HYSTER

SERVICE MANUAL

FOR HYSTER DIRECT DRIVE AND POWER CONTROLLED WINCHES

W6E

Form 599332

OPERATOR RULES

Safety is a necessary part of winch operation. Every operator must know the operating procedures and restrictions. The following list is a guide and not a complete list of rules for winch operation. Only trained and authorized operators can use the winch.

1. Do not operate a winch unless the vehicle is equipped with a rear screen for operator protection against a broken cable.

2. Make sure you are in the operator's seat when you operate the vehicle or the winch.

3. Do not use a winch that has damage.

4. Do not use a winch that has controls, oil pressure, or operation that is not normal.

5. Do not use the control levers for hand holds when moving to the operator position.

6. Do not use the control levers for hangers for clothes, water bags, grease guns, lunch pails, or other objects.

7. Do not permit personnel around the vehicle when using the winch.

8. Do not permit personnel to go near a cable under tension.

9. Do not permit personnel to stand in a loop of cable.

10. The operator must stay in the operator position when the winch cable is under tension.

11. Make sure the winch cable is in good condition.

12. Do not connect a double or two-part cable to the winch.

13. Do not permit personnel to ride on a load.

14. Do not permit extra personnel on the vehicle.

15. Do not pull the hook over the drum and through the throat of the winch. This action can damage the hook or the cable.

16. Always leave the winch in BRAKE ON position when not operating the winch.

17. Do not clean, service, or adjust a machine during operation.

18. Be careful when removing the cable and ferrule from the drum. When the ferrule is loosened, the cable can move like a compressed spring.

Winch Serial Number _____

Date put in service _____

TABLE OF CONTENTS

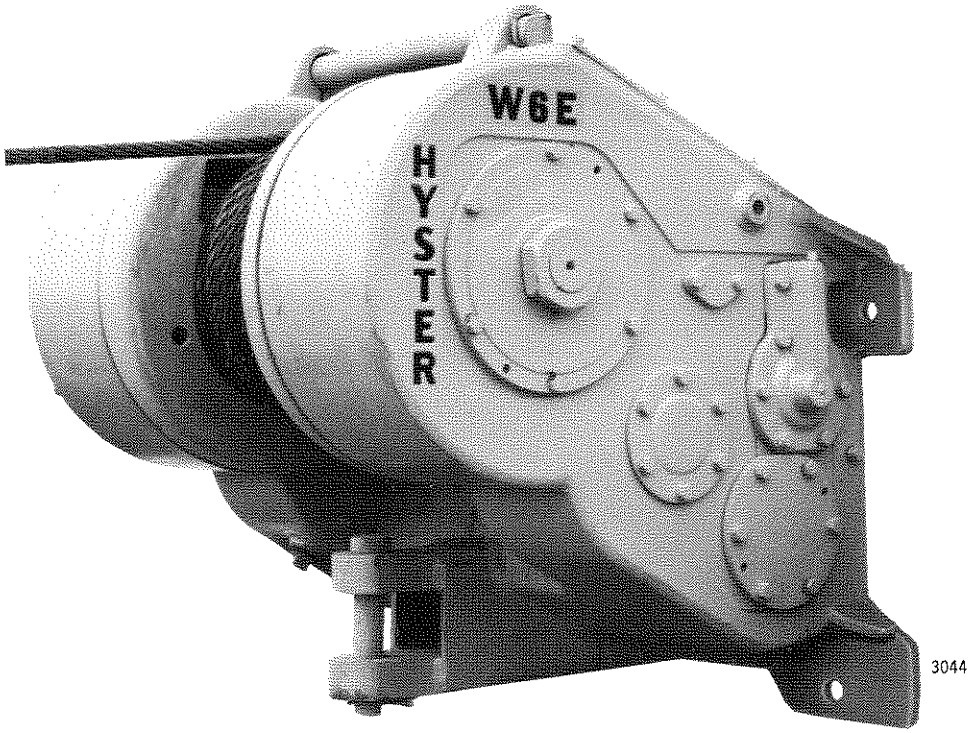
TABLE OF CONTENTS (CONT'D.)

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

This Service Manual contains operation, maintenance and repair instructions for the W6E Direct Drive and Power Controlled Towing Winches. Instructions are also included for removal and installation of the winch. Complete physical and functional descriptions of the winch are given to aid the repairman in understanding the operation of the winch components.



3044

SECTION 1
SPECIFICATIONS AND DESCRIPTIONS

1-1. GENERAL.

1-2. This section contains physical and functional descriptions of the W6E Direct Drive and Power Controlled Towing Winches. These descriptions will aid the repairman in understanding the construction and operation of the winch and its subassemblies.

TABLE 1-1. DRUM LINE CAPACITIES PER SAE J115B Specifications

ITEM	Small Diameter Drum	STD Dia. Drum 10"		CABLE FERRULE NO.
Cable Capacity (Allow for loose or unevenly spooled cable)				
⅝-inch (15.875 mm) cable	602 ft.	525 ft.		
¾-inch (19.1 mm) cable	425 ft.	370 ft.		L6
⅞-inch (22.225 mm) cable	305 ft.	293 ft.		L7
1-inch (25.40 mm) cable	237 ft.	206 ft.		L8

NOTE All dimensions given in inches unless otherwise specified.

TABLE 1-2. HYDRAULIC SPECIFICATIONS

	DESIGN DATA		
ITEM	DIRECT DRIVE	POWER CONTROLLED	REFERENCE FIGURE
CONTROL VALVE			
High Pressure Relief Valve	None	220 ± 5 PSI (15.468 ± 0.35 kg/cm²)	
Reverse Overlap Valve		120 ± 5 PSI (5.609 ± 0.35 kg/cm²)	
Cooling Oil Relief Valve		2-5 PSI (0.141± 0.35 kg/cm²)	
HYDRAULIC PUMP	None	Gear	
SUCTION FILTER	None	50-Mesh Screen Full Flow	
Relief Valve Opening		4.5-5.5 PSI (3.152 ± 0.35 kg/cm²)	
LUBRICATION AND SERVICE INFORMATION	10 Gal. (37.850 lts) SAE 90 Multipurpose Gear Oil per Mil-L-2105B	12 Gal. (45.420 lts) Automatic Transmission Fluid (Dexron)	

TABLE 1-3. TORQUE SPECIFICATIONS

ITEM	DESIGN DATA: DIRECT DRIVE	DESIGN DATA: POWER CONTROLLED	REFERENCE FIGURE
NOTE All torque values given in foot-pounds (kg-m) and with threads lubricated.			
PTO SHAFT ASSEMBLY			
Bearing Carrier Capscrews	75 (10.37 kg-m)	75 (10.37 kg-m)	
BEVEL GEAR SHAFT ASSEMBLY			
Bearing Retainer Capscrews	75 (10.37 kg-m)	75 (10.37 kg-m)	
Bearing Locknut	None	200 (27.66 kg-m)	
BRAKE SHAFT ASSEMBLY			
Bearing Retainer Capscrews	75 (10.37 kg-m)	75 (10.37 kg-m)	
INTERMEDIATE SHAFT ASSEMBLY			
Bearing Retainer Capscrews	75 (10.37 kg-m)	75 (10.37 kg-m)	
DRUM SHAFT ASSEMBLY			
RH Bearing Retainer Capscrews	75 (10.37 kg-m)	75 (10.37 kg-m)	
Internal Bearing Retainer Capscrews	75 (10.37 kg-m)	75 (10.37 kg-m)	
Drum To Adapter Capscrews	200 (27.66 kg-m)	200 (27.66 kg-m)	
Drum Shaft Nuts	Approx. 400 (52.32 kg-m)	Approx. 410 (55.32 kg-m)	
HOUSING COVERS, MISCELLANEOUS	75 (10.37 kg-m)	75 (10.37 kg-m)	
CLUTCH ASSEMBLY			
Clutch Piston Housing Capscrews	None	70 (9.68 kg-m)	
Clutch Piston Housing Setscrews	None	40 (5.53 kg-m)	
Dental Clutch Shifter Crank Bracket	88 (12.17 kg-m)	None	
CONTROL VALVE			
Mounting Capscrews	None	48 (6.64 kg-m)	

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

1-4. 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 below the nameplate the serial number indicates the design series, manufacturing plant, serial number and year manufactured. A typical serial number designates the following:

C82	P	1501	T
(1)	(2)	(3)	(4)

(1) The first letter and number denote the design series and model of the unit. In the example, C82 denotes the W6E Power Controlled Towing Winch for Caterpillar tractors. W6E winches may have the following S/N prefixes:

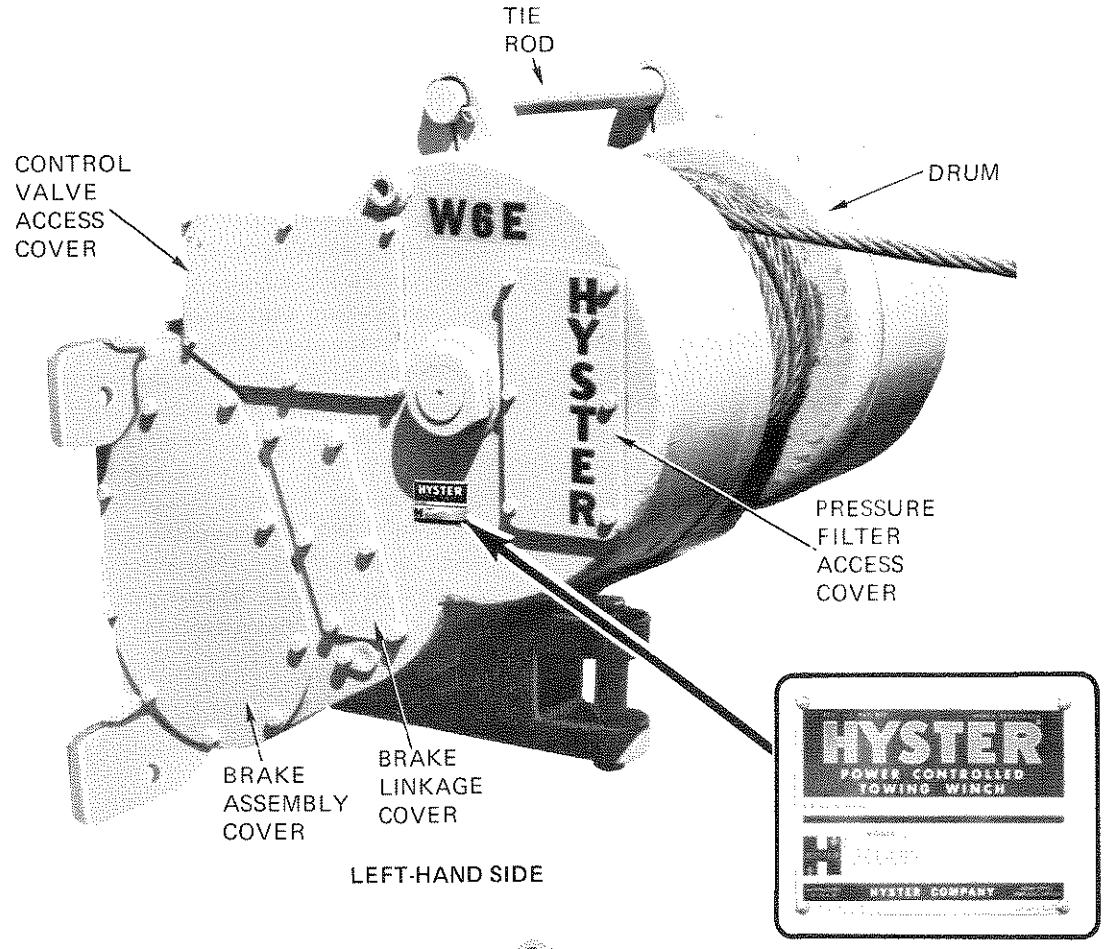
Model	Tractor Make	Direct Drive	Power Control
W6EA:	Allis Chalmers	A123	A124
W6EC:	Caterpillar	D39	C82 (eff. S/N C82P-3052
W6EF:	Fiat	A152	A153
W6EH:	International	A125	A126
W6EK:	Komatsu	A149	A145

(2) The second letter (P) denotes the plant at which the unit was manufactured. The following letters have been assigned to the various manufacturing plants.

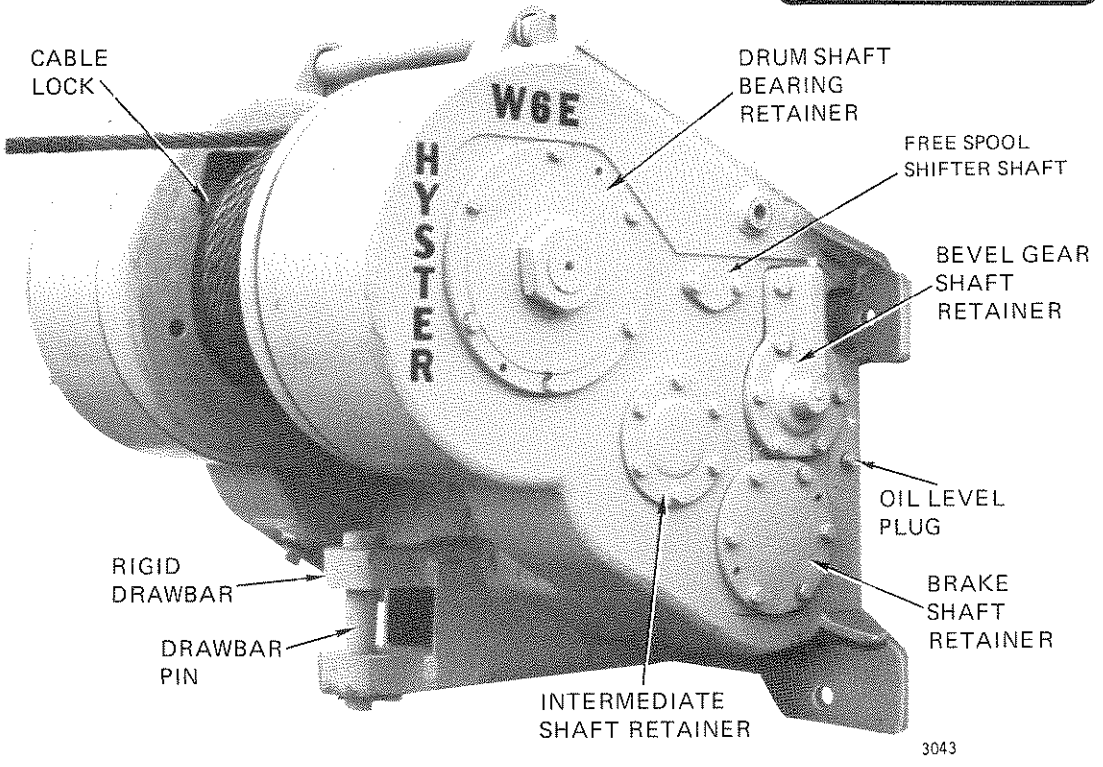
A. Scotland	G. Belgium	R. Ipswich
B. Tacoma	H. South Africa	S. Australia
C. Kewanee	J. Africa	T. Canada
D. Danville	L. Peoria	Y. Brazil
E. Nijmegen	N. New Zealand	
F. France	P. Portland	

(3) The number series designates the unit serial number.

(4) The final letter designates the year of unit manufacture, starting with the letter "T" indicating 1973. The letters I, O and Q are not used.



LEFT-HAND SIDE



RIGHT-HAND SIDE

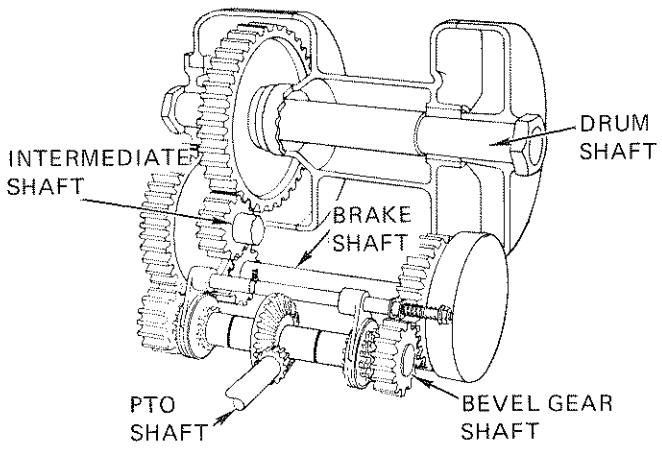
FIGURE 1-1. W6E TOWING WINCH

1-5. PHYSICAL DESCRIPTION.

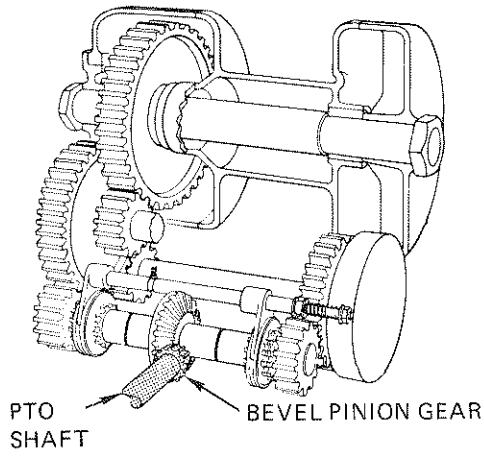
1-6. Towing Winch. (See Figure 1-1.)

1-7. The W6E Towing Winch is manufactured as a Direct Drive or Power Controlled Unit. The Direct Drive winch employs dental clutches with related mechanical linkage to shift the winch gear train to Forward, Neutral or Reverse. A brake drum and band arrangement with related mechanical linkage provides braking on the Direct Drive and Power Controlled winches. The Direct Drive winch is primarily designed for use on direct drive and torque converter tractors equipped with an interruptable power-take-off (PTO). The Power Controlled winch can be used on direct drive, torque converter and power shift tractors equipped with a constant running PTO. The Power Controlled winch is basically the same as the Direct Drive winch, except that multiple disc oil clutch assemblies are used to hydraulically shift the winch into Forward, Neutral or Reverse.

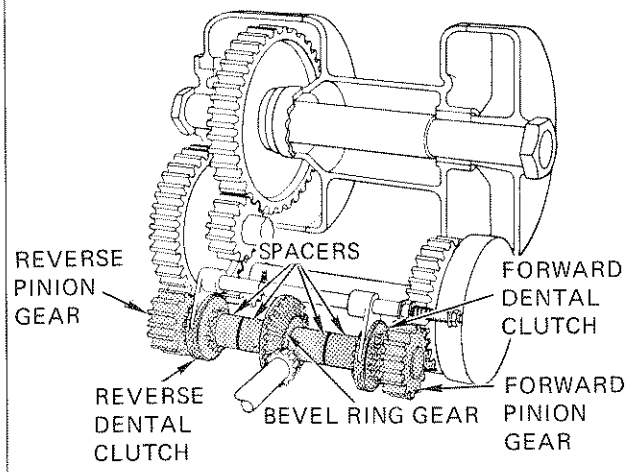
1-8. All major gear train components and brake assembly components for the Direct Drive and Power Controlled winches are mounted inside of a fabricated weldment. The gear train consists primarily of a PTO Shaft Assembly, Bevel Gear Shaft Assembly, Brake Shaft Assembly, Bevel Gear Shaft Assembly, and a Drum Shaft Assembly. The PTO shaft assembly, bevel gear shaft assembly and brake shaft assembly are mounted in the center and right-hand section of the weldment. The brake assembly and associated linkage are mounted in the left-hand section. These components are accessible by removing the transmission cover and left-hand side covers that are bolt-mounted to the weldment. The drum gear, intermediate shaft assembly and brake assembly are mounted in the center and right-hand section of the weldment. The drum shaft assembly, intermediate shaft assembly and reverse clutch assembly are mounted in the right-hand section of the weldment. These components are accessible by removing the top, right-hand cover and the right-hand bearing retainers. A control valve, cooling oil relief valve and related hydraulic hoses serve as the control mechanism on the Power Controlled winch. The control valve is mounted at the top, left-hand section of the weldment. Mechanical linkage is used to control the operation of the Direct Drive winch.



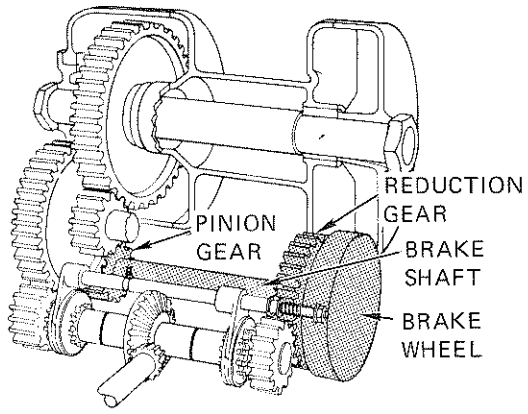
SHAFT ASSEMBLIES



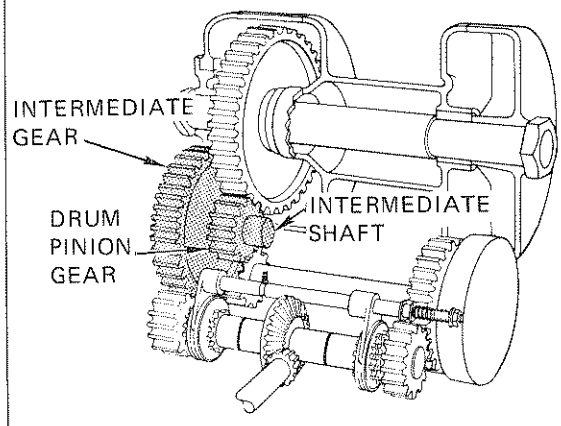
PTO SHAFT ASSEMBLY



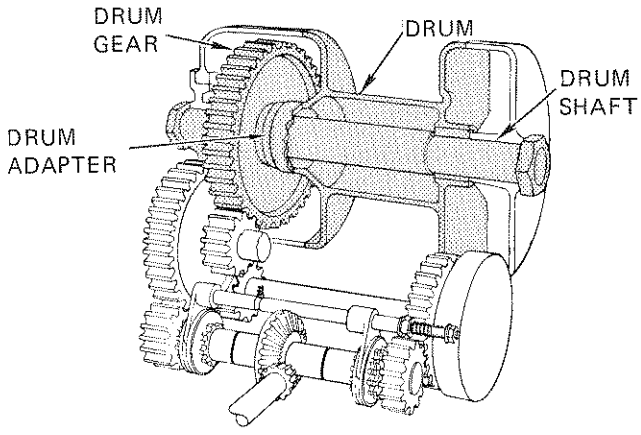
BEVEL GEAR SHAFT ASSEMBLY



BRAKE SHAFT ASSEMBLY



INTERMEDIATE SHAFT ASSEMBLY



DRUM SHAFT ASSEMBLY

W380

FIGURE 1-2. DIRECT DRIVE GEAR TRAIN

1-9. DIRECT DRIVE GEAR TRAIN. (See Figure 1-2.)

1-10. The direct drive gear train consists primarily of: (1) a PTO shaft assembly, (2) bevel gear shaft assembly, (3) brake shaft assembly, (4) intermediate shaft assembly and (5) a drum shaft assembly.

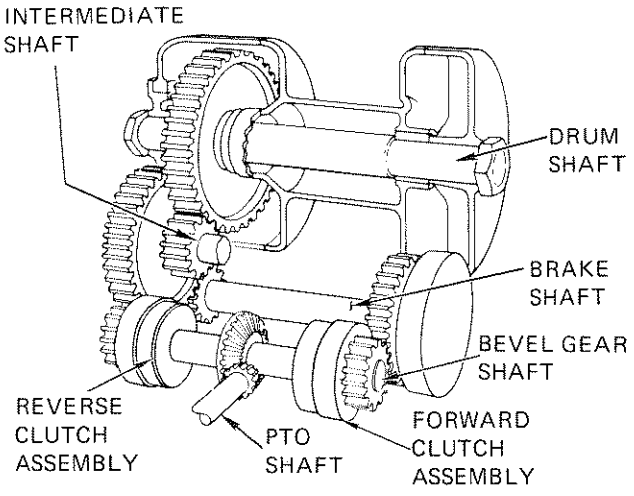
1-11. The PTO shaft assembly consists primarily of: (1) a splined shaft, (2) bevel pinion gear, (3) ball bearing and (4) a carrier. The front end of the shaft mates with the tractor PTO and the rear end carries the bevel pinion gear. On the Standard Speed winch, the bevel pinion gear is splined and locked to the PTO shaft by a lock ring. On the Lo- and Slo-Speed winches, the bevel pinion gear is an integral part of the PTO shaft. A carrier, shimmed and bolted to the winch housing front plate supports the PTO shaft with a single ball bearing just forward of the bevel pinion gear.

1-12. The bevel gear shaft consists primarily of: (1) a splined shaft, (2) forward pinion gear, (3) reverse pinion gear, (4) two dental clutches, (5) four spacers, (6) two tapered roller bearings, (7) a bevel gear and (8) a ball bearing. The bevel ring gear is splined to the shaft at its center. The forward pinion gear is located at the left-hand side of the shaft. Both pinion gears are roller bearing mounted and rotate independently of the shaft, except when locked-up by the adjacent dental clutch. A dental clutch hub is splined to the shaft next to each pinion gear. Spacers are used to separate the shaft components. The bevel gear shaft is supported by a tapered roller bearing at each end and a ball bearing located between the forward dental clutch and the bevel ring gear. Carriers are used to support and locate the pinion gear roller bearings and the ball bearing. Bearing retainers hold the tapered roller bearings in the winch housing. Both LH and RH retainers are shimmed to control shaft preload.

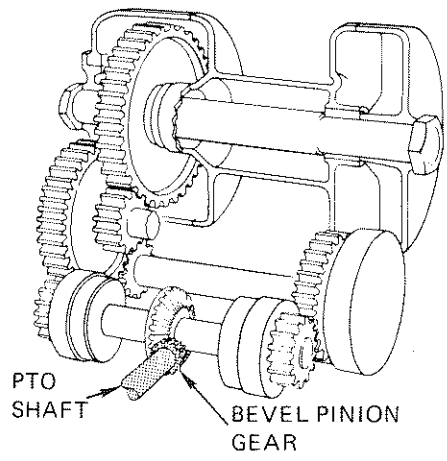
1-13. The brake shaft assembly consists primarily of: (1) a splined shaft, (2) forward reduction gear, (3) brake assembly, (4) intermediate pinion gear and (5) two tapered roller bearings. A tapered roller bearing supports each end of the brake shaft. The intermediate pinion gear is splined to the right-hand end of the shaft. The forward reduction gear is splined to the left-hand side of the shaft just inboard of the bearing. The brake wheel is splined to the left-hand end of the shaft just outboard of the bearing. The left-hand bearing retainer contains an oil seal and flange gasket to prevent oil leakage to the brake from the center compartment. The right-hand bearing retainer is shimmed to control shaft preload.

1-14. The intermediate shaft assembly consists primarily of: (1) a splined shaft, (2) intermediate gear, (3) drum pinion gear and (4) two tapered roller bearings. The shaft is supported at each end by a tapered roller bearing. The intermediate gear is splined to the right-hand side of the shaft and the drum pinion gear to the left-hand side. The left-hand bearing is fitted into the housing weldment. The right-hand bearing retainer is shimmed to control shaft endplay. If the unit is equipped with the optional free-spool arrangement (see Paragraph 1-23.) the drum pinion gear is not splined to the shaft but rotates freely on the shaft except when locked to the intermediate gear by an internally splined dental clutch. Shim between intermediate shaft retainer and winch case control free-spool drag.

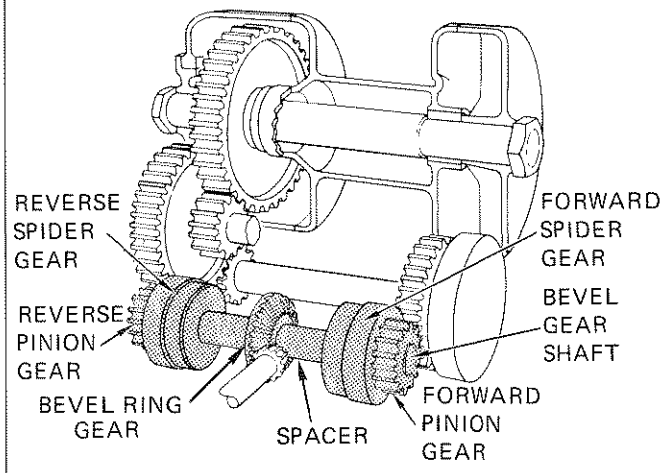
1-15. The drum shaft assembly consists primarily of: (1) a shaft, (2) drum, (3) drum gear, (4) drum adapter and (5) two sets of double tapered roller bearings. The drum shaft is aligned and supported by two matched, double tapered roller bearings. The shaft is secured to the winch housing by two large nuts and does not rotate. The right-hand side of the drum is bolted to an adapter which is splined to the drum gear. The right-hand end of the shaft is supported by a large cover/retainer which bolts to the right-hand side of the housing. The retainer is shimmed as necessary to maintain the tolerance between shaft and housing. The left-hand end of the shaft is supported by a fixed spacer which is part of the left-hand housing weldment.



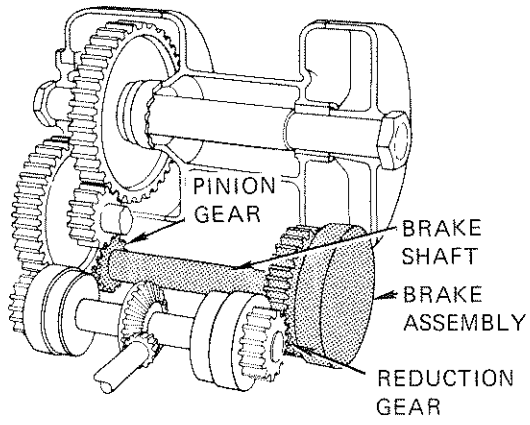
SHAFT ASSEMBLIES



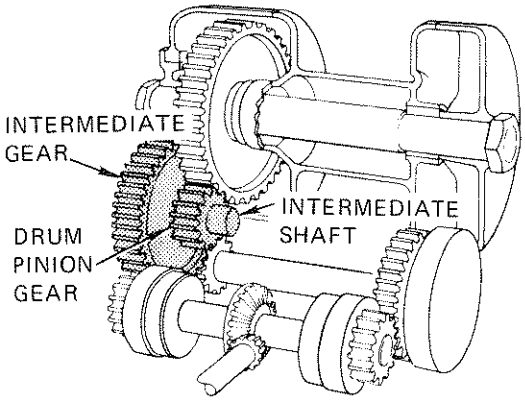
PTO SHAFT ASSEMBLY



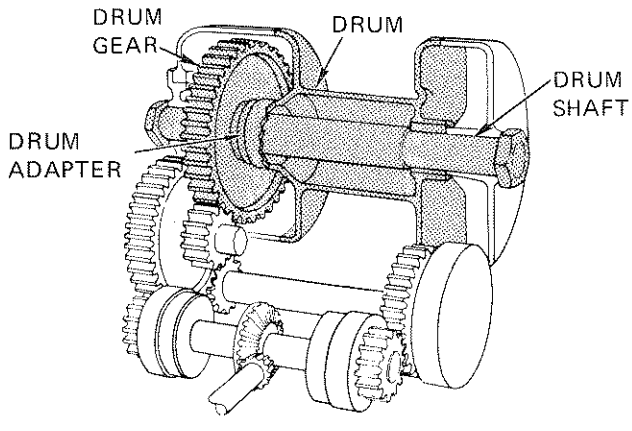
BEVEL GEAR SHAFT ASSEMBLY



BRAKE SHAFT ASSEMBLY



INTERMEDIATE SHAFT ASSEMBLY



DRUM SHAFT ASSEMBLY

W381

FIGURE 1-3. POWER CONTROLLED GEAR TRAIN

1-16. POWER CONTROLLED GEAR TRAIN. (See Figure 1-3.)

1-17. The power controlled gear train consists primarily of: (1) a PTO shaft assembly, (2) bevel gear shaft assembly, (3) brake shaft assembly, (4) intermediate shaft assembly and (5) a drum shaft assembly.

1-18. The PTO shaft assembly consists primarily of: (1) a splined shaft, (2) bevel pinion gear, (3) ball bearing and (4) a carrier. The front end of the shaft mates with the tractor PTO and the rear end carries the bevel pinion gear. On the Standard Speed winch, the bevel pinion gear is splined and locked to the PTO shaft by lock ring. On the Lo- and Slo-Speed winches, the bevel pinion gear is an integral part of the PTO shaft. A carrier, shimmed and bolted to the winch housing front plate, supports the PTO shaft with a single ball bearing just forward of the bevel pinion gear.

1-19. The bevel gear shaft assembly consists primarily of: (1) a splined shaft, (2) forward oil clutch with integral spider and pinion gear, (3) reverse oil clutch with integral spider and pinion gear, (4) two spacers, (5) two tapered roller bearings, (6) a ball bearing and (7) a bevel ring gear. The bevel ring gear is splined to the center of the shaft. The shaft is center drilled at each end and cross drilled at the oil clutch pack locations to allow pressurized oil flow to the clutches. The pressurized oil enters the bevel gear shaft ends through the bearing retainers. A cast iron seal ring on each end of the shaft prevents leakage of the pressurized oil. The forward pinion gear is an integral part of the left-hand clutch spider gear. The reverse pinion gear is an integral part of the right-hand oil clutch spider gear. The pinion/spider gears are roller bearing mounted and rotate independently of the bevel gear shaft except when the spider gear is locked up to the clutch assembly by hydraulic pressure. The clutch assemblies are splined to the bevel gear shaft. The bevel gear shaft is supported by a tapered roller bearing at each end and a ball bearing located between the forward oil clutch and the bevel ring gear. Spacers are used to separate the shaft components. Carriers are used to support and locate the pinion gear roller bearings and the ball bearing. Shimmed and bolted retainers hold the tapered roller bearings in the winch housing.

1-20. The brake shaft assembly consists primarily of: (1) a splined shaft, (2) forward second reduction gear, (3) brake assembly, (4) intermediate pinion gear and (5) two tapered roller bearings. The brake shaft is supported within the housing by a tapered roller bearing at each end. The intermediate pinion gear is splined to the right-hand end of the shaft. The forward reduction gear is splined to the left-hand side of the shaft just inboard of the bearing. The brake wheel is splined to the left-hand end of the shaft just outboard of the bearing. The left-hand bearing retainer contains an oil seal and flange gasket to prevent oil leakage between the center compartment and the brake. The right-hand bearing retainer is shimmed to control shaft preload.

1-21. The intermediate shaft assembly consists primarily of: (1) a splined shaft, (2) intermediate gear, (3) drum pinion gear and (4) two tapered roller bearings. The shaft is supported by a tapered roller bearing at each end. The intermediate gear is splined to the right-hand side of the shaft and the drum pinion gear to the left-hand side. The left-hand bearing is fitted into the housing weldment. The right-hand bearing retainer is shimmed to the housing to control shaft endplay. If the unit is equipped with the optional free-spool arrangement (see Paragraph 1-23) the drum pinion gear is not splined to the shaft but rotates freely on the shaft, except when locked to the intermediate gear by an internally splined dental clutch.

1-22. The drum shaft assembly consists primarily of: (1) a shaft, (2) drum, (3) drum gear, (4) drum adapter and (5) two sets of double tapered roller bearings. The drum shaft is aligned and supported by two matched, double tapered roller bearings. The shaft is secured to the winch

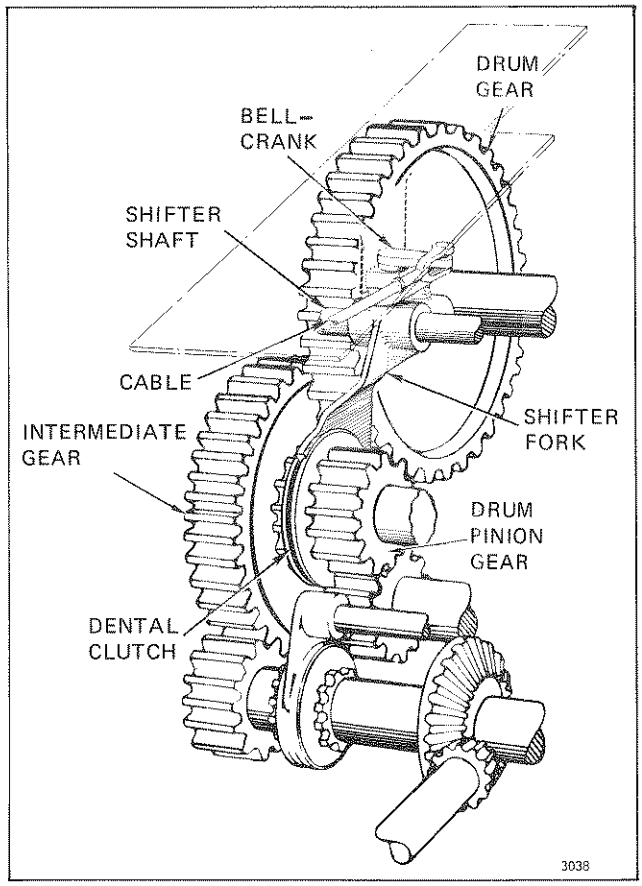


FIGURE 1-4. FREE-SPOOL ARRANGEMENT

housing by two large nuts and does not rotate. The right-hand side of the drum is bolted to an adapter which is coupled to the drum gear. The right-hand end of the shaft is supported by a large cover/retainer which bolts to the right-hand side of the housing. The retainer is shimmed to maintain the tolerance between shaft and housing. The left-hand end of the shaft is supported by a fixed spacer which is part of the left-hand housing weldment.

1-23. OPTIONAL FREE-SPOOL ARRANGEMENT. (See Figure 1-4.)

1-24. The optional free-spool arrangement allows cable to be payed out by hand. This is accomplished by disengaging the drum pinion gear from the remainder of the winch gear train, allowing the drum to rotate freely. The free-spool arrangement consists primarily of: (1) a control lever, (2) push-pull cable, (3) shift linkage, (4) shifter fork and (5) a dental clutch. The control lever is linked to the winch gear train through a mechanical push-pull cable. The cable extends through the right-hand drum gear cover and connects to a bellcrank mounted in the housing. The bellcrank engages a ball stud fitted into the bore of the shifter fork. The shifter fork is independently mounted on a shaft located directly above the drum pinion gear. A detent ball and spring fitted into the shaft, detents the shifter fork in the normal or free-spool position. The pads of the shifter fork are fitted into an internal tooth dental clutch that rides between the intermediate and drum pinion gears.

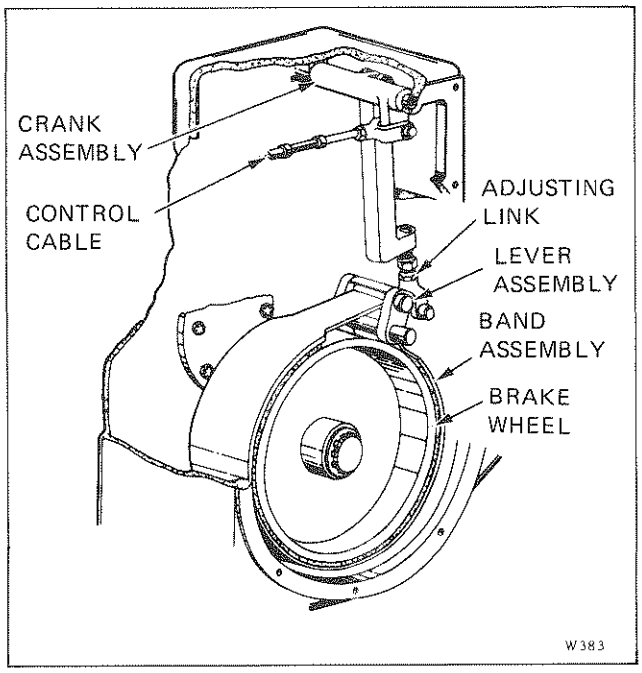


FIGURE 1-5. DRY BRAKE ASSEMBLY, DIRECT DRIVE WINCH

1-25. DRY BRAKE ASSEMBLY. (Direct Drive Winch.) (See Figure 1-5.)

1-26. The dry brake assembly consists primarily of: (1) a brake wheel, (2) band assembly, (3) lever assembly, (4) crank assembly and (5) connecting linkage. The brake wheel is splined to the left-hand side of the brake shaft and is held in place by a snap ring. A segmented lining is riveted to the brake band. The band is mounted over the brake wheel and attached to the lever assembly. The lever assembly is attached to the connecting linkage and band by means of two pins. Prelubricated bushings are installed in the pin bores of the lever assembly to prevent wear. When the brake lever is pulled the crank assembly rotates, pulling the brake band against the drum applying the brake. The ratchet teeth on the brake lever keep the linkage applied.

1-27. OPTIONAL AUTOMATIC BRAKE. (Direct Drive Winch.) (See Figure 1-6.)

1-28. The automatic brake assembly is an optional unit and is installed on the left-hand end of the brake shaft in place of the standard dry brake. The automatic brake assembly consists primarily of: (1) a brake drum, (2) hub, (3) pawl assembly, (4) two drag rings, (5) two oil seals, (6) two ball bearings, (7) a cover and (8) a vent lug. The hub is splined to the brake shaft and is retained by a snap ring. The brake wheel has an internal ratched ring and revolves around the hub on two ball bearings 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) the pawl engages the ratchet teeth, the brake will lock up and stop any line pay out provided the brake handlever is set.

1-29. HYDRAULIC BRAKE ASSEMBLY. (Power Controlled Winch.) (See Figure 1-7.)

1-30. The hydraulic brake assembly consists primarily of: (1) a brake wheel, (2) band assembly, (3) crank assembly, (4) adjustment link assembly, (5) two brake springs, (6) a hydraulic brake cylinder and (7) related hydraulic lines. The brake wheel is splined to the left-hand end of the brake shaft and is held in place by a snap ring. The brake band is mounted over the brake wheel and is attached to the adjustment link by two pins. Pre-lubricated bushings are pressed into the pin bores of the link assembly to allow the brake pins to pivot. A hydraulic cylinder is connected to the crank assembly by an adjustable rod end. The two brake springs are attached to the crank assembly and anchored to the housing. The springs apply the brake band.

1-31. The hydraulic brake assembly is a normally applied unit which requires hydraulic oil pressure to release the

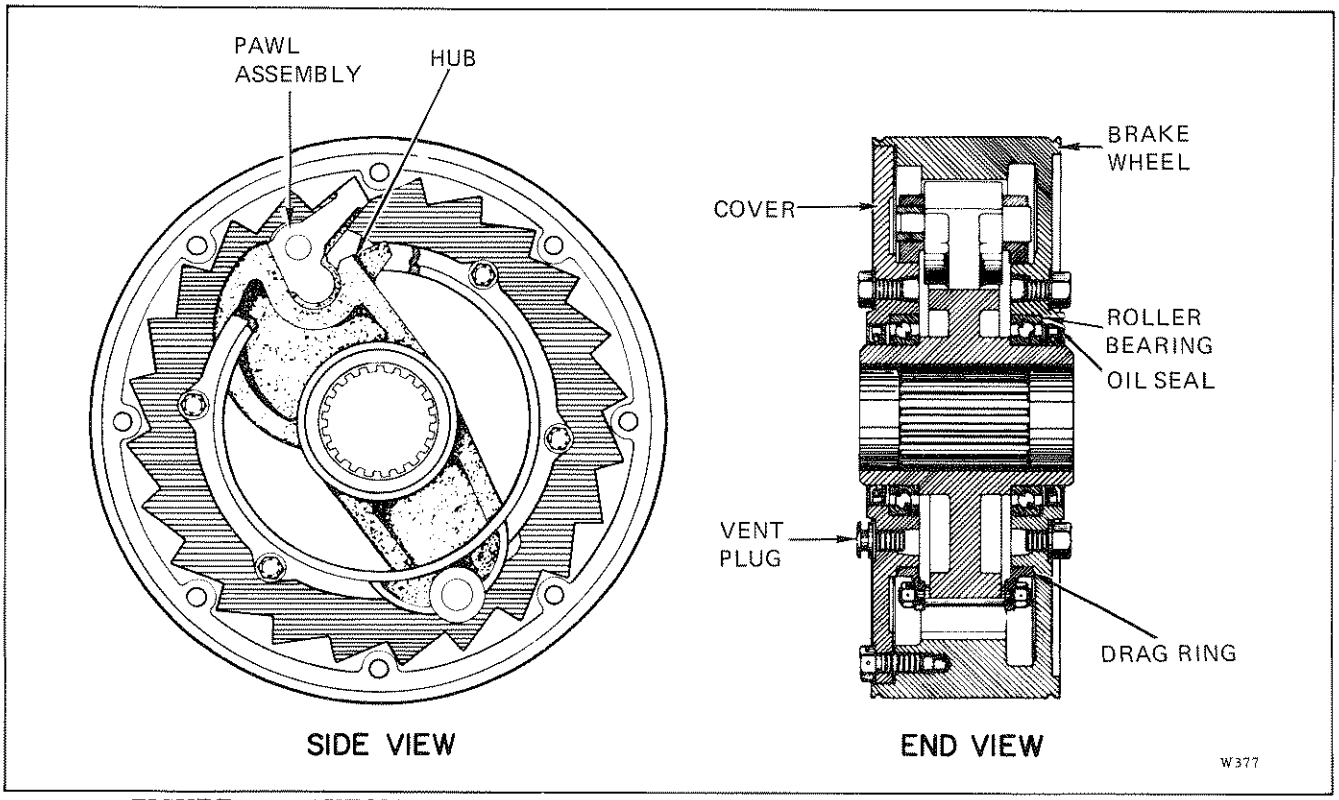


FIGURE 1-6. AUTOMATIC BRAKE ASSEMBLY (OPTIONAL) DIRECT DRIVE WINCH

brake. In the brake ON condition, the brake springs pull on the crank rotating it in a direction that will pull the brake band against the brake wheel. In this condition the cylinder rod is retracted. When hydraulic pressure is applied to the brake cylinder the cylinder rod extends and rotates the crank against the force of the springs. This extends the springs and allows the brake band to expand away from the brake wheel.

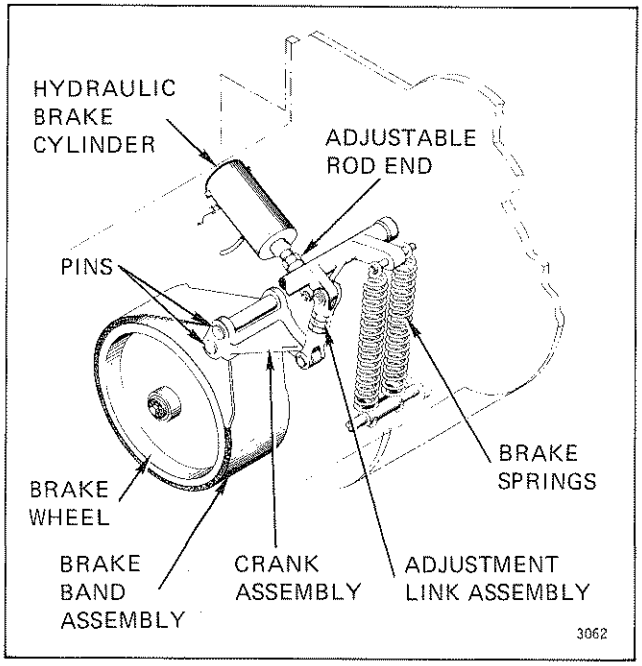


FIGURE 1-7. HYDRAULIC BRAKE ASSEMBLY, POWER CONTROLLED WINCH

1-32. Hydraulic oil, which normally leaks by the brake cylinder piston, is discharged out of the cylinder to the winch center compartment through a dump line. The dump line is equipped with two check valves: A lower valve in series and an upper valve in parallel with the dump line outlet. The lower check valve closes during piston return movement to prevent any hydraulic oil from being drawn up through the dump line. The upper check valve

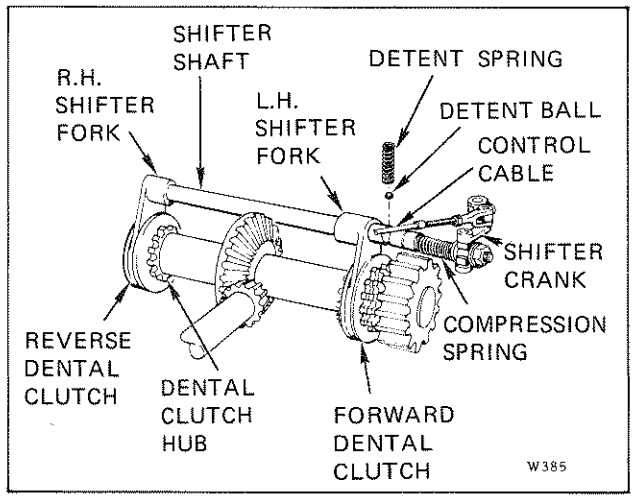


FIGURE 1-8. DIRECT DRIVE CLUTCH ASSEMBLY

opens during the same piston movement to prevent hydraulic lockup in the brake cylinder. Only air can enter through the upper check valve which speeds piston return.

1-33. DIRECT DRIVE CLUTCH ASSEMBLY. (See Figure 1-8.)

1-34. The dental clutch assembly used in the Direct Drive winch consists primarily of: (1) a reverse dental clutch, (2) forward dental clutch, (3) two dental clutch hubs, (4) right-hand shifter fork, (5) left-hand shifter fork, (6) shifter shaft, (7) crank assembly, (8) detent ball and (9) a detent spring. The forward clutch hub is splined to the left-hand side of the bevel gear shaft, the reverse clutch hub is splined to the right-hand side of the bevel gear shaft. External teeth on the inner side of each pinion gear match the external teeth of the clutch hubs. The dental clutches have matching internal teeth which mesh with their respective hub and pinion gear end. The shifter fork engages the dental clutch and as the fork is moved it causes the clutch to slide over the hub and onto the pinion gear end. This locks the pinion to the hub. The forward and reverse shifter forks are secured to the shifter shaft by means of a lockscrew and lockwire. The shifter shaft is connected through a shifter crank assembly to the clutch control cable. The detent ball and spring hold the shifter forks in the Forward, Neutral or Reverse position. The compression spring absorbs the shifting force until the external teeth of the clutch hub align with the external dental teeth of the pinion gear. When the teeth are aligned the dental clutch slides onto the dental teeth of the pinion gear.

1-35. POWER CONTROLLED OIL CLUTCH ASSEMBLY. (See Figure 1-9.)

1-36. The oil clutch assembly consists primarily of: (1) cylinder, (2) piston, (3) spring retainer, (4) clutch hub, (5) six separator plates, (6) six friction discs, (7) cooling oil valve assembly, (8) six release springs, (9) spider gear and (10) a cover plate. The piston operates within the piston retainer and is sealed by two O-rings. The hub is internally splined to mate with splines on the bevel gear shaft and externally splined to mate with internal teeth on the separator plates. The steel separator plates are dished to provide a compression spring-effect when stacked on the hub. A friction disc is placed between each set of separator plates. The hub contains six release springs and a cooling oil valve assembly. Six special socket head capscrews are used to secure the cover, hub, and piston retainer and serve as guides for the release springs. Shims are used between the hub and cover plate to control the clearance between the separator plates and friction discs. The friction discs are flat steel plates with sintered bronze facing on each side. External teeth on the discs are aligned to mate with internal spur gear teeth in the spider gear. The spider gear is an integral part of the pinion gear. The spring retainer is a flat plate which transmits and distributes the respecitve actuating and return forces

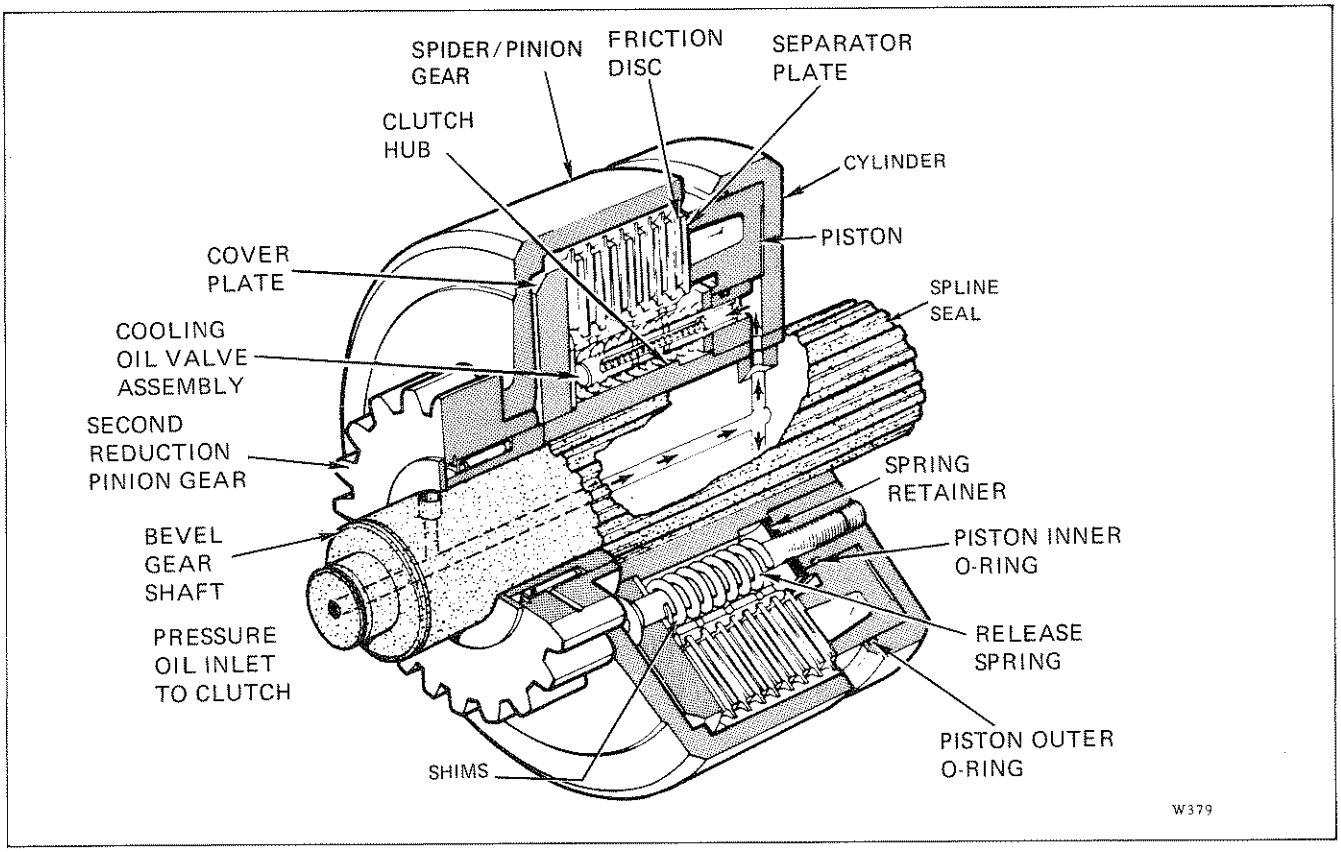


FIGURE 1-9. OIL CLUTCH ASSEMBLY, POWER CONTROLLED WINCH

between the piston and the release springs.

1-37. At all times during winch operation, pressurized oil flows into the clutch from the oil passage in the bevel gear shaft. When the oil pressure is low, the return springs hold the piston into the cylinder. The low pressure oil is used only for cooling and lubricating the separator discs and plates and is distributed through the disc/plate stack by the cooling oil valve. When high-pressure oil is applied to the clutch, a spring loaded plunger is forced to seat within the clutch cooling oil valve body, restricting the flow of cooling oil. Pressure builds up in the cavity in back of the piston, forcing the piston to compress the disc/plate stack, and lock up the clutch. When the clutch is locked up, the discs and plates can no longer turn independently of each other and torque is transmitted from the hub to the spider/pinion gear.

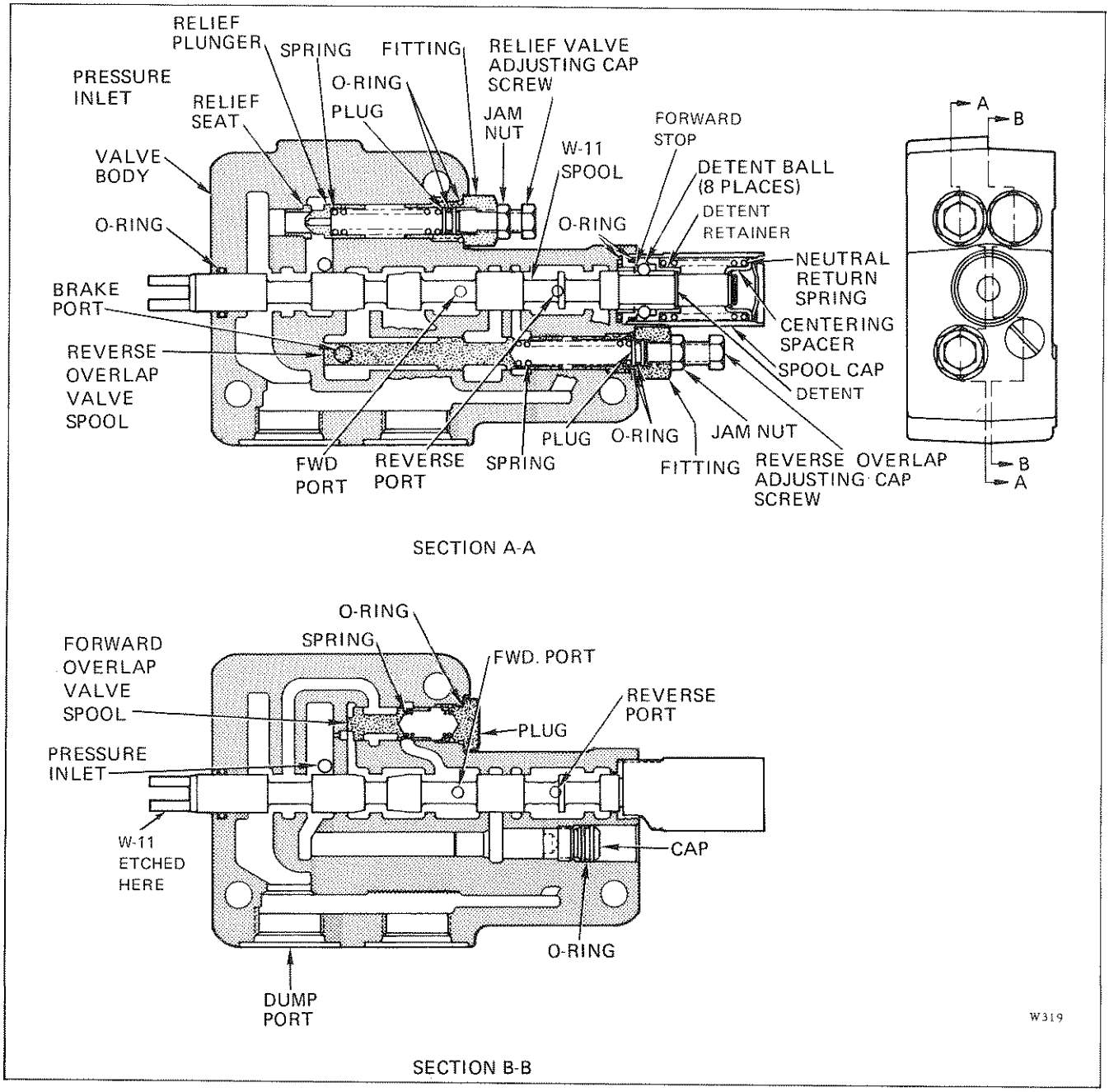


FIGURE 1-10. CONTROL VALVE ASSEMBLY, POWER CONTROLLED WINCH

1-38. CONTROL VALVE ASSEMBLY. (Power Controlled Winch.) (See Figure 1-10.)

1-39. The control valve assembly is used to control the flow of hydraulic oil to and from the hydraulic brake and clutches. The valve assembly is an open center valve consisting primarily of: (1) a valve body, (2) relief valve assembly, (3) a control spool assembly and (4) forward and reverse overlap valves. Passages within the valve body connect the spool bores with inlet, forward, reverse, brake and cooling oil (dump) ports either directly or through varying flow paths governed by the spool. Moving the spool connects these passages to obtain the desired hydraulic oil flow or pressure buildup. The relief valve assembly consists of a plunger and seat, plunger spring, adjusting capscrew and jam nut, special fitting and O-ring seal.

1-40. The relief valve adjusting capscrew varies the spring tension against the plunger which regulates the hydraulic system maximum pressure. The control spool assembly consists primarily of (1) a spool (W-11), (2) detent balls, (3) a retainer, (4) neutral return spring, (5) snap ring, (6) O-rings and (7) a cap assembly. The valve body acts as a mechanical stop for the spool in the forward position. In the reverse position, spool travel is limited by spool contact with the detent balls. Further spool travel in the reverse direction will cause the detent balls to lock the spool in the brake-off position. The neutral return spring ensures that the control spool returns to NEUTRAL when the control lever is released or moved out of detent. The forward overlap valve consists primarily of: (1) a modulating spool, (2) spool spring and (3) a plug. The modulating spool serves as a secondary control device by moving against spring force when hydraulic pressure against the spool face has risen to 20 PSI (1.408 kg/cm^2). The resulting movement of the spool connects a pressure passage to the forward clutch port. The reverse overlap valve consists primarily of: (1) a modulating spool, (2) spool spring, (3) an adjusting capscrew and jam nut, (4) a special fitting, (5) O-ring plug and (6) O-ring seals. The modulating spool serves as a secondary control device by moving against spring force when hydraulic pressure against the spool face has risen to 120 PSI (8.45 kg/cm^2). The resulting movement of the spool connects a pressure passage to the reverse clutch port. The adjusting capscrew varies the spring loading on the spool and controls sequencing between clutch engagement and brake release.

1-41. COOLING OIL RELIEF VALVE ASSEMBLY. (Power Controlled Winch.) (See Figure 1-11.)

1-42. The cooling oil relief valve is a spring-loaded, poppet-type valve installed in the control valve dump port. The valve consists primarily of: (1) a fitting assembly, (2) poppet, (3) spring, (4) plug, (5) O-ring seals and (6) a backup washer. The fitting assembly serves as a housing for the other parts. A stem on the plug serves as a guide for the

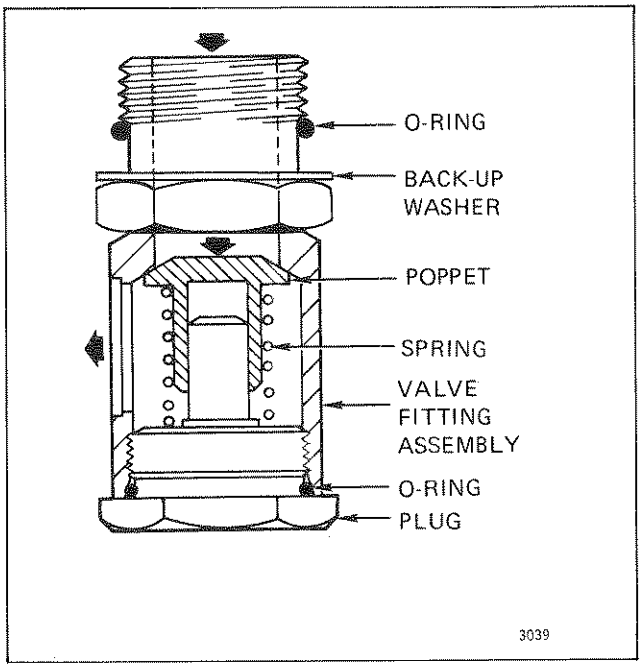


FIGURE 1-11. COOLING OIL RELIEF VALVE ASSEMBLY, POWER CONTROLLED WINCH

poppet and the poppet shaft serves as a guide for the spring. One O-ring seals the plug in the fitting assembly and the other O-ring, with a backup washer, seals the fitting assembly in the control valve dump port. The cooling oil relief valve is a low-pressure valve that provides sufficient back pressure to ensure that all cavities in the control valve, clutch engagement lines, and brake release lines are filled with oil and that enough oil flows to the clutch discs to remove excess heat. Discharge oil from the relief valve is dumped to the winch lower brake compartment through a drain hose.

1-43. Controls.

1-44. DIRECT DRIVE WINCH. (See Figure 1-12.)

1-45. The control lever assembly used to control the operation of the Direct Drive winch consists primarily of: (1) control cables, (2) a clutch handlever, (3) brake handlever assembly and (4) mounting bracket with attached quadrant bar. The control lever assembly is normally mounted on the tractor diagonally at the left-hand side of the operator's seat. 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. The brake handlever has a pawl and rod which engages teeth on the quadrant bar and locks the handlever in any desired position to control the degree of braking effort. A release button on the end of the brake handlever must be depressed before the handlever can be moved forward to release the brake. The pawl will allow increased brake application without depressing the release button. The control cables are anchored to a block on the mounting

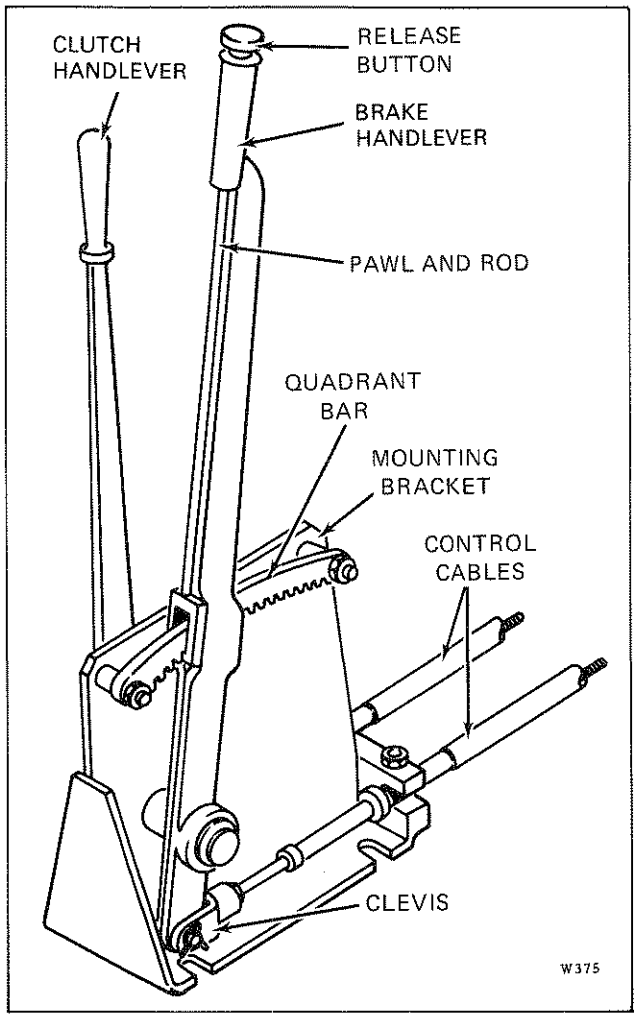


FIGURE 1-12. CONTROL ASSEMBLY, DIRECT DRIVE WINCH

bracket with setscrews which engage grooves in the cable housing ends.

1-46. FREE-SPOOL CONTROL LEVER.

1-47. Control for the free-spool arrangement (see Figure 1-13) used on Direct Drive winches is provided by a control assembly with a single control lever. The free-spool control lever is mounted on a pivot pin within the housing. A mechanical push-pull cable links the control lever to the winch gear train. The locknut is threaded on tight when shoulder on cable contacts cross pin. Control for the free-spool arrangement used on Power Controlled winches (see Figure 1-14) is provided by a second control lever mounted in the control lever assembly.

1-48. POWER CONTROLLED WINCH. (See Figure 1-14.)

1-49. The control lever assembly used to control the operation of the power controlled winch consists primarily of:

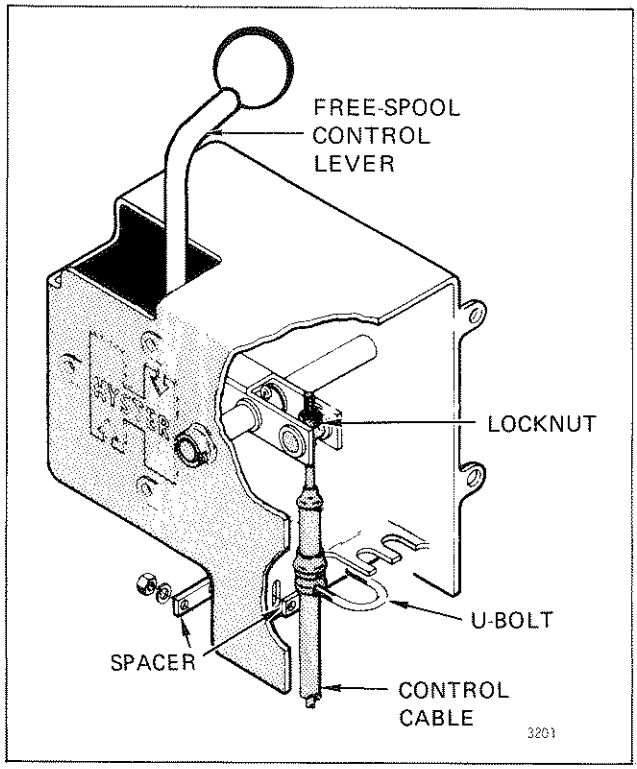


FIGURE 1-13. FREE-SPOOL CONTROL ASSEMBLY, DIRECT DRIVE WINCH

(1) a housing, (2) control lever, (3) pivot pin, and (4) a pressure gauge. The control lever is mounted on a pivot pin within the housing. A mechanical push-pull cable links the control lever to the control valve spool. The housing is normally mounted on the right-hand side of the operator's seat and is positioned so that the control lever is pulled to obtain FORWARD (line in) position and pushed away to obtain REVERSE (line out). The pressure gauge indicates operating brake release pressure. A second control lever is added for free-spool operation as described in Paragraph 1-47.

1-50. FUNCTIONAL DESCRIPTION.

1-51. Direct Drive Gear Train. (See Figure 1-15.)

1-52. The PTO shaft assembly rotates clockwise as viewed from the front of the tractor. Torque is transmitted from the PTO bevel pinion gear to the bevel ring gear. This causes the bevel gear shaft to rotate clockwise as viewed from the left-hand side. In NEUTRAL, the bevel gear shaft, bevel ring gear, two spacers and the dental clutches rotate, but the pinion gears do not. This is because neither clutch is engaged. In FORWARD, the left-hand dental clutch is moved toward the left-hand side of the unit to engage the forward pinion gear. This causes torque to be transfered from the forward pinion gear to the forward

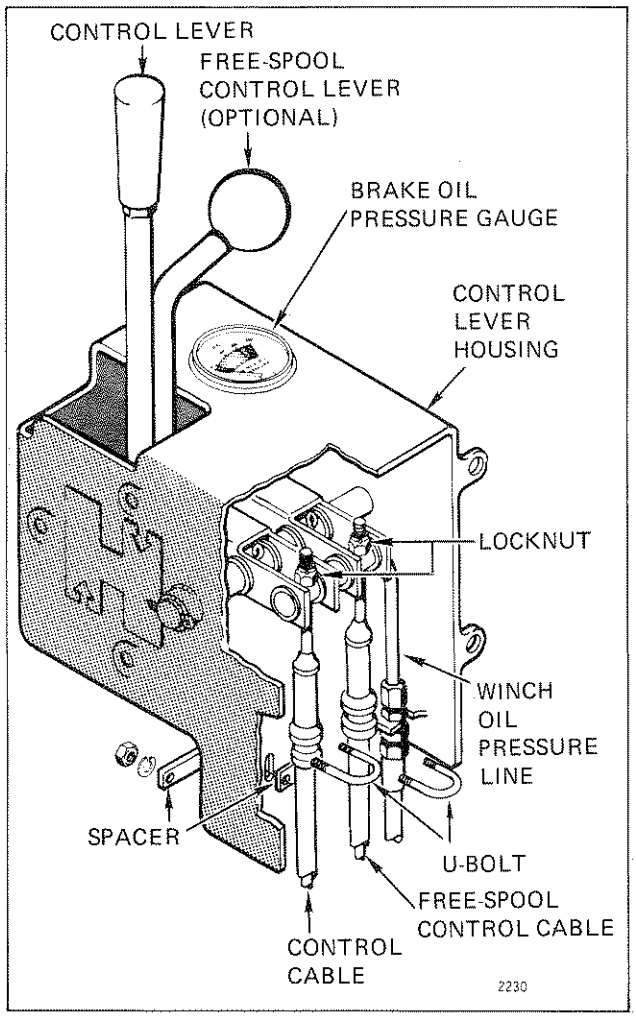


FIGURE 1-14. CONTROL ASSEMBLY, POWER CONTROLLED WINCH

reduction gear rotating the brakeshaft assembly counterclockwise. The brakeshaft intermediate pinion gear will now turn the large intermediate gear, causing the intermediate shaft assembly to rotate clockwise. The drum pinion gear will now turn the large drum gear and drum counterclockwise. In REVERSE, the right-hand dental clutch is moved toward the right-hand side of the unit to engage the reverse pinion gear. This causes torque to be transfered from the reverse pinion gear to the large intermediate gear causing the intermediate shaft assembly to rotate counterclockwise. The drum pinion gear will now turn the large drum gear and drum clockwise.

1-53. Power Controlled Gear Train. (See Figure 1-16.)

The PTO shaft assembly rotates clockwise as viewed from the front of the tractor. Torque is transmitted from the PTO bevel pinion gear to the bevel ring gear. This causes the bevel gear shaft to rotate clockwise as viewed from the left-hand side of the winch. In NEUTRAL, the bevel

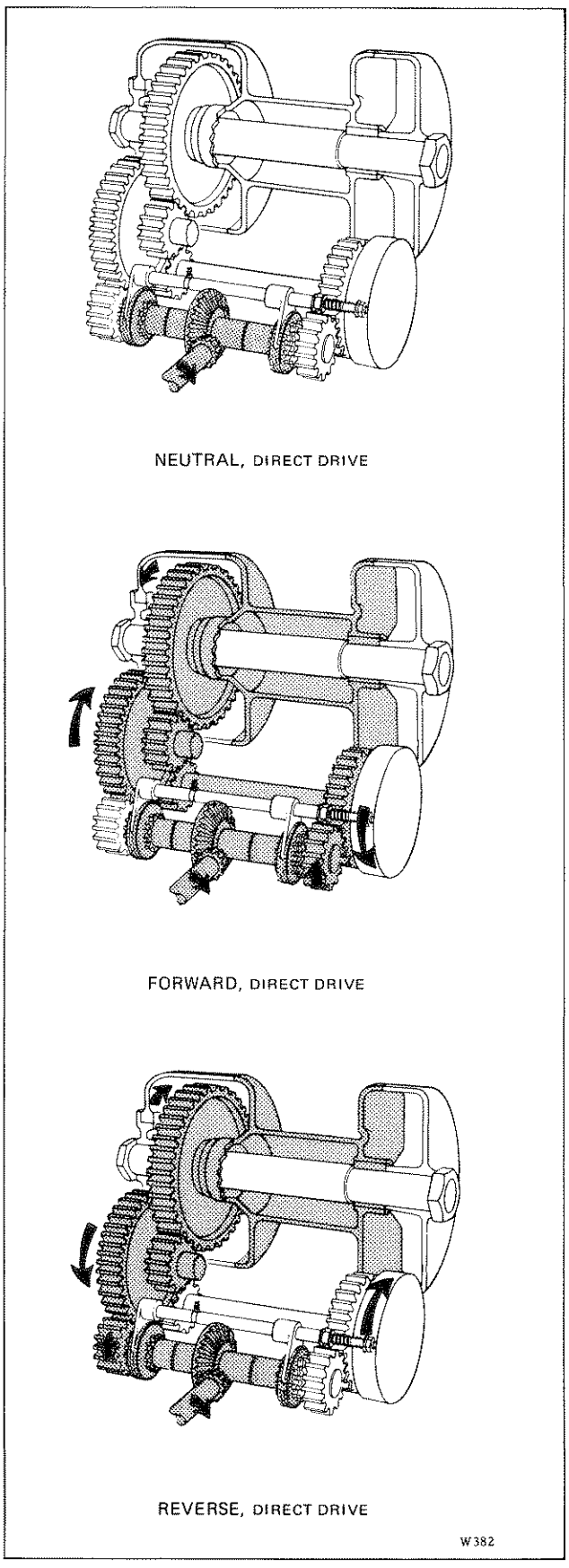


FIGURE 1-15. TORQUE TRANSFER, DIRECT DRIVE WINCH

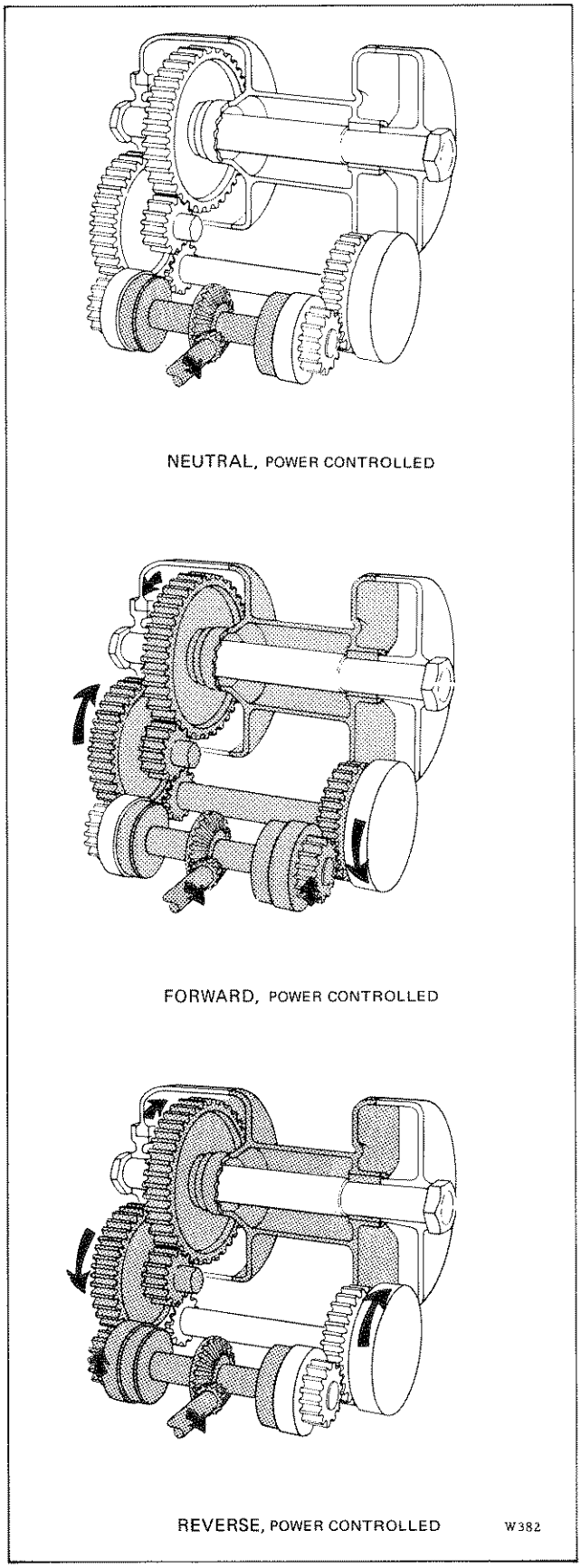


FIGURE 1-16. TORQUE TRANSFER, POWER CONTROLLED WINCH

gear shaft, bevel ring gear, two spacers and clutch assemblies rotate, but the associated spider/pinion gears do not. This is because neither clutch assembly is engaged. In FORWARD, the left-hand (forward) oil clutch assembly is locked up to the spider gear by hydraulic pressure. This causes torque to be transfered from the forward pinion gear to the forward reduction gear rotating the brake shaft assembly counterclockwise. The brakeshaft intermediate pinion gear will now turn the large intermediate gear causing the intermediate shaft to rotate clockwise. The drum pinion gear will now turn the large drum gear and drum counterclockwise. In REVERSE, the right-hand (reverse) oil clutch assembly is locked up to the spider gear by hydraulic pressure. This causes torque to be transfered from the reverse pinion gear to the large intermediate gear, causing the intermediate shaft assembly to rotate counterclockwise. The drum pinion gear will now turn the large drum gear and drum clockwise.

1-54. Optional Free-Spool Arrangement. (See Figure 1-17.)

1-55. When in FREE-SPOOLING the dental clutch is disengaged from the drum pinion gear through a mechanical linkage. Moving the FREE-SPOOL control lever to the FREE-SPOOL position pivots the cable-operated bellcrank, moving the shifter fork which disengages the drum pinion gear. This allows the drum to rotate freely. As the shifter fork is moved to the NORMAL position, the dental

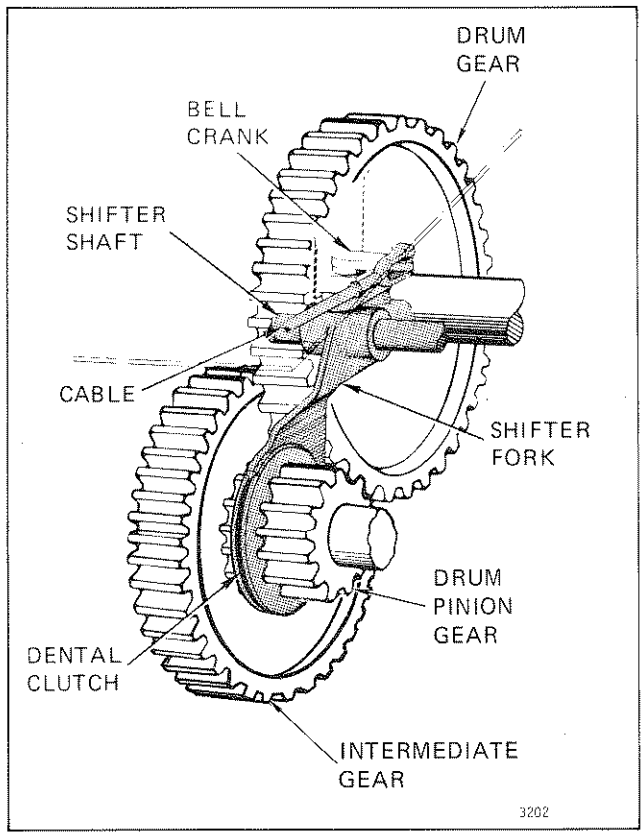


FIGURE 1-17. FREE-SPOOL ARRANGEMENT

clutch engages the drum pinion gear. At this time, the drum gear is mechanically connected to the remainder of the winch gear train.

1-56. HYDRAULIC SYSTEM (Power Controlled Winch.) (See Figure 1-18.)

1-57. The hydraulic system used for the power controlled winch consists primarily of: (1) a foot valve, (2) suction filter, (3) hydraulic pump, (4) pressure filter, (5) control valve, (6) forward oil clutch, (7) reverse oil clutch, (8) hydraulic brake cylinder, (9) pressure gauge, (10) clutch cooling oil relief valve and (11) associated hydraulic lines. The foot valve prevents suction line drainback and resulting delays in obtaining normal pump pressure output, especially with cold oil. The filters remove contaminants from the oil. The hydraulic pump supplies pressurized oil for the system. The control valve converts the control lever position into appropriate hydraulic oil flow distribution and regulation. The forward and reverse oil clutches lock up and transmit torque under high oil pressure and disengage when under low pressure. The hydraulic brake cylinder releases the brake under high oil pressure, and is partially applied under intermediate pressures. The pressure gauge is mounted in the control lever housing and indicates brake release pressure. The clutch cooling oil relief valve regulates oil flow from the control valve to dump and provides only enough back pressure to assure adequate oil flow for cooling the clutches when disengaged. The hydraulic dump line on the brake cylinder includes an upper and lower ball check valve. The upper valve allows air to be drawn in during retraction of the brake cylinder piston to prevent a suction pressure lock. The lower valve prevents oil being drawn into the line when the discharge end is below the sump oil level.

1-58. Operational Modes.

1-59. There are five modes of winch operation. These modes are as follows (refer to Paragraphs 1-60 through 1-69.):

1. NEUTRAL
2. FORWARD (line in)
3. BRAKE INCHING (inching line out)
4. REVERSE (line out)
5. BRAKE OFF (semi-free-spool)

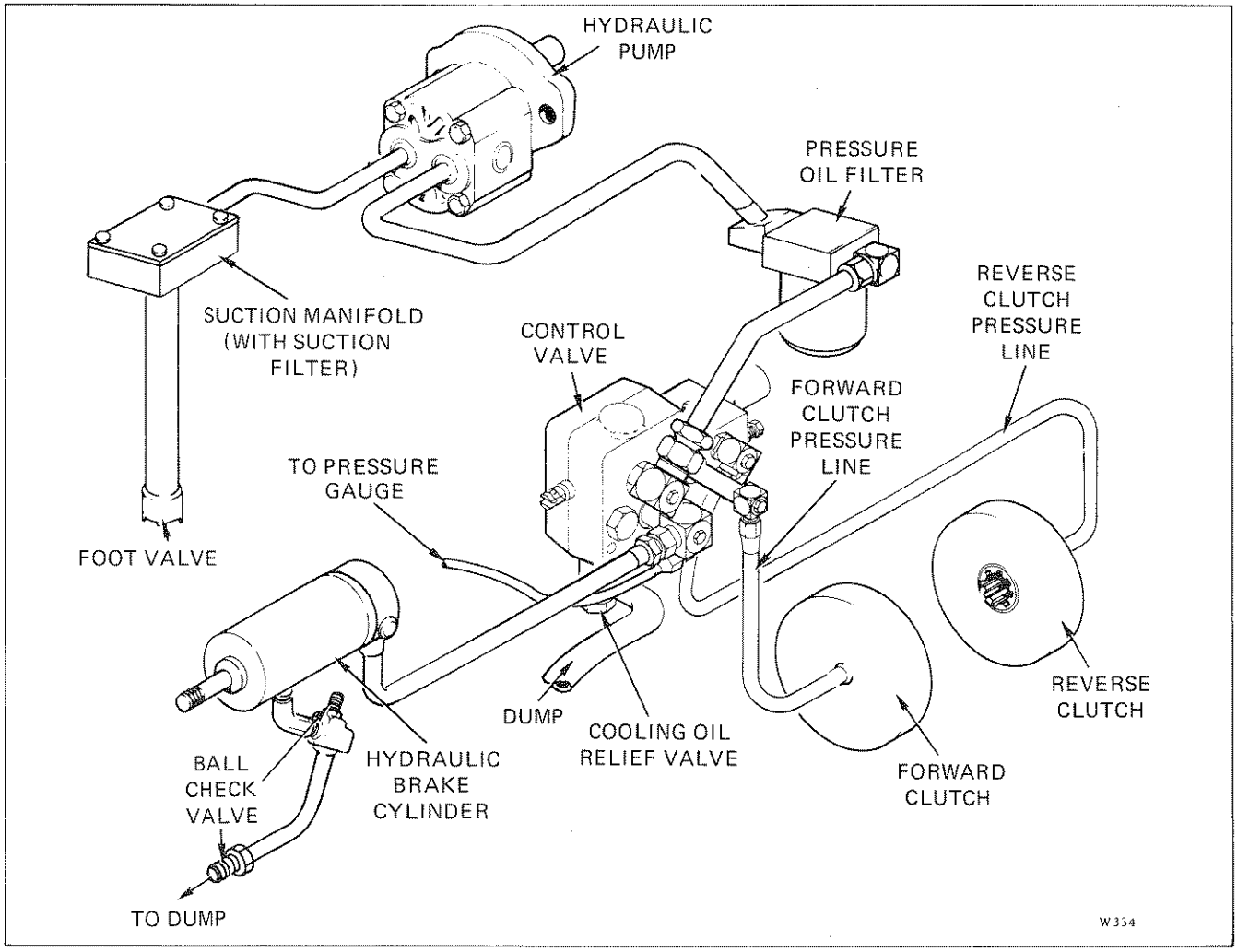


FIGURE 1-18. HYDRAULIC SYSTEM INTERCONNECTION DIAGRAM, POWER CONTROLLED WINCH

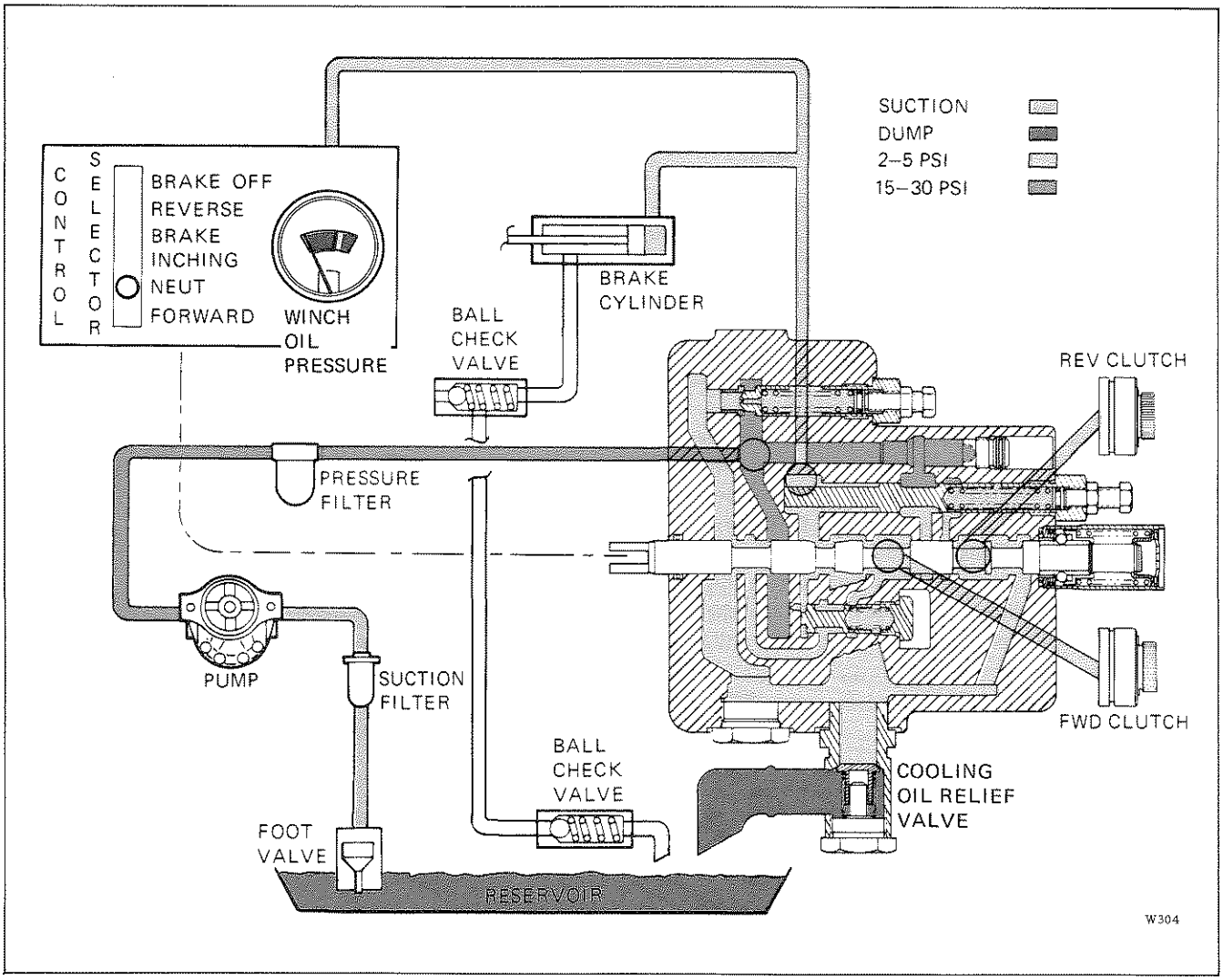


FIGURE 1-19. HYDRAULIC SYSTEM IN NEUTRAL

1-60. HYDRAULIC SYSTEM IN NEUTRAL. (See Figure 1-19.)

1-61. The control spool is connected to a cable to the control lever for operator control. A return spring moves the control spool and lever to the NEUTRAL position when the control lever is released. A detent will hold the control spool and the control lever in BRAKE OFF position. With the spool in the Neutral position, the hydraulic pump draws oil through the foot valve and suction filter, and delivers through the pressure filter to the control valve inlet port. The Neutral spool position allows the oil to flow through the open center valve, into the low pressure core passages, with only enough flow restriction to ensure that all cavities of the valve remain full while undergoing normal leakage rates. The only hydraulic work being done, other than maintaining leakage flow, is to open a spring loaded poppet in the cooling oil relief valve. This relief valve is located in the control valve dump port and opens when hydraulic pressure, in the working portion of the system, rises above 2 PSI (0.141 kg/cm^2). This pressure is not high enough to release the brake or actuate either oil clutch assembly but is adequate to lubricate an cool both clutches and keep the flow cavities full. The excess oil flowing past the open poppet is discharged directly to dump.

1-62. HYDRAULIC SYSTEM IN FORWARD. (See Figure 1-20.)

1-63. The system is placed in FORWARD (line in) by pulling the control lever all the way back to the Forward position. The control lever transmits this movement to the control spool in the control valve through the mechanical push-pull cable and the position is recognized by a stop without lock. With the spool in Forward position, the open center flow passage around the spool and the cooling oil (dump) ports is blocked. Pressure builds up rapidly in the control valve pressure inlet and forward overlap valve supply core passages. Oil flows from the inlet passage to the brake release port through an orifice. This orifice provides constant oil flow to the brake inching lands on the valve spool as the spool moves. As soon as oil pressure at the pilot end of the forward overlap valve spool rises above 20 PSI (1.408 kg/cm²), the spring-loaded spool will move, shunting high pressure oil directly from the forward overlap valve supply core passage to the forward clutch port passage where it is transmitted to the clutch for engagement pressure. The forward overlap valve assures that brake release pressure buildup leads the forward clutch engagement pressure build-up by 20 PSI (1.410 kg/cm²).

A second high-pressure oil supply to the forward clutch port passage is opened by the control valve spool during the final 20 percent of spool travel to the Forward position. At this point, high pressure oil from the forward clutch port bleeds through an orifice in the spring side of the forward overlap valve spool, balancing the pressure at the pilot end of the spool and returning the overlap valve to the off position. When the pressure starts to rise above 220 ± 5 PSI (15.468 ± 0.352 kg/cm²) in the control valve cavity at the inlet port, the excess pressure forces the spring loaded plunger in the relief valve off its seat and high pressure oil is bypassed to the forward dump passage, relieving the excess pressure. An orifice in the relief valve plunger tip dampens surges by allowing oil, trapped behind the plunger, to escape slowly. Some of the relief valve bypassed oil, and other leakage oil, in the low pressure passages is transmitted to the clutches for cooling and lubrication. If the back pressure of the excess oil exceeds 2 PSI (0.141 kg/cm²) it is discharged to dump by the cooling oil relief valve.

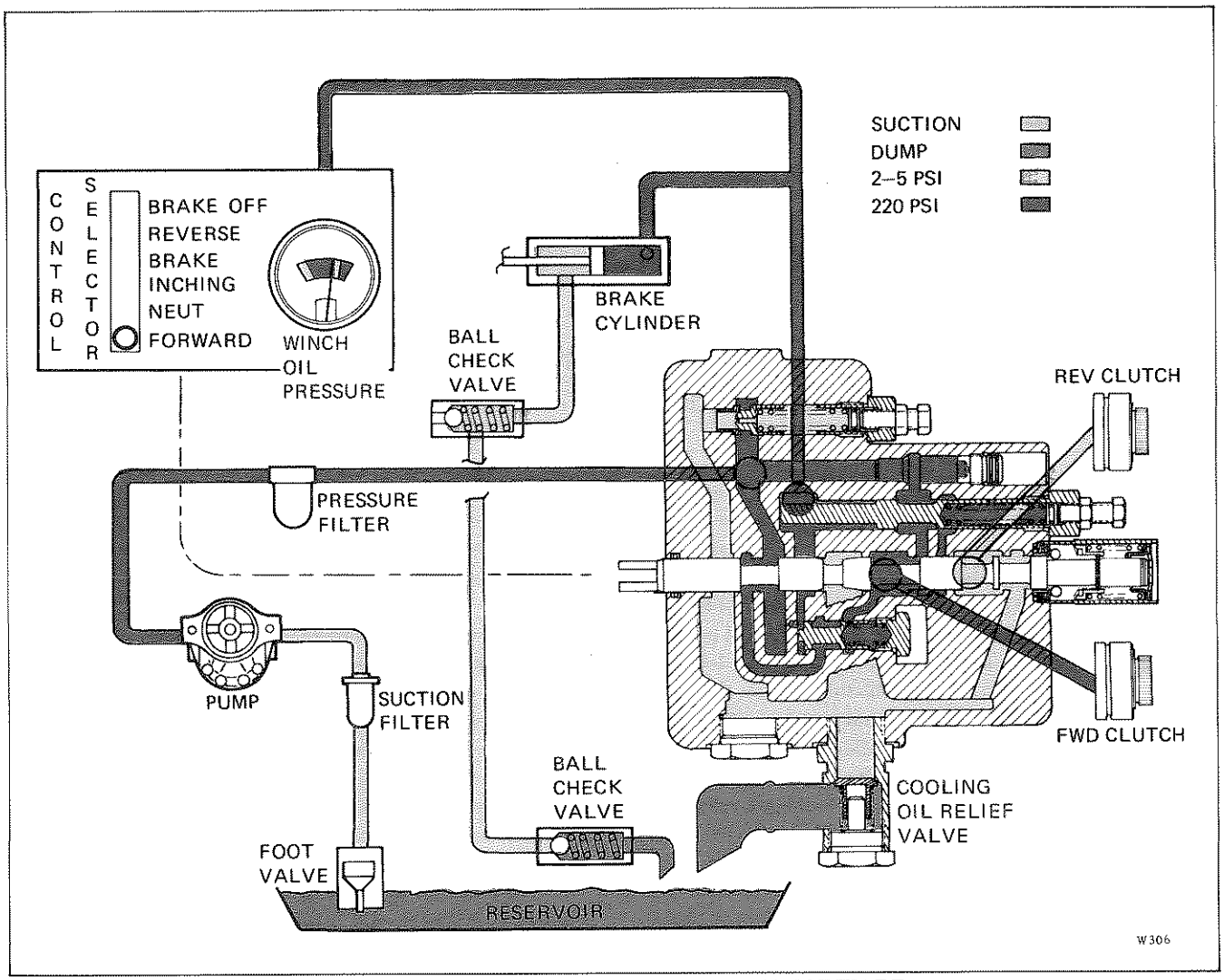


FIGURE 1-20. HYDRAULIC SYSTEM IN FORWARD

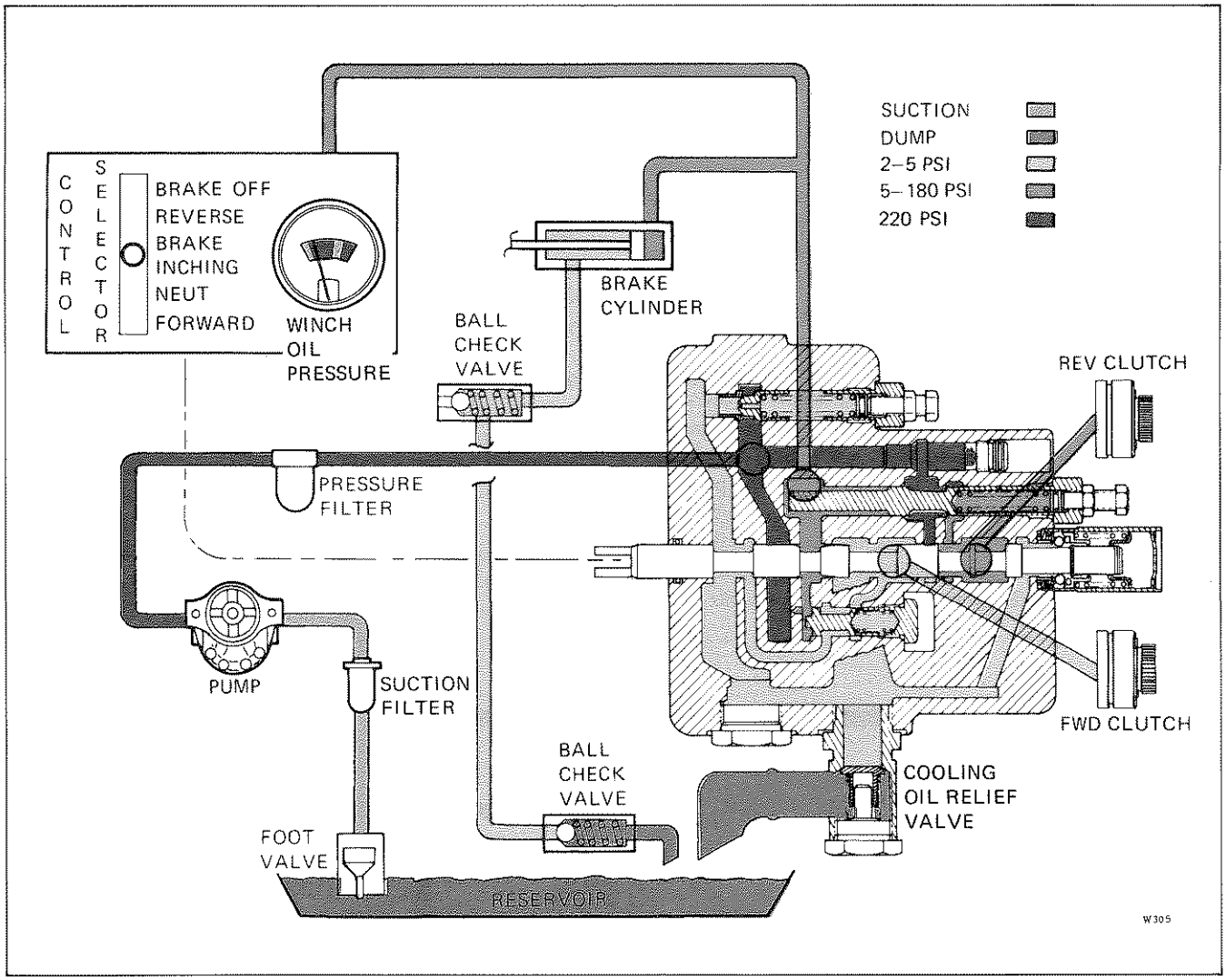


FIGURE 1-21. HYDRAULIC SYSTEM IN BRAKE INCHING

1-64. HYDRAULIC SYSTEM IN BRAKE INCHING. (See Figure 1-21.)

1-65. The system is placed in BRAKE INCHING (gradual brake release) by slowly pushing the control lever out of the Neutral position toward the Reverse position. The control lever transmits the movement to the control valve control spool by the mechanical push-pull cable. The hydraulic system flow conditions at the beginning of initiating brake inching are as described in Paragraph 1-61. As the control spool moves off the Neutral position, the open center flow passage around the spool and into the dump passage is blocked. As pressure builds up in the control valve inlet passage a restricted flow passes through an orifice to the brake release port. Pressure buildup is retarded by a restricted flow path to dump around tapered lands on the control spool. The farther the control moves away from Neutral, the more the tapered lands close off the flow path to dump and the higher the buildup of brake release pressure. When brake release pressure reaches approximately 120 PSI (8.437 kg/cm^2) the pressure is sufficient to shift the reverse overlap valve spool. This connects the brake release pressure port to the reverse clutch port. The reverse overlap valve assures that brake release pressure buildup leads the reverse clutch engagement pressure buildup by approximately 110 PSI (7.734 kg/cm^2). In this way, brake release is progressive and gradual with full release occuring only after positive reverse clutch engagement.

When pressure starts to rise above 220 ± 5 PSI (15.468 ± 0.342 kg/cm^2) in the control valve cavity at the inlet port, the excess pressure forces the spring-loaded plunger in the relief valve off its seat and high pressure oil is bypassed to the forward dump passage relieving the excess pressure. An orifice in the relief valve plunger tip dampens surges by allowing oil, trapped behind the plunger, to escape slowly. Bypassed oil from the relief valve mixes with other leakage oil and the combined flow is routed to the clutches for cooling and lubrication. Any excess flow opens the spring loaded cooling oil relief valve and is discharged directly to dump. This valve opens when the back pressure of the excess oil exceeds 2 PSI (0.141 kg/cm^2).

1-66. HYDRAULIC SYSTEM IN REVERSE. (See Figure 1-22.)

1-67. The system is placed in REVERSE (line out) by pushing the control lever to the Reverse position. The control lever transmits this movement to the control valve spool by the mechanical push-pull cable. With the control spool in the Reverse position, the open center passage around the spool and into the low-pressure passage is blocked. Pressure builds up rapidly in the control valve inlet passage and in the passage leading to a cavity just forward of the reverse clutch port. A space between lands on the control spool provides a passage between the two cavities so that high-pressure oil is routed to the reverse clutch.

Brake release pressure is built up down-stream of the orifice between the control valve inlet port and brake release port. During the final increment of spool travel, oil is routed around a spool land to the brake release port. A tapered land on the control spool prevents too rapid a pressure buildup. Pressure in the inlet port is regulated at 220 ± 5 PSI (15.468 ± 0.352 kg/cm²) by the control valve relief as described in Paragraph 1-63.

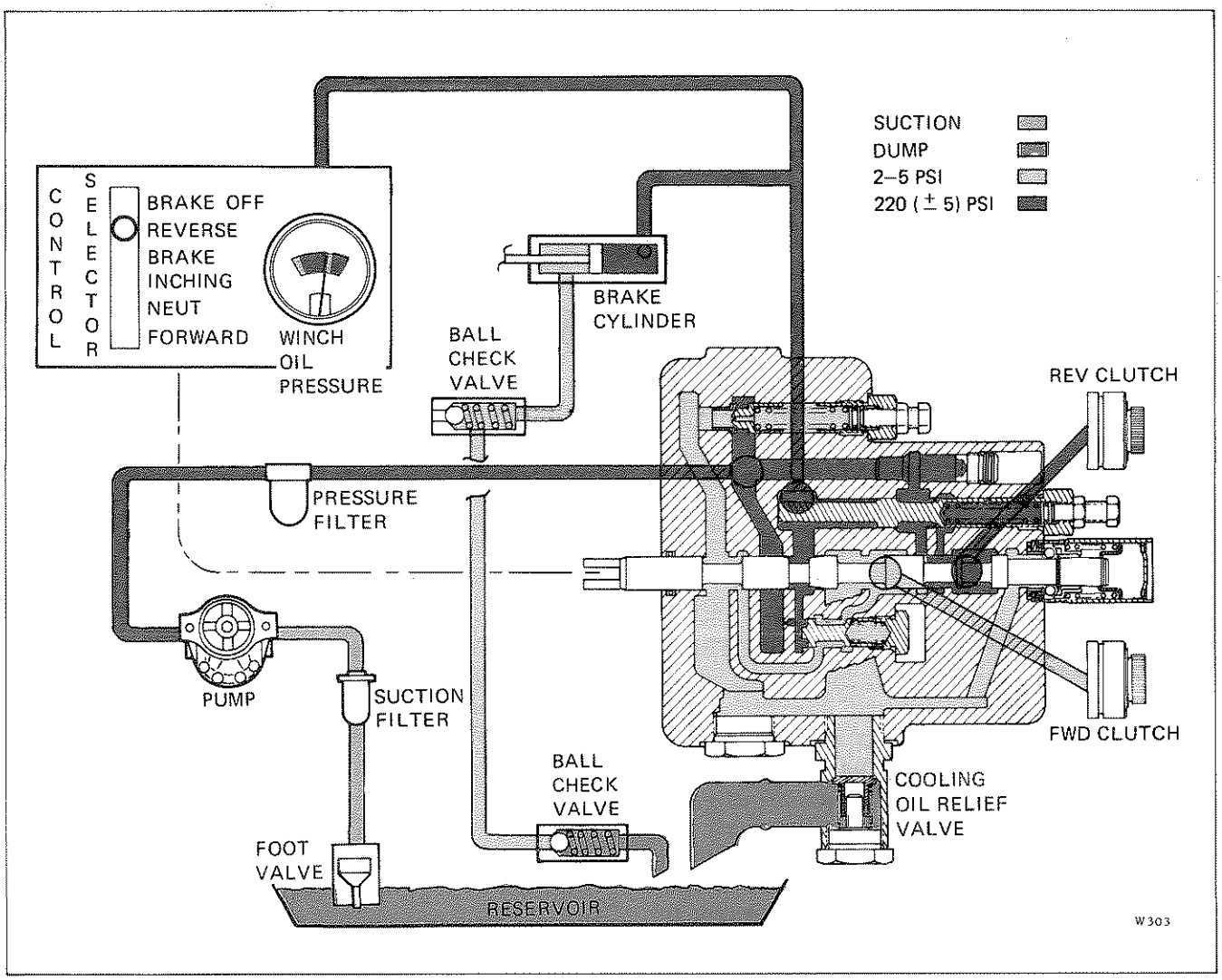


FIGURE 1-22. HYDRAULIC SYSTEM IN REVERSE

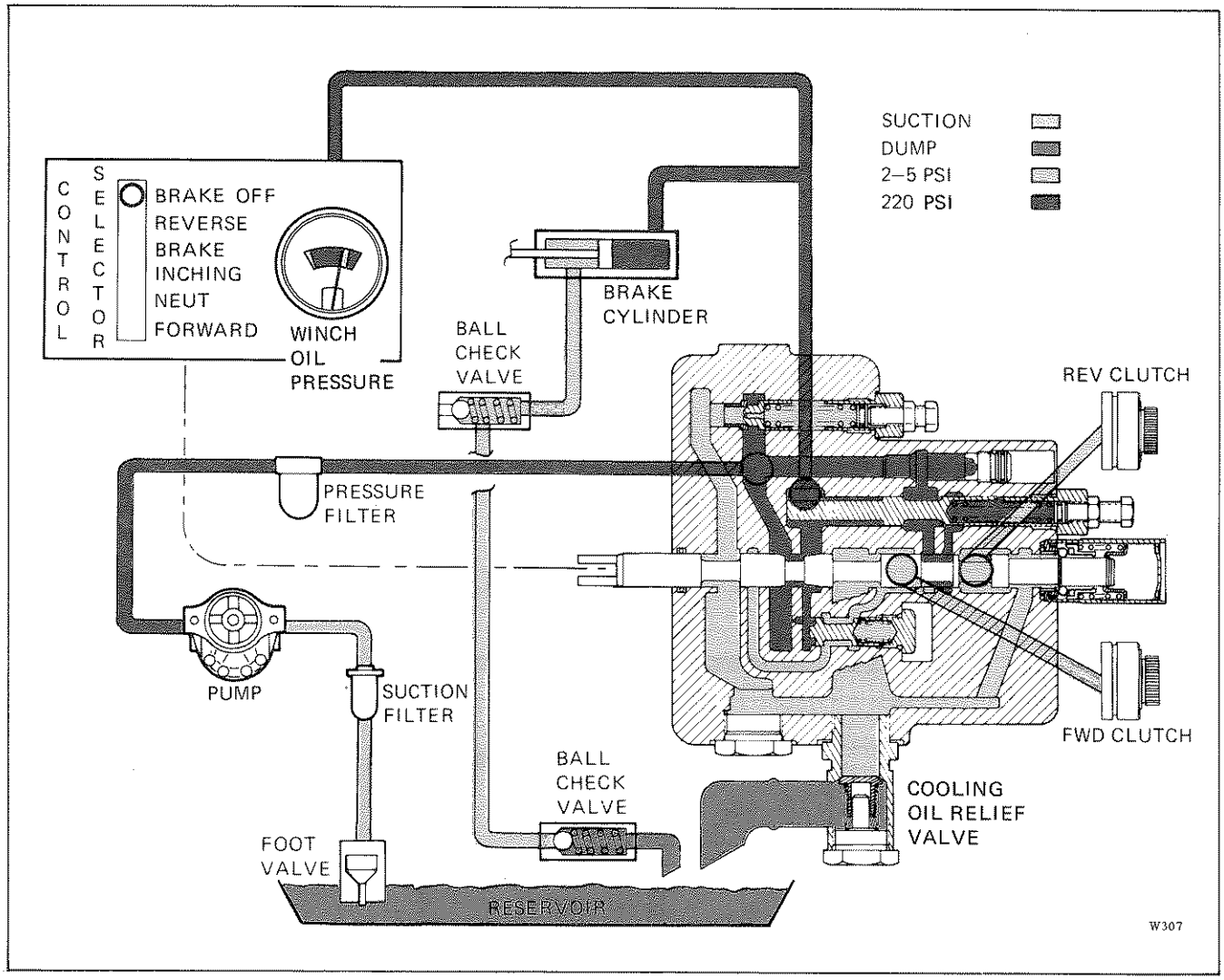


FIGURE 1-23. HYDRAULIC SYSTEM IN BRAKE OFF

1-68. HYDRAULIC SYSTEM IN BRAKE OFF. (See Figure 1-23.)

1-69. The system is placed in BRAKE OFF by pushing the control lever all the way away to the BRAKE OFF position. The control lever transmits this movement to the valve spool by the mechanical push-pull cable. The hydraulic flow conditions prior to initiating control lever movement are the same as in NEUTRAL or REVERSE. With the control spool in the BRAKE OFF position, all high pressure flow paths are blocked by the valve spool except the pressure flow path to the brake release port. Pressure increases rapidly in the brake port and oil pressure to the brake cylinder fully releases the brake. Oil is pushed out of the brake cylinder discharge end, by the brake piston, through the dump line, out the lower ball check valve, and into the center chamber sump. Release pressure is limited by the relief valve as described in Paragraphs 1-61 through 1-63. Some bypassed relief valve oil and other leakage oil is transmitted to the clutches for cooling and lubrication. Any excess flow opens the spring loaded cooling oil relief valve and is discharged directly to dump. This valve opens when the back pressure of the excess oil exceeds 2 PSI (0.141 kg/cm^2).

Operation in BRAKE OFF should be limited to avoid overheating the oil as the pump works against full output pressure in this position. The BRAKE OFF operation is not a true free-spool condition as it does not mechanically disengage the drum pinion gear.

2-1. GENERAL.

2-2. The W6E Direct Drive and Power Controlled winches use tractor mounted controls. These controls allow the operator to either pay-out or haul-in line easily without leaving the tractor. Every operator must know the exact operating procedure of these controls prior to operating the winch.

2-3. OPERATIONAL PRECAUTIONS.

2-4. Observe the following PRECAUTIONS to prevent injury to personnel and damage to equipment.

a. Report damage or erratic operation of winch or pressure gauge immediately.

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

c. Make sure that instruments and controls are operative before operating the unit.

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

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

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

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

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

i. Avoid operating near other personnel.

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

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

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

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

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

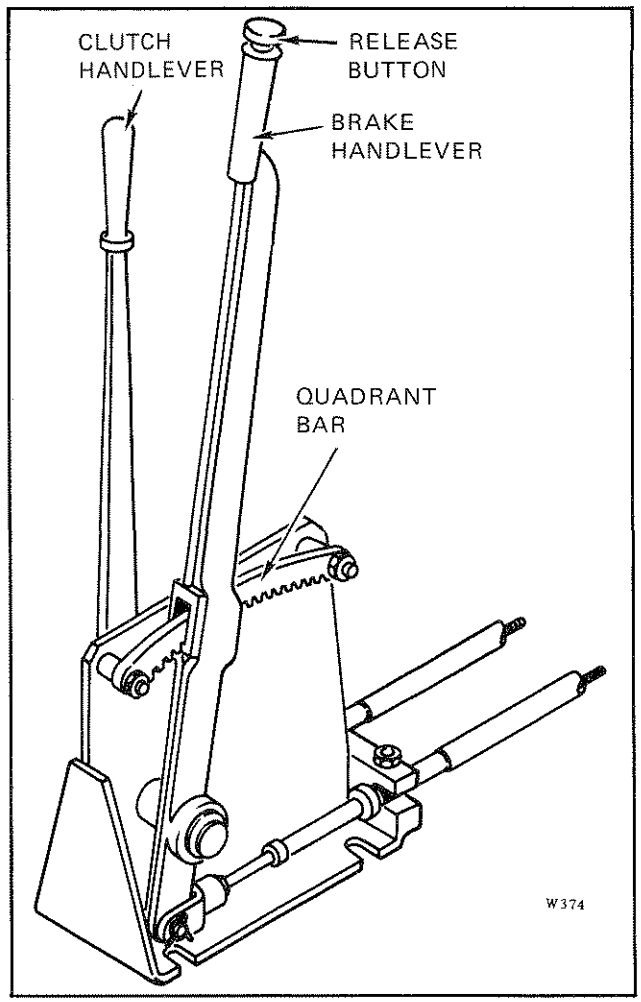


FIGURE 2-1. OPERATING CONTROLS FOR DIRECT DRIVE WINCH

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

p. Authorized operators only!

2-5. OPERATING PROCEDURES.

2-6. Direct Drive Winch. (See Figure 2-1.)

2-7. SETTING THE BRAKE. To set the brake, pull back on the Brake Handlever. The brake will remain in BRAKE APPLIED until manually moved.

2-8. RELEASING THE BRAKE. To release the brake, proceed as follows:

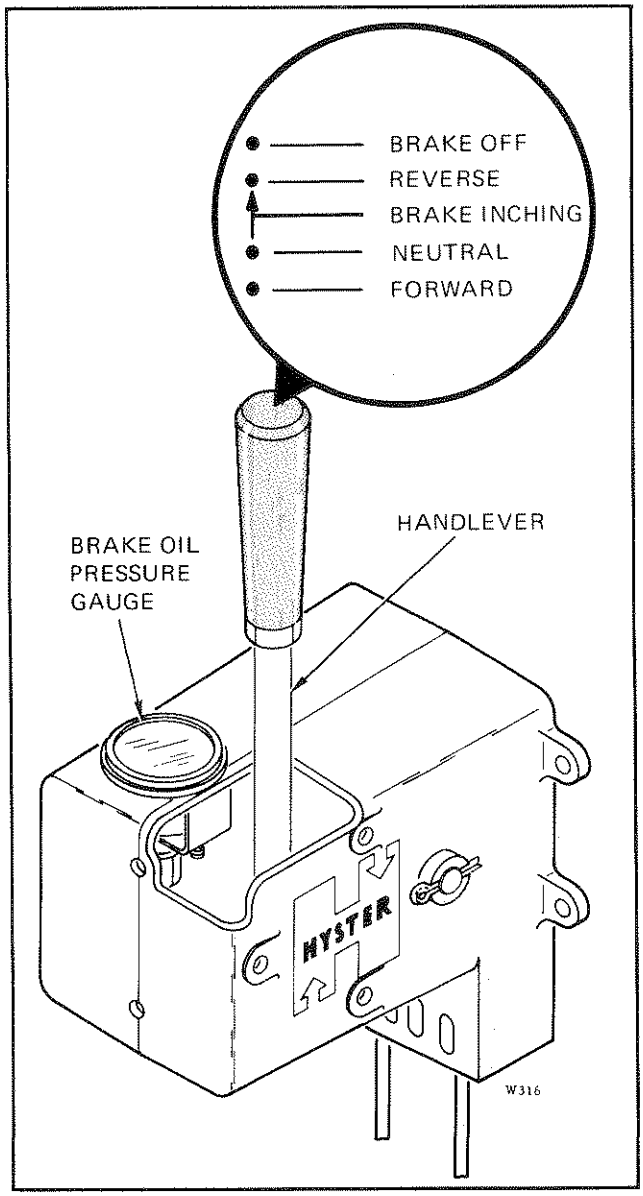


FIGURE 2-2. OPERATING CONTROL FOR POWER CONTROLLED WINCH

a. Pull back slightly on the Brake Handlever.

b. Depress the release button.

c. Push the Brake Handlever forward.

NOTE If the winch is equipped with the optional automatic brake (see Figure 1-5), the winch may haul-in line with the mechanical brake set, but the brake must be released to pay-out line.

2-9. HAULING-IN LINE. To haul-in line, proceed as follows:

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 (refer to Paragraph 2-8).

e. Engage the tractor master clutch.

NOTE Line speed is varied by throttling the tractor engine.

2-10. STOPPING THE WINCH. To stop the winch, proceed as follows:

a. Throttle down the engine.

b. Disengage the tractor master clutch and apply the brake 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.

2-11. PAYING-OUT LINE UNDER POWER. To pay-out line under power, proceed as follows:

a. Disengage the tractor master clutch.

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

c. Release the brake (refer to Paragraph 2-8).

d. Engage the master clutch.

NOTE Line speed is varied by throttling the engine.

2-12. SHIFTING TO NEUTRAL. To shift to NEUTRAL, proceed as follows:

a. Disengage the tractor master clutch.

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

CAUTION Do not operate the winch while the tractor is in motion.

2-13. Power Controlled Winch. (See Figure 2-2.)

2-14. A single control lever is used to select any one of five modes of operation: NEUTRAL, FORWARD (line in), BRAKE INCHING (gradual brake release), REVERSE (line out) and BRAKE OFF (semi-free-spooling). To operate the winch, proceed as follows:

a. NEUTRAL. The control lever is spring-centered to NEUTRAL and will remain in this position until moved by hand. The control lever will automatically return to NEUTRAL from any position, except BRAKE-OFF. In NEUTRAL, the brake is fully applied. The winch brake oil pressure gauge will be in the lower green zone.

b. FORWARD. Pull the control lever all the way to the left (toward the operator) to the FORWARD position and hold. In FORWARD, the brake is completely released, the forward clutch engaged, and the drum will haul-in line at a rate dependent on load and tractor engine speed. The winch brake oil pressure gauge will be in the upper green zone. Inching is available by varying the control lever position between NEUTRAL and FORWARD.

CAUTION Do not stall the tractor converter for prolonged periods of time.

c. BRAKE INCHING. The BRAKE INCHING position is useful where a fine control for paying-out line is required. Ease the control lever slowly away from the operator through the BRAKE INCHING band shown on the decal. This will gradually release the brake. As the brake nears the release point, the tractor torque converter and winch reverse clutch will assume control of the load to inch line out under power. The winch brake oil pressure gauge will rise from the lower green zone, pass through the red zone, and remain in the upper green zone as the control lever approaches REVERSE.

NOTE For optimum BRAKE INCHING, the oil temperature should be approximately 150°F.

d. REVERSE. Push the control lever away from the operator until a stop is felt. Hold in this position.

WARNING Do not force the lever past the stop. This will place the winch in the BRAKE OFF detent, resulting in possible uncontrolled line pay-out.

In REVERSE, the brake is completely released, the reverse clutch engaged, and the drum will pay-out line. The winch brake oil pressure gauge will rise quickly through the red zone to the upper green zone. The reverse modulation is bypassed.

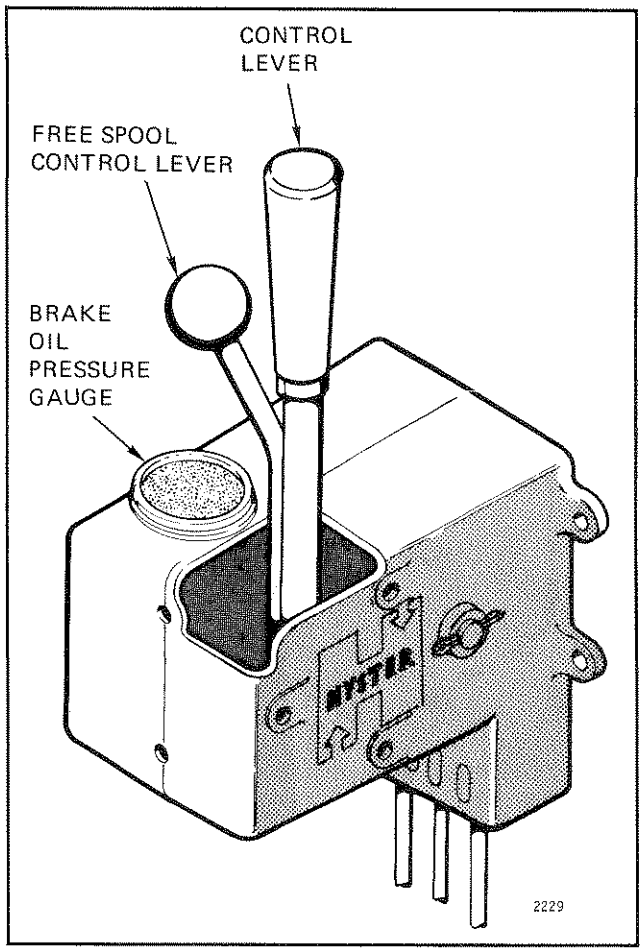


FIGURE 2-3. FREE-SPOOL CONTROL FOR POWER CONTROLLED WINCH

e. BRAKE OFF. Push the control lever all the way away from the operator into the BRAKE OFF detent position. The control lever will remain in this position until manually pulled out of detent. The BRAKE OFF position allows the operator to drive ahead with the tractor and unwind cable. The winch brake oil pressure gauge will be in the upper green zone.

CAUTION Do not operate winch for extended periods of time in the BRAKE OFF position. Overheating may result due to the hydraulic pump working continuously at full pressure output.

2-15. Optional Free-Spooling.

2-16. The optional FREE-SPOOL arrangement allows cable to be payed-out by hand. An additional control lever on Power Controlled winches (see Figure 2-3) is attached

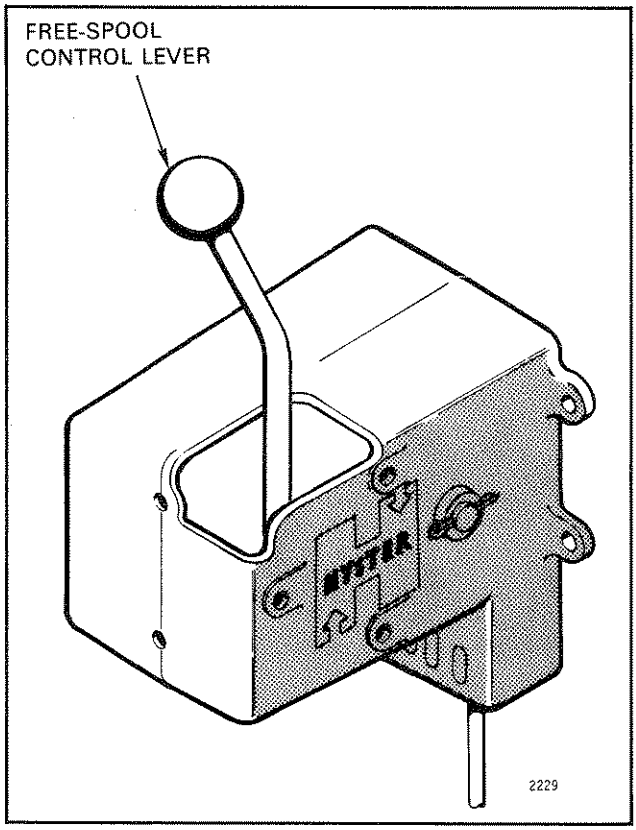


FIGURE 2-4. FREE-SPOOL CONTROL FOR DIRECT DRIVE WINCH

to the control lever assembly to control FREE-SPOOL operation. Direct Drive winches use a separate, single lever control assembly (see Figure 2-4) 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. FREE-SPOOL drag is determined by varying the shim pack under the intermediate shaft retainer. See Parts-Service Gram A4-Z-8 for improved parts.

3-1. GENERAL.

3-2. Tables 3-1 through 3-3 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 3-1 applies to the Direct Drive winch. The information contained in Table 3-2 applies to the Power Controlled winch. Table 3-3 applies to both the Direct Drive and Power Controlled winches equipped with optional free-spool.

TABLE 3-1. TROUBLE ANALYSIS CHECK CHART FOR DIRECT DRIVE WINCH (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 Paragraph 4-9.
	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Dental clutch too tight on hubs 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 fork so anchored end faces toward the center of the winch.

TABLE 3-1. TROUBLE ANALYSIS CHECK CHART FOR DIRECT DRIVE WINCH (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 each day if necessary.
	Brake lining saturated with oil.	Replace lining, clean brake wheel and adjacent surfaces. Locate and eliminate source of oil contamination.
	Improper clearance between brake band assembly and brake wheel.	Check that clearance is approximately 1/32-inch (0.7937 mm). Refer to Paragraph 4-13.
	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 Paragraph 4-14.
	Brake control cable assembly not anchored securely.	Check for loose connection of control cable housing to the: a. Handling Gear 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 for overwind operation and winch is used for underwind operation.	Change linkage for underwind operation. Refer to Paragraph 4-19.
	Brake linkage set for underwind operation and winch is used for overwind operation.	Change linkage for overwind operation. Refer to Paragraph 4-15.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 1 of 5)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Erratic Operation	Low oil level.	Add oil as necessary. Refer to Table 4-1.
	Pump cavitating due to air leaks in hydraulic system.	Check the following for air leaks: a. Suction manifold cover gasket. b. Suction manifold cover screw tightness. c. Suction hose to manifold connection. d. Suction hose to pump connection. e. Suction hose for cracks or collapsed condition. f. Suction manifold pick-up tube weld connection to manifold. g. Pump shaft seal. **CAUTION** Use only Hyster Approved gaskets and hoses.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 2 of 5)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Erratic Operation (Cont.)	Stuck or clogged suction foot valve.	Clean foot valve and remove restriction.
	Push-pull cable out of adjustment.	Check for proper adjustment as outlined in Paragraph 4-27. Adjust if necessary. Double check push-pull cable housing to be sure it is securely anchored on both ends.
	Tractor engine idling too low.	Adjust to correct idle RPM.
	Oil viscosity too high.	Drain oil and refill with specified hydraulic oil. Refer to Table 4-1.
	Oil too cold.	Allow oil to warm before operating the winch.
	Low oil pressure.	Refer to LOW OIL PRESSURE troubleshooting procedures.
Low Oil Pressure	Refer to ERRATIC OPERATION trouble shooting procedures.	
	Leaking pressure hoses and fittings.	Check for leaks and replace components where necessary.
	Defective or improperly adjusted relief valve.	Check relief valve setting with pressure gauge as outlined in Paragraph 4-25. Replace Relief Valve Assembly if defective.
		NOTE Do not rely on brake release pressure gauge when adjusting relief pressure. Always use a calibrated gauge.
	Brake Oil Pressure Gauge defective.	Check gauge reading against a calibrated gauge. Replace if gauge is faulty.
	Internal slippage (leakage) in hydraulic pump.	Check pump for pressure output only after all the above checks have been made. If pump is at fault, remove and replace.
Brake Not Releasing	Refer to LOW OIL PRESSURE troubleshooting procedure.	
	Cover plate capscrew too long. (These capscrews will jam against brake lever assembly.)	Remove and replace with correct capscrew.
	Rusted or corroded linkage and pins.	Clean and replace as necessary.
	Brake cylinder damaged or piston ring worn.	Repair or replace as necessary.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 3 of 5)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Brake Slipping	Water in brake compartment resulting from condensation or marine use.	Drain water from brake compartment each day if necessary.
	Brake lining saturated with oil.	Replace lining, clean brake wheel and brake compartment, locate source of oil leakage and repair leak. Refer to OIL IN BRAKE COMPARTMENT trouble.
	Broken springs.	Replace with new springs. See Figure 5-2.
	Hydraulic brake cylinder piston bottoming in cylinder.	Adjust as necessary. Refer to Paragraph 4-29.
	Improper clearance between brake band assembly and brake wheel.	Check that clearance is approximately 1/32-inch (0.7937 mm). Refer to Paragraph 4-30.
	Worn brake lining.	Replace with new lining.
	Brake linkage set for overwind operation and winch is used for underwind operation.	Change linkage for underwind operation. Refer to Paragraph 4-19.
	Brake linkage set for underwind operation and winch is used for overwind operation.	Change linkage for overwind operation. Refer to Paragraph 4-15.
Oil in Brake Compartment	Worn brake shaft seal.	Replace seal and check brake shaft preload to prevent re-occurrence.
	Bevel gear shaft or brake shaft retainer capscrews leaking.	Remove capscrews and coat with sealing compound.
	Ball check connectors (valves) are malfunctioning.	Replace valves as necessary. **CAUTION** Upper ball check must point up with pipe thread end installed in fitting and straight thread end out.
	Brake cylinder packing worn or damaged.	Replace packing as necessary.
	Oil leaking from control valve, pressure filter, cooling oil relief valve, brake cylinder, or associated fittings and hoses.	Repair leaks or replace components as necessary in brake compartment.
Overheating	Operating in BRAKE-OFF too long.	Position handlever in NEUTRAL when free spool condition is not required. In BRAKE-OFF, pump continually works against high pressure relief.
	Spool travel improperly adjusted.	Check and adjust as necessary. Refer to Paragraph 4-26.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 4 of 5)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Overheating (Cont.)	Excessive inching.	Allow oil to cool periodically. **NOTE** Install heat exchanger if excessive inching is necessary.
	Defective clutch cooling oil valves.	Replace valve. See Figure 5-6, step 6.
	Plugged suction or pressure filter.	Remove suction filter, clean, and replace. See Figure 5-20.
	High cooling oil pressure.	Check cooling oil pressure. Replace cooling oil relief valve assembly if reading is over 7 PSI (0.493 kg/cm^2) at the forward or reverse port. See Figure 5-10.
	Insufficient Clutch Assembly clearance.	Adjust to correct clearance. See Figure 5-12, step 10.
	Check causes listed above.	Check all points listed above.
Variation of Pressure Between Ports	Control valve spool travel improperly adjusted.	Check spool for correct travel. Refer to Paragraph 4-26.
	Broken cast iron seal ring on the bevel gear shaft.	Replace: a. Left-hand seal ring if low pressure is indicated when handlever is shifted to FORWARD. b. Right-hand seal ring if low pressure is indicated when handlever is shifted to REVERSE. **NOTE** A broken seal ring is the most common cause of a pressure differential between the two clutches. Check preload on bevel gear shaft and adjust if necessary to prevent additional breakage of seal rings. See Figure 5-17.
	Damaged bevel gear shaft seal ring grooves.	Check grooves for taper, scoring, and rust. Replace shaft if surfaces between the inner side of groove and seal ring are not flat.
	Damaged bevel gear shaft bearing retainers.	Check retainers for gooves, scoring, and rust. Replace retainers if found defective.
	Defective spline seals on the bevel gear shaft.	Always replace these seals when the bevel gear shaft has been removed. See Figure 5-17, step 7.
	Damaged clutch piston retainer or 0-rings.	Check piston retainer cavity for damage. Replace if scored or broken. Always replace both 0-rings when clutch is repaired. See Figure 5-12, step 1.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 5 of 5)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Brake Releases Before Clutch Engagement	Overlap valves in control valve not functioning or out of adjustment.	Check overlap valve springs. On reverse (line out), check adjustment of reverse overlap valve (refer to Paragraph 4-25).
High Oil Level	Engine oil transferring past pump shaft seal into winch hydraulic system (Allis Chalmers HD-11B tractor only).	Replace pump shaft seal. Refer to Section 6.

TABLE 3-3. TROUBLE ANALYSIS CHECK CHART FOR FREE-SPOOL OPTION

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hard to shift	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Shifting collar too tight on splines or splines rough.	Remove shifting collar, dress splines with fine stone, and replace parts if necessary.
	Dental clutch installed backwards.	Install clutch so that chamfered ramp will face drum pinion gear. See Figure 5-15.
Jumps Out of Gear	Control linkage improperly adjusted.	Check and adjust as necessary.
	Worn shifter fork.	Replace shifter fork and related parts as necessary.
	Worn drum pinion gear bushing.	Replace bushing and related parts as necessary.
	Detent ball and spring loose, damaged, or sticking.	Clean or replace as necessary.
Winch Will Not Free-Spool	Linkage improperly adjusted.	Check and adjust as necessary.
	Intermediate shaft assembly damaged, rusted, or pre-loaded.	Adjust or repair as necessary.
	Drum shaft assembly damaged, rusted, or binding.	Adjust for repair as necessary.

SERVICE INSTRUCTIONS

4-1. GENERAL.

4-2. This section contains instructions for performing SafeGuard Maintenance, adjustment of control linkage and the hydraulic system, and for unit painting. All instructions given in this section may be performed using standard shop tools. No special tools are required.

4-3. SafeGuard MAINTENANCE.

4-4. SafeGuard Maintenance is a planned maintenance program which includes periodic inspection and lubrication. SafeGuard Maintenance should be correlated closely with the operating hours recorded on the tractor SERVICE METER.

4-5. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE. (Refer to Table 4-1.)

4-6. 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 4-1. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 1 of 3)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	2000/ 1 yr	QUAN.	TYPE	PROCEDURE
4-1	Oil Level (Direct Drive)		✓		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 at level plug Ⓐ on right side of winch. Add oil as required at plug Ⓑ. Drain oil at plug Ⓒ. **NOTE** When checking winch oil level on winches mounted on powershift tractors, stop engine to obtain correct reading. For winches mounted on direct drive tractors, disengage tractor master clutch to obtain correct reading. **CAUTION** If winch is new or overhauled, drain after 50 hours of operation, then flush, refill, replace pressure filter element, and service suction filter.
4-1	Oil Level (Power Controlled)		✓		CHANGE		12 Gals. (45.42 lts.)	10 wt - Series 3 for temperatures above -10°F. SAE 5W, MIL-L-2104B, or MIL-L-45199 Series 3, for temperatures -10°F and lower.	
4-1	Transmission Compartment		✓				Variable	**NOTE** Water and/or oil may accumulate in transmission compartments.	Loosen plug Ⓔ and drain any accumulation of water in transmission compartment. Tighten plug Ⓔ when oil appears.
4-1	Brake Compartment		✓				None	None	Loosen plug Ⓓ and drain any accumulation.

TABLE 4-1. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 2 of 3)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	2000/ 1 yr	QUAN.	TYPE	PROCEDURE
2-1 2-2 2-3	Handling Gear	✓					Few drops	SAE 30.	Lubricate fulcrum pin connections and other moving parts at end of each eight hour shift.
4-1 4-2	Suction Filter (Power Controlled Only)			SERVICE			One	Refer to Parts Manual.	Remove suction filter ⑮, clean thoroughly, and reinstall. **CAUTION** If winch is new or overhauled, remove suction filter ⑮ after first 50 hours of operation, clean thoroughly and reinstall. **CAUTION** Suction manifold cover gasket must be in good condition to prevent air leaks. Replace with Hyster approved gasket.
5-2 5-28	Suction Hose Clamps (Power Controlled Only)		✓						Check both ends of suction hose to see that hose clamps are TIGHT. Retighten hose clamps as necessary.
5-2	Control Cables		✓						Check both ends of each cable housing to see that they are securely anchored. Retighten set screw, U-bolt, or bracket bolt as applicable. Check winch end of power control cable for condition of roll pin anchor.
4-1	Automatic Brake (Optional, Direct Drive Only)				SERVICE			High temperature grease as follows: Atlantic Richfield (Thermogrease) Mobil Oil (Mobil-temp Grease #1) Shell Oil (Darina Grease 1)	Remove automatic brake assembly. Disassemble and clean automatic brake assembly components ⑰. 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

TABLE 4-1. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 3 of 3)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	2000/ 1 yr	QUAN.	TYPE	PROCEDURE
	Automatic Brake (Optional, Direct Drive Only) (Cont.)				S E R V I C E			Standard Oil (Chevron Industrial grease Texaco (Thermatex EP #1) Union Oil (Strona HT-1) Sun Oil (Sunaplex 991 EP) BP Australia (Energrease HTB2)	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.
4-1	Cable Guide Rolls (Optional)	✓						Multi-purpose Grease	Lubricate two grease fittings Ⓖ.
4-1	Fairlead (Optional)	✓						Multi-purpose Grease	Lubricate six grease fittings Ⓗ.
4-1	Swiveling Drawbar (Optional)	✓						Multi-purpose Grease	Lubricate grease fitting.
4-1 4-2	Pressure Filter (Power Controlled Only)			C H A N G E			One	Refer to Parts Manual.	Replace with Hyster approved filter element Ⓙ. Coat O-ring and backup ring with multi-purpose grease to ensure a leak proof seal between filter and case.
5-17 (Step 17)	Bevel Gear Shaft Locknut					✓		Refer to Parts Manual if necessary to replace lockwasher.	Pry lockwasher tangs away from locknut flats and retighten locknut to 200 ft-lbs. (27.66 kg-m) torque. Bend lockwasher tangs over locknut flats.

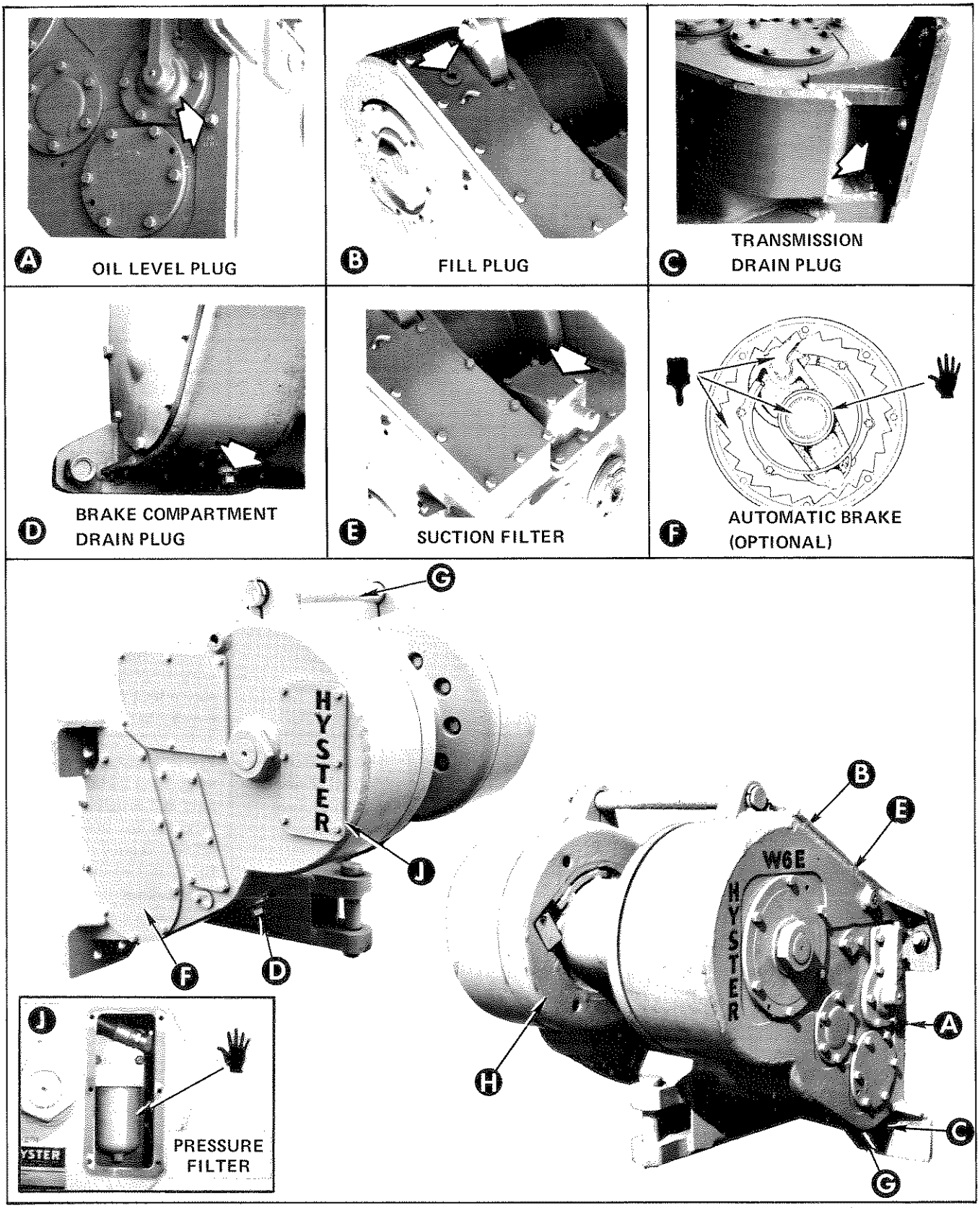
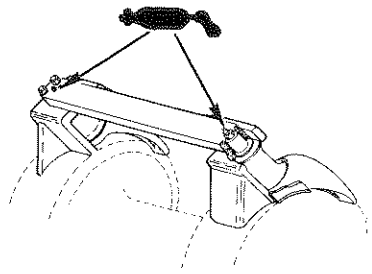
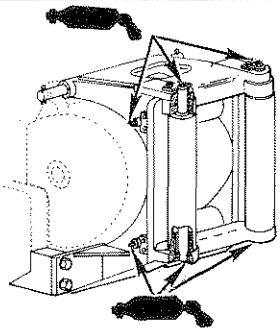


FIGURE 4-1. SafeGuard MAINTENANCE DIAGRAM (Sheet 1 of 2)



Ⓖ CABLE GUIDE ROLLS (OPTIONAL)



Ⓗ FAIRLEAD (OPTIONAL)

FIGURE 4-1. SAFEGUARD MAINTENANCE DIAGRAM (Sheet 2 of 2)

4-7. ADJUSTMENT PROCEDURES.

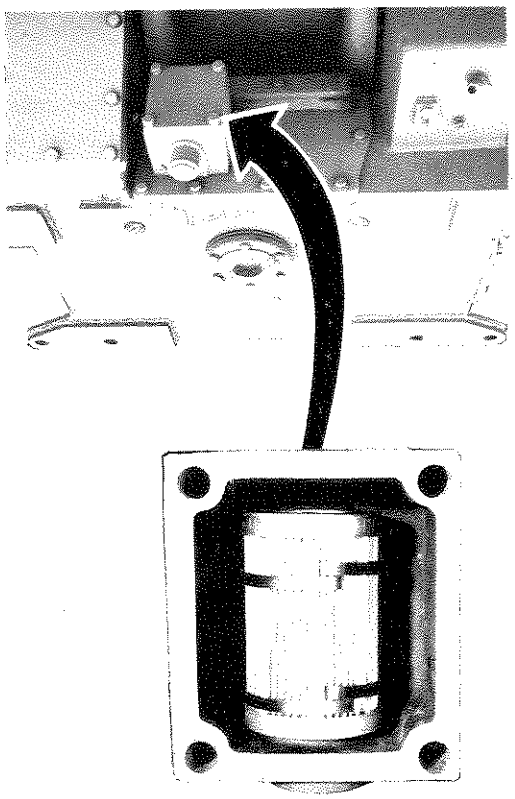
4-8. Adjustment procedures for the Direct Drive Winch are limited to minor mechanical linkage adjustments. The Power Controlled Winch requires mechanical adjustments plus hydraulic system adjustments.

4-9. Direct Drive Winch Adjustments.

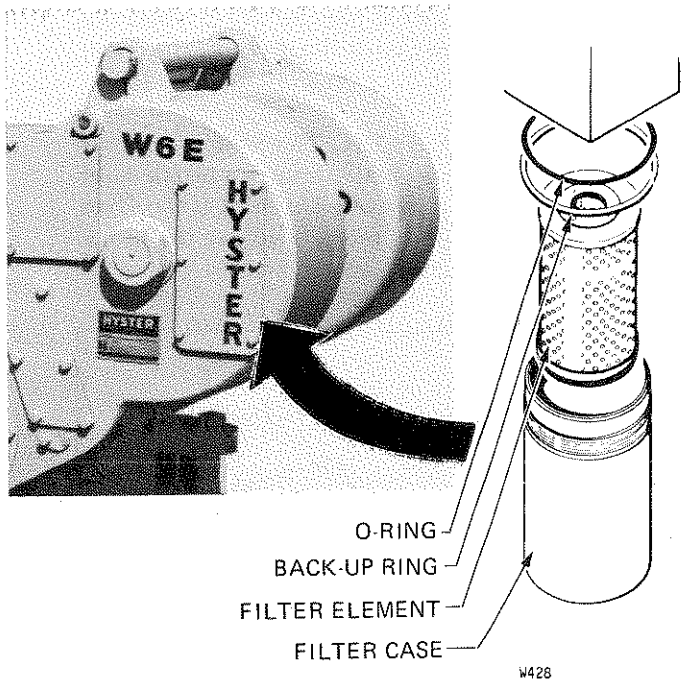
4-10. The handling gear that controls the operation of the Direct Drive Winch is mounted to the floor plate at the front, left-hand side of the operator's seat. The linkage connecting the handlevers to the clutches and brake will periodically require minor adjustments.

4-11. ADJUSTING CLUTCH HANDLEVER. The Clutch Handlever (see Figure 2-1) controls the dental clutches through a plastic-lined control cable. The shifter assembly will shift the dental clutches into Forward, Neutral and Reverse positions when the control cable-to-clutch handlever is properly adjusted. To adjust the position of the clutch handlever, proceed as follows:

a. Remove the transmission cover and place the shifter



SUCTION FILTER



PRESSURE FILTER

FIGURE 4-2. SUCTION AND PRESSURE FILTERS, POWER CONTROLLED WINCH

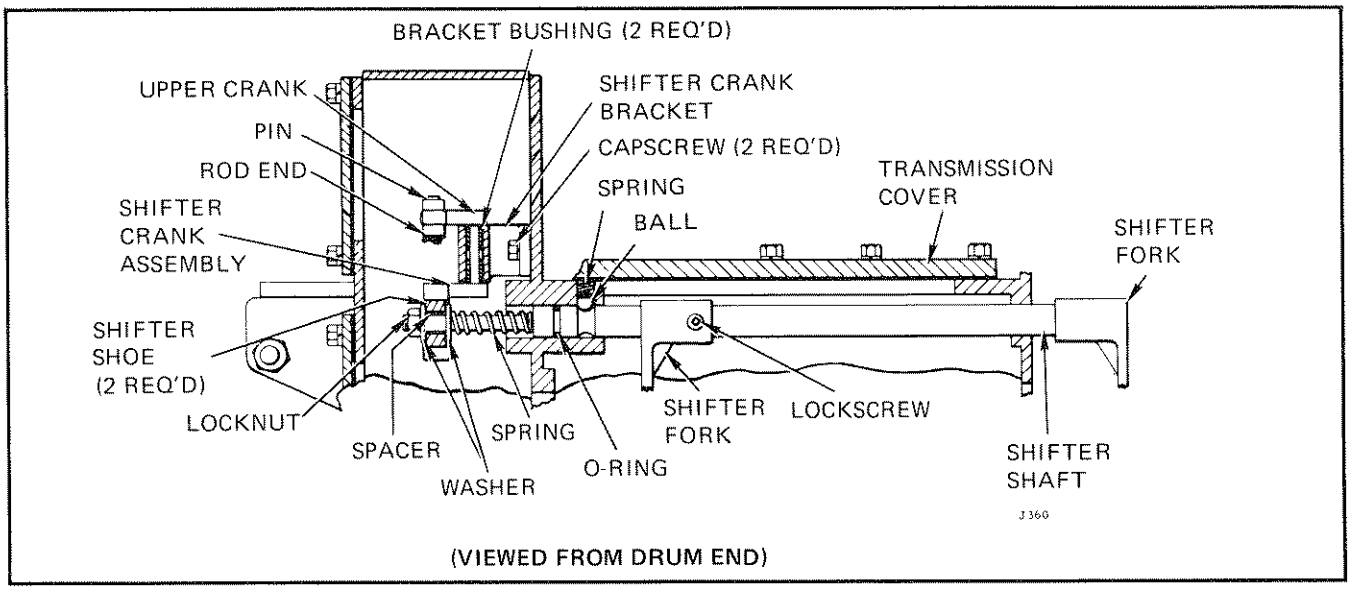


FIGURE 4-3. SHIFTER ARRANGEMENT, DIRECT DRIVE WINCH

assembly in Neutral (see Figure 4-3). The shifter linkage will positively detent to this position.

b. Adjust the control cable rod ends as necessary to place the Clutch Handlever vertical and in the center of travel when shifter assembly is in Neutral.

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

4-12. ADJUSTING THE BRAKE. The Brake Handlever (see Figure 2-1) controls the brake through a plastic-lined control cable (identical to the clutch control cable). Two adjustments are required to properly adjust the brake. Refer to Paragraphs 4-13 and 4-14.

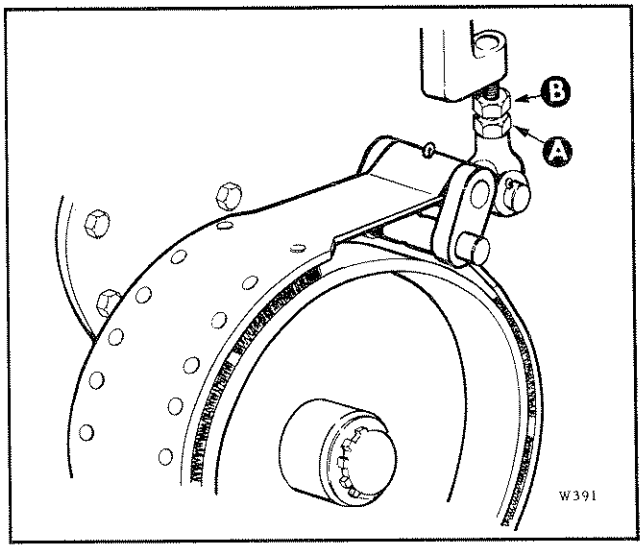


FIGURE 4-4. BRAKE BAND ADJUSTMENT DIAGRAM, DIRECT DRIVE WINCH

4-13. BRAKE BAND ADJUSTMENT. (See Figure 4-4.) To adjust the brake band, proceed as follows:

a. Remove the small brake cover from the left-hand side of the winch.

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

c. Loosen jam nut Ⓐ.

d. Turn adjusting link Ⓑ 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 Ⓐ.

f. Replace the brake cover.

4-14. BRAKE HANDLEVER ADJUSTMENT. (See Figure 4-5.) To adjust the positioning of the Brake Handlever, proceed as follows:

a. Adjust the brake band. (Refer to Paragraph 4-13.)

b. Loosen cable rod end jam nut.

c. Adjust the control cable at the winch control housing end until dimension Ⓐ is obtained (distance between the cable end and the centerline of the rod end pin).

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

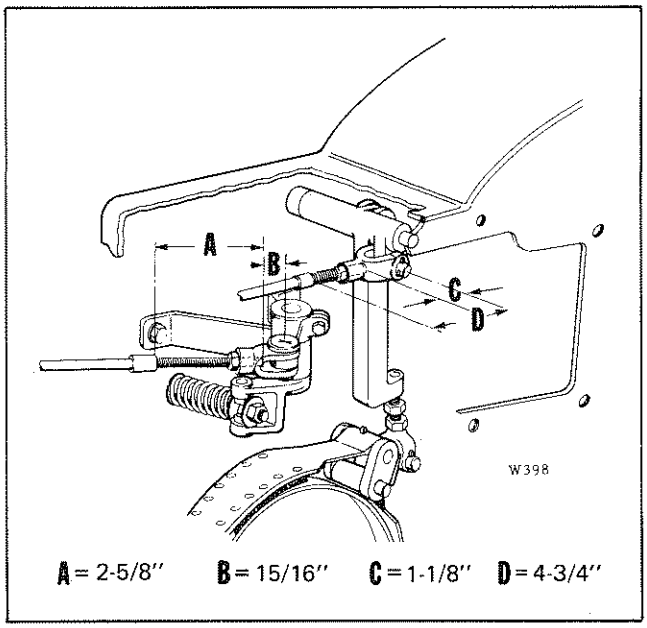


FIGURE 4-5. ADJUSTMENT OF BRAKE LINKAGE, DIRECT DRIVE WINCH

end (see Figure 2-1) until dimension Ⓑ, Figure 4-5, is obtained.

4-15. OVERWIND ADJUSTMENT PROCEDURE. When the cable passes over the top of the drum during forward rotation, the drum is said to be overwinding. Unless otherwise specified, the winch is set to overwind at the factory. The bevel gear shaft assembly, brake assembly, and drum assembly must be rearranged when using an original underwind winch for overwind operation (refer to Paragraphs 4-16 through 4-18).

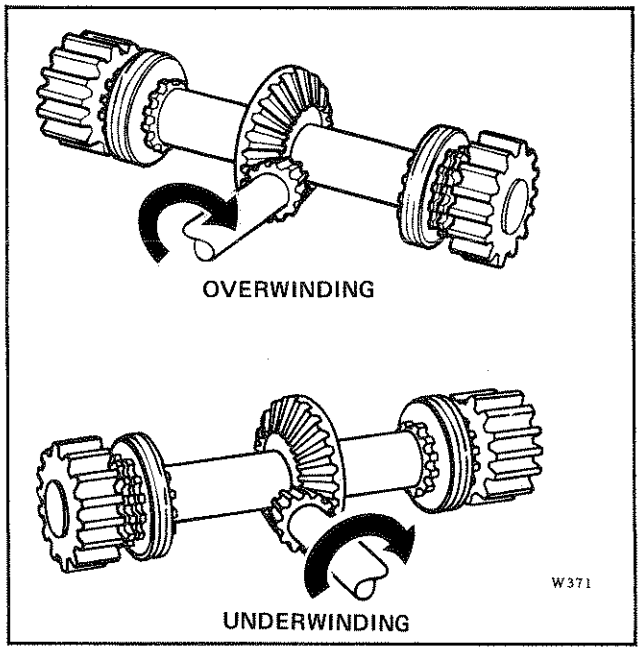


FIGURE 4-6. BEVEL GEAR SHAFT OVERWIND AND UNDERWIND ARRANGEMENT

4-16. BEVEL GEAR SHAFT ARRANGEMENT. (See Figure 4-6.) To arrange the bevel gear shaft for overwind operation, proceed as follows:

a. Pull the bevel gear shaft from the right-hand side of the winch (see Figure 5-5) far enough to enable switching of the bevel gear and the spacer.

b. Arrange the spacer and bevel gear so the bevel gear meshes on the right-hand side of the PTO shaft assembly.

c. Install bevel gear shaft.

NOTE This change in operation may affect gear lash, but should not affect the shaft endplay. However, both should be checked and adjusted if necessary.

4-17. BRAKE ASSEMBLY ARRANGEMENT. If the winch is equipped with a standard brake band, follow procedure a. Follow procedure b if the winch is equipped with an optional automatic brake.

a. Brake Band. (See Figure 4-7.) Change the anchoring end of the brake band by changing the positions of pins Ⓐ and Ⓑ.

NOTE Pin Ⓐ connects the moveable end of the band to the crank. This pin is 4-5/8 inches (117.48 mm) long and has a cotter pin hole in the center. Pin Ⓑ is 6-3/8 inches (161.93 mm) long and has a tapped hole in the end. It anchors the band and provides a pivot for the crank.

b. Automatic Brake (Optional). (See Figure 4-8.) Remove the automatic brake assembly and reinstall so that the word OVERWINDING is facing to the outside.

4-18. DRUM ASSEMBLY ARRANGEMENT. (See Figure 4-9.) The cable on the drum must be anchored and wound in the opposite direction for overwind operation. To setup the drum assembly for overwind operation, proceed as follows:

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.

a. Unwind the cable.

b. Unscrew capscrew (4).

c. Remove ferrule lock (3) and ferrule (2).

d. Break or cut the tack welds securing the filler (1). Smooth the ragged edges of filler and groove by grinding.

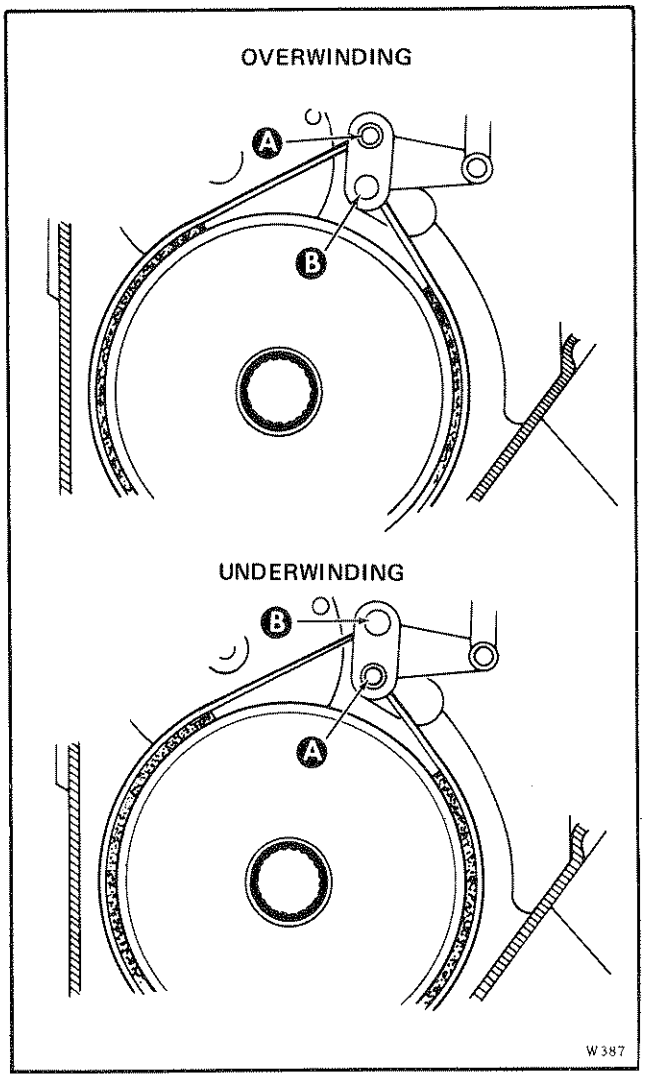


FIGURE 4-7. BRAKE BAND OVERWIND AND UNDERWIND ARRANGEMENT

e. Tack weld the filler in the overwind position.

f. Lock ferrule (2) in overwind position with ferrule lock (3) and capscrew (4).

4-19. UNDERWIND ADJUSTMENT PROCEDURE. When the cable is pulled under the drum during forward rotation, the drum is said to be UNDERWINDING. Unless otherwise specified, the winch is set for overwind at the factory. The bevel gear shaft assembly, brake assembly, and drum assembly must be rearranged when using an original overwind winch for underwind operation (refer to Paragraphs 4-20 through 4-22).

4-20. BEVEL GEAR SHAFT ARRANGEMENT. (See Figure 4-6.) To arrange the bevel gear shaft for underwind operation, proceed as follows:

a. Pull the bevel gear shaft from the right-hand side of the winch (see Figure 5-5) far enough to enable switching of the bevel gear and the spacer.

b. Arrange the spacer and bevel gear so that the bevel gear meshes on the left-hand side of the PTO shaft assembly.

c. Install bevel gear shaft (see Figure 5-17).

NOTE This change in operation may affect gear lash, but it should not affect the shaft endplay. However, both should be checked and adjusted if necessary.

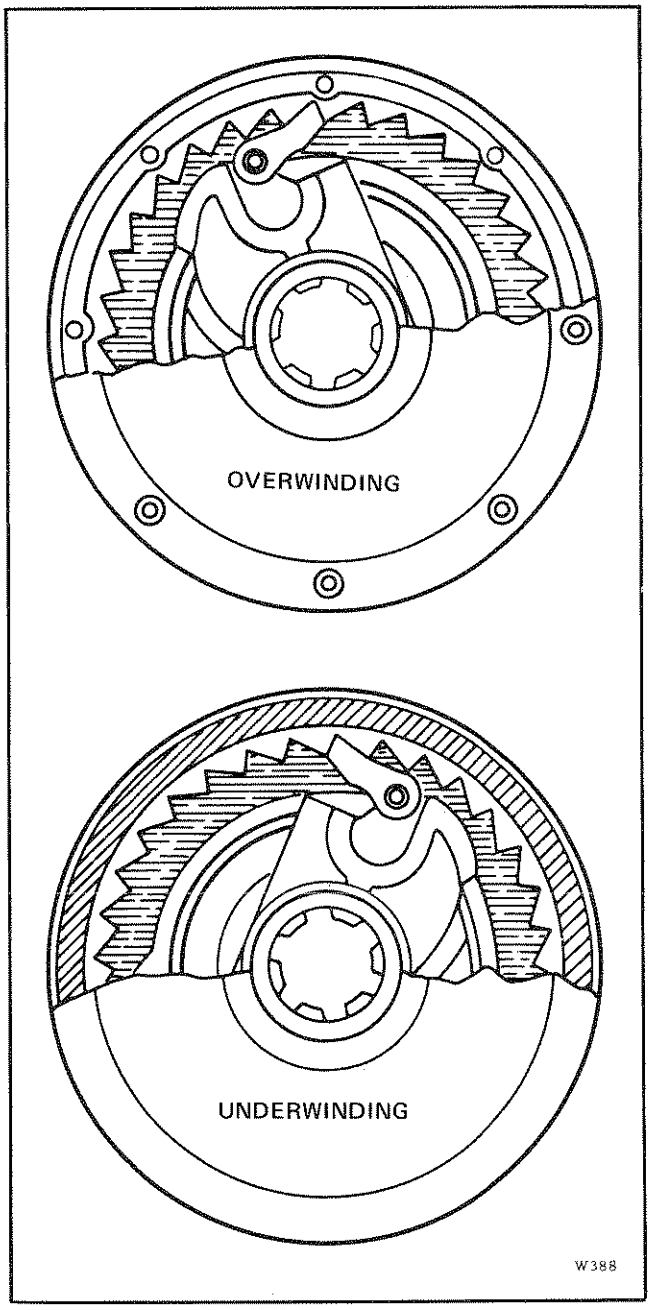


FIGURE 4-8. AUTOMATIC BRAKE OVERWIND AND UNDERWIND ARRANGEMENT

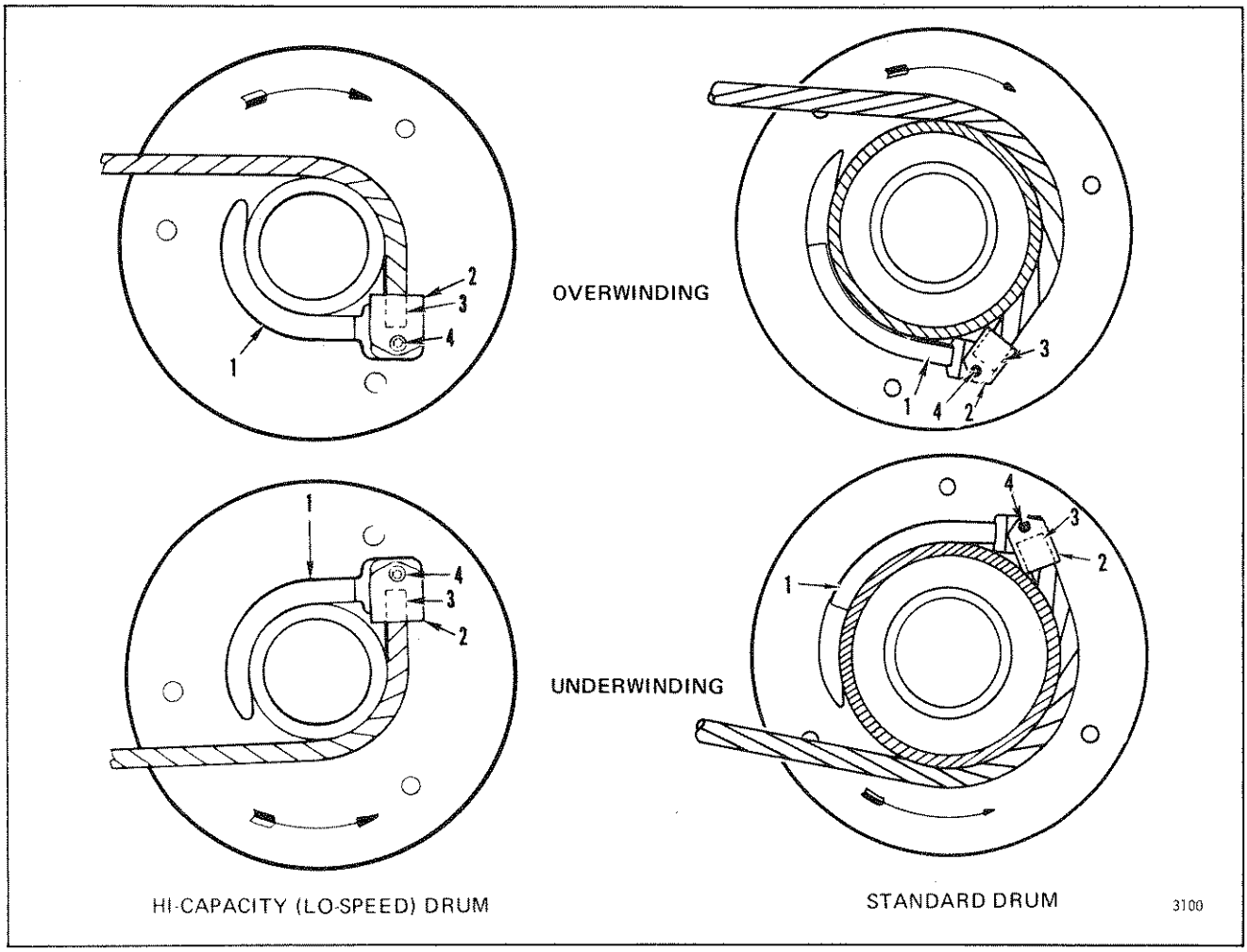


FIGURE 4-9. WINCH DRUM OVERWIND AND UNDERWIND ARRANGEMENT

4-21. BRAKE ASSEMBLY ARRANGEMENT. If the winch is equipped with a standard brake band, follow procedure a. Follow procedure b if the winch is equipped with an optional automatic brake.

a. Brake Band. (See Figure 4-7.) Change the anchoring end of the brake band by changing the positions of pins Ⓐ and Ⓑ.

NOTE Pin Ⓐ connects the moveable end of the band to the crank. This pin is 4-5/8 inches (117.48 mm) long and has a cotter pin hole in the center. Pin Ⓑ is 6-3/8 inches (161.93 mm) long and has a tapped hole in the end. It anchors the band and provides a pivot for the crank.

b. Automatic Brake (Optional). (See Figure 4-8.) Remove the automatic brake assembly and reinstall so that the word UNDERWINDING is facing to the outside.

4-22. DRUM ASSEMBLY ARRANGEMENT. (See Figure 4-9.) The cable on the drum must be anchored and wound in the opposite direction for UNDERWIND operation. To setup the drum for underwind operation, proceed as follows:

a. Unwind the cable.

b. Unscrew capscrew (4).

c. Remove ferrule lock (3) and ferrule (2).

d. Break or cut the tack welds securing the filler (1). Smooth the ragged edges of filler and groove by grinding.

e. Tack weld the filler in the underwind position.

f. Lock ferrule (2) in underwind position with ferrule lock (3) and capscrew (4).

PRESSURE PORT	PRESSURE PSI (kg/cm²) — CONTROL LEVER POSITION				
	FORWARD	NEUTRAL	BRAKE INCHING	REVERSE	BRAKE-OFF
A (INLET)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)	10-30 PSI (0.703-2.109 kg/cm²)	5-180 PSI (0.141-12.654 kg/cm²)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)
B (FORWARD)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)
C (REVERSE)	2-5 PSI (0.141-0.352 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)
D (BRAKE)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)	2-5 PSI (0.141-0.352 kg/cm²)	5-180 PSI (0.141-12.654 kg/cm²)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)	220 ± 10 PSI (15.468 ± 0.703 kg/cm²)

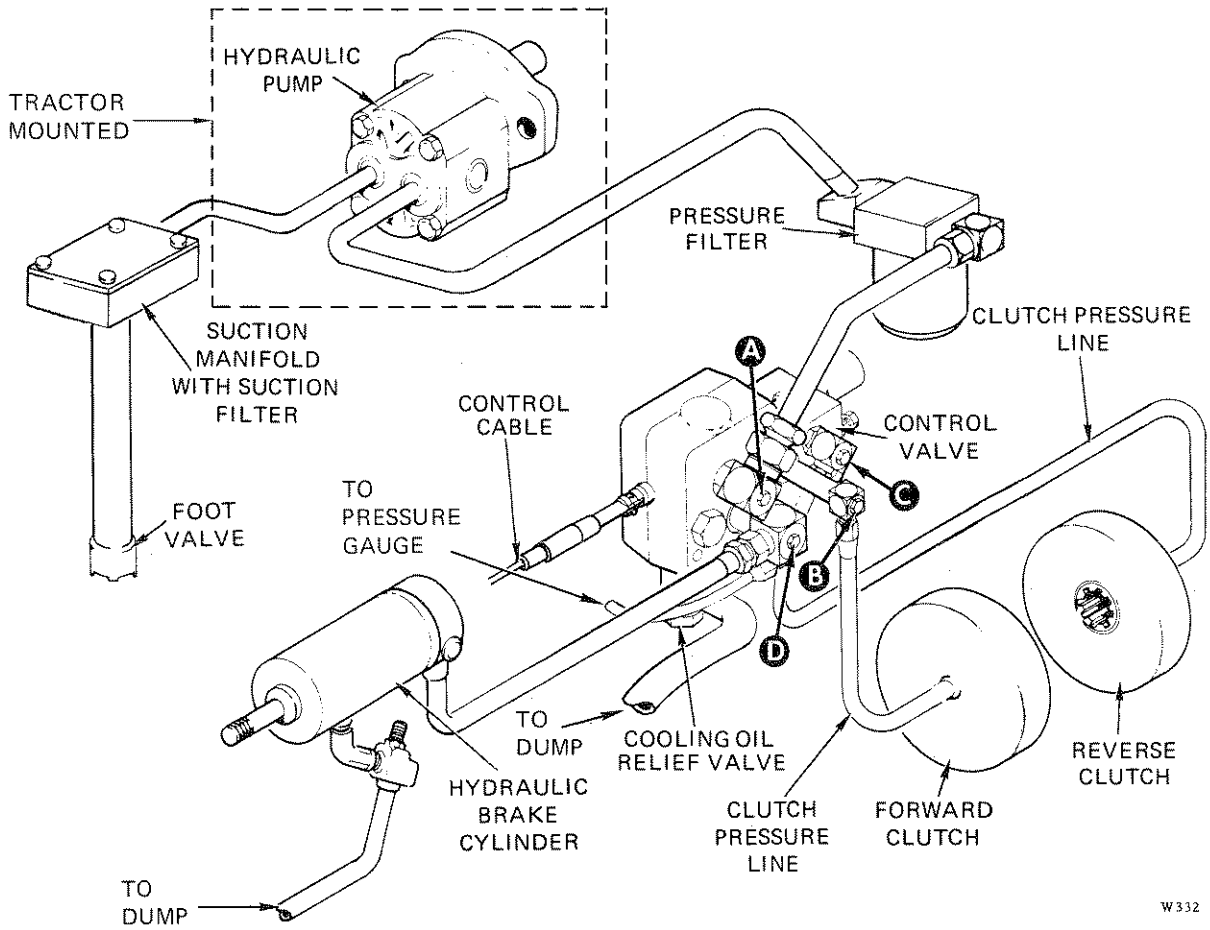


FIGURE 4-12 HYDRAULIC SYSTEM PRESSURE CHECKS

4-23. Power Controlled Winch Adjustments.

4-24. The checks and adjustments for the power controlled winch include hydraulic system pressure checks, a control valve spool travel check, and a control cable adjustment. The procedures for the hydraulic system pressure checks include the adjustment of the relief valve and reverse overlap valve.

4-25. HYDRAULIC SYSTEM PRESSURE CHECKS. (See Figure 4-10.) To check hydraulic system pressures, proceed as follows:

a. Remove cable from drum to prevent entanglement during pressure checks.

WARNING Tractor engine must be OFF before disconnecting line. Be extremely careful when removing the cable lock. The cable may spring away from the drum.

b. Remove control valve access cover plate on upper, forward portion of left side of winch housing.

c. Remove plug from control valve INLET port Ⓐ and connect a 400 PSI (945 kg/cm²) pressure test gauge to the port.

d. Start tractor engine, warm up, and stabilize engine speed at 1500 RPM. When winch hydraulic oil temperature is 100-140 degrees F, read pressure gauge with handlever in BRAKE OFF (free-spool position). Pressure should be 220 ±5 PSI (15.4682±0.703 kg/cm²). If pressure is not correct, then:

1. Loosen relief valve locknut.

2. Turn adjusting capscrew IN to increase pressure or OUT to decrease pressure. Retighten locknut after readjustment is completed.

e. Shut down tractor engine and transfer test pressure gauge to FWD port Ⓑ. Install plug in INLET port Ⓐ.

f. Start engine and stabilize speed at 1500 RPM with winch oil at operating temperature.

g. Check pressure at inlet port Ⓑ with handlever in FORWARD. Pressure should be 220 ±PSI (15.4682 ±0.703 kg/cm²). If pressure is not correct, check control cable adjustment (refer to Paragraph 4-27) and control spool travel (refer to Paragraph 4-26).

h. Shut down engine and transfer pressure gauge to REV port Ⓒ. Install plug in FWD port Ⓑ.

i. Start engine and stabilize speed at 1500 RPM with winch oil at operating temperature.

j. Check pressure at REV port Ⓒ with handlever in REVERSE. Pressure should be 220 ± 10 PSI (15.4682 ± 0.703 kg/cm²). If pressure is not correct, check control cable adjustment (refer to Paragraph 4-27) and control spool travel (refer to Paragraph 4-26).

k. Move handlever back to NEUTRAL, then slowly move handlever towards REVERSE until brake pressure Ⓓ rises to 160 PSI (11.25 kg/cm²). For Komatsu D65 use 185 PSI (13.0 kg/cm²). The reverse clutch pressure Ⓒ should be 125 PSI (8.79 kg/cm²) less than Ⓓ above. If the pressure at port Ⓒ is not correct, then:

1. Loosen reverse overlap valve locknut.

2. Turn reverse overlap adjusting capscrew IN to decrease port Ⓒ pressure, or OUT to increase pressure. Retighten locknut after adjustment is completed.

m. Move handlever to NEUTRAL. Pressure should be 2-5 PSI (0.141-0.352 kg/cm²) at port Ⓒ. If pressure is not correct, then:

1. Check control cable adjustment (refer to Paragraph 4-27). Check for cable binding which would prevent valve spool from automatically returning to NEUTRAL. If necessary, replace control cable.

2. Replace the non-adjustable cooking oil relief valve (Figure 4-10) if step 1 above does not correct trouble.

n. Shut down tractor engine and connect pressure gauge to BRAKE port Ⓓ. Install port Ⓒ plug.

o. Stabilize engine speed at 1500 RPM with winch oil at operating temperature.

p. Check pressure at brake port Ⓓ with handlever in FORWARD, REVERSE, and BRAKE OFF. Pressure should be 220 ± 10 PSI (15.4682± 0.703 kg/cm²) for each position. If pressure is not correct, review previous procedures and repeat as necessary.

q. Remove test pressure gauge. Install port Ⓓ plug, and replace control valve access cover plate on winch housing.

4-26. CONTROL VALVE SPOOL TRAVEL CHECK.

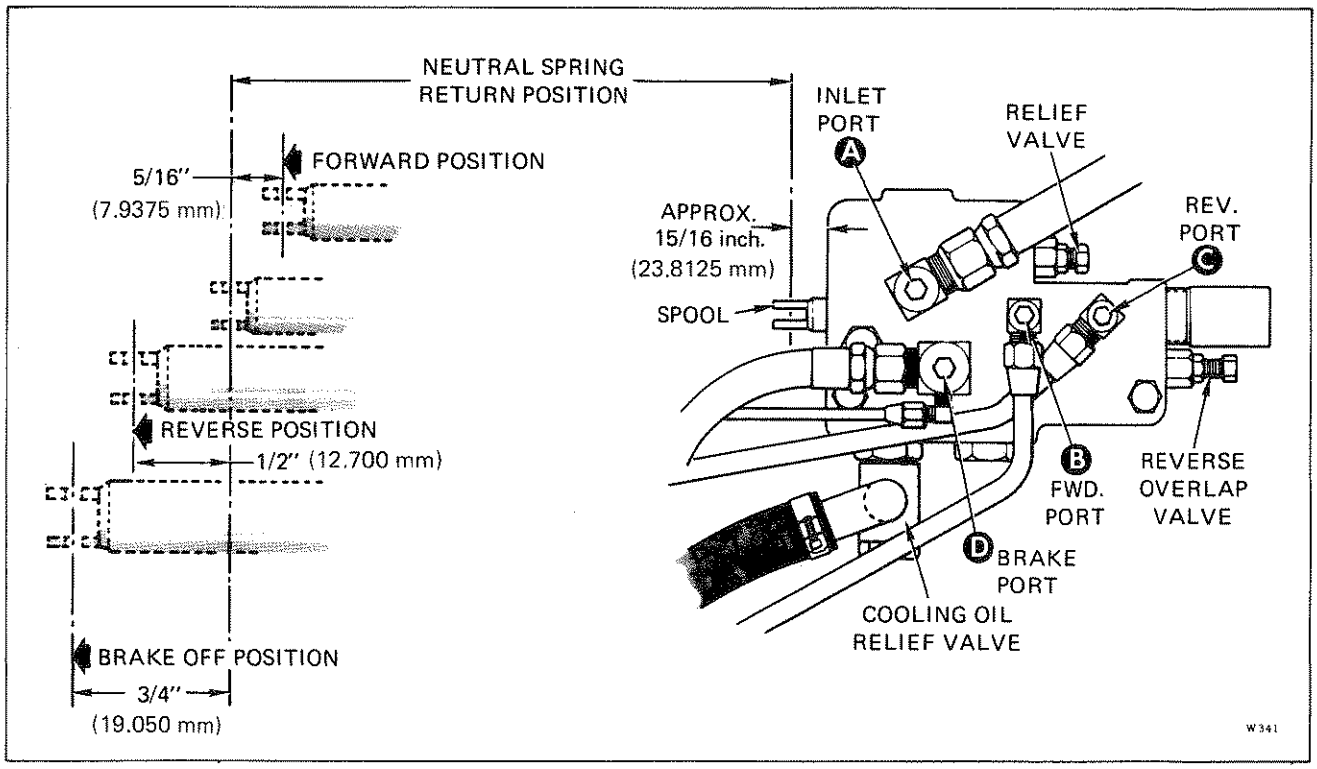


FIGURE 4-11. CONTROL VALVE SPOOL TRAVEL CHECK

(See Figure 4-11.) A spool travel check should be made to ensure that the spool mechanical stops will limit spool travel to the exact linear placement for each of the three principal control positions off NEUTRAL. Pressures are included, for reference only, to tie together corresponding mechanical position and valve hydraulic function. If hydraulic pressure readings are measured, observe procedures given in Paragraph 4-25. The control valve spool is self-positioned to NEUTRAL by the neutral return spring which is a part of the W-11 spool assembly. The three other travel positions are determined by spool assembly internal stops and detent. If spool travel is found to be out of adjustment, the spool assembly should be repaired or replaced (refer to Section 5). Perform the spool travel check as follows:

a. Remove cotter pin and clevis pin attaching control cable to end of control valve spool.

b. Check Neutral position of spool. In this position, spool end should protrude 15/16-inch (7.9 mm) from the valve body. Pressure at port Ⓐ should be 10-30 PSI (1.406-2.460 kg/cm²).

c. Move spool into body until it bottoms. This position is FORWARD and should be at 5/16-inch (7.9 mm) travel from NEUTRAL as shown in Figure 4-11. Pressure at port Ⓑ should be 220 ± 10 PSI (15.4682 ± 0.703 kg/cm²).

d. Move spool out of body until the first stop is felt. This position is REVERSE and should be at 1/2-inch (12.7 mm) travel from NEUTRAL as shown in Figure 4-11. Pressure at port Ⓒ should be 220 ± 10 PSI (15.4682 ± 0.703 kg/cm²).

e. Move spool out of body, past the stop felt in step d, into the detent lock-up position. This position is BRAKE OFF and should be at 3/4-inch (19.05 mm) travel from NEUTRAL as shown in Figure 4-11. Pressure at port Ⓓ should be 220 ± 10 PSI (15.4682 ± 0.703 kg/cm²).

NOTE Spool is self-holding in BRAKE OFF. If spool does not lockup in this position, the detent parts should be repaired or the spool assembly replaced.

f. Push the spool out of detent and allow spool to return to NEUTRAL. Reattach control cable to clevis end of spool and install cotter pin.

4-27. CONTROL CABLE ADJUSTMENT. (See Figure 4-12.) A single, teflon-lined control cable connects the handlever, on the handling gear assembly, to the spool end of the winch control valve. Cable adjustment is limited to synchronizing the handlever position to control valve spool position and ensuring that full spool travel is not restricted by the handling gear assembly housing. Adjust cable as follows:

a. Check control valve spool travel (refer to Paragraph 4-26).

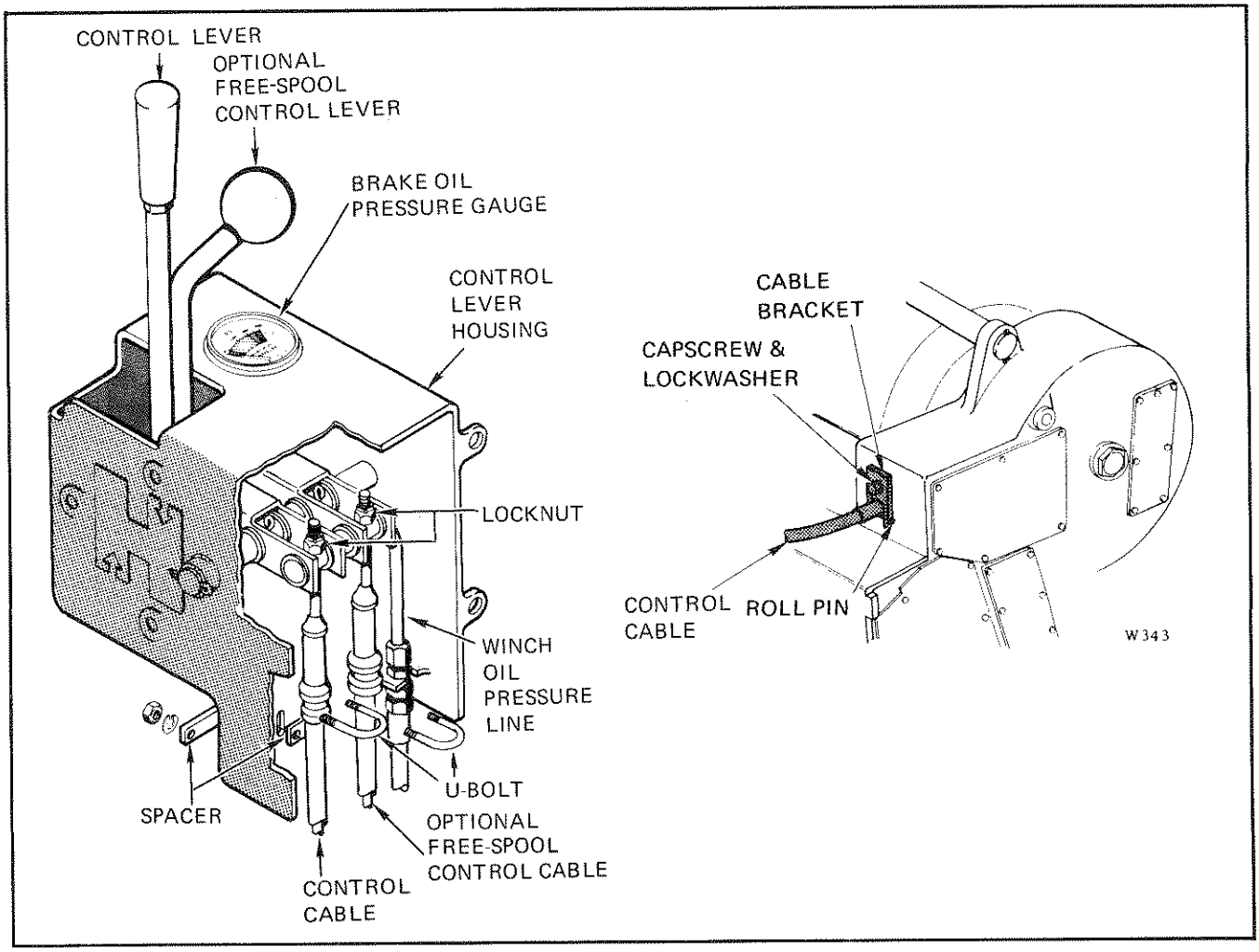


FIGURE 4-12. CONTROL CABLE ADJUSTMENT

b. Ensure that cable bracket, at winch end of control cable, is securely attached to winch housing and that roll pin in bracket is engaged in cable end groove.

c. Check position of handlever with control valve in NEUTRAL. The lever should be approximately vertical. If not, correct as follows:

1. Loosen nuts on U-bolt that clamp the control cable to the handlever housing. With U-bolt engaged in cable end groove, move U-bolt up or down in elongated slots to improve position of handlever. Tighten nuts securely.

2. If U-bolt elongated slots provide insufficient travel, loosen locknuts on cable end and adjust nuts as required to extend or retract cable threaded end in hole in handlever pin.

d. Move handlever to FORWARD and BRAKE OFF positions and check to ensure that handlever does not hit housing in either position. If interference is found, repeat step c.

4-28. ADJUSTING THE BRAKE. The brake is spring-applied and hydraulically-released. Two adjustments are required to properly adjust the brake. (Refer to Paragraphs 4-30 and 4-31.)

4-29. BRAKE CYLINDER ADJUSTMENT. (See Figure 4-13.) To adjust the brake cylinder, proceed as follows:

a. Fully extend the cylinder rod.

b. Loosen jam nut Ⓐ. Adjust rod end Ⓑ to maximum extended cylinder length of 10-7/8 inches (276.23 mm).

c. Tighten jam nut Ⓐ.

4-30. BRAKE BAND ADJUSTMENT. (See Figure 4-13.) To adjust the brake band, proceed as follows:

a. Release the brake (refer to Paragraph 2-13)

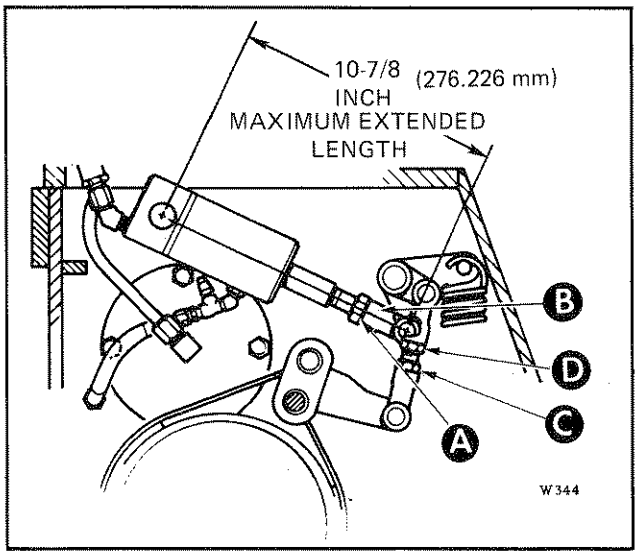


FIGURE 4-13 BRAKE CYLINDER ADJUSTMENT

b. Loosen jam nut Ⓒ.

c. Turn adjusting link Ⓓ to achieve 1-32-inch (0.8 mm) clearance between the brake band and drum.

d. Tighten jam nut Ⓒ.

4-31. OVERWIND AND UNDERWIND ADJUSTMENT PROCEDURE. Follow the same procedure as listed for the Direct Drive Winches. (Refer to Paragraph 4-15, or 4-19, except omit automatic brake.)

4-32. Free-Spooling Adjustments.

4-33. The only adjustment necessary is 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).

4-34. UNIT PAINTING.

4-35. Upon completion of unit overhaul or major repairs, paint the exterior sections of the winch as follows:

a. Remove any corrosion or peeling paint using a stiff wire brush or coarse sandpaper. Scrape off any deteriorated decals.

b. Touch-up bare metal surfaces using zinc chromate primer. Allow primer to air-dry for four hours.

c. Install all bearing retainers and covers. Cover the winch Nameplate, Filter Service Plate, HYSTER letter decals, and Caution decal with masking tape or grease.

d. Spray paint the entire external surface of the winch with HYSTER YELLOW enamel.

4-36. DECAL, NAMEPLATE, AND SERVICE PLATE INSTALLATION.

4-37. A Caution Decal is located on the drum gear cover, as shown in Figure 4-14. Make sure that all markings on the decal are clearly legible and that the decal is installed in the correct location. If the decal has been lost or damaged, install a new decal in the proper location.

4-38. The unit nameplate is located on the left-hand side of the winch housing near the drum shaft nut as shown in Figure 4-14. Data contained on the nameplate is given in Paragraph 1-5. If the nameplate has been damaged, install a new nameplate in the location shown in Figure 4-14. Use drive screws for nameplate installation.

4-39. A filter service plate is located on the left-hand side of the winch housing as shown in Figure 4-14. If the service plate has been damaged, install a new plate in the location shown. Use drive screws to retain the plate on the housing.

4-40. The W6E model decals and HYSTER letter decals are used on both sides of the winch housing as shown in Figure 4-14. Replace as necessary.

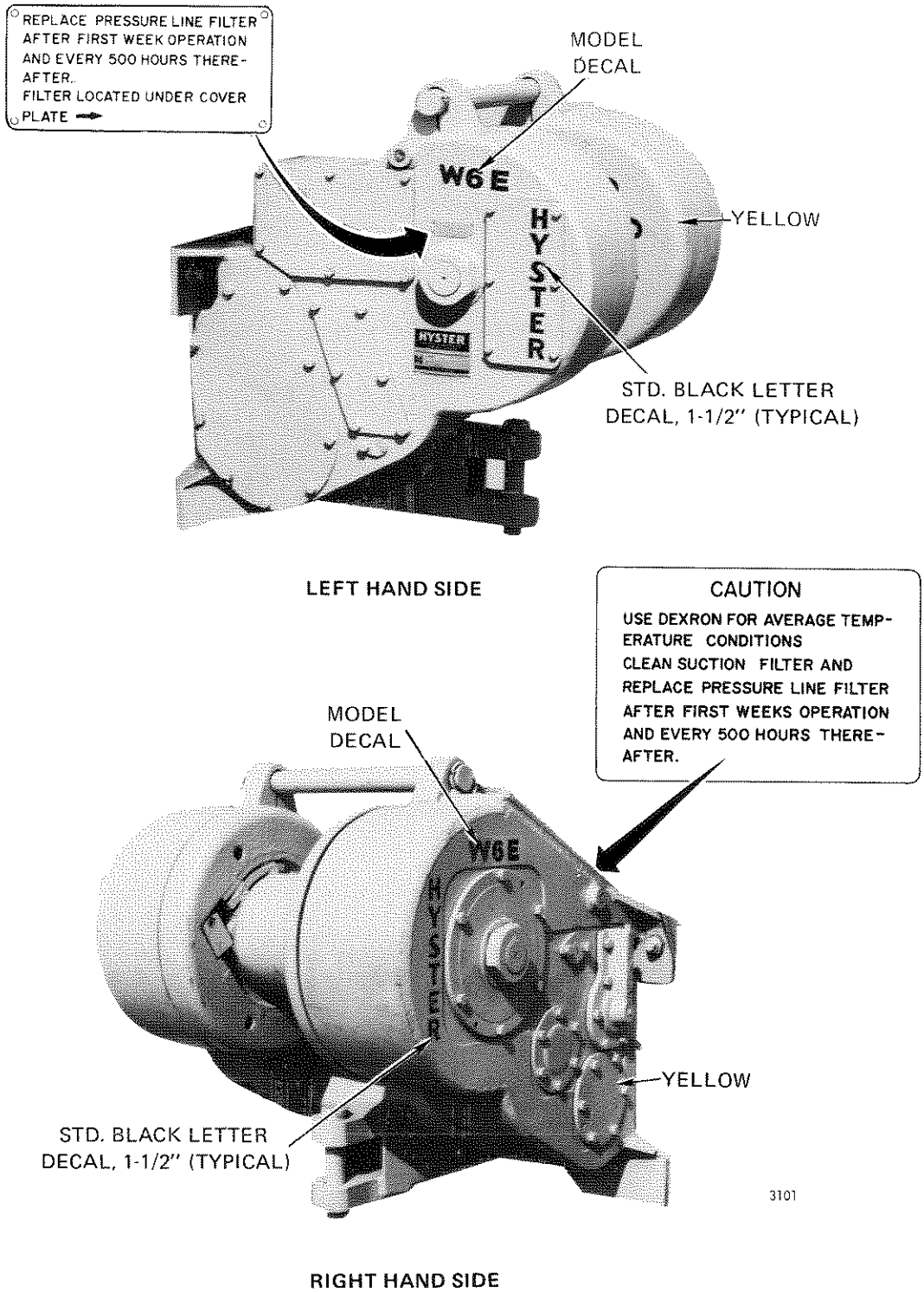


FIGURE 4-14. PAINTING AND DECAL INSTALLATION

Section 5
OVERHAUL INSTRUCTIONS

5-1. GENERAL.

5-2. This section contains overhaul instructions for the W6E Direct Drive and Power Controlled 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 show critical wear points. It is recommended that these points be checked 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 3 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 4).

5-3. This section does not include instructions for removal and installation of the winch. Removal and installation of the winch and hydraulic pump are given in Section 6, Mounting Instructions.

5-4. Component Removal.

5-5. All major assemblies (except the brake shaft and PTO shaft) can be removed with the winch mounted on the tractor. Most major components of the brake shaft can be removed with the winch mounted, however, the brake shaft will not clear the tractor tracks for complete removal of the shaft. The winch must therefore be removed from the tractor before removing the brake shaft.

5-6. Removal and Disassembly of PTO Shaft Assembly.

5-7. Removal and disassembly of the PTO shaft is shown in Figure 5-1. Before removing the PTO shaft assembly, the winch must be removed from the tractor. (Refer to Section 6.)

5-8. Removal and Disassembly of Hydraulic Brake Assembly (Power Controlled Winch).

5-9. Removal and disassembly of the hydraulic brake assembly used in the Power Controlled winch is shown in Figure 5-2. Removal and disassembly of the brake can be accomplished while the winch is mounted on the tractor. During disassembly, place all parts in a clean container to protect from dust, dirt and moisture.

5-10. Removal of Dry Brake and Automatic Brake (Direct Drive Winch).

5-11. Removal of the dry brake (or optional automatic brake) used in the Direct Drive winch is shown in Figure 5-3. Removal of the dry brake can be accomplished with the winch mounted on the tractor. During disassembly, check all parts for damage and wear.

5-12. Removal and Disassembly of Bevel Gear Shaft Assembly.

5-13. Removal and disassembly of the bevel gear shaft assembly is shown in Figure 5-5. Removal of the bevel gear shaft and associated components can be accomplished with the winch mounted on the tractor. Prior to removal of the bevel gear shaft, perform the following:

a. Drain oil from winch (see Figure 4-1).

b. Remove all brake components as shown in Figures 5-2 or 5-3, depending upon the winch model.

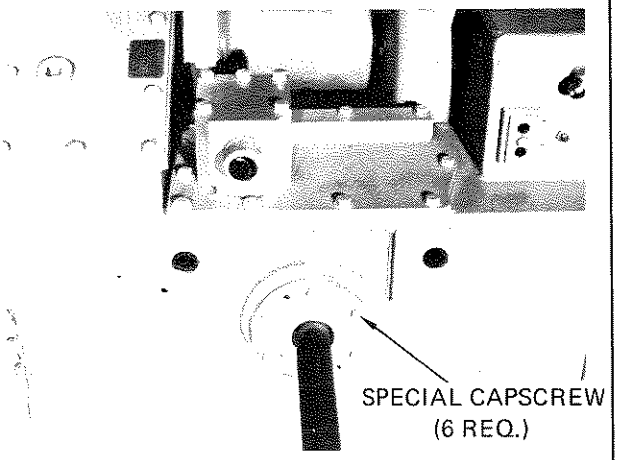
c. Remove the hydraulic fitting from the bearing retainer at each end of the bevel gear shaft (Power Controlled winches only).

d. Remove the brake connecting linkage (Direct Drive winch only).

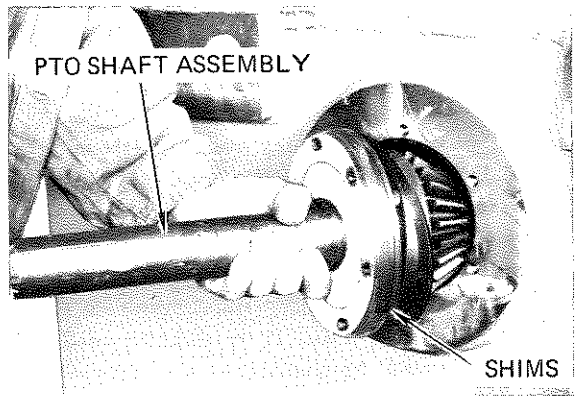
e. On direct drive models, slowly unscrew the nut from the left-hand end of the shifter shaft to relieve spring compression, and remove. Cut the lockwire retaining the shifter fork lockscrews and loosen lockscrews. Pull out shifter shaft being careful not to drop the forks (see Figure 1-7).

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

NOTE Procedures given in Figure 5-5 are for the bevel gear shaft used in Power Controlled winches. These procedures can be used for Direct Drive winches by omitting all references to hydraulic components. Figure 5-4 shows the bevel gear shaft assemblies used in both the Power Controlled and Direct Drive winches.

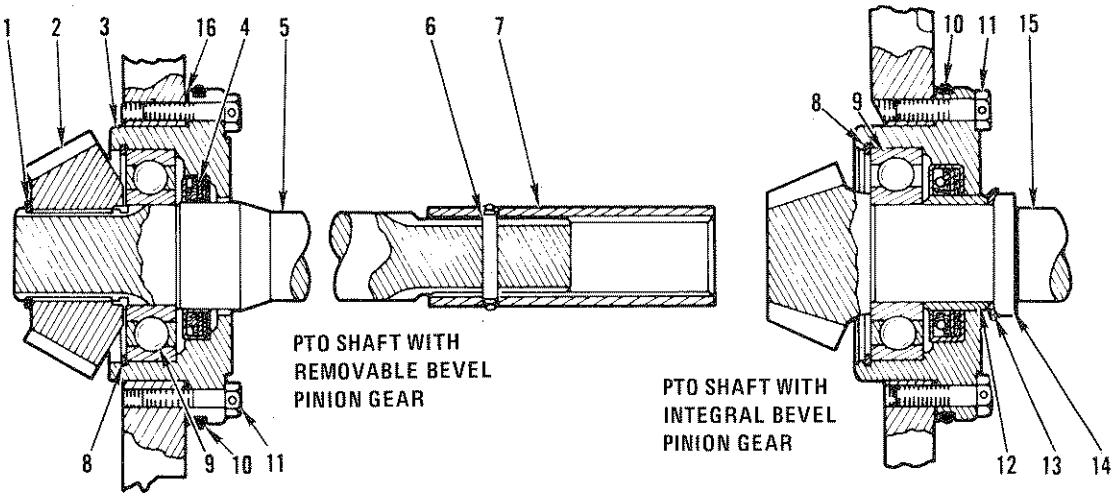


STEP 1. Remove the wire locking the six special capscrews, then remove the capscrews.



STEP 2. Pull PTO shaft assembly straight out.

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



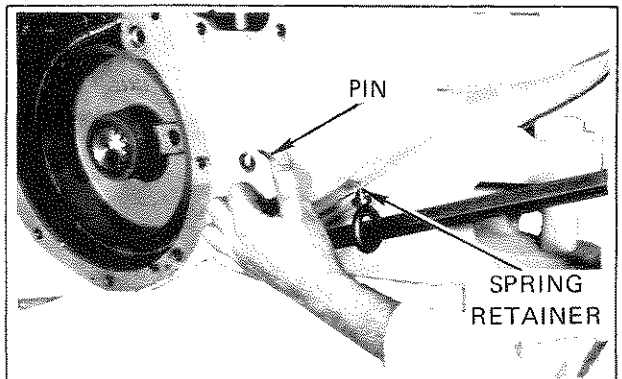
STEP 3. Disassemble PTO shaft as required

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

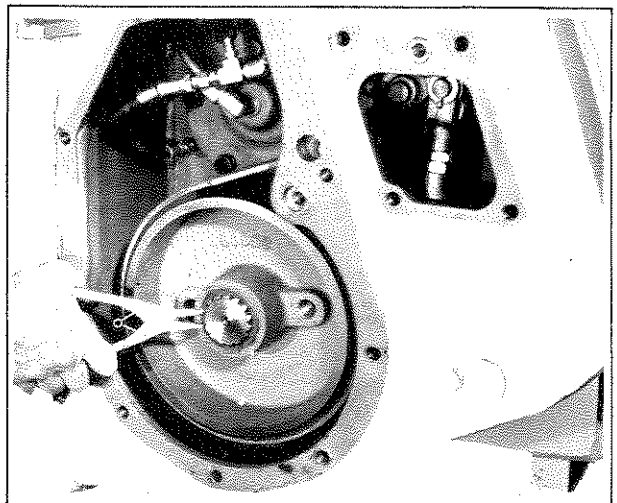
NOTE: The PTO shaft with integral bevel pinion gear is used on most Standard Speed winches (refer to Section 6 for specific type used). On shafts with removable pinion gear, the gear is splined on the shaft and retained by a snap ring.

W392

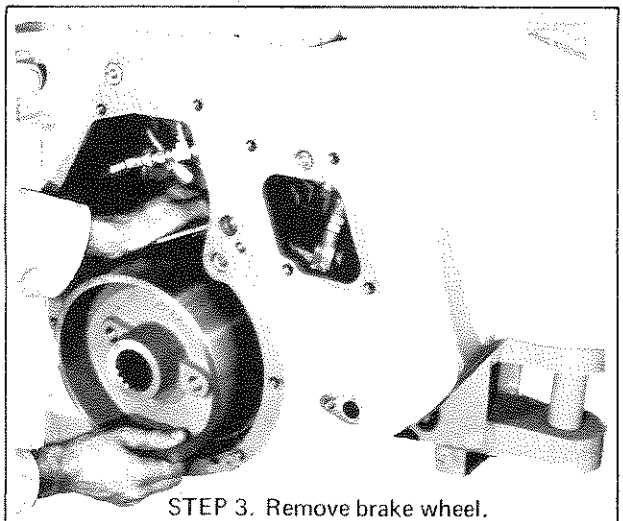
FIGURE 5-1. REMOVAL AND DISASSEMBLY OF PTO SHAFT ASSEMBLY, DIRECT DRIVE AND POWER CONTROLLED WINCH



STEP 1. Remove the access plug and install a 1/2 UNF eyebolt into the spring retainer. Pull down on the eyebolt to release the pin, then remove pin. This releases the brake.

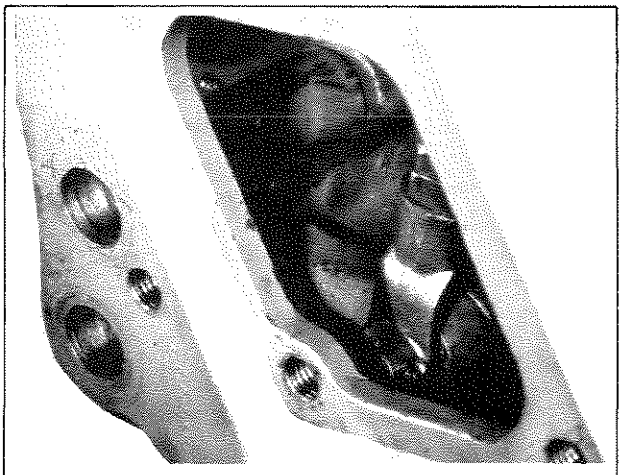


STEP 2. Remove snap ring.

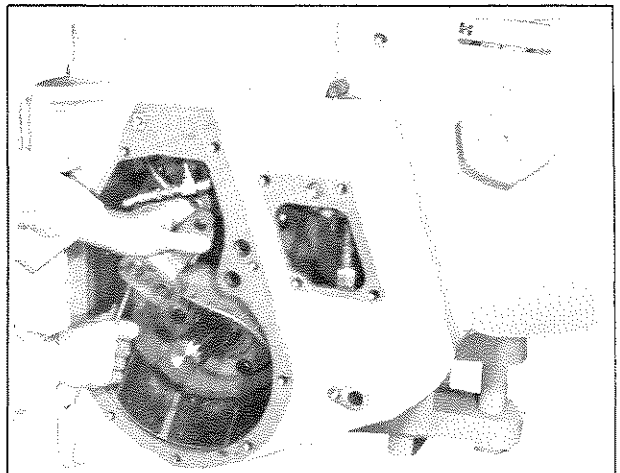


STEP 3. Remove brake wheel.

STEP 4. Remove brake pin using eyebolt as shown.

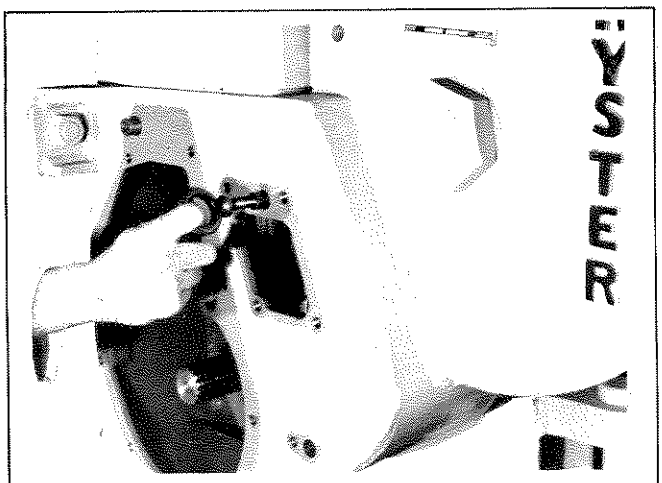


STEP 5. Remove cotter key and pin from adjustment link assembly.

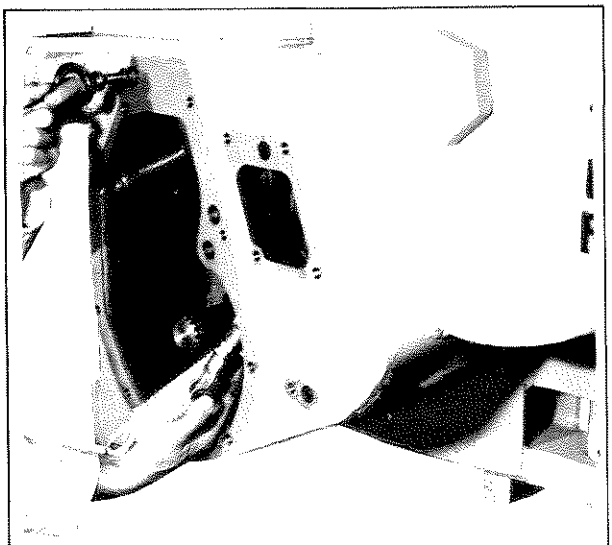


STEP 6. Pull out band assembly as shown.

FIGURE 5-2. REMOVAL OF HYDRAULIC BRAKE ASSEMBLY, POWER CONTROLLED WINCH (Sheet 1 of 2)



STEP 7. Remove brake pin using eyebolt as shown.



NOTE: Disconnect hydraulic tubing from hydraulic cylinder and left-hand bevel gear shaft retainer before removing the cylinder pin.

STEP 8. Remove cylinder pin, then remove hydraulic cylinder, two springs and linkage as an assembly.

STEP 9. Replace components on hydraulic cylinder and linkage assembly as required.

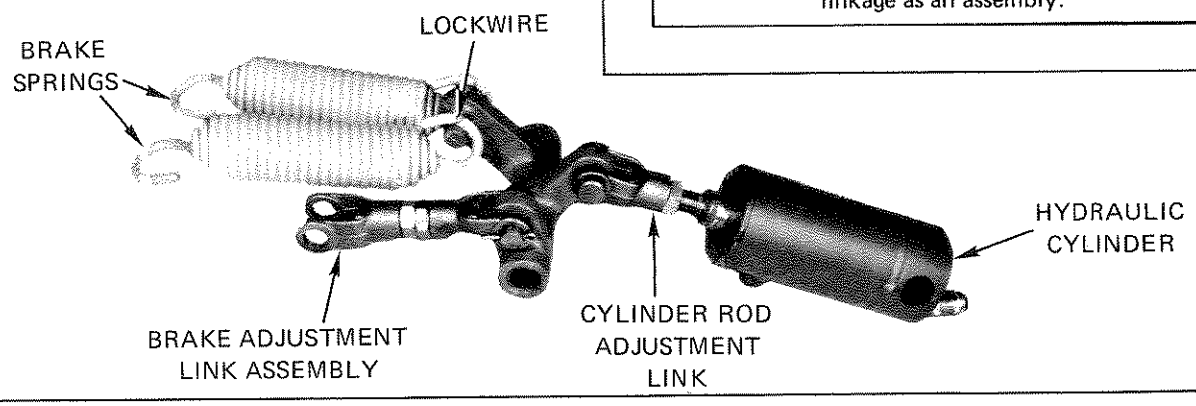


FIGURE 5-2. REMOVAL OF HYDRAULIC BRAKE ASSEMBLY, POWER CONTROLLED WINCH (Sheet 2 of 2)

5-14. Disassembly of Oil Clutch Assemblies (Power Controlled Winch).

5-15. Disassembly of the clutch assemblies used in the Power Controlled winch is shown in Figure 5-6. Removal of the clutch assemblies is shown in Figure 5-5.

5-16. Removal of Brake Shaft Assembly.

5-17. Removal of the brake shaft assembly is shown in Figure 5-7. 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 (refer to Section 6).

b. Drain oil from winch (see Figure 4-1).

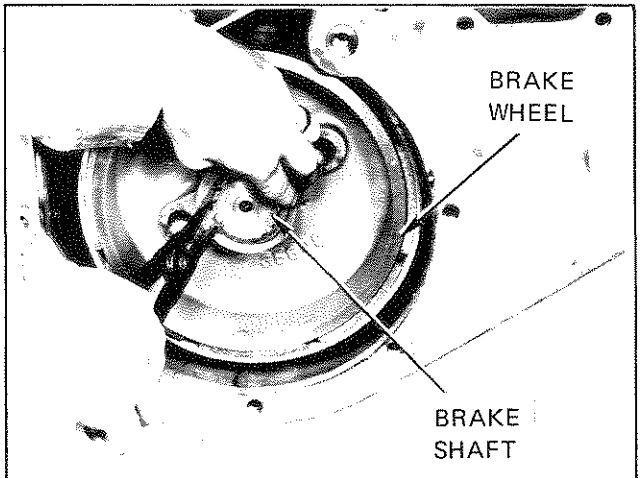
c. Remove all brake components as shown in Figure 5-2 or 5-3, depending upon the winch model.

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

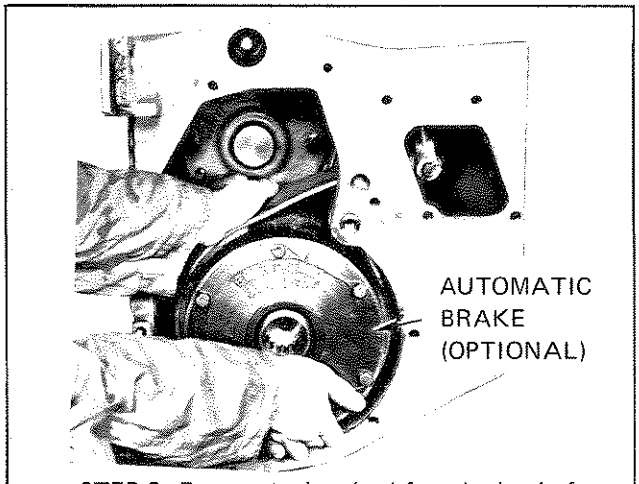
5-18. Removal of Intermediate Shaft Assembly.

5-19. Removal of the intermediate shaft and associated components is shown in Figure 5-8. The intermediate shaft can be removed with the winch mounted on the tractor. Prior to removal of the intermediate shaft, intermediate gear, and drum pinion gear, sufficient clearance can be obtained by removing the drum shaft bearing retainer as shown in Figure 5-9, step 3.

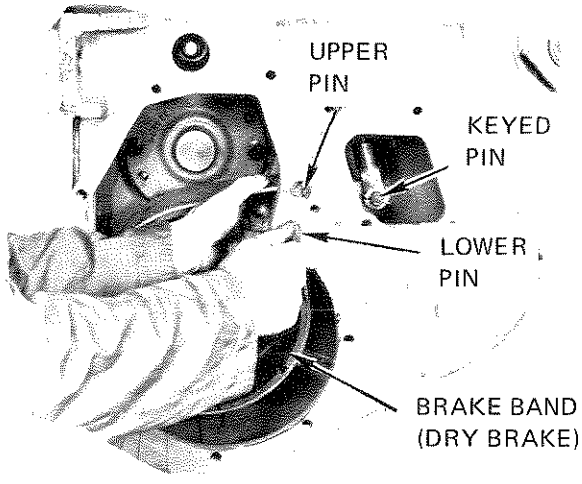
NOTE Figure 5-8 shows the winch removed from the tractor with the bevel gear shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but is not necessary for removal of the intermediate shaft only.



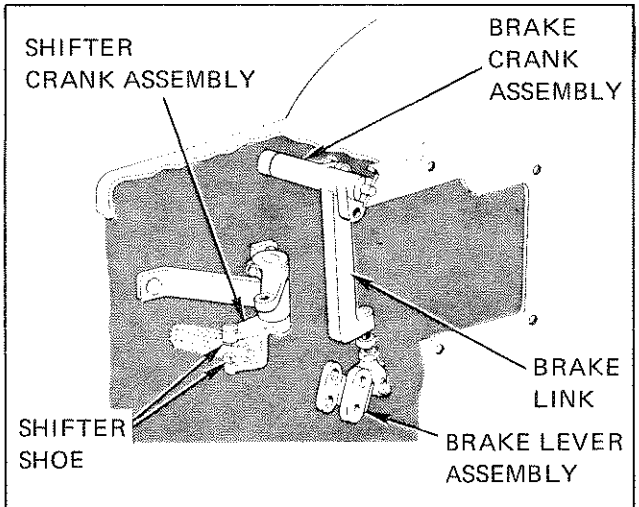
STEP 1. Remove snap ring from brake shaft.



STEP 2. Remove brake wheel from brake shaft (optional automatic brake shown).



STEP 3. Remove upper and lower pins and brake band.
NOTE: The shorter pin is cotterpinned to the center of the brake band pin boss. A 1/2-UNF capscrew may be screwed into the threaded end of the longer pin to aid in pin removal.

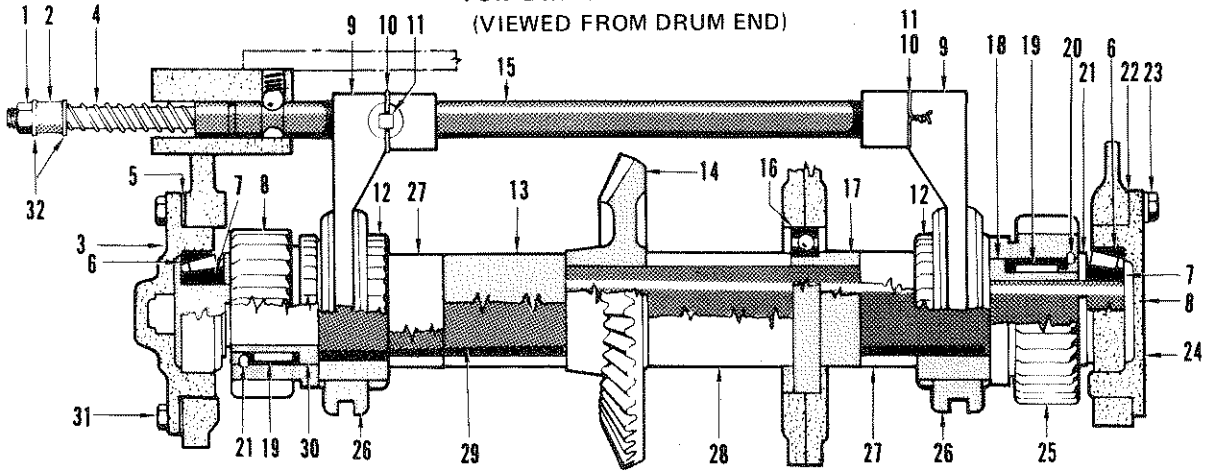


STEP 4. Note position of upper crank on linkage, shaft end of shifter crank assembly and apply index marks to aid alignment on reassembly. Remove remaining brake and dental clutch linkage.

FIGURE 5-3. REMOVAL OF DRY BRAKE AND AUTOMATIC BRAKE, DIRECT DRIVE WINCH

FOR DIRECT DRIVE WINCH

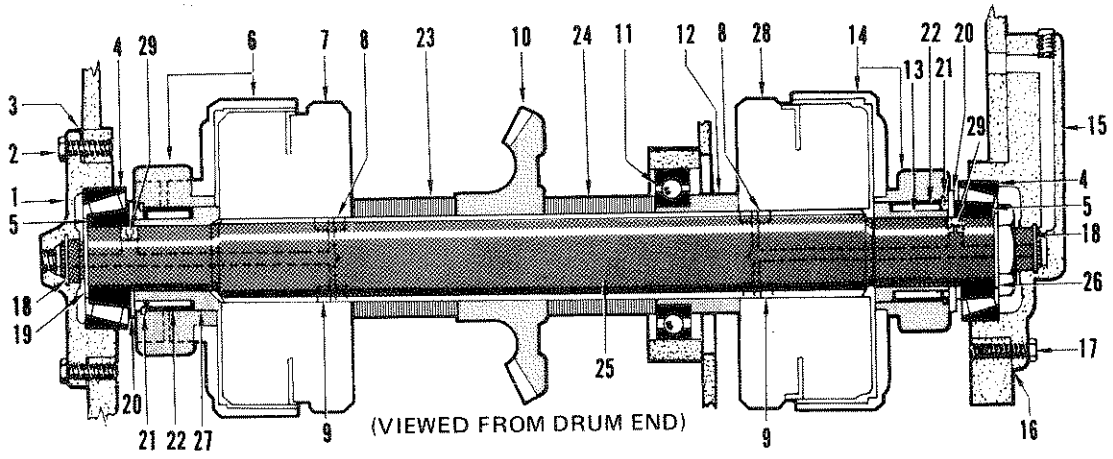
(VIEWED FROM DRUM END)



1. LOCKNUT
2. SPACER
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. BEVEL GEAR SHAFT
30. BEARING CARRIER
31. CAPSCREW - LOCKWASHER (6 REQ'D)
32. WASHER

FOR POWER POWER CONTROLLED WINCH

(VIEWED FROM DRUM END)



(VIEWED FROM DRUM END)

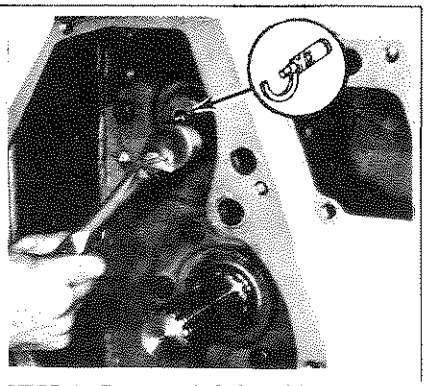
1. L.H. BEARING RETAINER
2. CAPSCREW - LOCKWASHER
3. SHIM(S)*
4. BEARING CUP
5. BEARING CONE
6. FORWARD SPIDER GEAR (INCLUDES 2ND REDUCTION PINION)
7. FORWARD CLUTCH ASSEMBLY
8. SEAL (THREE TEETH)
9. SEAL (TWO TEETH)
10. BEVEL RING GEAR
11. BALL BEARING
12. BEARING CARRIER
13. BEARING CARRIER
14. REV. SPIDER GEAR (INCLUDES 2ND REDUCTION PINION)
15. R.H. BEARING RETAINER
16. SHIM(S)*
17. CAPSCREW - LOCKWASHER
18. SEAL RING
19. SNAP RING
20. THRUST WASHER
21. SNAP RING
22. ROLLER BEARING
23. SPACER (SHORT)
24. SPACER (LONG)
25. BEVEL GEAR SHAFT
26. LOCKWASHER - LOCKNUT
27. BEARING CARRIER
28. REVERSE CLUTCH ASSEMBLY
29. ORIFICE PLUG

*SHIM(S) AVAILABLE IN 0.005, 0.007 AND 0.020-INCH (0.127, 0.178 AND 0.51 mm) THICKNESS

W322

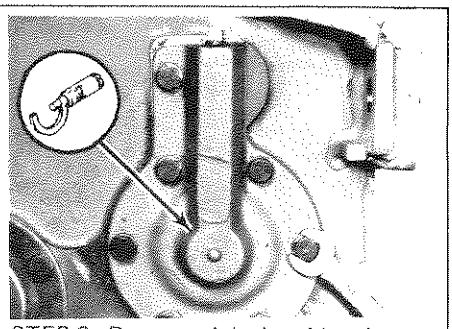
FIGURE 5-4. BEVEL GEAR SHAFT, LOCATION OF COMPONENTS

NOTE: Prior to removal and disassembly of the bevel gear-shaft assembly, perform the procedures given in paragraph 5-12.



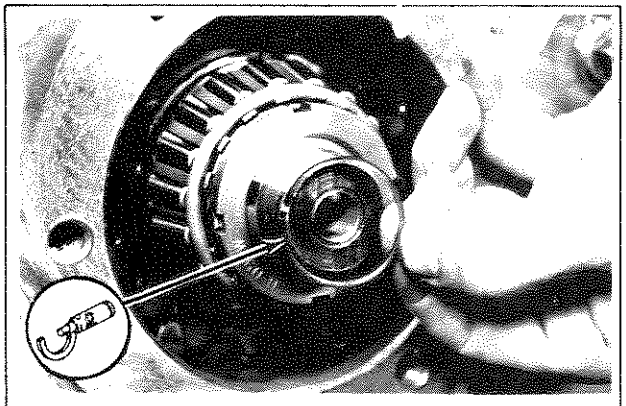
STEP 1. Remove left-hand bearing retainer with shims by removing the five capscrews.

NOTE: Keep shim pack with the retainer to aid reassembly.

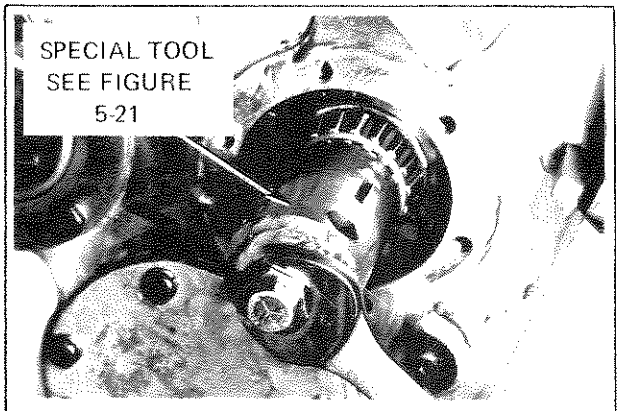


STEP 2. Remove right hand bearing retainer with shims by removing the seven capscrews. On power controlled models, disconnect hydraulic hose.

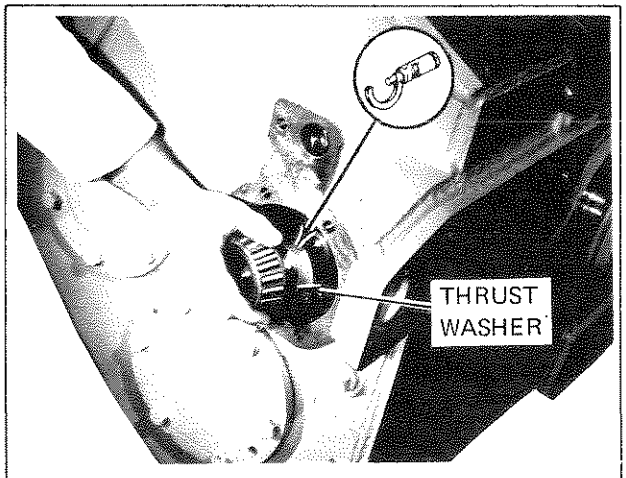
NOTE: Keep shim pack with the retainer to aid reassembly.



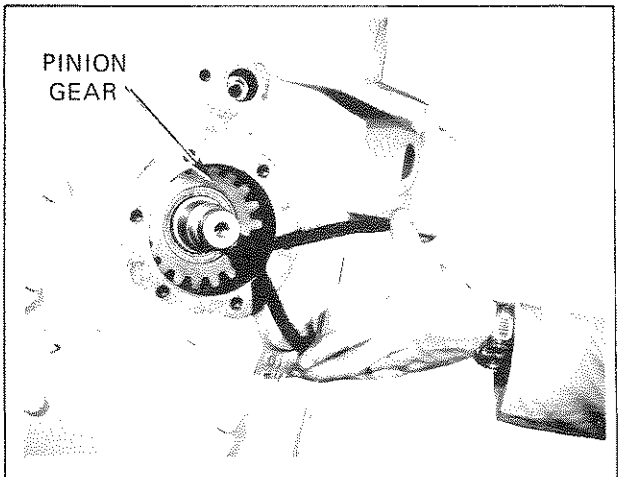
STEP 3. Remove cast-iron seal rings (one on each end of bevel gear shaft). Expand seal rings just enough to slip over the end of the shaft.



STEP 4. Straighten the lockwasher tangs securing the locknut. Remove locknut by turning counterclockwise. Remove lockwasher.

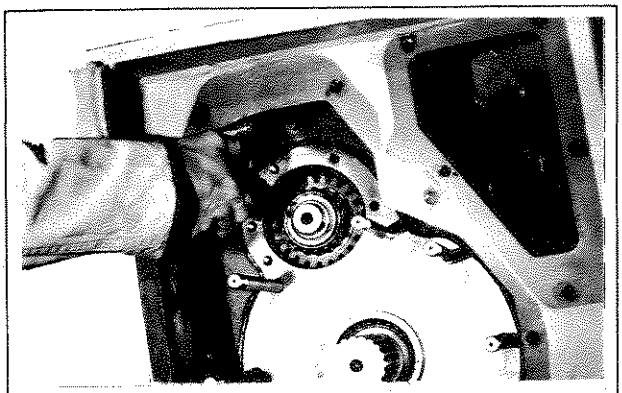


STEP 5. Remove taper roller bearing and thrust washer.

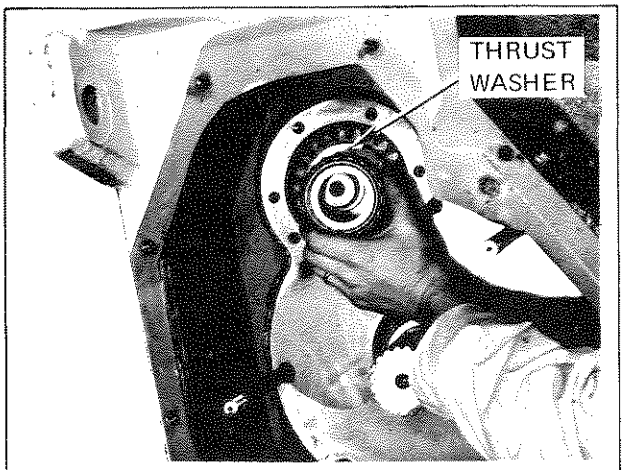


STEP 6. Remove the internal snap ring from the reverse pinion gear bore.

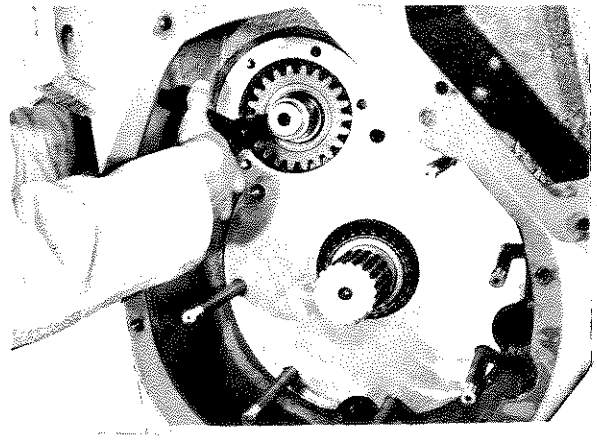
FIGURE 5-5. REMOVAL AND DISASSEMBLY OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 1 of 3)



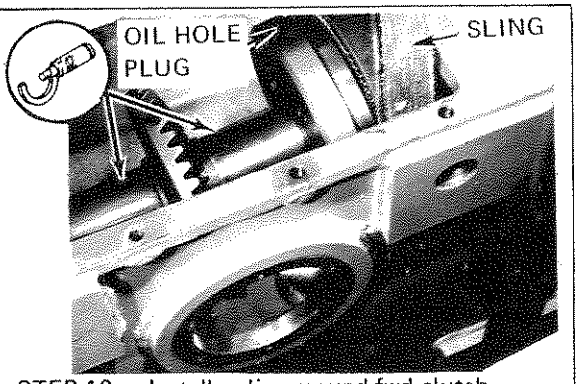
STEP 7. Remove external snap ring from left-hand end of the bevel gear shaft. It may be necessary to tap right-hand end of bevel gear shaft to relieve pressure on snap ring.



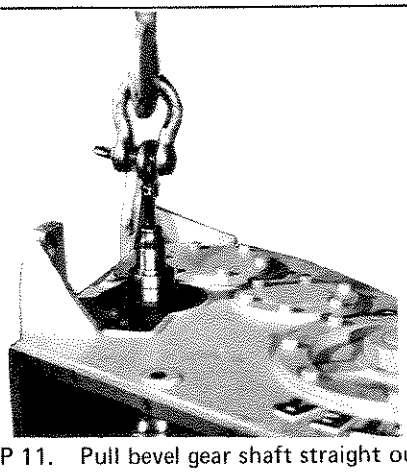
STEP 8. Remove taper roller bearing and thrust washer.



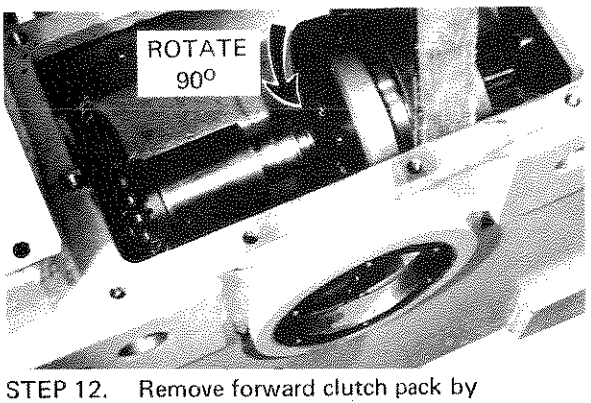
STEP 9. Remove the internal snap ring from the forward pinion gear bore.



STEP 10. Install a sling around fwd. clutch assembly or attach a cable to a lifting eye installed in oil hole with plug removed. Hoist until sling or cable just starts to lift clutch assembly.



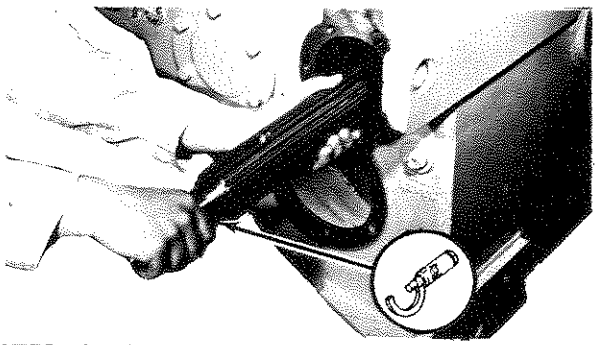
STEP 11. Pull bevel gear shaft straight out.
CAUTION: Pull out just far enough for removal of forward clutch pack.



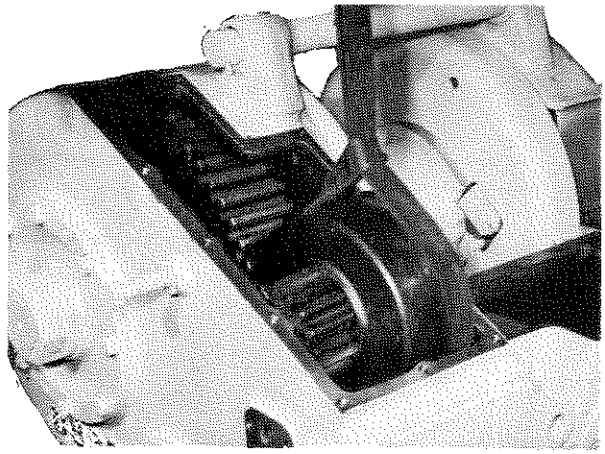
STEP 12. Remove forward clutch pack by rotating 90° from position shown. Lift straight out after rotating. Remove bevel gear and two spacers (3 for D.D.)

1527

FIGURE 5-5. REMOVAL AND DISASSEMBLY OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 2 of 3)



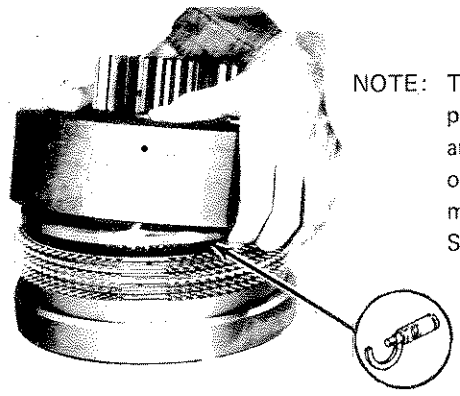
STEP 13. Install a sling around the reverse clutch pack or use lifting eye. Hoist until sling or cable just starts to lift clutch pack, then remove bevel gear shaft. Restrain center ball bearing and bearing carrier from falling into compartment.



STEP 14. Remove reverse clutch assembly, bearing carrier, and center ball bearing.

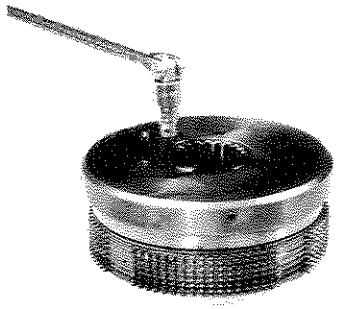
1528

FIGURE 5-5. REMOVAL AND DISASSEMBLY OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 3 of 3)

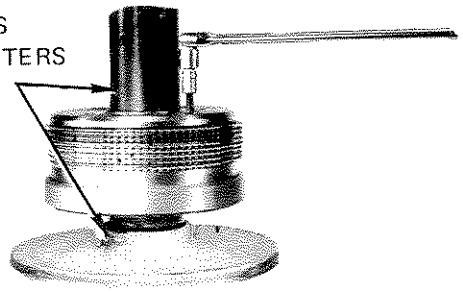


NOTE: Two feeler gauges placed 180° apart are required to obtain an accurate measurement. (See Step 10 figure 5-12.)

STEP 1. Lift spider gear from clutch pack. Measure clearance between cover plate and friction disc.

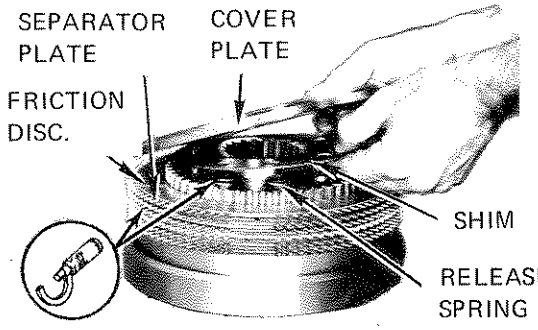


STEP 2. Remove six set screws that lock the special capscrews on opposite end of clutch.



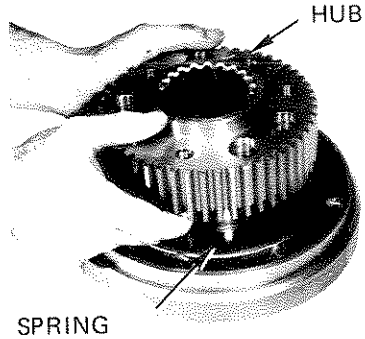
STEP 3. Remove six special capscrews. Hold assembly in press as shown.

CAUTION: The press adapters should contact the hub only. Apply only enough pressure to prevent the assembly from turning when capscrews are removed.

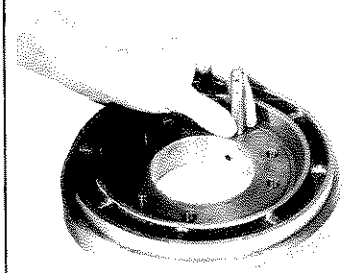


STEP 4. Lift cover plate, shim, six release springs, six friction discs and six separator plates from clutch hub.

CAUTION: Keep friction discs and separator plates in order. They must contact same surface when reinstalled.



STEP 5. Remove hub and spring retainer from clutch piston.

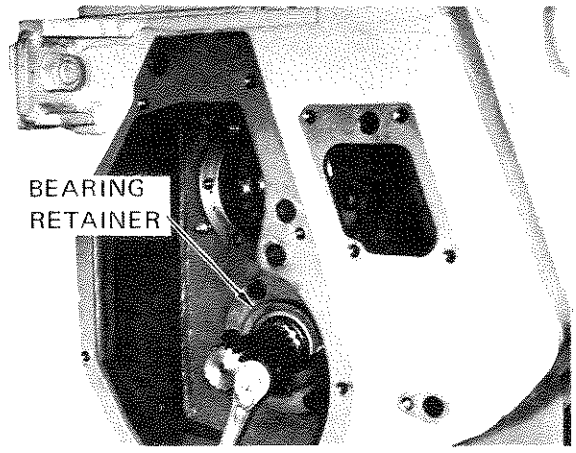


STEP 6. Remove clutch cooling oil valve. Use special tool (See figure 5-21.)

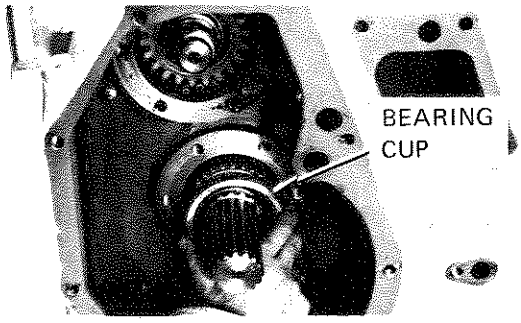
CAUTION: Do not insert any tool through valve body.

STEP 7. Remove clutch piston from piston retainer by applying compressed air at the cooling oil valve port. Then remove two O-rings.

FIGURE 5-6. DISASSEMBLY OF OIL CLUTCH ASSEMBLY, POWER CONTROLLED WINCH

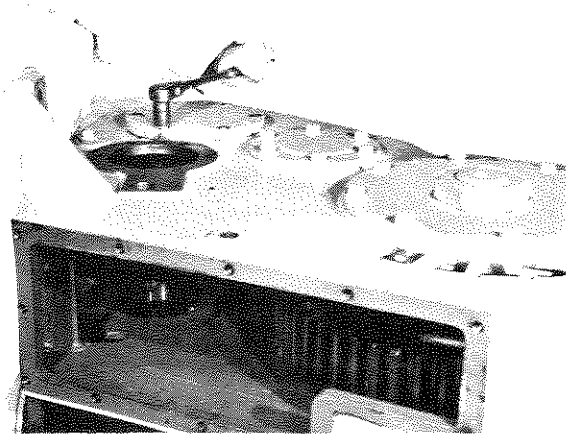


STEP 1. Remove left-hand bearing retainer. Tag shims for reference during reassembly.

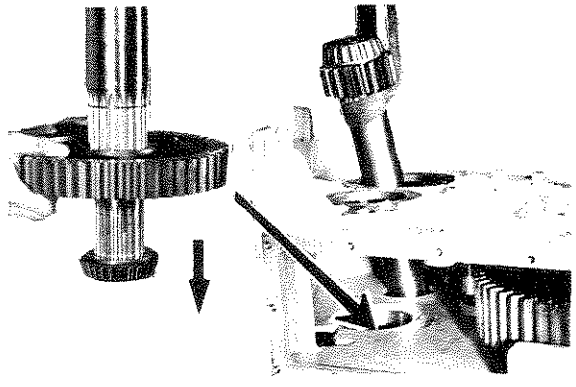


NOTE: Prior to removal and disassembly of the brake shaft, perform the procedures given in paragraph 5-16.

STEP 2. Remove left-hand bearing cup (outer race). Tag cup for reference during reassembly.



STEP 3. Position winch with right-hand side facing upward. Remove bearing retainer.

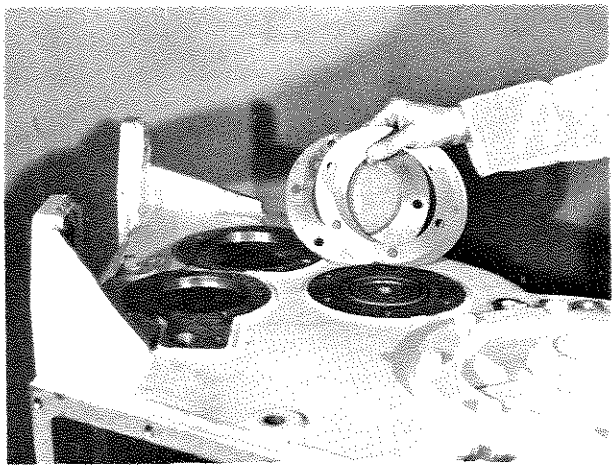


STEP 4. Pull brake shaft out of winch housing to approximate position shown. Tap bearing off of shaft using reduction gear as driver.

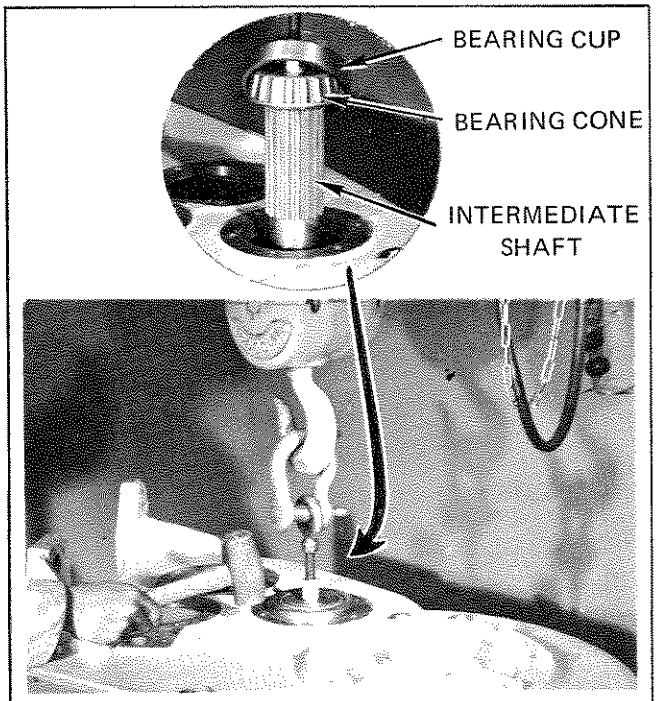
STEP 5. Remove bearing and pinion gear.

FIGURE 5-7. REMOVAL OF BRAKE SHAFT ASSEMBLY

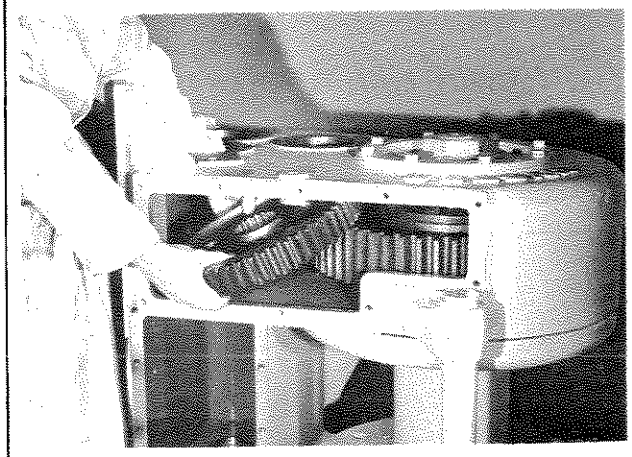
NOTE: The following illustrations show the winch removed from the tractor and positioned on its side with the brake shaft and bevel gear shaft removed. Removal of these shafts is not necessary for ON TRACTOR REPAIR of the intermediate shaft. Remove the drum shaft bearing retainer (see figure 5- 9,) to obtain the necessary clearance for removal of the intermediate shaft gears.



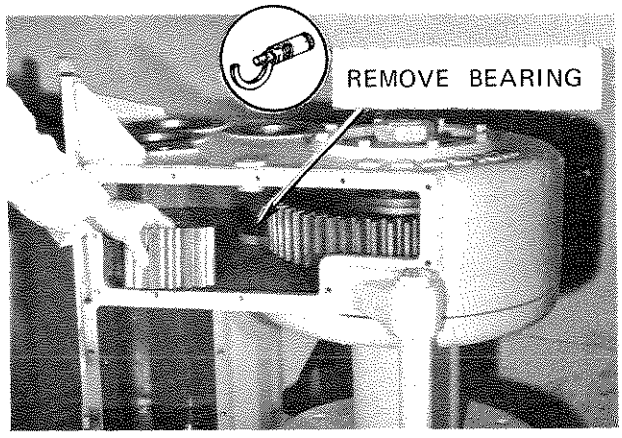
STEP 1. Remove the right-hand bearing retainer with shims. Tag shims for reference during reassembly.



STEP 2. Screw a 5/8-inch eyebolt into the end of intermediate shaft and pull out shaft. Tap on winch frame to break the bearing loose.



STEP 3. Remove intermediate gear.



STEP 4. Remove the drum pinion and bearing.

1521

FIGURE 5-8. REMOVAL OF INTERMEDIATE SHAFT ASSEMBLY

5-20. Removal of Drum Shaft and Drum.

5-21. Removal of the drum shaft and drum is shown in Figure 5-9. The winch should be removed from the tractor before the drum shaft and drum are removed (refer to Section 6). During removal of the drum shaft and drum, see the illustration of special tools (Figure 5-21) and locally fabricate the tools if possible. Do not attempt to remove heavy components (such as the drum or drum gear) by hand. Use the recommended attachments whenever possible. Removal of the intermediate shaft (see Figure 5-8) and the reverse clutch assembly (see Figure 5-5) is required prior to removal of the drum shaft and drum.

5-22. Removal of Control Valve (Power Controlled Winch).

5-23. Access to the control valve may be obtained by removing the control valve access cover plate on the upper left-hand side of winch housing. Improved access to adjacent hydraulic fittings can be made by also removing the brake cover plate. Remove the control valve as follows (see Figure 5-10):

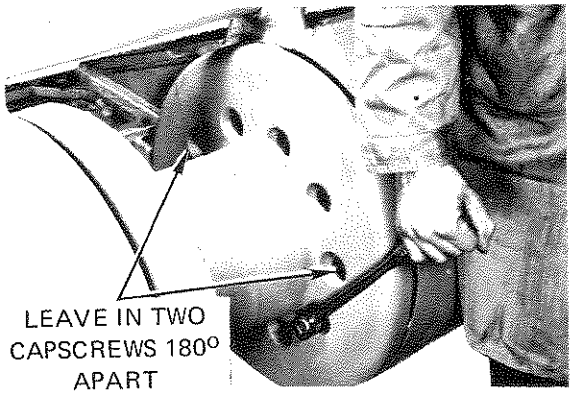
a. Detach the control cable from valve spool clevis.

b. Disconnect the inlet pressure line, brake pressure line, brake pressure gauge line, forward and reverse clutch pressure lines at their respective valve port fittings.

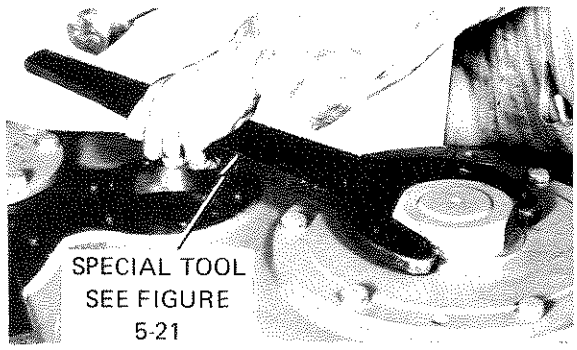
c. Remove dump hose line connection at cooling oil relief valve.

d. Remove the three capscrews and lockwashers and remove control valve, with attached cooling oil relief valve.

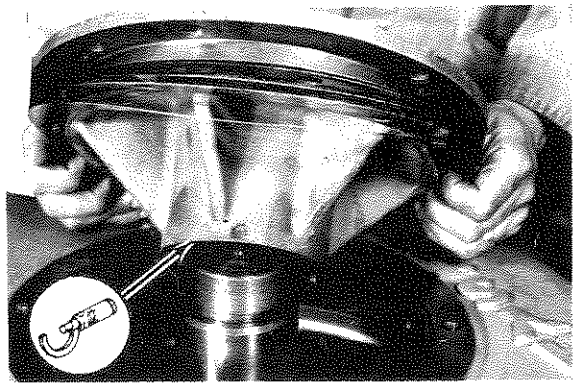
NOTE Refer to Paragraph 5-30 for control valve repairs.



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

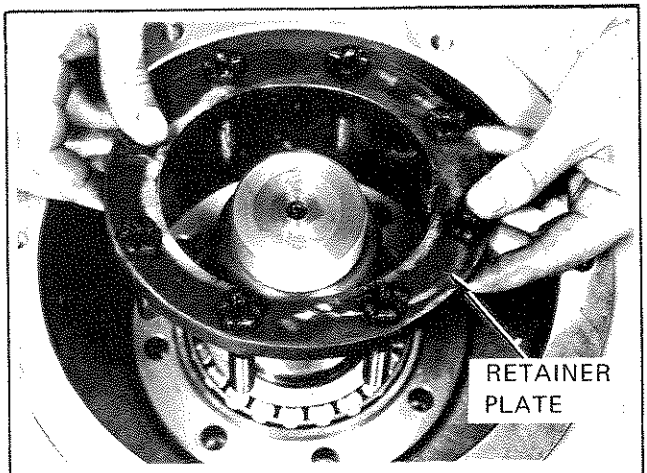


STEP 2. Remove left-hand drum shaft locknut, then turn winch so that right-hand side faces upward. Remove second drum shaft locknut.

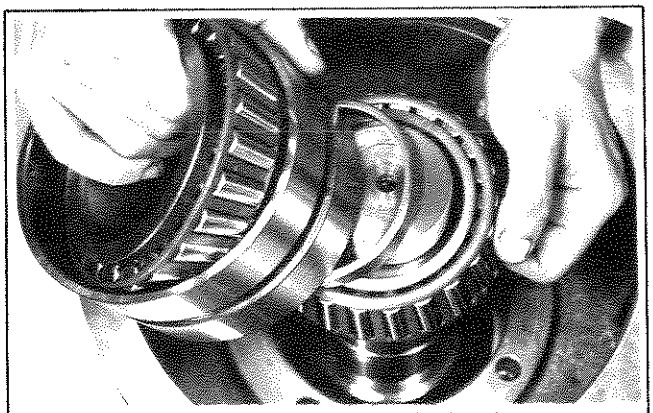


STEP 3. Remove bearing retainer and shim pack.

NOTE: Tag shim pack for reference during reassembly.

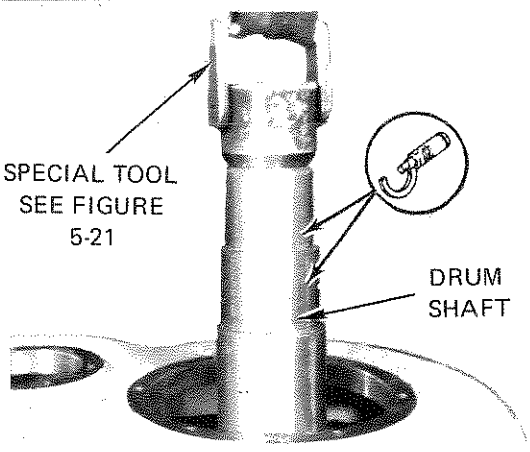


STEP 4. Remove retainer plate by removing the eight special capscrews.



STEP 5. Remove double taper roller bearing assembly.

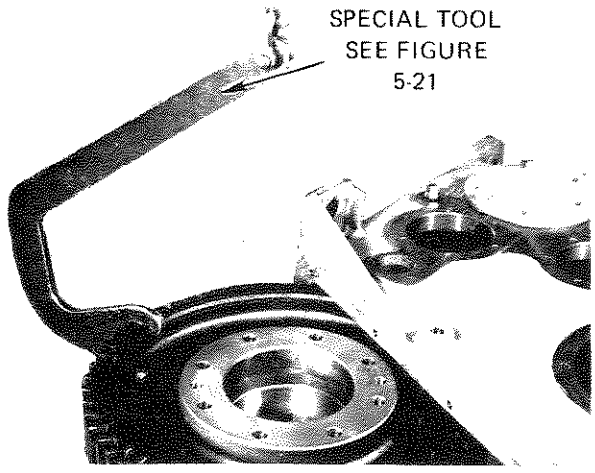
NOTE: Bearing assembly may be removed with the drum shaft if it is seized to the shaft.



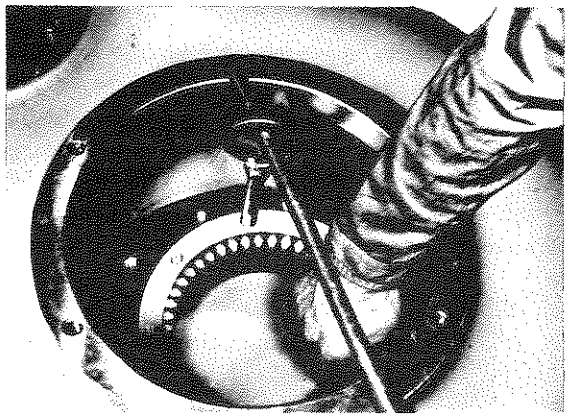
STEP 6. Remove drum shaft using special attachment.

1524

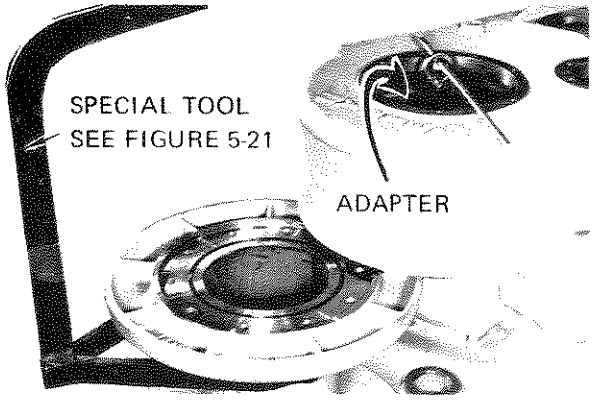
FIGURE 5-9. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 1 of 2)



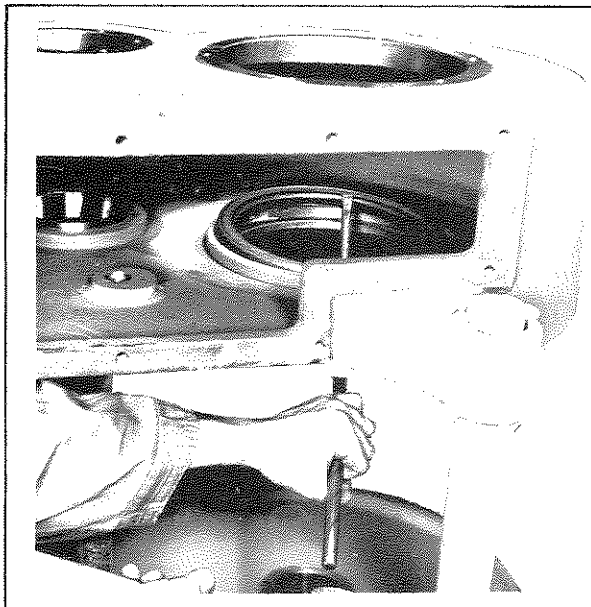
STEP 7. Remove drum gear using special attachment.



STEP 8. Hold adapter as shown, then remove two remaining drum capscrews.

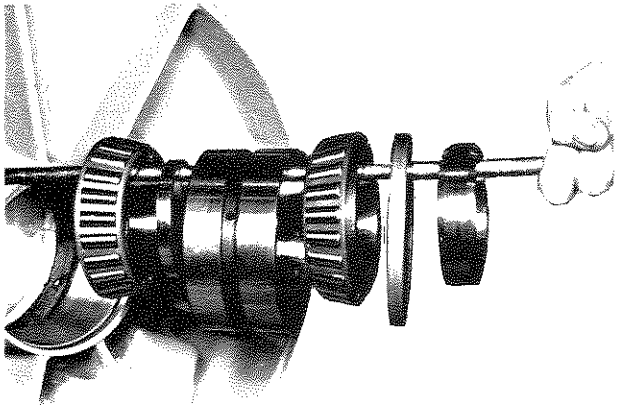


STEP 9. Remove from winch frame using attachment as shown. Remove adapter.



STEP 10. Remove and discard drum seal.

NOTE: This seal must be replaced with a new Hyster Approved seal during installation.



STEP 11. Remove double taper roller bearing assembly.

1525

FIGURE 5-9. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 2 of 2)

Overhaul Instructions

5-24. CLEANING.

5-25. When parts are removed from the winch, remove accumulated grease and dirt using mineral spirits or other suitable cleaning solvents. Never 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.

5-26. BEVEL GEAR SHAFT OIL PASSAGES. Ensure that the oil passage in each end of the bevel gear shaft is clean. To aid in cleaning the passages, remove the four seals from the inboard holes and the two orifice plugs from the outboard holes. Use air to blow out any accumulated dirt.

5-27. VISUAL INSPECTION.

5-28. Table 5-1 contains procedures for visual inspection of all critical parts of the winch assembly.

TABLE 5-1. VISUAL INSPECTION (Sheet 1 of 3)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
PTO Shaft, Lo-Speed and Slo-Speed	Check for broken or worn bevel gear teeth. Also check spline for wear or twisting.	Replace shaft if gear teeth are broken or severely worn or if splines are not true.
PTO Shaft, Standard Speed	Check splines for wear or twisting.	Replace shaft if splines are severely worn or twisted.
PTO Shaft Bevel Gear, Standard Speed	Check for broken or worn bevel gear teeth.	Replace bevel gear if teeth are broken or severely worn.
Bevel Gear Shaft, Direct Drive Winch	Check for deep scratches or scoring on bearing journals at each end of shaft.	Dress surface or replace shaft if severely worn.
Bevel Gear Shaft, Power Controlled Winch	Check for deep scratches or scoring on bearing journals at each end of shaft.	Dress surface or replace shaft if severely worn.
	Inspect bevel gear shaft seal ring grooves for taper, scoring, burrs, and corrosion.	Replace or repair shaft if mating surfaces between the inner side of groove and seal are not FLAT.
	Check for broken, scored, pitted, and corroded cast iron seal rings.	Replace seal rings if worn or damaged slightly.
	Check threads on right-hand end of bevel gear shaft for scoring or distortion: a. Puller Hole (internal threads). b. Locknut (external threads).	Dress threads with a thread chaser.
	Check for broken or severely worn splines.	Replace shaft if splines are broken or severely worn.

TABLE 5-1. VISUAL INSPECTION (Sheet 2 of 3)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Bevel Gear Shaft, Power Controlled Winch (Cont.)	Inspect spline seal counterbore for damage.	Replace shaft if a new spline seal will not seat properly.
	Check for damaged or enlarged orifice plugs.	Replace plugs if damaged.
Bevel Gear Shaft Bearing Retainers	Check retainer seal ring bore for grooves, scoring and rust.	Replace if scored, rusted.
Dental Clutch, Direct Drive Winch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Bevel Gear Shaft Spacers	Inspect spacer ends for scoring, mushrooming, or corrosion.	Replace if damaged in any way.
Bevel Gear Shaft Pinion Gears, Direct Drive Winch	Check for broken or worn teeth.	Replace pinion gears if teeth are broken or severely worn.
Bevel Ring Gears	Check for broken or 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 the hub faces are defective in any way. **NOTE** Do not machine gear faces. Overall length of components is critical.
Clutch Assembly, Power Controlled Winch	Check for plugged oil holes in clutch hub and cooling oil valve. Also check cooling oil valve plunger for free movement.	Clean oil holes as necessary. See Figure 5-12, Step 4.
	Carefully inspect friction discs for facing wear, distortion, and damaged teeth.	Replace friction disc if oil grooves are worn from sintered bronze facing or if distorted in any way.
	Carefully inspect separator plates to see if surfaces are conical (dished).	Replace separator plate if any surface is flat, warped, or scored. **NOTE** Separator plates must be dished to assist clutch release.
	Inspect piston retainer O-ring grooves for scoring, burrs, and corrosion.	Replace piston retainer if damaged.
	Inspect spider gear for broken or worn gear teeth. Check for broken welds between gear hub and clutch housing.	Replace gear if teeth are broken or severely worn or if there are any apparent cracks.

TABLE 5-1. VISUAL INSPECTION (Sheet 3 of 3)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Hydraulic Brake Cylinder, Power Controlled Winch	Check cylinder housing for damaged internal threads.	Dress threads using thread chaser. Replace housing if threads are severely damaged.
	Carefully check cylinder housing bore for deep scratches.	Replace cylinder housing.
	Check piston and rod assembly for deep scratches, scoring or excessive wear.	Replace piston and rod as an assembly.
Brakeshaft	Check for deep scratches or scoring on bearing journals at each end of shaft, and oil seal surface on Direct Drive winch.	Dress surface or replace shaft if severely worn.
	Check for broken or severely worn splines.	Replace if splines are broken or severly worn.
Brakeshaft 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.
	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.
Intermediate Gears	Inspect both gears for broken or severely worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gears if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing journal at each end of shaft.	Dress surface or replace shaft if severely worn.
	Check for crossthreaded or damaged threads.	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 quad-ring groove for burrs, scoring, and rust.	Replace drum or rebuild drum groove if a new quad-ring will not seat properly.
Drum Adapter	Carefully inspect double seal contact surface for deep scratches, burrs, and rust.	Replace if damaged.

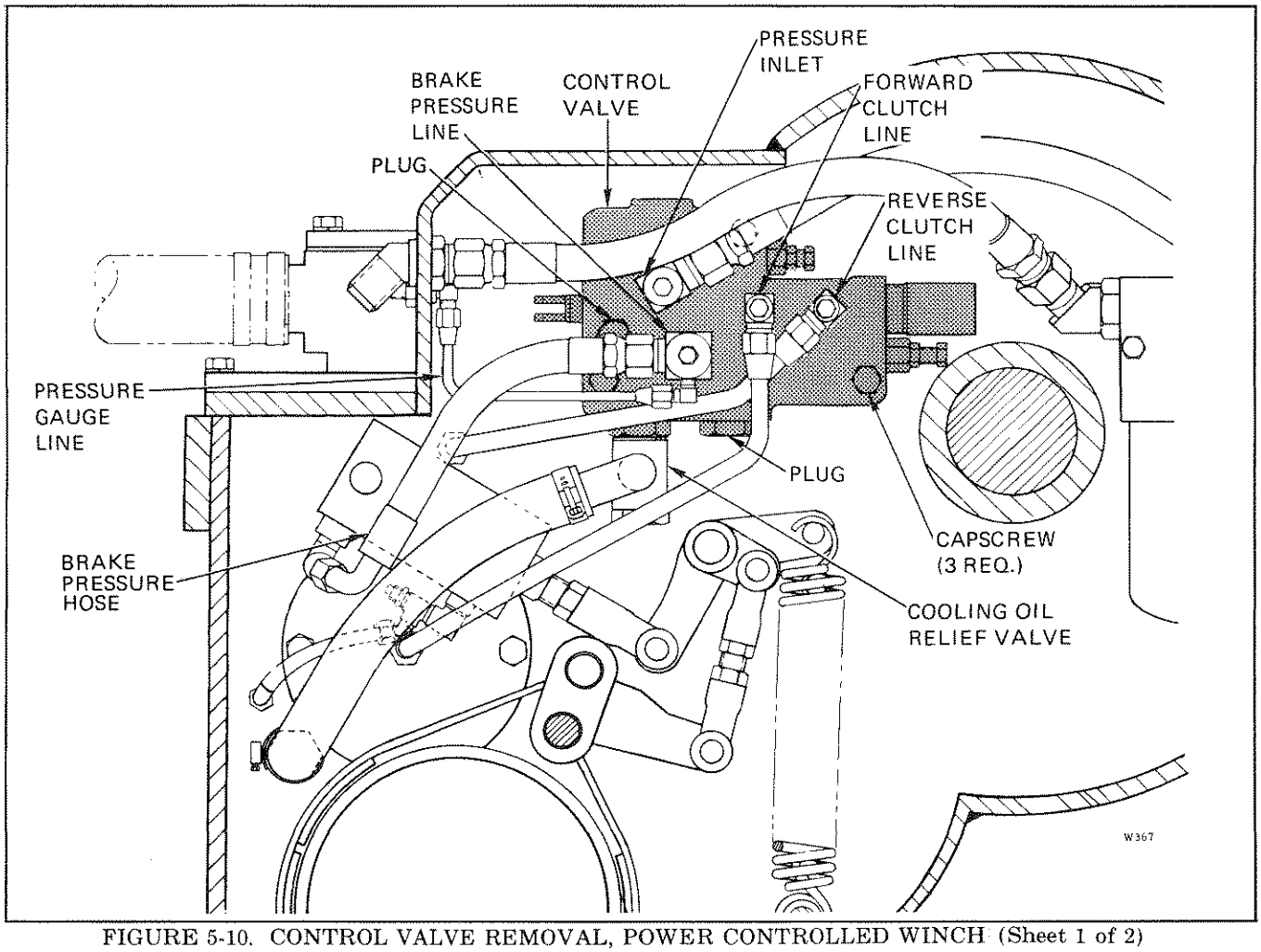


FIGURE 5-10. CONTROL VALVE REMOVAL, POWER CONTROLLED WINCH (Sheet 1 of 2)

5-29. MINOR REPAIRS.

5-30. Control Valve Repairs (Power Controlled Winch).

5-31. Repair of the control valve is limited to removal and replacement of individual components as shown in Figure 5-10. Replace defective components as required, observing the following:

CAUTION Do not attempt to machine any part of the control valve. If parts are found to be defective, replace the part. Do not hone the valve spool bores.

a. Discard all old O-rings. Lubricate all O-rings with hydraulic oil before installation.

b. Check all threads in the valve body and on external fittings. If threads in the valve body have been damaged, re-thread using same size tap. Make sure that all metal chips are removed from the valve ports.

c. Check all springs for weak or collapsed coils.

5-32. Cooling Oil Relief Valve (Power Controlled Winch).

5-33. Repair of the cooling oil relief valve is limited to replacement of the assembly as shown in Figure 5-10. Check spring for weak or collapsed coils.

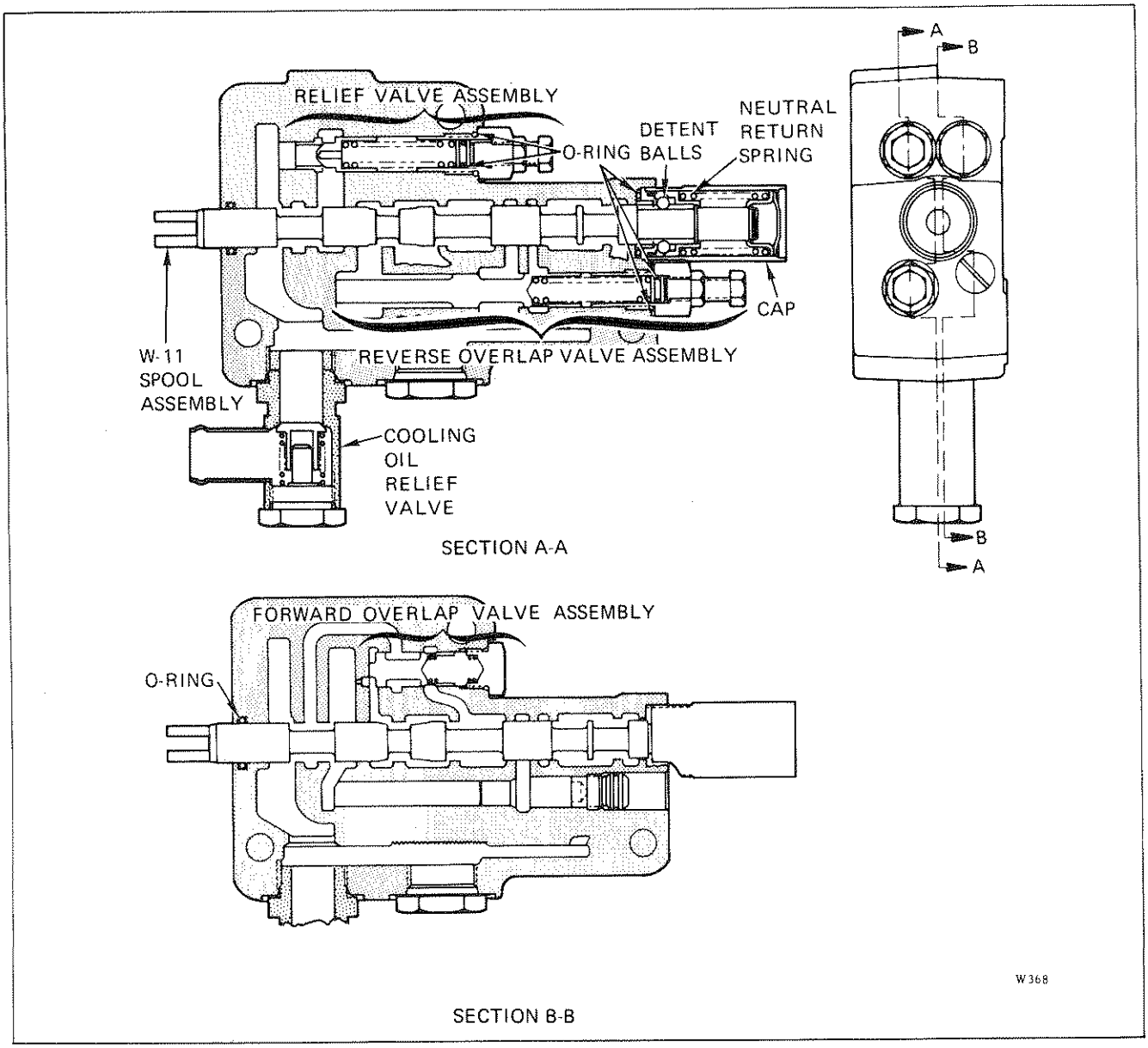


FIGURE 5-10. CONTROL VALVE REMOVAL, POWER CONTROLLED WINCH (Sheet 2 of 2)

5-34. Hydraulic Brake Cylinder Repairs (Power Controlled Winch).

5-35. Repair of the hydraulic brake cylinder is limited to removal and replacement of individual components shown in Figure 5-11. Replace defective components as required, observing the following:

CAUTION Do not attempt to machine any part of the brake cylinder. If parts are found to be defective, replace the part. Do not hone the cylinder housing bore or attempt to machine the piston and rod assembly.

a. Discard all old O-rings. Lubricate all O-rings with hydraulic oil prior to installation.

b. Check all threads in the cylinder housing. If threads are damaged, rethread using same size tap. Make sure that all metal chips are removed from the cylinder bore.

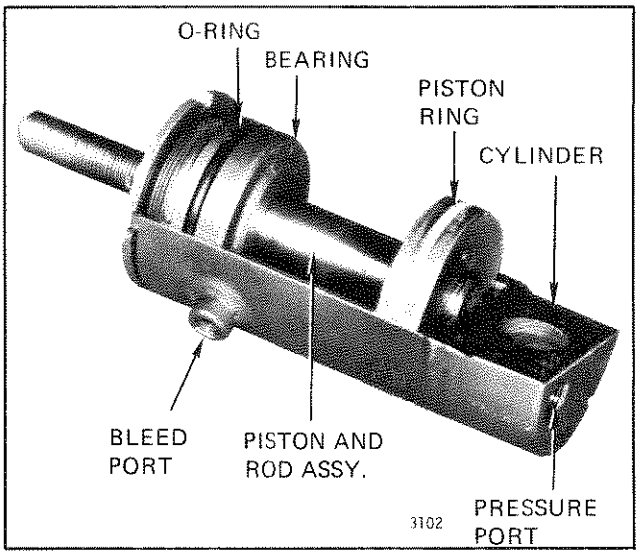


FIGURE 5-11. REPAIR OF HYDRAULIC BRAKE CYLINDER, POWER CONTROLLED WINCH

c. Lubricate the interior section of the cylinder housing with hydraulic oil prior to installing the piston and rod assembly.

5-36. REASSEMBLY AND INSTALLATION.

5-37. Before reassembly and installation of the winch, make sure that all removed parts have been inspected as specified in Table 5-1. Check all parts for wear as shown in the disassembly illustrations. 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. New bearings may prevent future troubles.

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

5-38. Reassembly of Oil Clutch Assemblies (Power Controlled Winch).

5-39. Reassembly of the clutch assemblies used in the Power Controlled winch is shown in Figure 5-12.

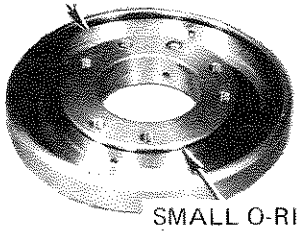
CAUTION Make certain that all parts have been thoroughly cleaned prior to reassembly. Dirt particles will seriously affect operation of the clutch assembly.

5-40. Installation of Drum and Drum Shaft.

5-41. Reassembly and installation of the drum and drum shaft is shown in Figure 5-13. During installation of the drum and drum shaft, see the illustration of special tools (Figure 5-21) and locally fabricate the tools if possible. The intermediate shaft and reverse clutch assembly must be removed before installation of the drum and drum shaft.

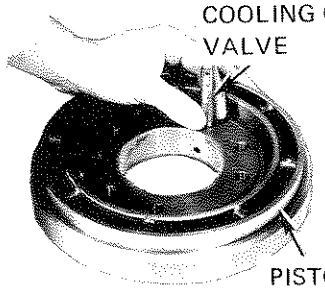
5-42. Installation of Intermediate Shaft Assembly.

5-43. Installation of the intermediate shaft and associated components is shown in Figures 5-14 and 5-15. Figures 5-14 and 5-15 show the winch removed from the tractor with the bevel gear 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.



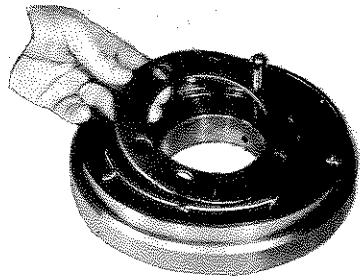
STEP 1. Install two new O-rings. Lubricate piston retainer cavity.

NOTE: It may be necessary to stretch large O-ring so it will stay in its groove when piston is installed.



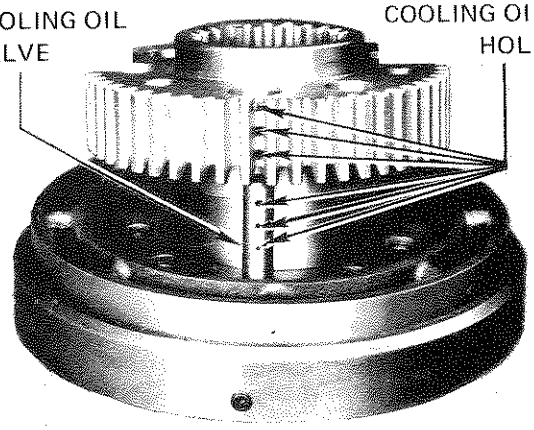
STEP 2. Install piston and cooling oil valve. Tighten valve with special tool (See Fig. 5-21).

CAUTION: Do not insert any tool through valve body. It will damage spring.



STEP 3. Install spring retainer with smooth side up.

NOTE: Holes are sequenced so spring retainer can only be installed as shown.

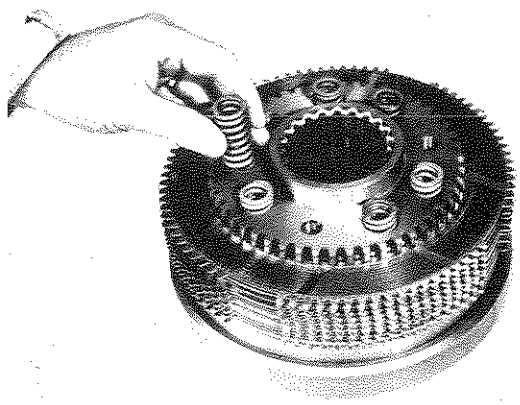


STEP 4. Install clutch hub.

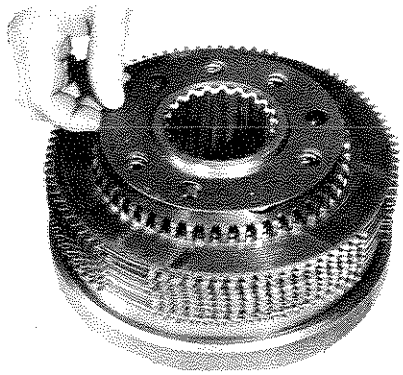
CAUTION: Cooling oil holes in the clutch hub must align with the holes in cooling oil valve.

STEP 5. Place six separator plates and six friction discs ALTERNATELY on clutch hub.

CAUTION: Separator plate must be placed next to piston. Separator plates are slightly conical (dished). Install ALL the plates facing the same direction.



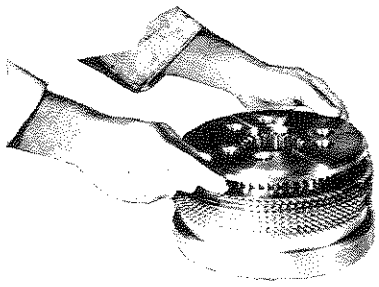
STEP 6. Install six release springs.



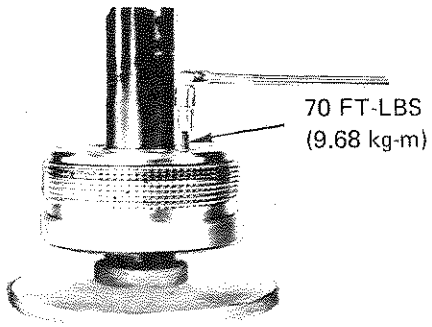
STEP 7. Install shim if required (See STEP 10.)

CAUTION: Holes are sequenced so shim can only be installed as shown.

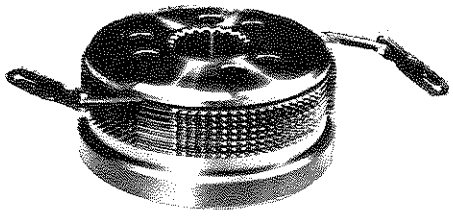
FIGURE 5-12. REASSEMBLY OF OIL CLUTCH ASSEMBLY, POWER CONTROLLED WINCH (Sheet 1 of 2)



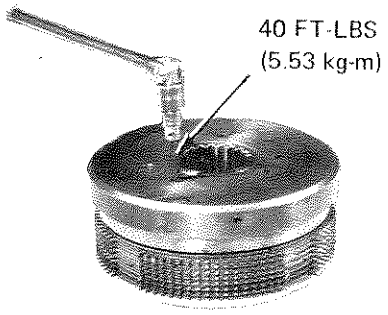
STEP 8. Install cover plate.
CAUTION: Holes are sequenced so cover plate can only be installed as shown.



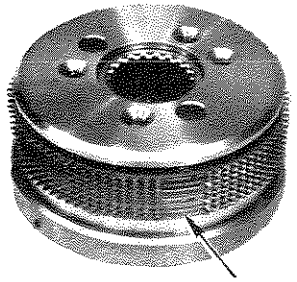
STEP 9. Install and tighten six special capscrews.
CAUTION: The press adapters should contact the hub only. Apply only enough pressure to prevent assembly from turning when capscrews are tightened.



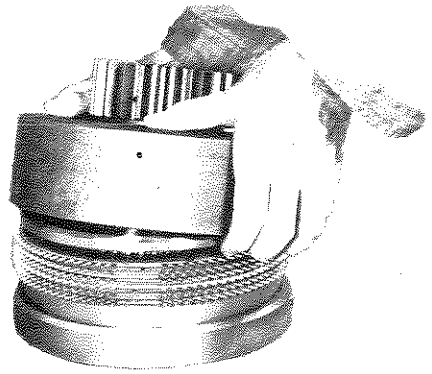
STEP 10. Measure distance between cover plate and top friction disc with two feeler gauges placed 180° apart as shown. Gap should be .085 to 0.125 inch (1.65-3.175 mm). Add or delete shims as required to obtain correct clearance (see Step 7).
CAUTION: When only one feeler gauge is used, friction disc will tip slightly giving false clearance.



STEP 11. Tighten six set screws that lock the special capscrews.

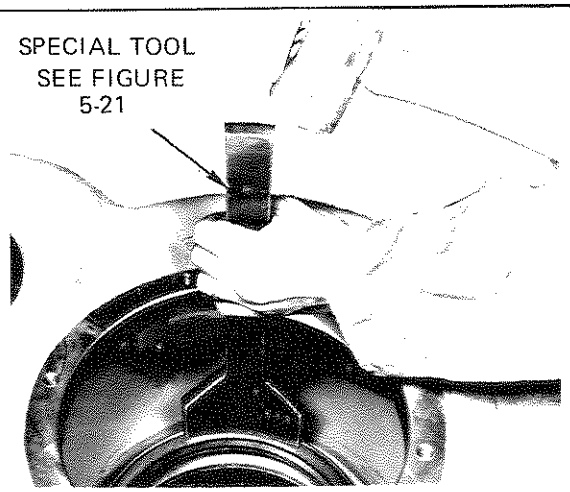


STEP 12. Align friction discs as shown.

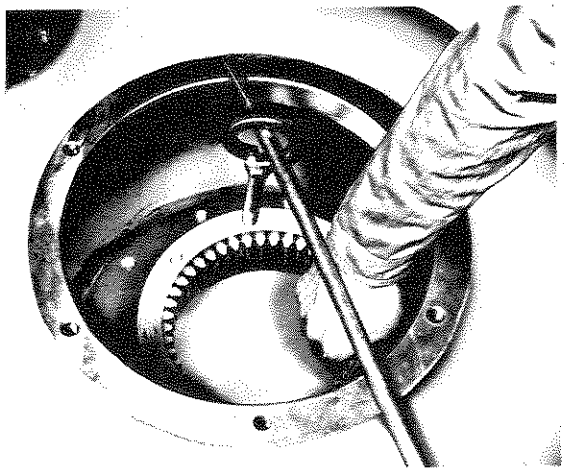


STEP 13. Carefully slide spider gear over clutch pack.

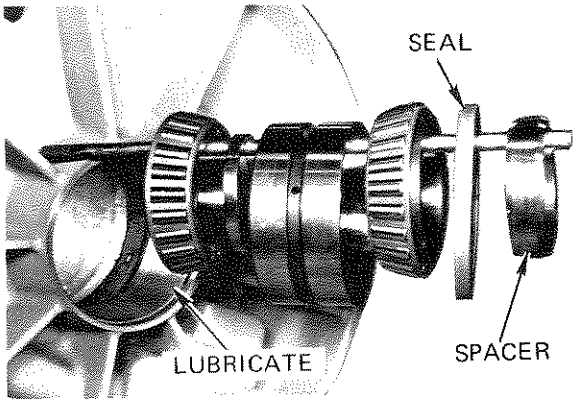
FIGURE 5-12. REASSEMBLY OF OIL CLUTCH ASSEMBLY, POWER CONTROLLED WINCH ONLY (Sheet 2 of 2)



STEP 1. Lubricate seal bore with Lubriplate or other light lube grease. Install double-lip seal with smooth side down. Use seal driver as shown to prevent seal distortion.

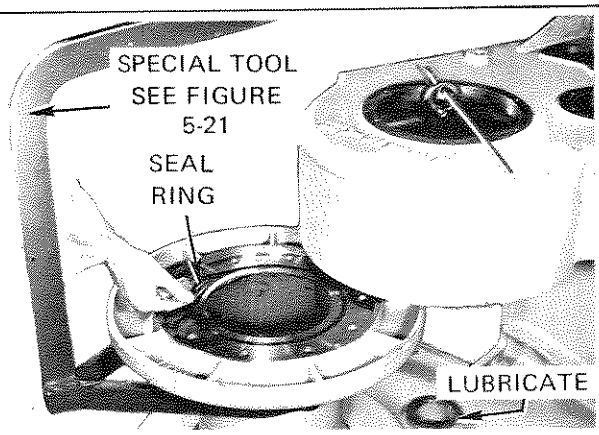


STEP 2. Install drum adapter by lifting it up through double-lip seal. Hold in place with bar and eyebolt as shown.



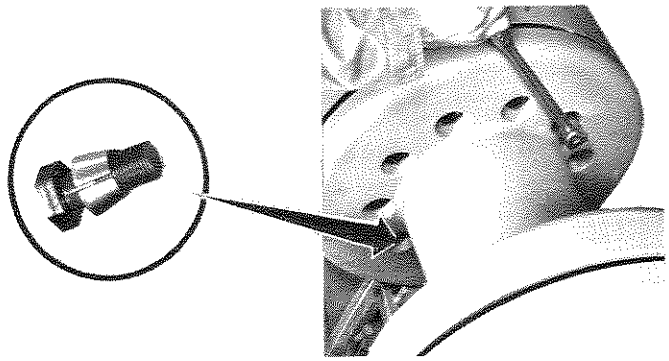
STEP 3. Lubricate drum bore with Lubriplate or other light lube grease, then install double-taper roller bearing, seal, and spacer as shown.

NOTE: Smooth side of seal must face inward.



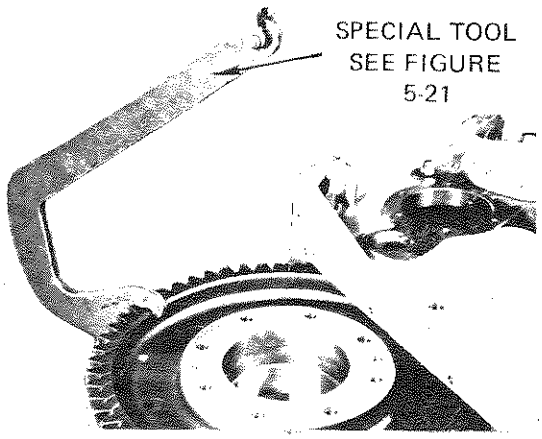
STEP 4. Lubricate left-hand drum shaft bore. Coat seal ring and groove with permatex or other suitable sealing compound. Install seal ring, then place drum in position using special attachment.

STEP 5. Align adapter and drum holes, then install the 12 locking dowels and capscrews. Tighten progressively and evenly to insure uniform compression of seal ring without shifting. Do not tighten to final torque.

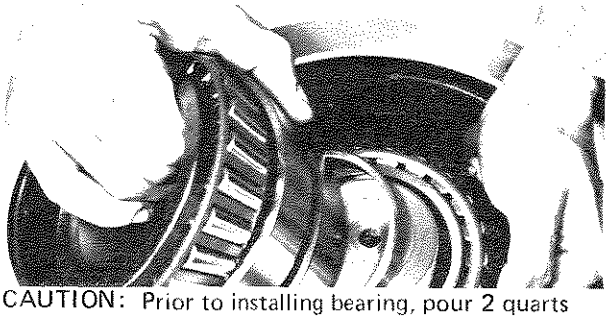


1593

FIGURE 5-13. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 1 of 3)

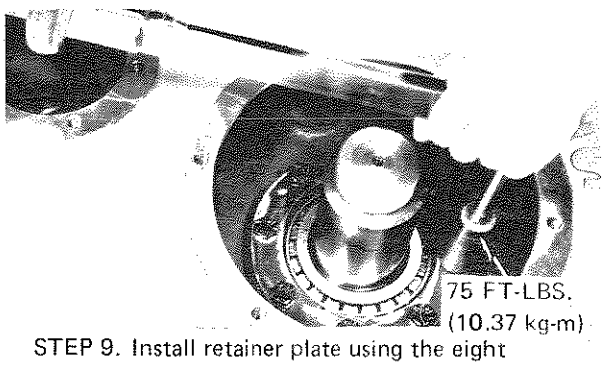


STEP 6. Install drum gear using special attachment as shown.



CAUTION: Prior to installing bearing, pour 2 quarts (1.89 liters) of oil over drum shaft to insure initial bearing lubrication (SAE 10 oil for P.C. and SAE 90 for D.D. winch).

STEP 8. Install bearing assembly. Install bearing parts in sequence shown. Tap into place.

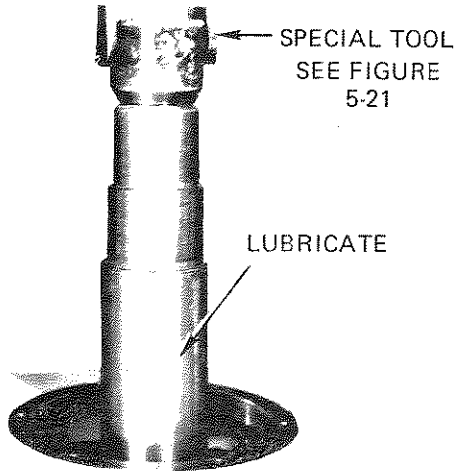


STEP 9. Install retainer plate using the eight special capscrews. Tighten capscrews to 75 ft-lbs. (10.37 kg-m)

NOTE: Capscrews cannot be installed unless drum gear and drum adapter have been aligned as shown in Step 7.

STEP 7. Rotate drum gear to align match mark on gear with match mark on drum adapter. Make sure that double taper roller bearing, seal and spacer are properly seated in drum (see step 3). Lubricate drum shaft and drum gear bore, then install drum shaft using special attachment as shown. Remove sling and drive shaft down through drum gear until shaft bottoms solidly against lower taper roller bearing.

CAUTION: Hammer on special attachment only. Do not hammer on drum shaft surface.



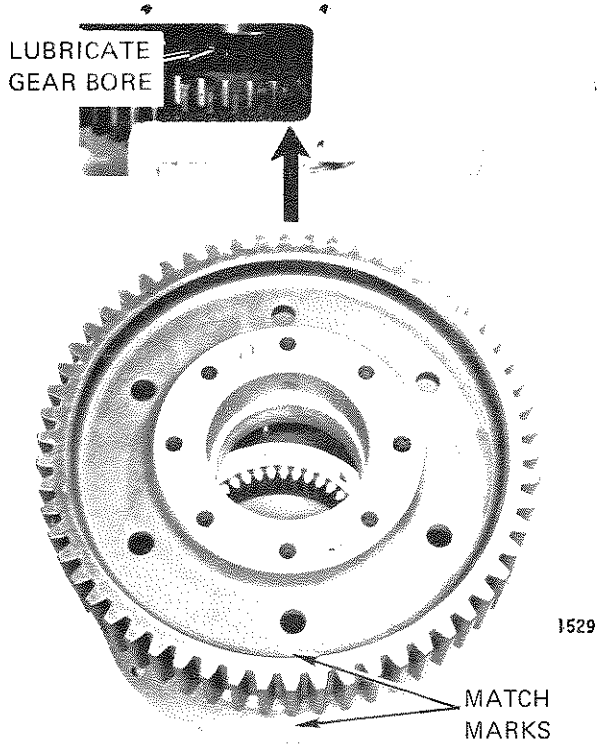
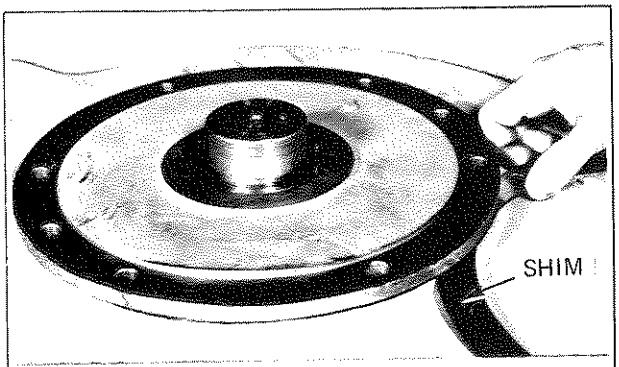
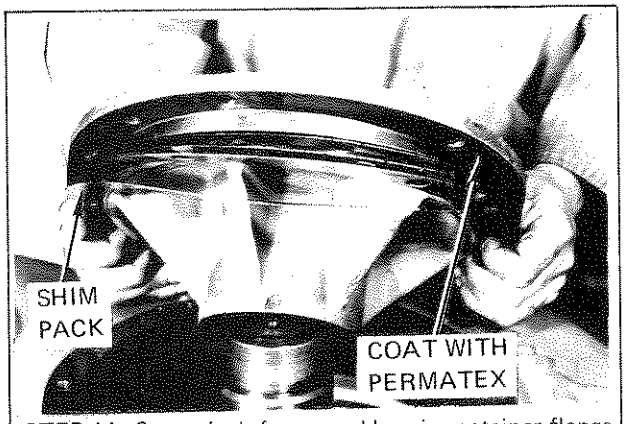


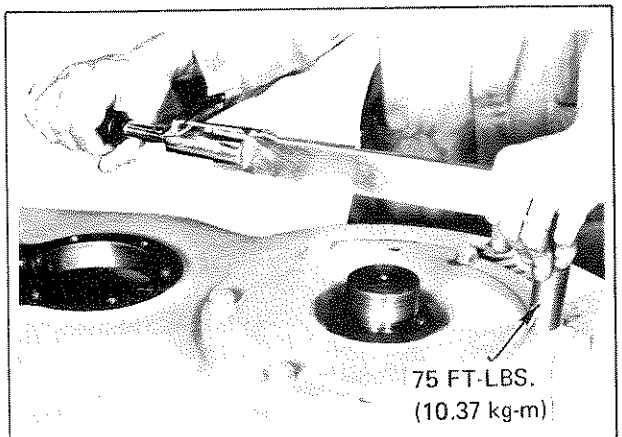
FIGURE 5-13. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 2 of 3)



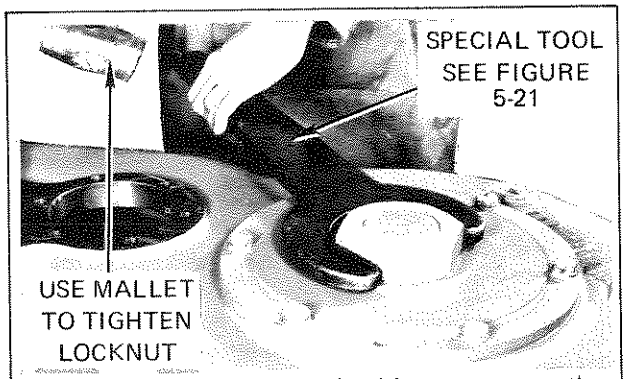
STEP 10. Set bearing retainer into place. Determine shim pack by sliding segment of shim between retainer and winch frame. Add shims until slight drag is felt. Remove retainer.



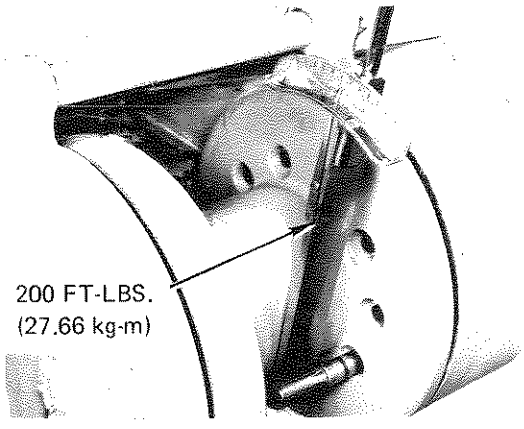
STEP 11. Coat winch frame and bearing retainer flange with permatex or other suitable sealing compound. Install shim pack (determined in Step 10).



STEP 12. Secure retainer using eight capscrews and lockwashers. Tighten capscrews to 75 ft-lbs. (10.37 kg-m).

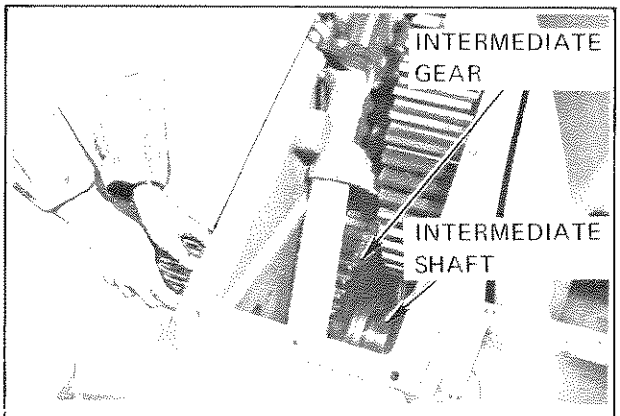


STEP 13. Coat locknut threads with permatex or other suitable sealing compound. Install nut and tighten securely as shown. Place winch in normal operating position and install locknut on opposite end of drum shaft.

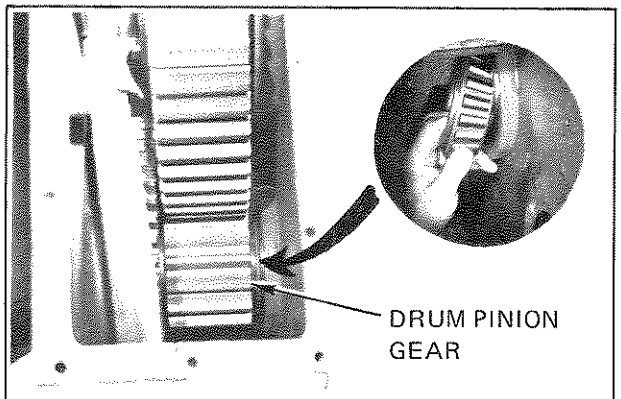


STEP 14. Tighten Drum-to-Adapter capscrews to 200 ft-lbs. (27.66 kg-m).

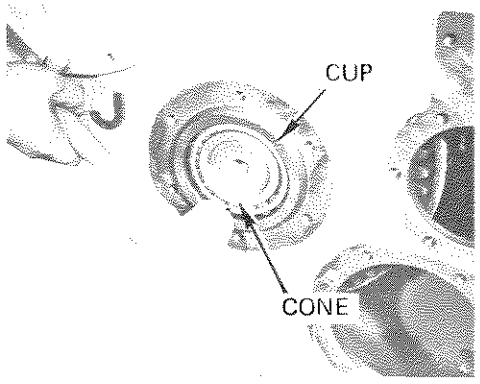
FIGURE 5-13. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 3 of 3)



STEP 1. Position intermediate gear in housing and install intermediate shaft far enough to support the gear.



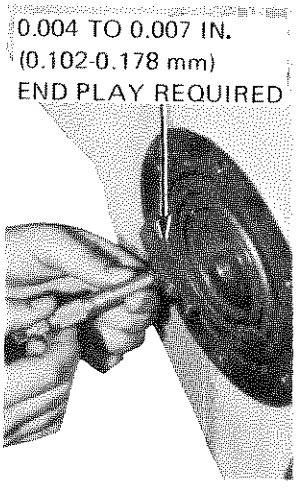
STEP 2. Install the intermediate shaft bearing and drum pinion gear. Tap the shaft through the pinion gear and against the bearing.

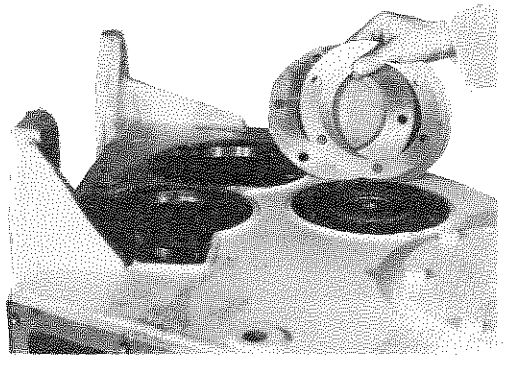


STEP 3. Install the bearing cone (inner race) and bearing cup (outer race). Make sure that cup is firmly seated against the bearing cone.

STEP 4. Measure the distance from the face of the bearing cup to the winch housing. Add shim pack 0.004 to 0.007 inch (0.102-0.178 mm) greater than the measured distance. For example, if the measure 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.

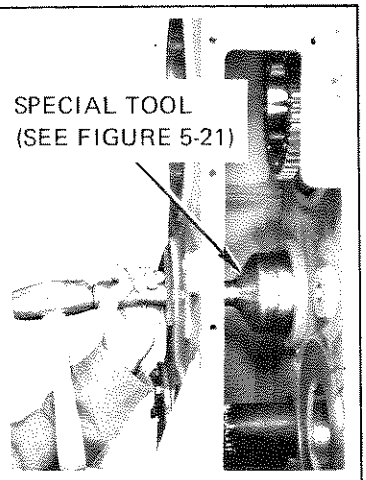
NOTE: Shafts requiring a shim pack greater than 0.020 are not uncommon.



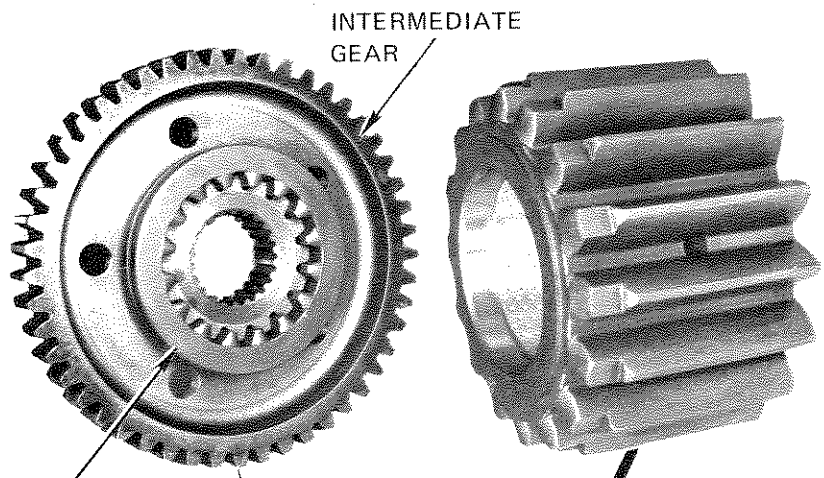


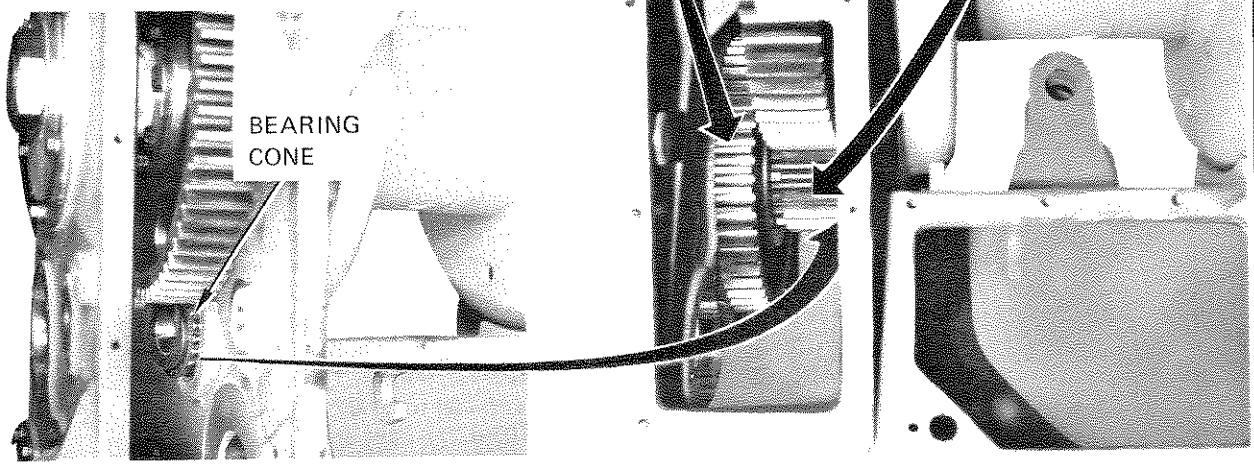
STEP 5. Install finalized thickness shim pack and bearing retainer. Tighten the six capscrews to 88 ft-lbs. (12.17 kg-m) torque.

FIGURE 5-14. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY FOR WINCH WITHOUT FREE-SPOOLING

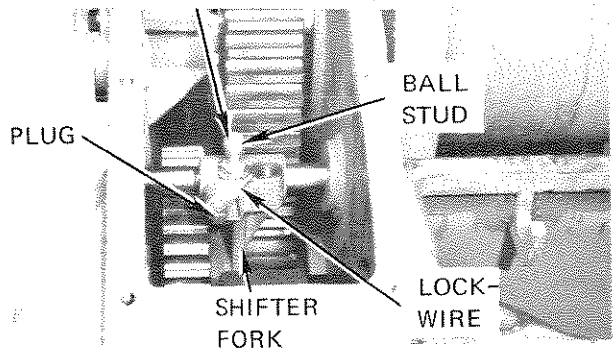


STEP 1. Install bearing cup if previously removed.

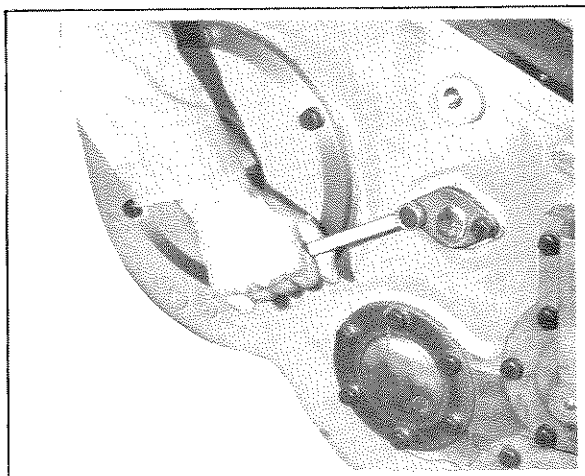




STEP 2. Install intermediate shaft, intermediate gear, dental clutch, drum pinion and bearing cone as shown.

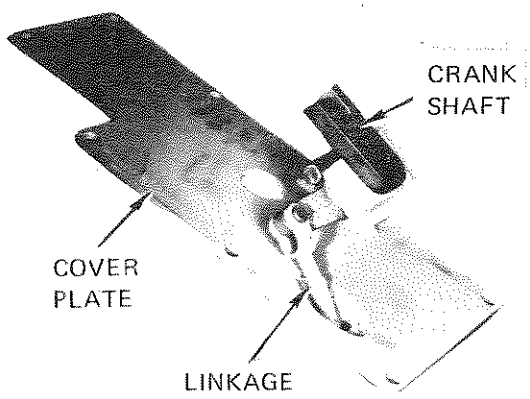


STEP 3. Install shifter fork assembly. Make sure that shifter fork is properly positioned in dental clutch groove. Install lockwire through drilled plug.

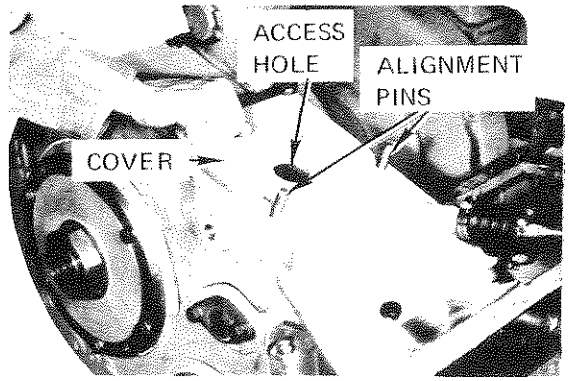


STEP 4. Install two capscrews with lockwashers. Tighten capscrews securely.

FIGURE 5-15. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY FOR WINCH WITH FREE SPOOLING (Sheet 1 of 2)



STEP 5. Assemble shift linkage and cover as shown.



STEP 6. Install two guide pins as shown, then install gasket and cover. Make sure that the ball stud (see Step 3) slides into the linkage crankshaft.

FIGURE 5-15. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY FOR WINCH WITH FREE SPOOLING (Sheet 2 of 2)

5-44. Installation of Brake Shaft Assembly.

5-45. Installation of the brake shaft and associated components is shown in Figure 5-16. The brake shaft and reduction gear must be installed before installation of the bevel gear 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 (0.000-0.102mm) preload.

5-46. Reassembly and Installation of Bevel Gear Shaft Assembly (Power Controlled Winch).

5-47. Reassembly and installation of the bevel gear shaft assembly used in the Power Controlled winch is shown in Figure 5-17. Installation of the bevel gear shaft can be accomplished with the winch mounted on the tractor.

NOTE The reduction gear (see Figure 5-16) must be installed before installation of the bevel gear shaft assembly. This is due to insufficient clearance for installing the reduction gear when the bevel gear shaft is installed.

5-48. Reassembly and Installation of Bevel Gear Shaft Assembly (Direct Drive Winch).

5-49. Reassembly and installation of the bevel gear shaft assembly used in the Direct Drive winch is essentially the same as for the bevel gear shaft used in the Power Controlled winch (see Figure 5-17). Reassemble and install the bevel gear shaft as shown in Figure 5-17, observing the following:

a. See Figure 5-4 for location of bevel gear shaft components.

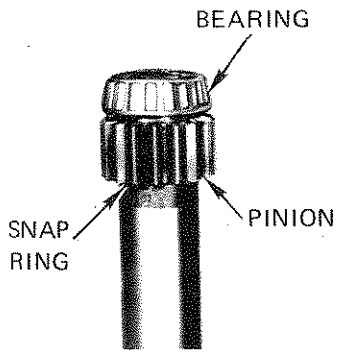
b. The Direct Drive winch is equipped with dental clutches. Install the dental clutch so that the chamfered ramp faces toward the pinion gear.

c. Install the bevel gear and two spacers for either Underwind or Overwind operation. Refer to Paragraph 4-15 or 4-19.

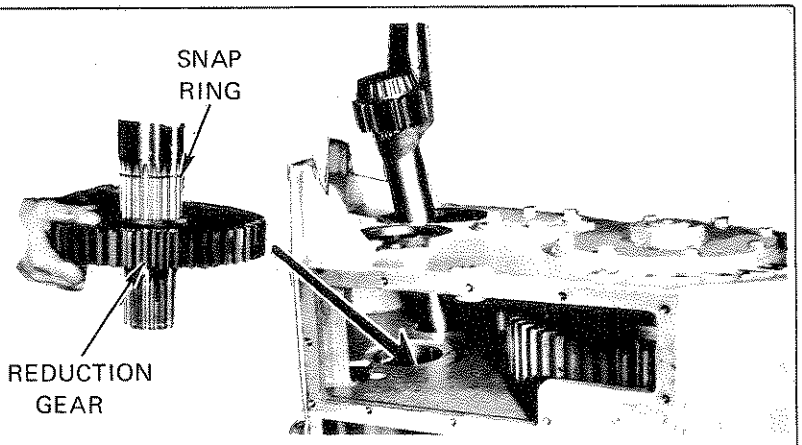
d. The bevel gear shaft must be adjusted for 0.006 to 0.009 inch (0.152-0.229 mm) endplay. This adjustment requires a different procedure than that used for preload adjustment for the Power Controlled winch (see Figure 5-17.)

5-50. Reassembly and Installation of Hydraulic Brake Assembly (Power Controlled Winch Only).

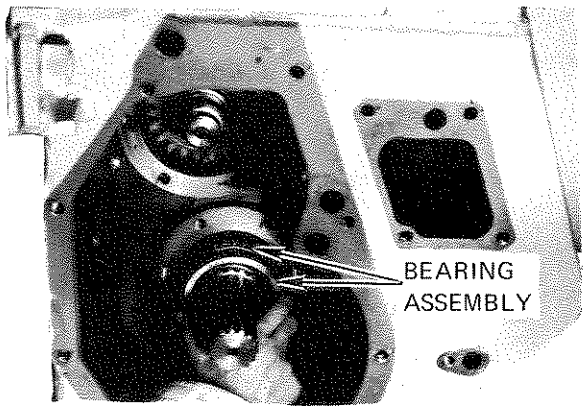
5-51. Installation of the hydraulic brake assembly used in the Power Controlled winch is shown in Figure 5-18. Reassembly and installation of the hydraulic brake can be accomplished with the winch mounted on the tractor. Make sure that the bevel gear shaft has been installed prior to installation of the brake assembly.



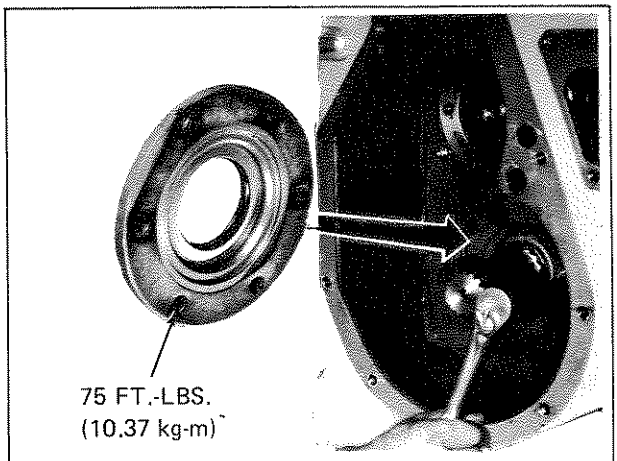
STEP 1. Press pinion and bearing on right-hand end of brake shaft.



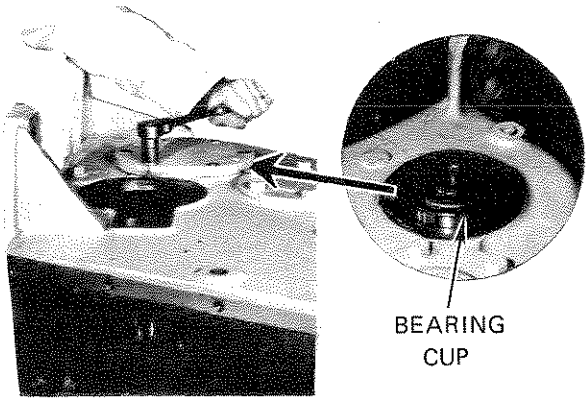
STEP 2. Lower shaft into winch housing and install Reduction Gear.



STEP 3. Set winch in normal operating position and install left-hand bearing assembly.



STEP 4. Install left-hand bearing retainer. Tighten capscrews to 75 ft.-lbs. (10.37 kg-m) torque.



STEP 5. Install bearing cup on right-hand end of shaft. Install retainer using three capscrews only. Tighten capscrews snugly.

FIGURE 5-16. INSTALLATION OF BRAKE SHAFT (Sheet 1 of 2)

STEP 6. Preload shaft as follows:

a. Using moderate pressure tap R.H. bearing retainer to seat brake shaft components.
b. Loosen the three capscrews previously installed in Step 3 above. Tighten capscrews finger tight only.
c. Measure gap between retainer and winch frame. Measure in three places around retainer. Add the three indications and divide by 3. This will give the average gap. Add 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.
d. Replace RH bearing retainer with final shim pack in place. Tighten six capscrews securely.

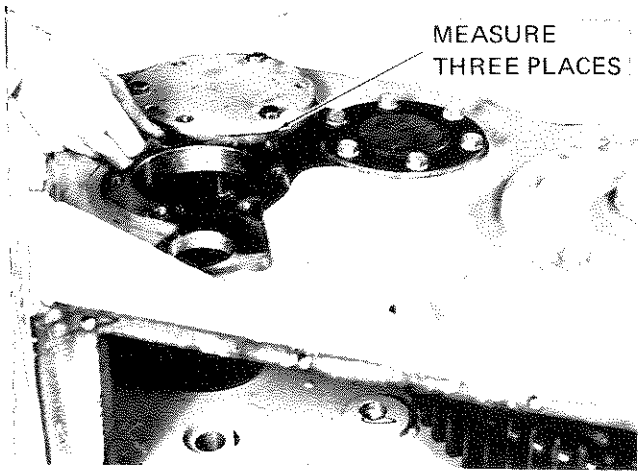
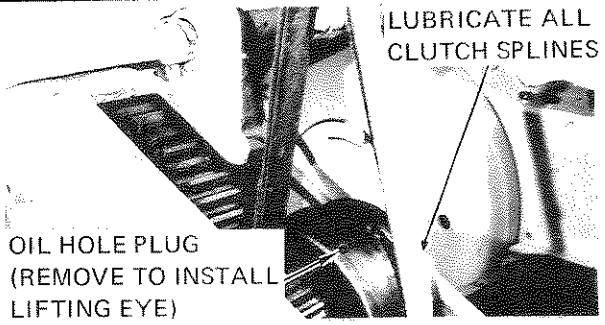


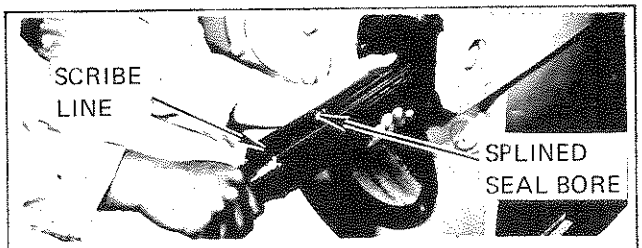
FIGURE 5-16. INSTALLATION OF BRAKE SHAFT ASSEMBLY (Sheet 2 of 2)

5-52. Installation of Dry Brake and Automatic Brake (Direct Drive Winch).

5-53. Installation of dry brake (or optional automatic brake) used in the Direct Drive winch is shown in Figure 5-19. Installation procedures shown in Figure 5-19 apply to both the dry brake and optional automatic brake.

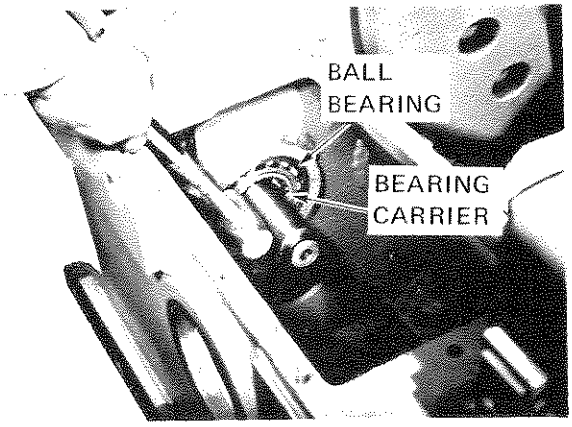


STEP 1. Use sling around clutch, or cable attached to lifting eye installed in oil hole, to lower reverse clutch assembly into housing. Position clutch so that oil hole is up as shown. Replace plug, if removed.



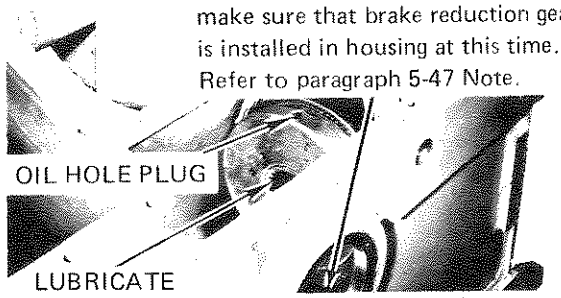
STEP 2. Position bevel gear shaft so that splined seal bore is directly in line with the setscrew at the top of reverse clutch assembly, then insert shaft. Make sure that scribe line on spline faces up. Lubricate entire shaft.

CAUTION: Make sure that the splined seals are removed before inserting the shaft. Splined seals may be damaged if installed at this time.

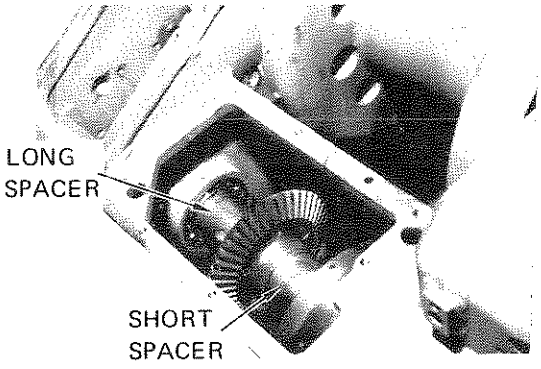


STEP 3. Install bearing. Make sure that bearing face is flush with winch frame.

NOTE: If brake shaft has not been installed, make sure that brake reduction gear is installed in housing at this time. Refer to paragraph 5-47 Note.

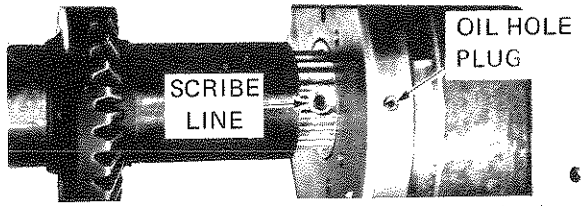


STEP 4. Use sling around clutch, or cable attached to lifting eye installed in oil hole, to lower forward clutch assembly into housing. Position clutch so that oil hole is up as shown. Replace plug, if removed.



STEP 5. Install the two spacers and bevel gear.

NOTE: Bevel gear and spacers are shown in overwind position. Refer to Paragraph 4-19 for underwind.



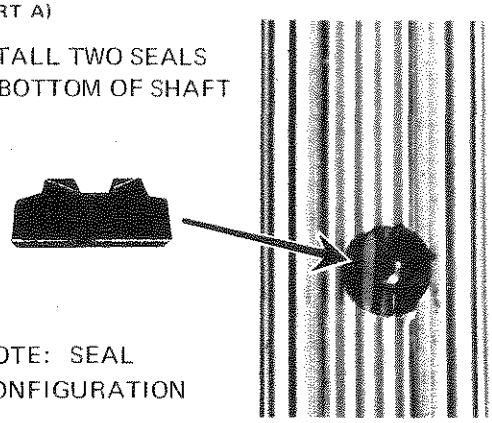
STEP 6. Tap bevel gear shaft through forward clutch assembly to position shown. Make sure that splined seal bore is aligned with setscrew at top of forward clutch assembly.

CAUTION: Splined seal bore and setscrew in clutch assembly must be exactly aligned. Misalignment of only one spline distance will impede flow of cooling oil during operation of the winch. Use scribe line on shaft spline for reference.

FIGURE 5-17. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 1 of 4)

(PART A)

INSTALL TWO SEALS ON BOTTOM OF SHAFT

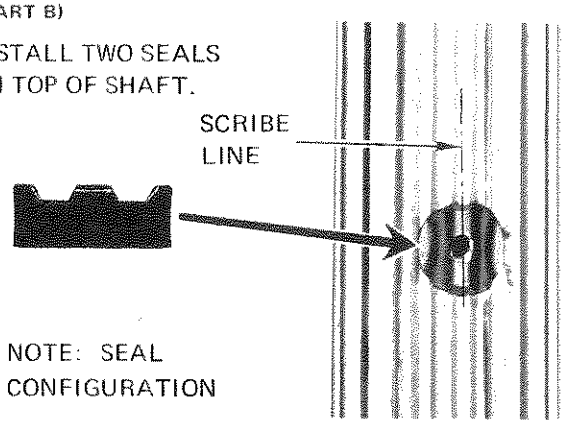


NOTE: SEAL CONFIGURATION

STEP 7. Carefully insert the four splined seals.

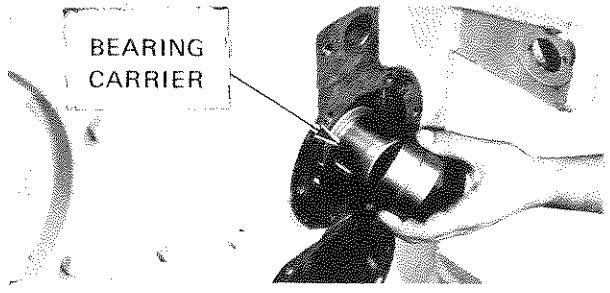
(PART B)

INSTALL TWO SEALS ON TOP OF SHAFT.



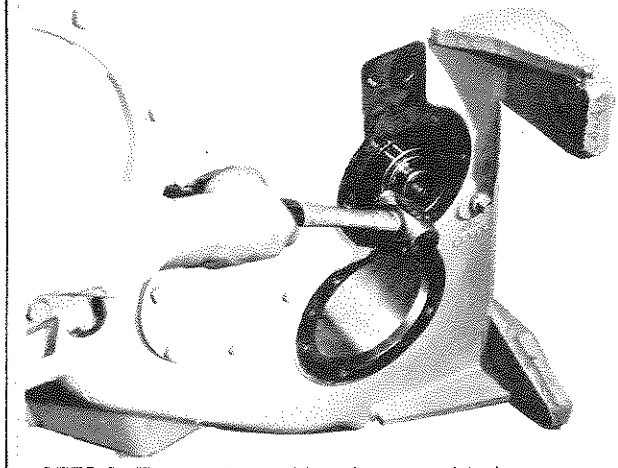
NOTE: SEAL CONFIGURATION

CAUTION: Lubricate spline seals with Lubriplate or equivalent prior to installation.

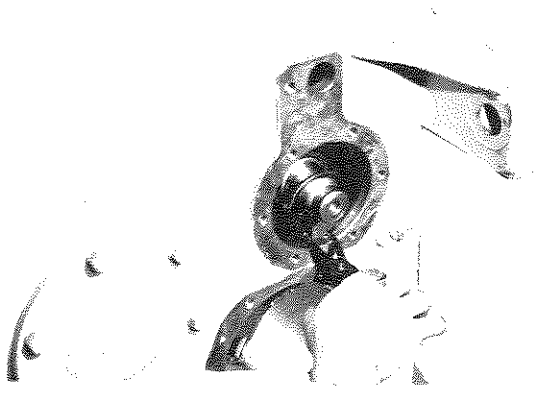


STEP 8. Carefully tap bevel gear shaft through the clutch assemblies. Install bearing carrier and roller bearing on RH end of shaft.

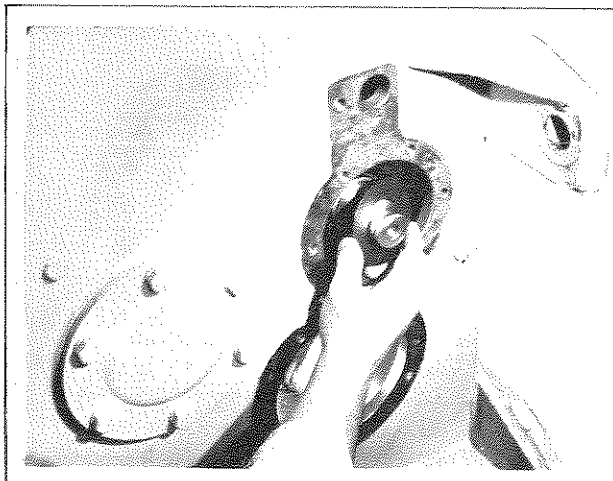
CAUTION: Use care to prevent interchanging LH and RH bearing carriers. The two bearing carriers are identical except that RH carrier is slightly wider.



STEP 9. Tap carrier and bearing assembly into reverse pinion gear



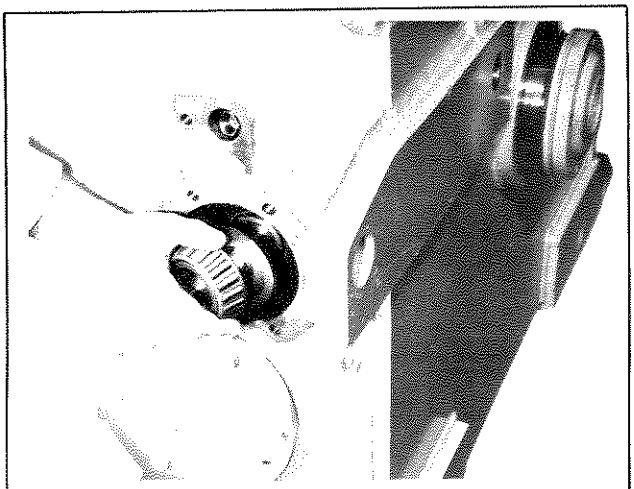
STEP 10. Install snap ring, making sure that it is properly seated.



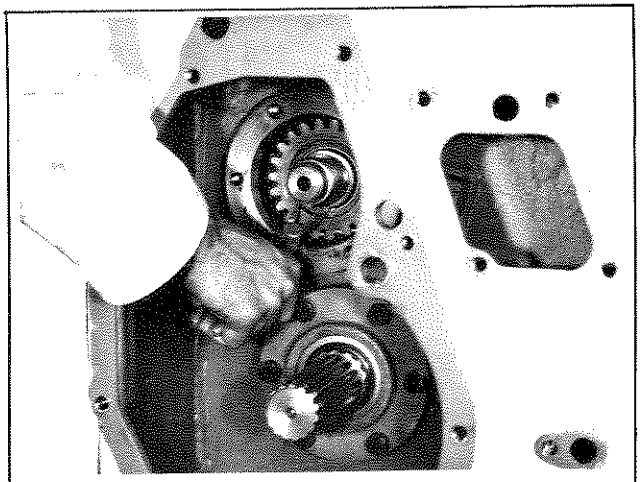
STEP 11. Install thrust washer.

1534

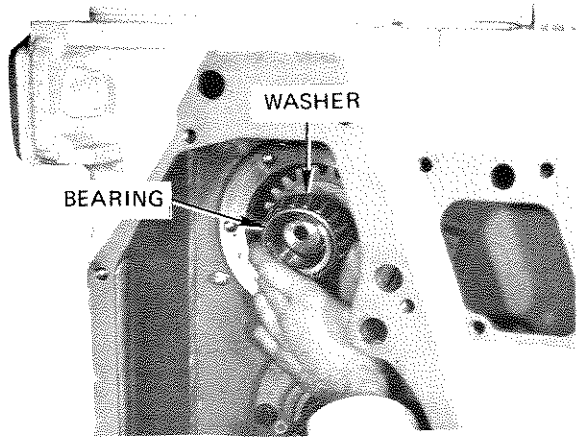
FIGURE 5-17. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 2 of 4)



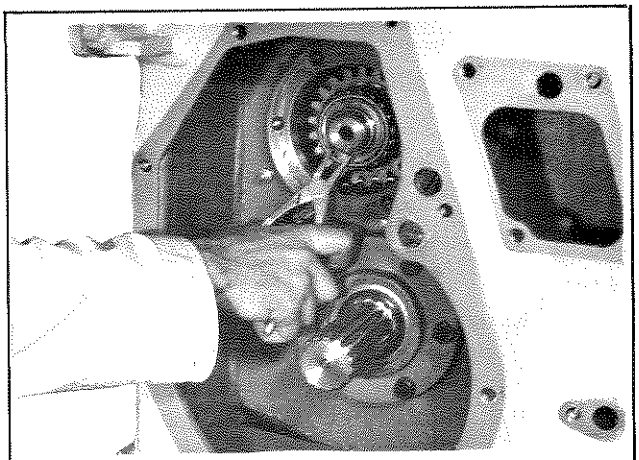
STEP 12. Install bearing.



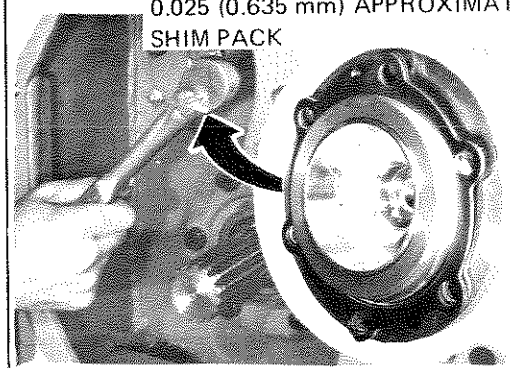
STEP 13. Install bearing assembly on left-hand end of shaft, then install snap ring.



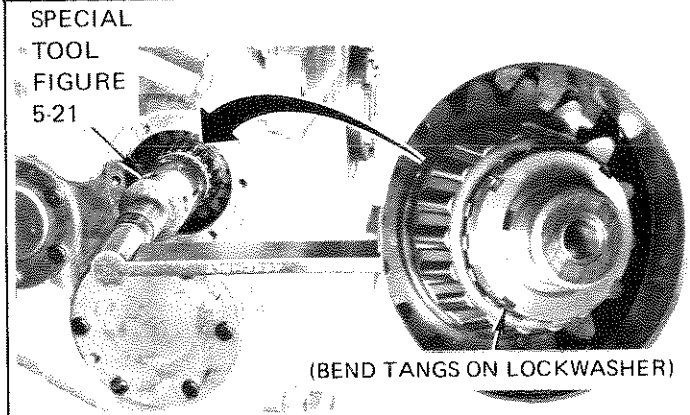
STEP 14. Install washer and bearing.



STEP 15. Tap bearing against clutch assembly, then install snap ring.

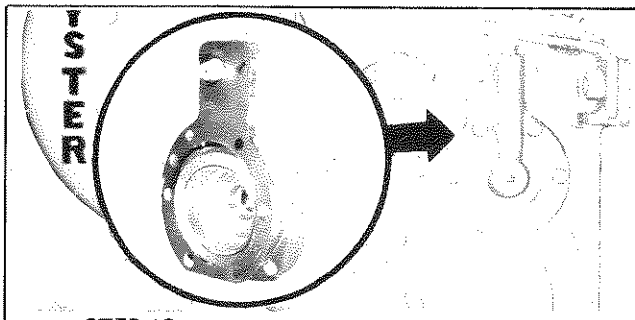


STEP 16. Install approximately 0.0025 inch (0.635 mm) shim pack on left-hand bearing retainer, then install retainer. Tighten capscrews securely. Final torque at this time is not necessary.

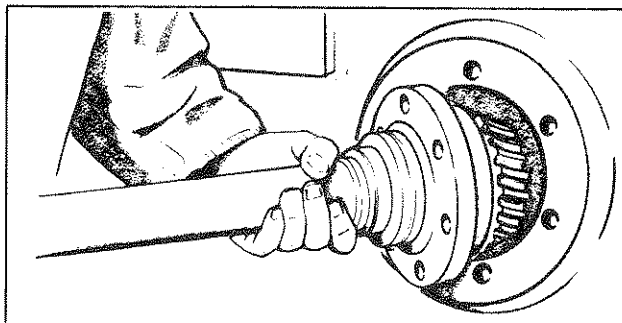


STEP 17. Install lockwasher and locknut on right-hand end of gear shaft. Tighten locknut to 200 ft.-lbs. (27.66 kg-m). Bend lockwasher tangs over flats of locknut.

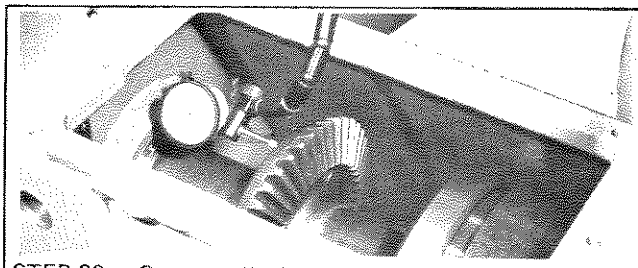
FIGURE 5-17. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 3 of 4)



STEP 18. Install approximately 0.040 inch (1.02 mm) shim pack on right-hand bearing retainer and install retainer. Tighten capscrews securely.



STEP 19. Install approximately 0.025 inch (0.635 mm) shim pack 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).

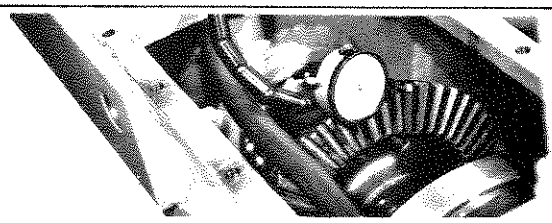


STEP 20. Connect dial indicator as shown. Add or subtract shims from the two bearing retainers to obtain zero endplay. When zero endplay is obtained, proceed as follows:

A. On Direct Drive winch, add 0.006 to 0.009 inch (0.152-0.229 mm) of shim(s) to one or to both retainers to produce 0.006-0.009 inch (0.152-0.229 mm) endplay.

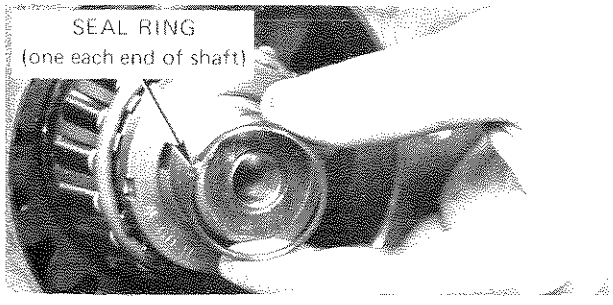
B. On Power Controlled winch, subtract 0.000-0.004 inch (0.000-0.102 mm) of shim(s) from retainers to produce a preload of 0.000-0.004 inch (0.000-0.102 mm)

NOTE: Adding or subtracting shims from these retainers will effect pinion-to-bevel gear backlash. See Step 21.



STEP 21. 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 opposite 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 or preload.

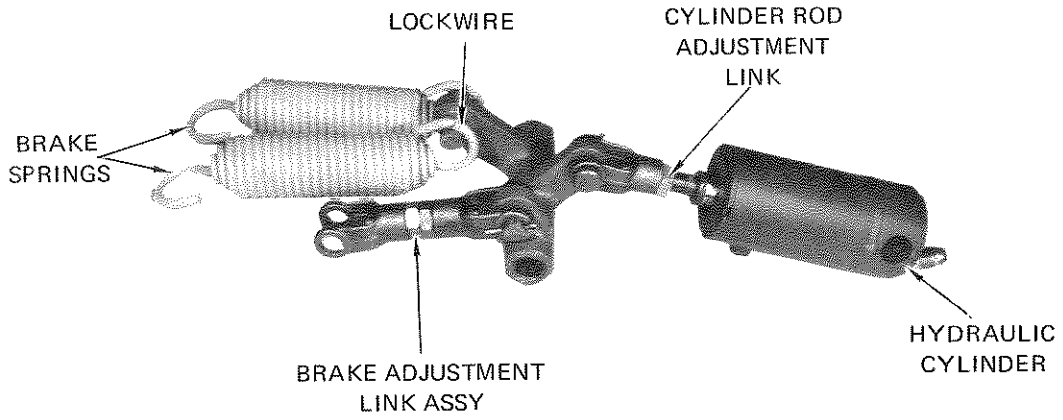
NOTE: Before checking backlash, place a prybar between the forward clutch pack and winch frame. Apply medium pressure to move gearshaft toward right-hand side of winch. This will place bevel gear in normal operating position. The bevel gear tends to move toward the right-hand side of winch wehn turned by PTO pinion during winch operation.



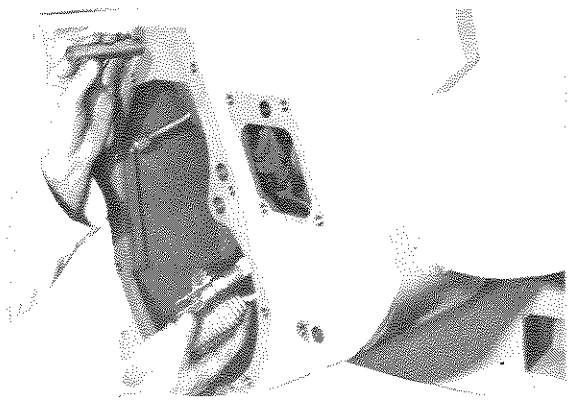
CAUTION: Use care when expanding seal rings. Seal ring material is fragile and breaks easily.

STEP 22. Remove right-hand and left-hand bearing retainers, then install two cast-iron seal rings. Re-install retainers (with shims) and tighten all capscrews. Tighten left-hand retainer capscrews to 75 ft.-lbs. (10.37 kg-m), on power controlled winches only.

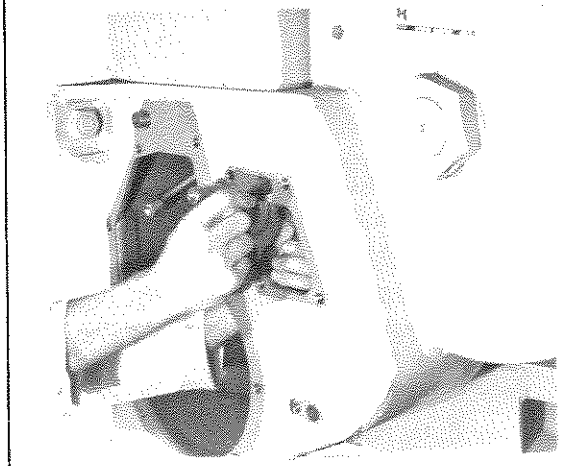
FIGURE 5-17. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 4 of 4)



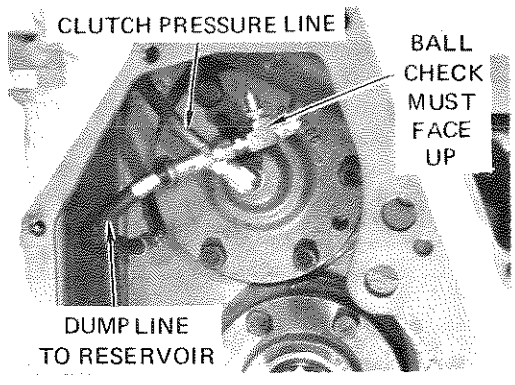
STEP 1. Reassemble components on hydraulic brake cylinder and linkage if previously removed.



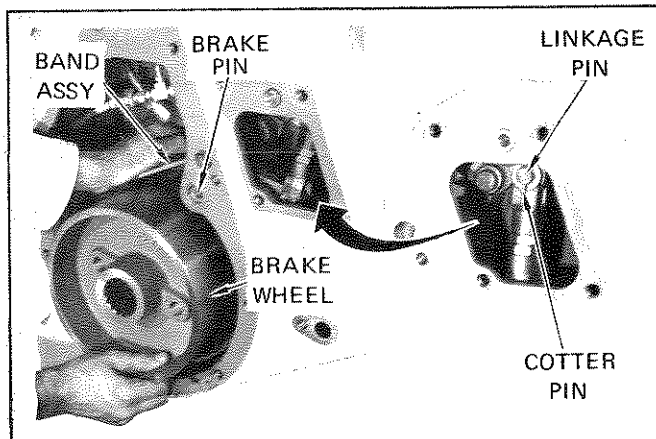
STEP 2. Install hydraulic cylinder, two springs and linkage as an assembly, then insert cylinder pin.



STEP 3. Install brake pin.

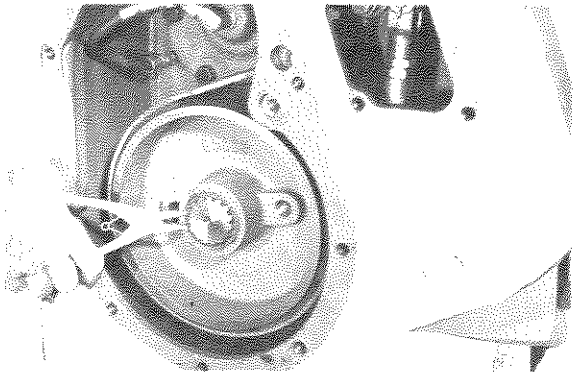


STEP 4. Connect hydraulic tubing to bevel gear shaft bearing retainer and hydraulic cylinder as shown. Also see Figure 5-10.



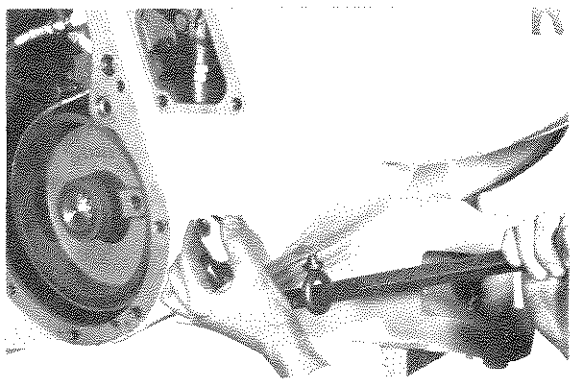
STEP 5. Install band assembly, brake pin, linkage pin, cotter pin and brake wheel.

FIGURE 5-18. INSTALLATION OF HYDRAULIC BRAKE ASSEMBLY, POWER CONTROLLED WINCH (Sheet 1 of 2)



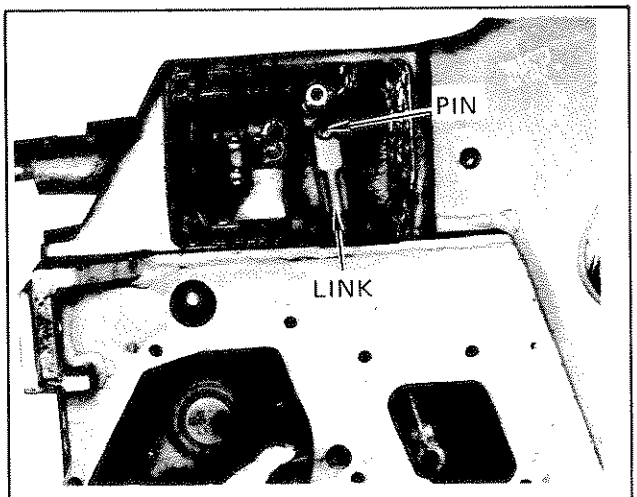
NOTE: Refer to Paragraph 4-15 or 4-19 for correct pin and band arrangement (Overwind or Underwind).

STEP 6. Install snap ring.

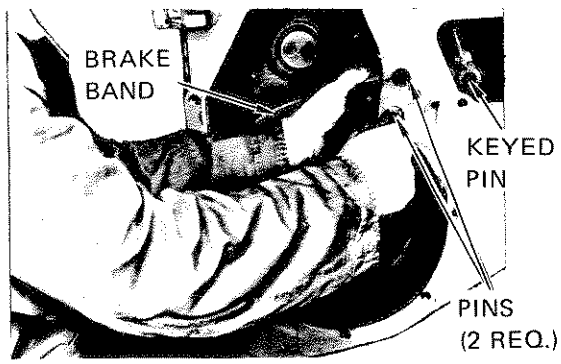


STEP 7. Insert an eyebolt into spring retainer, then attach the end-loop on each brake spring to the retainer. Pull down on the eyebolt, then insert retainer pin through the retainer. This pulls the brake band against the brake wheel. Adjust brake linkage as described in Paragraph 4-29.

FIGURE 5-18. INSTALLATION OF HYDRAULIC BRAKE ASSEMBLY, POWER CONTROLLED WINCH (Sheet 2 of 2)

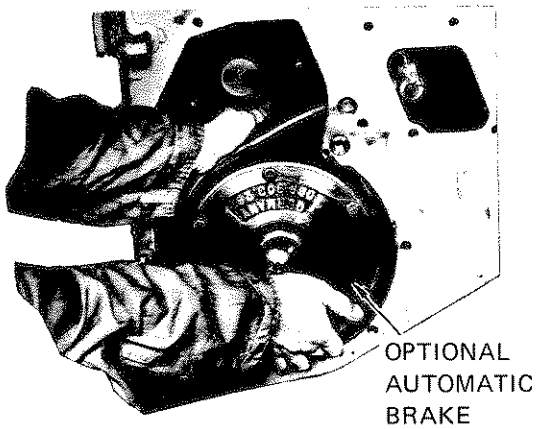


STEP 1. Install brake link and pin.

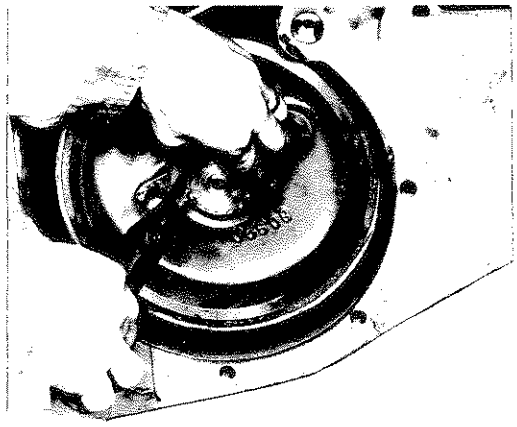


STEP 2. Install brake band and the three pins.

CAUTION: Refer to paragraph 4-15 or 4-19 for correct pin and band arrangement (overwind or underwind)

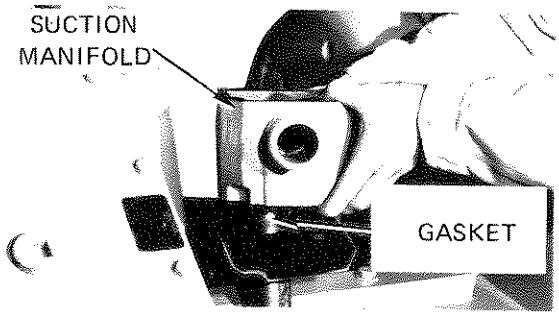


STEP 3. Slide brake wheel onto brake shaft (optional automatic brake shown).

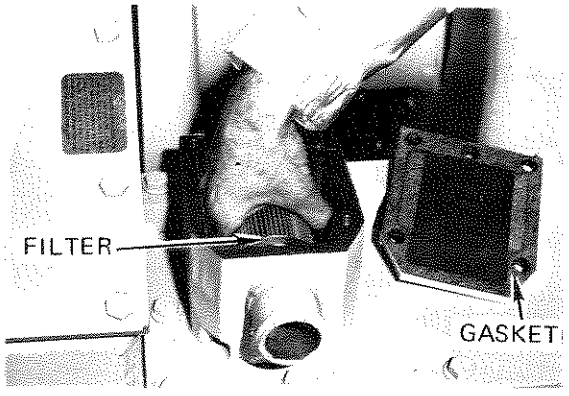


STEP 4. Install snap ring on brake shaft. Adjust brake linkage as described in paragraph 4-13 and 4-14.

FIGURE 5-19. INSTALLATION OF DRY BRAKE AND AUTOMATIC BRAKE, DIRECT DRIVE WINCH



STEP 1. Install suction manifold and transmission cover with new gasket.



STEP 2. Install filter element and cover (with new gasket). Do not over-tighten the filter element. The filter is difficult to remove if over-tightened. 1539

FIGURE 5-20. INSTALLATION OF SUCTION MANIFOLD, POWER CONTROLLED WINCH

5-54. Installation of Suction Manifold (Power Controlled Winch).

5-55. Installation of the suction manifold with filter is shown in Figure 5-20. It may be necessary, in some tractor installations, to remove the suction manifold prior to mounting the winch on the tractor. In such cases, it is advisable to install the manifold, with partially tightened capscrews to prevent the entrance of dirt until winch is mounted on the tractor. Install new gasket at both the base and cover of the suction manifold to avoid loss of pump suction. Never use old gaskets. Tighten the four capscrews to 75 ft. lbs. (10.37 kg-m) torque.

5-56. SPECIAL TOOLS.

5-57. Figure 5-21 shows the special tools required during overhaul and repair of the winch.

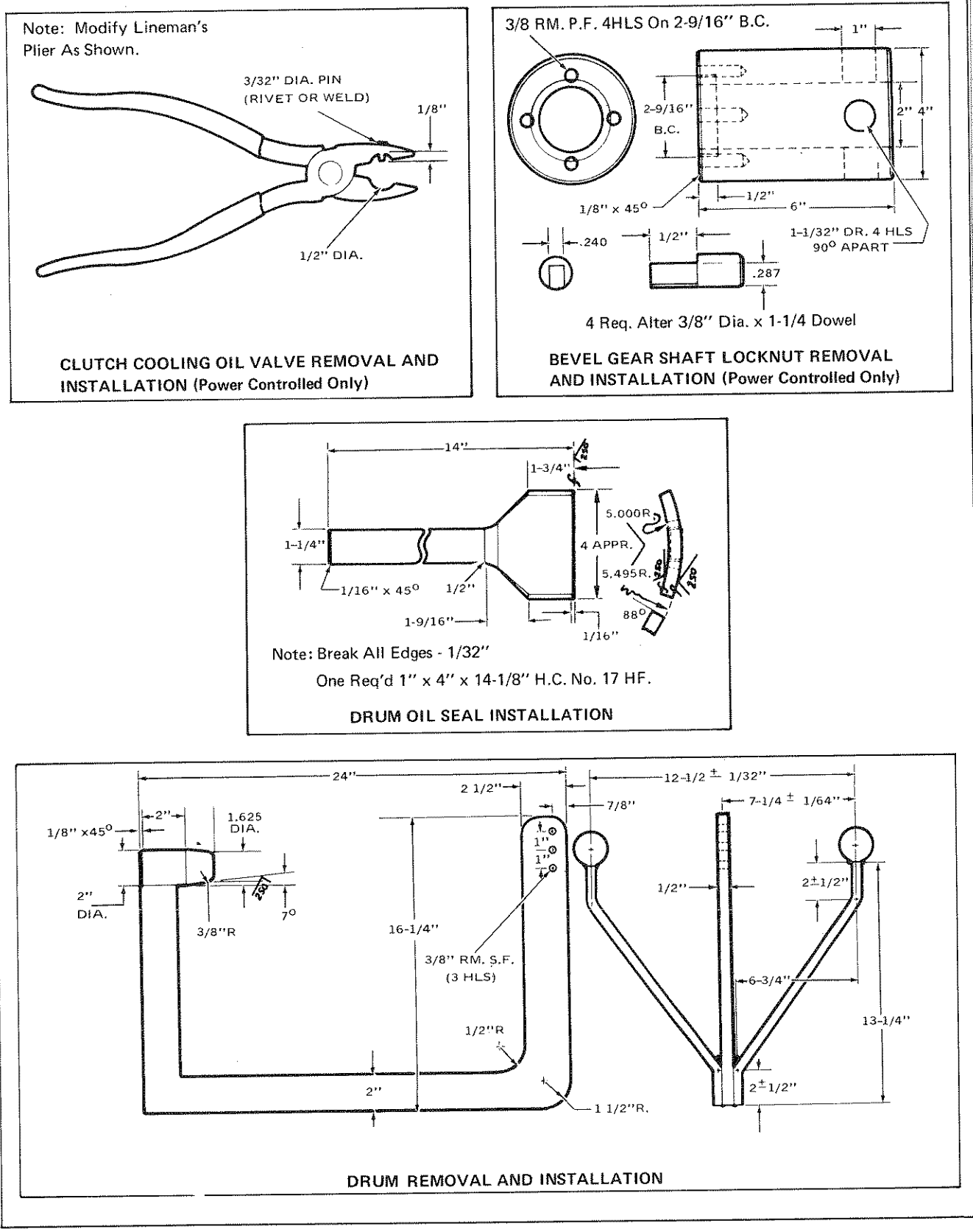
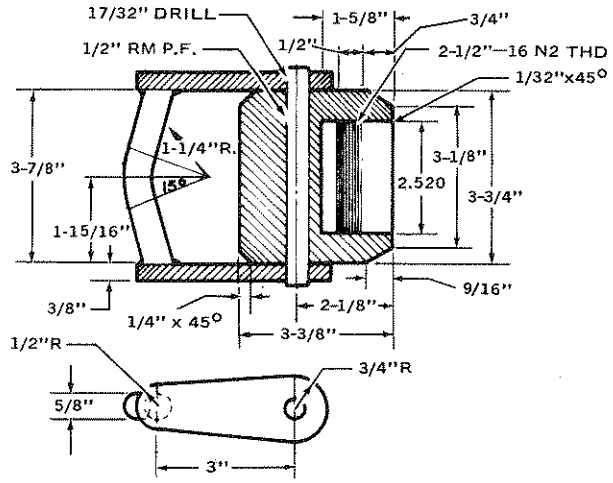
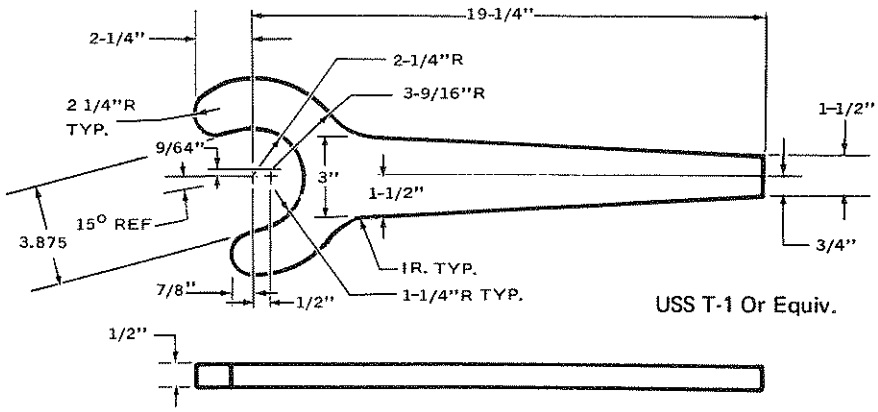


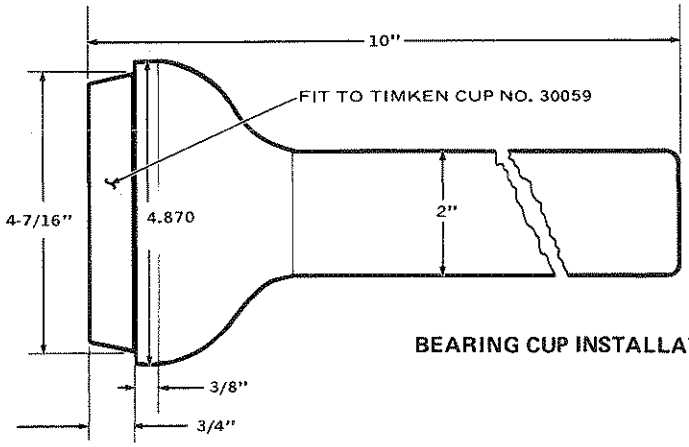
FIGURE 5-21. SPECIAL TOOLS (Sheet 1 of 2)



DRUM SHAFT REMOVAL AND INSTALLATION



DRUM SHAFT NUT REMOVAL AND INSTALLATION



BEARING CUP INSTALLATION

FIGURE 5-21. SPECIAL TOOLS (Sheet 2 of 2)

SECTION 6
INSTALLATION AND REMOVAL

6-1. GENERAL.

6-2. This section contains winch-to-tractor and pump-to-tractor mounting information. Instructions for tractor alterations and other specific data required for initial installation of the winch and pump are covered by the drawings supplied with the mounting kit.

CAUTION The winch and hydraulic pump are designed to be mounted on a specific tractor model, avoid mounting on a different tractor make or model.

6-3. SERIAL NUMBER DATA.

6-4. The winch serial number prefix (refer to Section 1) identifies the winch as either Direct Drive or Power Controlled. It also identifies the tractor make and model on which the winch will be mounted.

6-5. WINCH INSTALLATION.

6-6. Tractor Preparation.

6-7. Perform the following steps prior to installing the winch:

a. Complete the tractor alterations as indicated in the mounting kit instructions.

b. Clean all mounting surfaces on the tractor.

c. Check the condition of the mounting studs on the tractor. Replace any studs that are bent or otherwise damaged. Minor thread damage may be dressed with a thread chaser.

NOTE Be sure all seals and plugs are installed as indicated by mounting kit instructions.

d. Install 0-rings over studs as indicated by mounting instructions.

e. Check mounting kit instructions for proper application of Loctite to studs.

6-8. Winch Preparation.

6-9. Perform the following steps prior to installing the winch:

a. Remove the suction manifold on Power Controlled winches and the winch transmission cover on all winches.

b. Remove all shipping plugs and tape from PTO shaft opening and stud holes.

c. Clean all mounting surfaces on the winch.

d. Assemble PTO Group per mounting kit instructions.

e. Install PTO shaft assembly in winch as shown in Figure 6-1.

f. Carefully check bevel gear backlash and bevel gear shaft endplay or preload (See Figure 6-1).

g. Install O-ring over PTO shaft carrier.

h. Assemble coupling on PTO shaft.

NOTE Be sure pin and lock ring are secure.

i. Install breather in upper right hand cover.

j. Remove side cover on the control lever housing used with Power Controlled winches.

6-10. Installation.

6-11. Observe the following during mounting of the winch:

a. Install two 7/8 UNC x 2 1/2 inch (63.50 mm) capscrews or lifting eyes at each side of the winch.

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). Carefully check the cable or chain for damage.

b. Carefully check all hydraulic hoses and hose fittings for damage and general condition on Power Controlled winches.

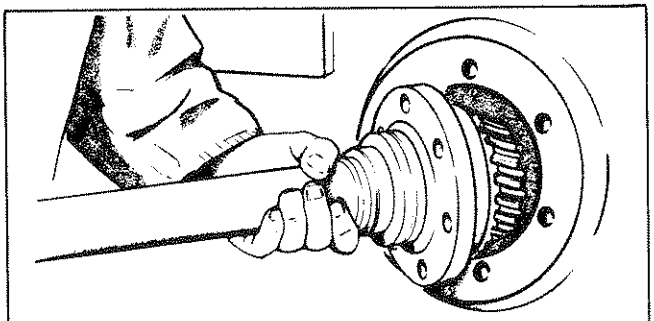
c. Raise the winch and align the splines on the tractor PTO with the splines of the PTO coupling.

d. Align the studs with the mounting holes to prevent thread damage.

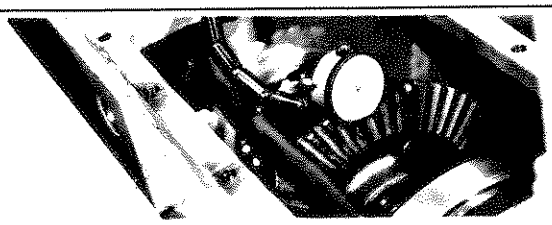
e. Route Direct Drive winch push-pull cables to the control levers as the winch is moved in against the rear tractor face.

f. Loosely install the two, top inboard nuts before the winch is fully seated against the tractor.

g. Secure the winch in place using the parts listed in the mounting kit instructions. Tighten the nuts alternately at each side of the winch to pull the winch evenly against the tractor. Final torque on the plain hex nuts should

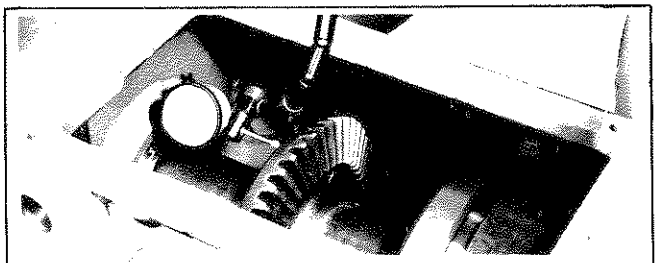


STEP 1. Install approximately 0.025 inch (0.635 mm) shim pack on PTO shaft and install shaft. Tighten capscrews securely. Check that PTO pinion teeth are positioned in the center of bevel gear teeth. Add or subtract shims at PTO shaft to center gear teeth. Tighten capscrews to 75 ft.-lbs. (10.37 kg-m).



STEP 2. 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 opposite 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 or preload.

NOTE: Before checking backlash, place a prybar between the forward clutch pack and winch frame. Apply medium pressure to move gear-shaft toward right-hand side of winch. This will place bevel gear in normal operating position. The bevel gear tends to move toward the right-hand side of winch wehn turned by PTO pinion during winch operation.



STEP 3. Connect dial indicator as shown. Add or subtract shims from the two bearing retainers to obtain zero endplay. When zero endplay is obtained, proceed as follows:

A. On Direct Drive winch, add 0.006 to 0.009 inch (0.152-0.229 mm) of shim(s) to one or to both retainers to produce 0.006-0.009 inch (0.152-0.229 mm) endplay.

B. On Power Controlled winch, subtract 0.000-0.004 inch (0.000-0.102 mm) of shim(s) from retainers to produce a preload of 0.000-0.004 inch (0.000-0.102 mm)

NOTE: Adding or subtracting shims from these retainers will effect pinion-to-bevel gear backlash. See Step 2. If the tolerances specified in Step 2 or 3 can not be obtained, refer to Figure 5-17.

FIGURE 6-1. PTO SHAFT INSTALLATION

be 550 ± 20 ft.-lbs. (73.06 ± 2.76 kg-m). Final torque on the slotted jam nuts should be 200 ± 20 ft.-lbs. (27.66 ± 2.76 kg-m).

CAUTION Be sure cotter pins are installed on all mounting studs as specified in the mounting kit instructions.

6-12. Final Installation. (Direct Drive Winch.)

6-13. With the winch installed on the tractor, perform the following steps:

a. Install transmission cover with a new gasket. Tighten capscrews to 75 ft.-lbs. (10.37 kg-m) torque.

b. Install control lever assembly per mounting kit instructions.

c. Attach push-pull cables to respective positions.

d. Adjust cables as described in Paragraphs 4-11 and 4-14.

e. Check oil level in transmission compartment.

f. Replace side covers. Tighten capscrew to 75 ft.-lbs. (10.37 kg-m) torque.

6-14. Final Installation. (Power Controlled Winch.)

6-15. With the winch installed on the tractor, perform the following steps:

a. Install transmission cover and suction manifold with new gaskets. Tighten capscrews to 75 ft.-lbs. (10.37 kg-m) torque.

b. Connect suction and pressure hoses to their respective fittings as specified in the mounting kit instructions.

c. Install control level assembly per instructions in the mounting kit.

d. Attach push-pull cable(s) to control lever assembly.

e. Attach cable bracket to winch.

f. Install pump and related hardware as specified in mounting kit instructions. See Paragraph 6-16.

g. Tighten hose fittings and clamps securely.

h. Attach push-pull cable to valve and secure cable bracket to winch.

i. Check hydraulic oil level.

j. Adjust control cable and check hydraulic pressure settings as described in Paragraphs 4-23 through 4-27.

NOTE Pressure checks should be taken with hydraulic oil at operating temperature. Run winch in Brake-Off position to raise temperature.

WARNING All checks and adjustments to be made with a bare drum.

6-16. PUMP INSTALLATION.

6-17. Install pump and related hardware following the procedures in the mounting kit instructions. Observe the following during pump installation:

a. Install pump drive components.

b. Be sure all O-rings and gaskets are properly installed.

NOTE If the pump requires an adapter, between the pump and the tractor accessory drive, apply plastic gasket compound (Loctite Co. 68-41 or equivalent) to the mating surfaces.

c. Torque all capscrews as specified.

d. Install hydraulic fittings securely.

e. Route suction and pressure hoses.

f. Prime the pump by filling the suction hose with hydraulic oil.

g. Secure hoses using clamps supplied.

n. Check to ensure all connections are tight.

6-18. INSPECTION.

6-19. Prior to operating the winch, check the following:

a. No leakage.

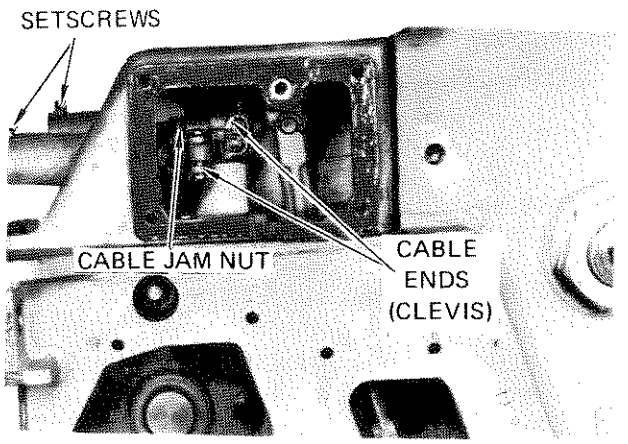
b. Proper oil levels.

c. All mounting nuts are tightened to specifications.

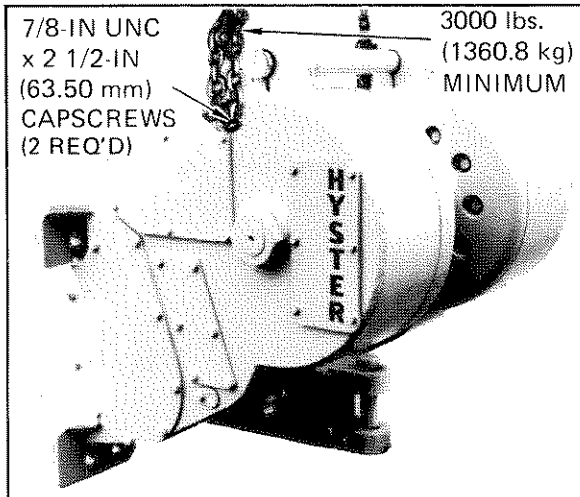
d. All covers are securely installed.

e. Ensure that all hydraulic hoses are properly routed to prevent chafing.

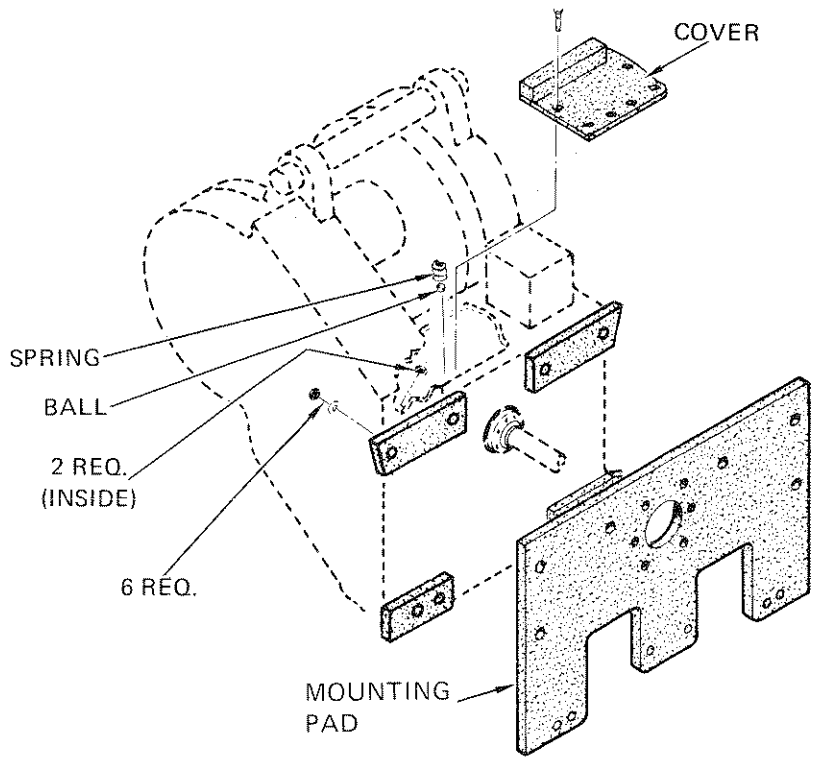
f. Ensure that the hydraulic pump is primed.



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



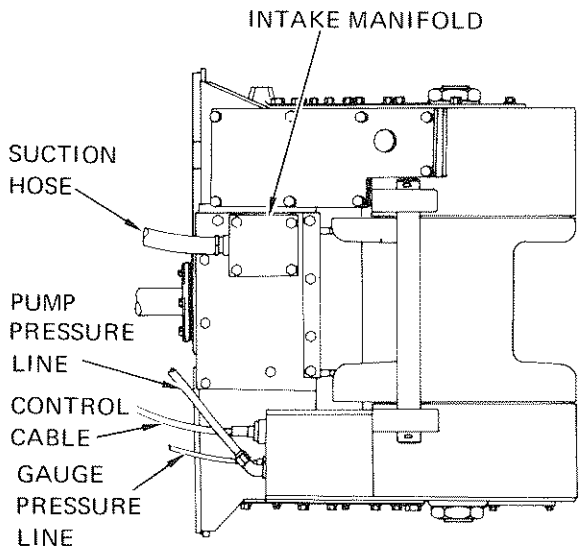
STEP 2. Connect lifting device to winch. Winch will be balanced when connected as shown.



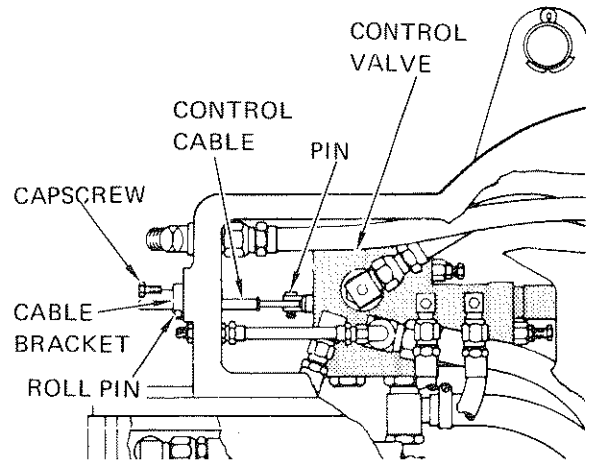
NOTE: When removing the eight nuts, loosen all nuts slightly, then pry winch away from mounting pad. Loosen all nuts again and pry winch again. Continue this sequence until winch can be removed.

STEP 3. Remove transmission cover. Be careful not to lose detent ball and spring. Remove the eight nuts and lockwashers attaching winch to mounting pad.

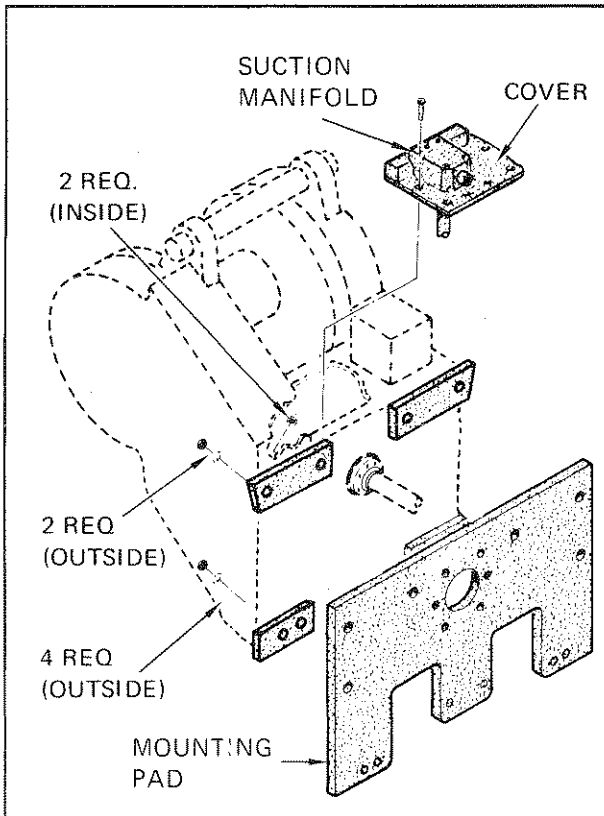
FIGURE 6-2. REMOVAL OF DIRECT DRIVE WINCH

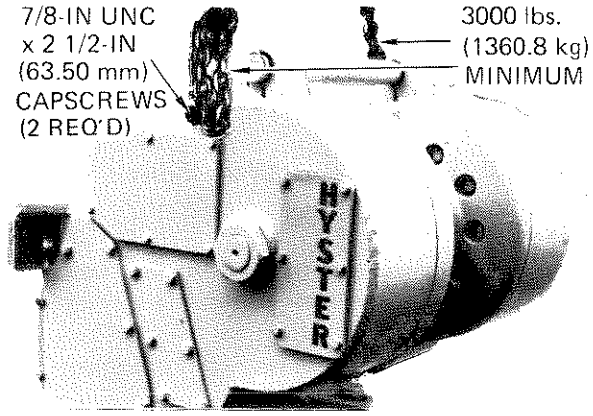


STEP 1. Remove suction hose from intake manifold. Disconnect pump pressure line. Disconnect gauge pressure line.



STEP 2. Remove access cover plate. Remove cotter pin and detach blade end of control cable from control valve spool clevis. Remove capscrew holding cable bracket to housing, and pull out control cable. If neccessary to remove cable bracket, remove roll pin.





STEP 3. Connect lifting device to winch. Winch will be balanced when connected as shown.

STEP 4. Remove suction manifold and cover. Remove the eight nuts and lockwashers attaching winch to mounting pad.

NOTE: When removing the eight nuts, 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 6-3. REMOVAL OF POWER CONTROLLED WINCH

Installation and Removal

6-20. WINCH REMOVAL.

6-21. Removal — (Direct Drive Winch.) (See Figure 6-2.)

WARNING If winch is to be disassembled, the line must be removed. 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.

6-22. Remove the winch as shown in Figure 6-2. Observe the following during removal:

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

b. Remove transmission cover.

c. Remove control cables from winch.

d. Attach lifting device as shown in Figure 6-2.

WARNING Make sure that the lifting device has a minimum capacity of 3,000 pounds (1360.8 kg) before lifting the winch off the mounting pad.

e. Drain oil from winch.

f. Remove nuts from mounting studs.

g. Remove winch from tractor.

6-23. Removal.(Power Controlled Winch.) (See Figure 6-3.)

WARNING If winch is to be disassembled the line must be removed. 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.

6-24. Remove the winch as shown in Figure 6-3. Observe the following during removal:

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

b. Remove suction manifold and transmission cover.

c. Remove control cable(s) from winch.

d. Remove hydraulic hoses.

e. Attach lifting device as shown in Figure 6-3.

WARNING Make sure that the lifting device has a minimum capacity of 3,000 pounds (1360.8 kg) before lifting the winch off the mounting pad.

f. Drain oil from winch.

g. Remove nuts from mounting studs.

h. Remove winch from tractor.

6-25. PUMP REMOVAL. (Power Controlled Winch.)

6-26. Remove the hydraulic pump as follows:

a. Thoroughly clean all surfaces around pump.

b. Disconnect hoses at the inlet and outlet fittings.

c. Cap all open lines and ports.

NOTE If pump is belt driven loosen capscrews securing pump to mounting bracket. Rotate the pump so that the drive belt can be removed from the sheaves. Keep bracket, pump and sheave together as assembly.

d. Remove mounting capscrews and remove pump.

NOTE Do not remove the adapter used with gear driven pumps unless it is necessary to replace the coupling or gasket between the adapter and traction accessory drive housing.

CAUTION Do not disassemble pump. Repair of the hydraulic pump is limited to replacement of the entire assembly.

"THE QUALITY KEEPERS"

HYSTER APPROVED PARTS

HYSTER COMPANY
TRACTOR ATTACHMENT OPERATIONS

1M 4/83 (12/79) AP Litho in U.