake shaft.



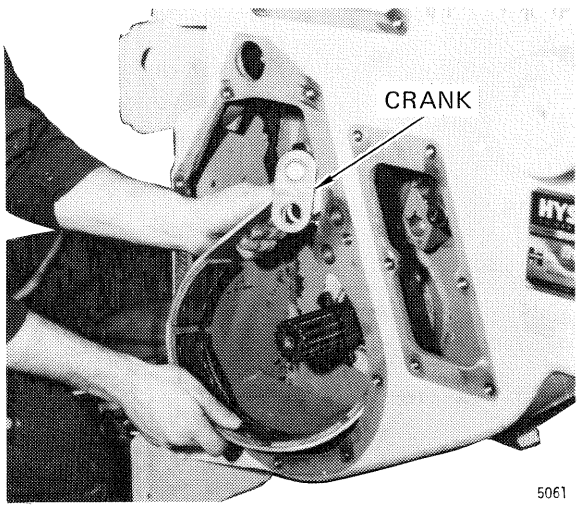
STEP 3. Remove brake wheel from brake shaft (optional automatic brake shown in Step 6).



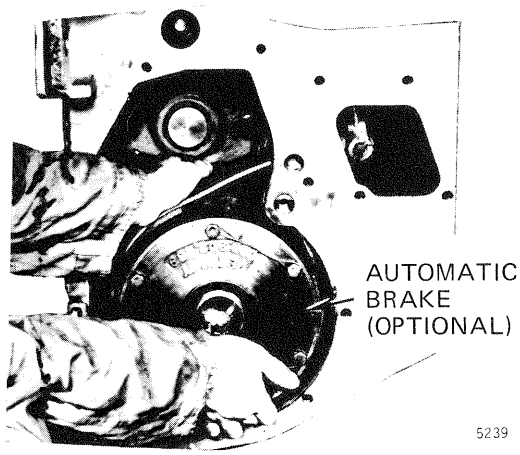
STEP 4. Remove lower anchor pin and disconnect the adjusting link from the brake band crank. Then remove the band and crank assembly.

NOTE A 5/8-UNF capscrew may be screwed into the threaded end of the lower anchor pin to aid in pin removal.

FIGURE 10-3. REMOVAL OF DRY BRAKE AND AUTOMATIC BRAKE (Sheet 1 of 2)

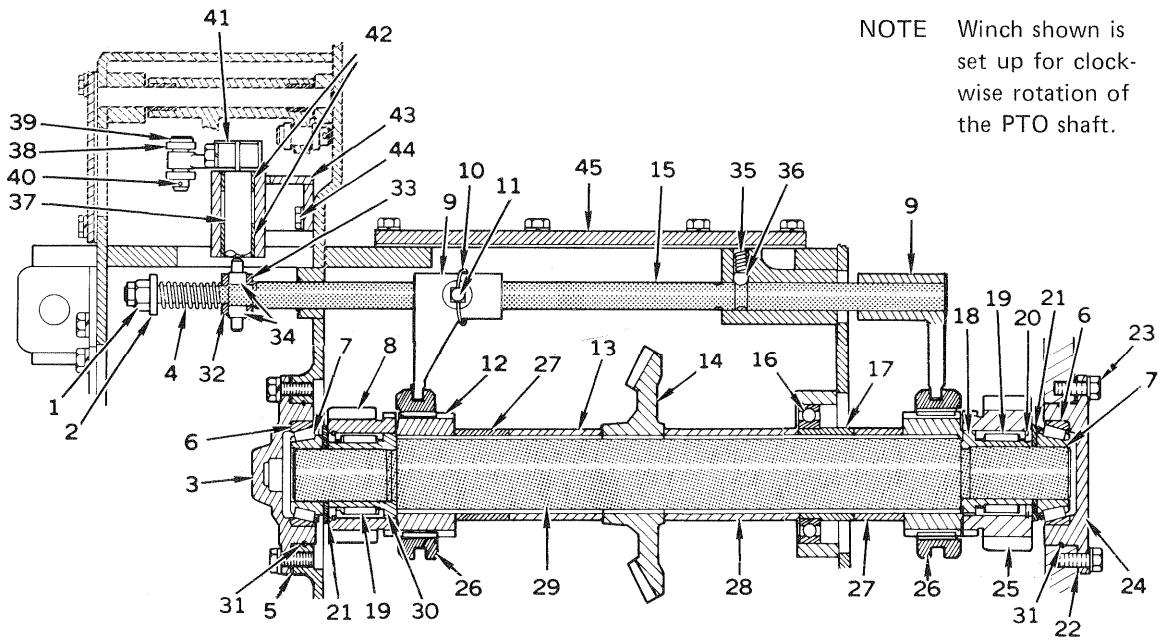


STEP 5. If new lining is to be installed or the band removed from the crank, note position of the crank on the band.



STEP 6. Removal of the automatic brake wheel is the same as shown in Step 3. Refer to Figure 6-6 for arrangement of internal components.

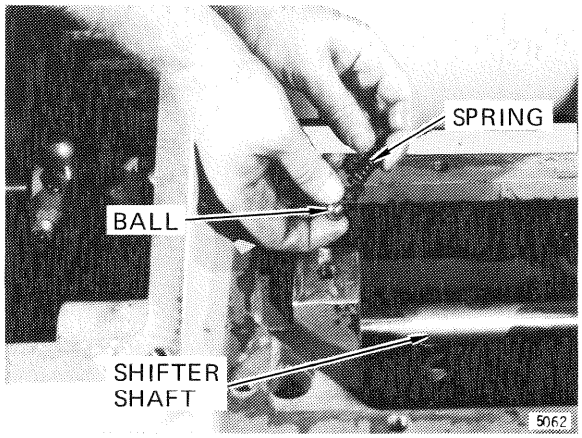
FIGURE 10-3. REMOVAL OF DRY BRAKE AND AUTOMATIC BRAKE (Sheet 2 of 2)



(VIEWED FROM DRUM END) 4663

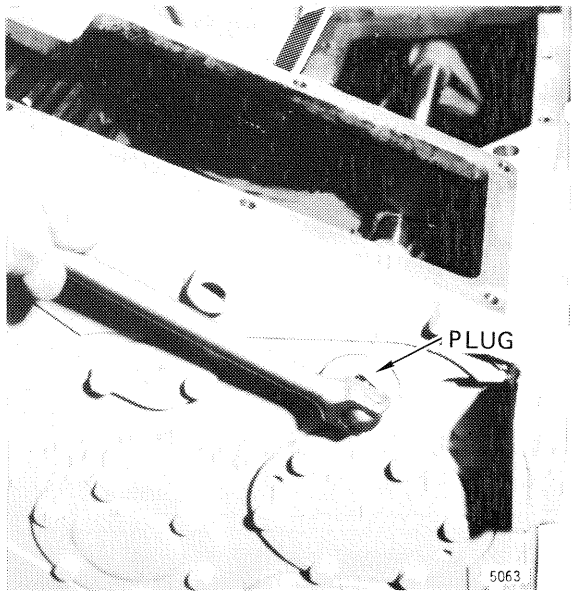
1. LOCKNUT
2. WASHER
3. L.H. BEARING RETAINER
4. SPRING
5. SHIM(S)
6. BEARING CUP
7. BEARING CONE
8. FWD. 2ND REDUCTION PINION GEAR
9. SHIFTER FORK
10. LOCKWIRE
11. LOCKSCREW
12. DENTAL CLUTCH HUB
13. SPACER
14. BEVEL RING GEAR
15. SHIFTER SHAFT
16. BALL BEARING
17. BEARING CARRIER
18. BEARING CARRIER
19. ROLLER BEARING
20. SNAP RING
21. THRUST WASHER
22. SHIM(S)
23. CAPSCREW – LOCKWASHER
24. R.H. BEARING RETAINER
25. REV. 2ND REDUCTION PINION GEAR
26. DENTAL CLUTCH
27. SPACER (SHORT)
28. SPACER (LONG)
29. CLUTCH SHAFT
30. BEARING CARRIER
31. O-RING
32. WASHER
33. WASHER
34. SHIFTER SHOES
35. SPRING
36. BALL
37. SHIFTER CRANK ASSEMBLY
38. ROD END
39. PIN
40. COTTER PIN
41. UPPER CRANK
42. BUSHING (2 REQ'D)
43. SHIFTER CRANK BRACKET
44. CAPSCREW (2 REQ'D)
45. TRANSMISSION COVER

FIGURE 10-4 CLUTCH SHAFT ASSEMBLY, LOCATION OF COMPONENTS

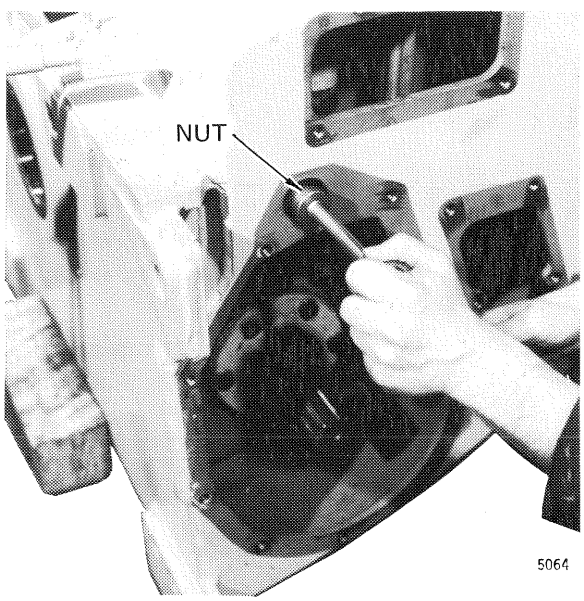


NOTE Prior to removal and disassembly of the clutch shaft assembly, perform the procedures given in paragraph 10-13.

STEP 1. Remove transmission cover and gear train cover if not previously removed. Then remove the shifter shaft detent spring and ball.

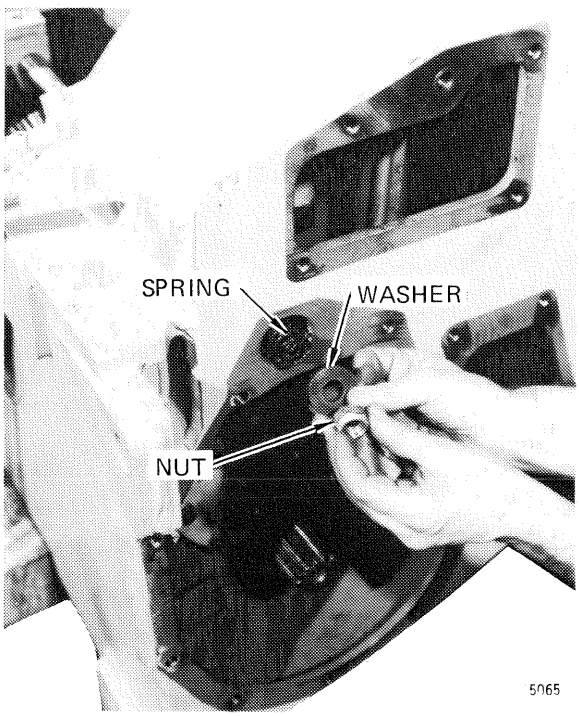


STEP 2. Remove shifter shaft access plug.



STEP 3. Slowly unscrew the nut from the left-hand end of the shifter shaft to relieve spring compression and remove.

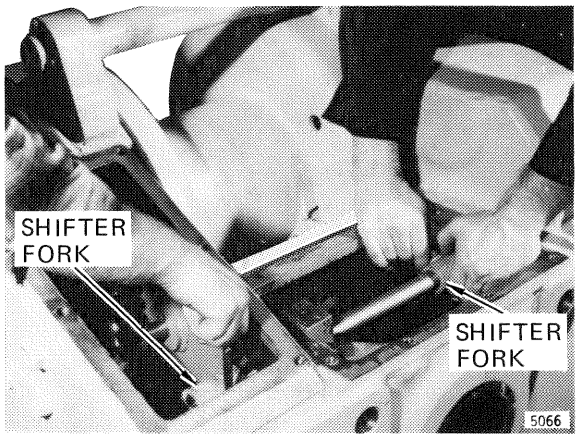
WARNING Compression force of spring when installed is equal to 60 pounds (26.22 kg).



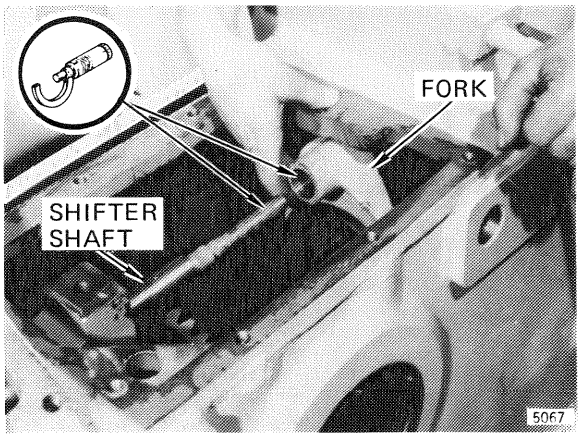
STEP 4. Remove spring, washers and shifter shoes.

NOTE Tag washers upon removal to ensure their proper installation.

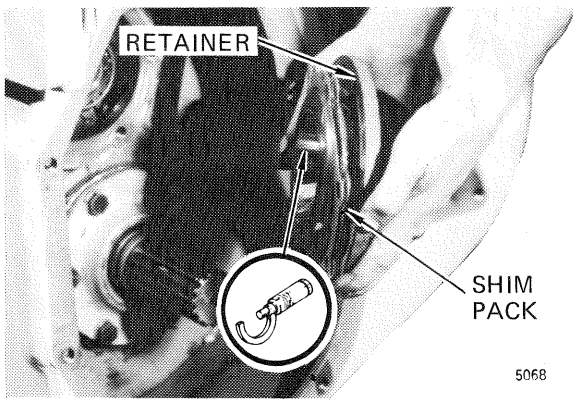
FIGURE 10-5. REMOVAL AND DISASSEMBLY OF CLUTCH SHAFT ASSEMBLY (Sheet 1 of 4)



STEP 5. Cut the lockwire retaining the shifter fork lockscrews and remove.

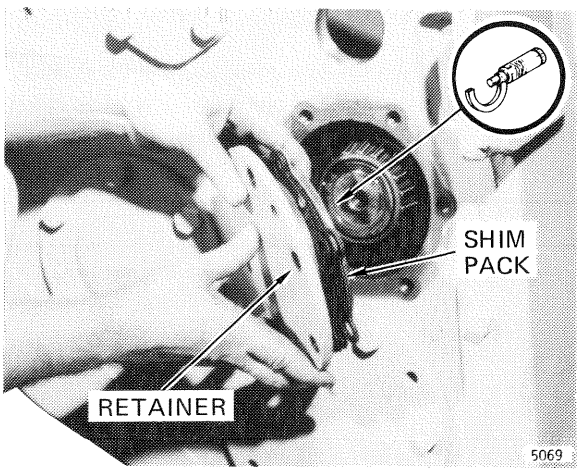


STEP 6. Pull the shifter shaft out being careful not to drop the forks.



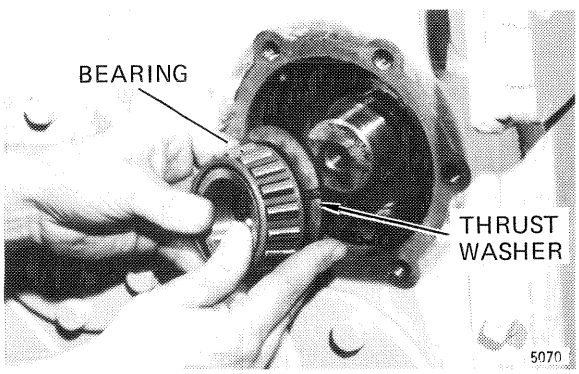
STEP 7. Remove left-hand bearing retainer with shims by removing the six capscrews.

NOTE Keep shim pack with the retainer to aid reassembly.

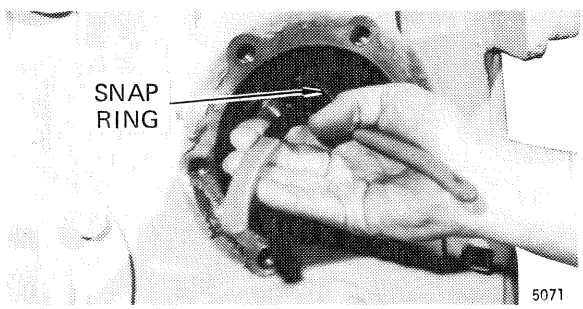


STEP 8. Remove right-hand bearing retainer with shims by removing the six capscrews.

NOTE Keep shim pack with the retainer to aid assembly.

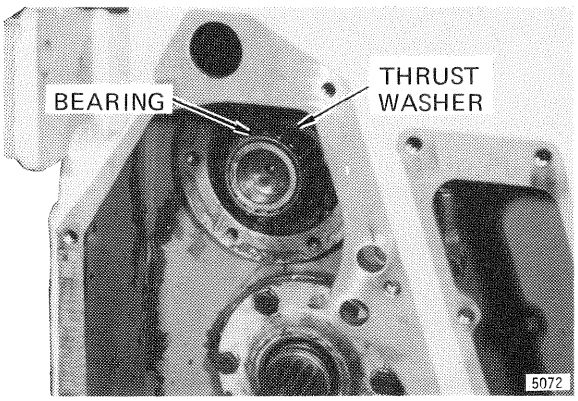


STEP 9. Remove tapered roller bearing and thrust washer from the right-hand end of the clutch shaft.

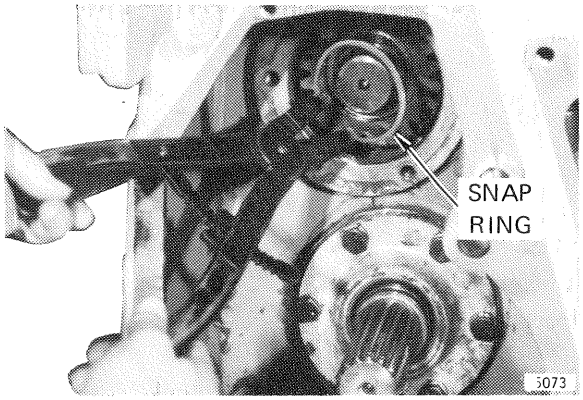


STEP 10. Remove the internal snap ring from the reverse pinion gear bore.

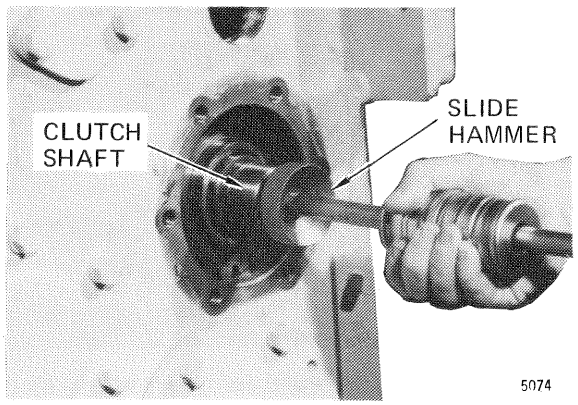
FIGURE 10-5. REMOVAL AND DISASSEMBLY OF CLUTCH SHAFT ASSEMBLY (Sheet 2 of 4)



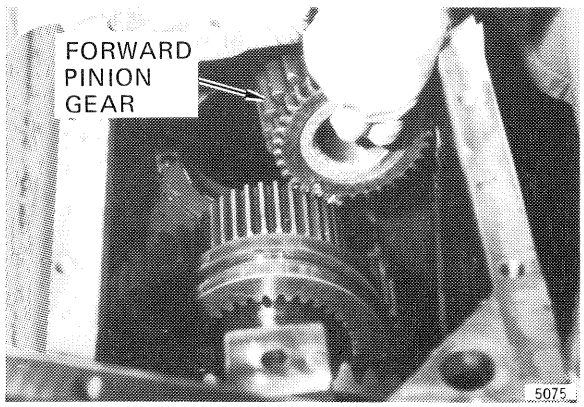
STEP 11. Remove tapered roller bearing and thrust washer from the left-hand end of the clutch shaft.



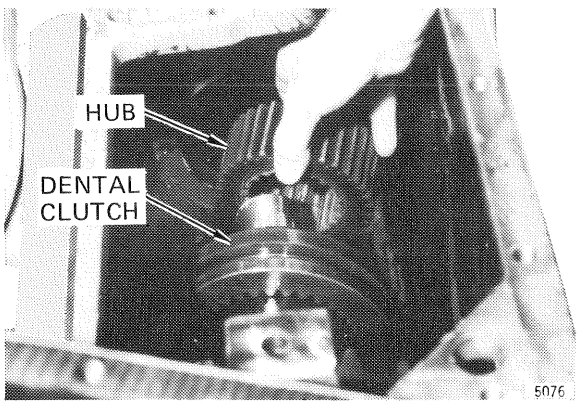
STEP 12. Remove the internal snap ring from the forward pinion gear bore.



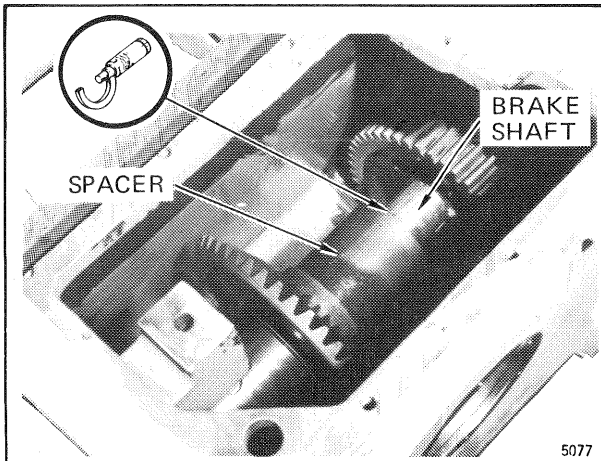
STEP 13. Install a 5/8" UNC slide hammer into the right-hand end of the shaft so that it may be pulled straight out.



STEP 14. Pull the shaft out just far enough to remove the forward pinion gear.

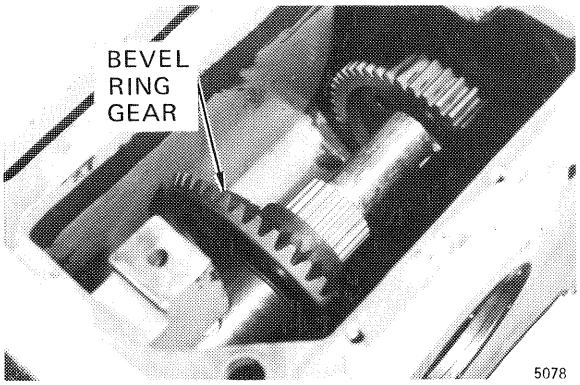


STEP 15. Pull the shaft out just far enough to remove the forward dental clutch and hub.

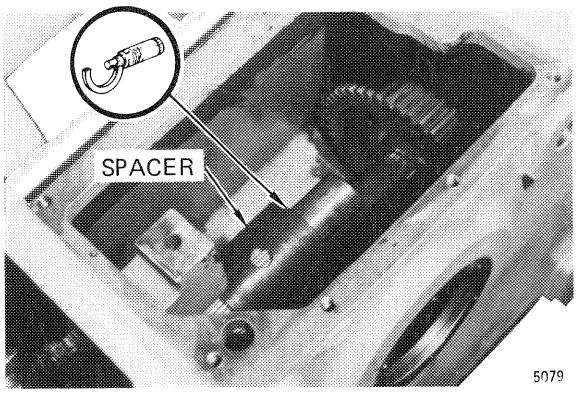


STEP 16. Remove spacer and tag to aid in reassembly.

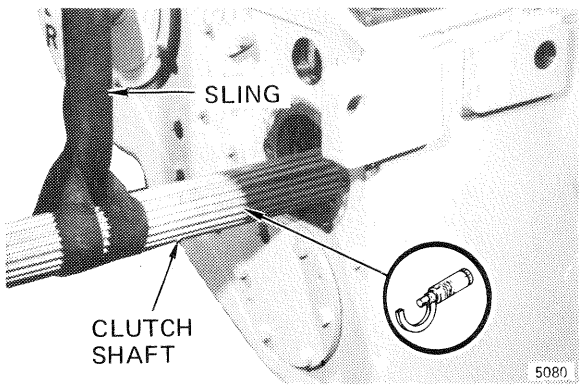
FIGURE 10-5. REMOVAL AND DISASSEMBLY OF CLUTCH SHAFT ASSEMBLY (Sheet 3 of 4)



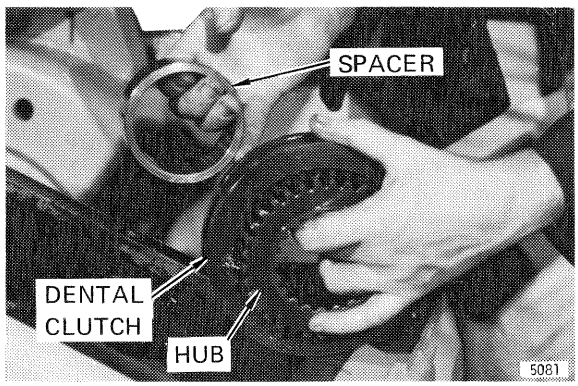
STEP 17. Pull the shaft out far enough to remove the bevel ring gear. Note direction of teeth to aid in reassembly.



STEP 18. Remove spacer and tag to aid in reassembly.

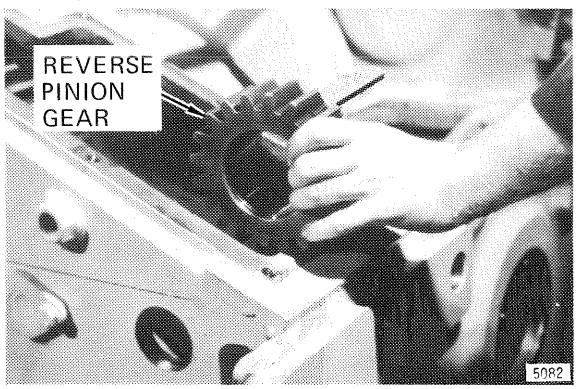


STEP 19. Install a sling around the clutch shaft. Hoist sling until shaft is level. Partially withdraw the shaft while restraining the center ball bearing and carrier from falling into the housing.



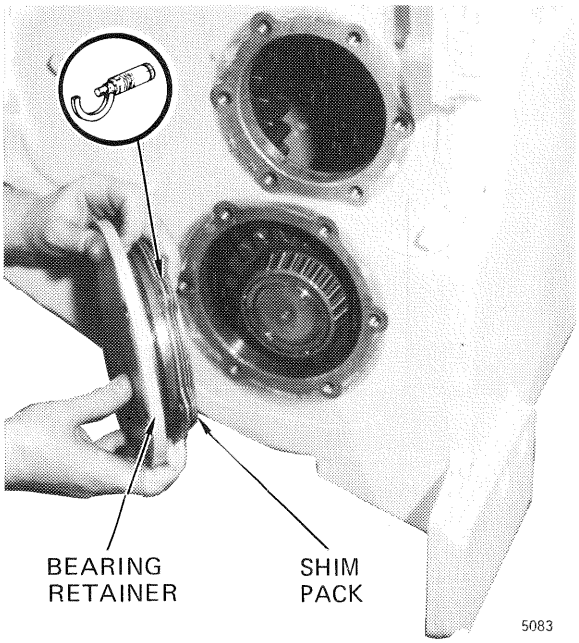
STEP 20. Pull the shaft out far enough to remove the shaft spacer, reverse dental clutch and hub.

NOTE Adjust sling so that the shaft remains balanced.



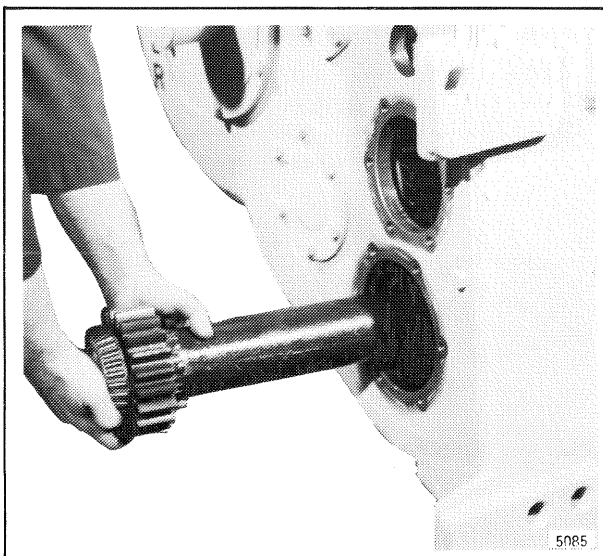
STEP 21. Remove the reverse pinion gear and carefully withdraw the shaft.

FIGURE 10-5. REMOVAL AND DISASSEMBLY OF CLUTCH SHAFT ASSEMBLY (Sheet 4 of 4)

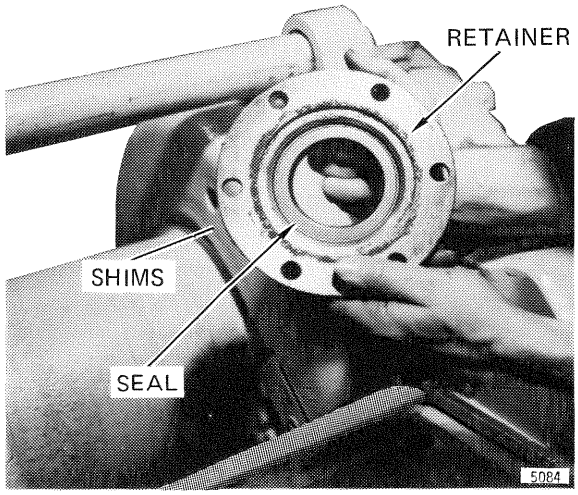


STEP 1. Remove right-hand bearing retainer. Tag shims for reference during reassembly.

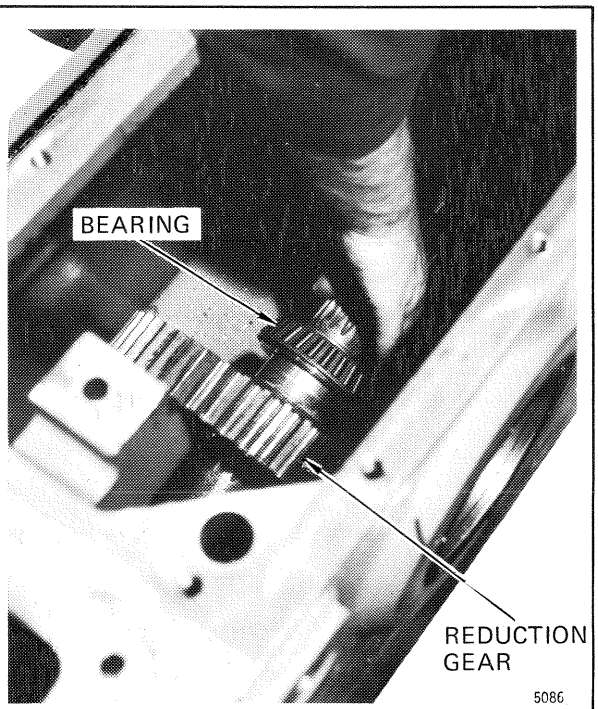
NOTE Prior to removal and disassembly of the brake shaft, perform the procedures given in paragraph 10-16.



STEP 3. Pull brake shaft out of winch housing to approximate position shown.



STEP 2. Remove left-hand bearing retainer. Tag shims for reference during reassembly.

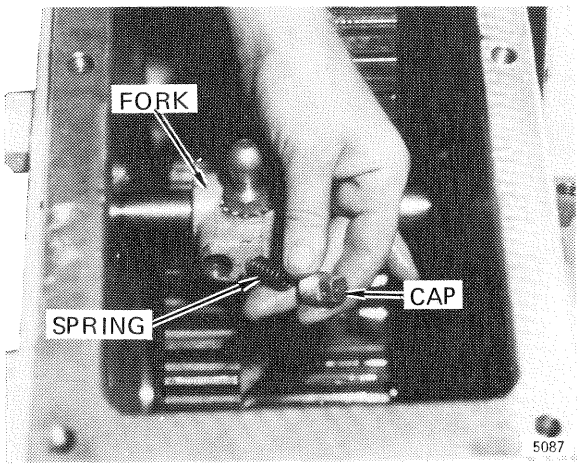


STEP 4. Tap the left-hand bearing off of shaft using reduction gear as driver. Then withdraw shaft from housing. Remove gear from winch housing.

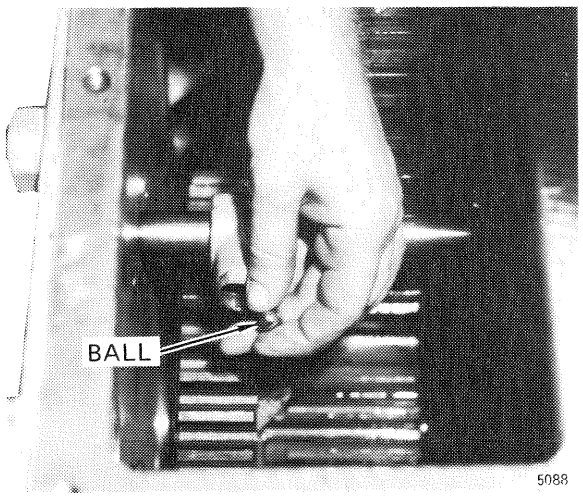
FIGURE 10-6. REMOVAL OF BRAKE SHAFT ASSEMBLY

NOTE

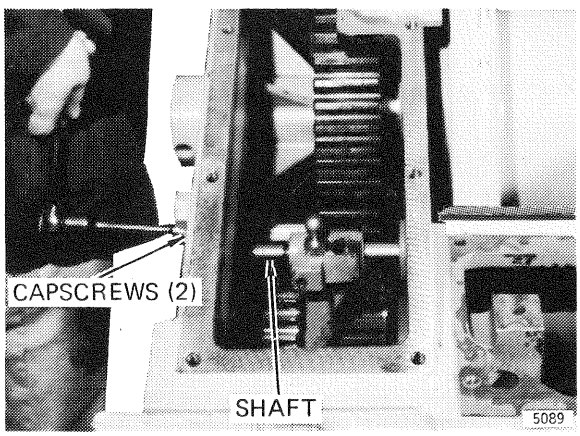
- The following illustrations show the winch removed from the tractor and and with the brake shaft and bevel gear shaft removed. Removal of these shafts is not necessary for ON TRACTOR REPAIR of the intermediate shaft. Remove the drum shaft bearing retainer (See Figure 10-8) to obtain the necessary clearance for removal of the intermediate shaft gears.
- The winch shown is equipped with the optional free-spool arrangement. Steps 1 through 4 do not apply to a standard winch.



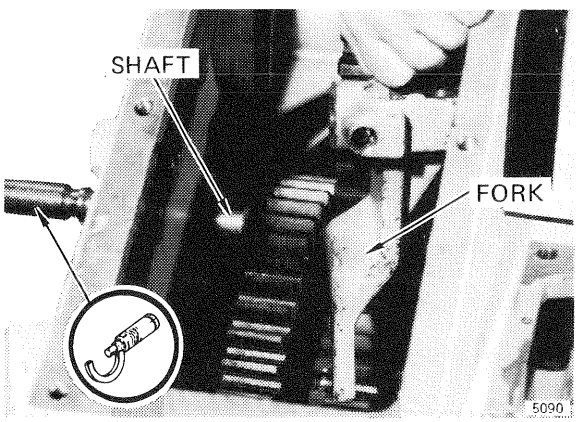
STEP 1. Remove the cap and spring from the free-spool shifter fork.



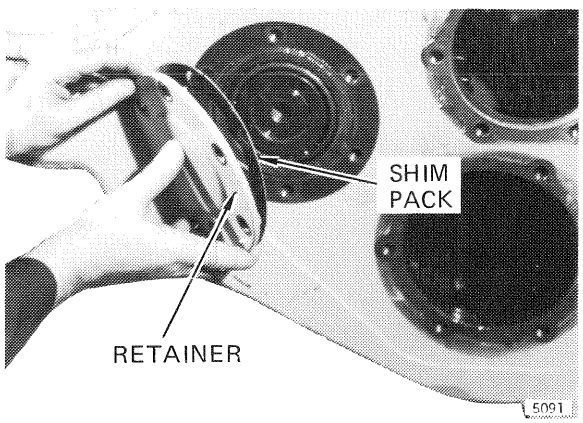
STEP 2. Using a magnet remove the detent ball.



STEP 3. Remove the capscrews securing the shifter shaft.

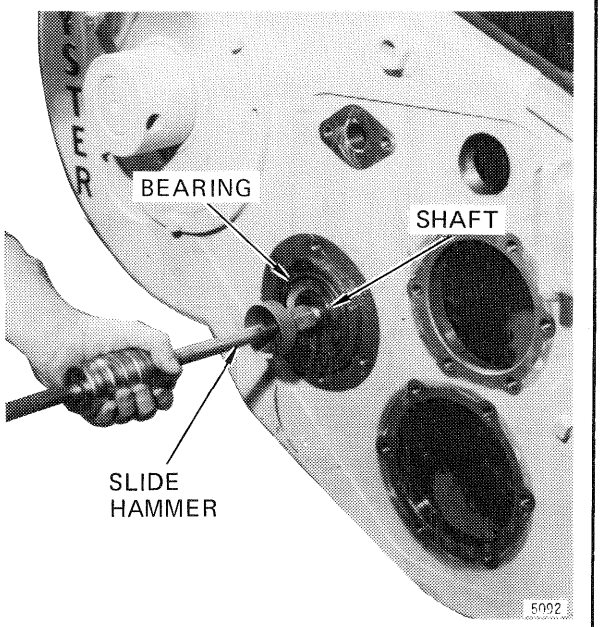


STEP 4. Withdraw the shaft and remove the fork.

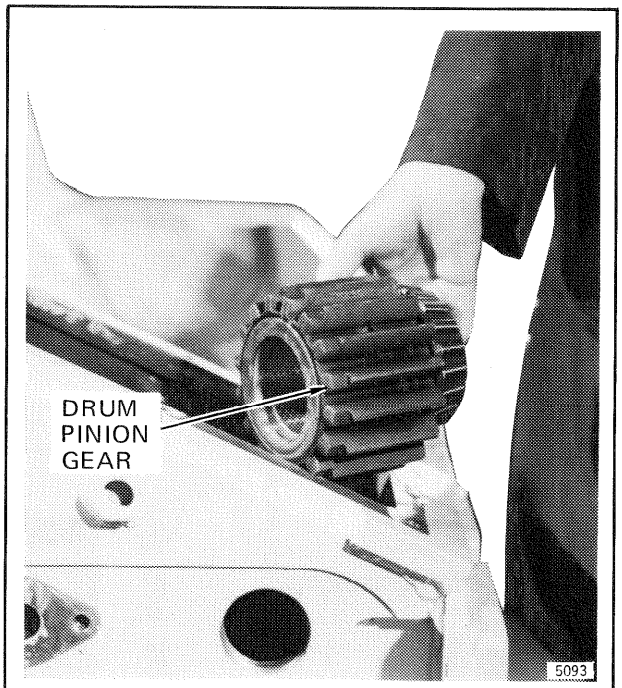


STEP 5. Remove the right-hand bearing retainer with shims. Tag shims for reference during reassembly.

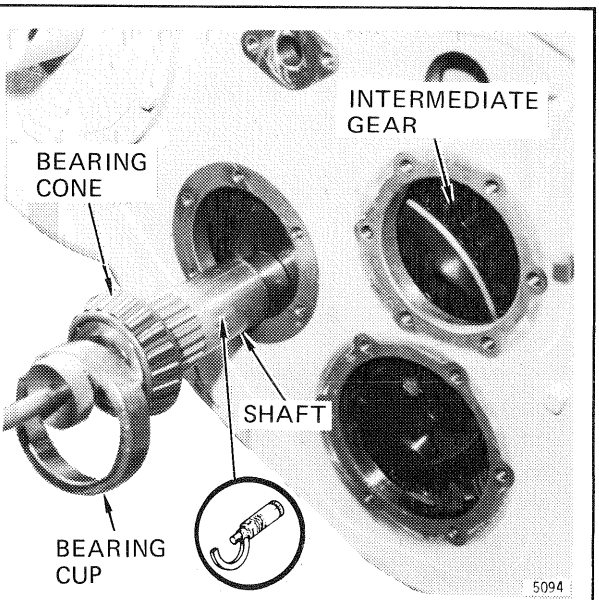
FIGURE 10-7. REMOVAL OF INTERMEDIATE SHAFT ASSEMBLY (Sheet 1 of 2)



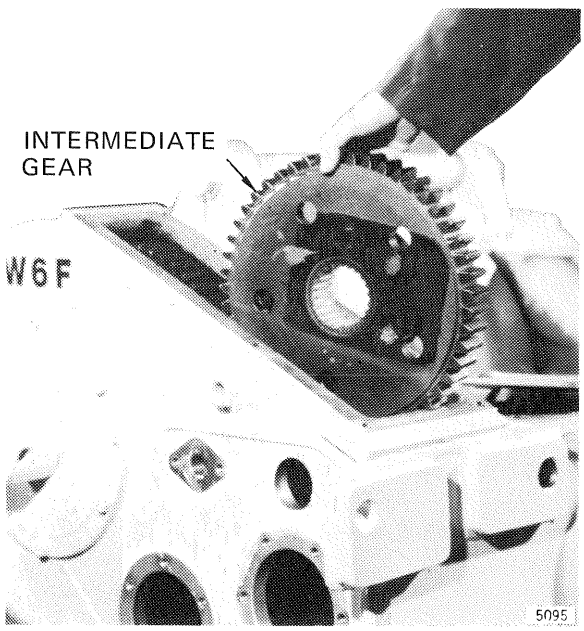
STEP 6. Screw a 5/8-inch slide hammer into the end of the intermediate shaft and partially pull out shaft.



STEP 7. Remove the drum pinion and inner bearing cone.

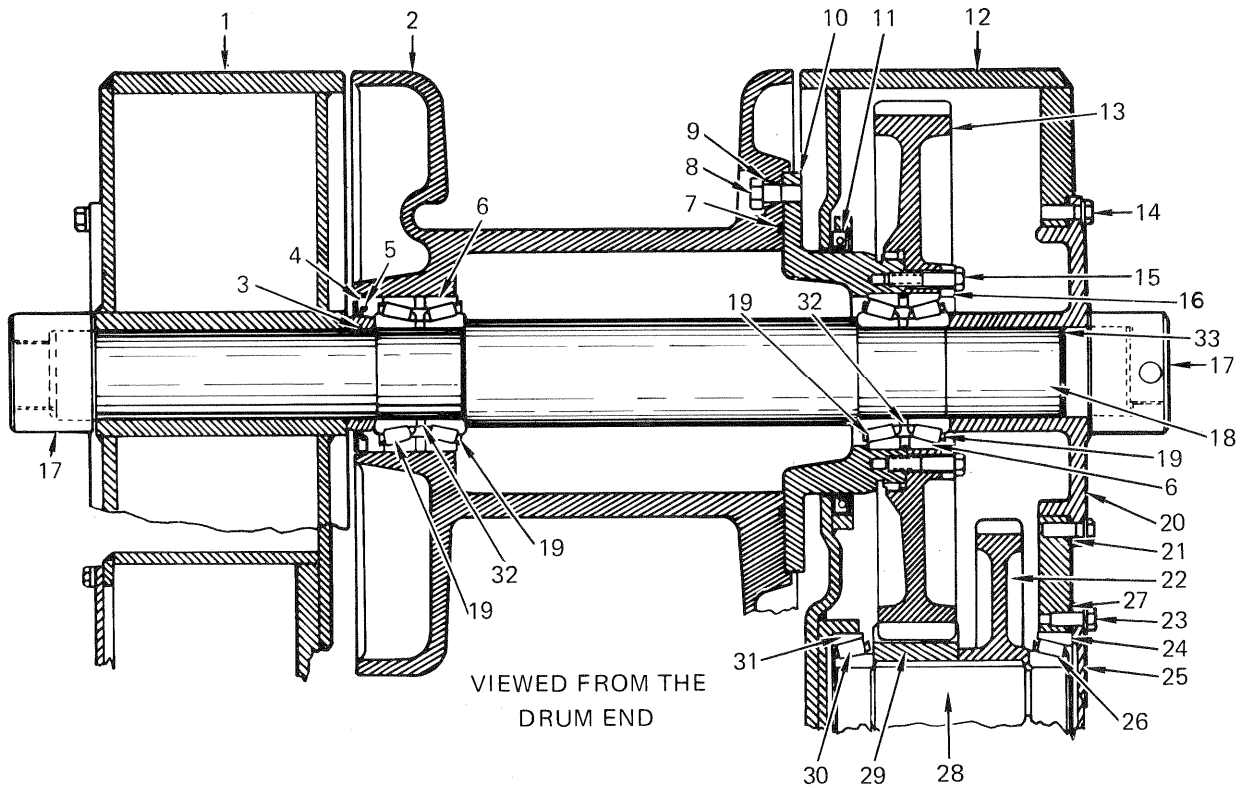


STEP 8. Remove the intermediate shaft, while ensuring that the intermediate gear does not fall.



STEP 9. Remove intermediate gear from winch housing.

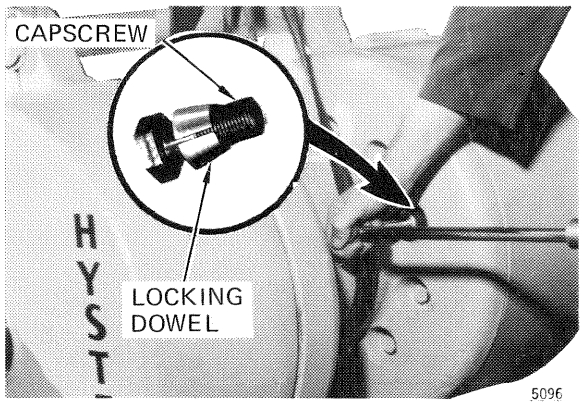
FIGURE 10-7. REMOVAL OF INTERMEDIATE SHAFT ASSEMBLY (Sheet 2 of 2)



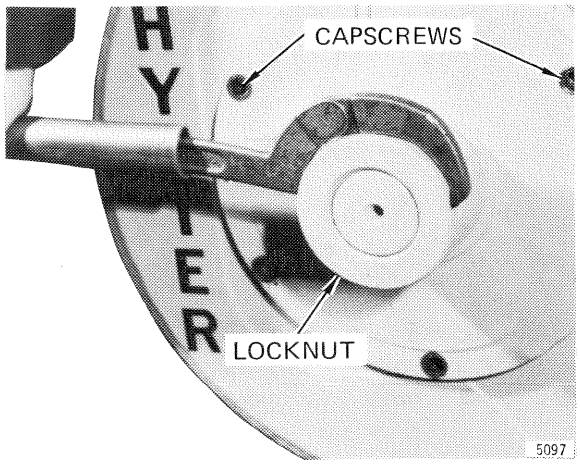
NOTE INTERMEDIATE SHAFT ASSEMBLY SHOWN IS NOT EQUIPPED WITH FREE-SPOOL.

1. L.H. WINCH HOUSING
2. DRUM
3. O-RING
4. SPACER
5. OIL SEAL
6. DOUBLE BEARING CUP (2 REQ'D)
7. SEAL RING
8. CAPSCREW (10 REQ'D)
9. LOCKING DOWEL (10 REQ'D)
10. DRUM ADAPTER
11. OIL SEAL
12. R.H. WINCH HOUSING
13. DRUM GEAR
14. SEALING CAPSCREW AND WASHER
15. CAPSCREW
18. DRUM SHAFT
19. BEARING CONE (4 REQ'D)
20. DRUM RETAINER
21. SHIMS
22. INTERMEDIATE GEAR
23. LOCKWASHER
24. BEARING CUP
25. COVER
26. BEARING CONE
27. SHIMS
28. INTERMEDIATE SHAFT
29. DRUM PINION GEAR
30. BEARING CONE
31. BEARING CUP
32. SPACER (2 REQ'D)
33. SHIM(s)
34. O-RING

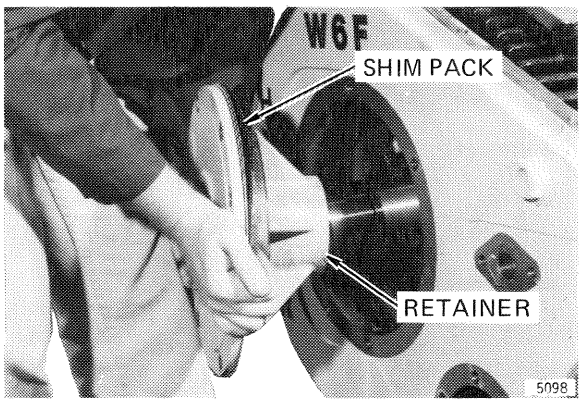
FIGURE 10-8. DRUM AND DRUM SHAFT, LOCATION OF COMPONENTS



STEP 1. Loosen the 12 drum capscrews, then remove 10 capscrews with locking dowels leaving two located 180 degrees apart.

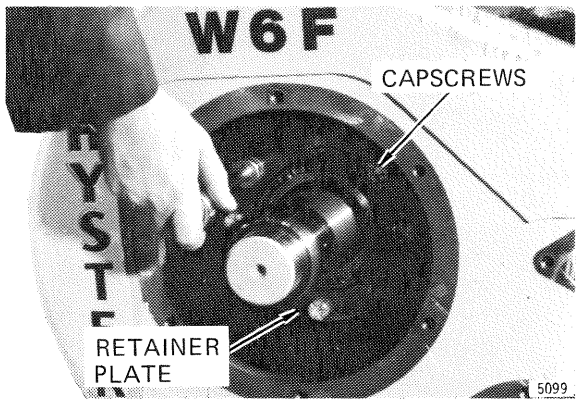


STEP 2. Remove both drum shaft locknuts and the six retainer capscrews.

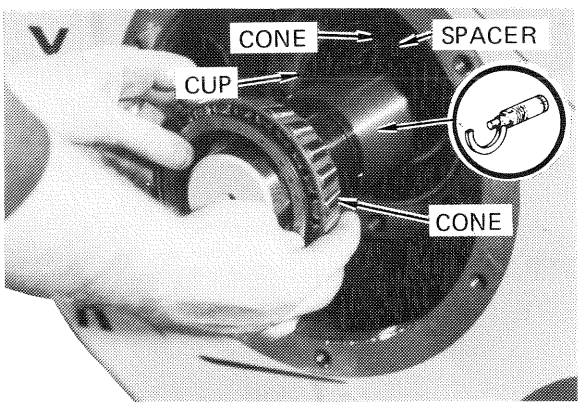


STEP 3. Remove bearing retainer and shim pack.

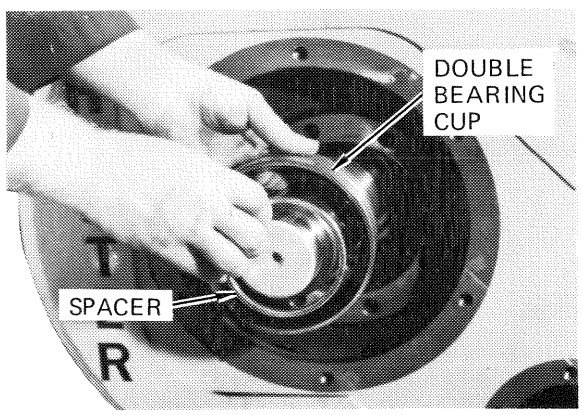
NOTE Tag shim pack for reference during reassembly.



STEP 4. Remove retainer plate by removing the six retainer capscrews.



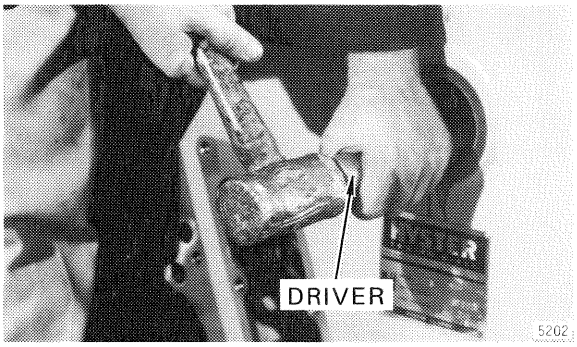
STEP 5. Remove the first tapered roller bearing cone.



STEP 6. Remove the double bearing cup, spacer and second cone.

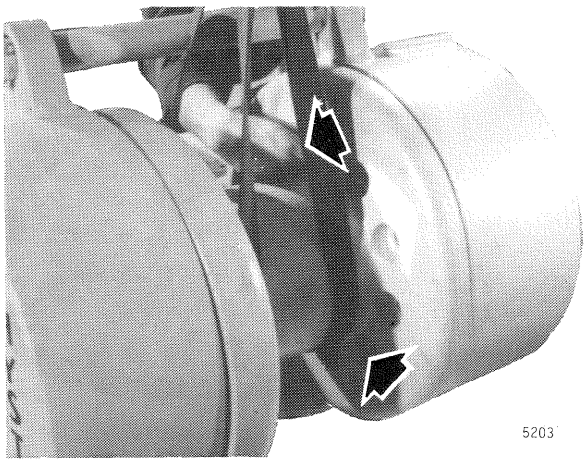
NOTE Bearing assembly may be removed with the drum shaft if it is seized to the shaft.

FIGURE 10-9. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 1 of 3)

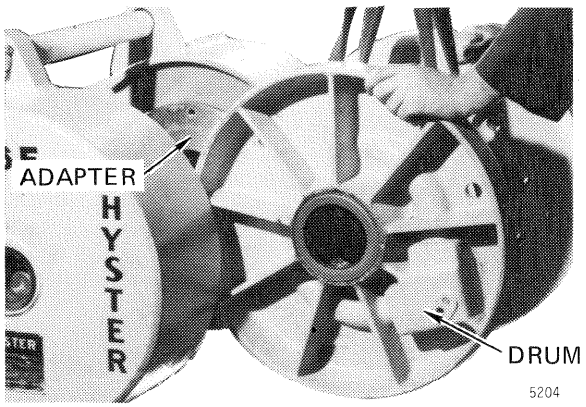


STEP 7. Attach a sling around the drum and hoist until there is no slack, then drive the shaft out the right-hand side.

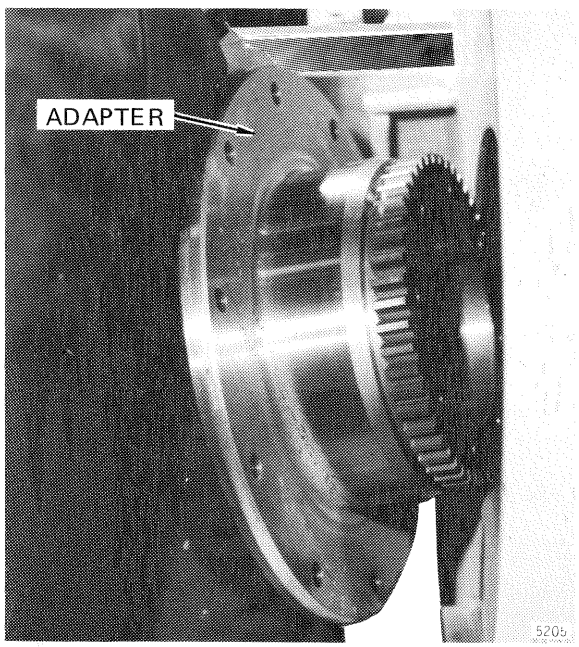
NOTE Support or sling the drum gear so that it does not fall during shaft removal.



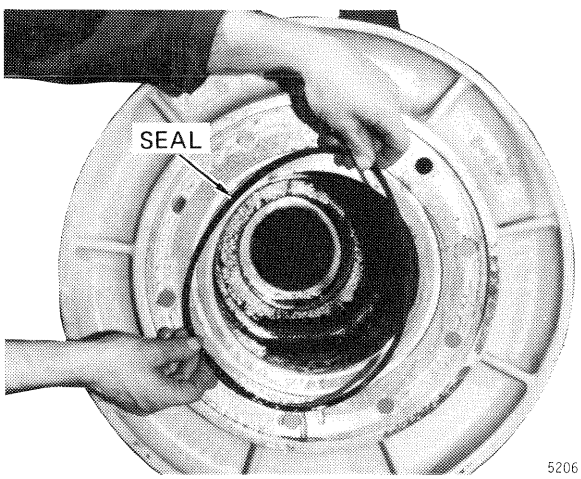
STEP 8. Remove two remaining drum cap-screws.



STEP 9. Carefully remove the drum from winch frame. Ensure that the adapter does not fall.



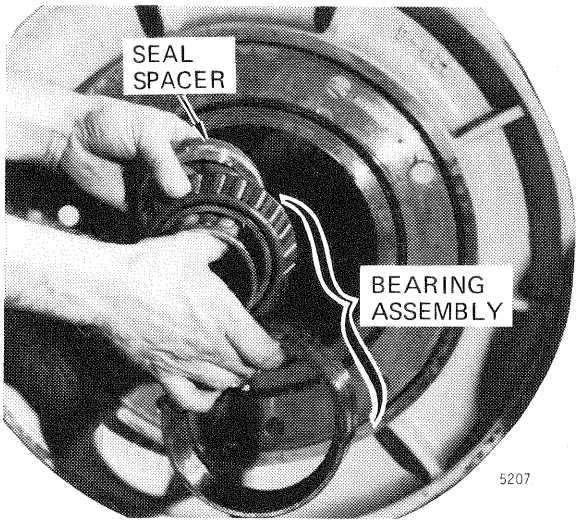
STEP 10. Remove adapter.



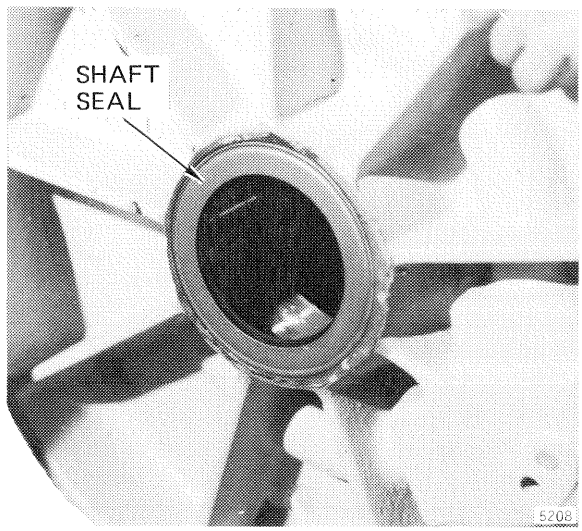
STEP 11. Remove and discard drum seal.

NOTE This seal must be replaced with a new Hyster-Approved seal during reassembly.

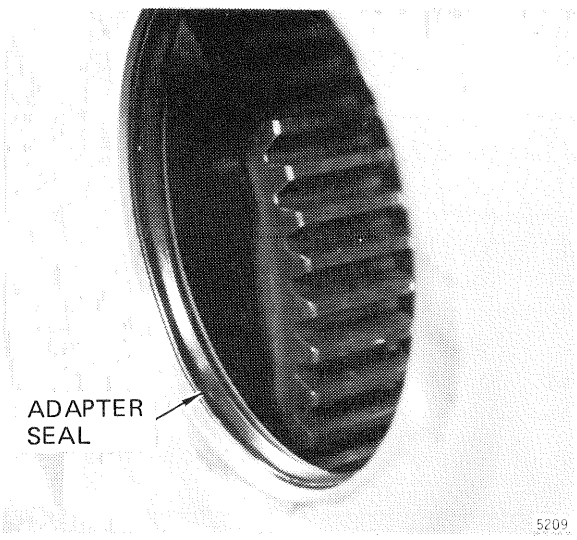
FIGURE 10-9. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 2 of 3)



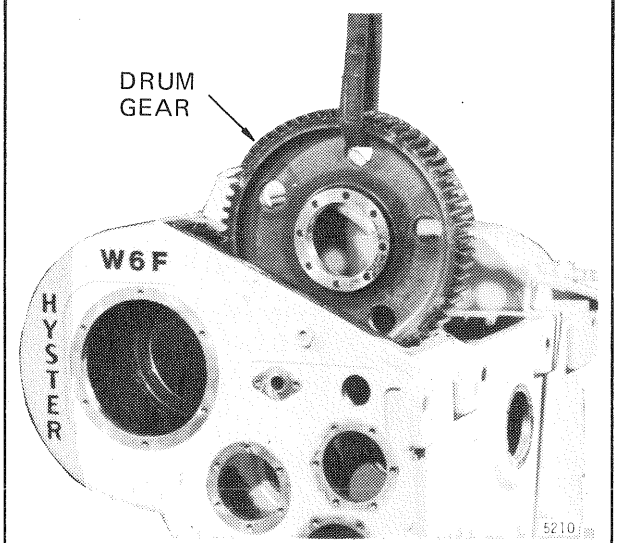
STEP 12. Remove double tapered roller bearing assembly and seal spacer from the left-hand end of the drum. Refer to Figure 10-8.



STEP 13. Remove and discard shaft seal from drum.



STEP 14. Remove and discard adapter seal from winch housing.



STEP 15. Using a suitable lifting device, the drum gear can now be removed.

FIGURE 10-9. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 3 of 3)

10-23. VISUAL INSPECTION.

10-24. Table 10-1 contains procedures for visual inspection of all critical parts of the winch assembly.

10-25. MINOR REPAIRS.

10-26. Drive Adapter. (See Figure 10-2.)

10-27. The Drive Adapter should be disassembled in the sequence of reference numbers in Figure 10-2. Inspect all parts as specified in Table 10-1. Assembly is essentially the reverse of disassembly.

TABLE 10-1. VISUAL INSPECTION (Sheet 1 of 2)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
PTO Shaft With Integral Pinion Gear	Check for broken or severely worn bevel pinion gear teeth. Also check splines for wear or twisting.	Replace shaft if gear teeth are broken or severely worn or if splines are not true.
PTO Shaft With Removable Pinion Gear	Check splines for wear or twisting.	Replace shaft if splines are severely worn or twisted.
PTO Shaft Bevel Pinion Gear (Removable)	Check for broken or severely worn bevel pinion gear teeth.	Replace bevel pinion gear if teeth are broken or severely worn.
Clutch Shaft	Check for deep scratches or scoring on bearing journals at each end of shaft.	Dress surface or replace shaft if severely worn.
Clutch Shaft Bearing Retainers	Check retainer o-ring bore for nicks, grooves, scoring and rust.	Replace if scored, rusted.
Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Clutch Shaft Spacers	Inspect spacer ends for scoring, wear, mushrooming, or corrosion.	Replace if damaged in any way.
Pinion Gears	Check for broken or worn teeth.	Replace pinion gears if teeth are broken or severely worn.
Bevel Ring Gear	Check for broken or severely worn teeth.	Replace if teeth are broken or severely worn.
	Inspect gear hub faces for scoring, mushrooming, or corrosion.	The gear should be replaced if hub faces are defective in any way. **NOTE** Do not machine gear faces. Overall length of components is critical.
Brake Shaft	Check for deep scratches or scoring on bearing journals at each end of shaft, and oil seal surfaces.	Dress surface or replace shaft if severely worn.
	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.

TABLE 10-1. VISUAL INSPECTION (Sheet 2 of 2)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Brake Shaft Gears	Check for broken or worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Intermediate Shaft	Check for deep scratches or scoring on bearing journals at each end of shaft.	Dress surface or replace shaft if severely worn.
Intermediate Shaft Gears	Check for broken or severely worn splines. Inspect both gears for broken or severely worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace if splines are broken or severely worn. Replace gears if teeth are broken or severely worn.
Free-Spool Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing journals at each end of shaft. Check for crossthreaded or damaged threads.	Dress surface or replace shaft if severely worn Dress threads with thread chaser.
Drum Gear	Check for broken or severely worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Drum	Inspect seal-ring groove for burrs, scoring and rust. Inspect oil seal adapter for deep scratches or scoring.	Replace drum or rebuild drum groove if a new seal-ring will not seat properly.
Drum Adapter	Carefully inspect double lip seal contact surface for deep scratches, burrs, and rust.	Replace if damaged.
Winch Frame		Consult the Factory.
Drive Adapter	Inspect gears for broken or severely worn teeth. Check for deep scratches or scoring on bearing journals at the ends of each shaft.	Replace gears if teeth are broken or severely worn. Dress surface or replace shaft if severely worn.

10-28. COMPONENT REASSEMBLY AND INSTALLATION.

10-29. Before reassembly and installation of the winch, make sure that all removed parts have been inspected as specified in Table 10-1. Check all parts for wear as indicated in the disassembly instructions. Replace any worn parts. Carefully check all bearings that have been removed. Used bearings often appear to be satisfactory, but may fail when placed under a load. When in doubt, installation of new bearings is recommended. Always install new O-rings and seals.

CAUTION Apply a light coat of sealing compound (John Crane, or equivalent) to all external bearing retainers and cover plate capscrews.

10-30. Installation of Drum and Drum Shaft.

10-31. Reassembly and installation of the drum and drum shaft is shown in Figure 10-10. If the drum gear was removed, it must be installed prior to installation of the intermediate shaft assembly and reverse clutch assembly.

10-32. Installation of Intermediate Shaft Assembly.

10-33. Installation of the intermediate shaft and associated components is shown in Figure 10-11. Figure 10-11 shows the winch removed from the tractor with the clutch shaft and brake shaft removed. However, the intermediate shaft can be installed with the winch mounted on the tractor and with only the drum shaft bearing retainer removed for the necessary clearance.

10-34. Installation of Brake Shaft Assembly.

10-35. Installation of the brake shaft and associated components is shown in Figure 10-12. The brake shaft and reduction gear must be installed before installation of the clutch shaft assembly. The brake shaft cannot be installed when the winch is mounted on the tractor unless the tractor tracks are removed or disconnected. The brake shaft must be adjusted for 0.000 to 0.004-inch (0.000-0.102 mm) endplay to obtain the desired preload.

10-36. Reassembly and Installation of Clutch Shaft Assembly.

10-37. Reassemble and install the clutch shaft as shown in Figure 10-13, observing the following:

a. See Figure 10-4 for location of clutch shaft components.

b. The Direct Drive winch is equipped with dental clutches. Install the dental clutch so that the chamfered ramp faces toward the pinion gear.

c. Install the bevel gear and two spacers as indicated in Figure 10-4.

d. The clutch shaft must be adjusted for 0.006 to 0.009 inch (0.152-0.299 mm) endplay.

10-38. Installation of Dry Brake and Automatic Brake.

10-39. Installation of dry brake (or optional automatic brake) used in the Direct Drive winch is shown in Figure 10-14. Installation procedures shown in Figure 10-14 apply to both the dry brake and optional automatic brake.

10-40. Installation PTO Shaft Assembly.

10-41. Reassembly and installation of the PTO shaft assembly is shown in Figure 10-15.

10-42. WINCH INSTALLATION.

10-43. Installation of the winch is shown in Figure 10-16. Observe the following during installation:

WARNING Before raising the winch into position, ensure that the lifting device is in safe operating condition and has a rating of at least 3,000 pounds (1360.8 kg).

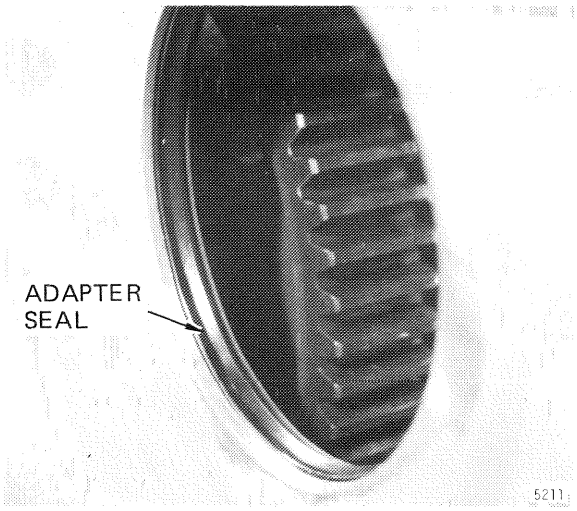
a. Clean the mounting surfaces on the tractor.

b. Check the condition of the mounting studs on the tractor. Ensure that all studs are tight. Replace any studs that are loose, bent or otherwise damaged. Minor thread damage may be dressed with a thread chaser.

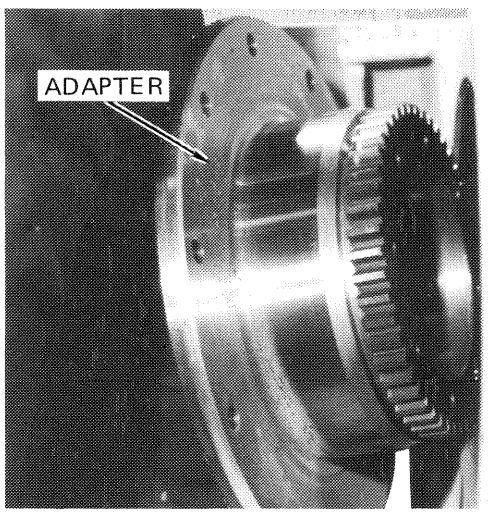
c. Apply Loctite to studs and install new O-rings.

d. If previously removed, install cable on drum.

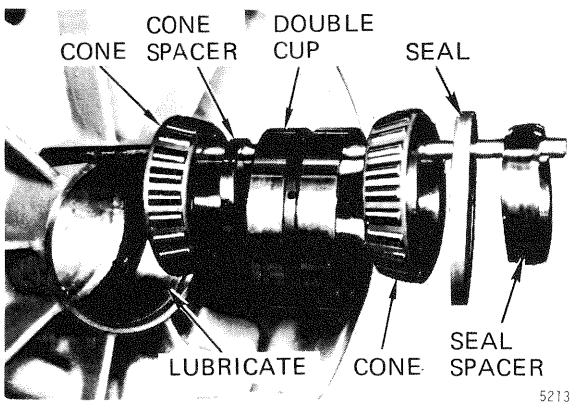
CAUTION Be sure pin and lock ring are securely installed in PTO coupling.



STEP 1. Lubricate seal bore with Lubriplate or other light lube grease. Install double-lip seal with smooth side toward the drum.

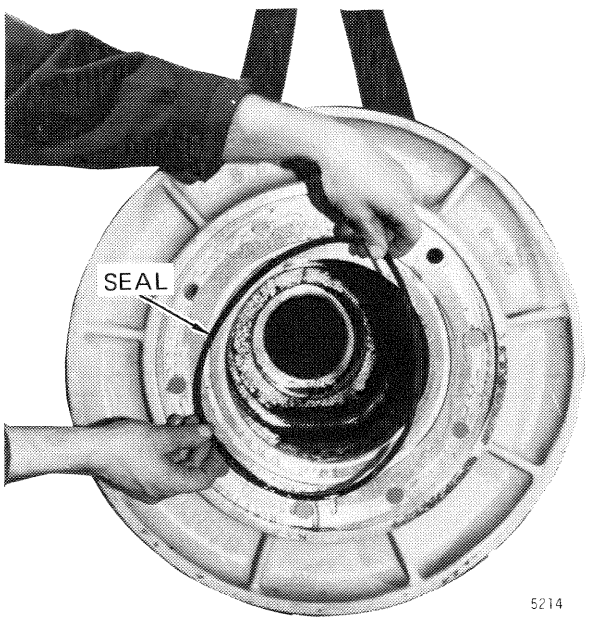


STEP 2. Coat double-lip seal with Lubriplate or other light lube grease and install drum adapter by pushing it through the seal.



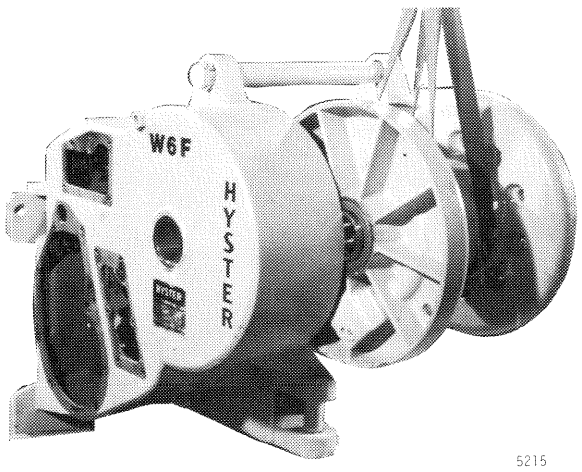
STEP 3. Lubricate the left-hand drum bore with Lubriplate or other light lube grease, then install double tapered roller bearing assembly, and spacer as shown.

NOTE Smooth side of seal must face bearing assembly.

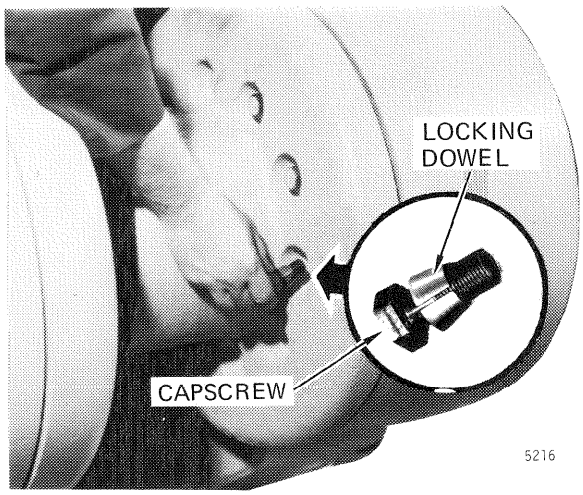


STEP 4. Lubricate right-hand drum bore. Coat right-hand seal ring and groove with O-ring lube. Install new seal ring.

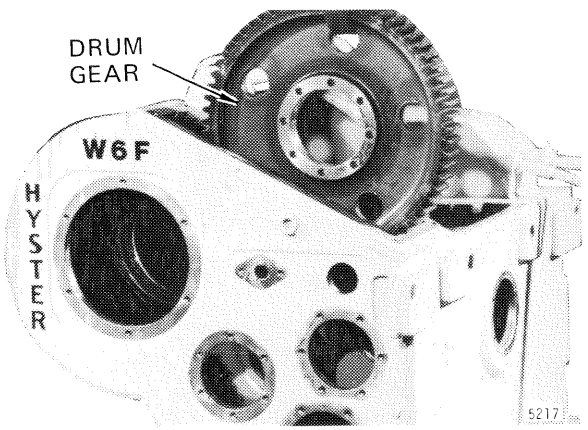
FIGURE 10-10. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 1 of 4)



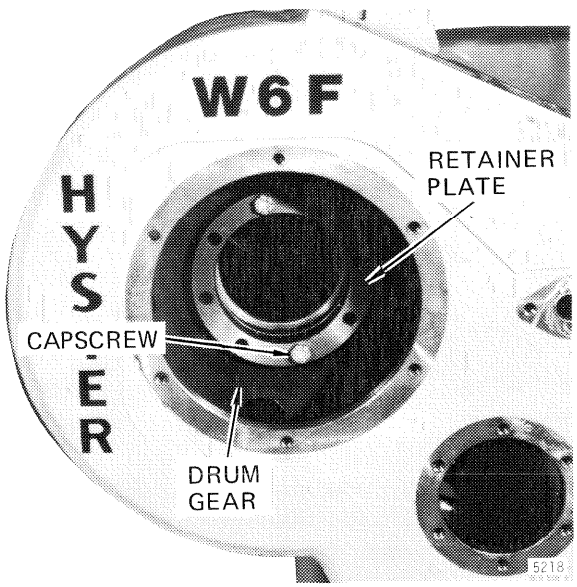
STEP 5. Using the sling, move the drum into position being careful not to move the seal ring.



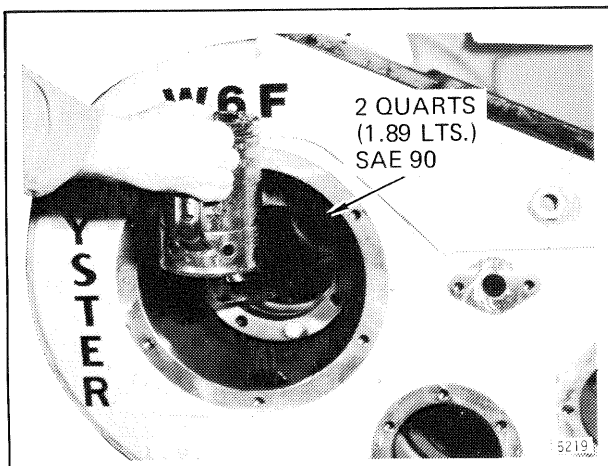
STEP 6. Align adapter and drum holes, then install the 10 locking dowels and capscrews. Tighten progressively and evenly to ensure uniform compression of seal ring. Do not tighten to final torque.



STEP 7. Install drum gear.

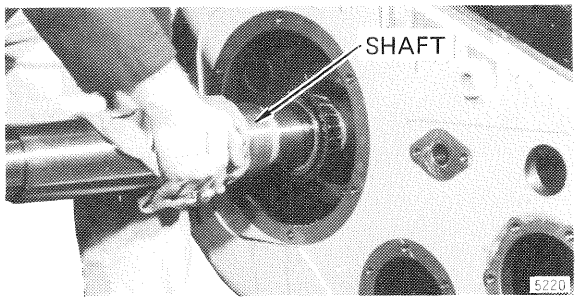


STEP 8. Align drum gear with adapter and temporarily secure the drum gear to the adpater using the retainer plate and two capscrews. This will ensure that the gear will not fall during the installation of the shaft.



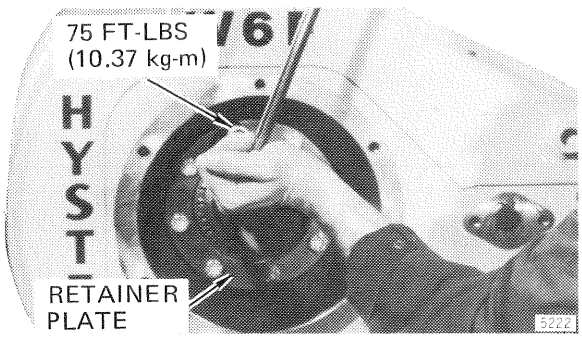
STEP 9. Pour 2 quarts (1.89 liters) of SAE 90 oil into the drum to insure initial bearing lubrication.

FIGURE 10-10. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 2 of 4)



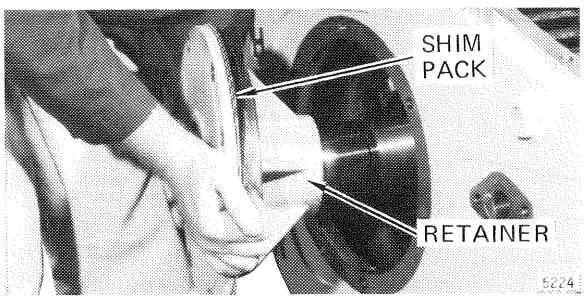
STEP 10. Make sure that double tapered roller bearing, seal and spacer are properly seated in the left-hand side of the drum. Then install the shaft until it bottoms solidly against the left-hand tapered roller bearing.

CAUTION Do not hammer on drum shaft surface.

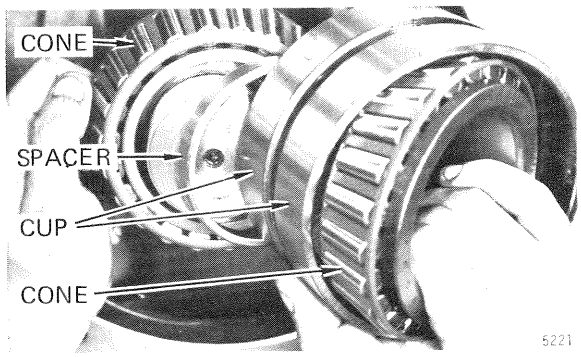


STEP 12. Install retainer plate using the eight special capscrews. Tighten capscrews to 75 ft-lbs. (10.37 kg-m) torque.

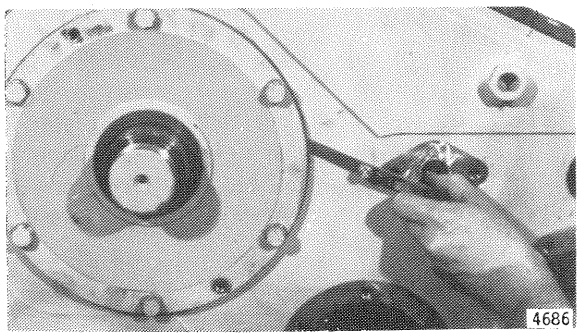
NOTE Capscrews cannot be installed unless drum gear and drum adapter have been aligned as indicated in Step 8.



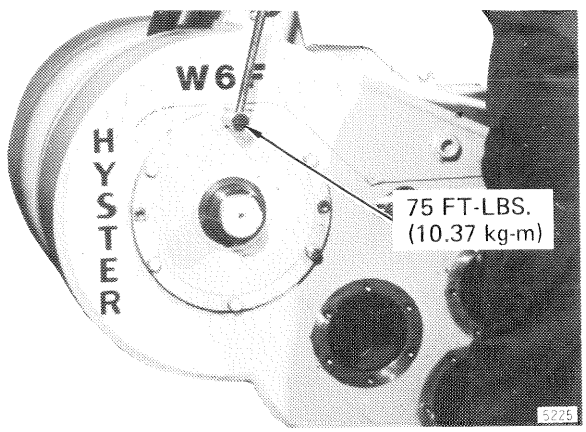
STEP 14. Coat winch frame and bearing retainer flange with John Crane or other suitable sealing compound. Install finalized shim pack (determined in Step 13).



STEP 11. Remove the retainer plate and install the bearing assembly in the sequence shown.

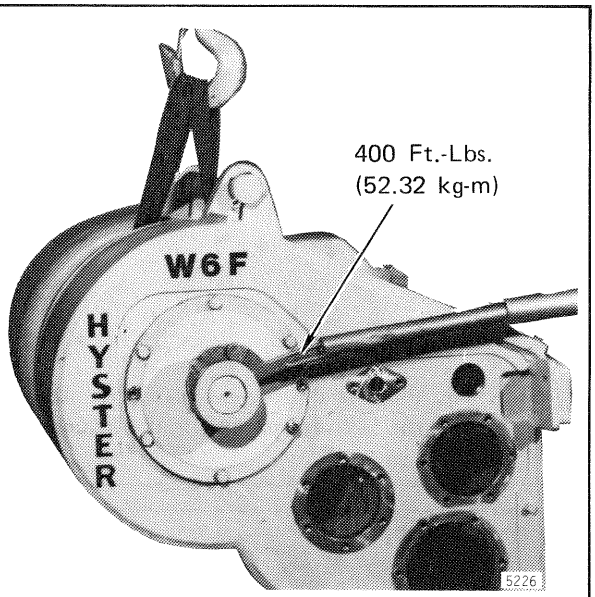


STEP 13. Set bearing retainer into place and securely tighten capscrews (do not tighten to final torque). Measure gap between retainer and winch frame in three places around the retainer. Add the 3 indications and divide by 3 to obtain the average gap. Assemble shim pack to provide a net fit with ± 0.005 inch (0.128 mm) tolerance.

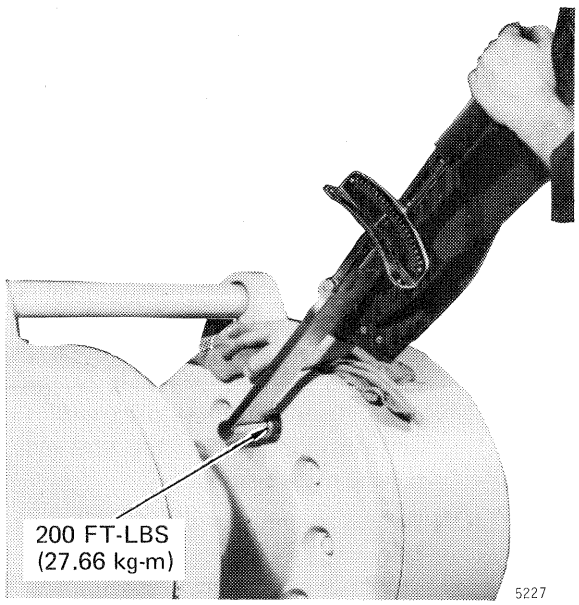


STEP 15. Secure retainer using eight capscrews and lockwashers. Tighten capscrews to 75 ft-lbs. (10.37 kg-m) torque.

FIGURE 10-10. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 3 of 4)



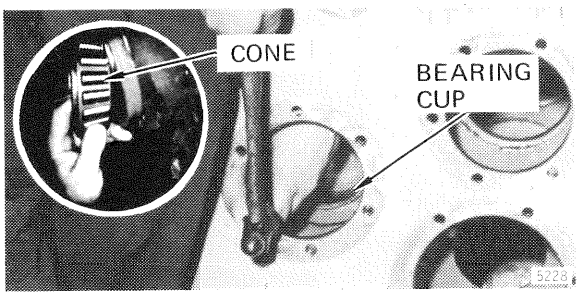
STEP 16. Coat shaft nut threads with John Crane or other suitable sealing compound. Install both shaft nuts and tighten to 400 ft.-lbs. (55.32 kg-m) torque.



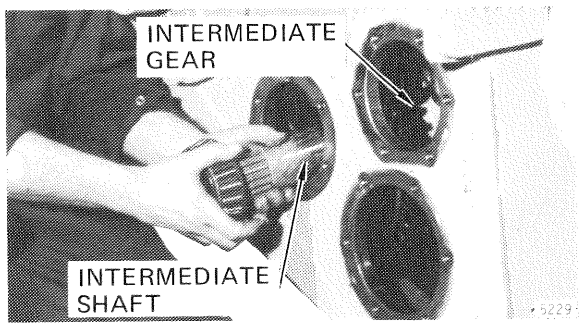
STEP 17. Tighten Drum-to-Adapter capscrews to 200 ft-lbs. (27.66 kg-m), torque.

FIGURE 10-10. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 4 of 4)

NOTE The winch shown is equipped with the optional free-spool arrangement. Steps 8 through 11 do not apply to a standard winch.

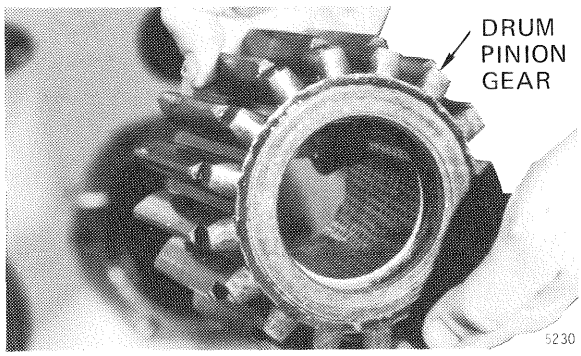


STEP 1. Install inner bearing assembly previously removed. Use a liberal amount of Lubriplate or other light lube grease to hold the inner bearing cone in place.

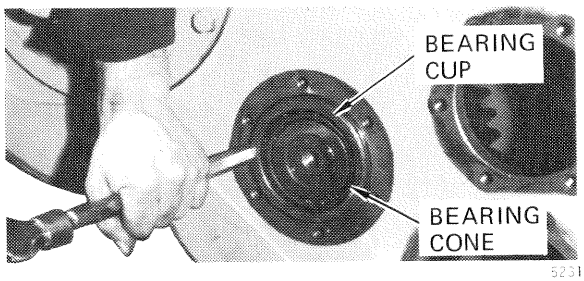


STEP 2. Position intermediate gear in housing and install intermediate shaft far enough to support the gear. If equipped with free-spool, place dental clutch on intermediate gear with the chamfered ramp facing the drum pinion gear.

NOTE The drum pinion gear on standard winches is splined to the intermediate shaft.

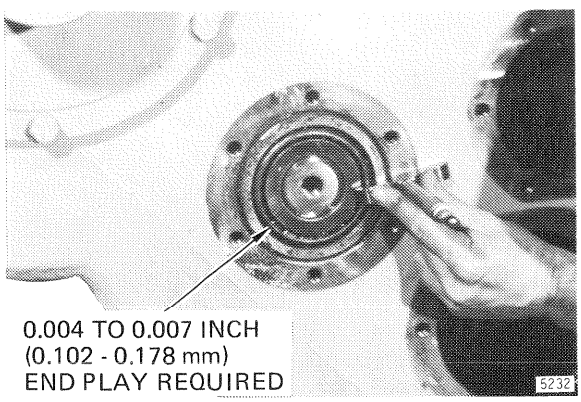


STEP 3. Position the drum pinion gear so that the short teeth are next to the intermediate gear and insert the intermediate shaft until it bottoms.



STEP 4. Install the outer bearing cup. Make sure that the cup is firmly seated against the bearing cone.

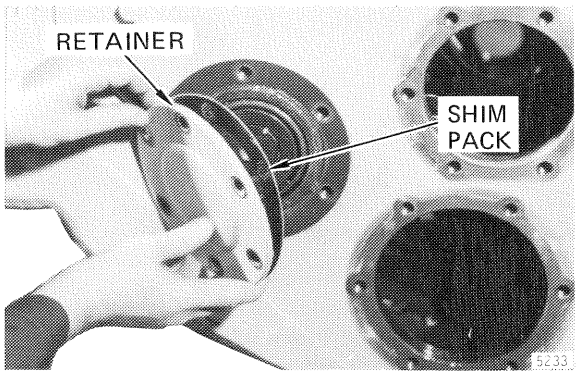
STEP 5. Using a depth gauge measure the distance from the face of the bearing cup to the winch housing. Add a shim pack 0.004 to 0.007 inch (0.102 - 0.178 mm) greater than the measured distance. For example, if the measured distance is 0.004 inch (0.102 mm) add a shim pack with a total thickness of 0.008 to 0.011 inch (0.203 - 0.279 mm). This will allow 0.004 to 0.007 inch (0.102 - 0.178 mm) endplay of the shaft.



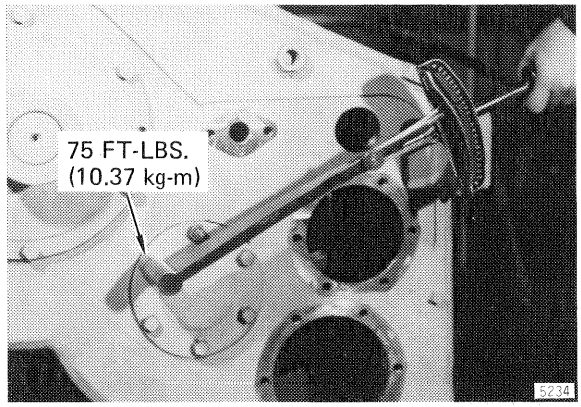
NOTE

- Shafts requiring a finalized shim pack of greater than 0.020 inch (0.510 mm) are not uncommon.
- If equipped with Free-spool adjust number of shims here to create approx. 20 ft.-lbs. (2.77 kg-m) of torque on the drum with the unit in free-spool.

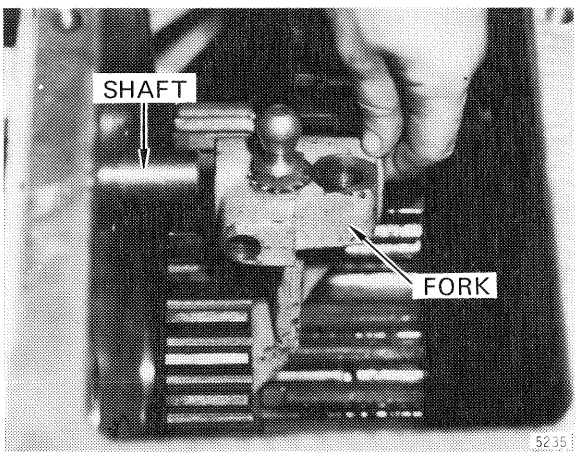
FIGURE 10-11. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY (Sheet 1 of 2)



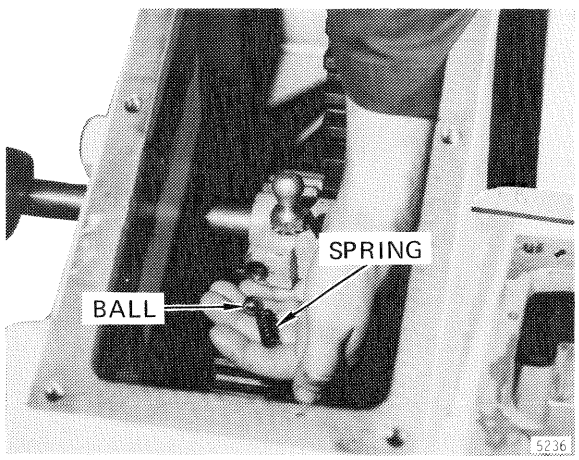
STEP 6. Coat the winch frame and retainer with John Crane or other suitable sealing compound. Install finalized shim pack and retainer.



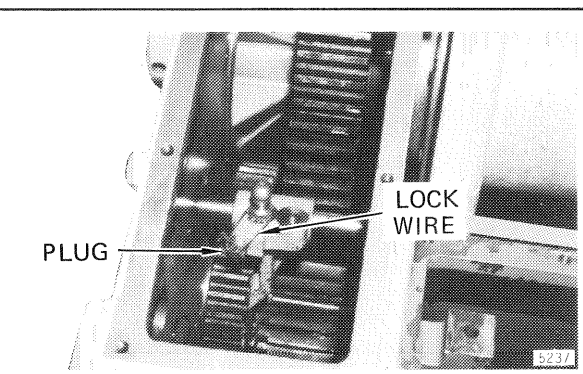
STEP 7. Tighten the six capscrews to 75 ft-lbs. (10.37 kg-m) torque.



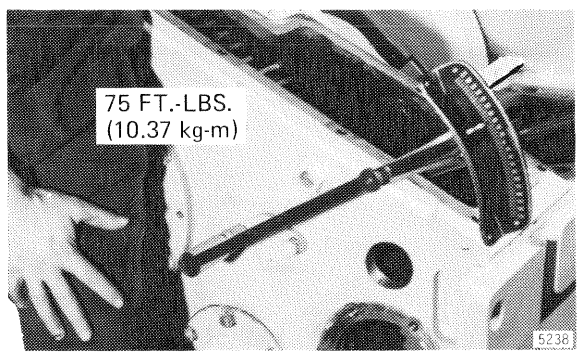
STEP 8. Position the free-spool shifter fork on the dental clutch and install the shifter shaft.



STEP 9. Install detent ball and spring into bore of the shifter fork.

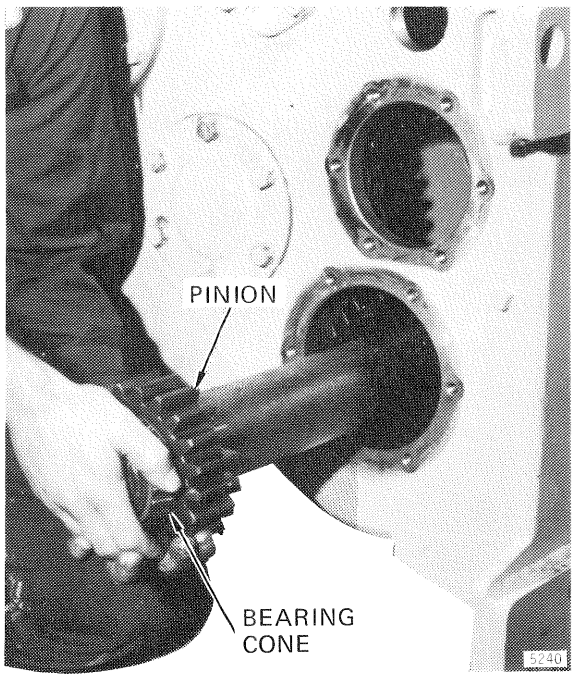


STEP 10. Install plug securely and lockwire as shown.

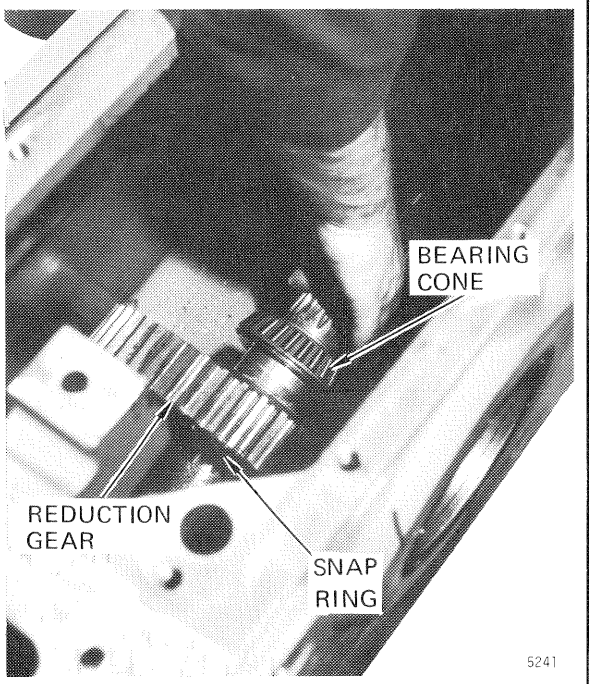


STEP 11. Install shifter shaft capscrews and tighten to 75 ft-lbs. (10.37 kg-m) torque.

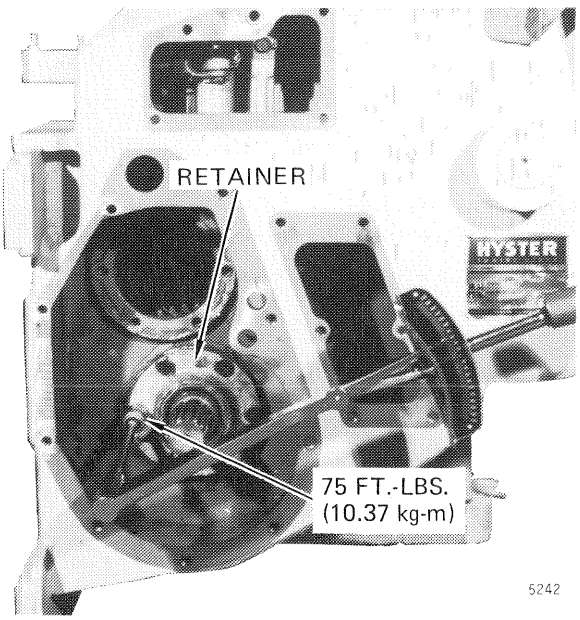
FIGURE 10-11. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY (Sheet 2 of 2)



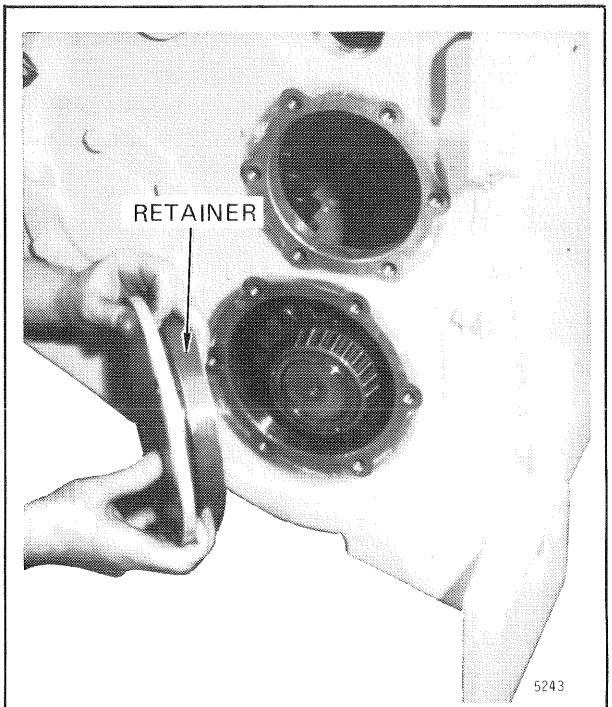
STEP 1. Press pinion and bearing cone on right-hand end of brake shaft.



STEP 2. Place shaft into winch housing and install reduction gear and bearing cone on the left-hand end of the shaft.

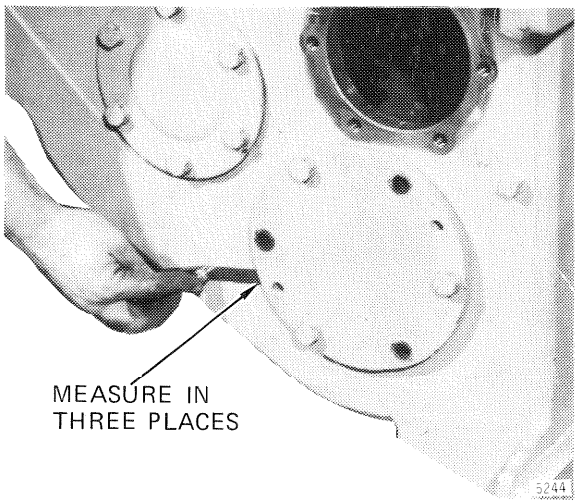


STEP 3. Install left-hand bearing cup in housing. Coat the winch frame and retainer with John Crane or other sealing compound then install retainer and tighten capscrews to 75 ft. lbs. (10.37 kg-m) torque.



STEP 4. Install right-hand bearing assembly and retainer without shim pack and tighten capscrews securely. (Do not tighten to final torque at this time.)

FIGURE 10-12. INSTALLATION OF BRAKE SHAFT ASSEMBLY (Sheet 1 of 2)

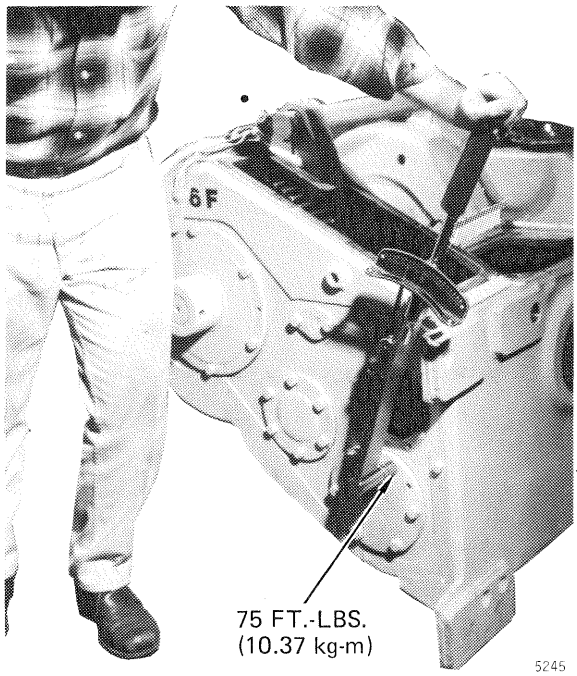


STEP 5. Adjust shaft endplay as follows:

a. Using moderate pressure,tap R.H. bearing retainer to seat brake shaft components.

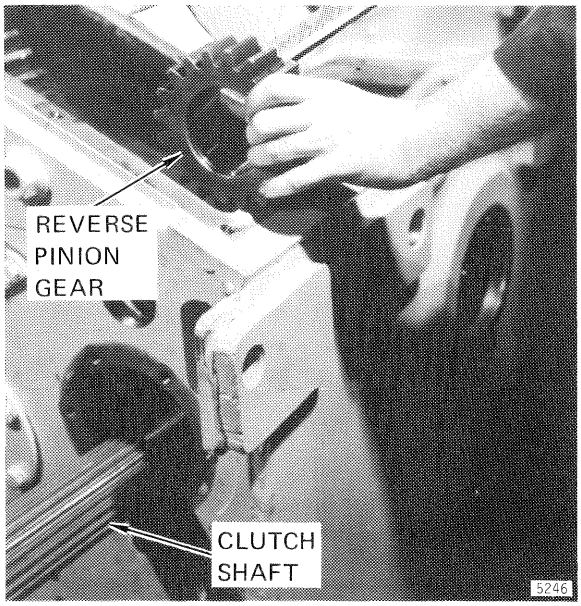
b. Loosen the capscrews previously installed in Step 4. Tighten capscrews finger tight only.

c. Measure gap between retainer and winch frame in three places around retainer. Add the 3 indications and divide by 3 to obtain the average gap. Assemble shim pack 0.000 to 0.004 inch (0.000 - 0.102 mm) less than average gap. This will place the desired preload on the brake shaft bearings.

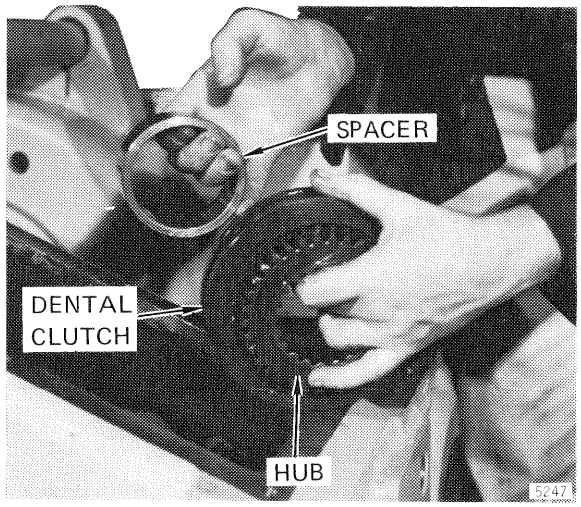


STEP 6. Coat winch frame and retainer with John Crane or other sealing compound. Replace R.H. bearing retainer with final shim pack in place. Tighten six capscrews to 75 ft-lbs. (10.37 kg-m) torque.

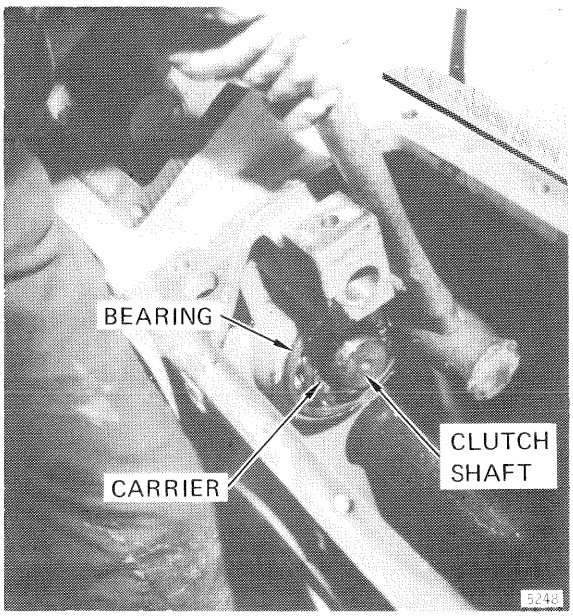
FIGURE 10-12. INSTALLATION OF BRAKE SHAFT ASSEMBLY (Sheet 2 of 2)



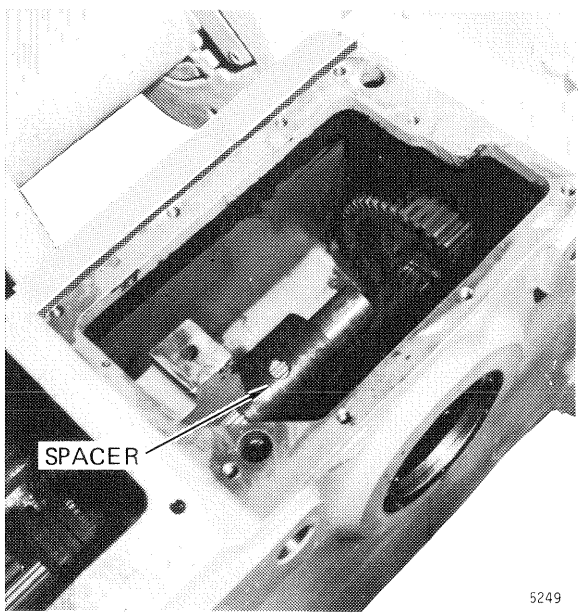
STEP 1. Place the clutch shaft in the housing just far enough to slide the reverse pinion gear on. Position the pinion gear so that the dental teeth face inward.



STEP 2. Place reverse dental clutch hub on shaft and install dental clutch so that the chamfered ramp faces the reverse pinion gear. Install spacer next to the dental clutch hub.

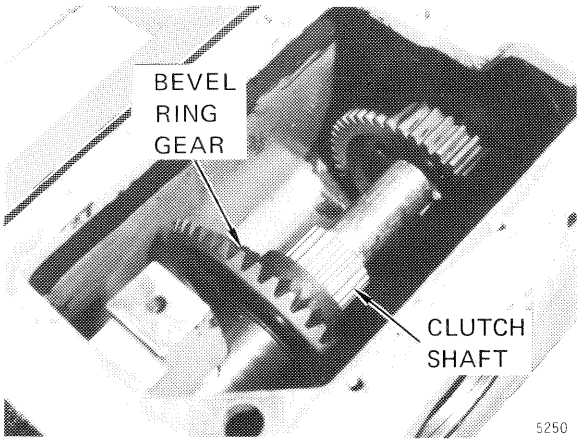


STEP 3. Install ball bearing and bearing carrier so that the bearing face is flush with winch frame. Hold bearing in place while inserting shaft through the bearing.



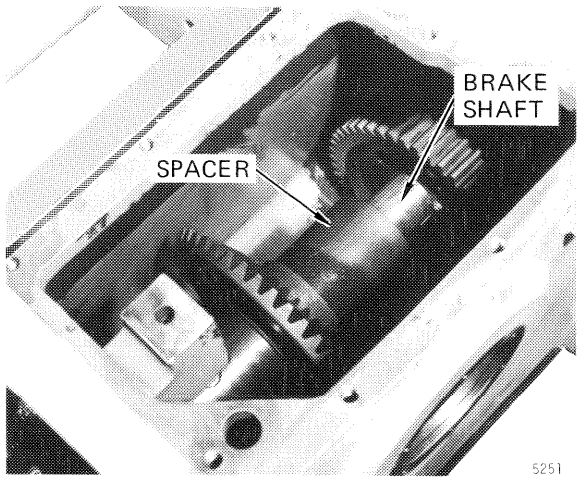
STEP 4. Insert clutch shaft far enough to install spacer.

FIGURE 10-13. REASSEMBLY AND INSTALLATION OF CLUTCH SHAFT ASSEMBLY (Sheet 1 of 6)

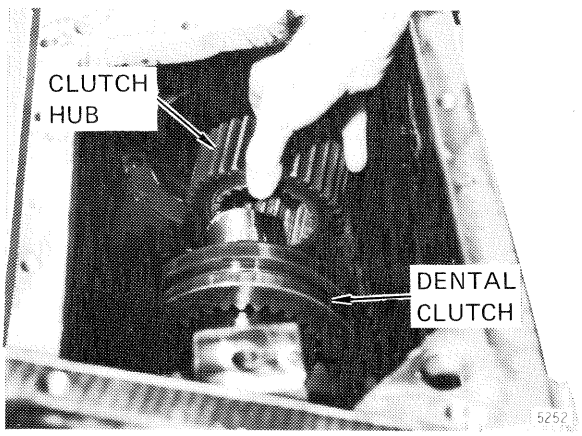


STEP 5. Install the bevel ring gear.

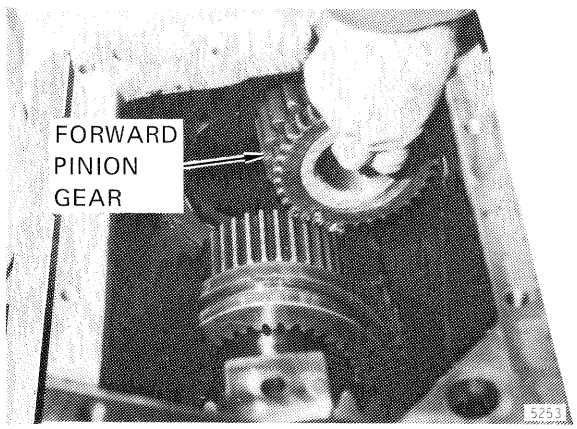
NOTE Bevel ring gear and spacers are shown for clockwise PTO shaft rotation (as viewed from the tractor).



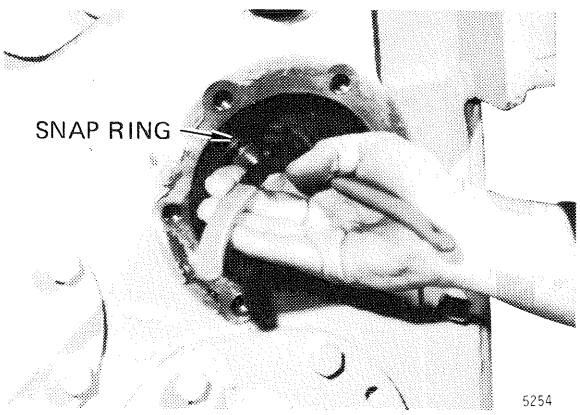
STEP 6. Insert the clutch shaft far enough to install spacer.



STEP 7. Install the forward dental clutch and dental clutch hub on clutch shaft. Ensure that the chamfered ramp on the dental clutch teeth faces the forward pinion gear.

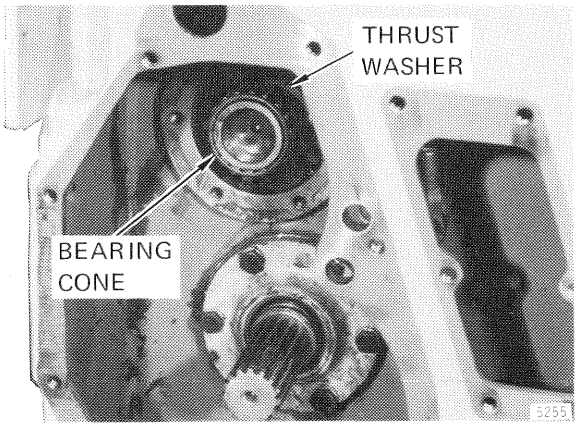


STEP 8. Push clutch shaft through the clutch assemblies and install the forward pinion gear with the dental teeth next to the dental clutch hub.

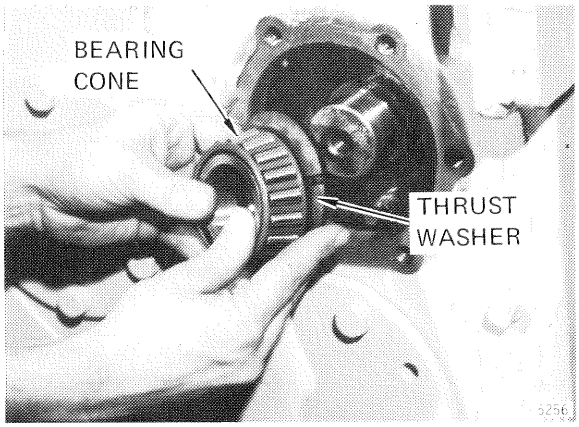


STEP 9. Install the bearing carriers and roller bearings on each end of the shaft and secure with the snap ring. Ensure that the snap ring is properly seated.

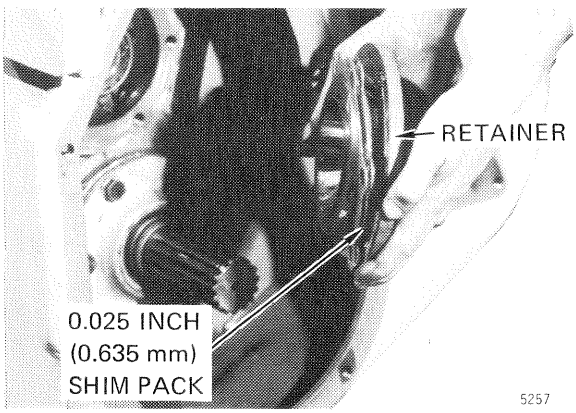
FIGURE 10-13. REASSEMBLY AND INSTALLATION OF CLUTCH SHAFT ASSEMBLY (Sheet 2 of 6)



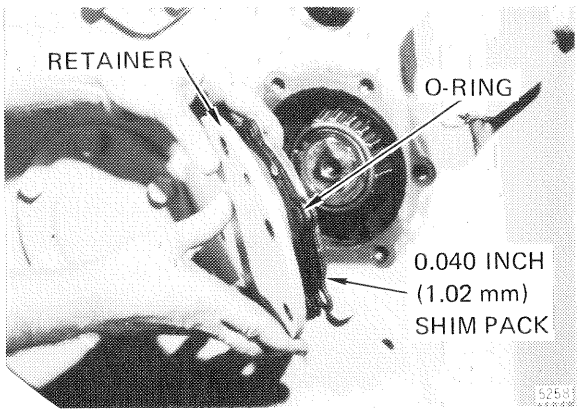
STEP 10. Install thrust washer and tapered roller bearing on the left-hand end of the clutch shaft.



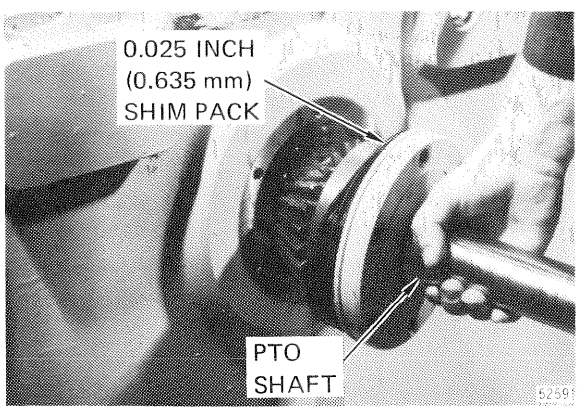
STEP 11. Install thrust washer and tapered roller bearing on the right-hand end of the clutch shaft.



STEP 12. If removed, install bearing cup in the left-hand retainer. Assemble approximately 0.025 inch (0.635 mm) shim pack on left-hand bearing retainer, then install retainer. Tighten capscrews securely. Do not tighten to final torque at this time.

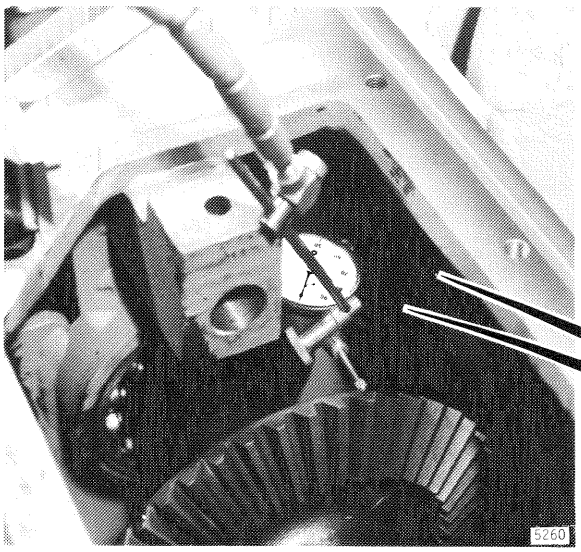


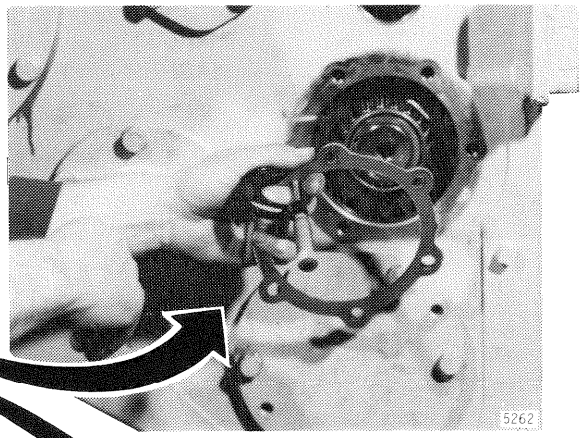
STEP 13. If removed, install bearing cup in the right-hand retainer. Install a new O-ring on the retainer. Assemble a shim pack approximately 0.040 inch (1.02 mm) thick on right-hand bearing retainer and install retainer. Tighten capscrews securely. Do not tighten to final torque at this time.



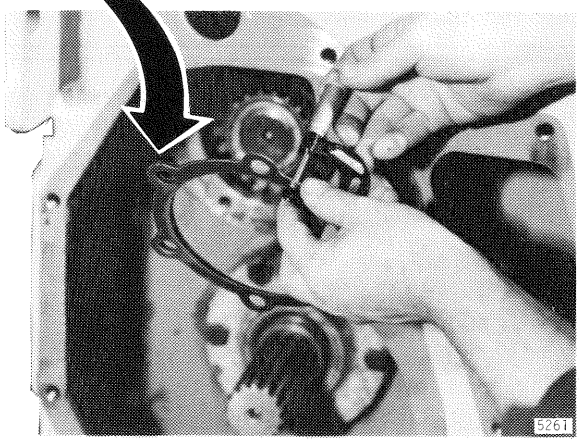
STEP 14. Assemble PTO shaft as described in Figure 10-15, if previously disassembled. Install a shim pack approximately 0.025 inch (0.635 mm) thick on PTO shaft and install shaft. Tighten capscrews securely. Check that PTO pinion teeth are positioned in the center of bevel gear teeth. Add or subtract shims at PTO shaft to center gear teeth. Tighten capscrews to 75 ft.-lbs. (10.37 kg-m) torque.

FIGURE 10-13. REASSEMBLY AND INSTALLATION OF CLUTCH SHAFT ASSEMBLY (Sheet 3 of 6)





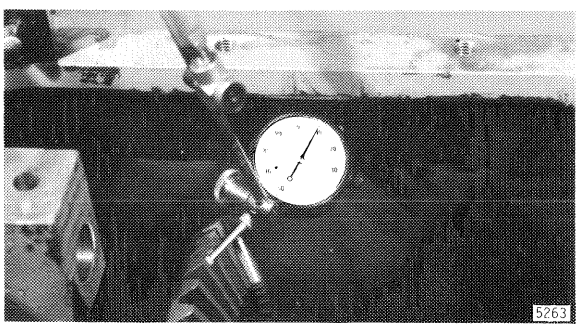
RIGHT-HAND SIDE



LEFT-HAND SIDE

STEP 15. Connect dial indicator as shown. Add or subtract shims from the two clutch shaft bearing retainers to obtain zero endplay. When zero endplay is obtained, add 0.006 to 0.009 inch (0.152-0.299 mm) of shim(s) to one or both retainers to produce 0.006-0.009 inch (0.152 - 0.299 mm) endplay. This will provide the desired preload on the clutch shaft.

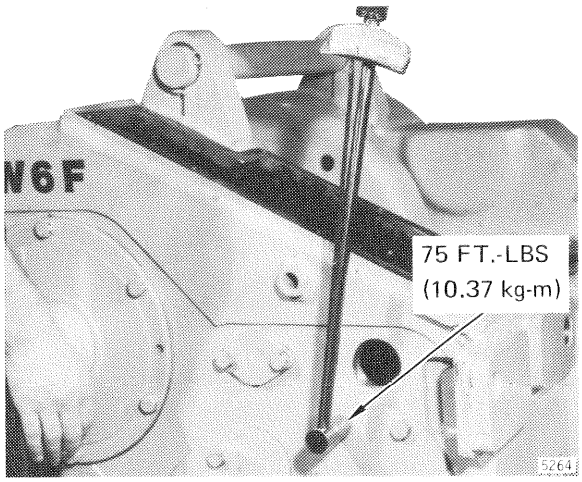
NOTE Adding or subtracting shims from these retainers will effect pinion-to-bevel gear backlash. See Step 16.



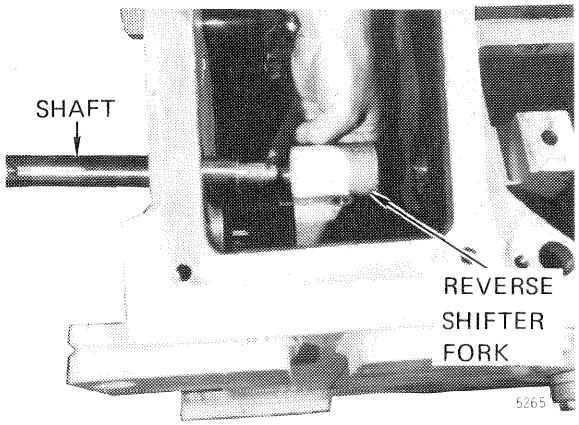
NOTE Prior to checking pinion-to-bevel gear backlash, the clutch shaft and bevel ring gear should be placed in a normal operating position by moving the ring gear away from the pinion gear. Check the gear contact as shown in Figure 10-16, step 7 by coating the ring gear teeth with Prussian blue and then rotating the PTO shaft.

STEP 16. Connect dial indicator as shown to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.014 inch (0.152 - 0.356 mm). If less than 0.006 inch (0.152 mm) remove shims from right-hand bearing retainer as required. Add same amount to retainer at left-hand end of shaft to maintain preload. If greater than 0.014 inch (0.356 mm) remove shims from left-hand retainer as required. Add same amount to right-hand retainer to maintain endplay (preload).

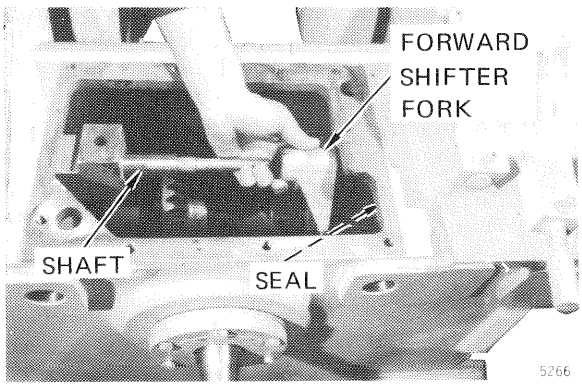
FIGURE 10-13. REASSEMBLY AND INSTALLATION OF CLUTCH SHAFT ASSEMBLY (Sheet 4 of 6)



STEP 17. Tighten both bearing retainer cap-screws to 75 ft-lbs. (10.37 kg-m) torque.

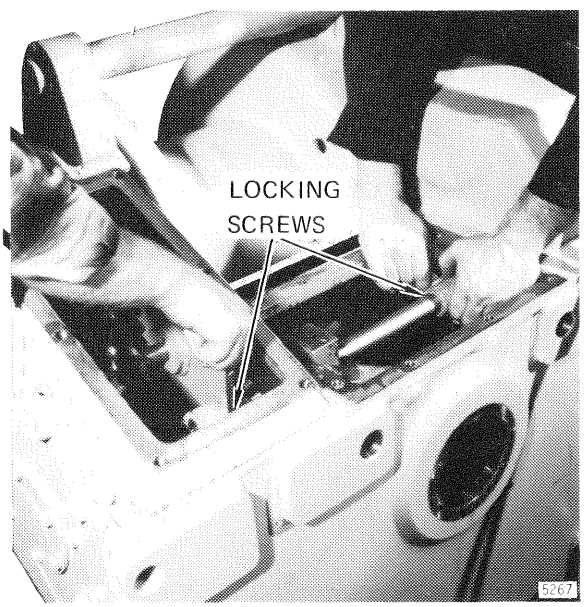


STEP 18. Position reverse shifter fork as shown and insert the shifter shaft.

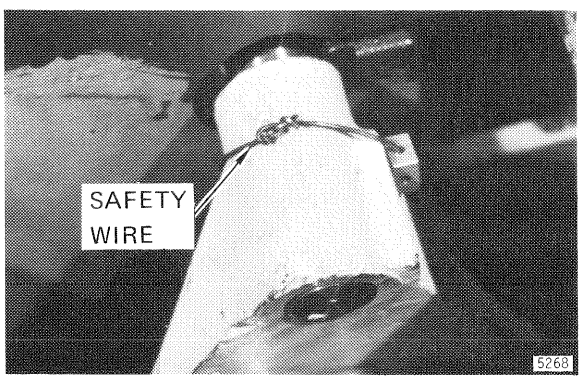


STEP 19. Install a new oil seal in the left hand side of the case. Push shifter shaft through from the right and place the forward shifter fork in position as shown.

CAUTION Be careful not to damage the shaft oil seal in the housing.

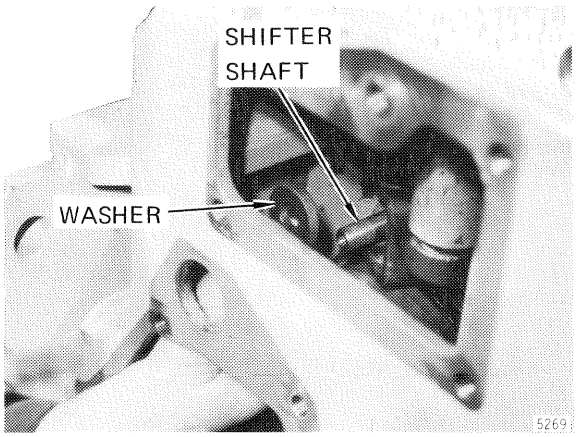


STEP 20. Install the locking screws in each fork and tighten securely.

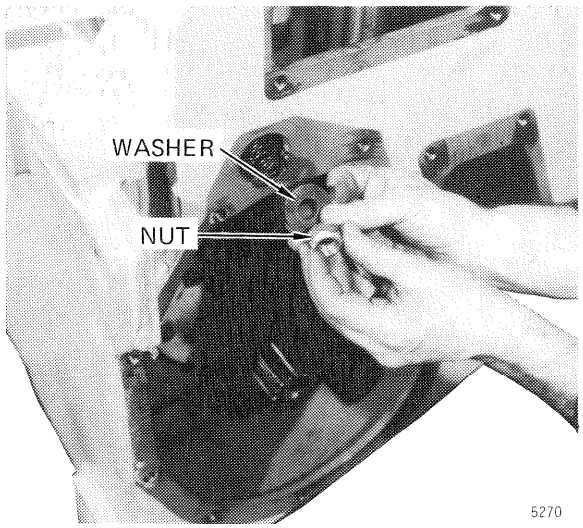


STEP 21. Install safety wire through the locking screws as shown.

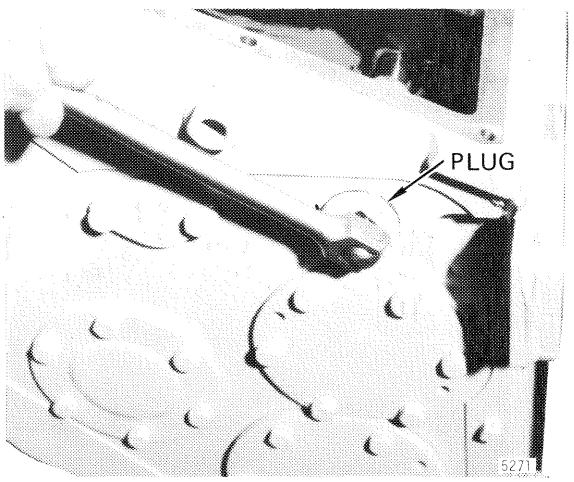
FIGURE 10-13. REASSEMBLY AND INSTALLATION OF CLUTCH SHAFT ASSEMBLY (Sheet 5 of 6)



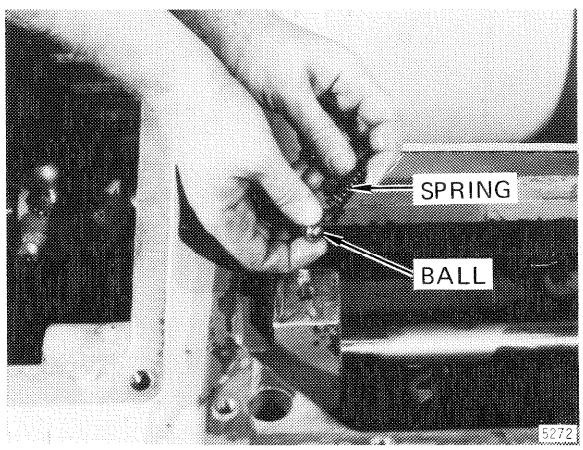
STEP 22. Install the three washers, wear shoes and spring over left-hand end of the shifter shaft as tagged during removal. (Refer to Figure 10-4 for location of components.)



STEP 23. Install nut on shaft and tighten until it is completely bottomed.

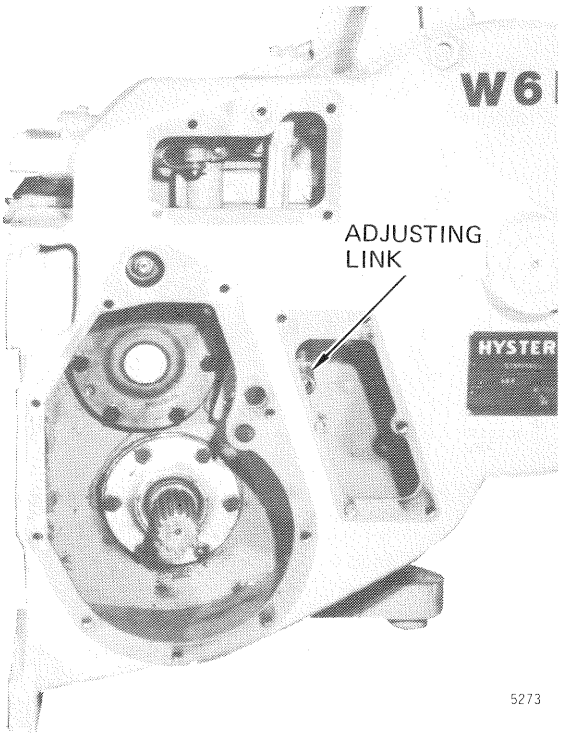


STEP 24 Install access plug in case and tighten securely.

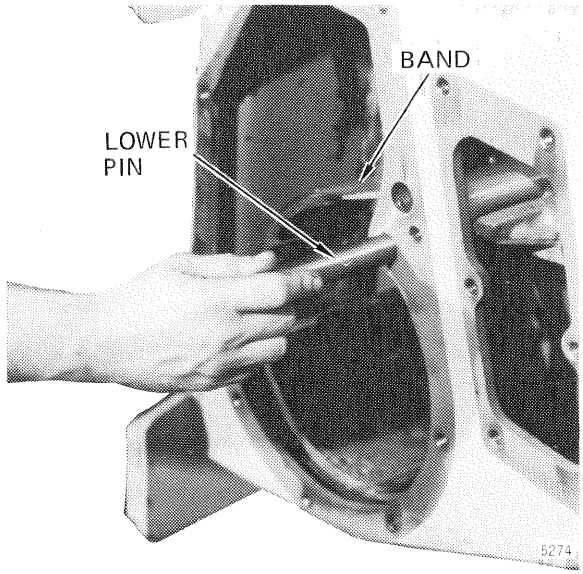


STEP 25 Install detent ball and spring. Then install cover and tighten capscrews to 75 ft-lbs. (10.37 kg-m) torque.

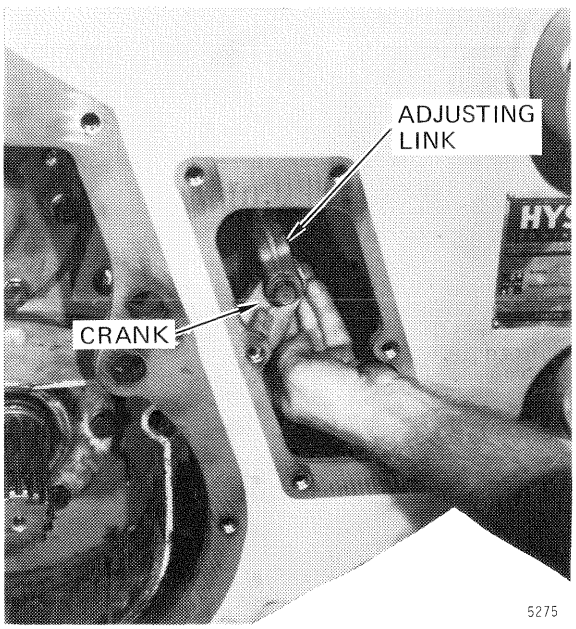
FIGURE 10-13. REASSEMBLY AND INSTALLATION OF CLUTCH SHAFT ASSEMBLY (Sheet 6 of 6)



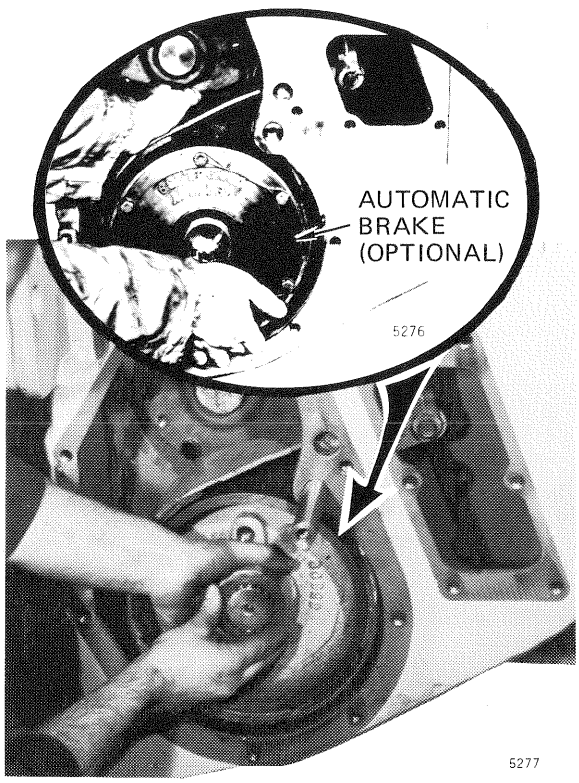
STEP 1. If previously removed, install adjusting link.



STEP 2. Place brake band and the crank assembly in the case. Then install the lower pin.

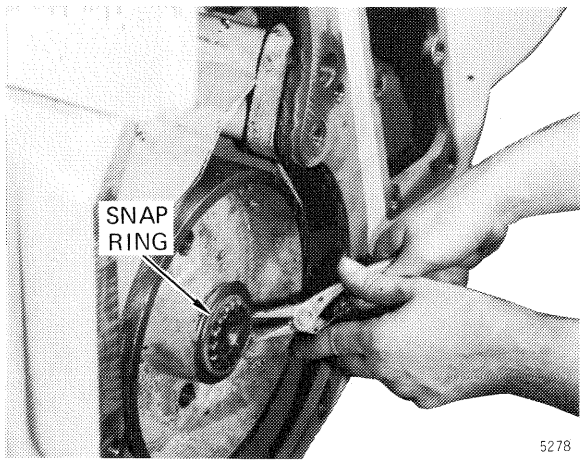


STEP 3. Connect the crank to the adjusting link.

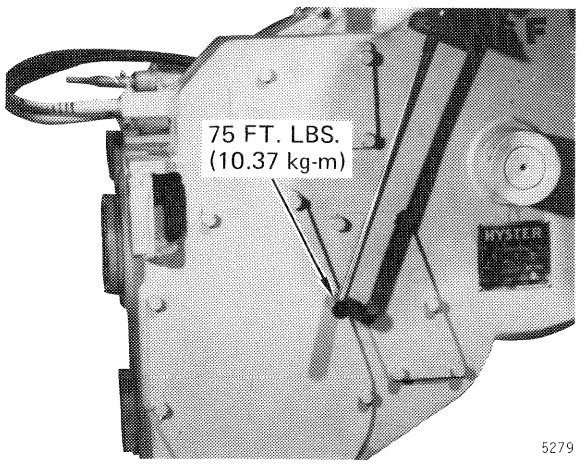


STEP 4. Slide brake wheel onto brake shaft.

FIGURE 10-14. INSTALLATION OF DRY BRAKE AND AUTOMATIC BRAKE (Sheet 1 of 2)



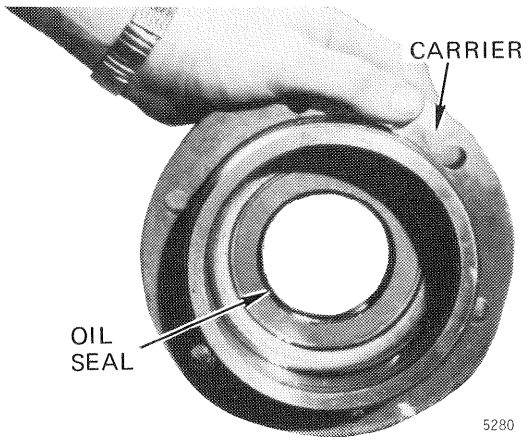
STEP 5. Install snap ring on brake shaft. Adjust brake linkage as described in paragraphs 9-13 and 9-14.



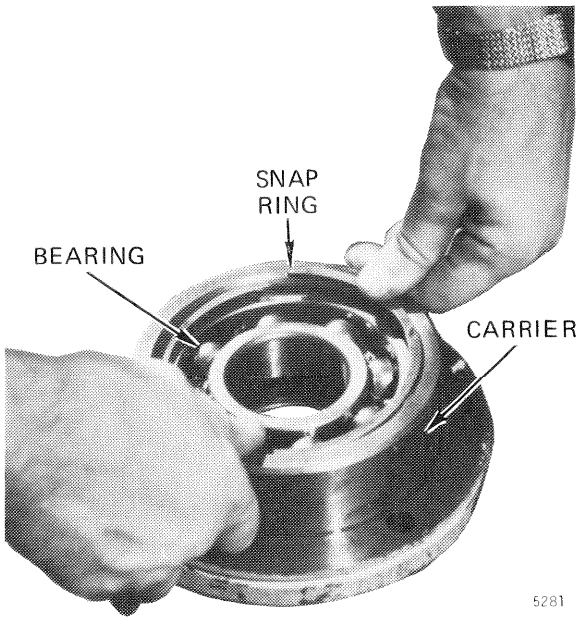
STEP 6. Replace all covers and tighten capscrews to 75 ft-lbs. (10.37 kg-m) torque.

FIGURE 10-14. INSTALLATION OF DRY BRAKE AND AUTOMATIC BRAKE (Sheet 2 of 2)

NOTE If equipped with a drive adapter refer to Figure 10-2 for location of components. Assembly of the PTO shaft is essentially the same as shown in Step 1 through 5.

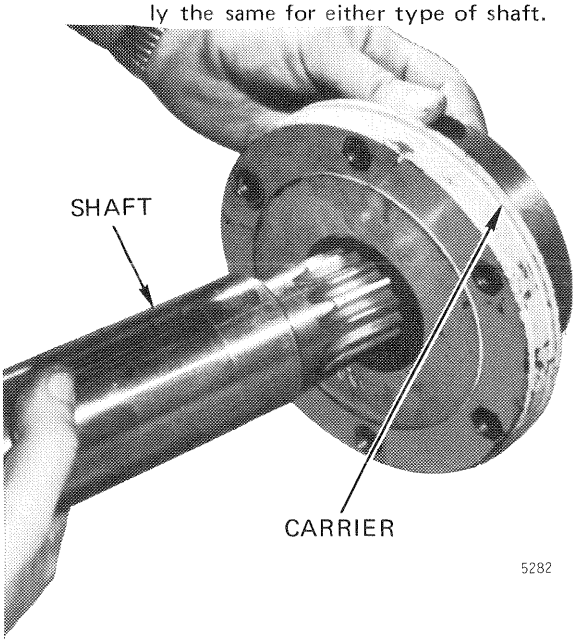


STEP 1. Install new oil seal in the bearing carrier.

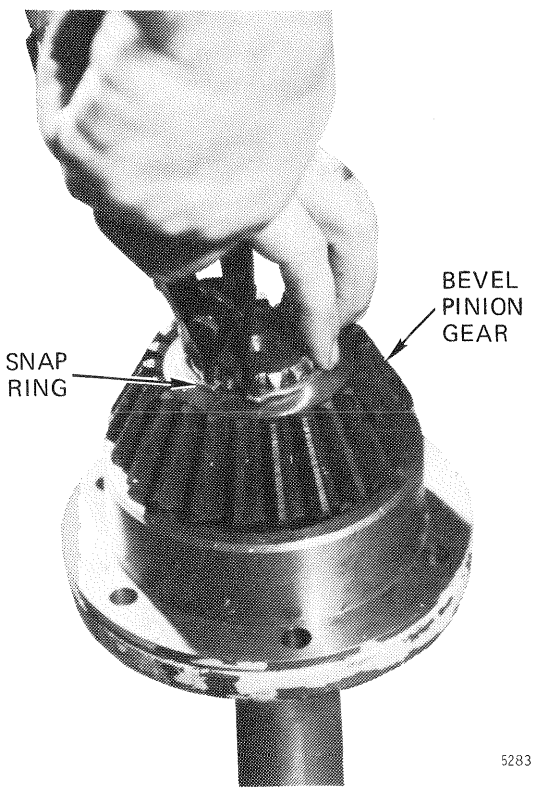


STEP 2. Install bearing and secure with snap-ring.

NOTE The PTO shaft with removable bevel pinion gear is shown in the following steps. Refer to Figure 10-2 for information on the integral shaft type. Assembly and installation is essentially the same for either type of shaft.

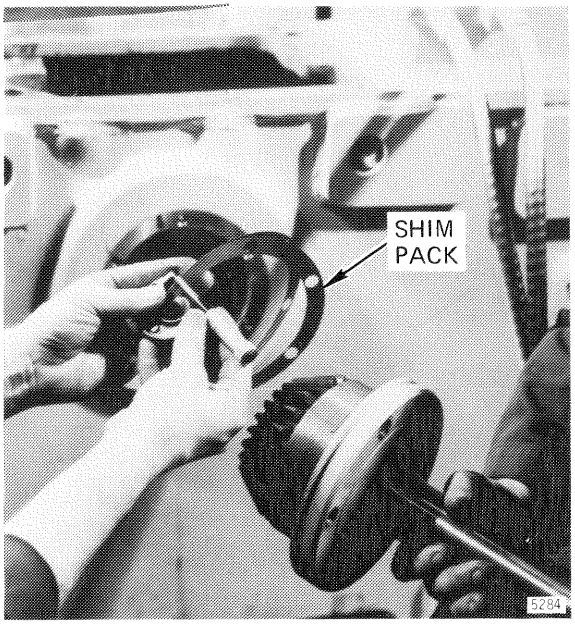


STEP 3. Place the carrier on the shaft being careful not to damage the seal.

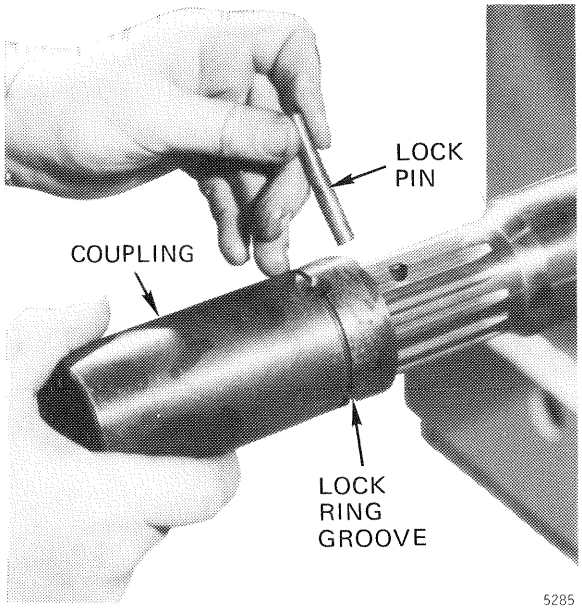


STEP 4. Place pinion gear on shaft and secure with snap ring.

FIGURE 10-15. REASSEMBLY AND INSTALLATION OF PTO SHAFT ASSEMBLY (Sheet 1 of 2)

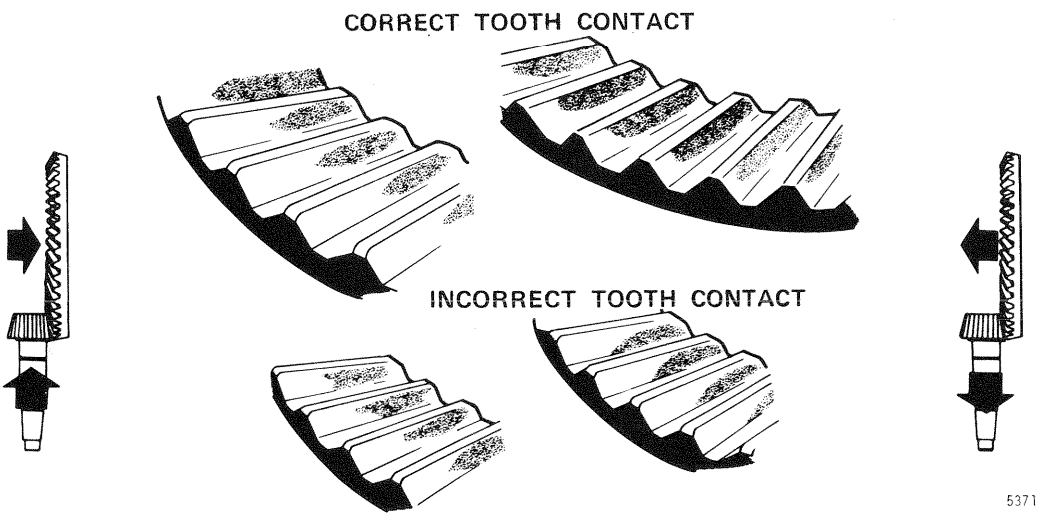


STEP 5. Assemble shim pack and install PTO shaft as described in Figure 10-13, Step 16. Coat the ring gear teeth with Prussian Blue and rotate the PTO shaft to check the gear contact as shown.



STEP 6. Install PTO coupling on shaft and secure with lockpin and lock ring. Ensure that the lock ring is installed securely.

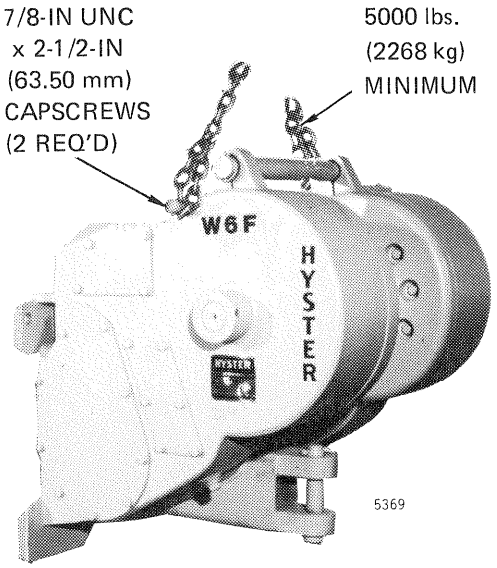
NOTE If equipped with a drive adapter, the PTO shaft assembly should be assembled and installed as described in Figure 10-13 Step 16. After the PTO shaft is installed the adapter box can be placed over the PTO shaft assembly and secured to the winch.



A high contact indicates pinion is too far out. Set the pinion to the correct depth by removing shims from the carrier.

A low contact indicates pinion is too deep. Set the pinion to the correct depth by adding shims to the carrier.

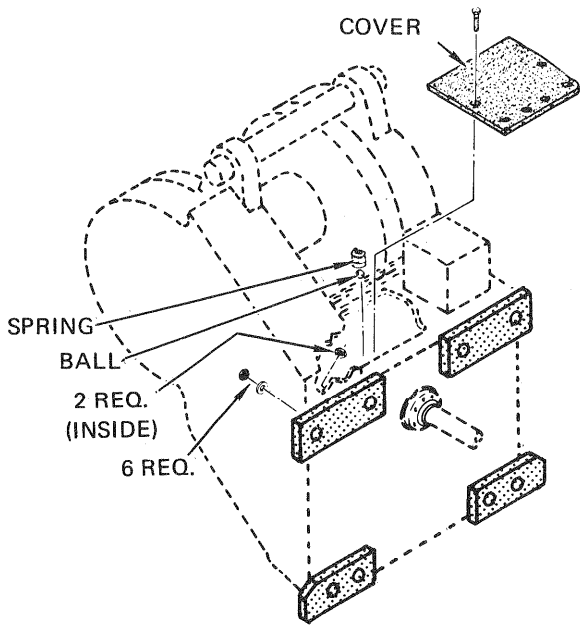
FIGURE 10-15. REASSEMBLY AND INSTALLATION OF PTO SHAFT ASSEMBLY (Sheet 2 of 2)



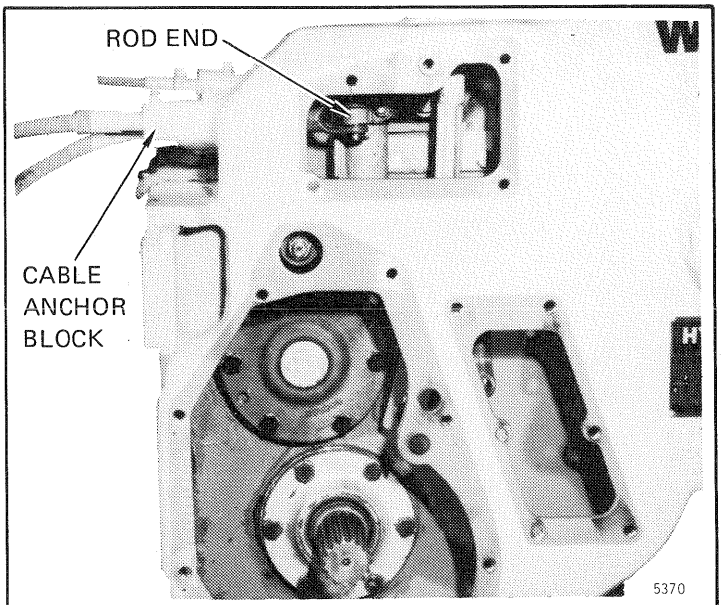
Prior to installing the winch, perform the procedures given in paragraph

STEP 1. Attach lifting device to winch. Winch will be balanced when connected as shown.

WARNING Make sure that the lifting device has a minimum capacity of 5,000 pounds (2268 kg) before lifting the winch.



STEP 2. Align the studs with holes in the mounting pads and loosely install two nuts (or capscrews) on top before the winch is fully seated against the tractor. Tighten the nuts (or capscrews) alternately at each side of the winch to pull winch evenly against the tractor. The two top inboard nuts should be snug then turned on to the next slot so that the cotter pin can be installed. All outboard nuts should be tightened to 500 ft.-lbs. (69.15 kg-m) torque.



STEP 3. Attach cables to their respective cranks then tighten cable brackets. Adjust cable and fill unit with oil as described in Section 9.

FIGURE 10-16. INSTALLATION OF WINCH

INTENTIONALLY BLANK

"THE QUALITY KEEPERS"

HYSTER APPROVED PARTS

Allied Systems COMPANY
WINCH DIVISION

HYSTER

Manufactured by Allied Systems Company
Trademark under license from Hyster Company

1/91 (5/79) AP Litho in USA