

SERVICE MANUAL

FOR
HYSTER
POWER CONTROLLED
WINCH



INTENTIONALLY BLANK

CONTENTS

INTRODUCTION

Serial Number Codes	0-2
Metric Conversion Chart	0-3
Drum Line Capacities	0-3

SECTION 1 — DESCRIPTION

Gear Train	1-1
Hydraulic Control	1-3
Oil Clutch	1-4
Oil Brake	1-5
Control Valve	1-6
Accumulators	1-7
Control Lever Assembly	1-8
Sequence of Operation (Hydraulic System)	1-9
Figure 1.18 Hydraulic System	1-15
Figure 1.19 Drum Assembly	1-16

SECTION 2 — OPERATION

Operator Rules	2-1
Operating Procedures	2-1
Power Operation	2-2
FREESPOOL Operations	2-2

SECTION 3 — TROUBLESHOOTING

Table 3.1 Troubleshooting Chart	3-1
---------------------------------------	-----

SECTION 4 — SERVICE

General	4-1
Maintenance	4-1
Maintenance Schedule	4-1
Checks And Adjustments	4-3
Control Cable Adjustments	4-3
Hydraulic Pressure	4-4
Table 4.2 Hydraulic Pressure Tests	4-6
Adjustment of the Relief Valve	4-6
Accumulator Pressure	4-6
Accumulator Volume Test	4-7
Relief Valve for the Cooling Oil	4-8
Pressure Check for the LINE IN Clutch	4-8
Pressure Check of the LINE IN Modulator	4-8
Pressure Check for the LINE OUT Clutch	4-8
Pressure Check of the LINE OUT Modulator	4-9
Adjustment of the FREESPOOL Lever	4-9
Table 4.3 Hydraulic Specifications	4-9
Filter and Screen	4-10

SECTION 5 — REPAIRS

General	5-1
Winch Removal	5-1
Winch Installation	5-2
Disassembly of The Winch	5-2
PTO Gear Arrangements:	
32.27:1 Gear Ratio	5-2
117:1 Gear Ratio	5-3
FIATALLIS 8, FL9, 10B and 10C.....	5-6
CATERPILLAR D4 with Powershift	5-9
KOMATSU D41, D45, and D53	5-11
Removal of the Pinion	5-13
Installation of the Pinion	5-15
The Brake and Clutch Shaft	5-16
Disassembly of the Brake	5-20
Assembly of the Brake	5-22
Disassembly of the Clutches	5-25
Assembly of the Clutches	5-27
Removing the Drum and Drum Shaft	5-29
Removal of the Intermediate Shaft and Drum Gear	5-30
Removal of the Intermediate Gear and the Freespool Fork	5-32
Table 5.1 Visual Inspection	5-33
Assembly of the Winch.....	5-37
PTO Gear Arrangements:	
32.27:1 Gear Ratio	5-37
117:1 Gear Ratio	5-38
FIATALLIS 8, FL9, 10B, and 10C	5-40
CATERPILLAR D4 with Powershift	5-44
KOMATSU D41, D45, and D53	5-47
Installation of the Clutch and Brake Shaft	5-50
Installation of the Intermediate Gear and the Freespool Shifting Fork.....	5-55
Installation of the Drum	5-59
Hydraulic Pump	
Removal of the Hydraulic Pump	5-60
Installation of the Hydraulic Pump	5-62
Control Valve and Accumulators	
Removal of the Control Valve and Accumulators	5-63
Repair of the Accumulators.....	5-65
Installation of the Control Valve and Accumulators	5-66
Table 5.2 Torque Specifications	5-68
Table 5.3 Clutch Location	5-68



INTRODUCTION

This Service Manual is for the W5B Towing Winch.

This manual has the following information:

- DESCRIPTION of the assemblies are given as an aid for troubleshooting and repair.
- OPERATION describes the normal operating procedures for this winch.
- TROUBLESHOOTING gives a list of some common problems and the possible causes.
- SERVICE gives a guide for periodic maintenance and checks and adjustments.
- REPAIRS describes the removal, disassembly, assembly, and installation of the winch.

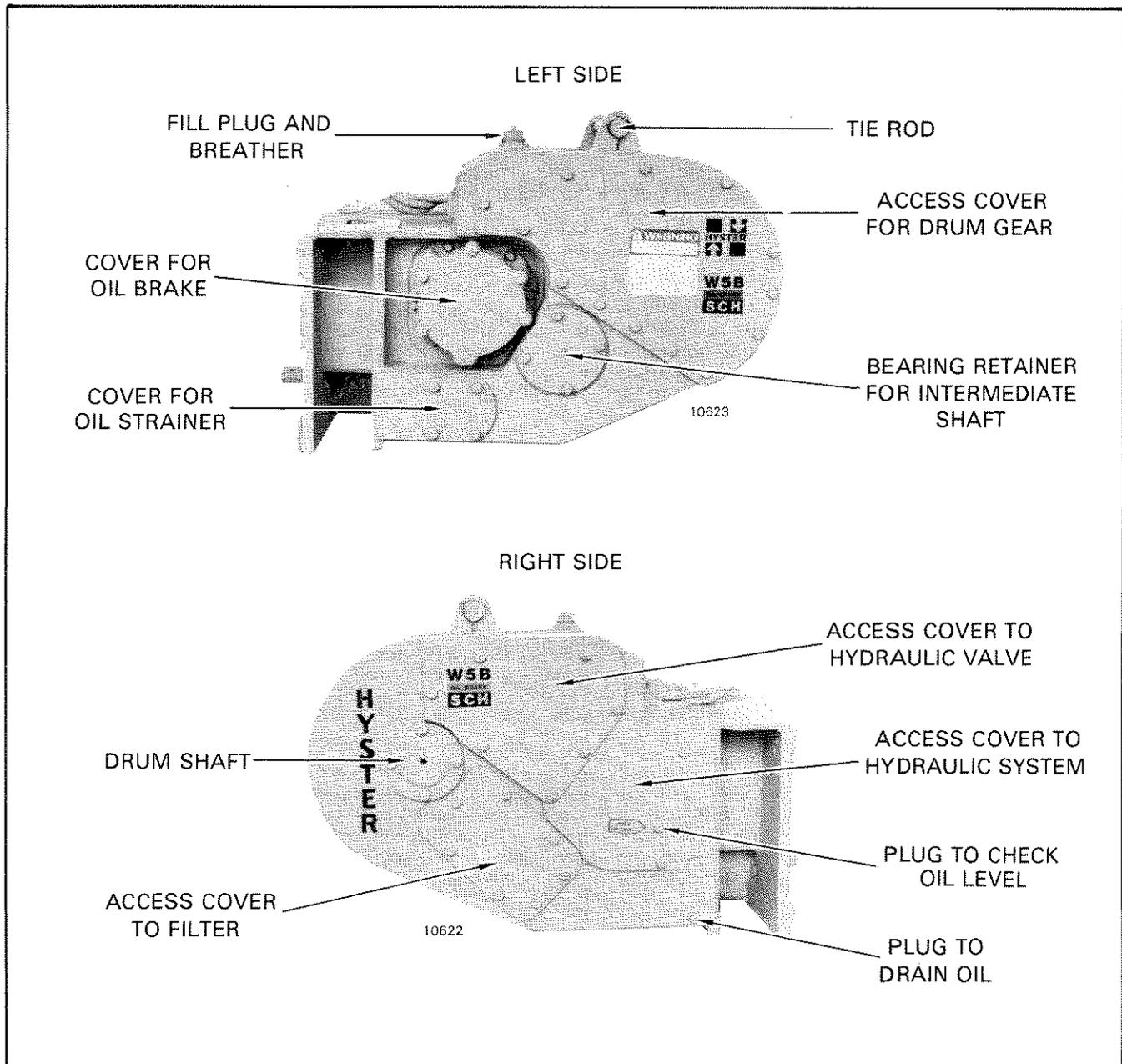


FIGURE 0.1 W5B TOWING WINCH

Introduction

SERIAL NUMBER CODES

The nameplate with the serial number code is found on the left front corner of the winch case. A serial number code indicates the following information:

W5B P 4 B 1995 A33
 ① ② ③ ④ ⑤ ⑥

- ① Winch Model
- ② Type of winch drive: P = Power Controlled Winch
- ③ Gear ratio code (see Table 0.1)
- ④ B = Power Forward and Power Reverse

- ⑤ Sequence number
- ⑥ Tractor code
(See Table 0.1 for tractor identification)

NOTE

The metric measurement system used by Hyster Company is described as SI (Le Systeme International d'Unites or The International System of Units, also called SI in all languages). The SI system of measurement is described in ISO Standard 1000, 1973. These units of measurement will come first in the sentence. Some other traditional units of measurement will be shown in parenthesis ().

WINCH MODEL W5B	Tractor Make, Model and Tractor S/N Where Applicable						
	FIAT ALLIS	CAT	JOHN DEERE	FMC	IHC	KOMATSU	CASE
	CODE A	C	E	F	H	K	R
34	8B, FL9 *4 #7 #9	D4E *1 #3 (1)	JD655 JD750 JD755 *5 #2	CA220 #2	175C *2 #10	D45 *4 #6	1150C *2
35	10C *4 #7 #9	D5B-PS *2 #10			TD12 *2 #10	D41 *8 #6	1150D *2
36		D5B-DD *2 #10					
W1(2)		D6D *2 #10			TD15C *2 #5	D53 *8	

* Indicates standard gear ratio.
Indicates optional gear ratio

(1) Cat Serial Numbers: D4PS 83J 3553 & up, 47H 1786 & up, 59J 2553 & up, 7R 926 & up. All 28X, 51X, 52X 69X, 71X, 77W.

(2) Sometimes a winch is adapted to another tractor using special parts. A special suffix W1 code is used after the code letter for the tractor manufacturer.
Example: CW1 = D6D
Example: HW1 = International TD15C
Example: KW1 = Komatsu D53

CODE	GEAR RATIO
1	25.82
2	32.27
3	40.33
4	41.31
5	66.91
6	69.92
7	71.70
8	55.32
9	115.00
10	117.00

TABLE 0.1 TRACTOR IDENTIFICATION

Introduction

Multiply	By	To Get	Multiply	By	To Get
AREA					
inches ²	x 6.452	= centimetres ² (cm ²)	centimetres ²	x 0.155	= inches ² (in ²)
feet ²	x 0.093	= metres ² (m ²)	metres ²	x 10.764	= feet ² (ft ²)
LINEAR					
inches	x 25.4	= millimetres (mm)	millimetre	x 0.039	= inches (in)
feet	x 0.305	= metres (m)	metre	x 3.281	= feet (ft)
yards	x 0.914	= metres (m)	metre	x 1.094	= yards (yd)
miles	x 1.609	= kilometres (km)	kilometre	x 0.621	= miles (mi)
MASS					
ounces (oz)	x 28.35	= grams (g)	grams	x 0.035	= ounces (oz)
pounds (lb)	x 0.454	= kilograms (kg)	kilograms	x 2.205	= pounds (lb)
tons (2000 lb)	x 907.18	= kilograms (kg)	kilograms	x 0.001	= tons (2000 lb)
tons (2000 lb)	x 0.907	= metric ton (t)	metric ton	x 1.102	= tons (2000 lb)
POWER					
horsepower	x 0.746	= kilowatts (kW)	kilowatts	x 1.34	= horsepower (hp)
PRESSURE					
pounds/in ²	x 6.895	= kilopascal (kPa)	kilopascals	x 0.145	= pounds/in ² (psi)
pounds/in ²	x 0.007	= megapascal (MPa)	megapascals	x 145.04	= pounds/in ² (psi)
bar	x 100	= kilopascal (kPa)	kilopascals	x 0.01	= bar
TEMPERATURE					
° Fahrenheit-32	x 0.56	= ° Celsius (C)	° Celsius	x 1.8 + 32	= ° Fahrenheit (F)
TORQUE					
pound inches	x 0.113	= Newton metre (N.m)	Newton metre	x 8.851	= pound inches (lbf in)
pound feet	x 1.356	= Newton metre (N.m)	Newton metre	x 0.738	= pound feet (lbf ft)
VELOCITY					
miles/hour	x 1.609	= kilometer/hour (km/h)	kilometer/hour	x 0.621	= miles/hour (mph)
VOLUME					
inches ³	x 16.387	= centimetres ³ (cm ³)	centimetres ³	x 0.061	= inches ³ (in ³)
inches ³	x 0.016	= litres	litres	x 61.024	= inches ³ (in ³)
quarts, U.S.	x 0.946	= litres	litres	x 1.057	= quarts, U.S. (qt)
quarts, U.S.	x 0.83	= quarts, Imp. (qt)	quarts, Imp.	x 1.205	= quarts, U.S. (qt)
gallons, U.S.	x 3.785	= litres	litres	x 0.264	= gallons, U.S. (gal)
gallons, U.S.	x 0.83	= gallons, Imp. (gal)	gallons, imp.	x 1.205	= gallons, U.S. (gal)
ounces	x 29.57	= millilitres (ml)	millilitres	x 0.034	= ounces (oz)

TABLE 0.2 METRIC CONVERSION CHART

CABLE DIAMETER	216 mm (.85 in) SPOOL DIAMETER
16 mm (5.8 in) 19 mm (3/4 in) 22 mm (7/8 in)	124 m (407 ft) 87 m (287 ft) 63 m (206 ft)

TABLE 0.3 DRUM LINE CAPACITIES

INTENTIONALLY BLANK



SECTION 1 DESCRIPTION

The W5B Towing Winch is a Power Forward and Power Reverse winch used on tractors with a constant running power-takeoff (PTO). The "SCH" (Self Contained Hydraulics) indicates that the hydraulic system is inside of the winch case. A hydraulic pump is connected by a gear drive to the constant running pinion. Access covers on both sides of the winch case permit service repairs, and adjustments. The design of the winch case permits different arrangements of PTO gear assemblies to fit the different tractors that use this winch. (See the Repair section for the PTO gear assemblies.)

GEAR TRAIN (See Figure 1.1)

The pinion assembly drives the hydraulic pump from a spur gear. A bevel gear is found on each side

of the pinion. One bevel gear is connected to an oil clutch to give the LINE IN direction. The other bevel gear and oil clutch gives the LINE OUT direction. An oil brake on the end of the clutch and brake shaft holds the winch drum in a fixed position when no power operation occurs. If one of the clutches is applied, the brake is released by the same oil pressure. When neither clutch is applied, springs apply the brake.

An intermediate gear assembly gives a gear reduction to increase the torque at the winch drum. A sliding sleeve with splines engages the drum pinion gear and the intermediate gear. The operator can disengage the sliding sleeve with a hand lever to give the FREESPOOL operation. When the control lever is in the FREESPOOL position, the sliding

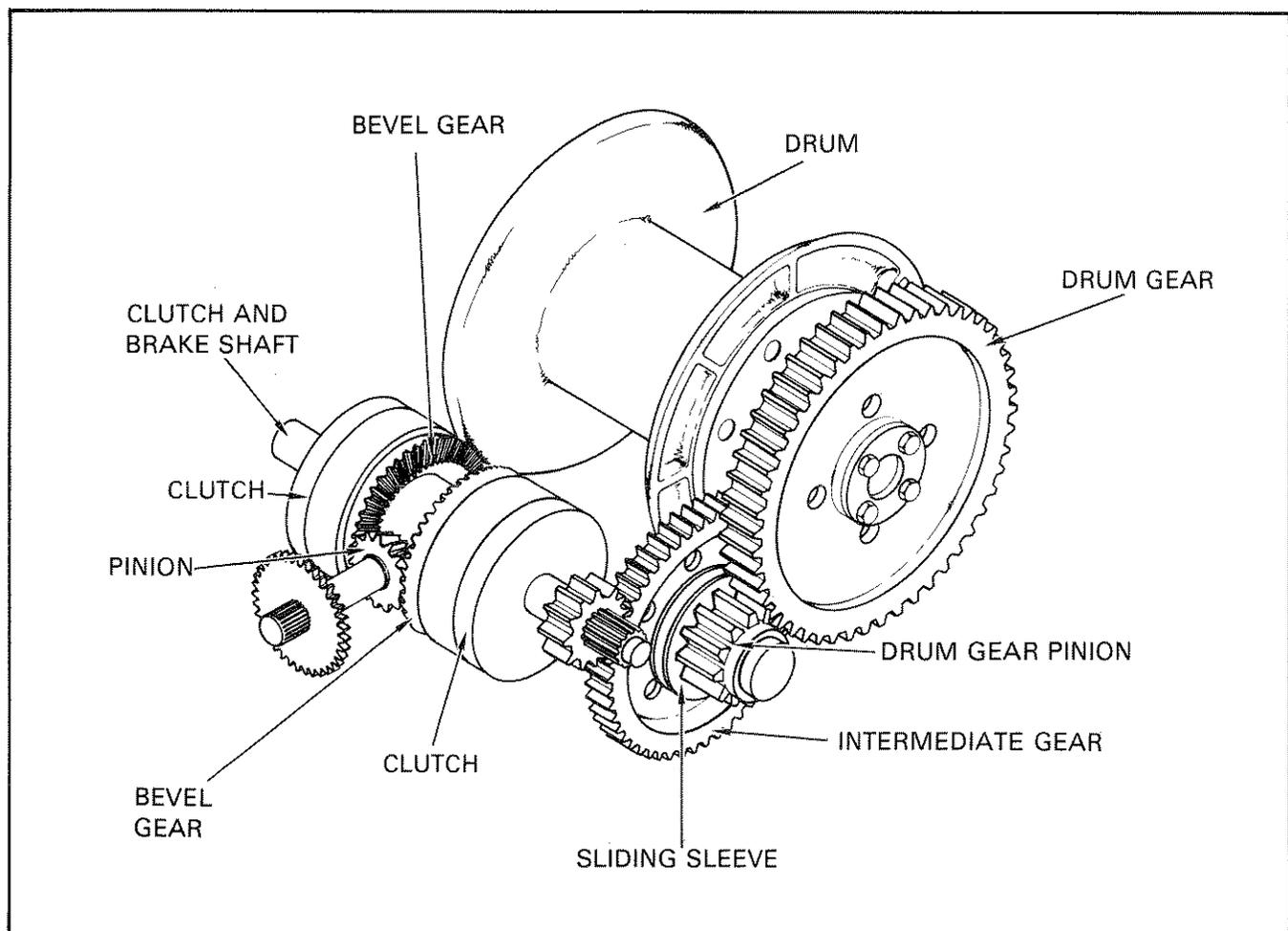


FIGURE 1.1 GEAR TRAIN

Description

sleeve disengages the drum pinion gear from the intermediate gear. The gear train is disengaged from the clutch and brake shaft so that the cable can be pulled from the drum by hand. Only the drum and drum pinion gear rotate when the cable is pulled from the drum during FREESPOOL operation. The resistance to rotation by the drum during FREESPOOL is controlled by the preload on the bearings for the intermediate shaft.

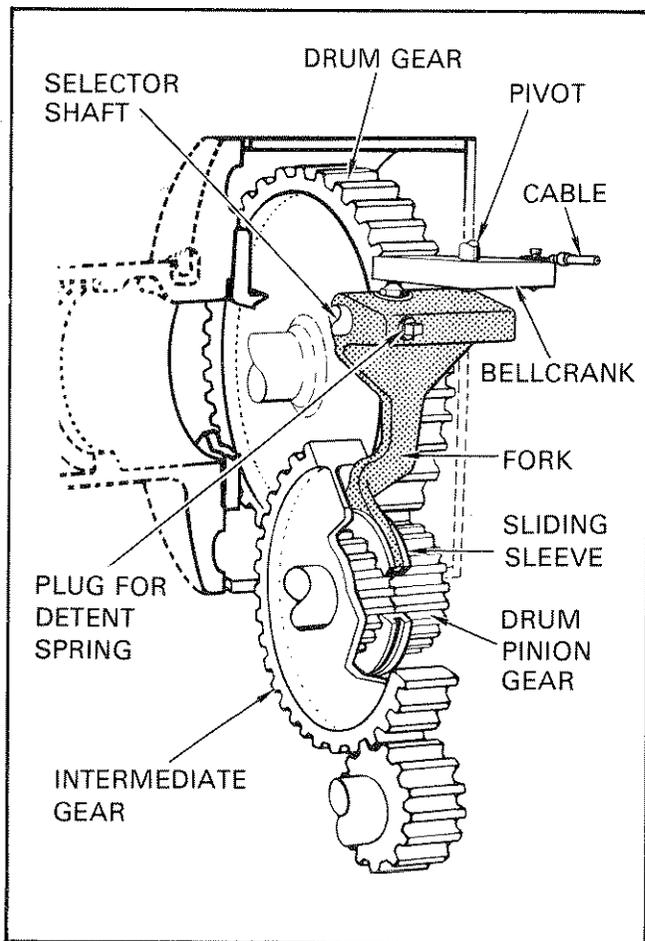


FIGURE 1.2 FREESPOOL SELECTOR

A drum gear engages the drum pinion gear and is connected to the drum. When power is applied to the gear train, the drum will rotate in the forward or reverse direction. One side of the winch case has a bearing support for the tapered roller bearings that hold the drum adapter. The drum adapter connects the drum to the drum gear. The other side of the drum runs on roller bearings held by a drum shaft. The drum shaft is connected to the winch case.

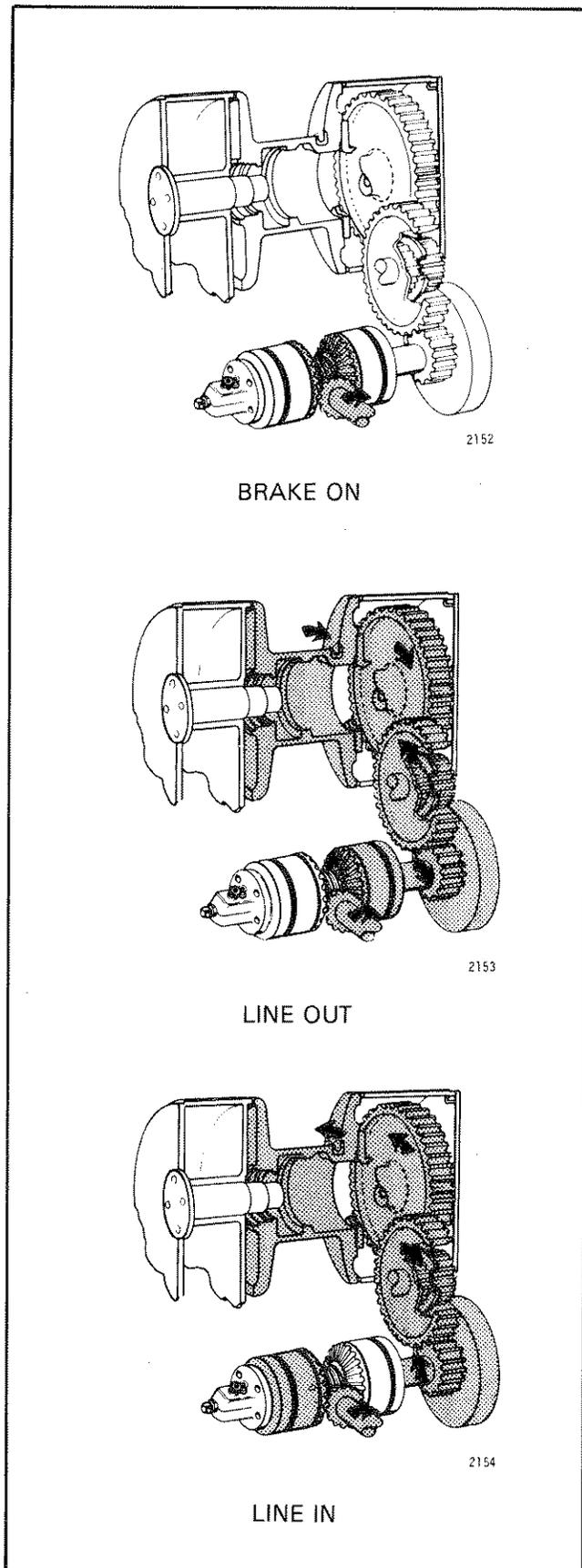


FIGURE 1.3 TORQUE TRANSFER

HYDRAULIC CONTROL

The operation of the winch is controlled by a hydraulic circuit. See Figure 1.4. A hydraulic gear pump is connected to the pinion with gears. The bottom of the winch case is the sump for the hydraulic oil. There is a strainer on the suction line to the hydraulic pump. The output of the hydraulic pump flows through a filter to the hydraulic control valve. The control valve is connected by a cable to the control lever. The control valve controls the flow and pressure of the hydraulic oil to the clutches and the brake when the control lever is moved.

An accumulator valve is fastened to the control valve. The accumulator valve is actuated by a cam

on the control valve spool. The cam opens the accumulator valve when the control valve spool is moved from the neutral (BRAKE ON) position. When the hydraulic pump is operating and the control valve spool is moved, a pressure of 1725 kPa (250 psi) (17.25 bar) can be in the hydraulic system. When the cam on the control valve spool opens the accumulator valve, the accumulators are charged to the hydraulic pressure. If the hydraulic pump is not operating, the accumulators discharge into the inlet of the control valve when the control valve spool is moved from neutral. This operation permits the release of the winch brake when the tractor engine or the hydraulic pump is not operating. A description of the operation of the hydraulic circuit is shown in Figures 1.12 through 1.16.

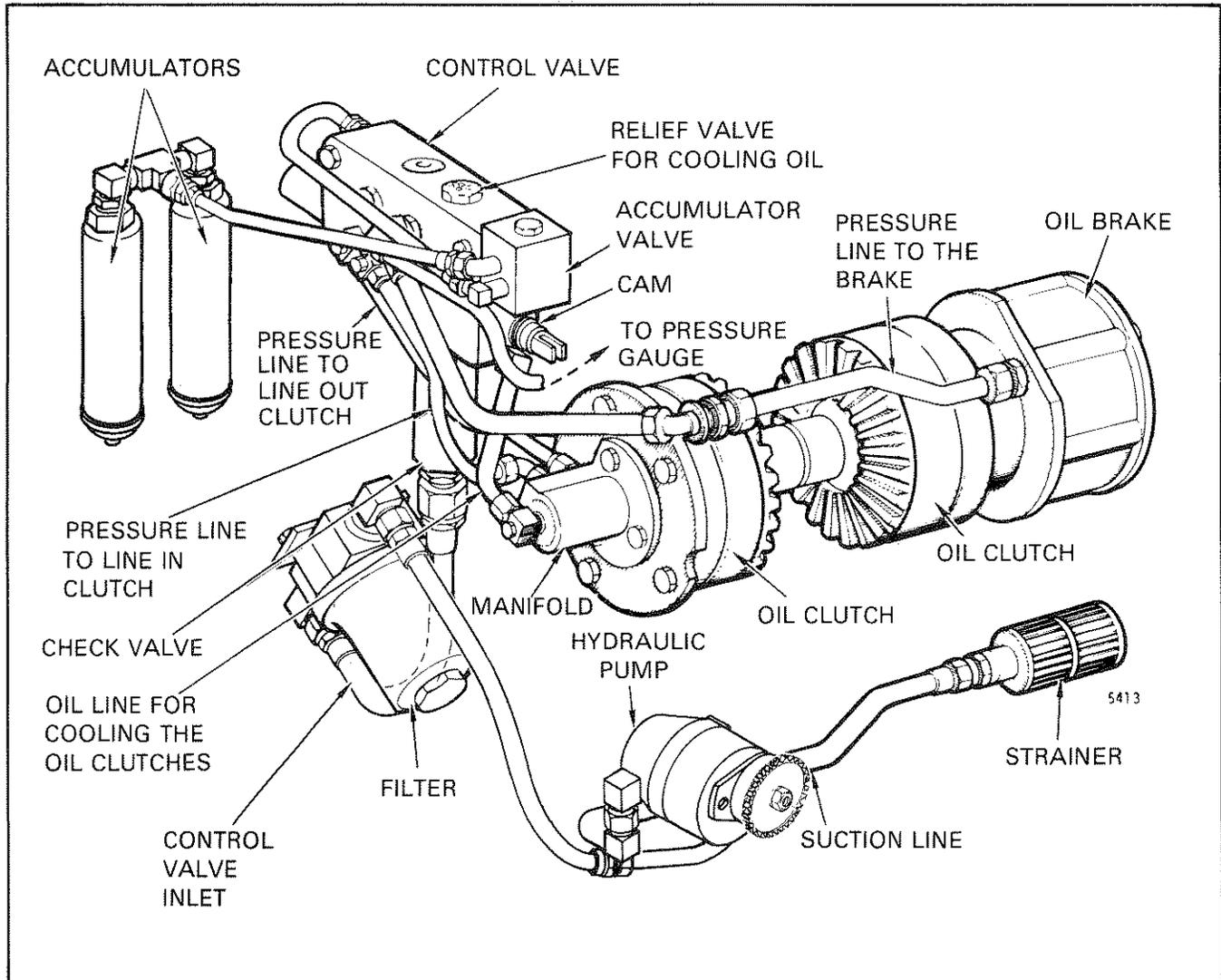


FIGURE 1.4 HYDRAULIC SYSTEM

Description

Oil Clutch

The LINE IN and LINE OUT clutch assemblies in the winch are the same part number. Each clutch has five friction discs, four separator plates, a piston housing, piston assembly and carrier. See Figure 1.5. The bevel ring gear is fastened to the carrier with eight 12 point capscrews. The friction discs have large splines that fit the splines in the carrier. The friction discs rotate with the carrier. The piston housing is connected to the shaft for the clutches and brake with splines. When a clutch is applied, the torque from the pinion turns the clutch and causes the clutch and brake shaft to rotate.

Passages are drilled in the shaft for the clutches and the brake so that oil can flow from the control valve to each clutch. The oil fills the cavity between the

piston housing and the piston. Oil pressure pushes the piston against the separator plates and the friction discs to engage the clutch. Torque from the pinion is transferred through the clutch to the shaft for the clutches and brake. This shaft is connected to the gear train. The LINE IN and LINE OUT clutch assemblies are on the same shaft, but on opposite sides of the pinion. The clutch that is applied will cause the shaft to rotate in the opposite direction than if the other clutch were applied. A third passage, drilled through the center of the clutch and brake shaft, supplies lubrication to both clutches and the shaft bearings. This third passage is also for the flow of cooling oil to the clutches and brake.

Some power-takeoffs rotate in a clockwise direction and other tractors have a power-takeoff that rotates counterclockwise. Because of this difference in PTO

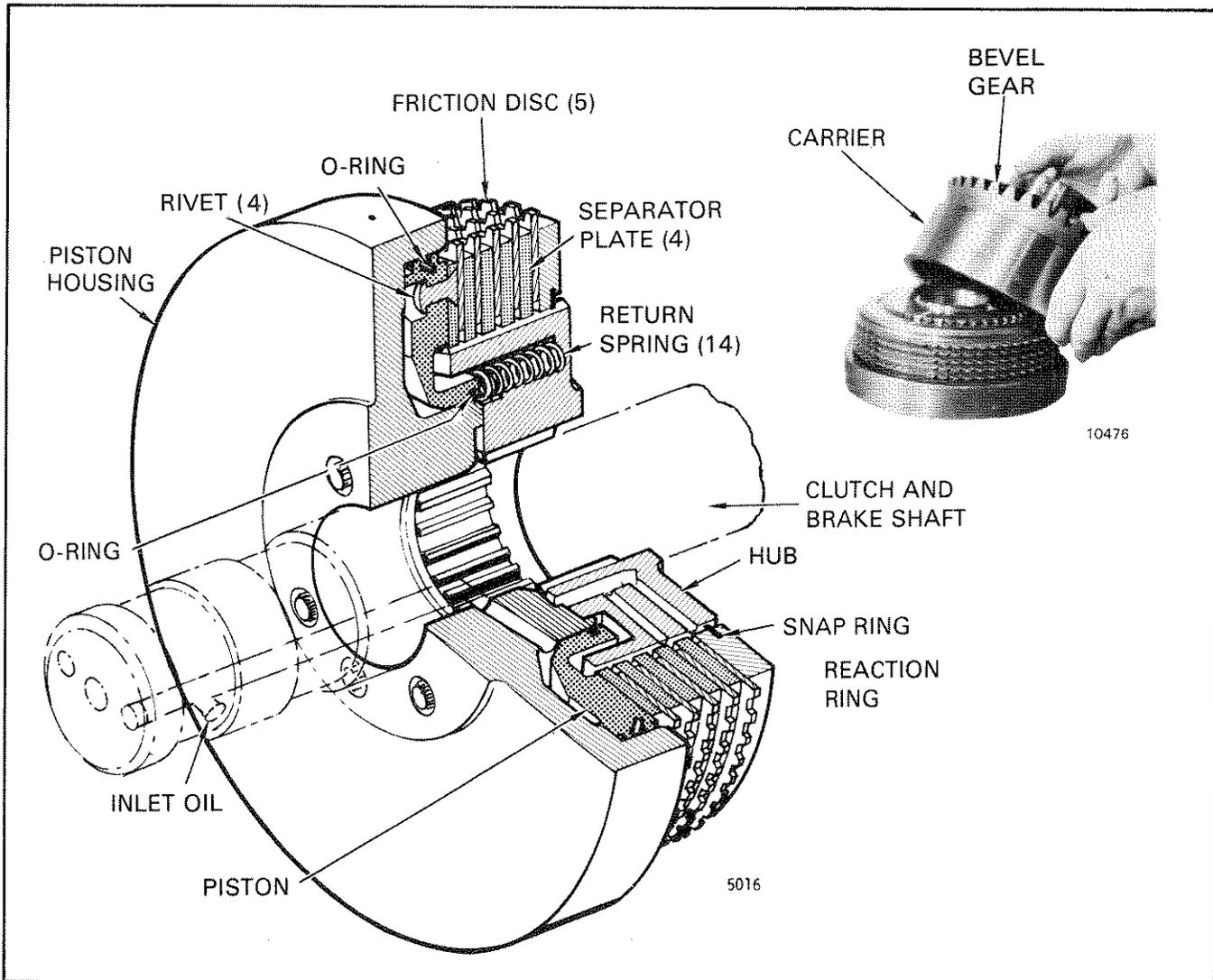


FIGURE 1.5 OIL CLUTCH ASSEMBLY

rotation, a LINE OUT clutch can be a LINE IN clutch in another application. The hydraulic connections from the control valve to each clutch are changed to the opposite clutch. This change keeps the LINE IN and LINE OUT rotation of the winch the same as indicated on the control lever. The hydraulic pump will operate in either direction. The inlet and outlet are also changed when the hydraulic pump is operated in the opposite direction.

Oil Brake

The oil brake is a disc brake that has six friction discs and five separator plates. The hub is connected to the brake and clutch shaft with splines. The brake is applied if a clutch is not applied. When oil pressure applies a clutch, oil pressure releases the brake. The brake will also be released when the hand lever is in

the BRAKE OFF position. Two Belleville springs apply the brake when the oil pressure is decreased. The brake release pressure is controlled by the number of shims under the brake cover. The brake is also cooled by the hydraulic oil.

Belleville springs push against the plungers to apply the brake. Oil pressure causes the piston to compress the Belleville springs and retract the plungers to release the brake. The six friction discs have splines that fit the splines in the housing and are held stationary. Splines in the five separator plates fit the splines in the hub and rotate with the hub. When the brake is applied, the clutch and brake shaft cannot rotate. The gear train to the winch drum is connected to the clutch and brake shaft. The operation of the winch is controlled by the clutches and the brake except when the intermediate shaft is disengaged for FREESPOOL.

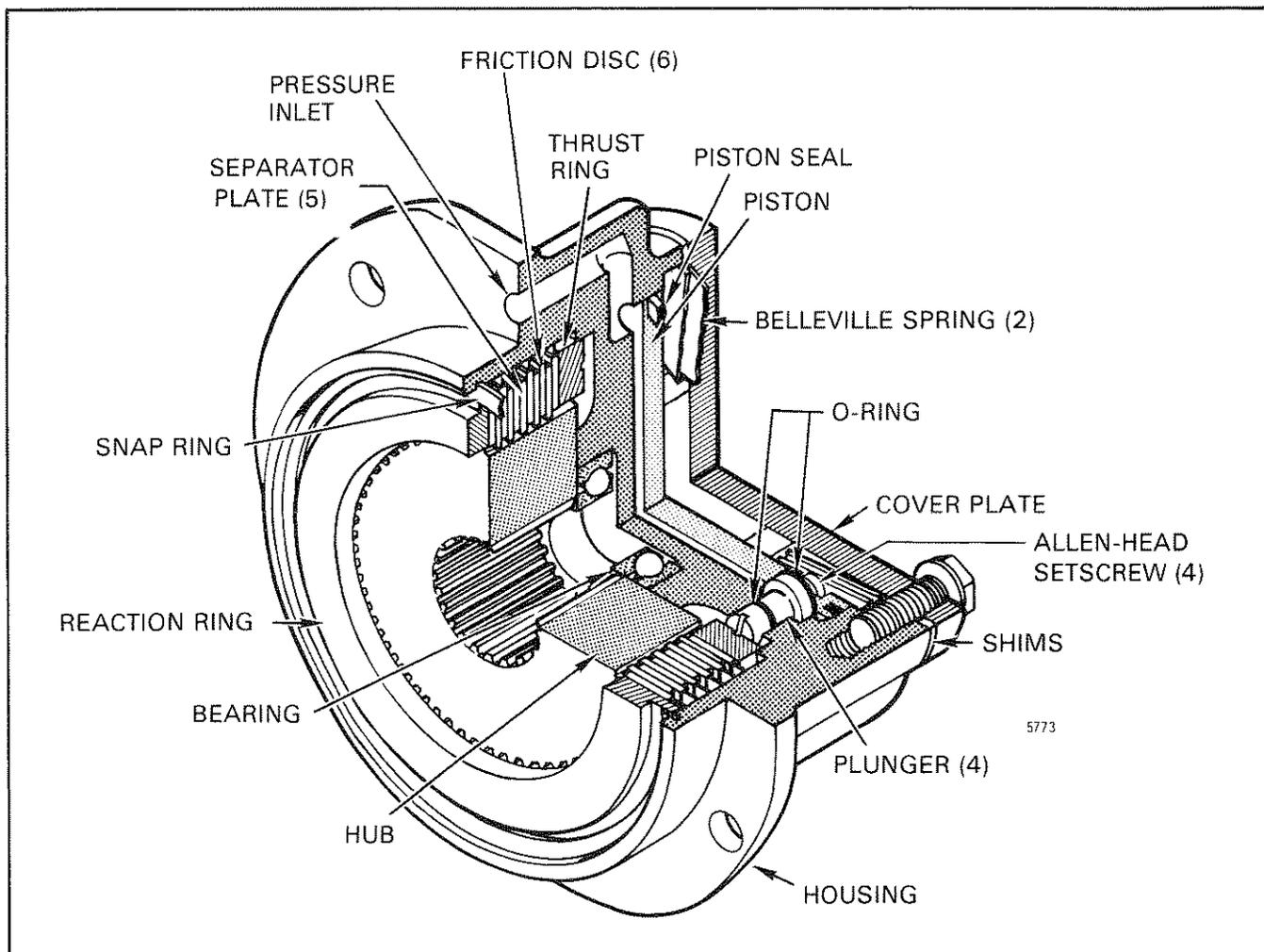


FIGURE 1.6 OIL BRAKE

Description

Control Valve

The flow of hydraulic oil to and from the clutches and the brake is controlled by the control valve. Passages inside the valve body connect the oil flow and pressure with the functions that control the winch. Valve spools move inside the valve body to open and close the passages to apply and release the clutches and brake.

The control spool is connected through a cable to the control lever for operator control. A return spring moves the spool to the BRAKE ON position when the hand lever is released. A detent holds the control valve spool in the BRAKE OFF position. There are two modulator valves in the valve body: a modulator valve for LINE IN, and a modulator valve for LINE OUT. The modulator valves are used to control a difference between hydraulic clutch pressure and brake pressure during inching.

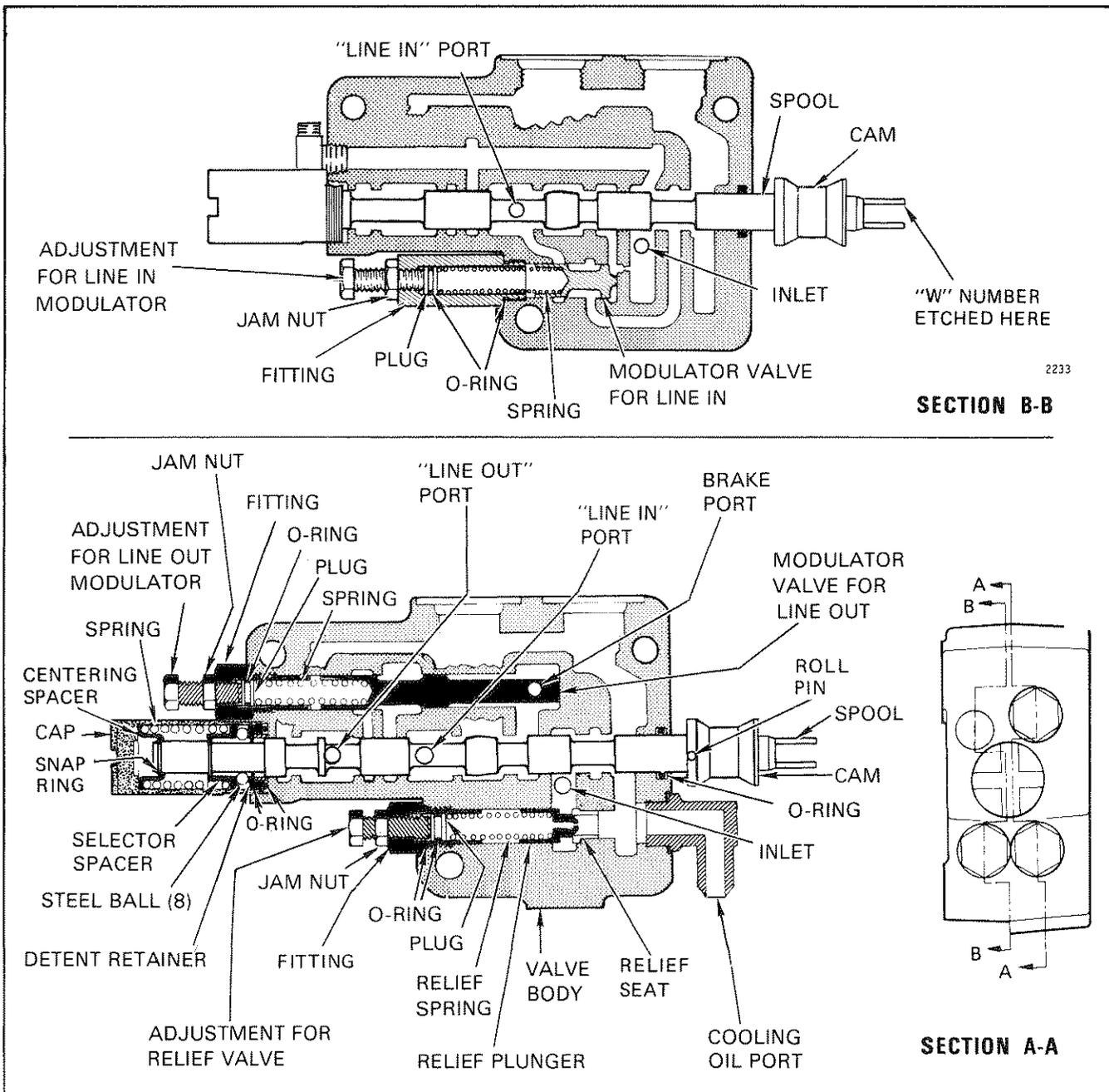


FIGURE I.7 CONTROL VALVE

During inching, a clutch is not completely applied. The clutch does not hold completely, but some power is applied to the gear train. The brake is disengaged enough so that it does not hold completely and the gear train will slowly rotate. This condition where hydraulic pressures are applied to both the clutch and the brake is frequently called "overlap". The pressure difference controlled by the modulator valves controls the overlap during inching. Each modulator valve has an adjustment for the modulator pressure. The modulator valves have adjustments for the following overlap pressures:

LINE OUT 515-585 kPa (75-85 psi) (5.2-5.9 bar)
LINE IN 310-380 kPa (45-55 psi) (3.1-3.8 bar)

A relief valve is in the control valve to prevent the hydraulic oil pressure becoming too great. The relief valve is a single poppet valve that is controlled by spring pressure. An adjustment increases or decreases the spring pressure on the poppet. If the oil pressure in the hydraulic system increases to 1690-1760 kPa (245-255 psi) (16.9-17.6 bar), the poppet opens. Some hydraulic oil will flow through the poppet from the high pressure system into the cooling oil passage and keep the pressure within the limits.

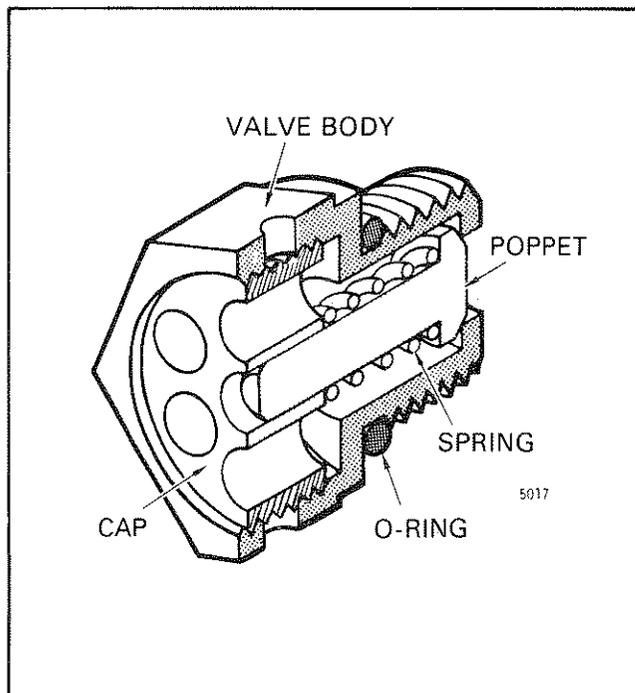


FIGURE 1.8. RELIEF VALVE FOR THE COOLING OIL

The design of the hydraulic system permits a small continuous flow of oil through the clutches and brake for cooling. A relief valve for cooling is found on the top of the control valve. This poppet valve is in the drain passage for the control valve. The poppet opens at approximately 55 kPa (8 psi) (0.55 bar) and permits the oil to drain from the hydraulic circuit to the sump in the winch case. (The pressure will be less than 55 kPa if the tractor engine is operating at idle.)

Accumulators

There are two accumulators joined by a tee fitting and connected to the hydraulic system. The purpose of the accumulators is to keep hydraulic pressure in storage. If the power-takeoff stops, the hydraulic pump stops. The pressure in the accumulators permits the operator to release the winch brake. Each accumulator has an internal rubber bladder

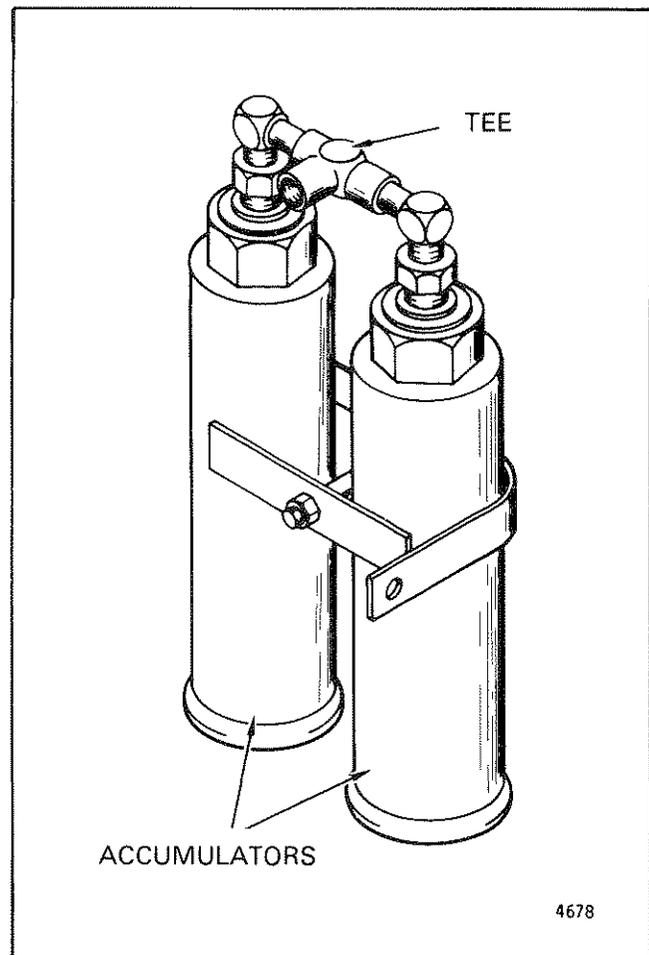


FIGURE 1.9 ACCUMULATORS

Description

that holds nitrogen at a pressure of 690 kPa (100 psi) (6.9 bar). The pressure from the hydraulic pump compresses the nitrogen in the accumulator. The accumulator valve is a ball check valve that is manually operated. (See Figure 1.10) The accumulator valve permits the hydraulic pressure to charge the accumulator during operation. When the operator moves the control spool when the hydraulic pump is stopped, a cam moves the check ball to permit the accumulator pressure to enter the control valve. A check valve between the control valve and the hydraulic pump prevents the flow of oil from the accumulator backward to the hydraulic pump.

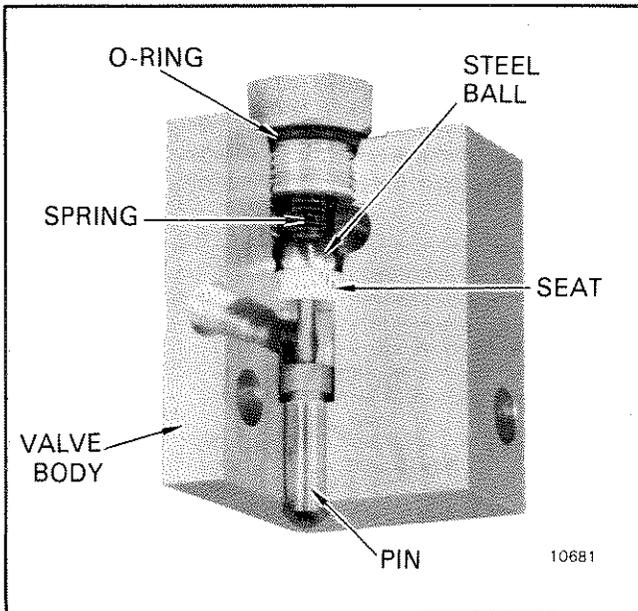


FIGURE 1.10 ACCUMULATOR VALVE

CONTROL LEVER ASSEMBLY

The control lever assembly has two control levers and an oil pressure gauge. See Figure 1.11. Both control levers are connected to the winch through control cables. One control lever is connected to the spool in the control valve and control the LINE IN and LINE OUT operations of the winch.

The BRAKE ON position is a neutral position. No hydraulic pressure is applied to the brake or the clutches. Belleville springs apply the brake so that the winch drum will not rotate.

The BRAKE OFF position has a detent and is a neutral position for the clutches. Hydraulic pressure is applied to release the brake. The winch will not rotate easily because of friction in the clutches, brake, and gear train. Cable can not be pulled from the winch by hand. The BRAKE OFF position is different from the FREESPOOL position where the drum is disengaged from the gear train. BRAKE OFF position is used when the operator has a load on the winch cable. The operator can move the tractor forward without moving the load.

A second control lever disengages and engages a sliding sleeve to control the FREESPOOL operation. Cable can be pulled from the winch by hand in the FREESPOOL position.

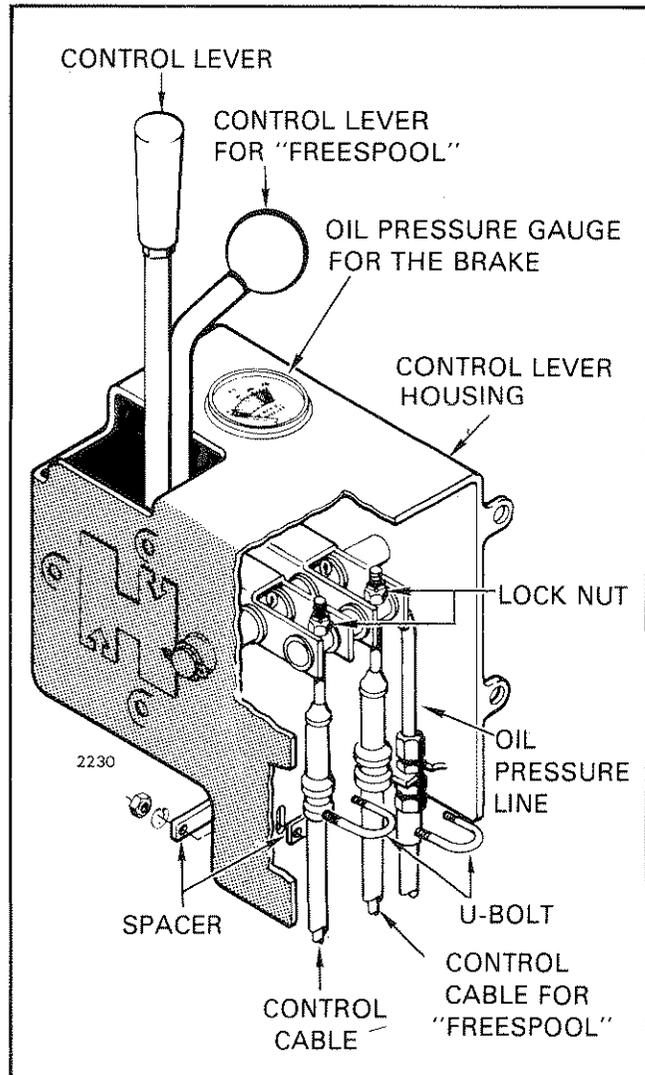
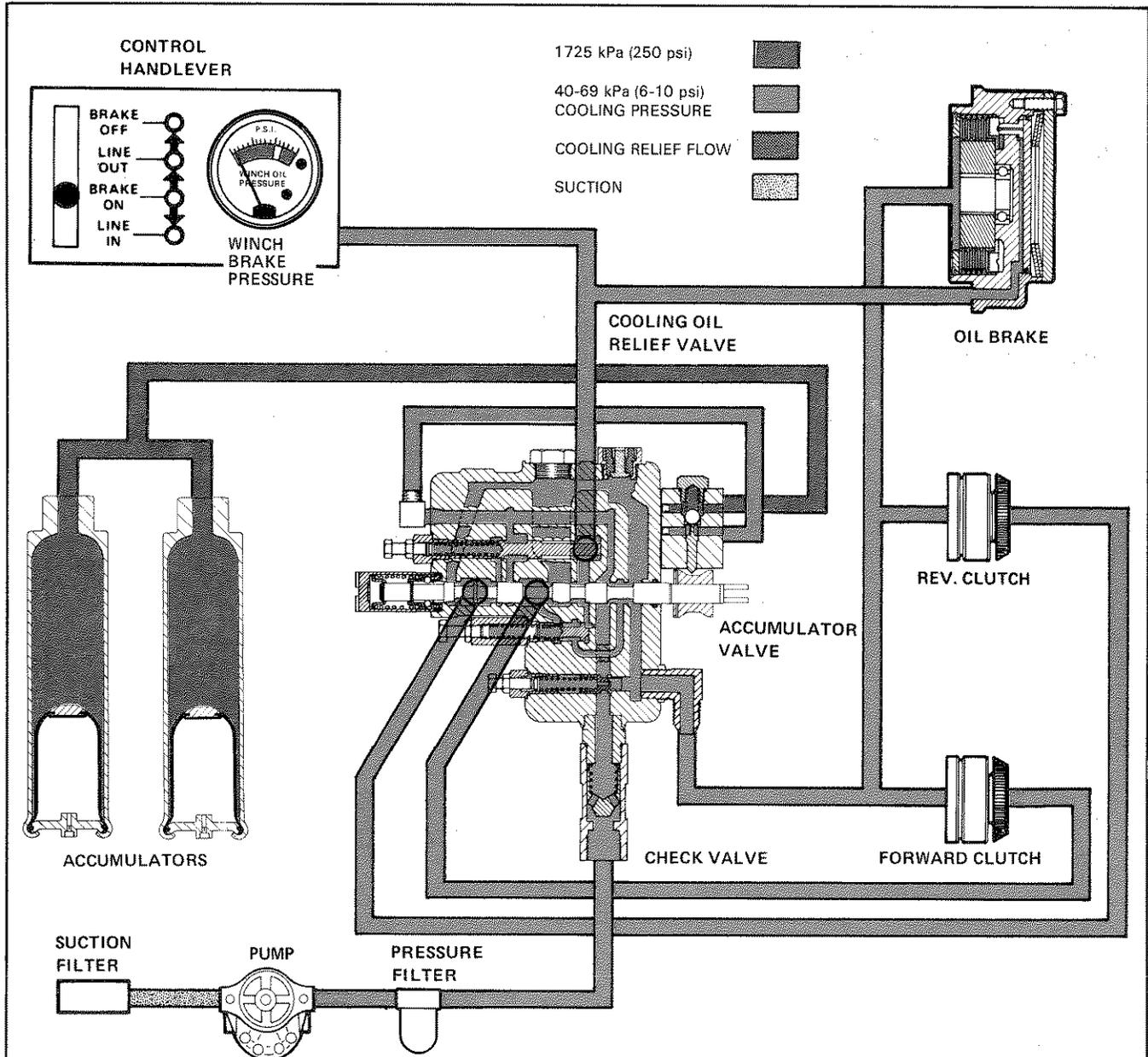


FIGURE 1.11 CONTROL LEVER ASSEMBLY

SEQUENCE OF OPERATION



- Hydraulic oil flows through the hydraulic circuit and returns to the sump. A pressure in the hydraulic circuit of approximately 55 kPa (8 psi) (0.55 bar) is caused by the relief valve for the cooling oil.
- If the winch has been operated, the accumulators will have a pressure of approximately 1720 kPa (250 psi) (17.2 bar).
- The Belleville springs have applied the oil brake.

FIGURE 1.12 HYDRAULIC SYSTEM IN BRAKE ON

Description

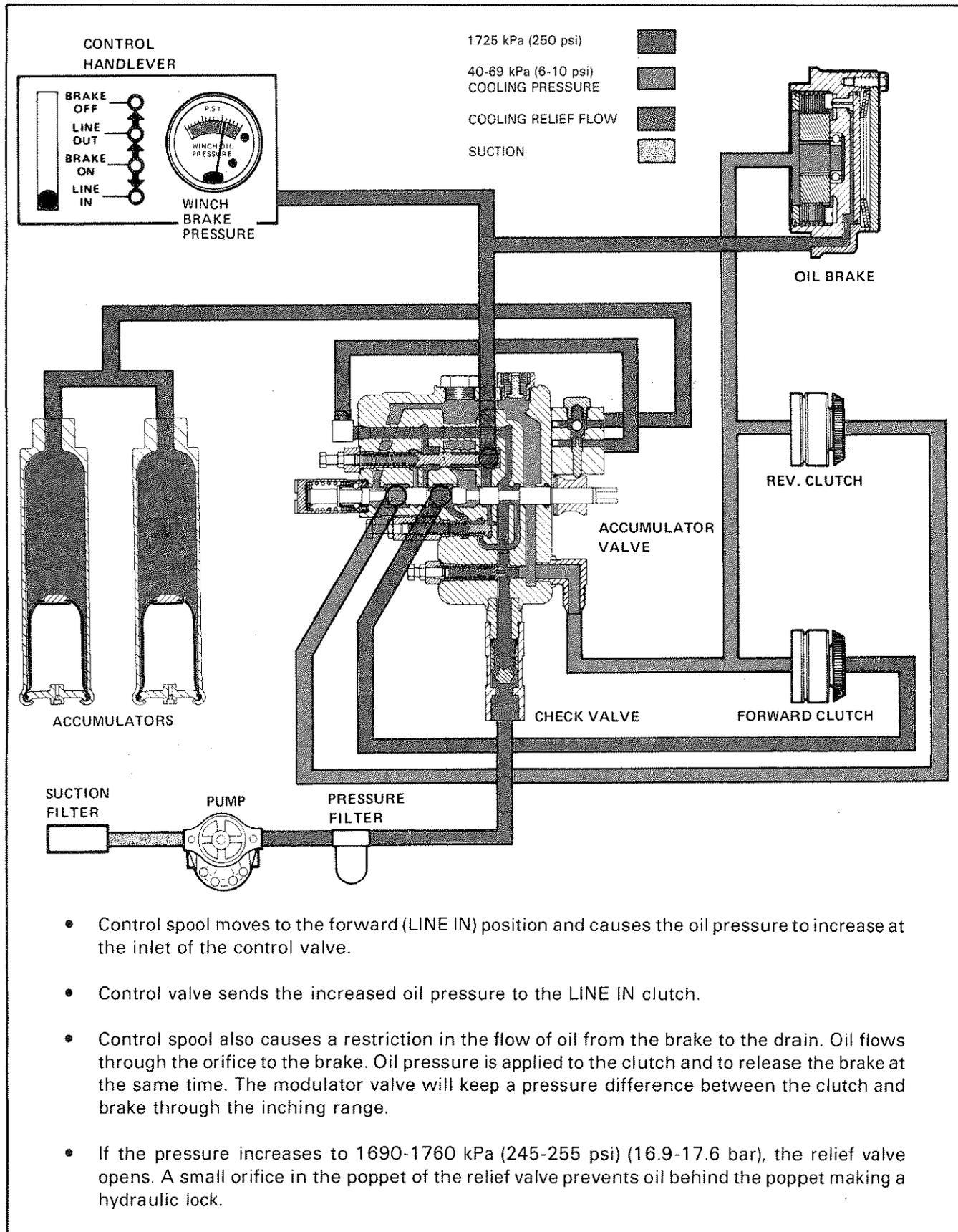


FIGURE I.13 HYDRAULIC SYSTEM IN "LINE IN"

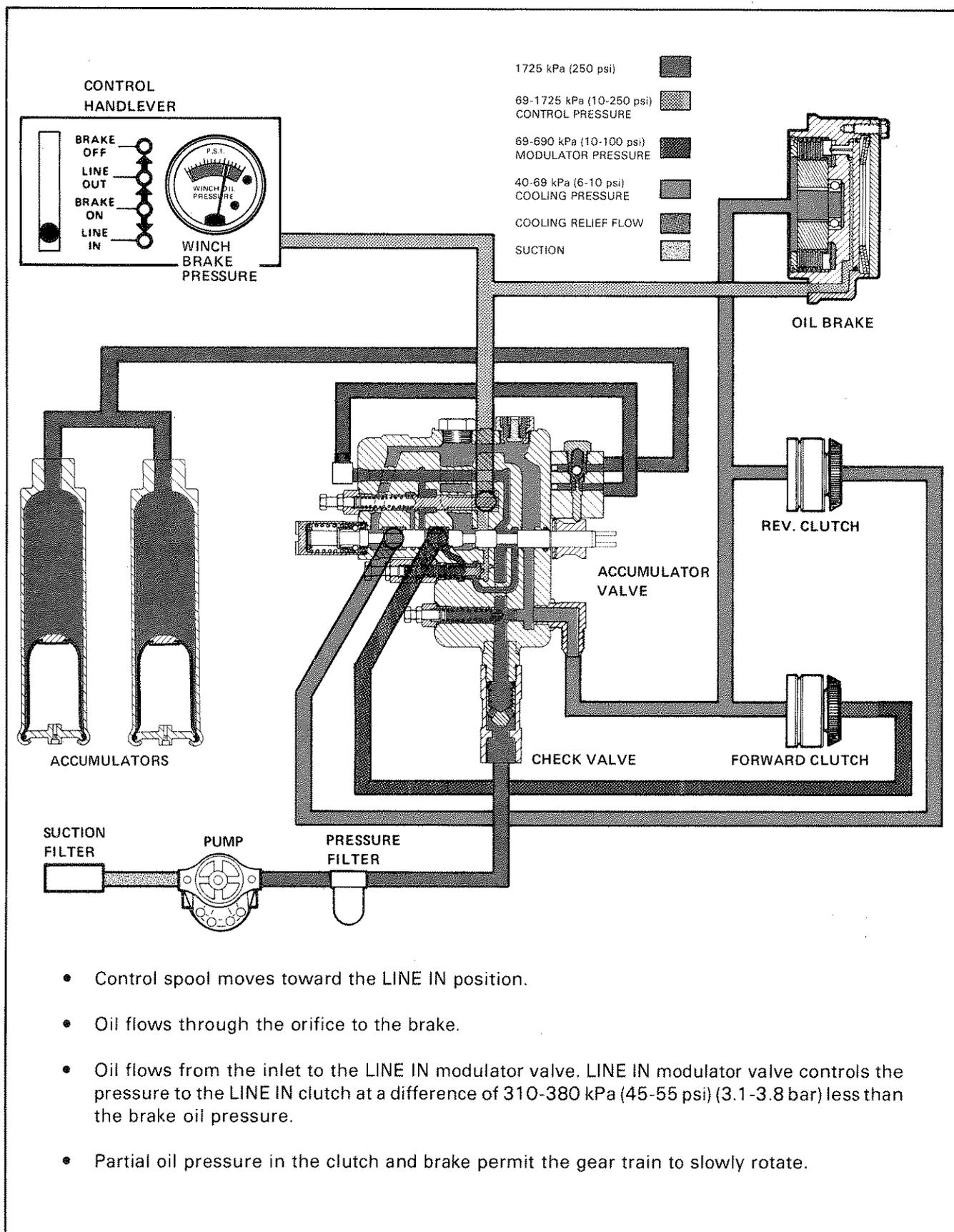


FIGURE I.14. HYDRAULIC SYSTEM IN "INCHING"

Description

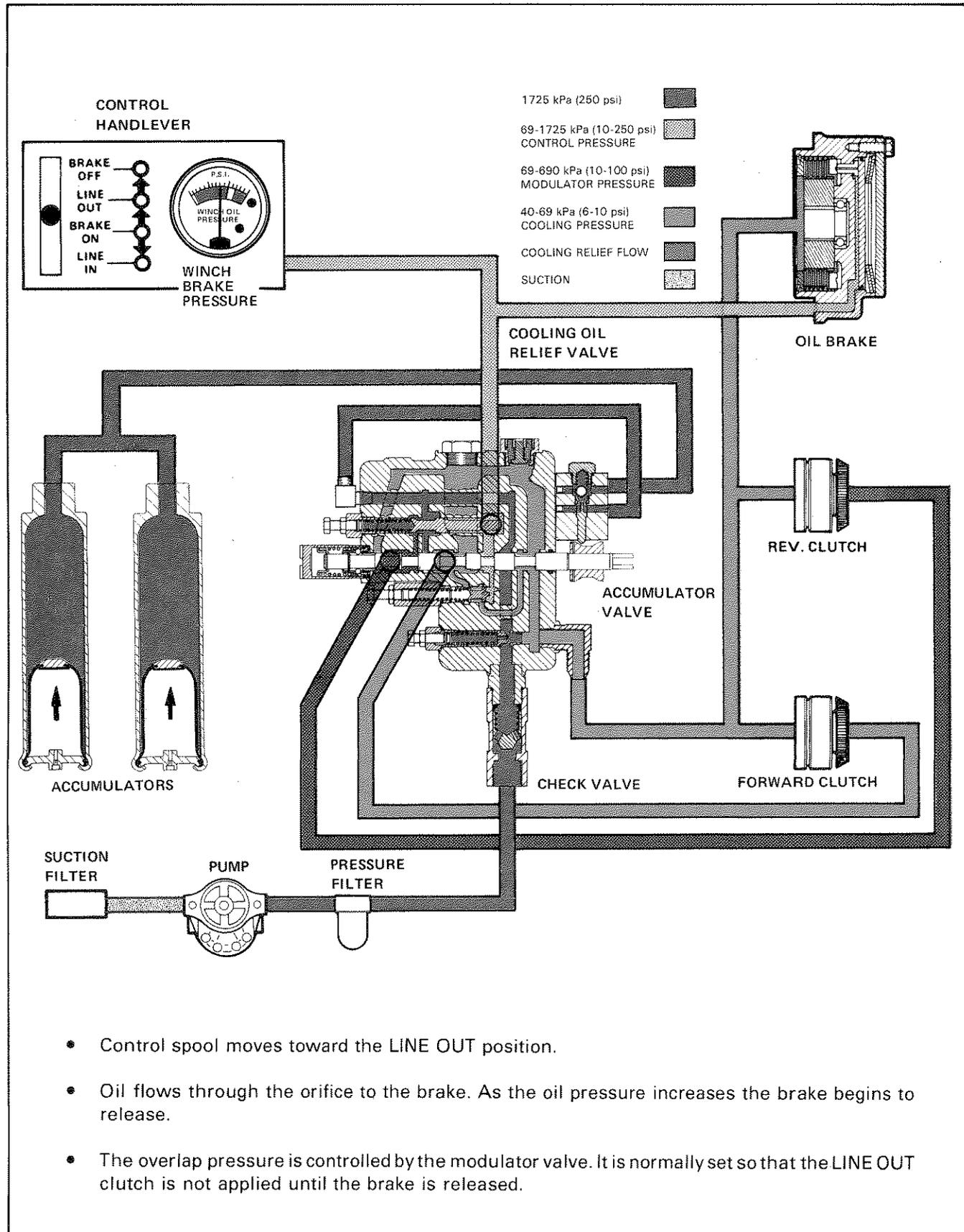


FIGURE I.15 HYDRAULIC SYSTEM IN "INCHING" (LINE OUT)

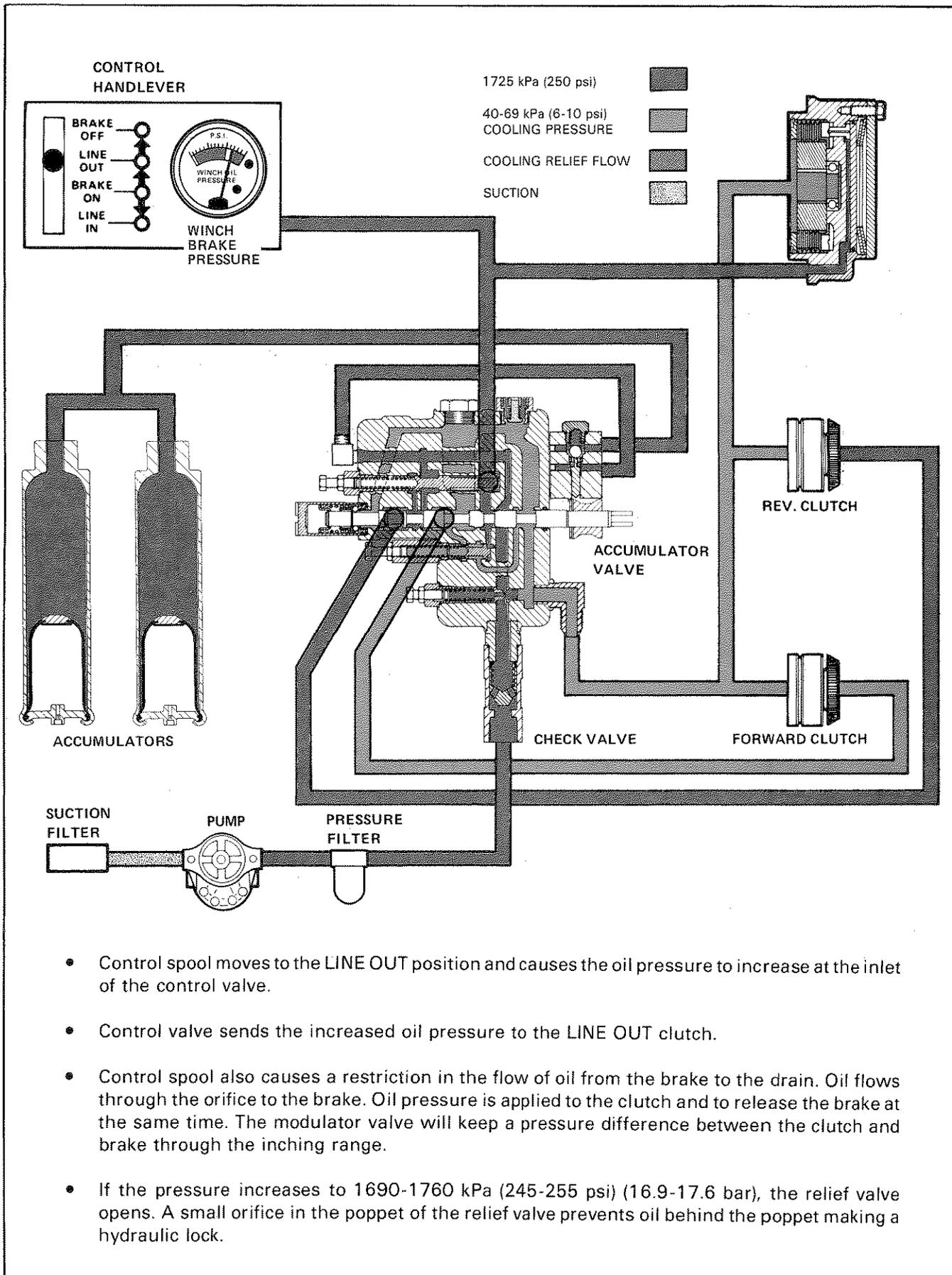


FIGURE 1.16 HYDRAULIC SYSTEM IN LINE OUT

Description

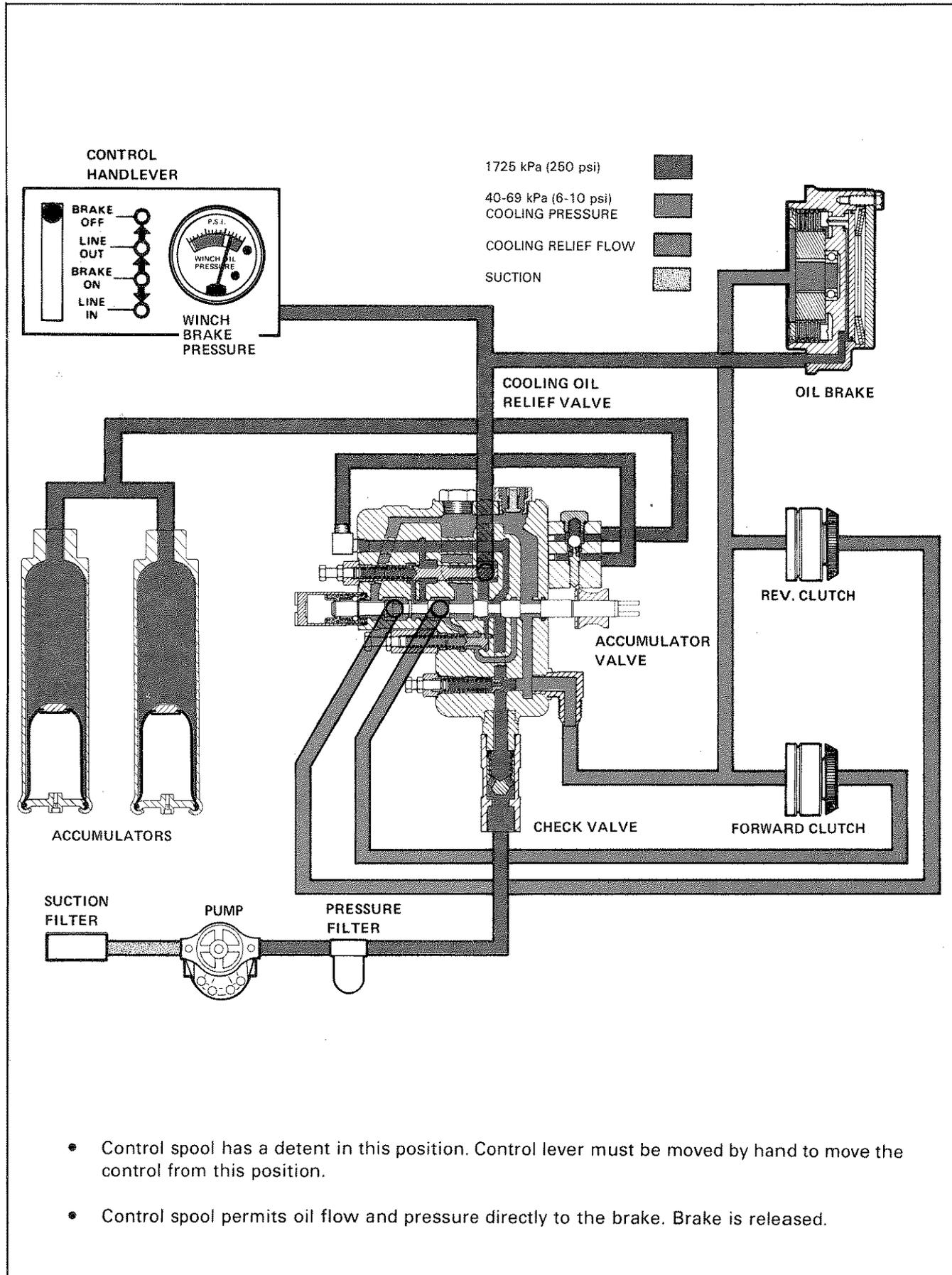


FIGURE I.17 HYDRAULIC SYSTEM IN "BRAKE OFF"

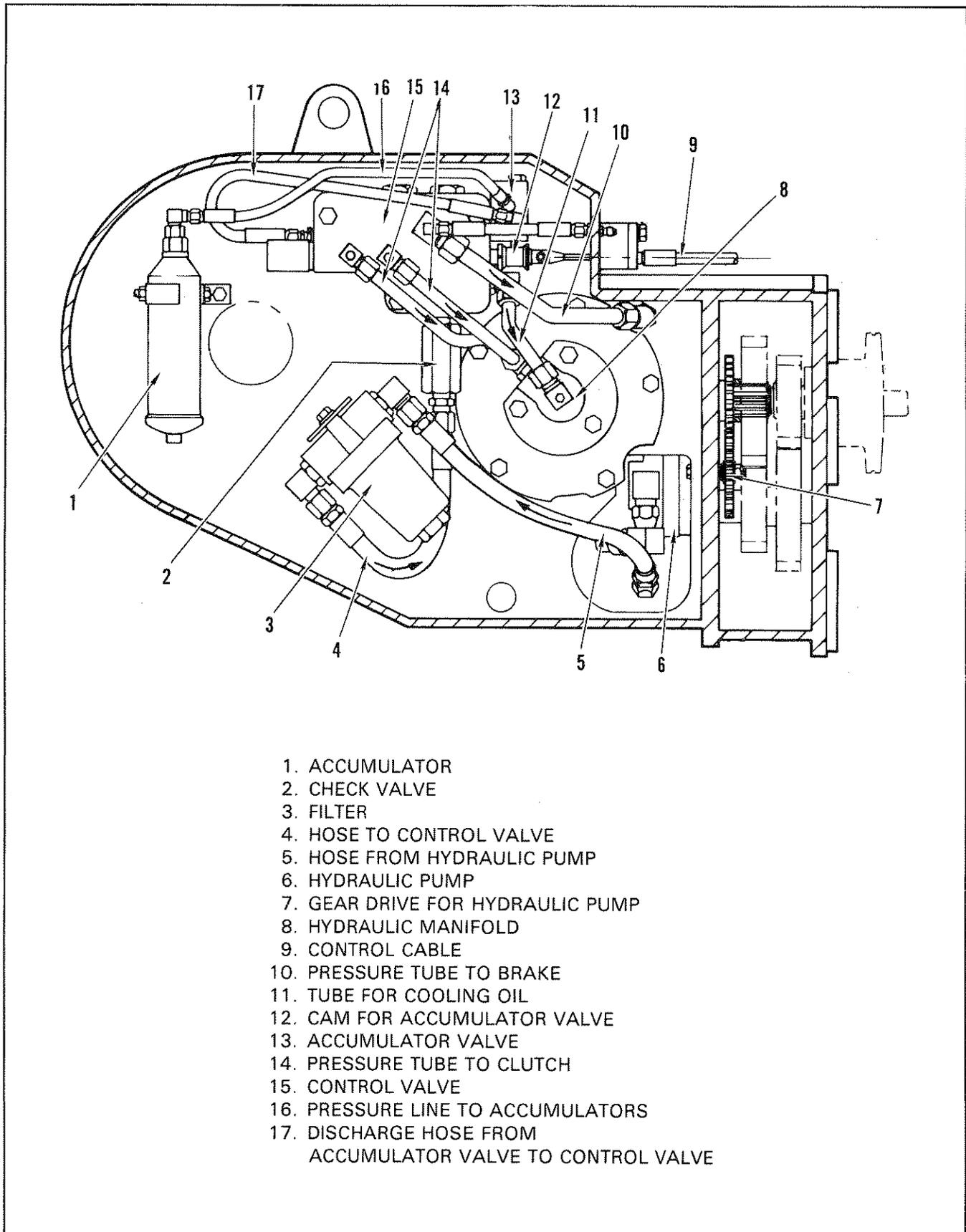


FIGURE 1.18 HYDRAULIC SYSTEM

Description

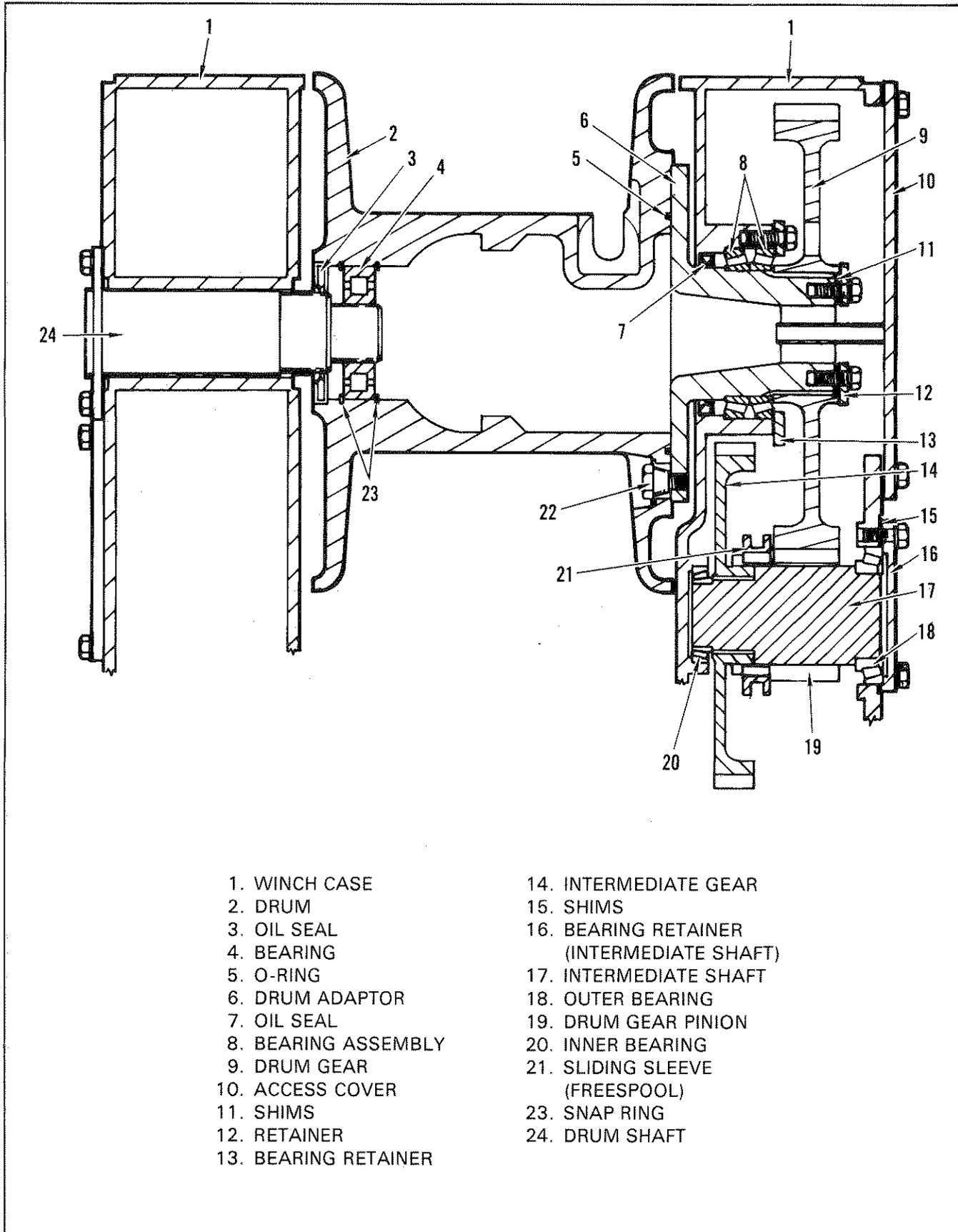


FIGURE 1.19 DRUM ASSEMBLY

SECTION 2 OPERATION

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.

OPERATING PROCEDURES

Two control levers are used for winch control. The power control lever is used to select one of the power operations:

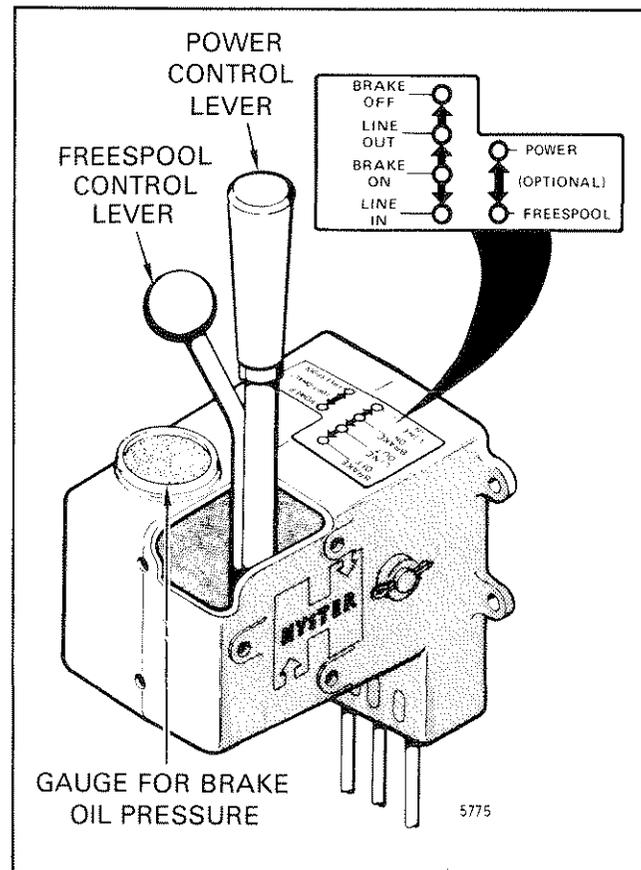


FIGURE 2.1 OPERATOR CONTROLS

Operation

- LINE IN
- BRAKE ON (Neutral)
- LINE OUT
- BRAKE OFF
- Inching in both power directions

Except for the BRAKE OFF position, the power control lever will return to the BRAKE ON position when the lever is released. A spring arrangement on the spool of the control valve returns the spool and control lever to the BRAKE ON position. A ball and detent will hold the spool and control lever in the BRAKE OFF position. The operator must pull the control lever out of the BRAKE OFF position.

The FREESPOOL control lever has two positions: POWER and FREESPOOL. The FREESPOOL control lever disengages the gear train so that cable can be pulled from the winch by hand.

Power Operation

BRAKE ON position is a neutral position. Neither clutch is applied. The brake is fully applied. The gauge will indicate the brake oil pressure in the lower pressure green area.

LINE IN position applies the LINE IN clutch and releases the brake. The winch will wind the cable at a speed controlled by the engine speed of the tractor. The gauge will indicate the brake oil pressure at the high pressure green area.

LINE OUT position applies the LINE OUT clutch and releases the brake. The winch will unwind at a speed controlled by the engine speed of the tractor and the weight of the load. The gauge will indicate the brake oil pressure at the high pressure green area.

Inching is used for a fine control of the winch speed. When the power control lever is slowly moved to a position between BRAKE ON and LINE IN or between BRAKE ON and LINE OUT, inching occurs. The normal adjustment of inching for LINE IN is different from the adjustment for LINE OUT. These adjustments can be changed by changing the overlap pressures of the modulator valves. This change is necessary for some customer operations. The following paragraphs describe the normal adjustments for inching.

Inching (LINE IN). This operation is used to slowly move a load toward the tractor. The control valve will cause the oil pressure to slowly release the brake and slowly apply the LINE IN clutch. As the brake is released, the clutch takes control and begins to move the load. The pressure gauge will indicate the brake oil pressure increasing from the lower green area to the upper green area.

Inching (LINE OUT). This operation will release the brake before the LINE OUT clutch is applied. This adjustment permits the weight of the load to unwind cable from the winch drum against the resistance of the brake. The operator controls the resistance of the brake by the position of the power control lever. The LINE OUT clutch is not applied until the operator moves the power control lever more toward the LINE OUT position. When the power control lever is moved so that the LINE OUT clutch is applied, the speed that the drum unwinds is controlled by the RPM of the tractor engine.

BRAKE OFF position is a detent position. The clutches are in neutral and the oil pressure has released the brake. This position will permit the cable to unwind from the winch against the friction of the clutches, brake, and gear train as the tractor moves away from the load. The brake oil pressure will indicate in the upper green area.

FREESPOOL Operations

The power control lever must be in the BRAKE ON position to operate the FREESPOOL control lever. When the FREESPOOL control lever is moved to the FREESPOOL position, the winch drum is disengaged from the gear train.

NOTE

The FREESPOOL control lever cannot be moved to the FREESPOOL position if there is tension on the winch cable.

If the FREESPOOL control lever can not be moved to engage the gear train for power operation, apply a clutch to move the gear train a small amount.



SECTION 3 TROUBLESHOOTING

TABLE 3.1 TROUBLESHOOTING CHART (Sheet 1 of 4)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Not Regular Operation	Low oil level	Add oil to the correct level
	Wrong oil	Drain the oil. Add the correct oil as shown in the specifications.
	Control cables need adjustment	Check for the correct adjustment. Make sure the ends of the cables are correctly fastened.
	Oil is too cold	Put the control lever in the BRAKE OFF position. Run the engine at 1000 RPM warm the oil before operating the winch.
	Tractor engine is running too slow	Adjust the idle speed to the correct value.
	Low oil pressure	See the Troubleshooting for low oil pressure.
Winch stops during shift when engine speed is low	Not enough engine torque	Increase engine rev/min
	No accumulator charge	See the instruction in the SERVICE section to check and repair the accumulator.
	Pressure modulator adjustment is wrong	Turn adjustment screw into the valve to release the brake more quickly.
	Accumulator valve does not seal. Low pressure in accumulators	Tighten plug to increase spring pressure in valve seat. Replace a bad valve.
Low oil pressure	Loose connections in the winch hydraulic system	Check for leaks. Look for loose hydraulic connections, bad seal rings, or bad O-rings.
	Suction screen is dirty	Clean the screen.
	Main relief valve is not correct	Check relief valve as described in the SERVICE section. Use a calibrated gauge to set the relief pressure. Replace bad relief valve.

Troubleshooting

TABLE 3.1 TROUBLESHOOTING CHART (Sheet 2 of 4)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Low oil pressure (Cont'd.)	Pressure gauge for winch is not correct	Check the pressure with a calibrated gauge. Replace a bad pressure gauge.
	Brake has an internal leak (Indicated by low brake pressure and quick loss of pressure from the accumulators.)	Remove brake and check the O-rings on the plungers and the piston.
	Worn hydraulic pump	Check the hydraulic system and the relief valve setting first. Repair or replace the hydraulic pump.
Brake does not hold	Wrong shim arrangement	Remove a shim from under the brake cover.
	Worn friction discs in the brake	Repair the brake.
	Spring pressure is too weak	Remove shims from under brake cover to increase the pressure of the Belleville springs.
	Belleville springs have a defect	Check installation of springs. Replace a broken spring.
Brake does not release	Low oil pressure	See the Troubleshooting for low oil pressure.
	Accumulators have a defect	See the instructions in the SERVICE section to check and repair the accumulators.
	A piston O-ring leaks	Replace the O-rings.
	Capscrews that fasten plungers to piston are too tight and will not permit piston to move freely	Loosen capscrews so that the plungers can be turned with a screwdriver. Use Loctite® 232 on the threads of the capscrews.
	Too few shims will cause the brake piston to hit the cover. The brake will not release correctly.	Add shims.
Brake begins to release before clutch is applied	Brake release pressure is too low	Remove shims from under the brake cover to increase the pressure of the Belleville springs.

TABLE 3.1 TROUBLESHOOTING CHART (Sheet 3 of 4)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Brake begins to release before clutch is applied (Cont'd.)	The modulator valve for the the clutch being applied	See the SERVICE section for instructions to adjust or repair the modulator valves.
		Decrease the overlap pressure.
Clutch does not apply completely	Low oil pressure	See the Troubleshooting for low oil pressure.
	Control valve spool has a defect	Check hydraulic pressure to both clutches. The pressure must be approximately the same.
	Worn friction discs in the clutch. (Remove top access cover to check if a clutch slips.)	Repair the clutch.
	Broken seal rings between the clutch and brake shaft and the hydraulic manifold	Replace the seal rings. NOTE: A damaged seal ring is a common cause of a difference in oil pressure between the two clutches. Check the preload on clutch and brake shaft to prevent broken seal rings. When seal rings are replaced, check the clutch and brake shaft for wear and damage.
Oil becomes too hot	Low cooling oil pressure	Check the cooling oil relief valve.
	High cooling oil pressure	Check the cooling oil relief valve. (High cooling oil pressure causes increased friction in the clutches.)
	Winch is operated in the BRAKE OFF position for long time periods	Use the BRAKE OFF position less. When the BRAKE OFF position is used, the hydraulic oil continuously flows through the relief valve.
	Winch is used frequently for inching	Do not use the inching function too frequently. The friction from the clutch and brake heats the hydraulic oil.
	Plugged suction screen	Clean the screen.

Troubleshooting

TABLE 3.1 TROUBLESHOOTING CHART (Sheet 4 of 4)

PROBLEM	POSSIBLE CAUSE	CORRECTION
FREESPOOL lever is difficult to move	Cable or linkage has dirt or corrosion	Clean, straighten, adjust and replace the parts as necessary.
	Detent pressure is wrong	Turn adjustment plug out of the shifting fork to decrease detent pressure.
FREESPOOL will not stay engaged	Cable or linkage needs adjustment	Adjust as necessary.
	Worn shift fork	Replace bushing or parts as necessary.
	Detent pressure is wrong	Turn adjustment plug in to increase detent pressure.

GENERAL

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

MAINTENANCE

The Maintenance Schedule is a program that includes periodic inspection and lubrication. Use the operating time on the hour meter of the tractor to find the maintenance time for the winch.

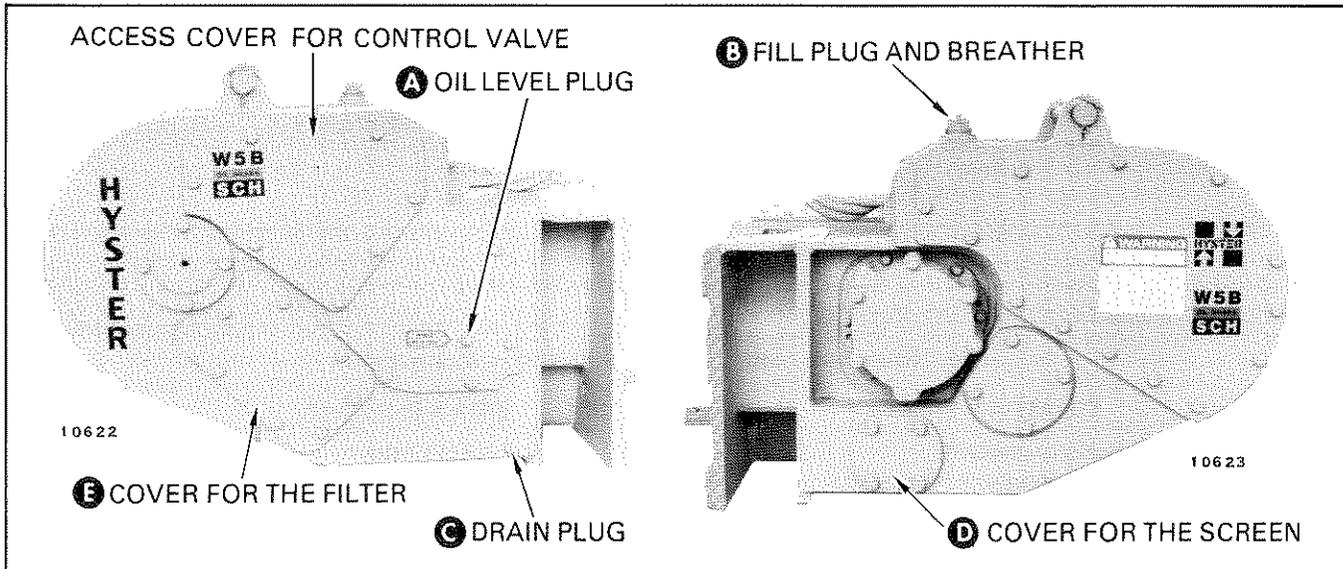


FIGURE 4.1. MAINTENANCE POINTS

MAINTENANCE SCHEDULE

INTERVAL	SERVICE	NOTES
50 hours or weekly	Check oil level at plug A . Add oil as necessary at plug B . (Do not operate the tractor when checking the oil level)	See Table 4.1 for a list of approved oils.
	Lubricate the winch control lever and the FREESPOOL control lever	Use a few drops of SAE 30 oil. Check that the control cables and control housing are fastened correctly.
	Clean the breather in the fill plug.	Clean the breather with solvent.
	Lubricate the fairlead rollers if the winch has this optional equipment	Use multi-purpose grease with 2-4% molybdenum disulphide.

MAINTENANCE SCHEDULE

INTERVAL	SERVICE	NOTES
500 hours or 3 months	Clean the suction screen and magnets See Figures 4.5 and 4.6 for additional information.	Tilt the tractor approximately 15° to prevent loss of oil when the cover is removed. Use a new gasket between the screen and suction tube. (See parts manual.)
	Replace the filter	
1000 hours or 6 months	Change the hydraulic oil. Drain oil from plug C .	See Table 4.1 for list of approved oil.
	Add 24 litres (25 qt) through plug B . Check the oil level at plug A .	

TABLE 4.1 APPROVED OIL LIST

The following oils meet J20A specifications:	
COMPANY	BRAND NAME
Amoco Oil Company	Amoco 1000 Fluid
Atlantic Richfield	Arco Tractor Fluid
Bessel Kok	Tractorelf ST.3
Bessel Kok	Tractorelf BF 12
Burmah Castrol Ltd.	Agricastrol MD Oil
Burmah Castrol Ltd.	Agricastrol JD Oil
British Petroleum	Tractran 9
Caltex	RPM Tractor Hydraulic Fluid
Chevron USA	Tractor Hydraulic Fluid
Cities Service Company	Citgo Tractor Hydraulic Oil
Duckhams Oils	Hydrolube 303
Exxon Company	Torque Fluid 56
Esso Company	Torque Fluid 56
Fina Oil Company	Pontonic JDF
Getty Refining Company	Tagoline 303
Getty Refining Company	Veedol Hydro Trans 303
Gulf Canada Ltd	Duratran
John Deere	Hy-Gard Transmission & Hydraulic Oil
Mobil Oil Company	Mobilfluid 423
Pennzoil	Hydra Tranz & Wet Brake Lube
Shell Oil Company	Donax T4
Sun Oil Company	Sunfleet TH Universal Tractor Fluid
Texaco	1893 TDH Oil
Union Oil Company	Union Hydraulic/Tractor Fluid
Total Oil Company	Transmission MP Totalube
Wolf's Head Oil Co	Tractor H-T Fluid

CHECKS AND ADJUSTMENTS

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

- Control cable adjustments
- Hydraulic system

Control Cable Adjustments

A. Check the operation of the power control lever to make sure it moves smoothly and will return to the BRAKE ON position. The power control lever will stay in the BRAKE OFF position when pushed into the detent.

B. Check that the positions of the power control lever are the same as the position indications on the control housing. Loosen the U-bolt that holds the control cable in the housing to adjust the control lever (see Figure 4.2).

C. Check the operation of the FREESPOOL lever for a smooth operation. Each of the two positions has a detent.

D. Check that the positions of the FREESPOOL lever are the same as the position indications on the control housing. Loosen the U-bolt that holds the control cable in the housing to adjust the control lever (see Figure 4.2).

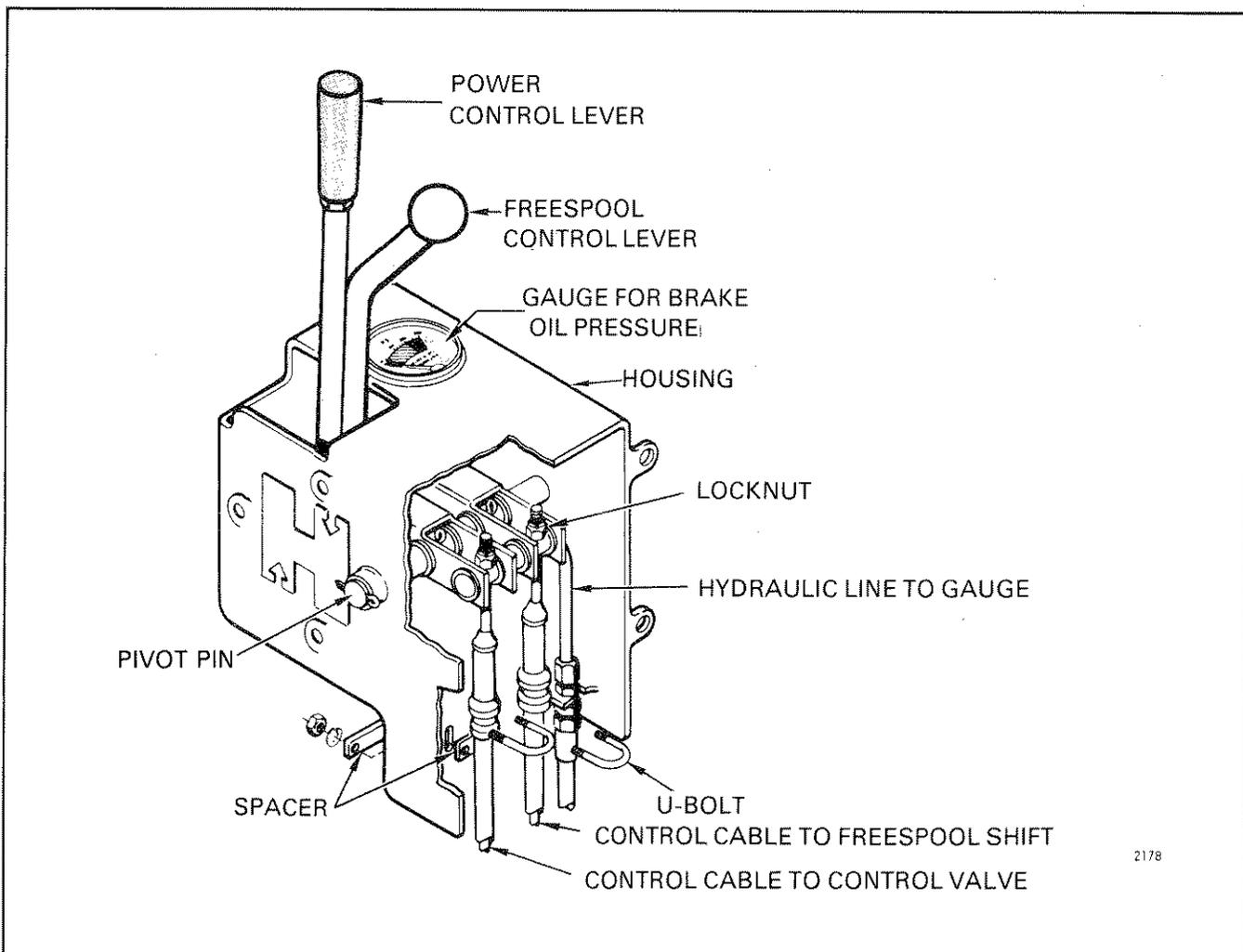


FIGURE 4.2 CONTROL CABLE ADJUSTMENTS

Service

Hydraulic Pressure

PREPARATION

A. Put the FREESPOOL control lever in the FREESPOOL position.

B. The oil in the winch must be at least 20°C (70°F). The oil can be heated by operating the winch in the BRAKE OFF position. When the oil is warm, stop the tractor engine.

C. Remove the dirt from the right side of the winch. Remove the access cover to the control valve.

D. The oil must be drained to a level below the bottom of the large access cover on the right side of the winch. Remove the bottom capscrew for the large access cover to drain the oil. Tilt the tractor approximately 15° by raising the right side. Put the right side of the tractor on a block or a raised surface to tilt the tractor.

E. Remove the large access cover. Put a piece of cardboard or cloth at the top of the opening for a spray guard. A spray guard will help keep the oil from the relief valve for the cooling oil in the winch case.

PRESSURE GAUGES

If three 2000 kPa (300 psi) (20 bar) pressure gauges and one 200 kPa (30 psi) (2 bar) gauge are available, you can do the pressure checks without stopping the

engine. The pressure checks can be done with one 2000 kPa gauge and one 200 kPa gauge.

Checking the overlap pressure will be described using two 2000 kPa gauges.

WARNING



There is oil under pressure stored in the accumulator. Keep the power control lever in the BRAKE ON position when connecting or disconnecting the pressure gauges. Except when doing pressure checks, stop the tractor engine when working in the winch.

Figure 4.3 shows the test ports for doing the hydraulic pressure checks. The chart shows the pressure and overlap for spool travel in the control valve.

Table 4.2 shows the connection and pressure test for each port. The paragraphs following Table 4.2 are notes and instructions for Table 4.2.

If the brake pressure at **D** is not correct, check for the following problems:

- relief valve is not set correctly
- leak in a hydraulic line
- damaged O-ring in the brake piston
- damaged O-ring on any of the four brake plungers
- dirty filter or screen
- worn hydraulic pump

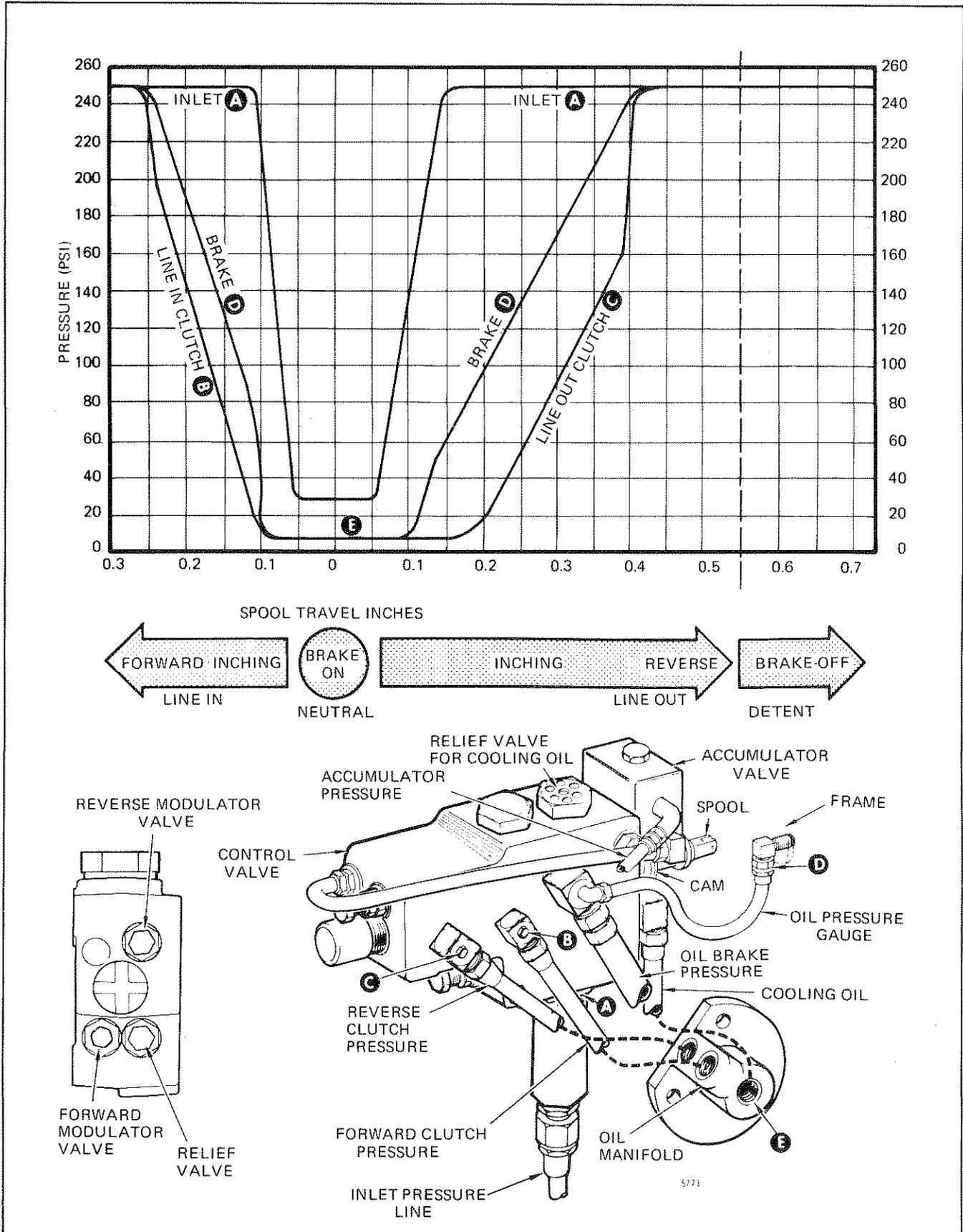


FIGURE 4.3. HYDRAULIC PRESSURE CHECK PORTS

TABLE 4.2 HYDRAULIC PRESSURE TESTS

SYSTEM CHECK	CHECK PORT	CONTROL POSITION	PRESSURE STANDARDS	ADJUSTMENT
BRAKE	D 2000 kPa (300 psi) (20 bar) gauge	BRAKE OFF 1000 RPM	1690-1760 kPa (245-255 psi) (16.9-17.6 bar)	Adjust relief valve
ACCUMULATOR	D 2000 kPa (300 psi) (20 bar) gauge	See Instructions	690 kPa (100 psi) (6.9 bar) minimum after 30 seconds	See instructions for accumulator repair and charge.
COOLING OIL	E 100 kPa (15 psi) (1 bar) gauge	BRAKE ON 1000 RPM	48-62 kPa (7-9 psi) (0.5-0.6 bar)	Adjust cooling oil relief valve.
LINE IN	B 2000 kPa (300 psi) (20 bar) gauge	LINE IN 1000 RPM	1690-1760 kPa (245-255 psi) (16.9-17.6 bar)	If pressure is wrong, see Troubleshooting.
LINE IN Modulator	B and D 2000 kPa (300 psi) (20 bar) gauge	LINE IN INCHING 1000 RPM	Port B must be less than Port D by 310-280 kPa (45-55 psi) (3.1-3.8 bar)	Adjust Forward modulator valve.
LINE OUT	C 2000 kPa (300 psi) (20 bar) gauge	LINE OUT 1000 RPM	1690-1760 kPa (245-255 psi) (16.9-17.6 bar)	If pressure is wrong, see Troubleshooting.
LINE OUT Modulator	C and D 2000 kPa (300 psi) (20 bar) gauge	LINE OUT INCHING 1000 RPM	Port C must be less than Port D by 515-585 kPa (75-85 psi) (5.2-5.9 bar)	Adjust Reverse modulator valve.

Adjustment of the Relief Valve (Check Port **D**)

A. Loosen the locknut on the relief valve. Run the tractor engine at 1000 rpm.

B. Turn the adjuster screw into the control valve to increase the pressure and out of the valve to decrease the pressure. Pressure standard: 1690-1760 kPa (245-255 psi) (16.9-17.6 bar).

C. Tighten the locknut after the adjustment is complete.

Accumulator Pressure (Check Port **D**)

A. Run the tractor engine at 1000 RPM.

B. Move the power control lever to the BRAKE OFF position for one minute. Move the power control lever to the BRAKE ON position and stop the engine.

C. Move the power control lever to the BRAKE OFF position. The pressure on the gauge at test port **D** must immediately increase to approximately 1035 kPa (150 psi) (10.3 bar). The pressure must not decrease to less than 690 kPa (100 psi) (6.9 bar) after 30 seconds.

D. If the pressure test is not correct, do the Accumulator Volume Test in the next paragraph.

Accumulator Volume Test

The purpose of this test is to measure the charge and operation of the accumulators.



WARNING

A charged accumulator has oil under pressure.

A. Run the tractor engine at 1000 RPM.

B. Move the power control lever to the BRAKE OFF position for one minute. Move the power control lever to the BRAKE ON position and stop the engine.

C. Disconnect the hose from the 90° elbow that goes to the control valve.



WARNING

Do not disconnect the hose that goes between the accumulator valve and the accumulators.

D. Turn the 90° elbow so that the open end is down. Hold a one litre (one quart) container under the elbow.

E. Move the power control lever to the BRAKE OFF position to discharge the accumulators. The flow of oil from the accumulators through the 90° elbow is very rapid. Make sure that the oil does not flow out of the container because of the rapid discharge of the accumulators.

F. Measure the amount of oil that was discharged from the accumulators. If the accumulators are in good condition, there will be approximately 0.65 litres (22 fluid ounces) of oil.

G. If the amount of oil is wrong, see the following causes:

- accumulators are not charged to 680 kPa (100 psi) (6.8 bar)
- rubber container in the accumulator is damaged
- valve stem on an accumulator has leaks

The accumulators are charged with dry nitrogen to a pressure of 690 kPa (100 psi) (6.9 bar). Check the pressure. Charge the accumulators or install new accumulators. The accumulators must be removed from the winch case for checks.

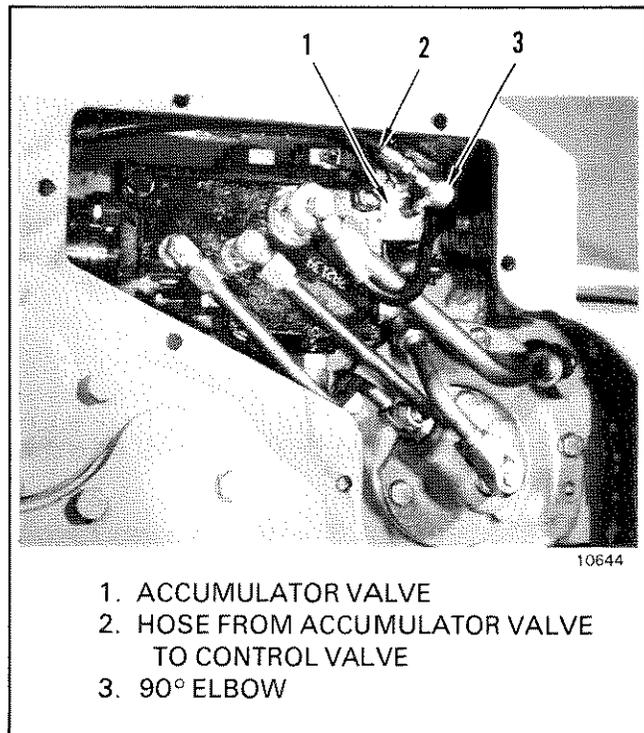


FIGURE 4.4. CONTROL VALVE

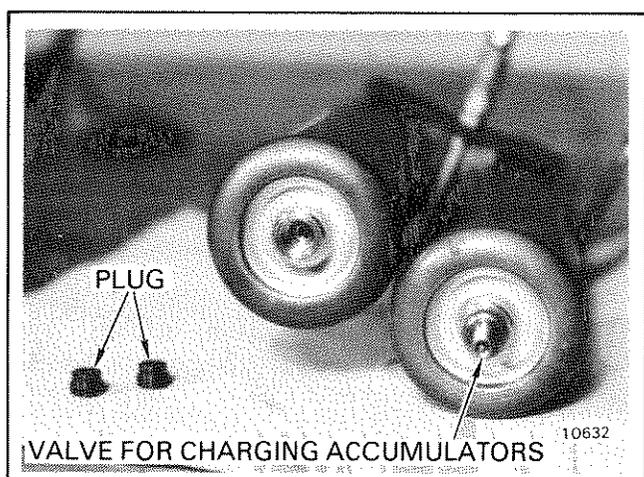


FIGURE 4.5 ACCUMULATORS

Service

Remove the plug from the valve in the bottom of the accumulator. Push on the pin of the valve. If the rubber bladder is damaged, oil will come out of the valve. Replace a damaged accumulator. If the accumulator is good, make sure it is charged to the correct pressure.

Relief Valve for the Cooling Oil (Check Port ③)

A. Install the pressure gauge. Start and run the engine at 1000 RPM.

B. The power control lever must be in the BRAKE ON position. Check that the pressure is 48-62 kPa (7-9 psi) (0.5-0.6 bar).

C. If the pressure is not correct, check the cooling relief valve for damage. Adjustment of the relief valve is made by turning the cap. Turn the cap into the valve to increase the pressure. Turn the cap out of the valve to decrease the pressure. Normal position of the cap is approximately even with the top of the valve body. (See Figure 1.8.) Use a punch to lock the cap in the correct position.

Pressure Check for the LINE IN Clutch (Check Port ②)

A. Install the pressure gauge. Put the winch control in FREESPOOL so that the drum will not turn. Start and run the tractor engine at 1000 RPM.

B. Hold the power control lever in the LINE IN position. Check that the pressure is 1690-1760 kPa (245-255 psi) (16.9-17.6 bar).

C. If the pressure is wrong, check for the following problems:

- valve spool does not travel full stroke
- leak in a hydraulic fitting or hose
- broken seal rings between the hydraulic manifold and the clutch and brake shaft
- damaged O-ring in a clutch
- loose rivets in the clutch piston

Make repairs as needed to have a correct oil pressure.

Pressure Check of the LINE IN Modulator (Forward Inching) (Check Ports ② and ③)

You will need a 2000 kPa (300 psi) (20 bar) pressure gauge installed in Port ② and Port ③ to make the check.

A. Put the winch control in FREESPOOL so that the drum will not turn. Start and run the tractor engine at 1000 RPM.

B. Move the power control lever from the BRAKE ON position to the LINE IN position until the oil pressure indicates 1690-1760 kPa (245-255 psi) (16.9-17.6 bar) at Port ②. Then move the power control lever towards BRAKE OFF until the gauge at Port ③ indicates 1035 kPa (150 psi) (10.3 bar).

C. The pressure indicated at Port ③ must indicate 345 kPa (50 psi) (3.4 bar) less than the pressure indicated at Port ②.

D. If the overlap pressure indicated in step C is wrong, adjust the LINE IN (forward) modulator valve. Loosen the lock nut on the adjusting screw of the forward modulator valve. Turn the adjusting screw into the valve to decrease the clutch pressure. Turn the adjusting screw out of the valve to increase the clutch pressure. Do steps B-D until the overlap pressure is correct.

NOTE

The pressure for the LINE IN modulator must be adjusted for the operating conditions of the customer. If the load on the cable unwinds the drum during inching, the pressure difference between port ② and port ③ must be decreased. Decrease the pressure difference 35 kPa (5 psi) (0.35 bar) at a time until the winch will operate correctly for the conditions. If the brake release pressure must be increased, remove a shim.

Pressure Check for the LINE OUT Clutch (Check Port ④)

A. Install the pressure gauge. Put the winch control in FREESPOOL so that the drum will not turn. Start and run the tractor engine at 1000 RPM.

B. Hold the power control lever in the LINE OUT position. Check that the pressure is 1690-1760 kPa (245-255 psi) (16.9-17.6 bar).

C. If the pressure is wrong, check for the following problems:

- valve spool does not travel full stroke
- leak in a hydraulic fitting or hose
- broken seal rings between the hydraulic manifold and the clutch and the brake shaft
- damaged O-ring in a clutch
- loose rivets in the clutch piston

Make repairs as needed to have a correct oil pressure.

Pressure Check of the LINE OUT Modulator (Reverse Inching) (Check Port **C** and **D**)

You will need a 2000 kPa (300 psi) (20 bar) pressure gauge installed in Port **C** and Port **D** to make this check.

- A. Start and run the tractor engine at 1000 RPM.
- B. Move the power control lever from the BRAKE ON position toward the LINE OUT position until the oil pressure indicates 1690-1760 kPa (245-255 psi) (16.9-17.6 bar) at Port **D**. Then move the power

control lever toward BRAKE OFF until the gauge at Port **D** indicates 1035 kPa (150 psi) (10.3 bar).

C. The pressure indicated at Port **C** must indicate 550 kPa (80 psi) (5.5 bar) less than the pressure indicated at Port **D**.

D. If the overlap pressure indicated in step C is wrong, adjust the LINE OUT (reverse) modulator valve. Loosen the locknut on the adjusting screw of the reverse modulator valve. Turn the adjusting screw into the valve to decrease the clutch pressure. Turn the adjusting screw out of the valve to increase the clutch pressure. Do steps B-D until the overlap pressure is correct.

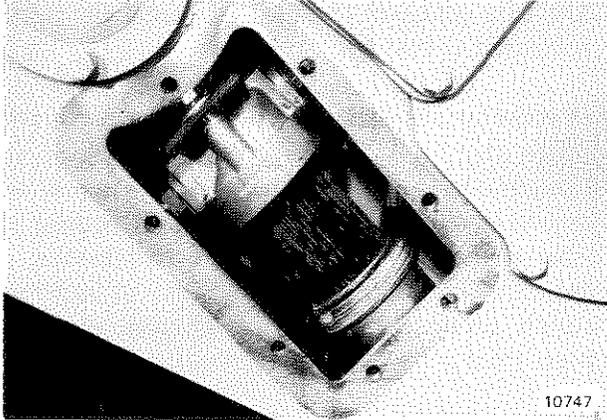
Adjustment of the FREESPOOL Lever

The linkage and cable must be adjusted so that the FREESPOOL shifter mechanism will move the sliding sleeve to both positions. Both positions have a detent.

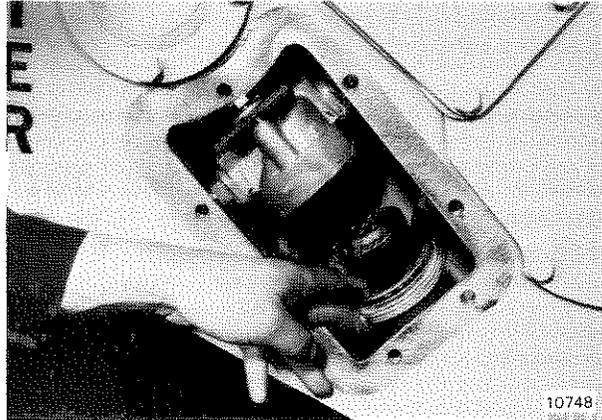
ITEM	DESIGN DATA
CONTROL VALVE	
Relief Valve Pressure	1690-1760 kPa (245-255 psi) (16.9-17.6 bar)
Cooling Oil Pressure	48-62 kPa (7-9 psi) (0.5-0.6 bar)
LINE IN Modulator Valve (overlap pressure)	310-380 kPa (45-55 psi) (3.1-3.8 bar)
LINE OUT Modulator Valve (overlap pressure)	515-585 kPa (75-85 psi) (5.2-5.9 bar)
SUCTION SCREEN	50 mesh strainer
PRESSURE FILTER	20 micron, replaceable element
HYDRAULIC OIL	45 litres (11.5 gal) (See Table 4.1 for list of approved oil)

TABLE 4.3 HYDRAULIC SPECIFICATIONS

FILTER AND SCREEN



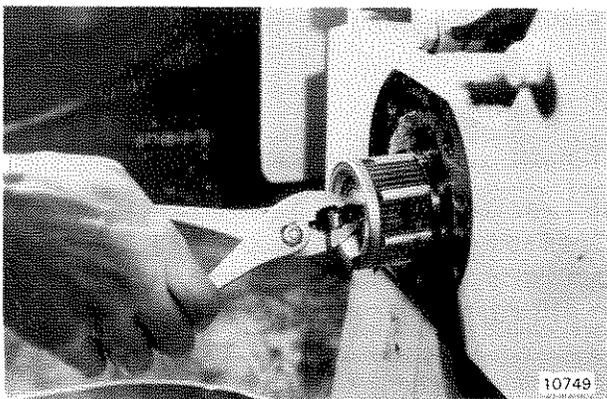
1. Use a wrench to loosen the filter bowl. Turn the filter bowl until it is loose from the filter head. Slide the filter bowl down the filter element.



2. Slide the filter element into the filter bowl and remove both of them from the winch.

3. Discard the filter element. Clean the filter bowl. Install a new filter element in the filter bowl. Lubricate the seal between the filter element and the filter head. Install the filter element and filter bowl on the filter head.

FIGURE 4.5 CHANGING THE FILTER



Remove the access cover to the screen. Remove the screen from the suction tube. Clean the screen in solvent. Make sure any metal particles are removed from the magnets. When the screen is installed in the winch, use a new gasket between the screen and the suction tube.

FIGURE 4.6 CLEANING THE SCREEN

GENERAL

This section has the instructions for disassembly and assembly of the winch for repairs. The winch must be removed from the tractor to disassemble the following assemblies:

- PTO gear assembly
- pinion assembly

The instructions in this section will show the winch removed from the tractor for complete disassembly. If the winch does not need complete disassembly for repairs, disassemble the winch only for the repairs that are needed. Make sure you have done good troubleshooting before you disassemble a winch for repairs. Table 5.1 is a guide for inspecting the parts.

Instructions for removal and installation of the winch are included in this section.

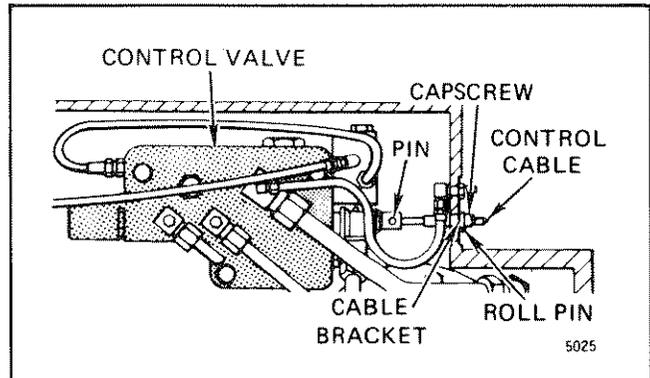


FIGURE 5.1 CONTROL VALVE CONNECTIONS

D. Move the power control lever to the BRAKE OFF position three times to discharge the pressure in the accumulators.

E. Disconnect the control cables from the control levers.

F. Disconnect the hose to the pressure gauge at the winch. Put a protective cap on each end of the connection.

WINCH REMOVAL

WARNING



Be careful when you remove the cable from the drum. The end of the cable can operate like a compressed spring when the ferrule is loosened on the drum.

WARNING



The slings and crane used to lift the winch must have a minimum capacity of 1500 kg (3000 lb).

A. Remove the cable from the drum.

B. Clean the outside of the winch. Remove the dirt and grease from the winch and the tractor where the winch is attached.

C. Drain the oil from the winch.

NOTE

Raise the back of a CAT D4 so that the transmission oil does not drain when the winch is removed.

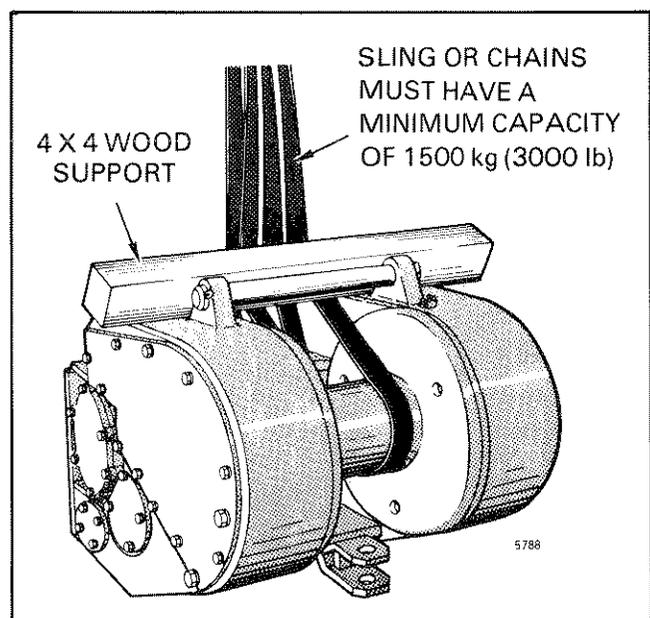


FIGURE 5.2 LIFTING THE WINCH

Repairs

G. Connect a sling and a crane or lift mechanism to the winch as shown in Figure 5.2. The sling and crane must have a minimum capacity of 1500 kg (3000 lb). The 4 x 4 wood support shown in Figure 5.2 will keep the winch almost balanced. Use the crane to hold the weight of the winch.

H. Remove the nuts and lock washers that hold the winch to the tractor.

I. Pull the control cables out of the tractor as the winch is moved away from the tractor. Put the winch in a work area so that you can make repairs.

WINCH INSTALLATION

WARNING



The slings and crane used to lift the winch must have a minimum capacity of 1500 kg (3000 lb.)

A. Connect a crane or lift mechanism to the winch as shown in Figure 5.2. Move the winch to the attachment point of the tractor.

B. Align the splines of the coupling with the PTO. Install the control cables as the winch is installed. Align the winch with the bolt holes and install the bolts, nuts, and lockwashers that hold the winch on the tractor. Remove the slings and crane.

C. Connect the hose to the pressure gauge.

D. Leave the access to the hydraulics open if you need to make checks and adjustments. See the instructions for making checks and adjustments. Add the correct hydraulic oil to raise the level to the bottom of the large access cover on the right side of the winch.

E. When the checks and adjustments are complete, install the large access cover. Add oil to raise the level to the bottom of the plug for checking the oil level.

DISASSEMBLY OF THE WINCH

Figures 5.3 - 5.14 describe the disassembly of components that requires the winch to be removed from the tractor. These components are the PTO gears and the pinion. There are five arrangements of the PTO gears. A figure describes the disassembly of each gear arrangement. The pinion arrangement is the same for all of the winches and is described in Figures 5.12 - 5.14. Figures 5.15 - 5.23 describe the disassembly of the gear train when the winch is either removed or installed on a tractor.

Disassembly Of The PTO Gear Arrangements

PTO GEAR RATIO OF 32.27:1

This gear ratio is used on the following tractors:

CATERPILLAR® D5B

JOHN DEERE® JD655, JD750, JD755

INTERNATIONAL HARVESTER® 175C, TD12

See Figure 5.3 for arrangement. The procedure for the disassembly of this gear arrangement is the same for all the tractors shown in the list. There are differences in the connection of the input shaft to the tractor PTO and the shape of the bearing carrier for the input shaft. These differences do not change the disassembly procedures for this PTO gear arrangement. Step-by-step disassembly procedures are not described for this PTO arrangement because the PTO is coupled directly to the pinion. See Figure 5.12 for the removal of the pinion.

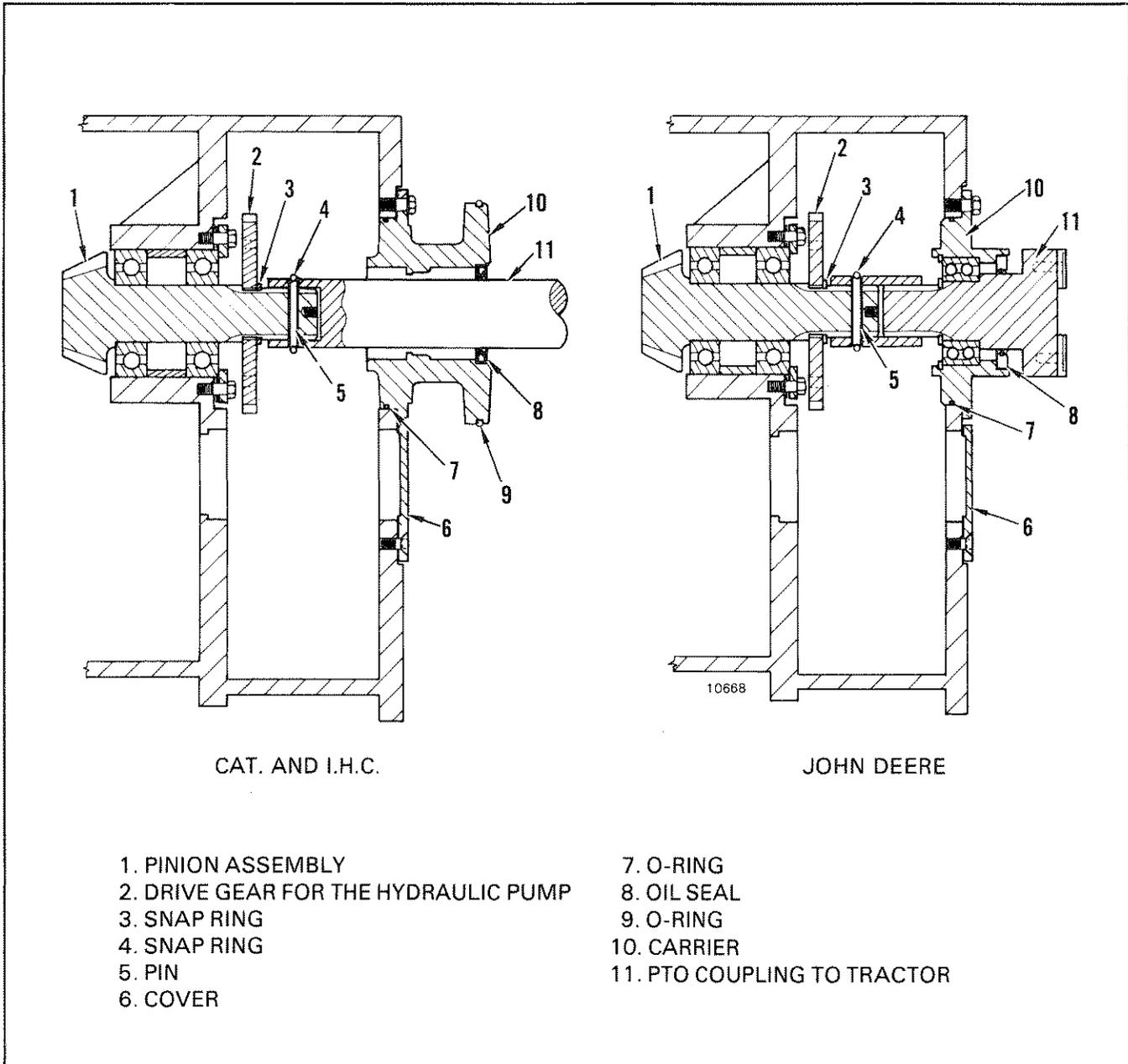


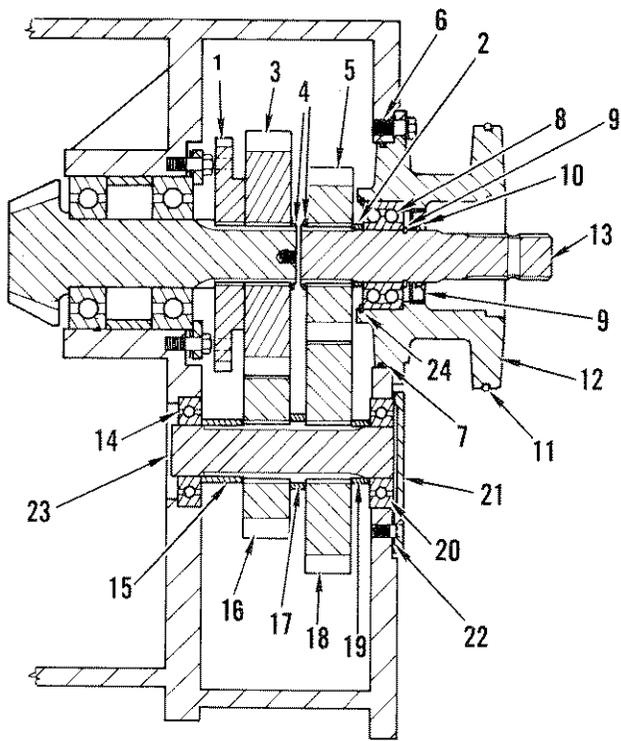
FIGURE 5.3 GEAR ARRANGEMENT FOR THE 32.27:1 GEAR RATIO

PTO GEAR ARRANGEMENT FOR THE 117:1 GEAR RATIO

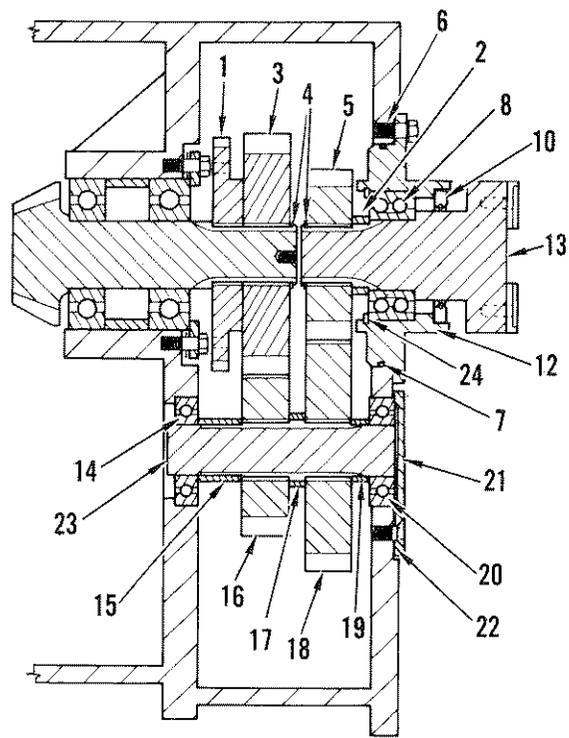
This gear arrangement is used on the following tractors:

CATERPILLAR® D5B
 JOHN DEERE® JD655, JD750, JD755
 INTERNATIONAL HARVESTER® 175C, TD12

The procedures for the disassembly of this PTO gear arrangement is the same for all the tractors shown in the list. There are differences in the connection of the input shaft to the tractor PTO and the shape of the bearing carrier for the input shaft. These differences do not change the disassembly procedure for this PTO gear arrangement.

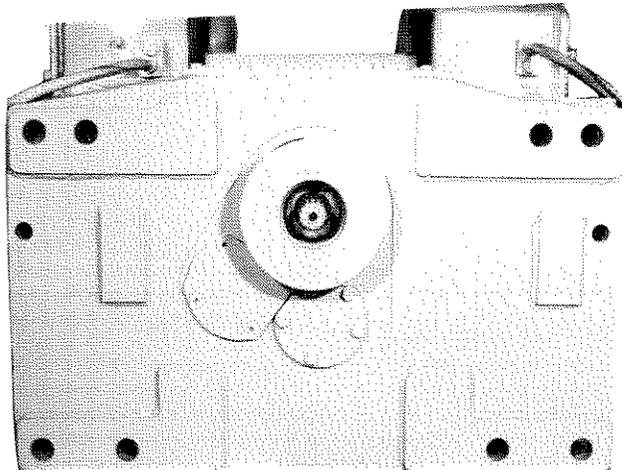


CAT. AND I.H.C.



JOHN DEERE

(Items 9 and 11 not on John Deere)



10647

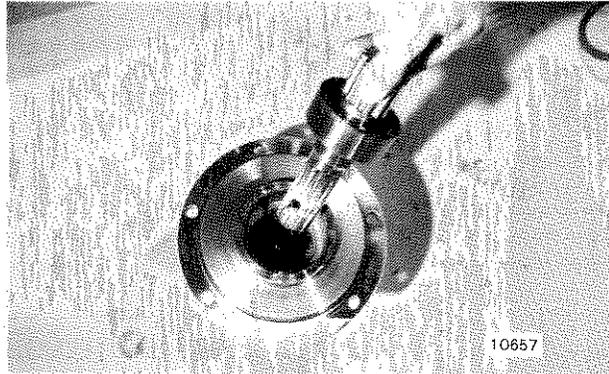
W5B WINCH FOR CAT AND I.H.C.

1. DRIVE GEAR FOR THE HYDRAULIC PUMP
2. SPACER
3. PINION GEAR
4. SNAP RING
5. DRIVE GEAR
6. GASKET
7. O-RING
8. BEARING
9. SNAP RING
10. OIL SEAL
11. O-RING
12. CARRIER
13. INPUT SHAFT OR YOKE
14. BEARING
15. SPACER
16. SECOND IDLER GEAR
17. SPACER
18. FIRST IDLER GEAR
19. SPACER
20. BEARING
21. COVER
22. GASKET
23. IDLER SHAFT
24. SNAP RING

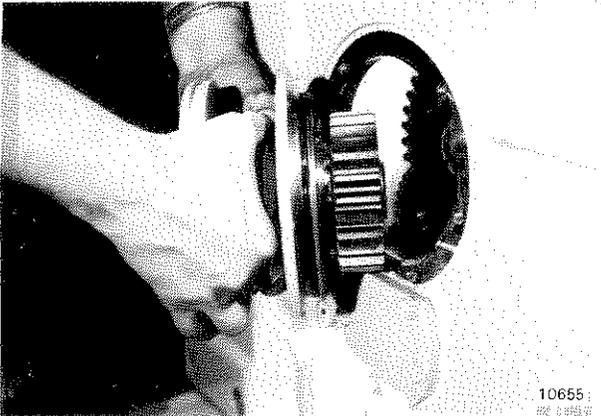
FIGURE 5.4. ARRANGEMENT OF THE PTO GEAR ASSEMBLY FOR THE WINCH WITH A 117:1 GEAR RATIO



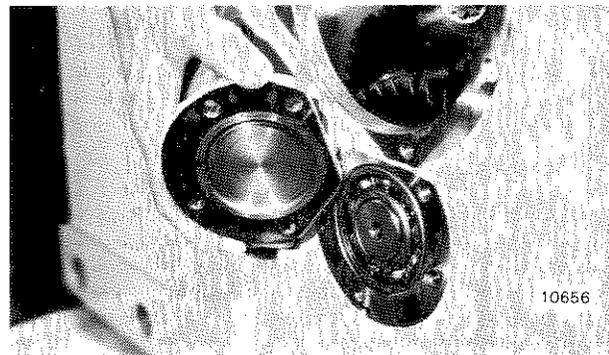
1. Remove the top access cover and gasket.



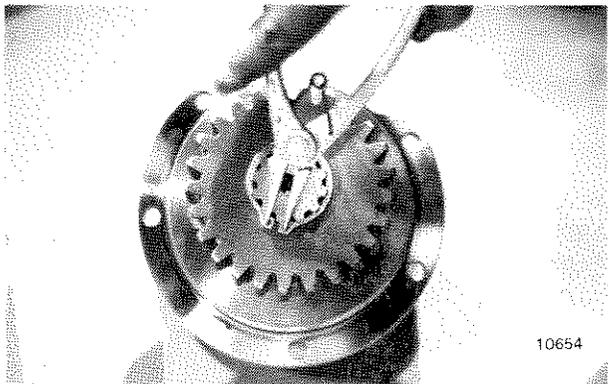
4. Remove the bearing and input shaft from the carrier. Use a driver to remove the oil seal.



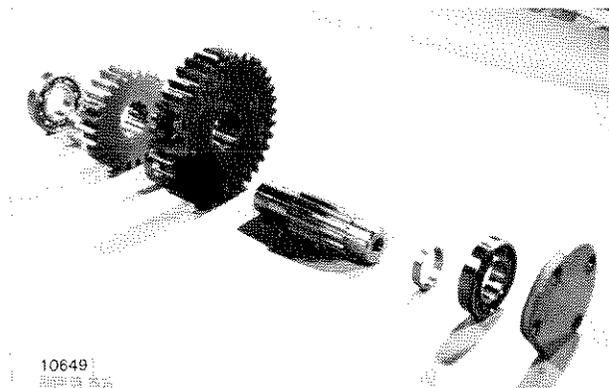
2. Remove the five capscrews and pull the carrier and input shaft assembly from the winch case.



5. Remove the cover for the idler shaft. The idler shaft has a 1/2-13 UNC threaded hole in the end so that you can connect a puller.

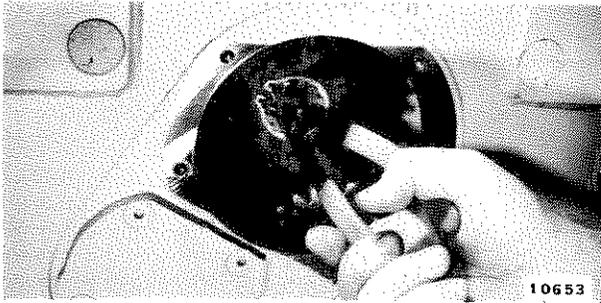


3. Remove the snap ring and pull the gear and spacer from the input shaft.



6. Use a puller to pull the idler shaft from the winch case. The bearings, spacers and gears will slide from the end of the idler shaft as it is pulled from the winch case. Use a puller to remove the bearings from the winch case.

FIGURE 5.5 DISASSEMBLY OF THE PTO GEAR ASSEMBLY WITH THE 117:1 GEAR RATIO
(Page 1 of 2)

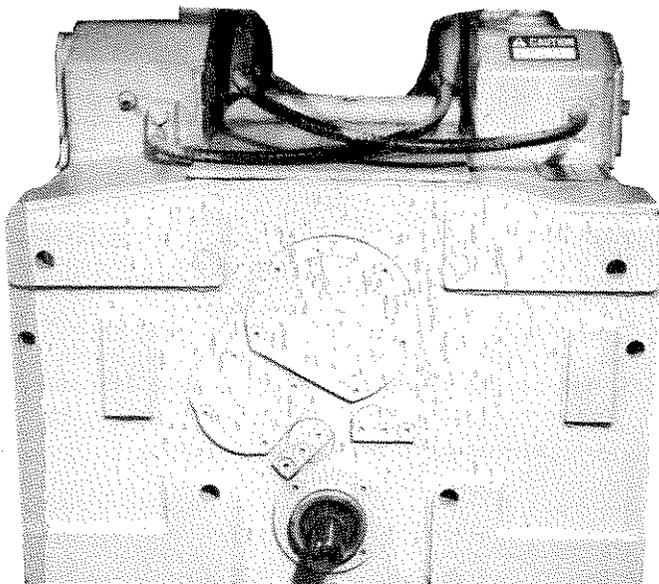


7. Remove the snap ring from the pinion. Slide the pinion gear, spacer, and drive gear for the hydraulic pump from the pinion shaft.

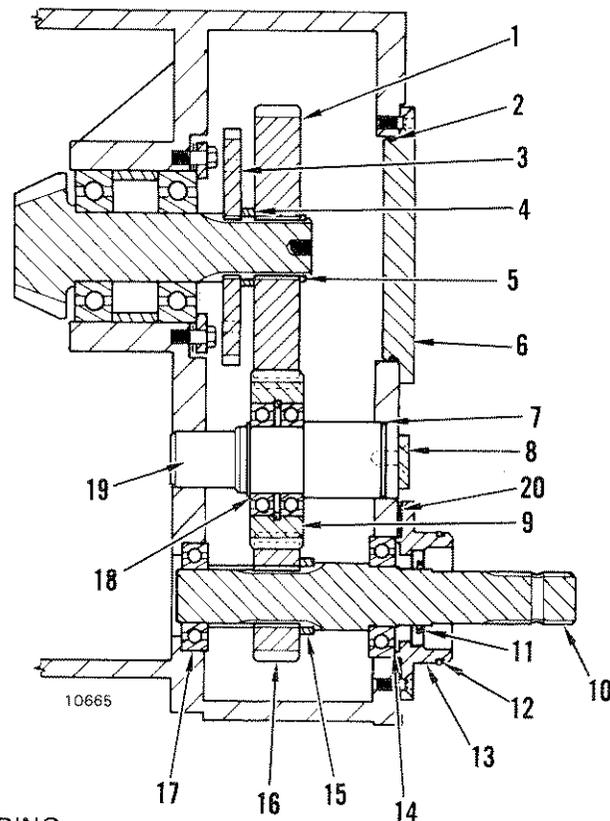
NOTE

Later production winches do not use a spacer between the pinion gear and the drive gear for the hydraulic pump.

FIGURE 5.5 DISASSEMBLY OF THE PTO GEAR ASSEMBLY WITH THE 117:1 GEAR RATIO
(Page 2 of 2)



W5B WINCH FOR FIATALLIS



- | | |
|---|-----------------|
| 1. PINION GEAR | 12. O-RING |
| 2. O-RING | 13. CARRIER |
| 3. DRIVE GEAR FOR
THE HYDRAULIC PUMP | 14. BEARING |
| 4. SPACER | 15. SPACER |
| 5. SNAP RING | 16. DRIVE GEAR |
| 6. COVER | 17. BEARING |
| 7. O-RING | 18. SNAP RING |
| 8. KEEPER | 19. IDLER SHAFT |
| 9. IDLER GEAR | 20. GASKET |
| 10. INPUT SHAFT | |
| 11. OIL SEAL | |

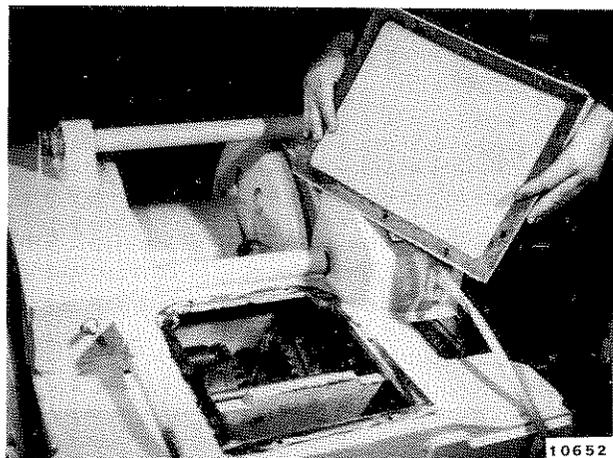
NOTE:
LATER PRODUCTION WINCHES
DO NOT USE A SPACER (4).

FIGURE 5.6 PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B, AND 10C

PTO GEAR ARRANGEMENT FOR FIATALLIS 8, FL9, 10B, AND 10C

There are two standard PTO gear ratios (41.31:1 and 69.92:1) used in this winch. The disassembly procedure is the same for both gear ratios. The PTO

enters the winch case at the bottom. The joint between the bearing carrier on the input shaft and the tractor has an O-ring seal. There is a gear train of three gears inside the winch case.



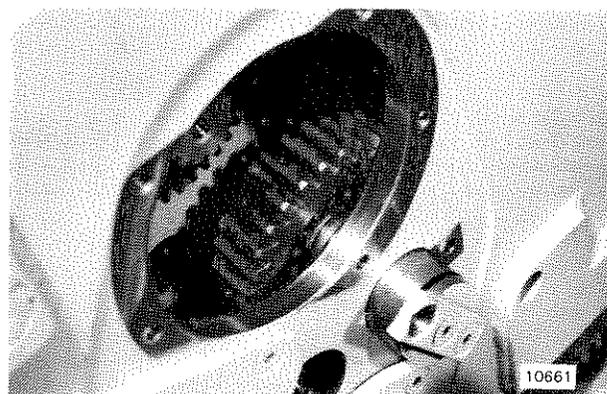
1. Remove the top access cover and gasket.



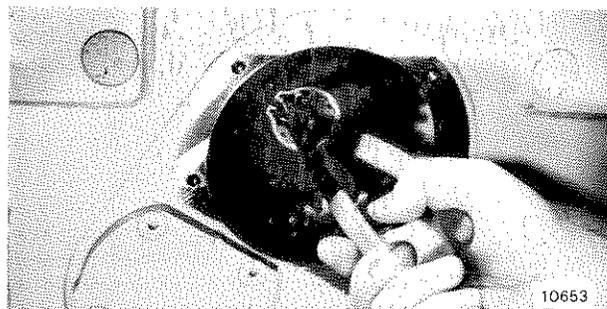
2. Remove the five socket head capscrews with an Allen wrench. Lightly hit the cover from inside of the case to remove the cover.



3. Remove the keeper and plug from the winch case.



4. Remove the socket head capscrew that holds the keeper of the idler shaft to the winch case. Pull the idler shaft out of the winch case until the idler gear is against the front of the winch case. This action gives enough clearance to remove the pinion gear and the drive gear for the hydraulic pump from the pinion shaft.

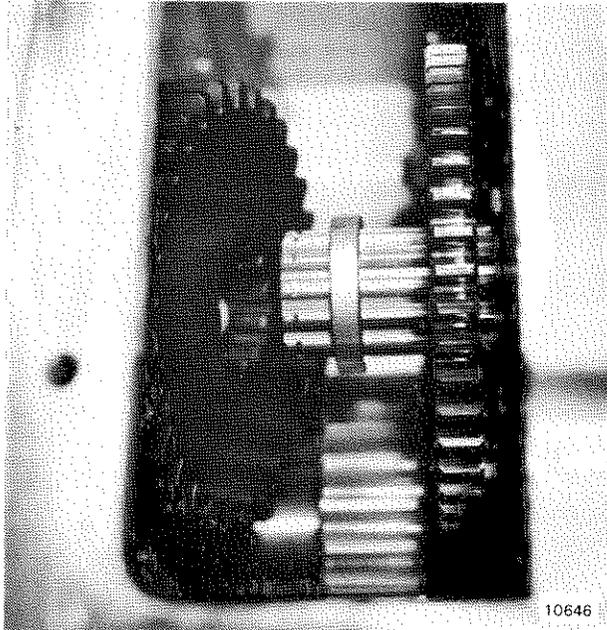


5. Remove the snap ring that holds the pinion gear to the pinion shaft.

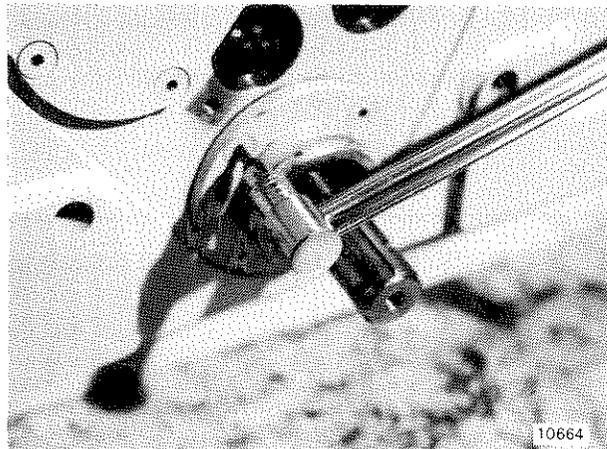
NOTE

Later production winches do not use a spacer between the pinion gear and the drive gear for the hydraulic pump.

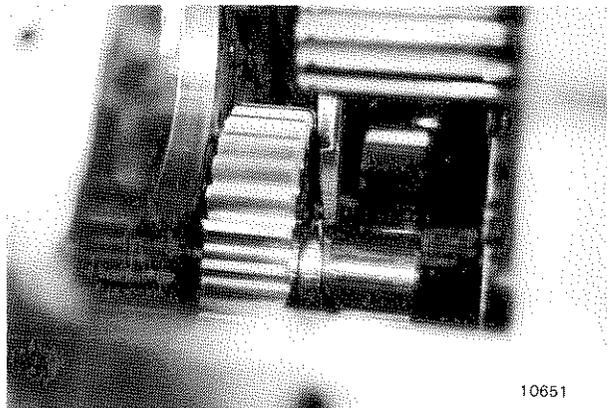
FIGURE 5.7 DISASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B, AND 10C (Page 1 of 3)



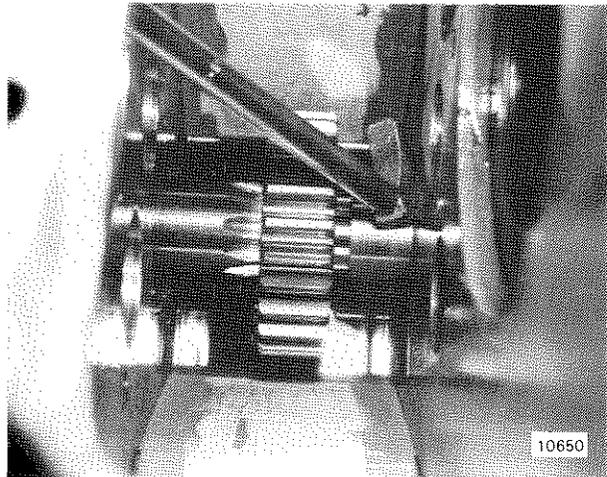
6. Pull the pinion gear and spacer through the access hole in the front of the winch. The pinion gear has two $3/8 - 16$ UNC holes for use with a puller. Remove the drive gear for the hydraulic pump.



8. Remove the four socket head capscrews from the carrier. Hit the side of the carrier with a hammer to loosen the carrier from the winch case.

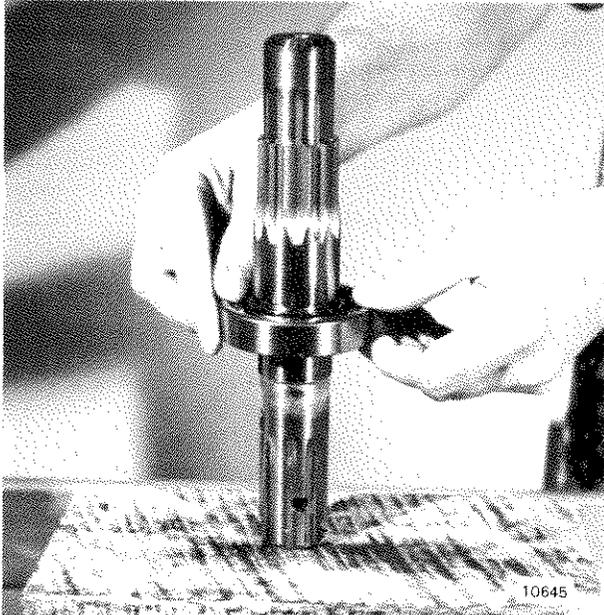


7. Remove the snap ring from the idler shaft. Pull the idler shaft out of the winch case. The idler gear and bearing will slide from the idler shaft. Remove the idler gear and bearing from inside of the winch case. The spacer that is between the bearing and the shoulder of the idler shaft, normally stays on the idler shaft.



9. Put a prybar behind the drive gear. Push the drive gear away from the rear of the case until the input shaft comes out of the rear bearing. Pull the input shaft out of the winch case. The drive gear and spacer will slide from the input shaft. Remove the drive gear and spacer from the winch case.

FIGURE 5.7 DISASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B, AND 10C (Page 2 of 3)

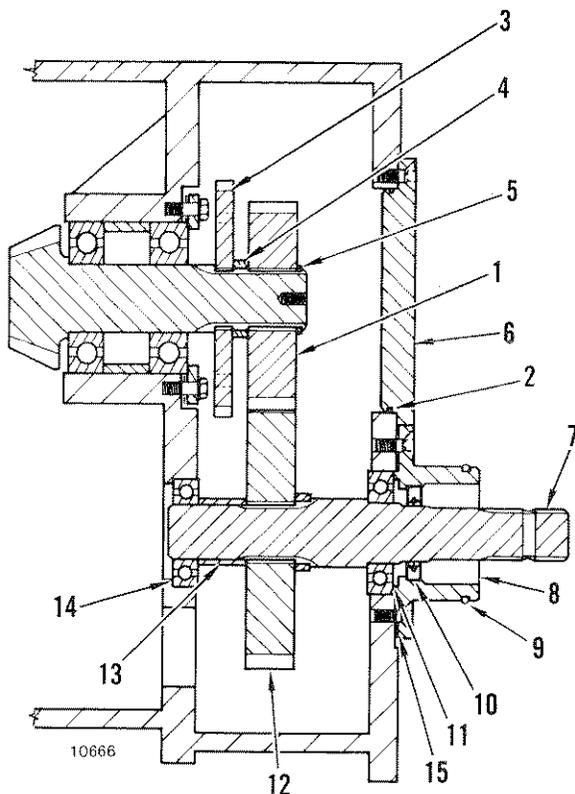


10. Hit the end of the input shaft on a block of wood to remove the bearing from the input shaft.



11. Use a puller to remove the rear bearing from the winch case.

FIGURE 5.7 DISASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B AND 10C (Page 3 of 3)



- 1. PINION GEAR
- 2. O-RING
- 3. DRIVE GEAR FOR THE HYDRAULIC PUMP
- 4. SPACER
- 5. SNAP RING
- 6. COVER
- 7. INPUT SHAFT
- 8. CARRIER
- 9. O-RING
- 10. OIL SEAL
- 11. BEARING
- 12. DRIVE GEAR
- 13. SPACER
- 14. BEARING
- 15. GASKET

NOTE: LATER PRODUCTION WINCHES DO NOT USE A SPACER (4).

FIGURE 5.8 PTO GEAR ASSEMBLY FOR THE CATERPILLAR® D4 WITH POWERSHIFT

CATERPILLAR® D4 WITH POWERSHIFT

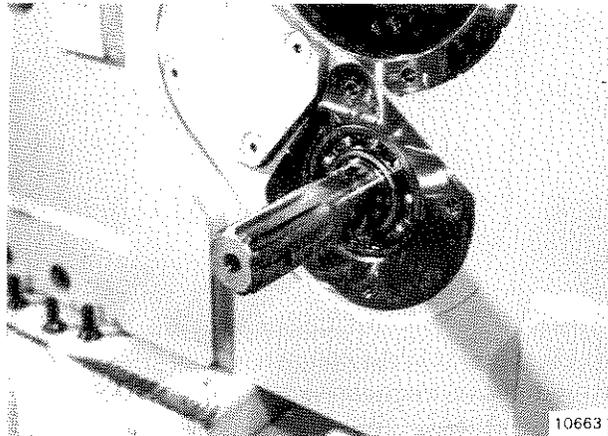
The PTO enters the winch case at the bottom. The joint between the bearing carrier for the input shaft and the tractor has an O-ring seal. There is a gear train

of two gears inside the winch case. Two gear ratios (25.82:1 and 40.33:1) are available by changing the arrangement of the gears on the two shafts. The disassembly of both gear ratios is the same.

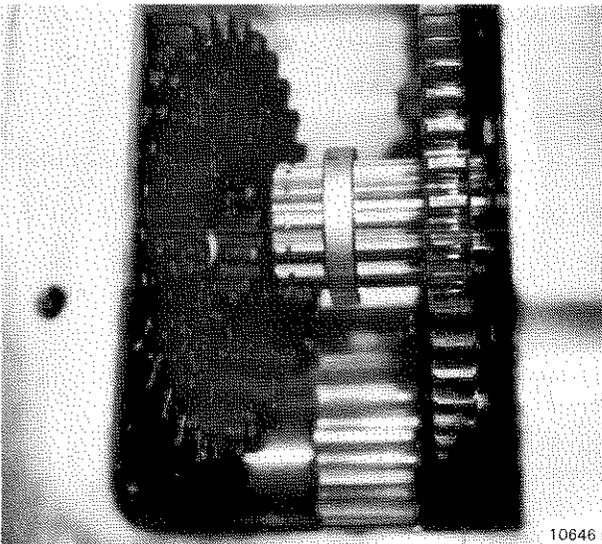


1. Remove the top access cover and gasket.

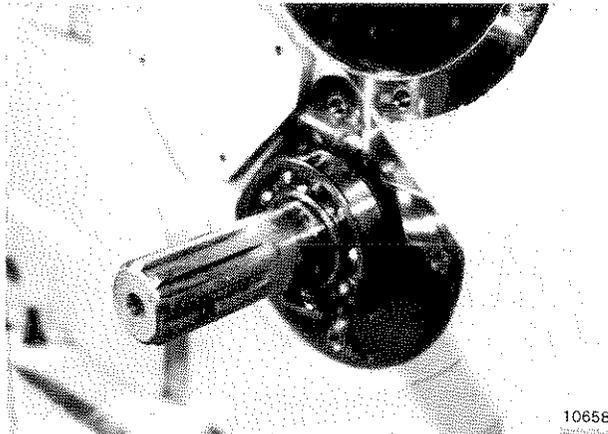
2. Remove the cover to the pinion. Remove the five socket head capscrews with an Allen wrench. Lightly hit the cover from inside the winch case to remove the cover.



4. Remove four socket head capscrews that hold the carrier to the winch case. Remove the carrier and gasket. Use a driver to remove the oil seal from the carrier.



3. Remove the snap ring from the end of the pinion shaft. Remove the pinion gear, spacer, and drive gear for the hydraulic pump.



5. Pull the input shaft forward and remove the front bearing. Reach inside the winch case and hold the drive gear while you pull the input shaft from the winch case. The spacer and drive gear will slide from the input shaft.

FIGURE 5.9 DISASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE CATERPILLAR® D4 WITH POWERSHIFT

KOMATSU® D41, D45 AND D53

The PTO gear arrangements for the models of the KOMATSU tractors are similar. This description for disassembly applies to all three models.

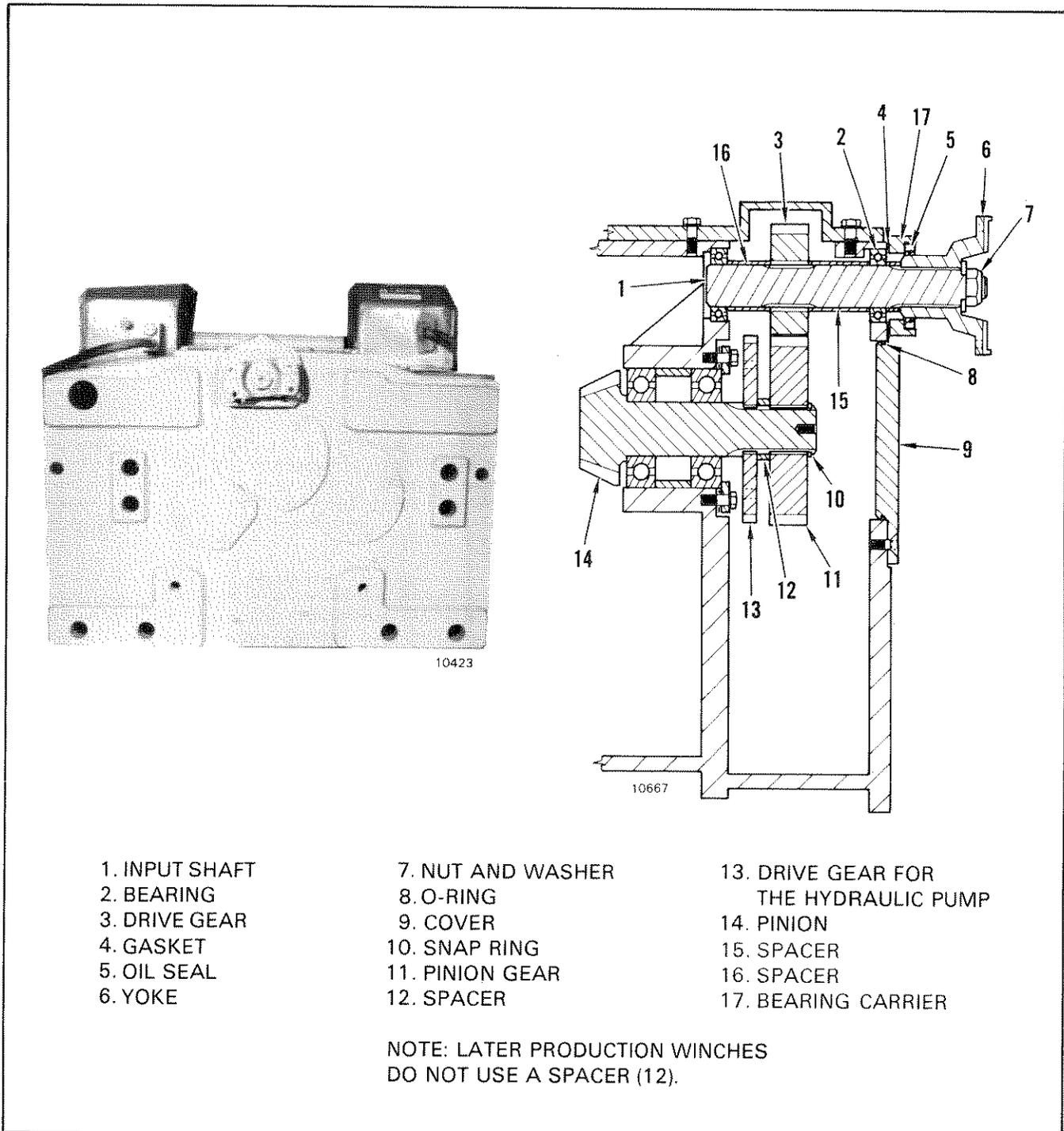
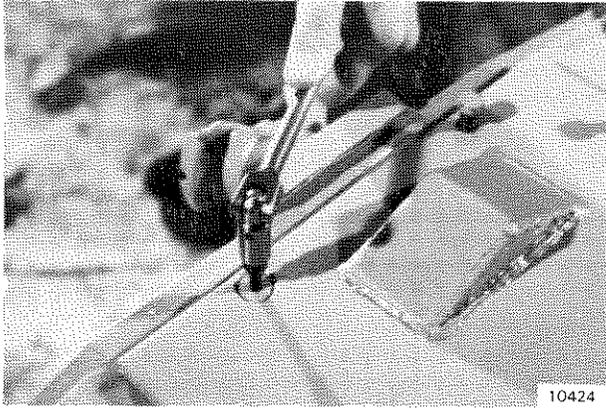
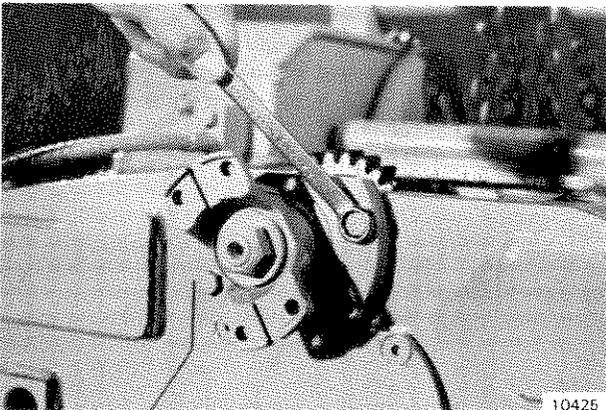


FIGURE 5.10 ARRANGEMENT OF THE PTO GEAR ASSEMBLY FOR THE KOMATSU D41, D45, AND D53



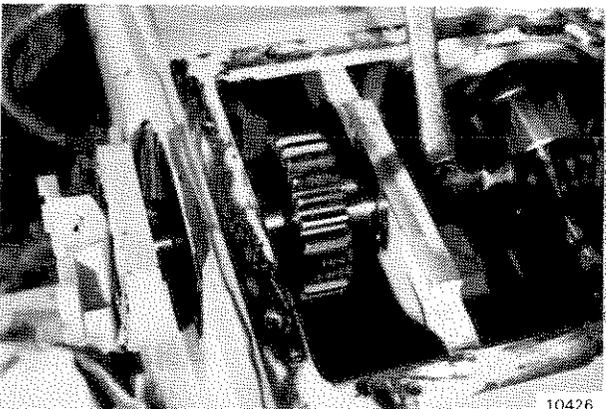
10424

1. Remove the top access cover. Make a note of the position of the one countersunk cap screw.



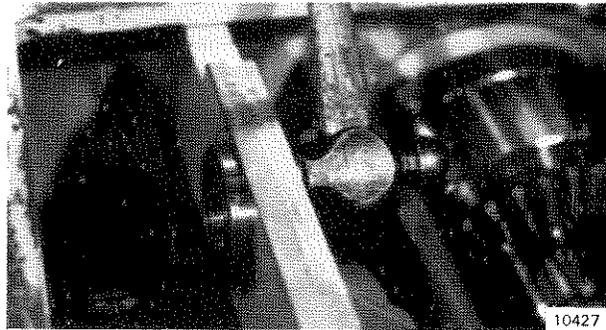
10425

2. Remove the four 3/8 UNC X 1-1/4 inch cap screws from the bearing carrier.



10426

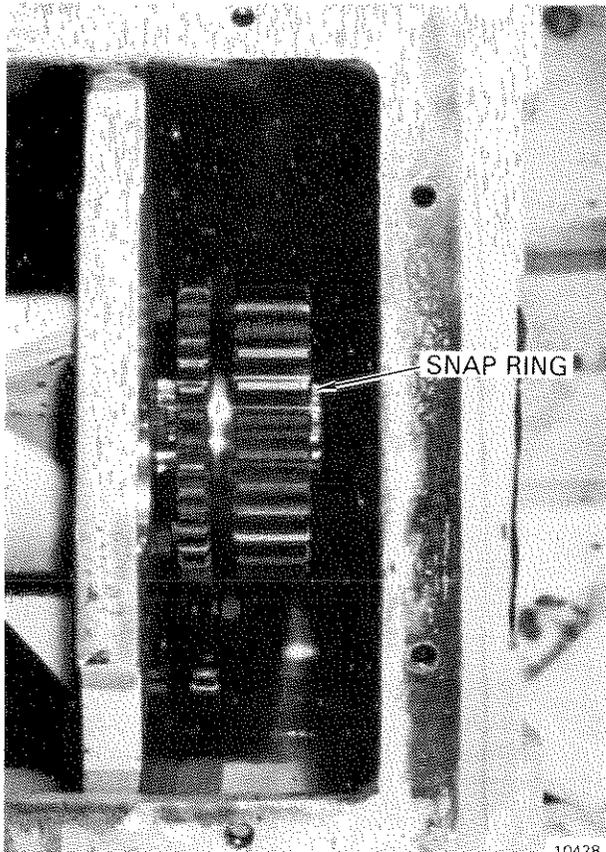
3. Use a hammer to remove the input shaft from the winch case. The bearings and the spacers will slide from the input shaft as it is pulled from the winch case.



10427

4. Use a hammer to remove the rear bearing for the input shaft from the winch case.

5. Remove the five cap screws from the front access cover. Lightly hit the cover from the inside of the winch case to remove the cover.

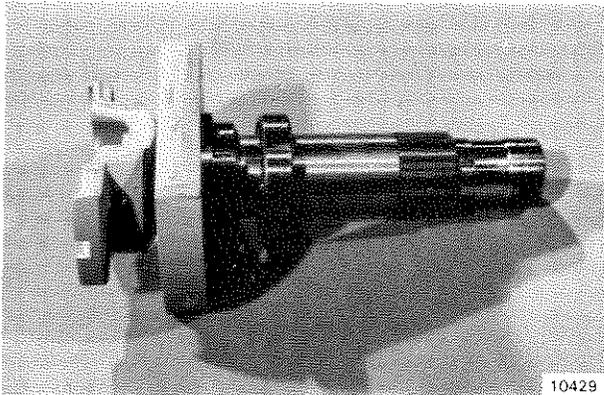


SNAP RING

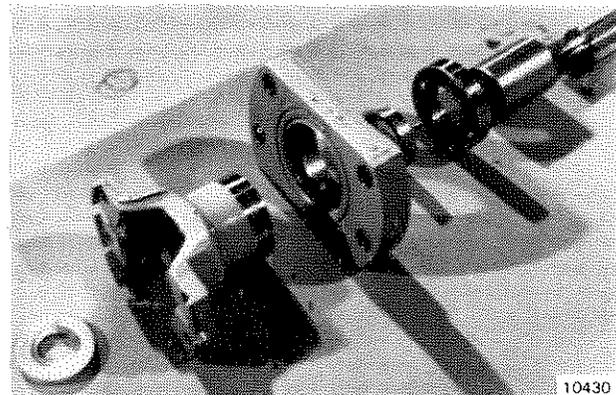
10428

6. Remove the snap ring from the end of the pinion shaft. Pull the pinion gear, spacer, and the drive gear for the hydraulic pump from the pinion shaft.

FIGURE 5.11 DISASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE KOMATSU® D41, D45, AND D53 (Page 1 of 2)



7. Put the yoke in a vise. Use a 1-1/8 in socket wrench to remove the nut and lock washer from the input shaft.



8. Remove the yoke, bearing carrier, small spacer, bearing, and large spacer from the input shaft.

FIGURE 5.11 DISASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE KOMATSU D41, D45 AND D53 (Page 2 of 2)

Removal Of The Pinion

This procedure is for all PTO arrangements for the winch. The PTO gear assembly in front of or engaged

with the pinion must be removed before the pinion is removed.

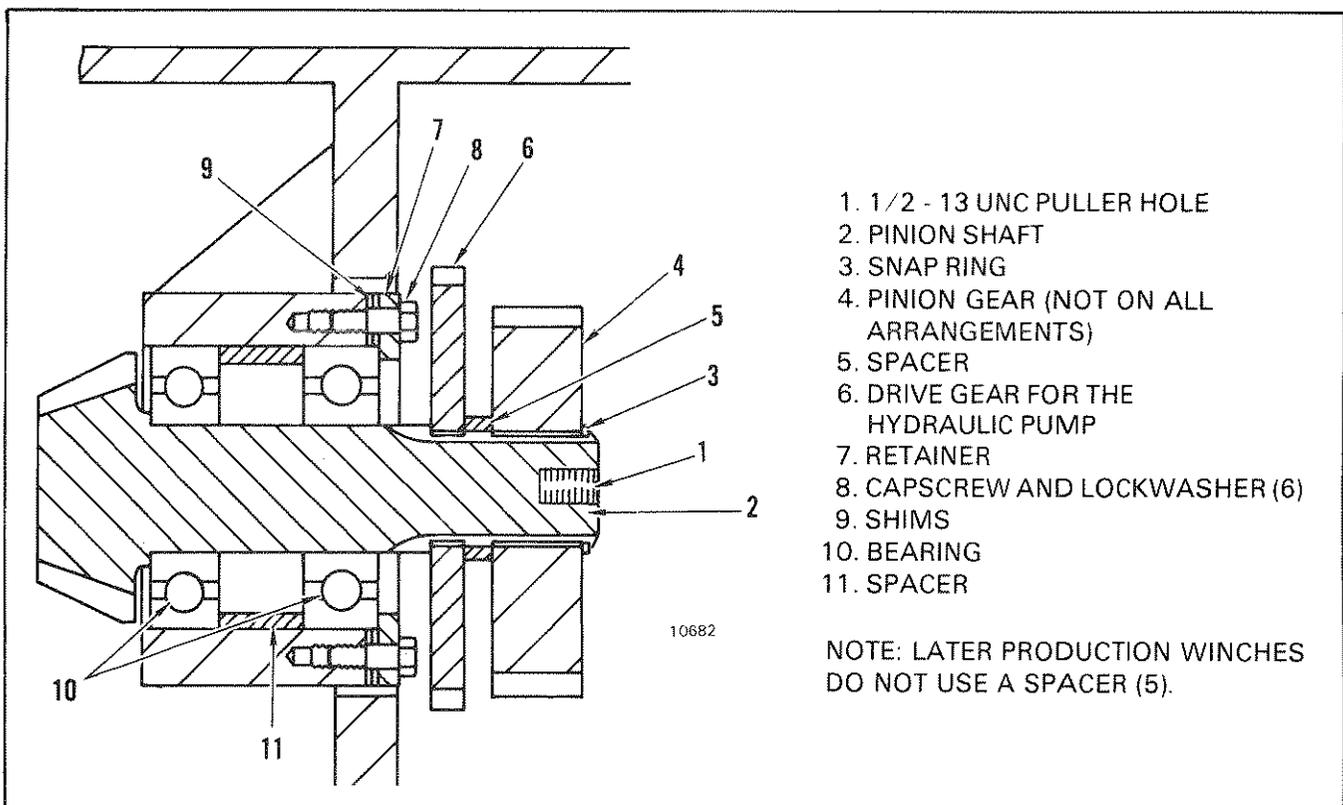
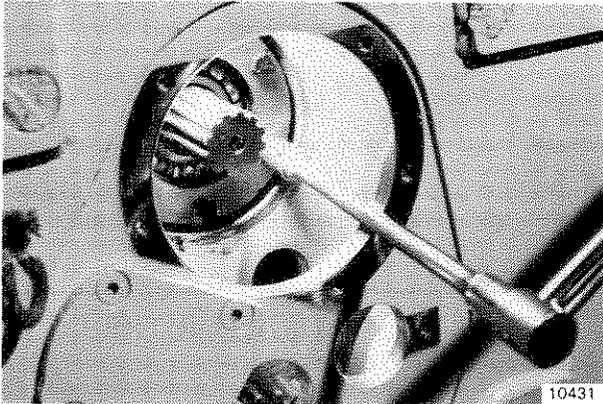
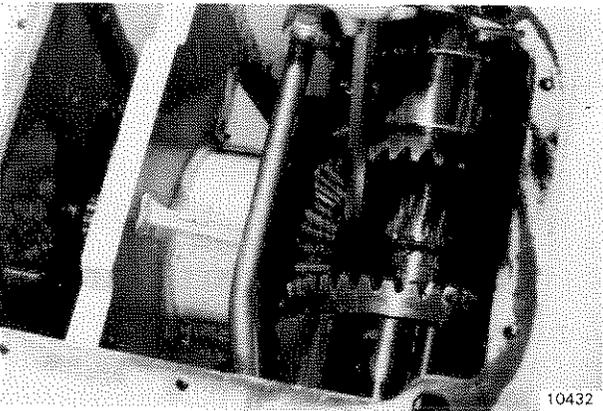


FIGURE 5.12 PINION ASSEMBLY

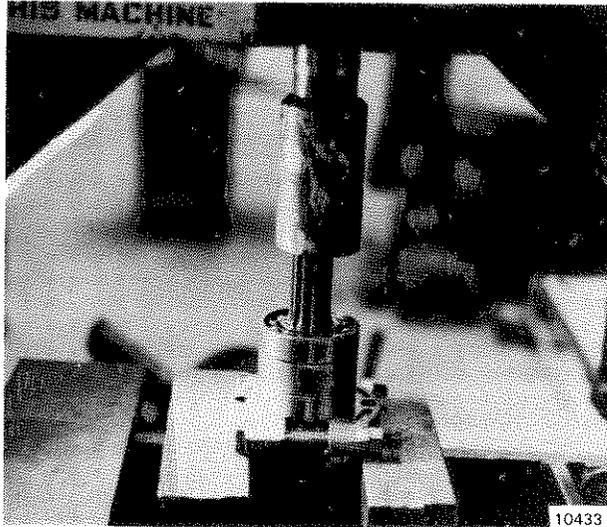
1. Remove the snap ring, pinion gear, spacer, and drive gear for the hydraulic pump from the pinion shaft. These parts are normally removed from the pinion shaft when the PTO gear arrangement is disassembled.



2. Remove the six capscrews from the retainer. Remove the retainer and shims from the pinion shaft. Make a note of the shim arrangement.



3. Put a prybar between the clutch carriers and the pinion to push the pinion out of the winch case. The pinion can also be removed by connecting a puller to the end of the pinion shaft. There is a 1/2 - 13 UNC hole for use with a puller. The two bearings and the spacer will stay on the pinion shaft.

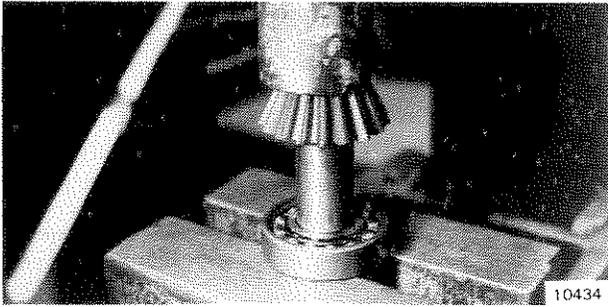


4. Put a tool for pulling bearings between the bevel gear and the bearing. Use a press to push the pinion out of the two bearings and the spacer.

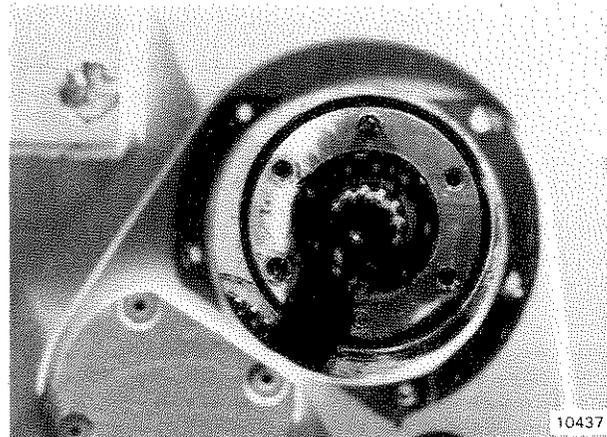
NOTE

Later production winches do not use a spacer between the pinion gear and the drive gear for the hydraulic pump.

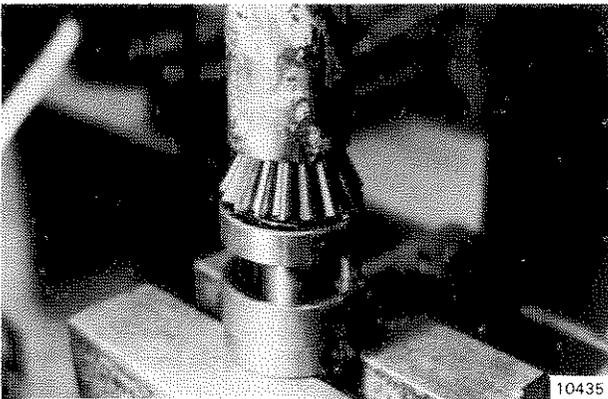
FIGURE 5.13 REMOVAL OF THE PINION



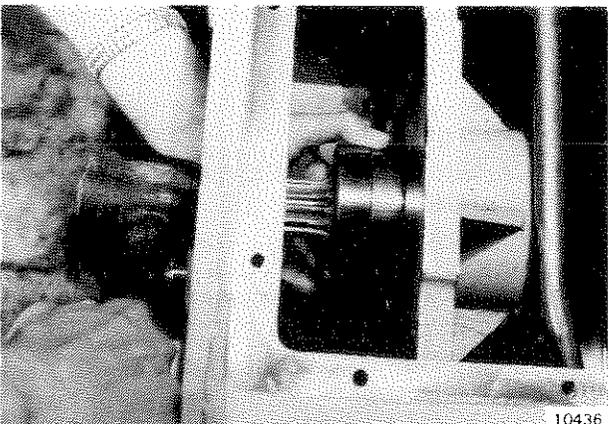
1. Use a press to install the first bearing on the pinion shaft. Make sure the bearing fits against the shoulder of the bevel gear.



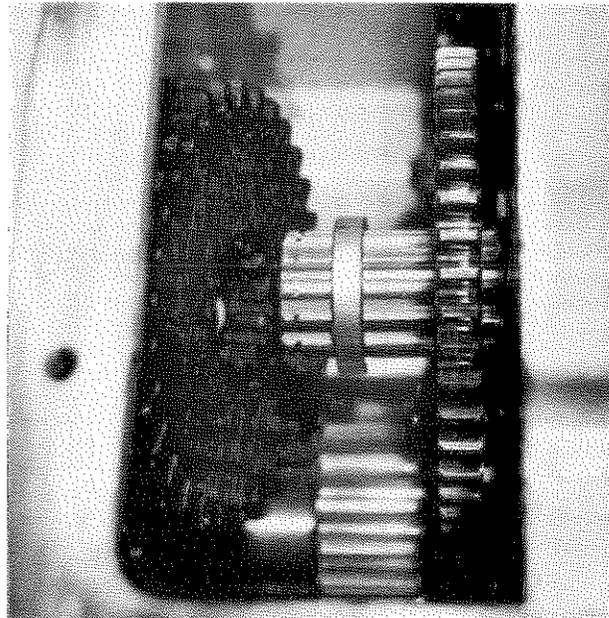
4. Install the shims and the retainer. Tighten the six capscrews evenly to move the pinion the remaining 3 mm (1/8 in) into the winch case. Tighten the capscrews to 50 N.m (35 lbf ft). Measure the gear clearance between the bevel gear of the pinion and the ring gears. The correct clearance is 0.15 - 0.30 mm (0.006 - 0.012 in). Add or subtract shims as necessary. The bearing clearance permits a small amount of movement of the pinion. When the gear clearance is measured, use a prybar to push the pinion towards the front of the winch so that the measurement is more correct.



2. Put the spacer on the pinion and use a press to install the second bearing. The bearings and the spacer will fit tightly together.



3. Lubricate the bore for the pinion in the winch case. Use a brass hammer or a brass driver to push the pinion into the winch case. Do not push the pinion the last 3mm (1/8 in) of movement into the winch case.



5. Install the drive gear for the hydraulic pump on the pinion shaft. Install the spacer, pinion gear, and snap ring.

FIGURE 5.14 INSTALLATION OF THE PINION

The Brake And Clutch Shaft

This section describes the removal and installation of the clutches, brake, and shaft. The repair of the clutches and the brake is described in a separate section.

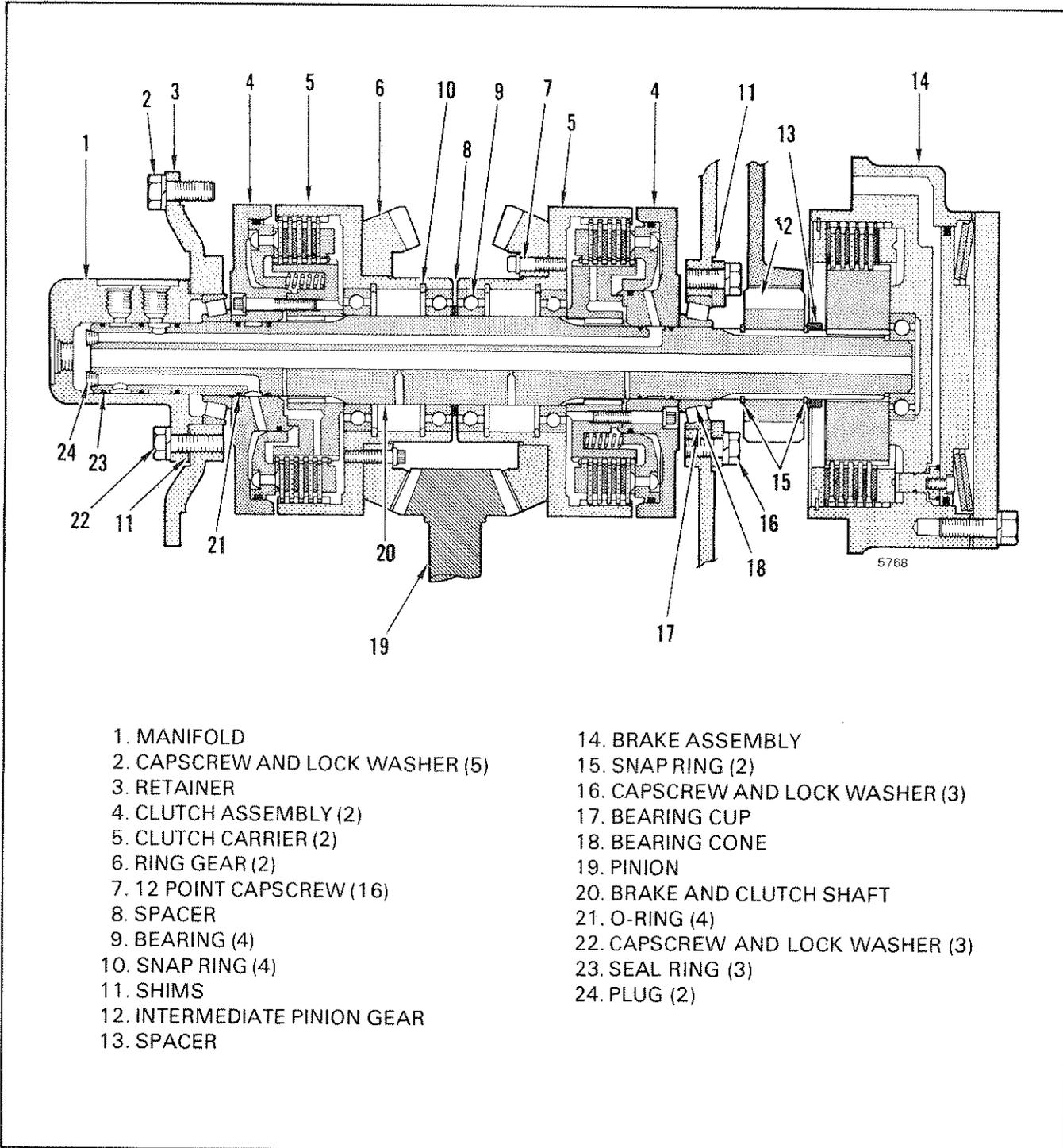
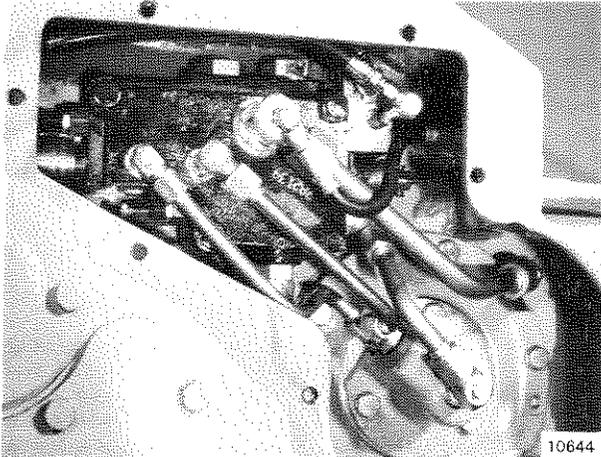
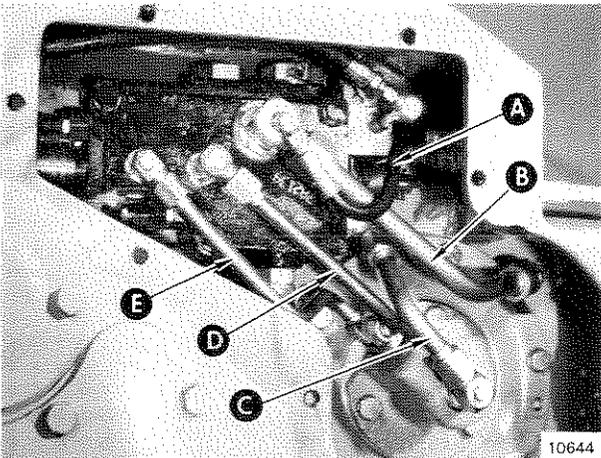


FIGURE 5.15 ARRANGEMENT OF COMPONENTS, BRAKE AND CLUTCH SHAFT



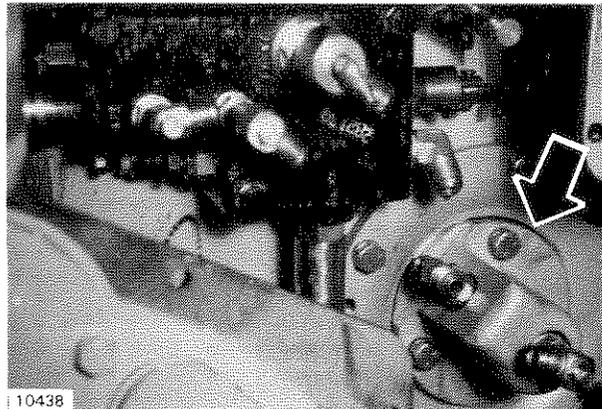
1. Drain the oil from the winch case and remove the access covers to the hydraulic system.

2. Make sure the accumulators are discharged. Move the hand lever to the BRAKE OFF position three times to discharge the accumulators. If the hand lever is not connected, put a screwdriver under the control pin of the accumulator valve. Lift the control pin until the accumulators are discharged.

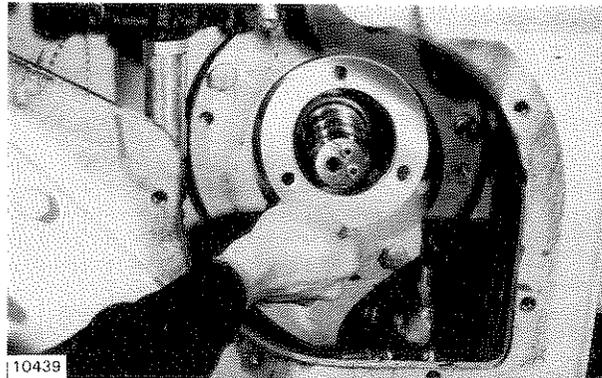


3. Disconnect the hoses and the tubes in the following sequence:

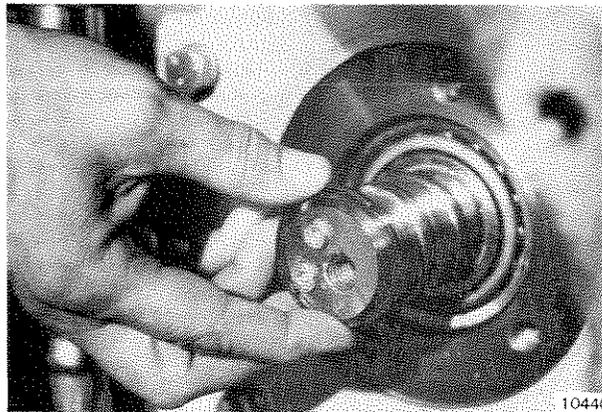
- A** Hose to the pressure gauge.
- B** Tube to the brake.
- C** Tube to the clutch cooling oil.
- D** Tube for the forward clutch pressure.
- E** Tube for the reverse clutch pressure.



4. Remove the capscrews for the manifold. Pull the manifold straight from the clutch and brake shaft.

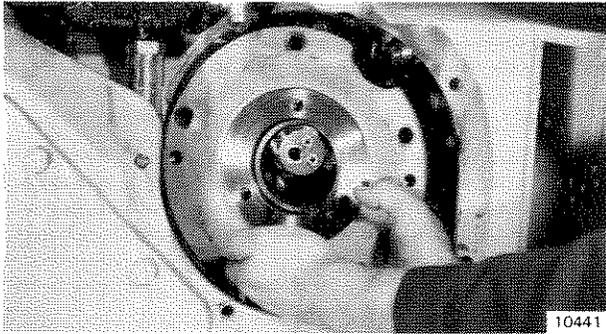


5. Remove the shims. Keep the shims together. The shims will be installed in the same arrangement.

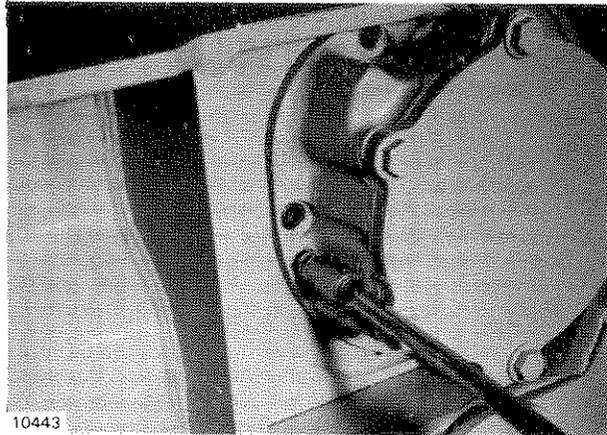


6. Remove the three seal rings from the end of the shaft. Be careful to not break the hooks from the ends of the seal rings. Protect the seal rings from damage.

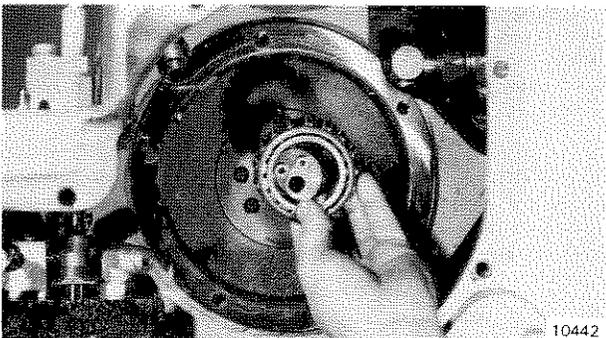
FIGURE 5.16 REMOVAL OF THE BRAKE, CLUTCHES AND SHAFT (Page 1 of 3)



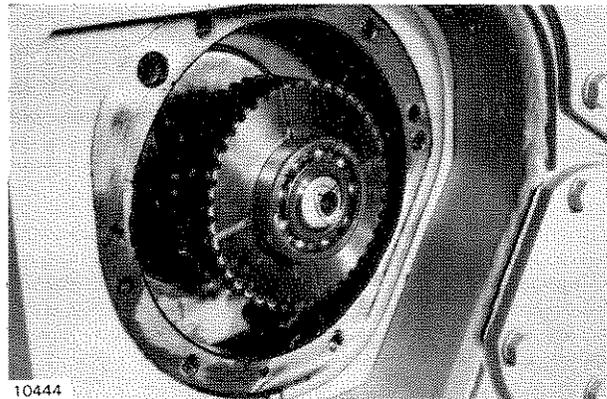
7. Remove the five capscrews that hold the retainer to the winch case. Install two of the capscrews into the threaded holes in the retainer. Turn the capscrews evenly until the retainer is loose from the winch case. Remove the retainer.



10. Remove the 12 point capscrews that hold the brake to the winch case. Install two of the capscrews into the threaded holes of the brake housing. Turn the two capscrews evenly to pull the brake from the shaft. Pull the brake from the end of the shaft.



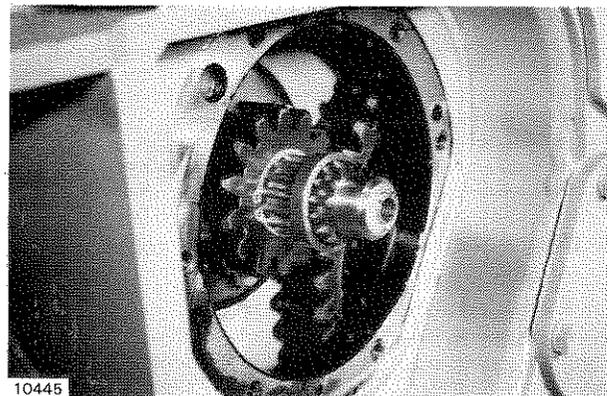
8. Remove the bearing cone from the shaft.



11. Remove the bearing and gear from the shaft.

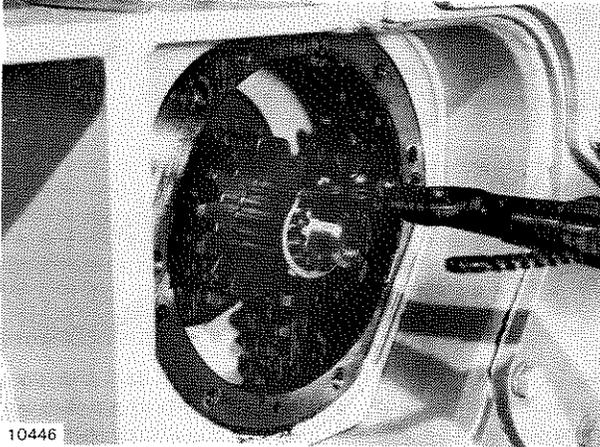


9. Remove the top access cover. Put a prybar between the two clutches. Push the clutch along the shaft towards the open side of the winch case. Remove the clutch and clutch carrier from the winch case.

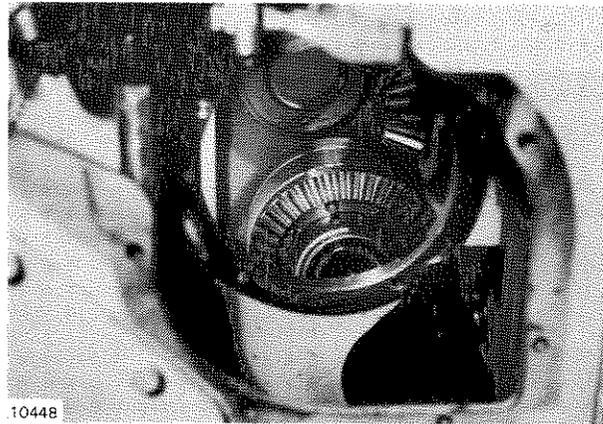


12. Remove the spacer from the shaft.

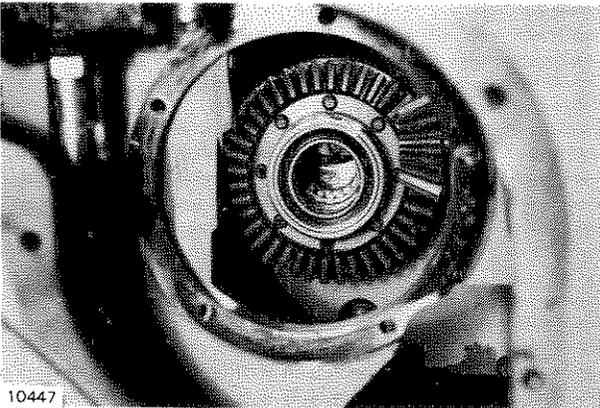
FIGURE 5.16 REMOVAL OF THE BRAKE, CLUTCHES AND SHAFT (Page 2 of 3)



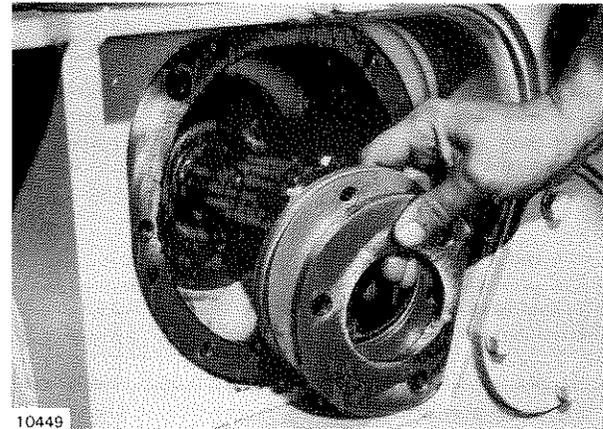
- 13.** Remove the snap ring. Pull the intermediate pinion gear from the shaft. Remove the snap ring between the pinion gear and the bearing.



- 15.** Move the clutch and clutch carrier that is under the pinion (if the pinion is still installed) to the hydraulics side of the winch case. Remove the clutch and clutch carrier. Remove the bearing cone.

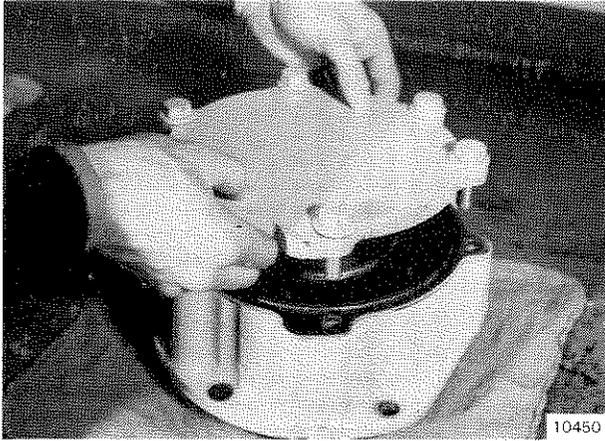


- 14.** Use a driver and hit the brake end of the shaft to remove it from the winch case. Remove the shaft from the hydraulic side of the winch case. Do not permit the clutch to fall to the bottom of the winch case.



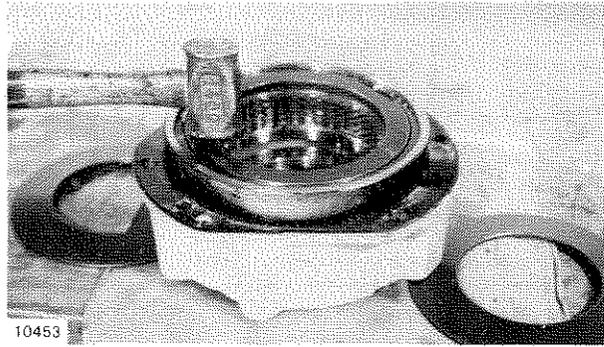
- 16.** If the bearing cup for the brake end of the shaft must be replaced, remove the retainer and shims. Remove the bearing cup.

FIGURE 5.16 REMOVAL OF THE BRAKE, CLUTCHES AND SHAFT (Page 3 of 3)



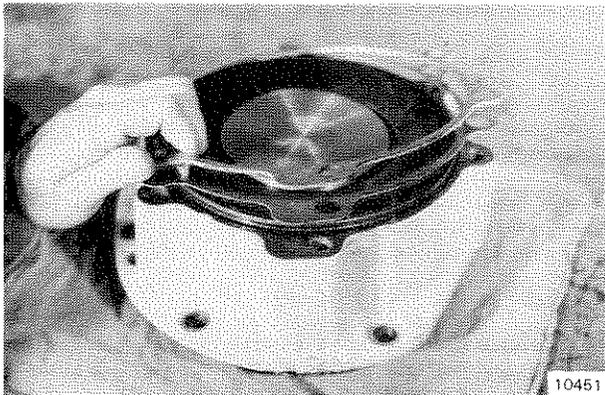
10450

1. See Figure 5.16 for instructions for removal of the brake. Loosen the cap screws for the cover evenly until the spring tension is released.



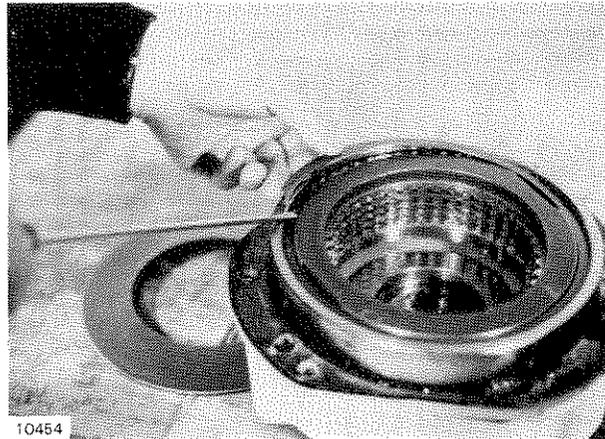
10453

4. Turn the brake housing over and put the two Belleville springs under the housing as shown. Hit the brake with a brass hammer until the brake piston is pushed out of the housing and hits the work surface.



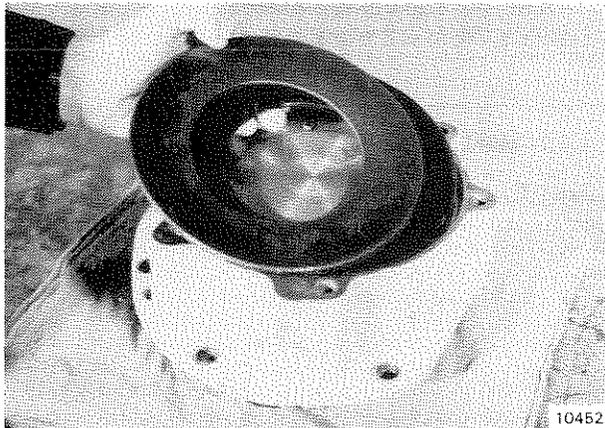
10451

2. Make a note of the shim arrangement and remove the shims.



10454

5. Remove the double spiral snap ring.



10452

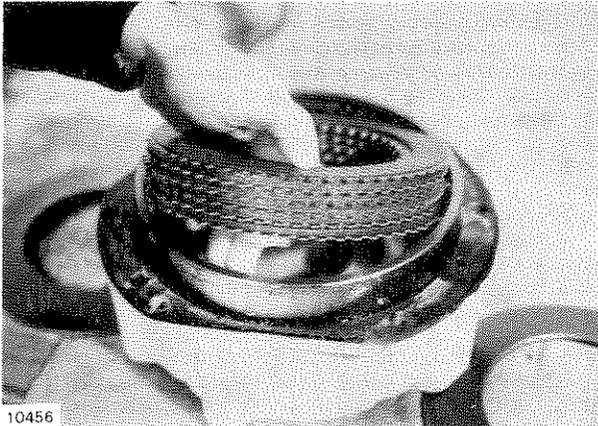
3. Remove the two Belleville springs.



10455

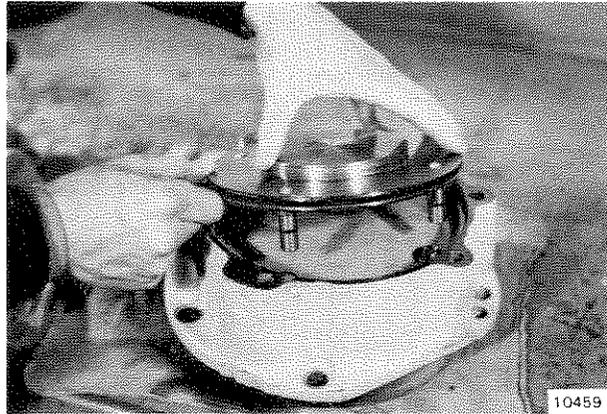
6. Remove the reaction ring.

FIGURE 5.17 DISASSEMBLY OF THE BRAKE (Page 1 of 3)



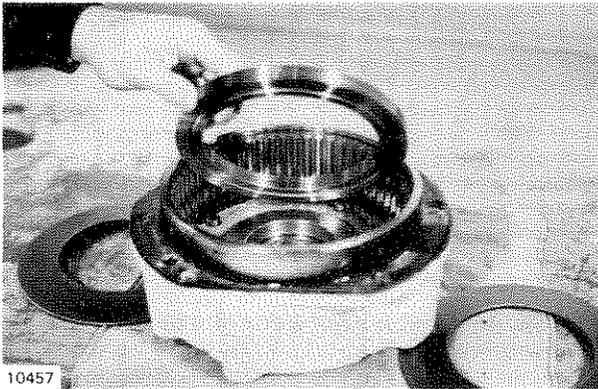
10456

7. Remove the pressure plates and separators. Check the pressure plates and separators as described in Table 5.1. Replace the pressure plates and separators if they are worn.



10459

10. Lift the piston out of the housing. Remove the circumference seal.



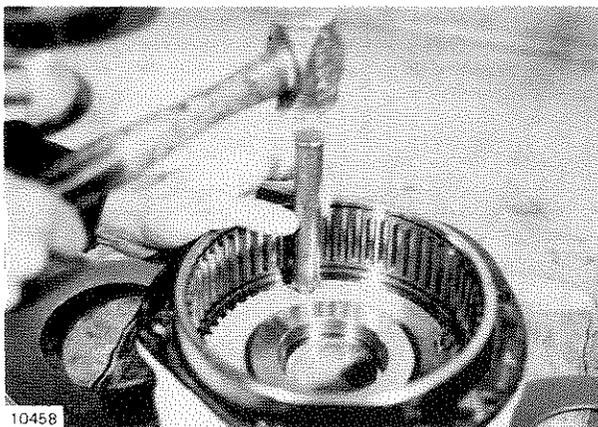
10457

8. Remove the thrust ring.



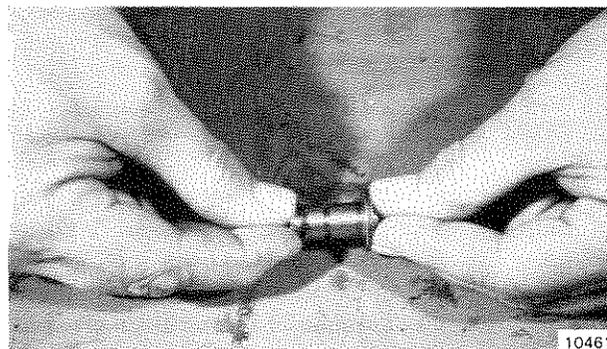
10460

11. There is a screwdriver slot in one end of the plungers. Use an Allen wrench to remove the cap screw from each plunger. Use a screwdriver to keep the plunger from turning. Remove and discard the large circumference seal. Clean the threads of the plungers.



10458

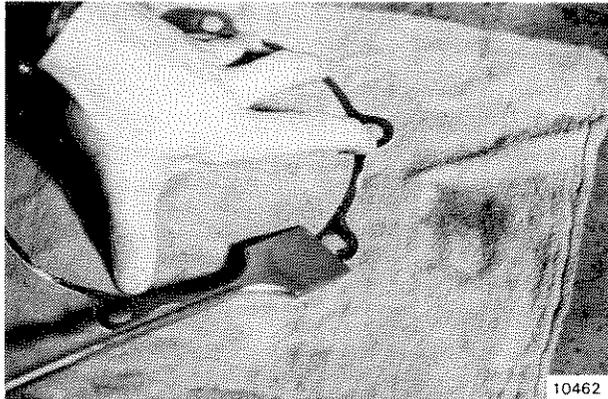
9. Use a driver to remove the four plungers from the housing.



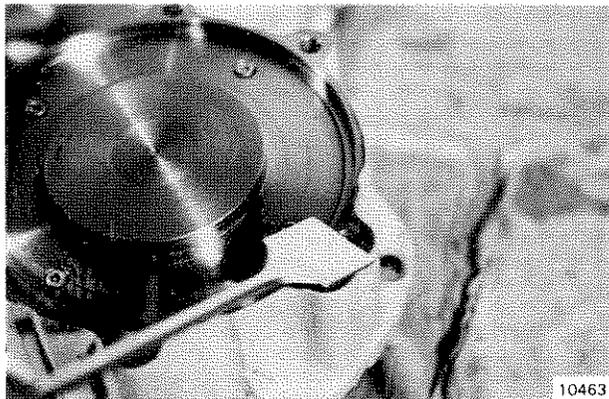
10461

12. Remove the two O-rings on each plunger. Make sure the plungers are not worn.

FIGURE 5.17 DISASSEMBLY OF THE BRAKE (Page 2 of 3)

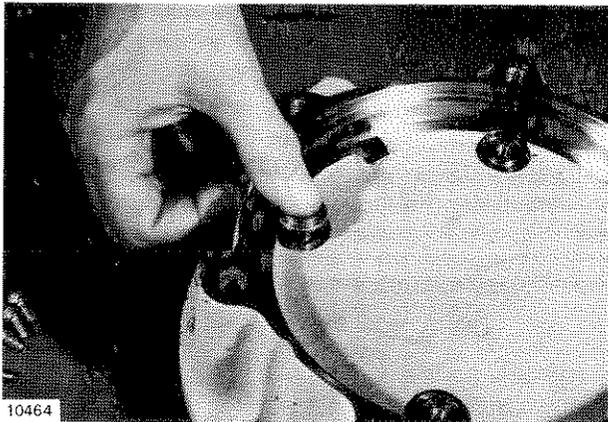


13. Clean the brake shims. Do not damage the surfaces.

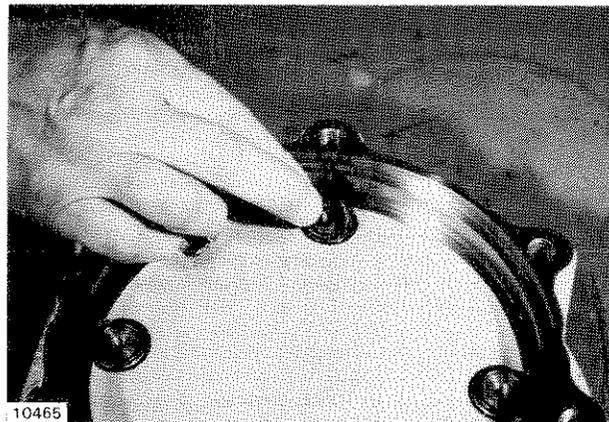


14. Clean the joint surfaces of the brake housing. Make sure the surfaces do not have damage or there will be oil leaks.

FIGURE 5.17 DISASSEMBLY OF THE BRAKE (Page 3 of 3)

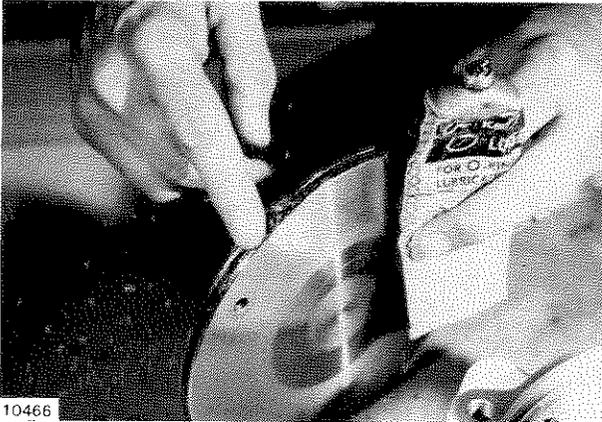


1. Install new O-rings in the shank of each plunger. Lubricate the plungers with O-ring lubricant or hydraulic oil and push the plungers into the bores of the housing. Make sure the O-rings are not damaged or the brake oil pressure will be low and the brake will not operate correctly.



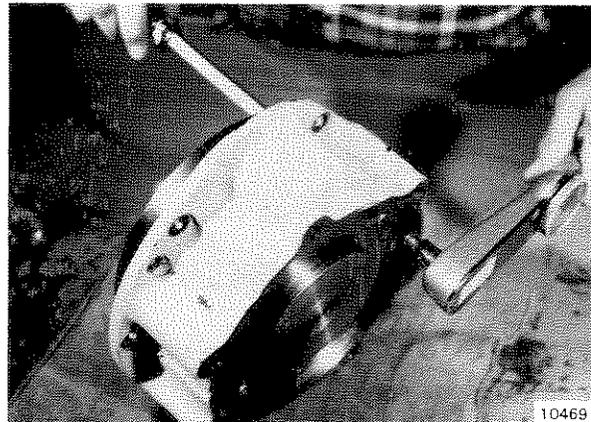
2. Install a new O-ring in each head of the four plungers.

FIGURE 5.18 ASSEMBLY OF THE BRAKE (Page 1 of 4)



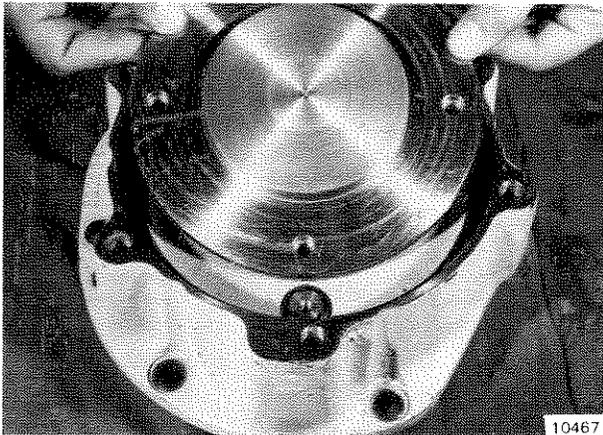
10466

3. Install a new circumference seal in the piston. Use O-ring lubricant or hydraulic oil on the seal.



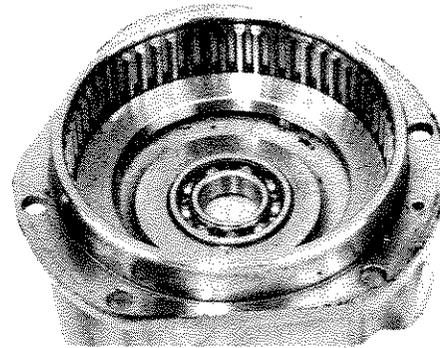
10469

6. Tighten the capscrews in the plungers to 3 N.m (25 lbf in).



10467

4. Align the holes in the piston with the plungers. Install the piston in the housing.

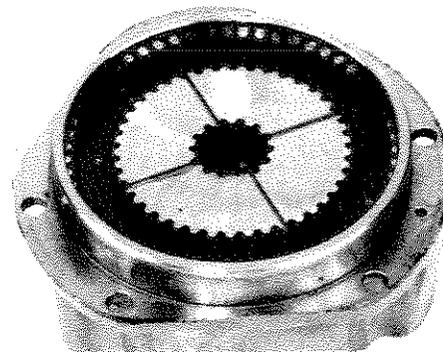


7. Install the bearing in the housing. Install the thrust ring. The side of the thrust ring with a groove goes against the plungers.



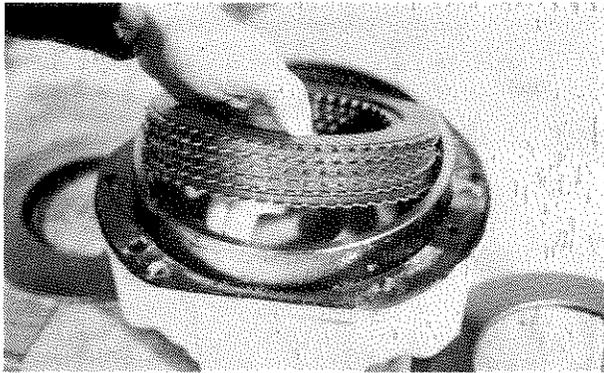
10468

5. Apply LOCKTITE number 271 to the capscrews that hold the plungers to the piston.

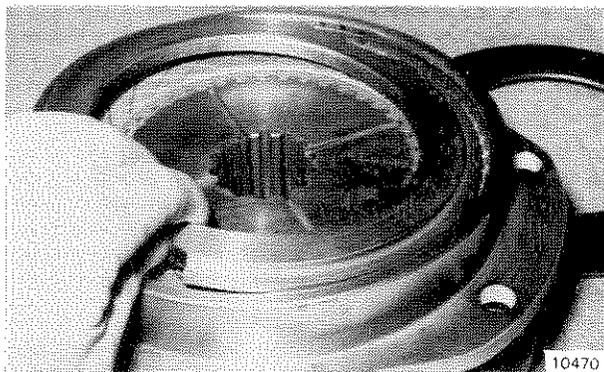


8. Install the brake hub. Align the hub with the bearing. The hub is used to align the friction discs and separator plates as they are installed in the housing.

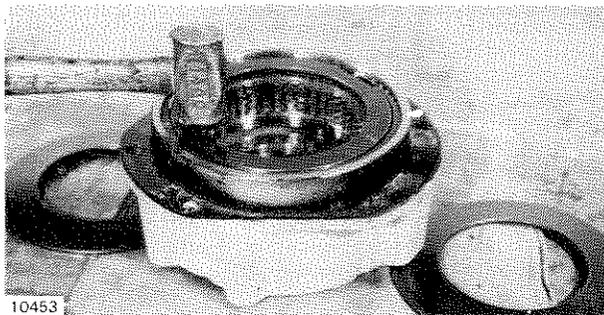
FIGURE 5.18 ASSEMBLY OF THE BRAKE (Page 2 of 4)



9. Install a friction disc on the thrust ring. Next, install a separator plate. Install the remainder of the friction discs and separator plates in the same sequence. There are missing teeth in the outer circumference of the friction discs. Make sure these spaces on the friction discs are aligned.



10. Install the flat side of the reaction ring against the last friction disc. Align the two slots in the circumference of the pressure ring with the missing teeth in the friction discs.

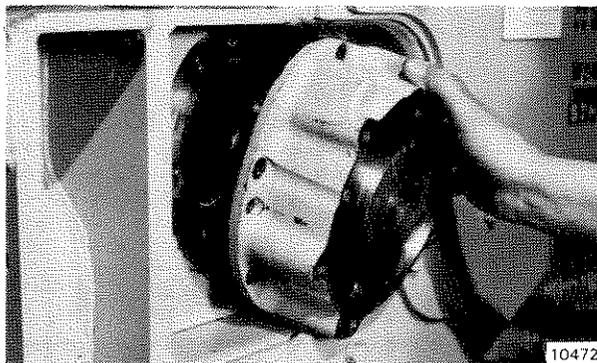


11. Put the two Belleville springs under the housing as shown. Hit the reaction ring with a brass hammer until the reaction ring is below the snap ring groove in the housing.

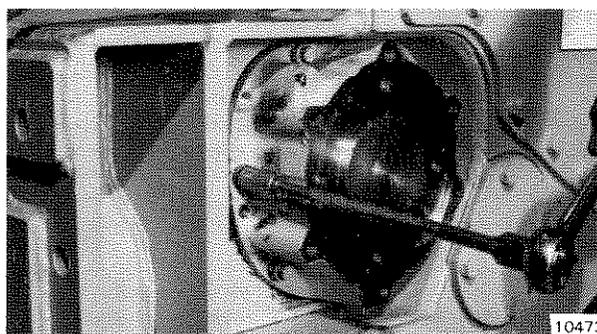


12. Install the double spiral snap ring. Make sure the snap ring is completely installed in the groove.

Apply a thin layer of liquid sealer to the gasket surface of the housing. Make sure you do not get liquid sealer in the oil leakage passages or the oil pressure passages. Apply a thin layer of liquid sealer to the gasket where it joins the winch case.

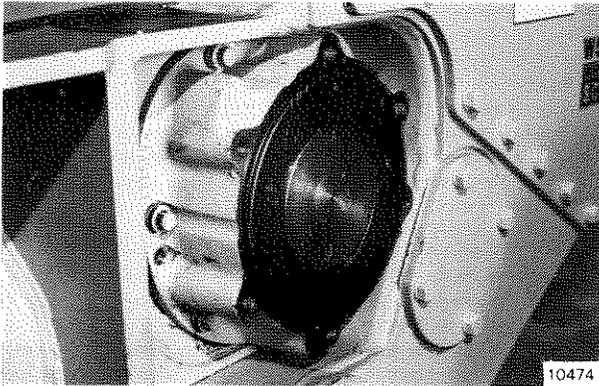


13. Put the brake into position on the winch case. Align the splines of the brake hub with the shaft and push the brake onto the shaft. Lift and rotate the brake so that the shaft will go into the bearing.

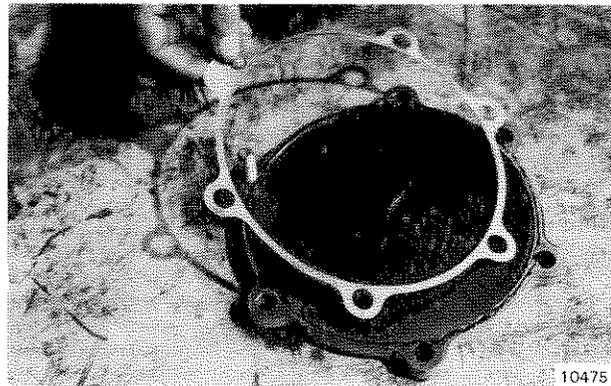


14. Install the 12 point capscrews and tighten to 175 N.m (130 lbf ft).

FIGURE 5.18 ASSEMBLY OF THE BRAKE (Page 3 of 4)



15. Install the two Belleville springs.

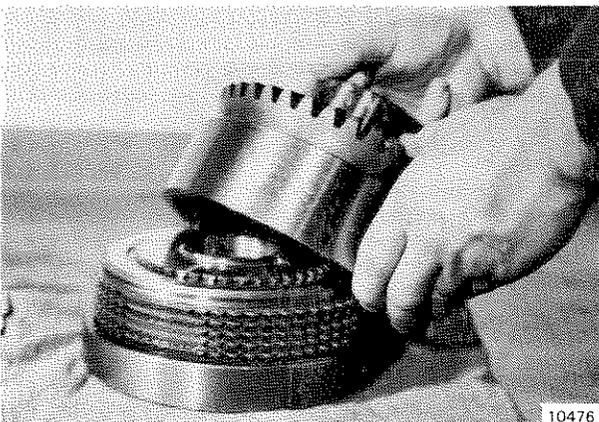


16. Apply LOCKTITE number 271 to both sides of all the shims. Install the cover and the shims. Tighten the capscrews for the cover to 100 N.m (75 lbf ft).

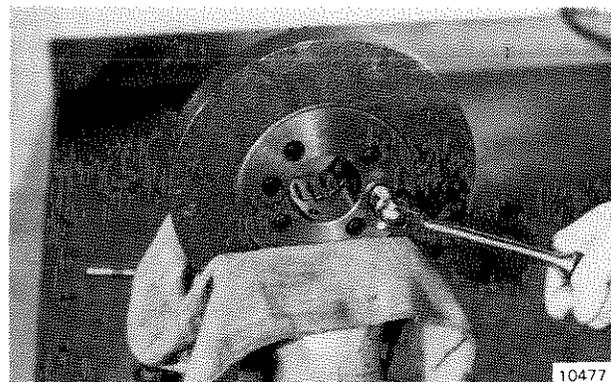
FIGURE 5.18 ASSEMBLY OF THE BRAKE (Page 4 of 4)

NOTE:

The two clutches in the W5B winch are the same. The disassembly instructions are the same for both clutches.



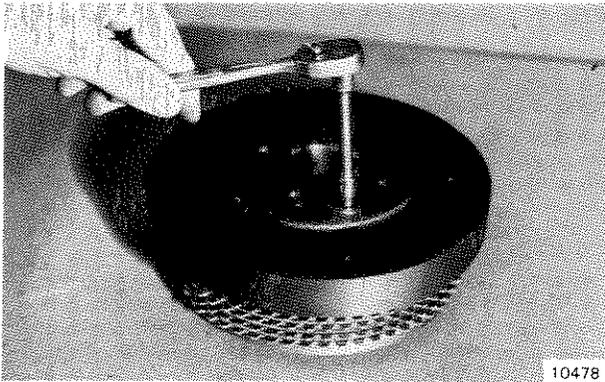
1. Lift the clutch carrier from the clutch.



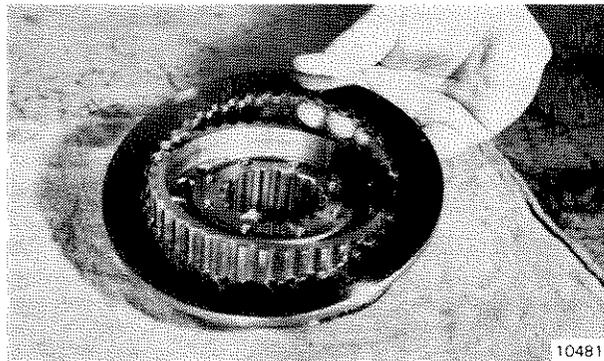
2. Put the clutch in a vise with soft jaws. Loosen the six 5/16 inch 12 point capscrews.

FIGURE 5.19 DISASSEMBLY OF THE CLUTCHES (Page 1 of 3)

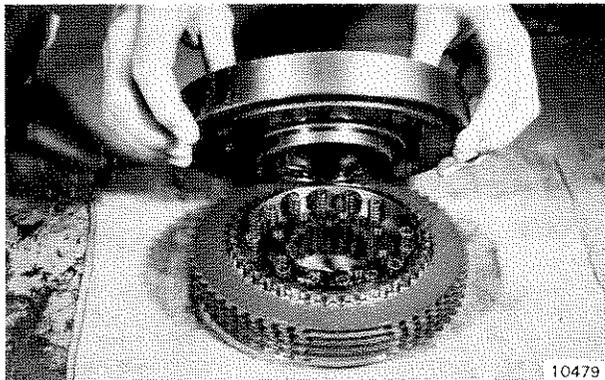
Repairs



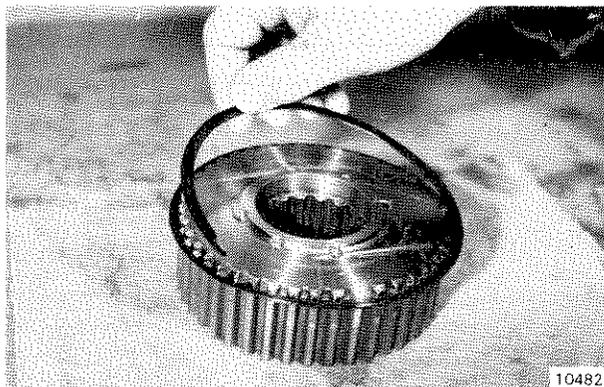
3. Put the clutch on the workbench and remove the six 12 point capscrews. Lift the housing from the clutch.



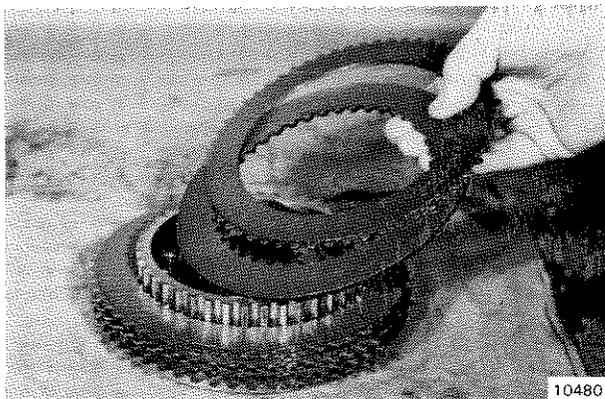
6. Remove the reaction ring. Inspect that the reaction ring is flat.



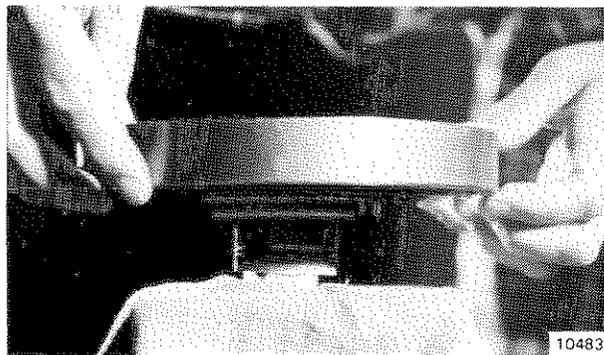
4. Remove and discard the 14 clutch return springs. Replace the clutch return springs because the heat generated in the clutches will make the springs weak. Weak clutch return springs will cause additional friction and the clutch will become too hot during operation.



7. Remove the double spiral snap ring. Check the groove for the snap ring and the splines of the hub for damage.

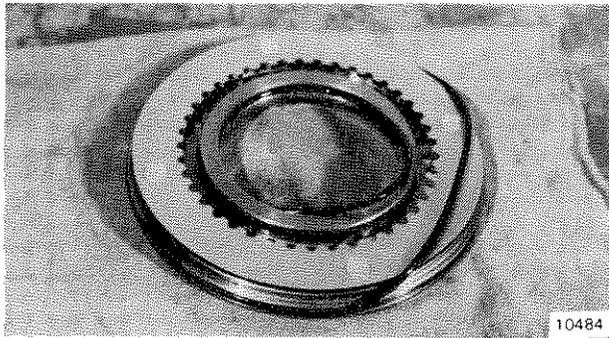


5. Remove the friction discs and the separator plates. Inspect that the friction discs and the separator plates to make sure they are flat.

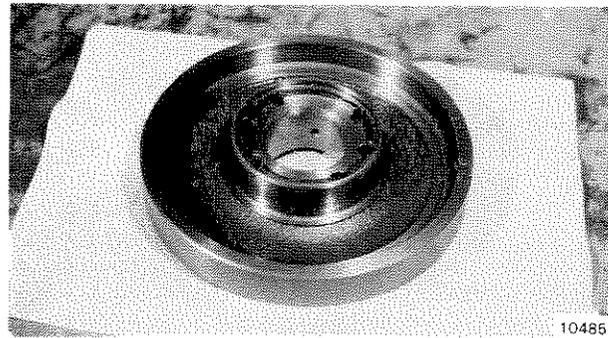


8. Hit the center of the housing against a wood block. The piston will fall from the housing.

FIGURE 5.19 DISASSEMBLY OF THE CLUTCHES (Page 2 of 3)

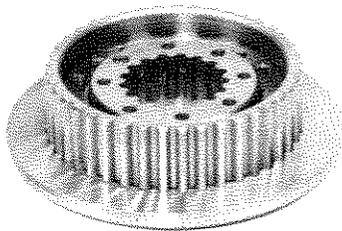


9. Remove and discard the two large O-rings from the piston. Clean the O-ring grooves. Check that the rivets are tight.

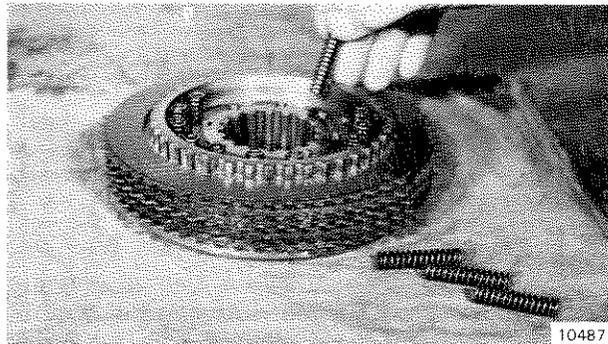


10. Inspect the O-ring surfaces of the housing for wear or damage. Inspect the right angle corners of the housing for cracks.

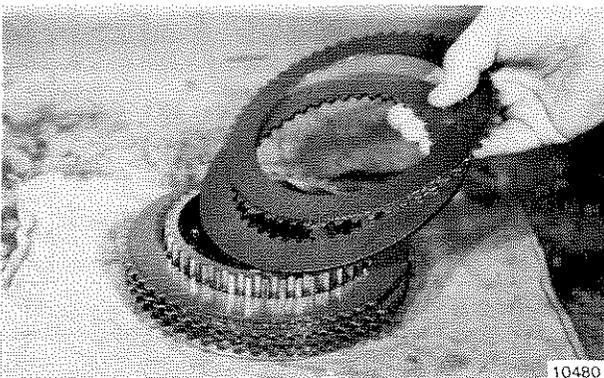
FIGURE 5.19 DISASSEMBLY OF THE CLUTCHES (Page 3 of 3)



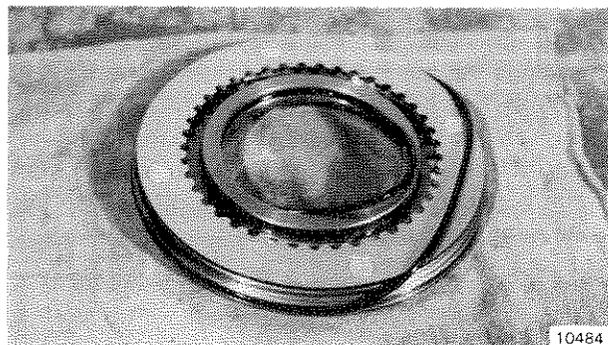
1. Install the snap ring and the reaction ring on the clutch hub.



3. Install 14 new clutch return springs. Align the missing teeth in the friction discs.

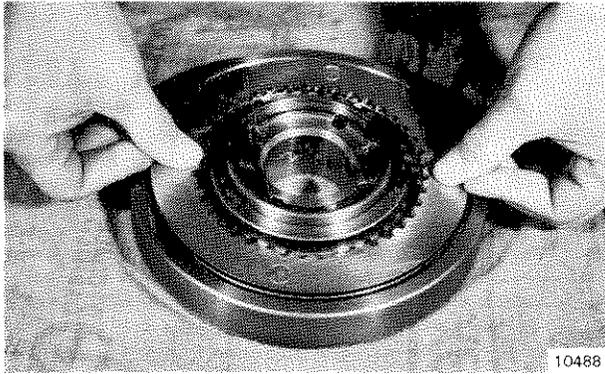


2. Install a friction disc on the reaction ring. Next, install a separator plate. Install the remainder of the friction discs and separator plates in the same sequence.

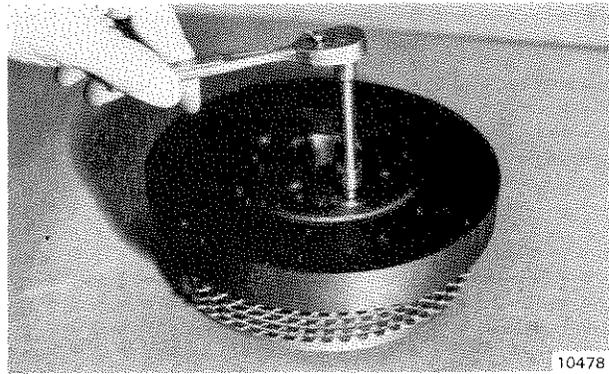


4. Install the two large O-rings on the piston. Use new O-rings. Lubricate the O-rings.

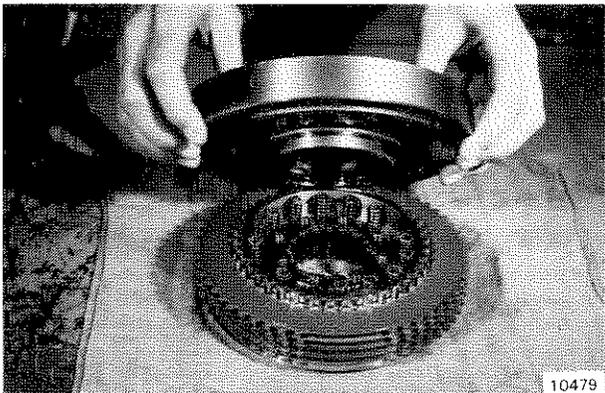
FIGURE 5.20 ASSEMBLY OF THE CLUTCHES (Page 1 of 3)



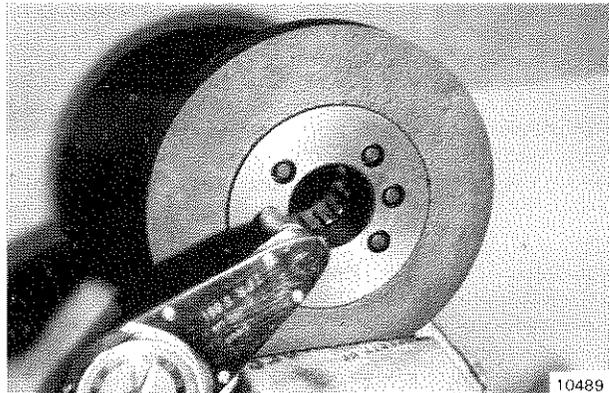
5. Install the piston in the housing. Use your thumbs to push evenly on the piston. Push the piston the complete travel into the housing.



8. Install the 12 point cap screws and lock washers. The lock washers are special and must be in good condition if they are used again.

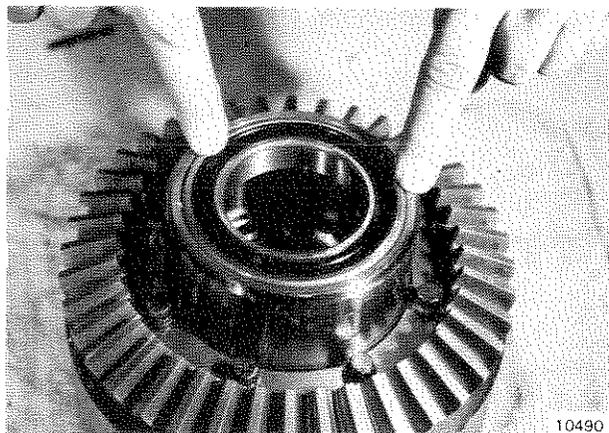


6. Install the housing on the clutch hub. The holes for the cap screws must be aligned and the splines must be engaged. Both items must be in alignment before the cap screws are installed and tightened.



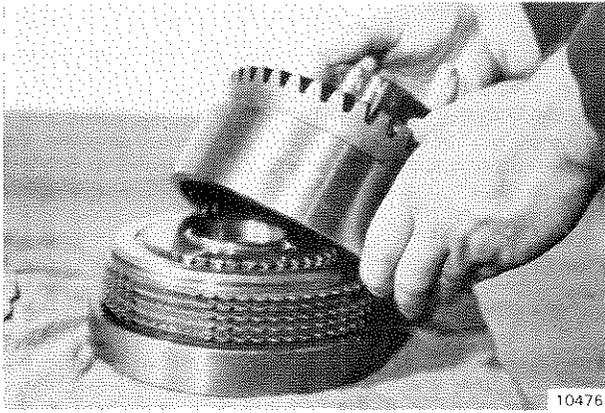
9. Put the clutch assembly in a vise with soft jaws. Tighten the cap screws evenly to 40 N.m (30 lbf ft).

7. If the housing is difficult to align with the holes and the splines, remove the clutch return springs. Rotate the piston inside the housing to align the splines and the holes for the cap screws. When the parts are all in alignment, carefully lift the housing from the clutch. Install the clutch return springs. Carefully install the housing on the clutch again.



10. Install the bearings if the bearings were removed or replaced. The inner bearing does not have a seal. The bearing with the seal must be installed as shown.

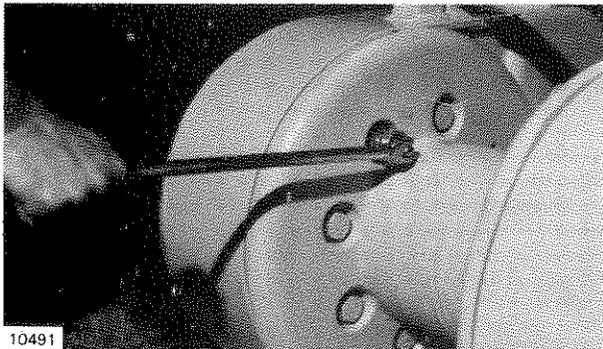
FIGURE 5.20 ASSEMBLY OF THE CLUTCHES (Page 2 of 3)



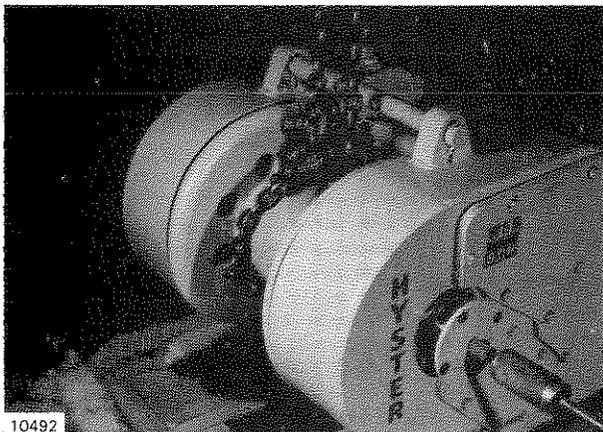
11. Install the clutch carrier over the clutch. Be careful that you do not bend any of the teeth on the friction discs.

FIGURE 5.20 ASSEMBLY OF THE CLUTCHES (Page 3 of 3)

Removing The Drum And Drum Shaft



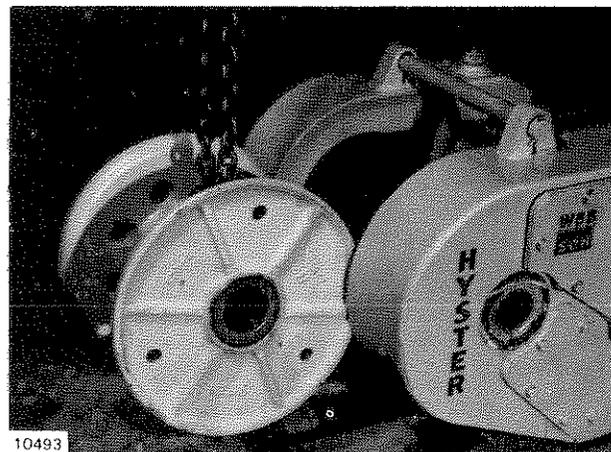
1. Loosen the seven bolts that hold the drum to the drum adapter. Remove five of the bolts and leave two bolts in the drum across from each other.



2. Remove the four capscrews that hold the drum shaft. Use a crane and slings to hold the drum. Use a puller to remove the drum shaft.

NOTE

Corrosion can make the drum shaft difficult to remove. Some service personnel remove the control valve and accumulators and apply heat to the sleeve around the drum shaft.

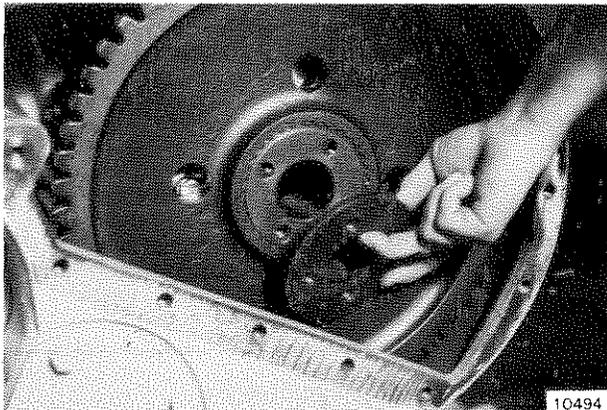


3. Remove the two bolts that are holding the drum and drum adapter together. Use the crane to lift the drum away from the winch case.

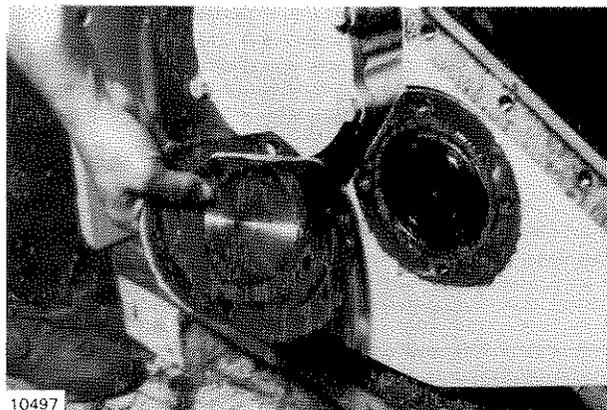
FIGURE 5.21 REMOVAL OF THE DRUM

Repairs

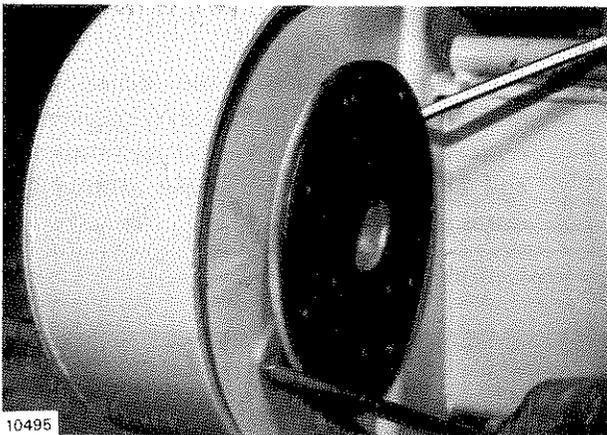
Removal Of The Intermediate Shaft And Drum Gear



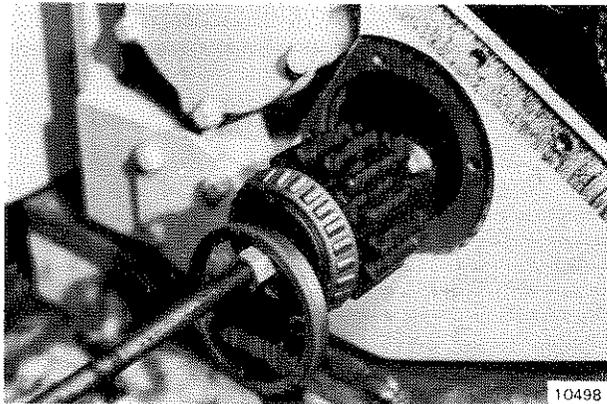
1. Remove the retainer and the shims for the intermediate shaft.



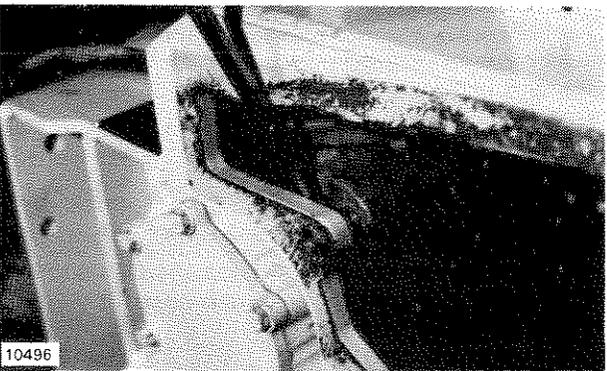
4. Remove the retainer and the shims for the intermediate shaft.



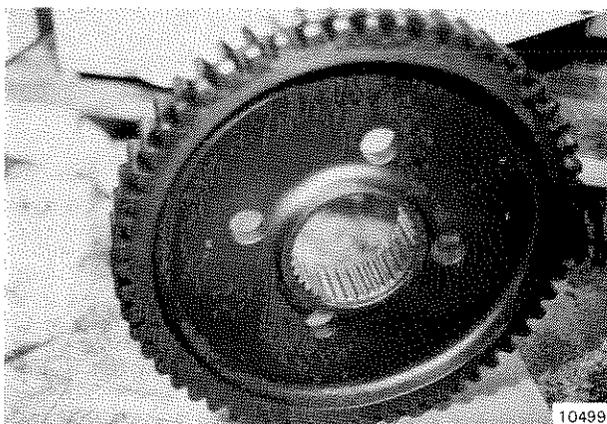
2. Use prybars to pull the drum adapter from the winch case. DO NOT permit the drum adapter to fall from the winch case.



5. Use a puller to remove the intermediate shaft assembly. Move the intermediate gear towards the front of the winch case when removing the intermediate shaft.

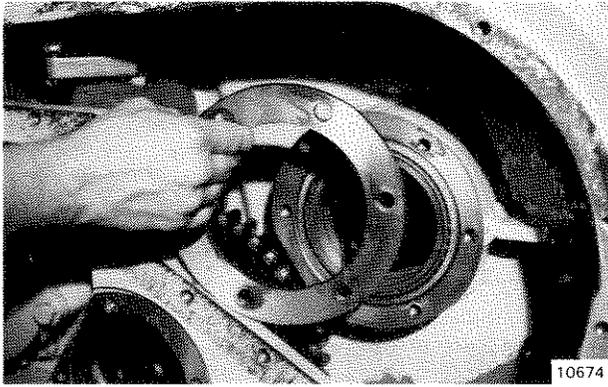


3. Use a prybar to move the freespool shifting fork towards the inside of the winch. The detent will hold the fork in this position.

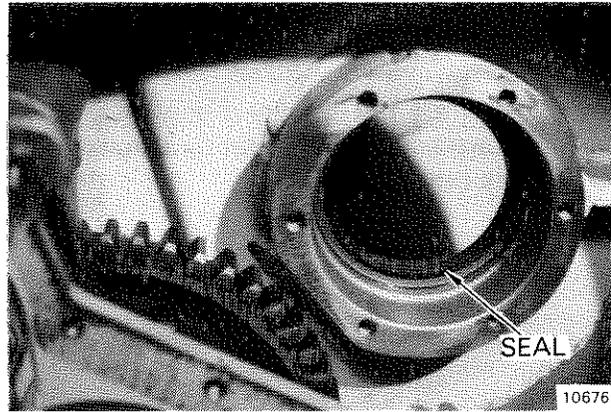


6. Lift the drum gear out of the winch case.

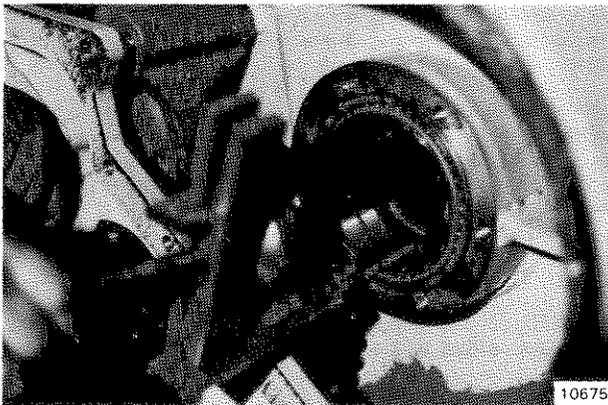
FIGURE 5.22 REMOVAL OF THE INTERMEDIATE SHAFT AND DRUM GEAR (Page 1 of 2)



7. Remove the bearing retainer for the drum adapter.



9. Remove the drum seal.



8. Use a puller to remove the drum bearings from the winch case.

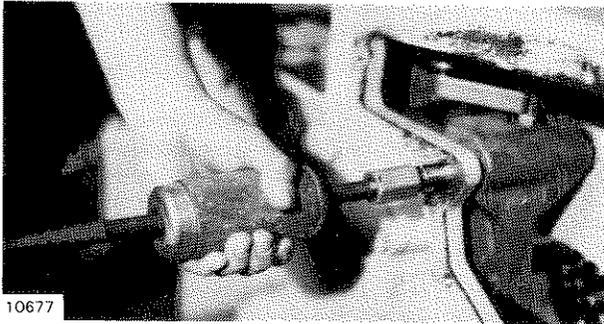
FIGURE 5.22 REMOVAL OF THE INTERMEDIATE SHAFT AND DRUM GEAR (Page 2 of 2)

Repairs

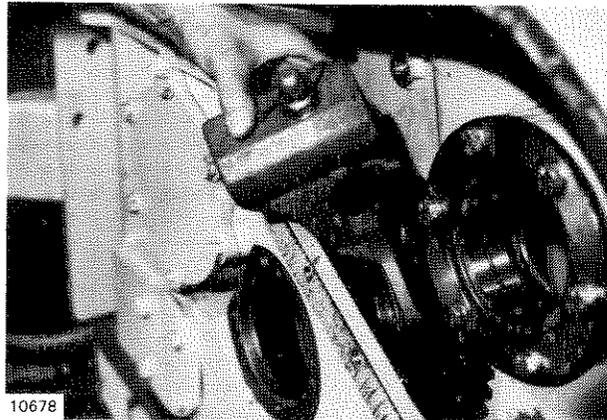
Removal Of The Intermediate Gear And The Freespool Fork

NOTE:

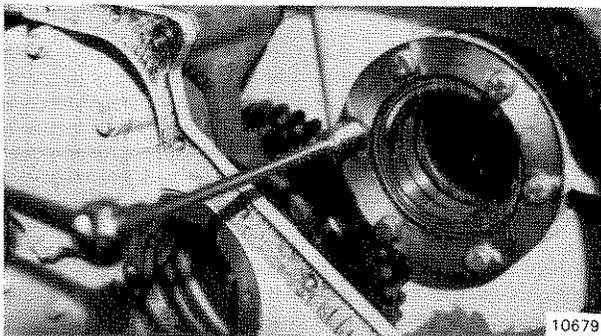
The drum and drum gear must be removed from the winch before the freespool shifting fork can be removed.



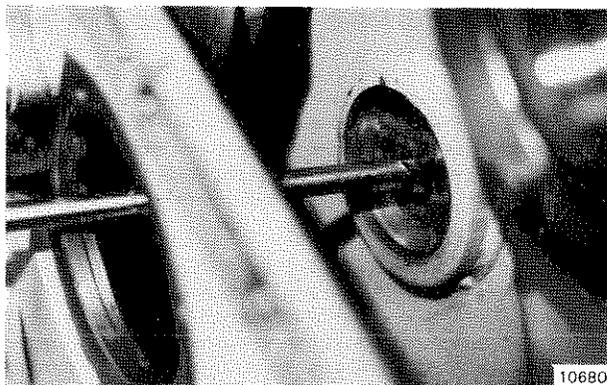
1. Use a puller with a 3/8 UNC thread to remove the shaft for the freespool shifting fork. The steel ball will fall from the freespool detent as the shaft is removed. Remove the detent spring from the freespool shifting fork so that it does not drop and become lost.



3. Lift the freespool shifting fork out of the winch case. Remove the detent ball and spring if they have fallen to the bottom of the winch case.



2. If the bearing retainer for the drum gear has not been removed, it is necessary to remove one of the cap screws from the bearing retainer. The removal of the cap screw nearest the intermediate gear will give the necessary clearance to remove the gear. The bearing cone for the intermediate gear will fall to the bottom of the winch case as the intermediate gear is removed.



4. Remove the bearing cup and cone from the winch case.

FIGURE 5.23 REMOVAL OF THE INTERMEDIATE GEAR AND THE FREESPOOL FORK

WSB WINCH

TABLE 5.1 VISUAL INSPECTION (Sheet 1 of 3)

ITEM	INSPECTION	ACTION
Pinion gear	Check for a wear pattern that is not even.	Check gear clearance between the pinion gear and the bevel gears on the clutches.
Pinion shaft	Check the splines for wear and twist.	Replace the pinion if worn or the splines have a twist.
Pump drive	Check the gears for wear.	Replace a gear that is worn or damaged.
Clutch and brake shaft	Check for grooves or other damage on the machined surfaces.	Repair the surface or replace the shaft.
	Check the seal rings for damage and wear.	Replace damaged or worn seal rings.
	Check the grooves in the shaft for the seal rings. Clean the oil orifices.	Replace or repair the shaft if the surfaces that join the seal rings are not flat.
Bearing retainers	Check the bearing bore and seal ring bore for damage and corrosion.	Replace the retainer if it is damaged or has corrosion.
	Check the snap ring between the clutches.	Replace the snap ring if it is worn or damaged.
Bevel gears	Check for a wear pattern that is not even.	Make sure that the clearance between the bevel gears and the pinion is correct. Make sure that the bearing preload on the clutches is correct.
	Check for worn or broken teeth.	Replace a bevel gear that can not stay within the clearance limits.
	Check the faces of the gear hubs for wear and damage.	Replace a worn or damaged gear.
Intermediate pinion gear	Check gear for broken or worn teeth.	Replace a worn or damaged gear.
Clutch assembly	Make sure that the oil passages are clean.	Clean and repair the clutch assemblies.
	Check the friction discs for wear, distortion or damage. Minimum thickness of wear surface: 0.5 mm (0.020 in). Maximum thickness of friction disc: 3.1 mm (0.121 in).	Replace the friction discs if the oil grooves are worn away, burned, or the discs are damaged or not flat. Minimum stack height for 4 frictions and 4 separators is 1.043".

Repairs

TABLE 5.1 VISUAL INSPECTION (Sheet 2 of 3)

ITEM	INSPECTION	ACTION
Clutch Assembly	Check that the separator plates are flat, do not have large blue areas from too much heat, or damaged surfaces.	Replace separator plates that have damage.
	Inspect the piston housing and piston for cracks and damage. Make sure the O-ring grooves and sealing surfaces are good.	Replace a damaged piston or piston housing.
	Check for weak clutch return springs.	Replace the clutch return springs when the clutch is disassembled for repairs.
Oil brake Assembly	Check plungers for wear and damage.	Replace a damaged plunger.
	Check for a cracked or broken Belleville spring.	Replace a damaged or broken Belleville spring.
	Inspect the oil brake cover for leakage or damage.	Replace or repair the cover if the sealing surfaces are bad or the cover has damage.
	Inspect that the face of the thrust ring is smooth.	Replace a worn thrust ring.
	Check the friction discs for wear or damage.	Replace the friction discs if the oil grooves are worn away or the discs are damaged or are not flat.
	Check that the separator plates are flat, do not have large blue areas from too much heat, or damaged surfaces.	Replace separator plates that have have damage.
	Inspect the piston for damage. Make sure the sealing surfaces are good.	Replace a damaged piston. The rivets must be tight
	Inspect the brake housing cracks and notches (wear).	Replace a damaged housing.
	Inspect the brake hub for damage and notches (wear).	Replace a damaged hub.
Control valve cam	Inspect the cam surface for wear.	Replace a worn cam.
Accumulator valve	Valve does not keep pressure in the accumulators.	Replace a bad accumulator valve.

TABLE 5.1 VISUAL INSPECTION (Sheet 3 of 3)

ITEM	INSPECTION	ACTION
Intermediate gear shaft	Check for bad bearing surfaces.	Repair a surface with minor damage. Replace a damaged shaft.
	Check for broken teeth or splines.	Replace a broken or worn part.
Intermediate gear	Check for broken teeth. Inspect the leading edge the teeth for wear.	Replace a damaged or worn of gear.
Freespool assembly	Check the gears and the sliding sleeve for broken teeth and wear.	Replace a damaged or worn part.
Drum shaft	Check for worn or damaged bearing surfaces.	Replace a damaged shaft. A "Speedi Sleeve", part number 99300 is available from Chicago Rawhide to repair a damaged drum shaft.
	Inspect the sealing surface for corrosion.	Remove corrosion with fine abrasive cloth or paper.
Drum gear	Inspect the leading edge of the teeth for wear.	Replace a worn gear.
Drum adapter	Inspect the sealing surfaces.	Repair a damaged sealing surface or replace the drum adapter.
	Check for a damaged bearing surface.	Replace a damaged adapter.
Control valve	Check for damaged or worn parts if the performance the valve is not correct.	Replace a damaged part in the of control valve.

(This page intentionally left blank.)

ASSEMBLY OF THE WINCH

Figures 5.24 - 5.32 describe the assembly of components which required the winch to be removed from the tractor. These components are the PTO gears and the pinion. There are five arrangements of the PTO gears. A figure describes the assembly of each gear arrangement. The pinion arrangement is the same for all of the winches and is described in Figures 5.12 - 5.14.

Assembly Of The PTO Gear Arrangements

PTO GEAR RATIO OF 32.27:1

This gear ratio is used on the following tractors:
 CATERPILLAR D5B with Direct Drive
 JOHN DEERE JD655, JD750, JD755
 INTERNATIONAL HARVESTER 175C, TD12

(continued on page 5-39)

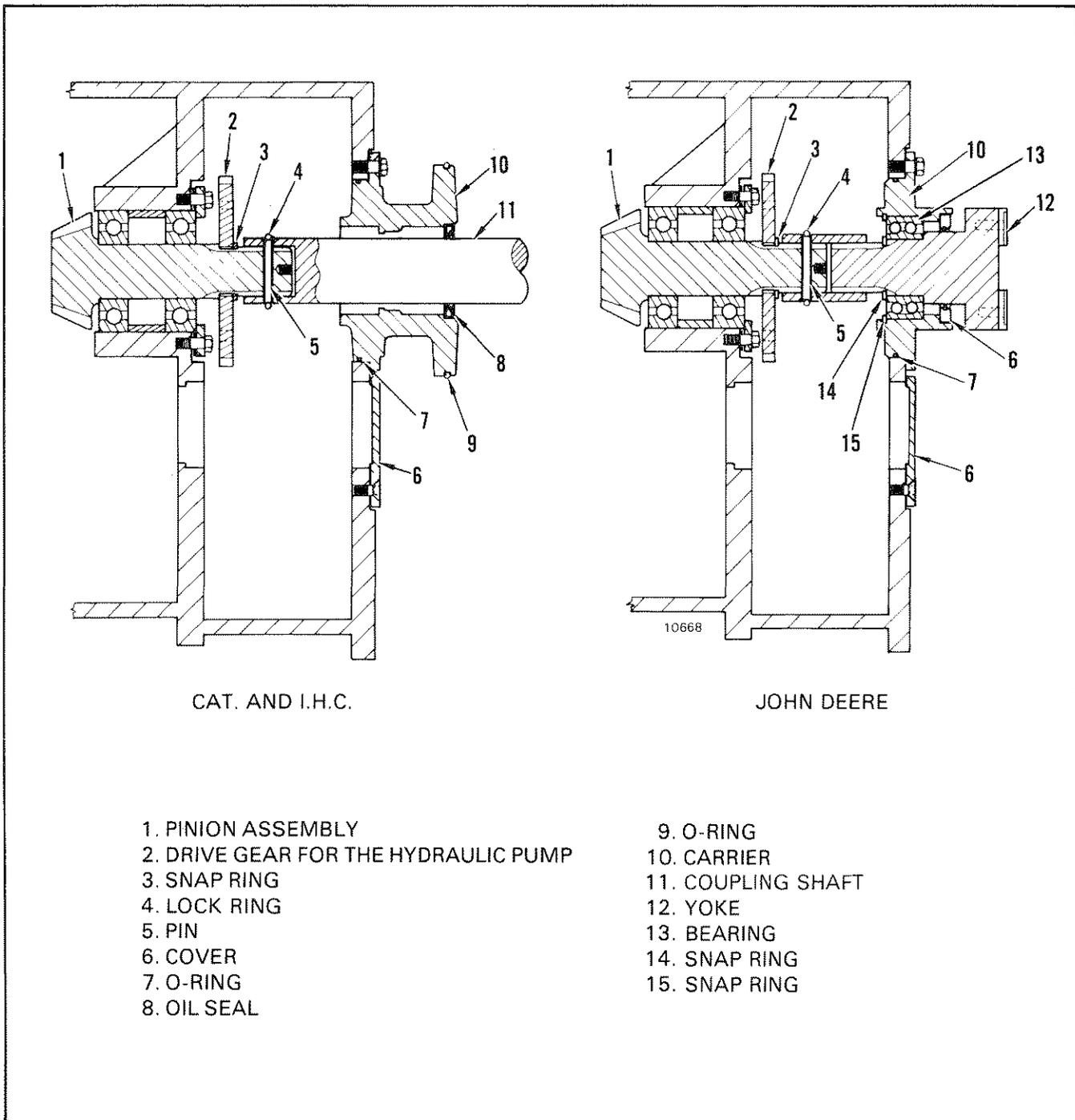
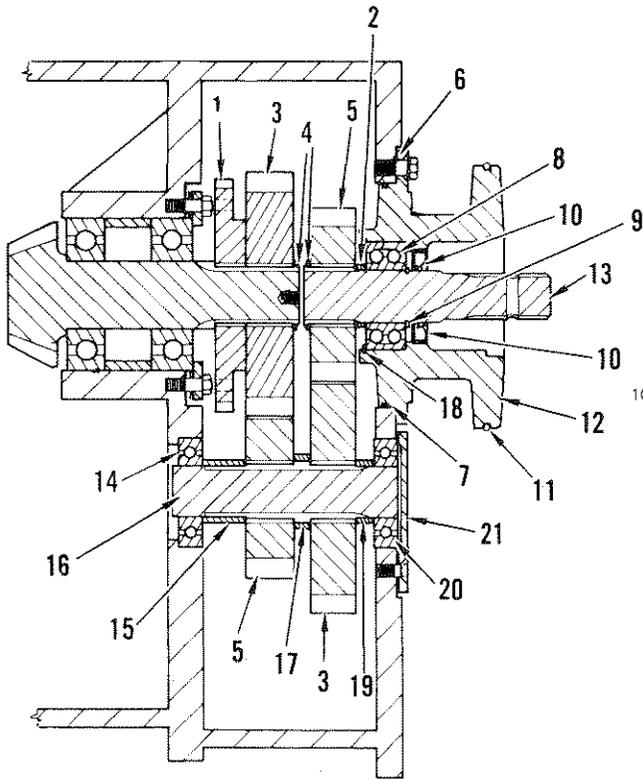
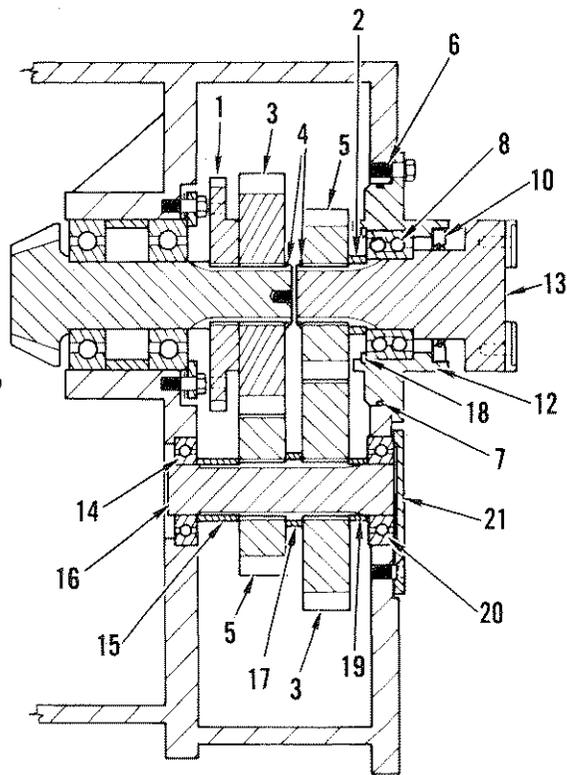


FIGURE 5.24 GEAR ARRANGEMENT FOR THE 32.27:1 GEAR RATIO

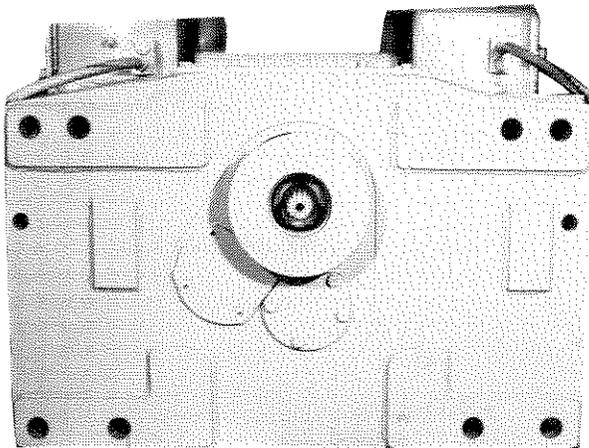


CAT. AND I.H.C.



JOHN DEERE

(Items 9 and 11 not on John Deere)



W5B WINCH FOR CAT AND I.H.C. 10647

1. DRIVE GEAR FOR THE HYDRAULIC PUMP
2. SPACER
3. PINION GEAR
4. SNAP RING
5. DRIVE GEAR
6. PINION
7. O-RING
8. BEARING
9. SNAP RING
10. OIL SEAL
11. O-RING
12. CARRIER
13. INPUT SHAFT OR YOKE
14. BEARING
15. SPACER
16. IDLER SHAFT
17. SPACER
18. SNAP RING
19. SPACER
20. BEARING
21. COVER

FIGURE 5.25 ARRANGEMENT OF THE PTO GEAR ASSEMBLY FOR THE WINCH WITH A 117:1 GEAR RATIO

PTO GEAR RATIO 32.27:1 (continued from page 5-37)

The procedure for the assembly of this gear arrangement is the same for all the tractors shown in the list. There are differences in the connection of the input shaft to the tractor PTO and the shape of the bearing carrier for the input shaft. These differences do not change the assembly procedures for this PTO gear arrangement. Step by step assembly procedures are not described for this PTO arrangement because the PTO is fastened directly to the pinion. Figure 5.14 describes the assembly of the pinion.

PTO GEAR ARRANGEMENT FOR THE 117:1 GEAR RATIO

This gear arrangement is used on the following tractors:

CATERPILLAR D5B

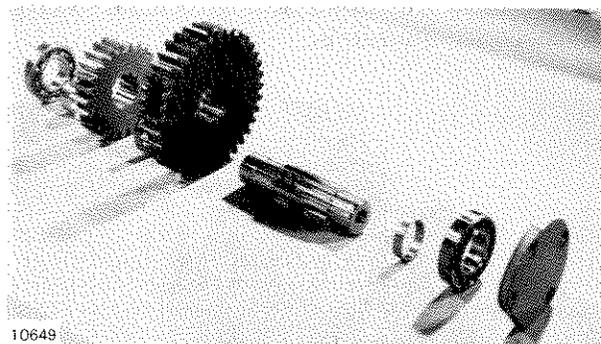
JOHN DEERE JD 655, JD750, JD755

INTERNATIONAL HARVESTER 175C, TD12

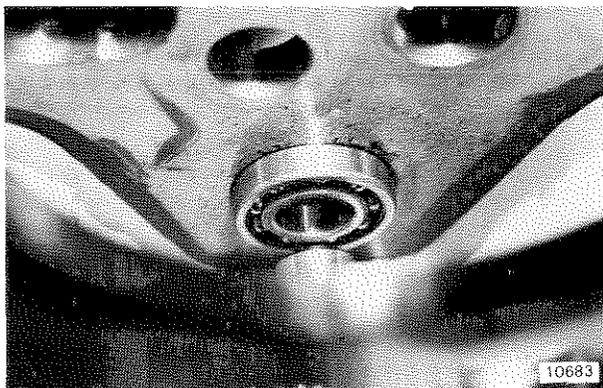
The procedures for the assembly of this PTO gear arrangement is the same for all the tractors shown in the list. There are differences in the connection of the input shaft to the tractor PTO and the shape of the bearing carrier for the input shaft. These differences do not change the assembly procedure for this PTO gear arrangement.



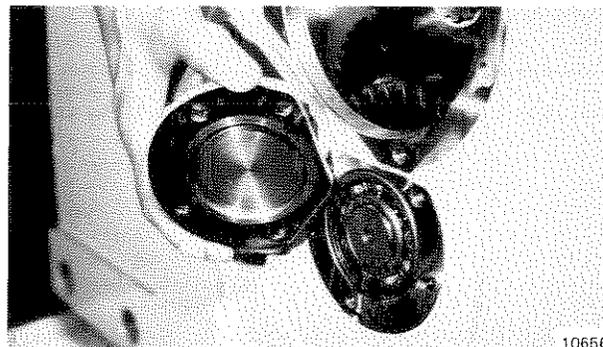
1. Install the drive gear for the hydraulic pump, spacer, and pinion gear on the pinion shaft. Install the snap ring on the end of the pinion shaft.



3. Put the spacers and gears inside the winch case. Put the idler shaft in the bore of the winch case and slide the spacers and gears on the idler shaft in the correct sequence. Use a hammer to push the idler shaft into the rear bearing.

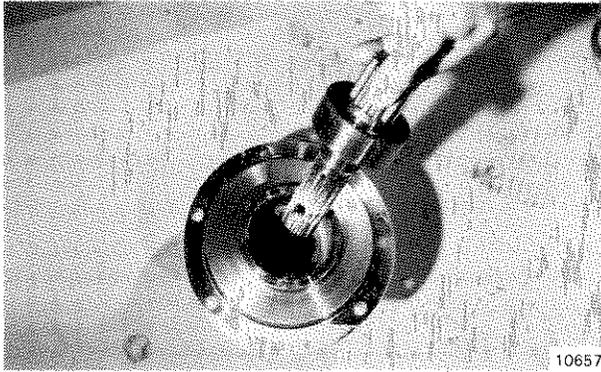


2. Install the rear bearing for the idler shaft in the winch case. Use a driver to push the bearing against the stop in the winch case.

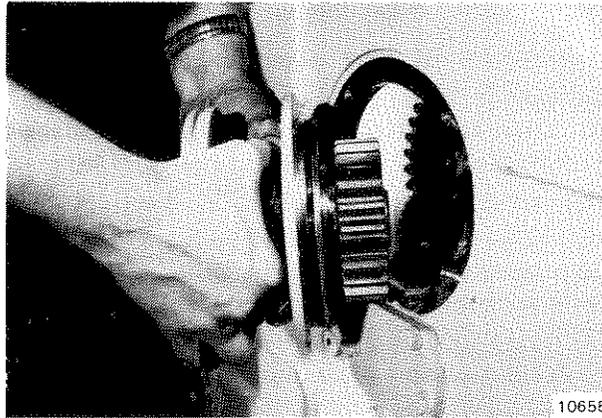


4. Install the front bearing on the idler shaft. Use a hammer and driver to push the bearing into the bore of the winch case. Put liquid sealer on the gasket and put the gasket on the cover. Install the cover for the idler shaft.

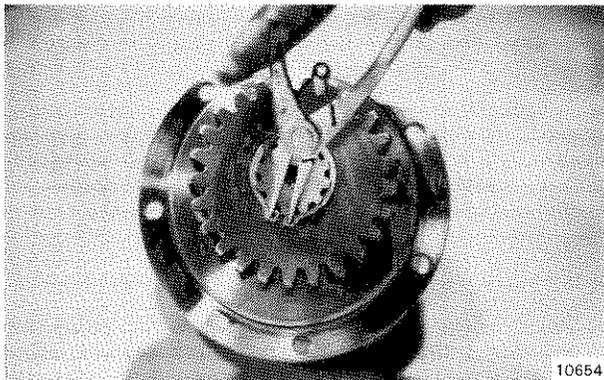
FIGURE 5.26 ASSEMBLY OF THE PTO GEAR ASSEMBLY WITH THE 117:1 GEAR RATIO
(Page 1 of 2)



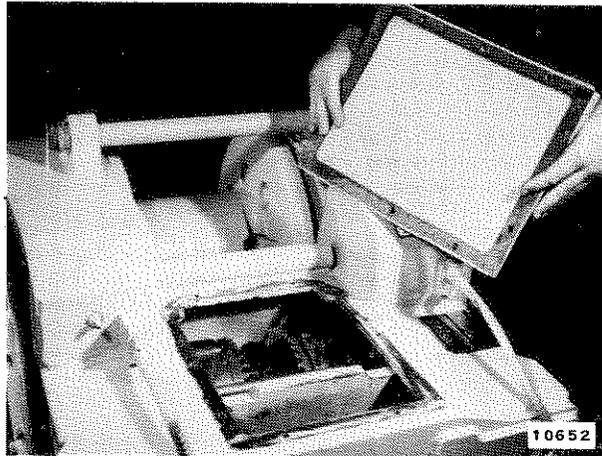
5. Press a new oil seal into the carrier for the input shaft. Install the snap ring and the bearing on the input shaft. Install the input shaft and bearing in the carrier and install the snap ring that holds the bearing in the carrier. NOTE: The design of the input shaft for the JD 750 is different. The bearing and snap ring must be installed in the carrier before the input shaft is installed in the carrier.



7. Install a new O-ring on the carrier where the carrier joins the winch case. Install the carrier assembly into the winch case. Tighten the five 3/8 UNC x 1 inch capscrews.



6. Slide the spacer and drive gear on the input shaft. Install the snap ring on the end of the input shaft.



8. Install the access cover on the winch.

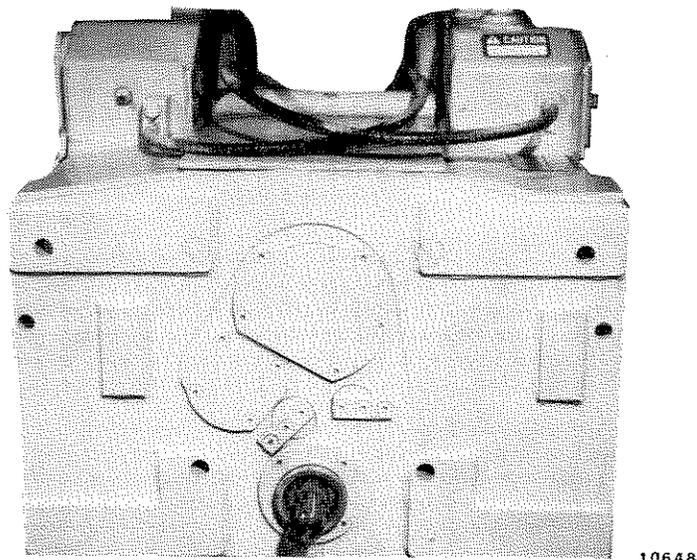
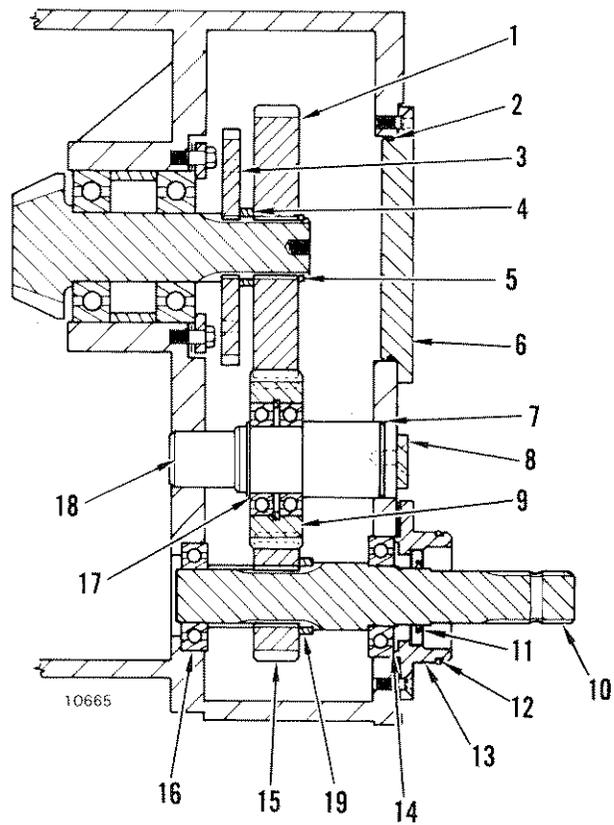
FIGURE 5.26 ASSEMBLY OF THE PTO GEAR ASSEMBLY WITH THE 117:1 GEAR RATIO
(Page 2 of 2)

PTO GEAR ARRANGEMENT FOR FIATALLIS 8, FL9, 10B, AND 10C

There are two standard PTO gear ratios (41.31:1 and 69.92:1) used in this winch. The assembly procedure is the same for both gear ratios. The PTO enters the

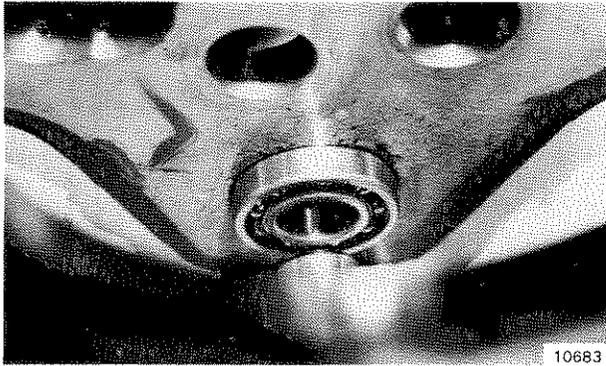
winch case at the bottom. The joint between the bearing carrier on the input shaft and the tractor has an O-ring seal. There is a gear train of three gears inside the winch case. The two gear ratios are made by changing the arrangement of the gears in the gear train.

1. PINION GEAR
2. O-RING
3. DRIVE GEAR FOR THE HYDRAULIC PUMP
4. SPACER
5. SNAP RING
6. COVER
7. O-RING
8. KEEPER
9. IDLER GEAR
10. INPUT SHAFT
11. OIL SEAL
12. O-RING
13. CARRIER
14. BEARING
15. DRIVE GEAR
16. BEARING
17. SNAP RING
18. IDLER SHAFT
19. SPACER



W5B WINCH FOR FIATALLIS

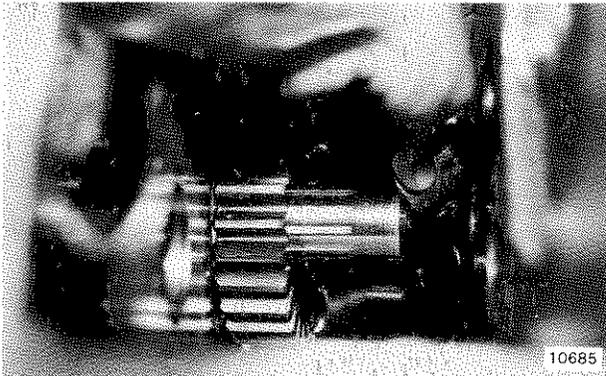
FIGURE 5.27. PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B, AND 10C



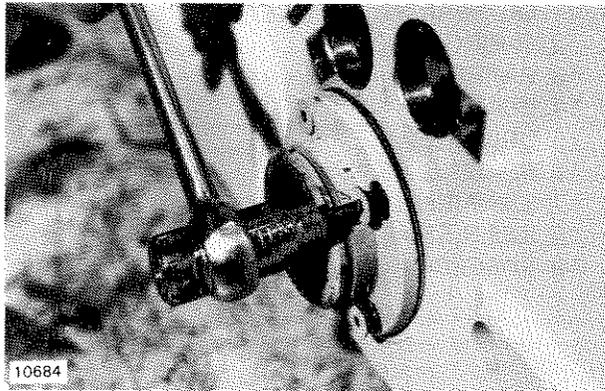
1. Install a new bearing in the rear bore for the PTO input shaft. Use a driver to install the bearing against the seat in the bore.



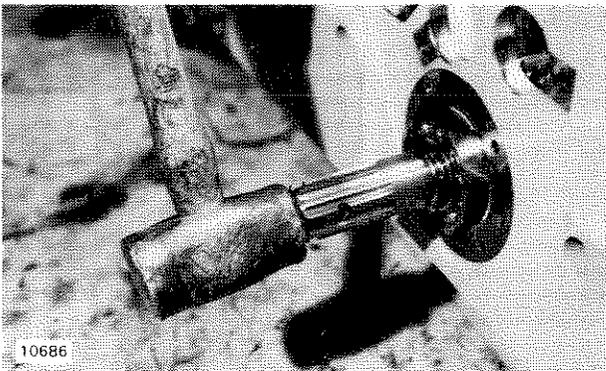
4. Install a new oil seal in the carrier. The lip on the oil seal is towards the tractor. Apply a thin layer of liquid sealant to the mounting surface of the carrier and the gasket.



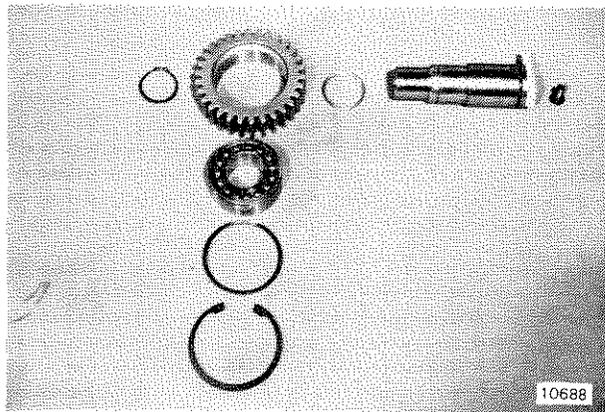
2. Put the drive gear and spacer in the winch case and align them with the input shaft. Put the input shaft through the winch case and engage the splines in the drive gear. The spacer goes between the drive gear and the rear bearing. Use a driver to push the input shaft through the drive gear and spacer and into the rear bearing.



5. Install the carrier on the input shaft. Tighten the socket head capscrews to 35 N.m (25 lbf ft).

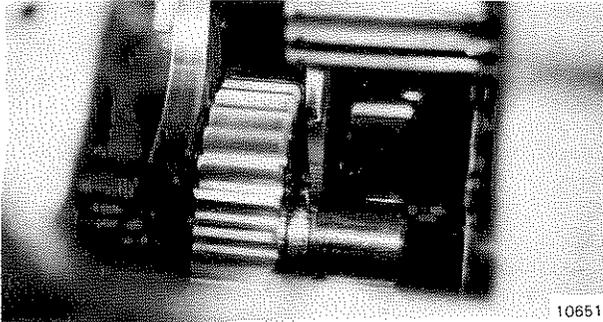


3. Install a new front bearing on the input shaft. Make sure the bearings are installed fully in their seats and the input shaft is installed fully in the bearings.

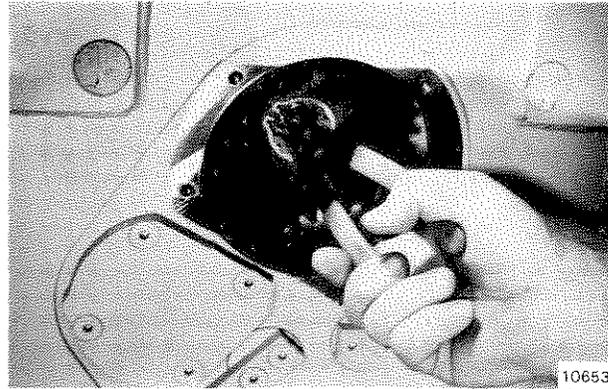


6. Put a new O-ring on the idler shaft. Lubricate the O-ring with hydraulic oil. Put the idler shaft into the winch case far enough to install the idler gear and spacer. (Idler shaft for 41.3:1 gear ratio shown.)

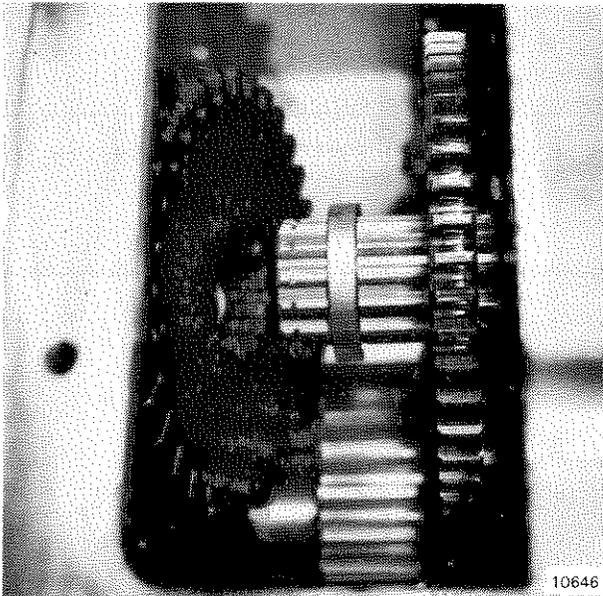
FIGURE 5.28 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B AND 10C (Page 1 of 3)



7. Install the spacer and then the idler gear on the idler shaft. The snap ring that holds the bearing in the idler gear must be toward the spacer. Install the snap ring that holds the idler gear on the idler shaft. (No spacer for 71.7:1 gear ratio.)



9. Install the snap ring on the end of the pinion shaft.

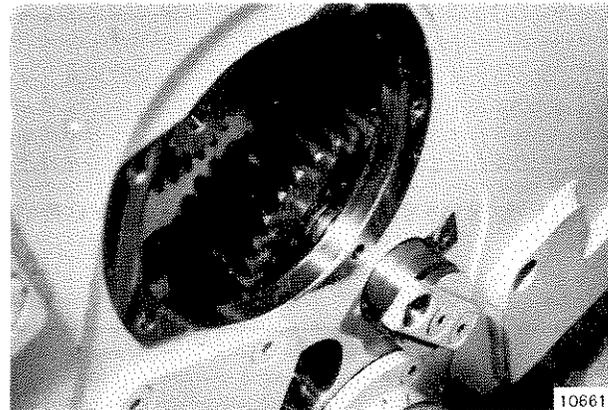


8. Hold the idler gear against the front of the winch case so that you have clearance to install the gears on the pinion. Install the drive gear for the hydraulic pump on the pinion.

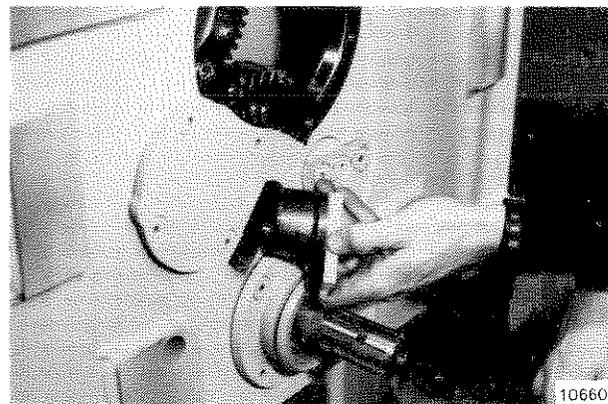
Install the spacer and then the pinion gear on the pinion shaft. Align the splines of the pinion gear with the splines in the pinion. Use a driver to push the gear on the pinion.

NOTE

Later production winches do not use a spacer between the pinion gear and the drive gear for the hydraulic pump.



10. Align the rear end of the idler shaft with the bore in the winch case. Engage the idler gear as you push the idler shaft into the winch case. Align the keeper and install the socket head capscrew. Tighten the capscrew to 35 N.m (25 lbf ft).



11. Install a new O-ring and install the plug and keeper in the winch case. Tighten the socket head capscrew to 35 N.m (25 lbf ft).

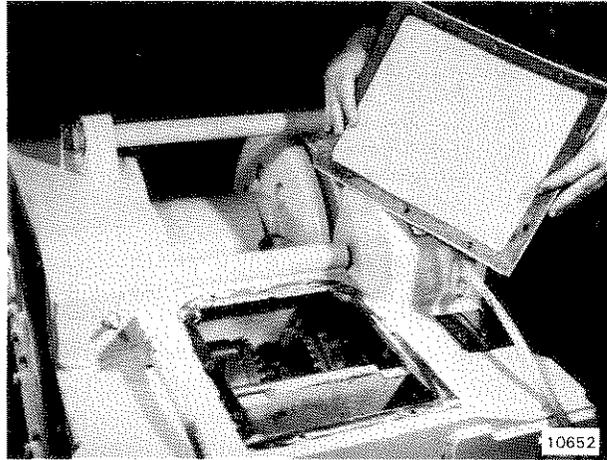
FIGURE 5.28 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B AND 10C (Page 2 of 3)

Repairs



12. Clean the groove for the O-ring in the cover. Install a new O-ring. Install the cover.

Install the five socket head capscrews and tighten them to 35 N.m (25 lbf ft).



13. Clean the top access cover. Apply a thin layer of liquid sealant to the gasket and the gasket surface of the cover. Install the cover and capscrews. Tighten the capscrews to 35 N.m (25 lbf ft).

FIGURE 5.28 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE FIATALLIS 8, FL9, 10B AND 10C (Page 3 of 3)

1. PINION GEAR
2. O-RING
3. DRIVE GEAR FOR THE HYDRAULIC PUMP
4. SPACER
5. SNAP RING
6. COVER
7. INPUT SHAFT
8. CARRIER
9. O-RING
10. OIL SEAL
11. BEARING
12. DRIVE GEAR
13. SPACER
14. BEARING

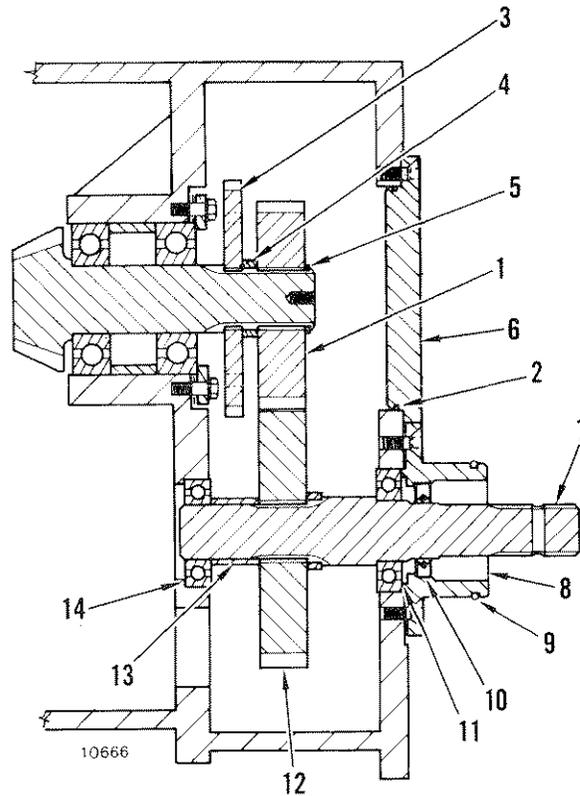
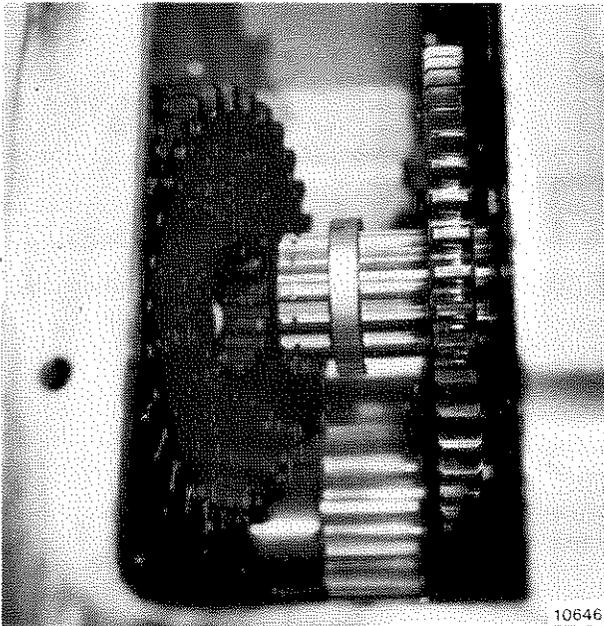


FIGURE 5.29 PTO GEAR ASSEMBLY FOR THE CATERPILLAR D4 WITH POWERSHIFT

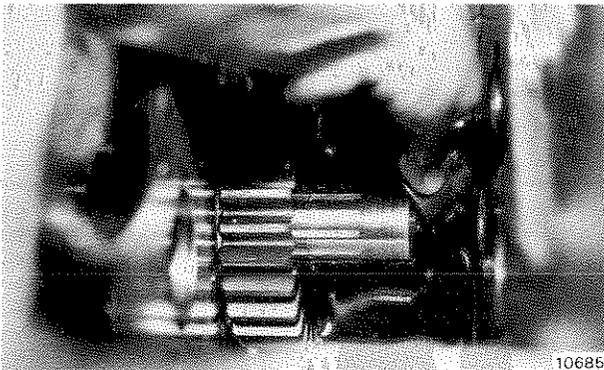
CATERPILLAR D4 WITH POWERSHIFT

The PTO enters the winch case at the bottom. The joint between the bearing carrier for the input shaft and the tractor has an O-ring seal. There is a gear

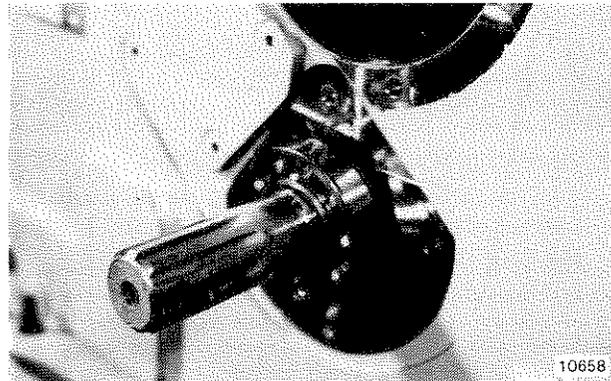
train of two gears inside of the winch case. Two gear ratios (25.82:1 and 40.33:1) are available by changing the arrangement of the gears on the two shafts. The assembly of both gear ratios is the same procedure.



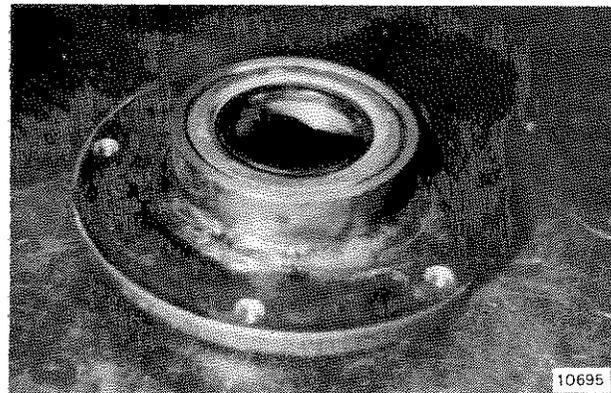
1. Install the drive gear for the hydraulic pump, spacer, and pinion gear on the pinion shaft. Install the snap ring on the end of the pinion shaft.



2. Install the rear bearing for the input shaft in the winch case. Use a driver to push the bearing against the stop in the winch case. Put the drive gear and spacer inside the winch case and align them with the front bore. Push the input shaft into the winch case and engage the splines in the drive gear. Install the spacer on the input shaft between the rear bearing and the drive gear. Push the input shaft into the rear bearing.

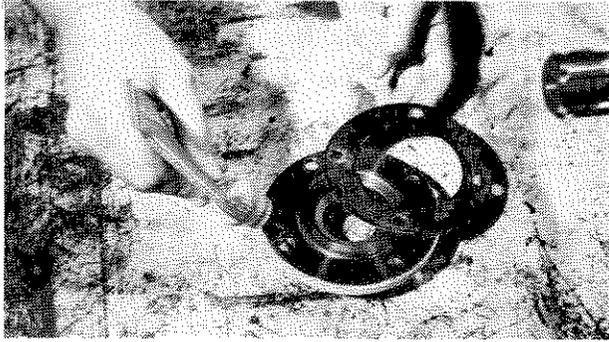


3. Install the front bearing on the input shaft. Use a short piece of pipe to push the bearing into the bore of the winch case.

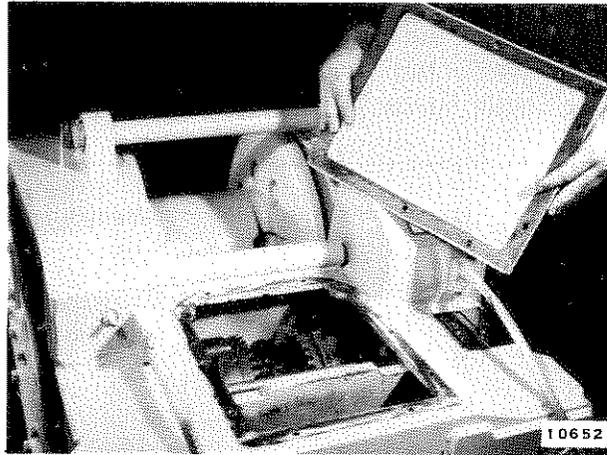


4. Press a new oil seal in the carrier. The flange on the oil seal must be toward the front of the winch.

FIGURE 5.30 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE CATERPILLAR D4 WITH POWERSHIFT (Page 1 of 2)



5. Apply a thin layer of liquid sealant to the gasket surface of the carrier and the gasket. Install the carrier and gasket on the input shaft. Tighten the four capscrews to 45 N.m (35 lbf ft).



7. Install the access cover on top of the winch case.



6. Put a new O-ring on the access cover for the pinion. Install the cover for the pinion. Install the cover on the winch case and tighten the five capscrews to 45 N.m (35 lbf ft).

FIGURE 5.30 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE CATERPILLAR D4 WITH POWERSHIFT (Page 2 of 2)

KOMATSU D41, D45 AND D53

The PTO gear arrangements for the models of the KOMATSU tractors are similar. This description for assembly is for all three models.

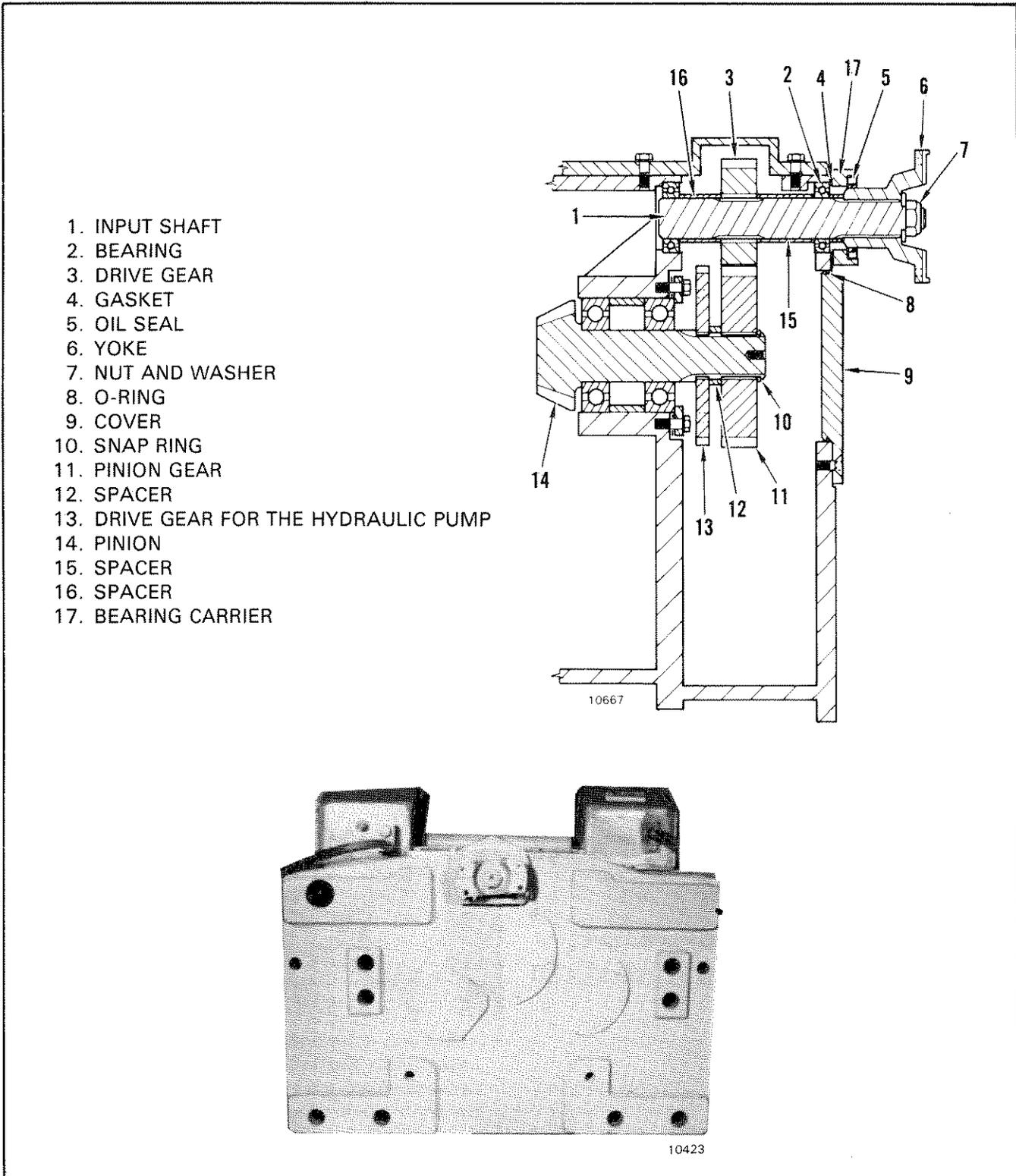
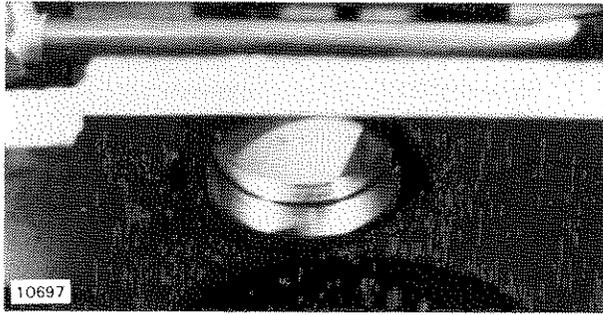
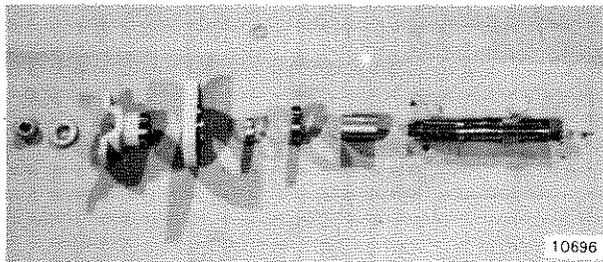


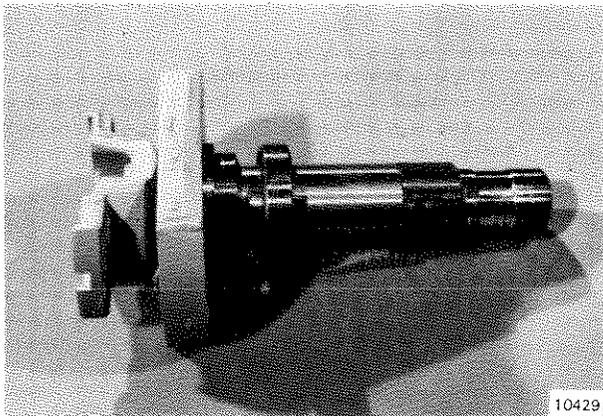
FIGURE 5.31 ARRANGEMENT OF THE PTO GEAR ASSEMBLY FOR THE KOMATSU D41, D45, AND D53



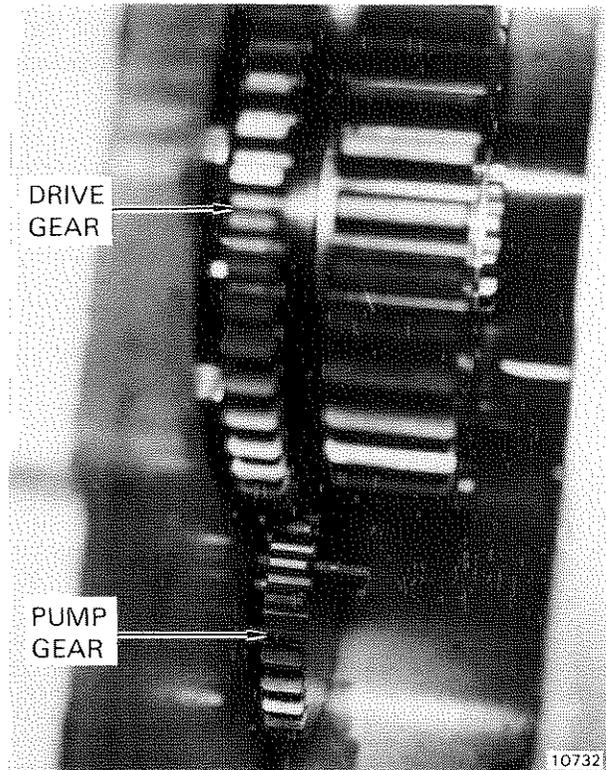
1. Use a driver to install the rear bearing for the input shaft into the winch case.



2. Assemble the components of the input shaft.

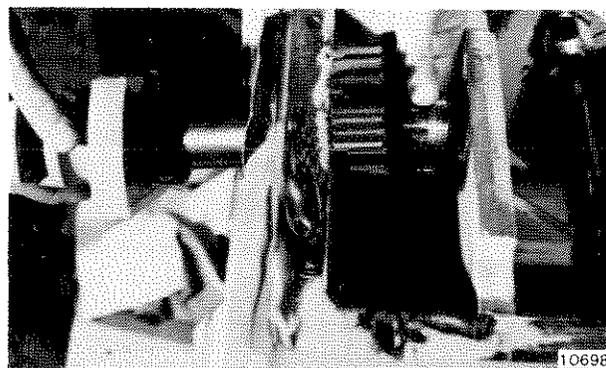


3. Put the yoke in a vise and tighten the nut to 135 N.m (100 lbf ft).



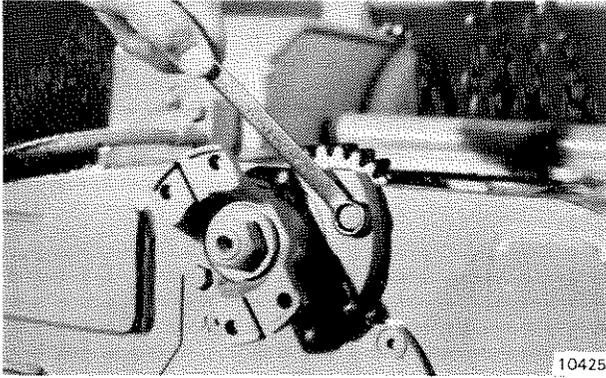
4. Install the drive gear for the hydraulic pump, spacer, pinion gear, and snap ring on the pinion shaft.

5. Install a new O-ring on the front access cover and install the cover on the winch case. Tighten the five socket head capscrews.

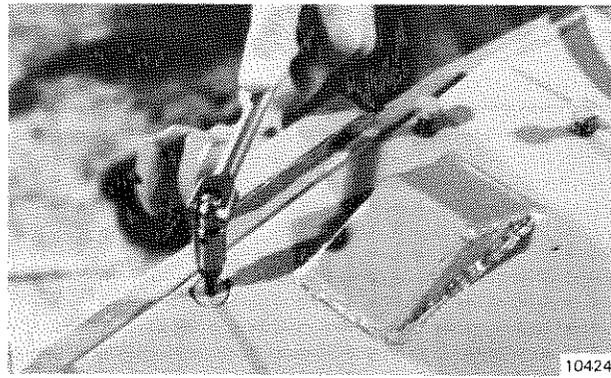


6. Install the input shaft in the bore of the winch case. Slide the rear spacer, drive gear, and forward spacer on the input shaft as you push the shaft into the rear bearing. Use a hammer to push the input shaft into the rear bearing.

FIGURE 5.32 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE KOMATSU D41, D45, AND D53 (Page 1 of 2)



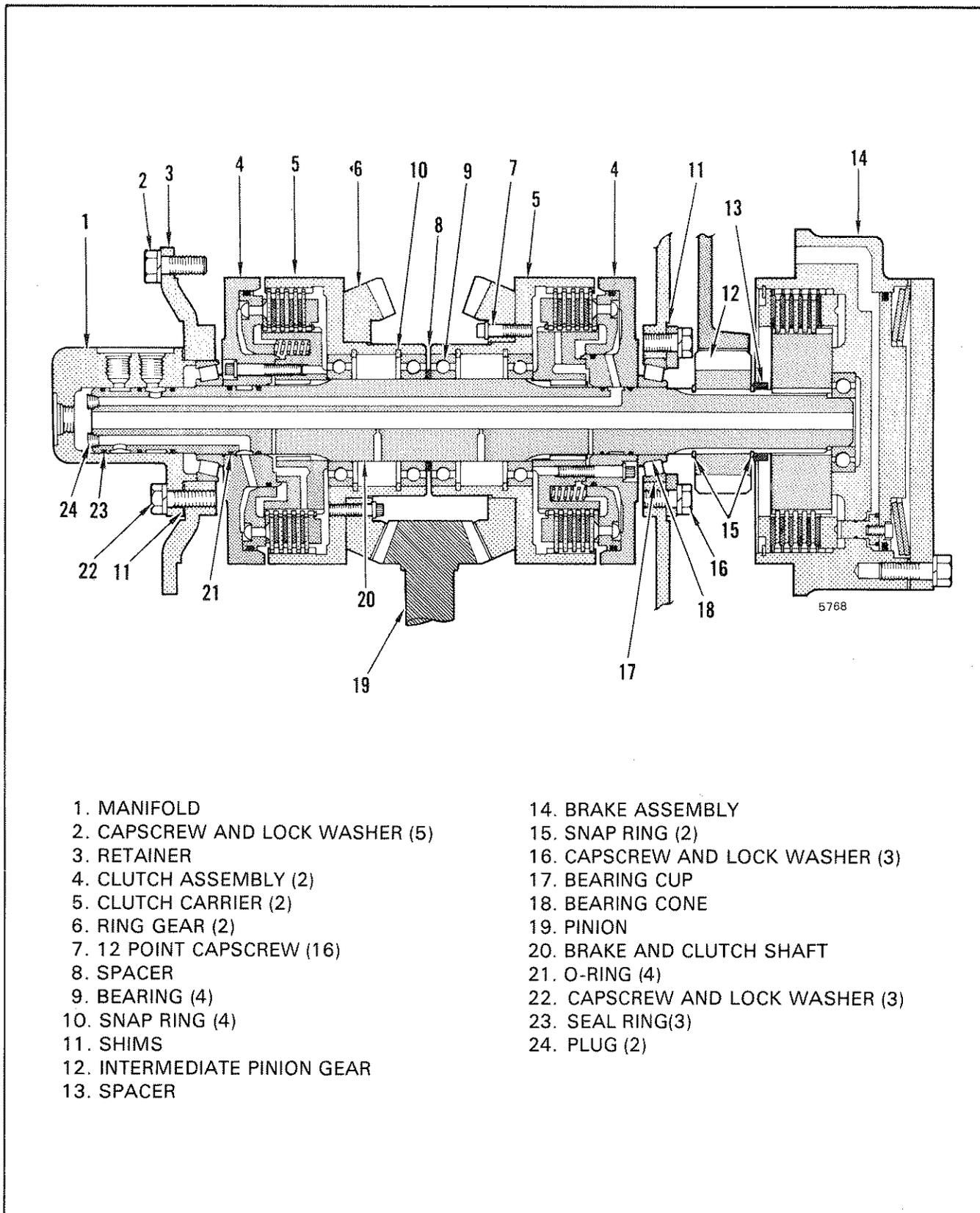
7. Install the four cap screws that hold the bearing carrier to the winch case. Tighten the cap screws to 45 N.m (35 lbf ft).



8. Install the top access cover. Make sure the countersunk cap screw is installed in the correct position or there will be an interference problem when the winch is installed on the tractor.

FIGURE 5.32 ASSEMBLY OF THE PTO GEAR ASSEMBLY FOR THE KOMATSU D41, D45, AND D53 (Page 2 of 2)

INSTALLATION OF THE BRAKE, CLUTCHES, AND SHAFT



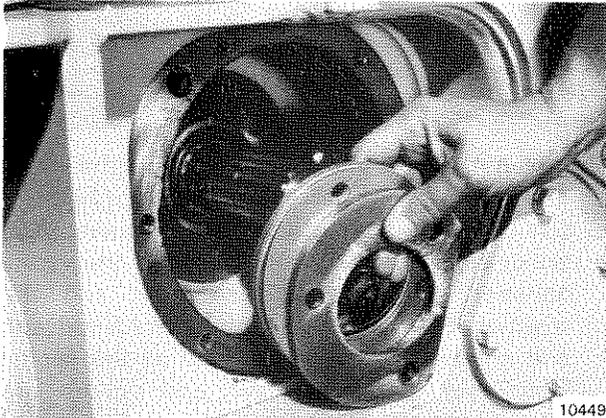
- | | |
|---------------------------------|----------------------------------|
| 1. MANIFOLD | 14. BRAKE ASSEMBLY |
| 2. CAPSCREW AND LOCK WASHER (5) | 15. SNAP RING (2) |
| 3. RETAINER | 16. CAPSCREW AND LOCK WASHER (3) |
| 4. CLUTCH ASSEMBLY (2) | 17. BEARING CUP |
| 5. CLUTCH CARRIER (2) | 18. BEARING CONE |
| 6. RING GEAR (2) | 19. PINION |
| 7. 12 POINT CAPSCREW (16) | 20. BRAKE AND CLUTCH SHAFT |
| 8. SPACER | 21. O-RING (4) |
| 9. BEARING (4) | 22. CAPSCREW AND LOCK WASHER (3) |
| 10. SNAP RING (4) | 23. SEAL RING(3) |
| 11. SHIMS | 24. PLUG (2) |
| 12. INTERMEDIATE PINION GEAR | |
| 13. SPACER | |

FIGURE 5.33 ARRANGEMENT OF COMPONENTS, BRAKE AND CLUTCH SHAFT

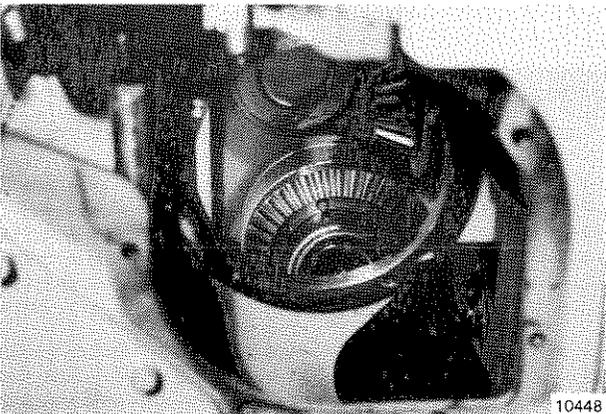
NOTE

If the pinion is not installed, a clutch can be assembled on the shaft and both the clutch and the shaft can be installed as a unit. If the pinion is not installed, some service personnel assemble both clutches on the shaft and use a lifting device to lift

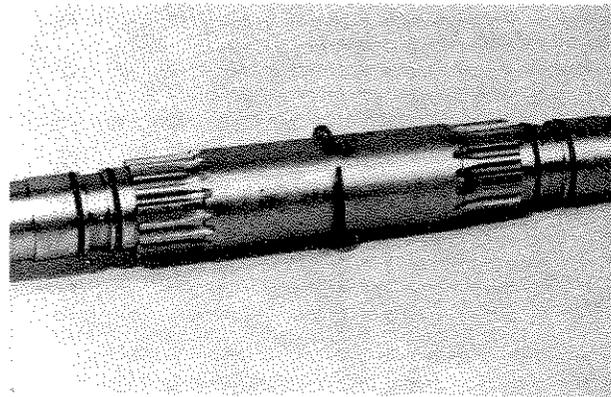
the assembly into the winch case. The side of the winch case with the hydraulics section will be turned up. An assembly of both clutches on the shaft is normally too heavy to lift by hand. This procedure will describe the installation of each clutch and the shaft.



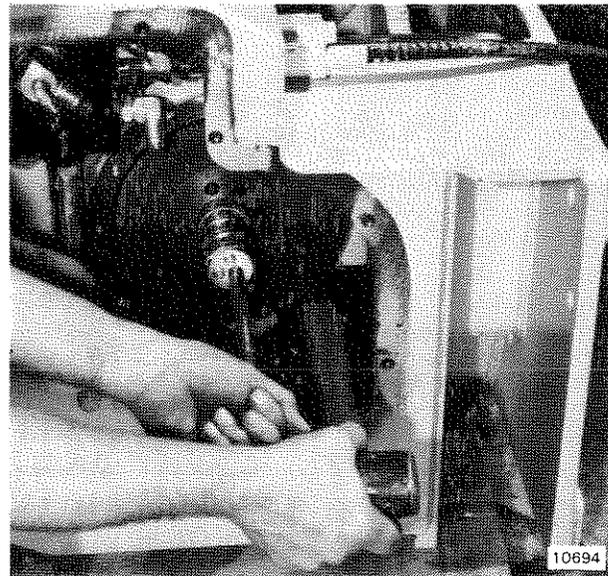
1. If the bearing for the brake end of the shaft was removed, put the replacement bearing cup in the winch case. Install a thickness of 1.28 mm (0.050 in) of shims. The smoothest side of the retainer goes towards the bearing cup. Install the retainer and tighten the capscrews to 100 N.m (75 lbf-ft).



2. Put a clutch and carrier into the winch case and move it under the pinion (if the pinion is still installed). Install the bearing cone into the bearing cup. Use some grease to hold the bearing cup in the bearing cone.

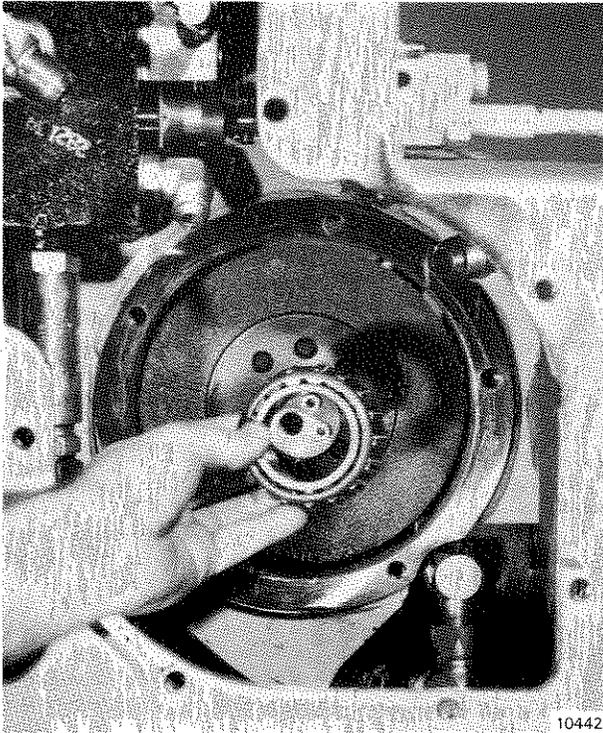


3. Install new O-rings and the center snap ring on the shaft. Install the shaft in the clutch in the winch case. Align the clutch and shaft with the bearing cone and use a driver to push the shaft through the bearing cone.

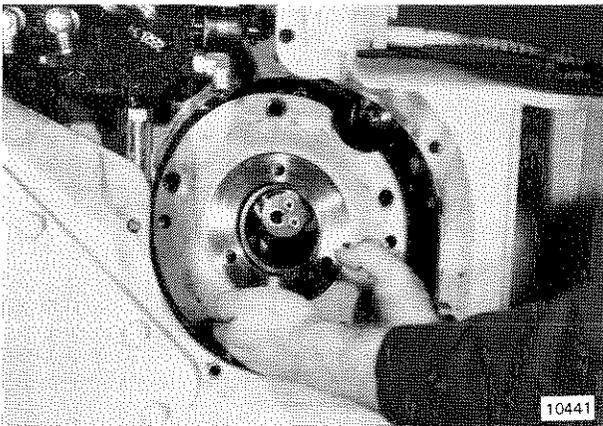


4. Use a drift to hold the shaft when the second clutch is installed. Install the second clutch on the shaft. Use a hammer handle or wood driver to push the clutch on the shaft. Rotate the clutch as necessary to engage the splines on the shaft. Move the clutch so that the bevel gear fully engages the pinion.

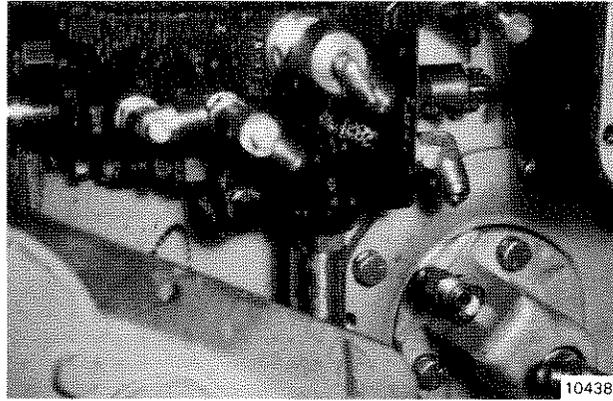
FIGURE 5.34 INSTALLATION OF THE BRAKE, CLUTCHES AND SHAFT (Page 1 of 4)



5. Lubricate the bearing cone with hydraulic oil and install the bearing on the shaft.



6. Install the retainer and tighten the five cap screws evenly to 100 N.m (75 lbf ft).

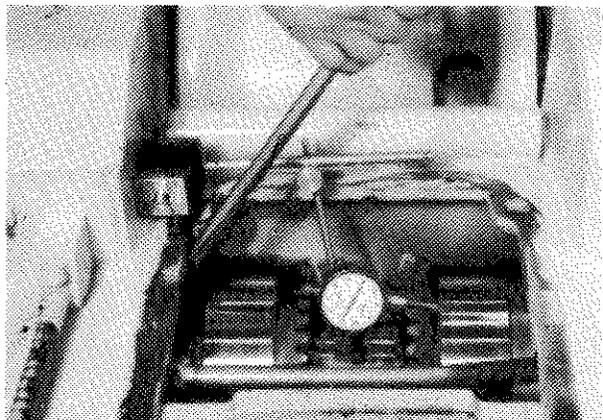


7. Install the hydraulic manifold without the shims and tighten the capscrews to 100 N.m (75 lbf ft). Use a prybar to push the clutches toward the brake side of the winch. Measure the space between the hydraulic manifold and the retainer. Remove the hydraulic manifold and add shims the same thickness as the space. Install the manifold again and tighten the capscrews to 100 N.m (75 lbf ft). Shims are available in the following thicknesses:

0.13 mm (0.005 in)
0.18 mm (0.007 in)
0.51 mm (0.020 in)

8. Check for the preload specification of 0.00 - 0.10 mm (0.000 - 0.004 in) between the clutches.

FIGURE 5.34 INSTALLATION OF THE BRAKE, CLUTCHES AND SHAFT (Page 2 of 4)

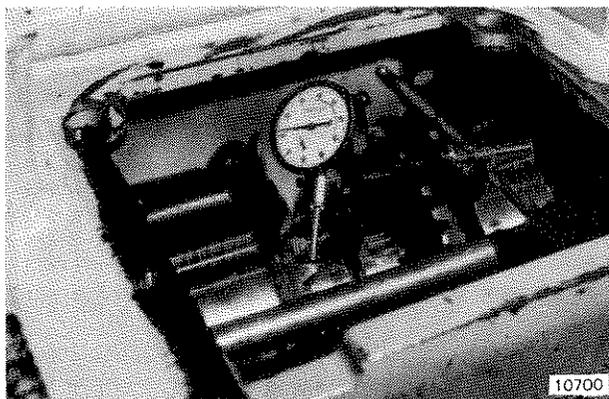


9. Put a dial indicator against the clutch on the brake side of the winch. Use a prybar to move the clutches from side to side. The movement indicated on the dial indicator is the thickness of shims that must be removed. No movement can indicate that shims must be added. Add or remove shims so that the preload is within specifications.



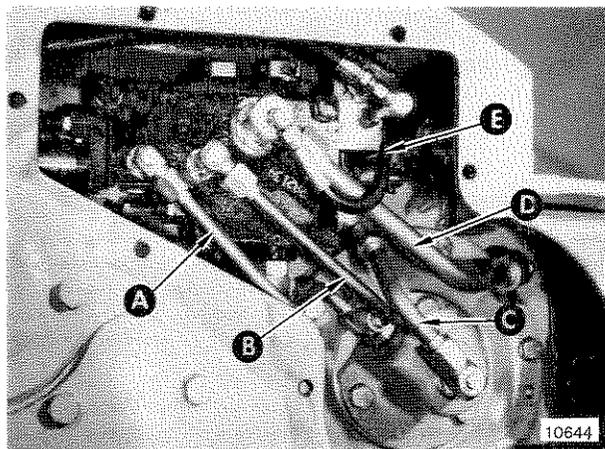
10440

11. When the gear clearances are correct, remove the hydraulic manifold. Install the three seal rings on the shaft. Lubricate the seal rings with hydraulic oil. Carefully install the hydraulic manifold and tighten the capscrews to 100 N.m (75 lbf ft).



10700

10. Check the clearance between the bevel gears on the clutches and the pinion. The pinion must be centered within 0.13 mm (0.005 in). Move shims between the hydraulic manifold and the retainer near the brake as necessary so that the pinion is centered between the two bevel gears. The clearance between the bevel gears and the pinion must be 0.15-0.30 mm (0.006-0.012 in). See the Installation Of The Pinion for instructions to adjust the clearance between the bevel gears and the pinion.

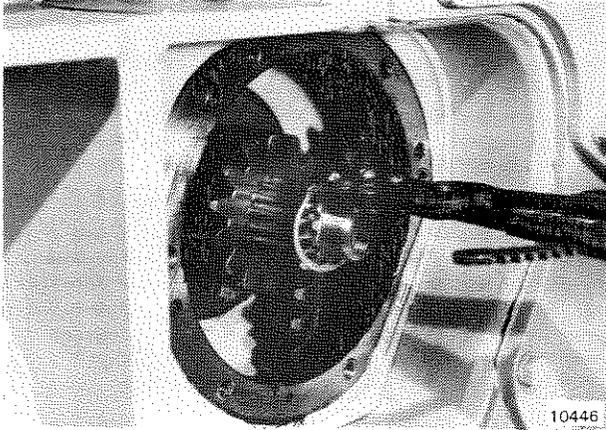


10644

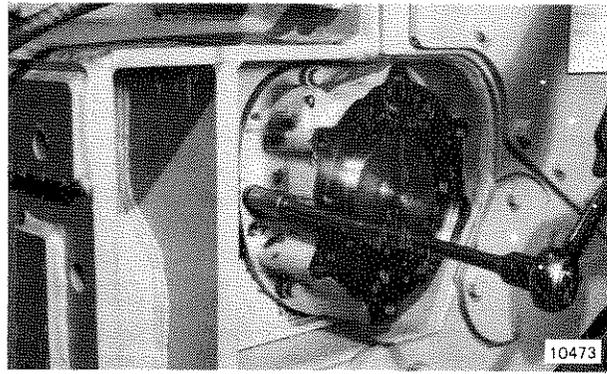
12. Connect the hoses and tubes in the following sequence:

- A** Tube for the reverse clutch pressure.
- B** Tube for the forward clutch pressure.
- C** Tube for the clutch cooling oil.
- D** Tube for the brake.
- E** Hose to the pressure gauge.

FIGURE 5.34 INSTALLATION OF THE BRAKE, CLUTCHES AND SHAFT (Page 3 of 4)

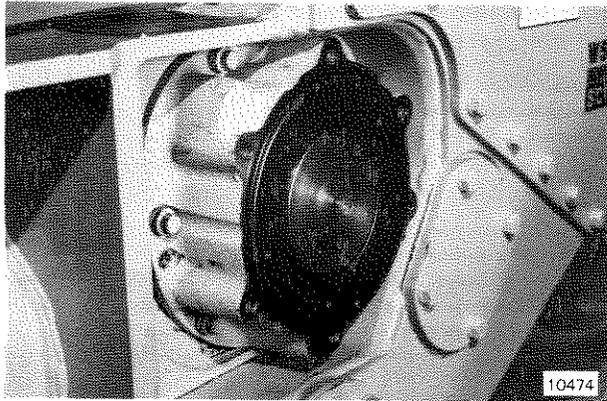


13. Install the snap ring that goes on the shaft between the bearing and the intermediate gear. Install the intermediate pinion gear. Install the outer snap ring and spacer.

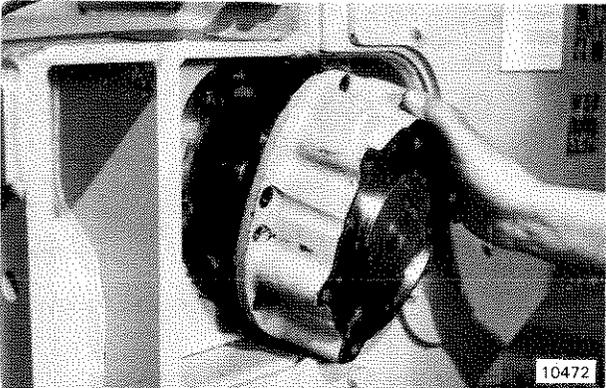


16. Install the 12 point capscrews and tighten to 175 N.m (130 lbf ft).

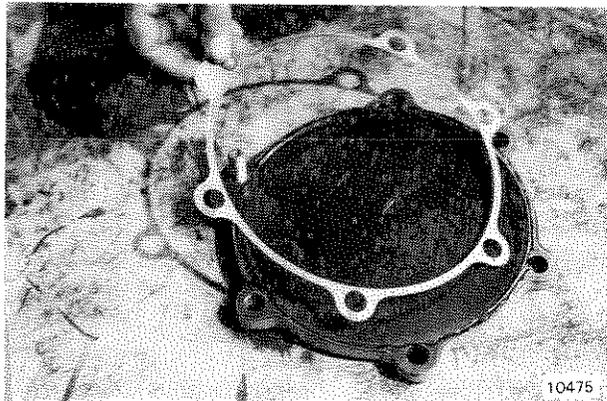
14. Apply a thin layer of liquid sealer to the gasket surface of the housing. Make sure you do not get liquid sealer in the oil leakage or the oil pressure passages. Apply a thin layer of liquid sealer to the gasket where it joins the winch case.



17. Install the two Belleville springs.



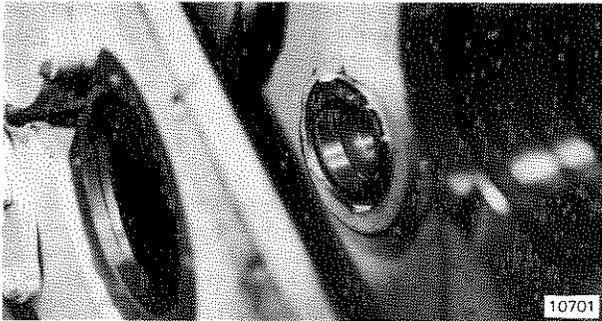
15. Put the brake into position on the winch case. Align the splines of the brake hub with the shaft and push the brake onto the shaft. Lift and rotate the brake as necessary so that the shaft will go into the bearing.



18. Apply LOCKTITE number 271 to both sides of all the shims. Install the cover and the shims. Tighten the capscrews for the cover to 100 N.m (75 lbf ft).

FIGURE 5.34 INSTALLATION OF THE BRAKE, CLUTCHES AND SHAFT (Page 4 of 4)

Installing The Intermediate Gear And The Freespool Shifting Fork



1. Install the bearing cup in the winch case. Put grease on the bearing cone and put the bearing cone into the bearing cup. The grease will hold the bearing cone in the bearing cup.



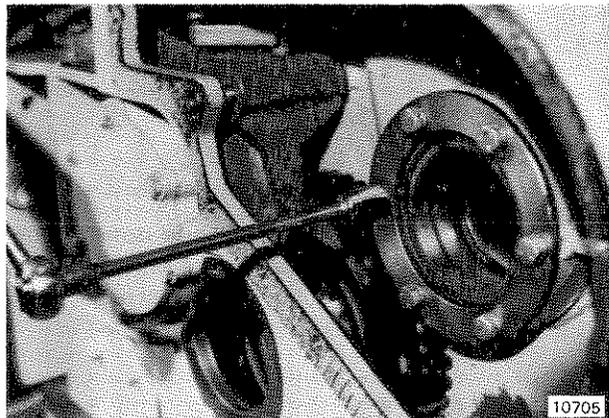
3. Lubricate the shaft for the freespool shifting fork. Align the freespool shifting fork with the bore in the case. Slide the shaft into the bores of the winch case and the freespool shifting fork. Use a punch in two places to lock the shaft in the winch case.



2. Put the intermediate gear in the winch case and hold the gear against the inside wall. Install the sliding sleeve on the intermediate gear with the beveled side of the teeth towards the outer wall of the winch case. Cut the lock wire that holds the detent plug in the freespool shifting fork. Remove the detent plug. Put the freespool shifting fork into the groove of the sliding sleeve. Push the sliding sleeve against the intermediate gear.

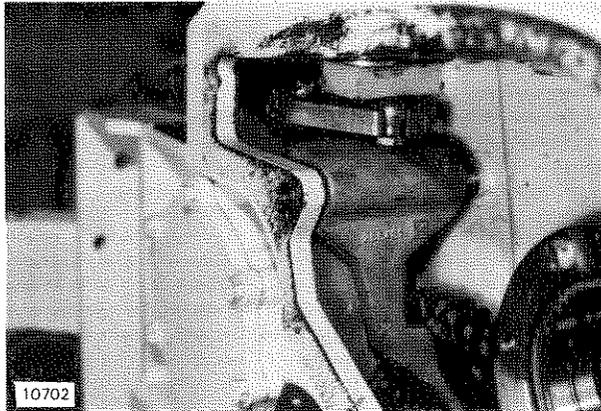
NOTE:

If the drum seal and bearings have been removed, do Steps 8 through 10. If the drum seal and bearings have not been removed, go to Step 5.

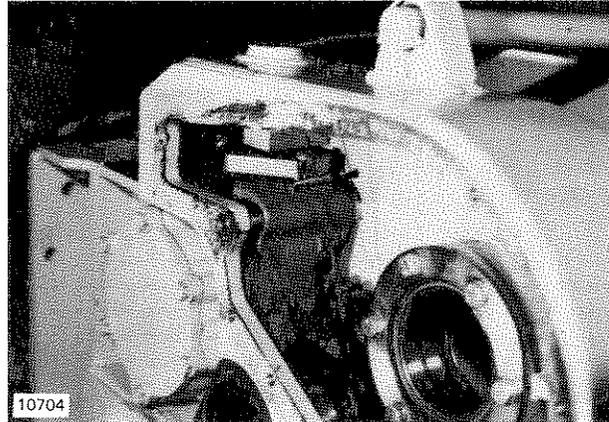


4. Install the drum bearings and bearing retainer in the winch case. If the bearing retainer was not removed, install the capscrew. The torque for the retainer capscrews is 100 N.m (75 lbf ft).

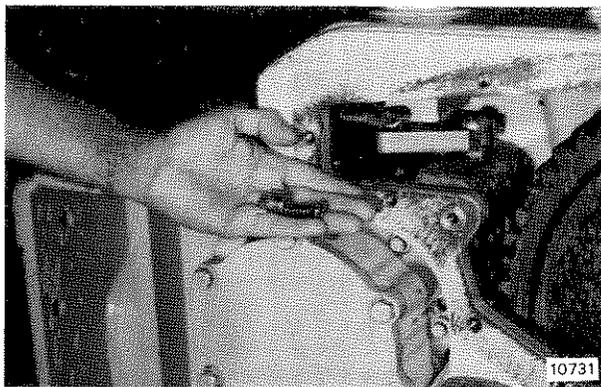
FIGURE 5.35 INSTALLING THE INTERMEDIATE GEAR AND THE FREESPOOL SHIFTING FORK (Page 1 of 4)



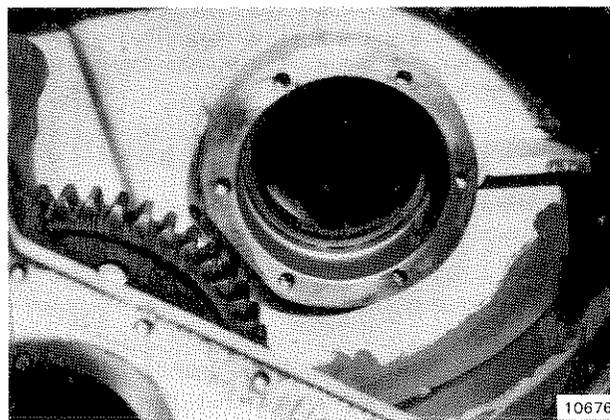
5. Pull the freespool shifting fork towards the outside of the winch case.



7. Use wire that is strong enough to hold the intermediate gear. Put the wire around the collar of the sliding sleeve and through the oil fill hole in the winch case (see the photograph). Fasten the wire to the cross bar. Put the anchor pin for the control cable through the two strands of wire and twist the wire until it is tight. You will tighten the wire to raise the intermediate gear into position after the drum gear is installed.

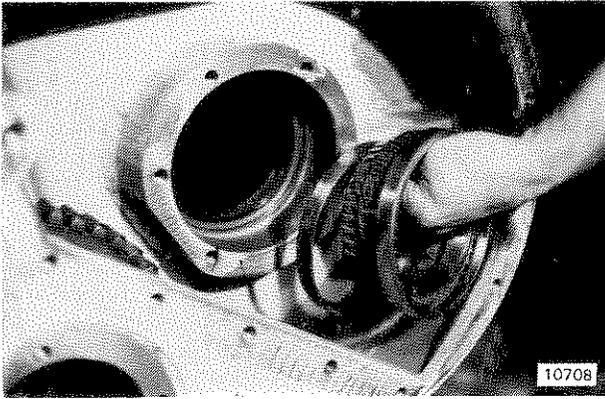


6. Install the detent ball, spring and detent plug. Turn the plug into the fork approximately two threads. (Adjustment of the detent pressure will be made later in this procedure.)

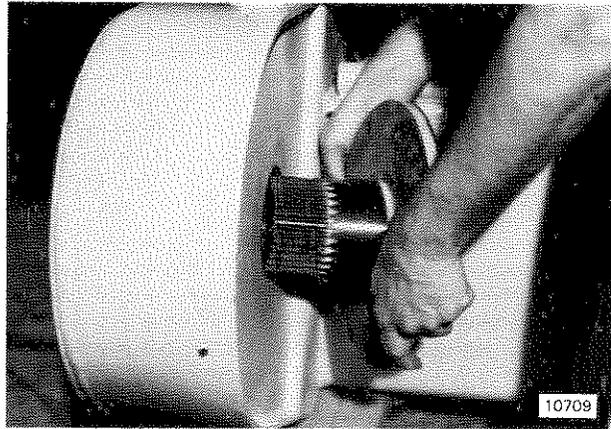


8. Install a new drum seal in the winch case. The lip of the seal is installed towards the drum.

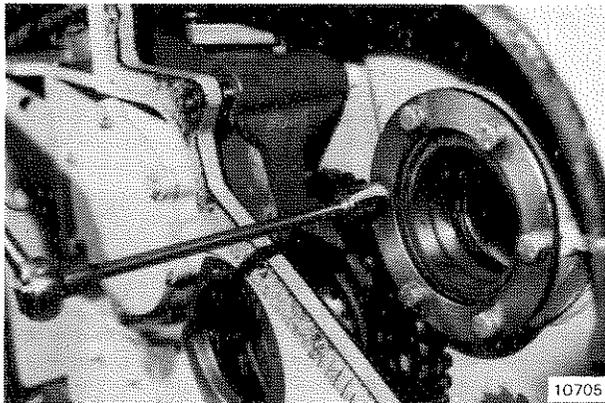
FIGURE 5.35 INSTALLING THE INTERMEDIATE GEAR AND THE FREESPOOL SHIFTING FORK (Page 2 of 4)



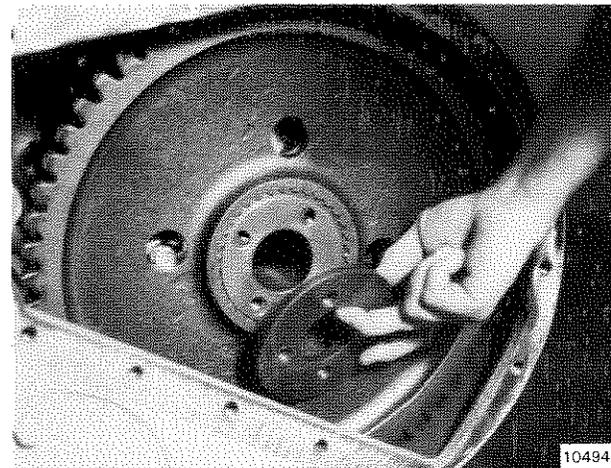
9. Install the set of bearings for the drum adapter in the winch case.



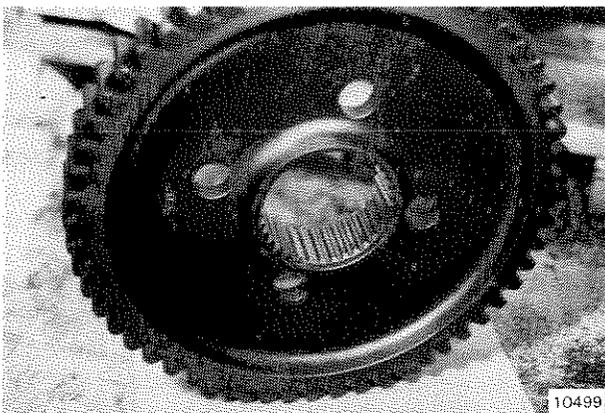
12. Lubricate the hub of the drum adapter with hydraulic oil before it is installed in the bearings and seal. Hit the drum adapter with a hammer to make sure it is fully installed in the bearings and seal.



10. Install the retainer for the drum bearings. Tighten the capscrews to 100 N.m (75 lbf ft).

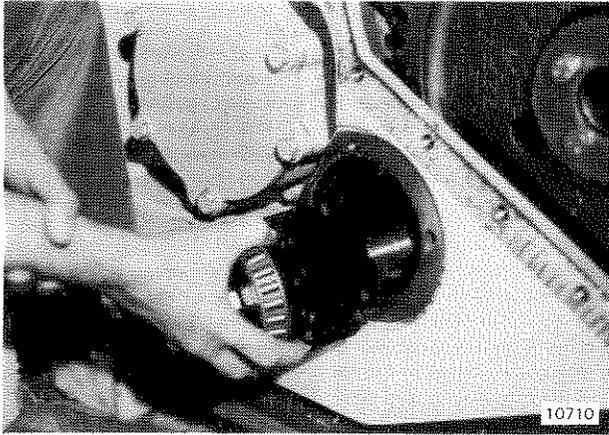


13. Make sure the drum gear is fully installed on the splines of the drum adapter. Put a straight edge across the hub of the drum gear. Measure the distance from the straight edge to the hub of the drum adapter. Add shims to the hub of the drum adapter so that the clearance is 0.00-0.89 mm (0.000-0.035 in). This clearance sets the preload on the bearings of the drum adapter. Tighten the four capscrews to 100 N.m (75 lbf ft).

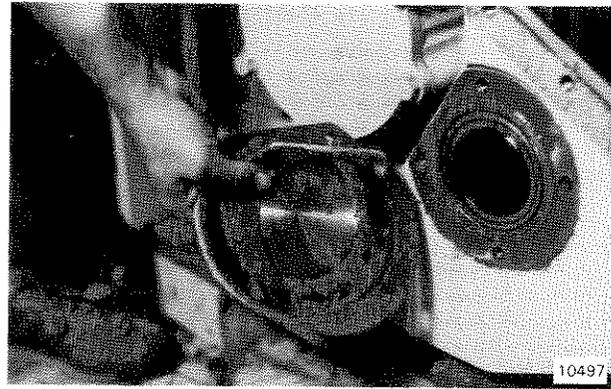


11. Put the drum gear into the winch case. The bevel on the inside splines of the drum gear goes against the drum bearing retainer.

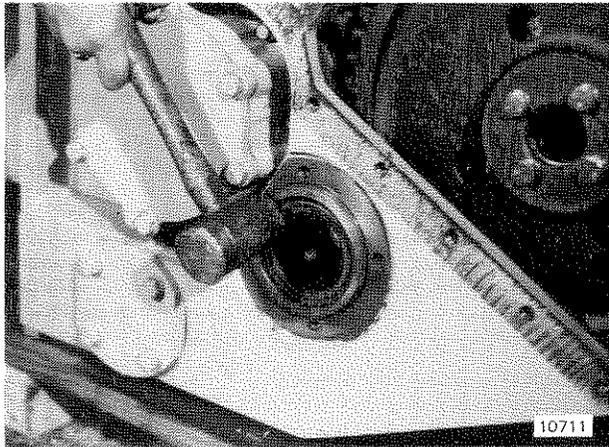
FIGURE 5.35 INSTALLING THE INTERMEDIATE GEAR AND THE FREESPOOL SHIFTING FORK (Page 3 of 4)



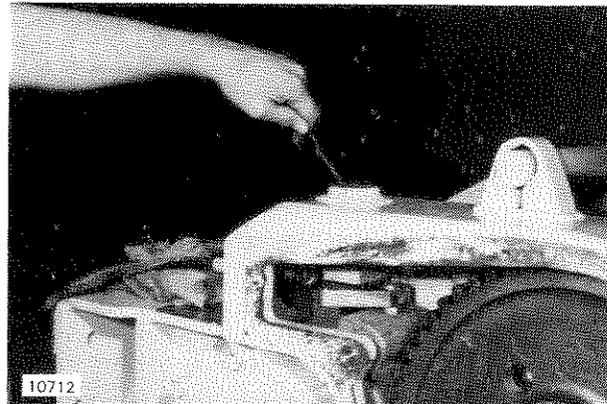
14. Tighten the wire around the sliding sleeve until the intermediate gear is aligned with the bearing in the winch case. Install the intermediate shaft into the intermediate gear. Rotate the intermediate shaft as necessary so that the drum pinion gear engages the drum gear. Use a hammer to push the intermediate shaft into the bearing.



16. Clean the shims that were removed from under the cover for the intermediate shaft. Install the shims and cover. Tighten the capscrews to 100 N.m (75 lbf ft). [If the original shims are damaged or not available, install new shims for a thickness of 1.1 mm (0.045 in). This shim thickness will be adjusted after the winch is assembled.]



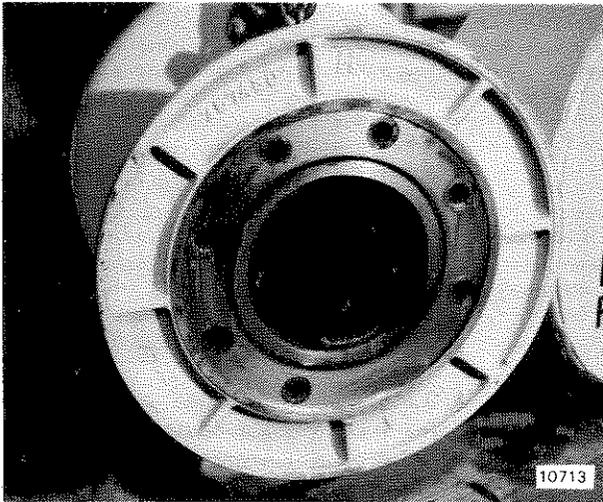
15. Install the bearing cone into the winch case.



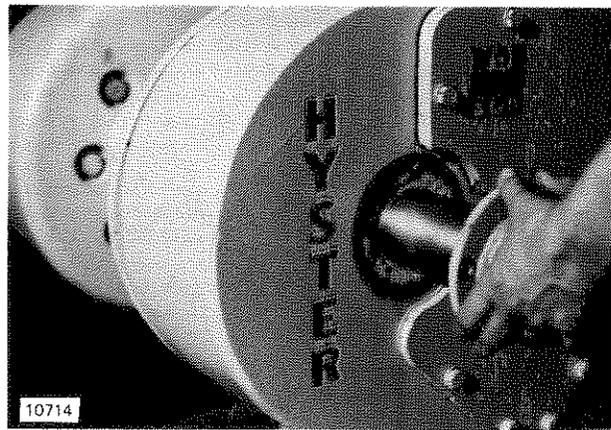
17. Cut the wire and pull it out of the winch case. Adjust the detent plug to set the pressure on the detent ball. The force to move the freespool shifting fork out of the detent can be adjusted to the needs of the operator. The pressure on the detent ball must be enough to make sure that the freespool shifting fork will stay in each detent position. When the adjustment is complete, install a safety wire through the hole in the adjustment plug and around the freespool shifting fork. Connect the freespool control cable to the bellcrank with the pin and cotter pin.

FIGURE 5.35 INSTALLING THE INTERMEDIATE GEAR AND THE FREESPOOL SHIFTING FORK (Page 4 of 4)

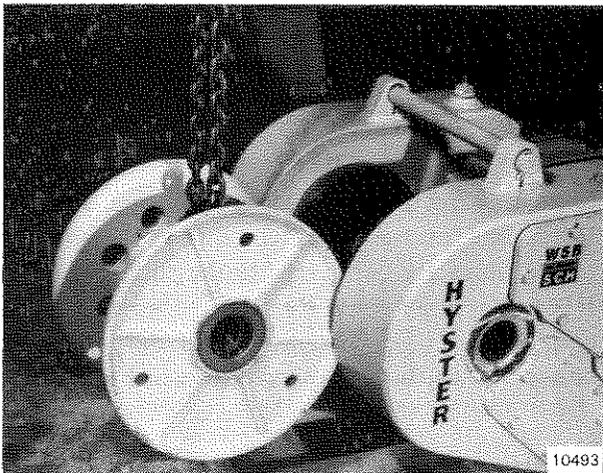
Installation Of The Drum



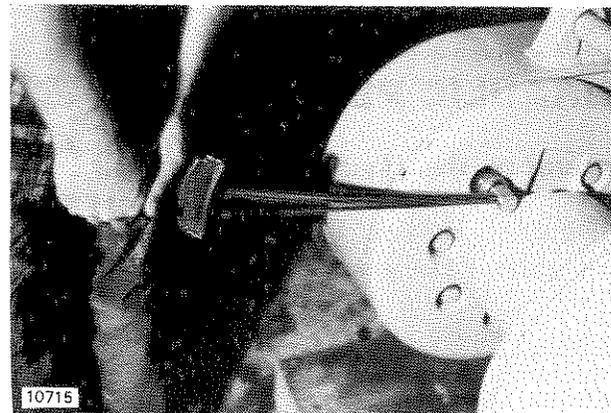
1. Install a new seal ring in the left side of the drum.



3. Inspect the drum shaft for grooves or other damage. A "Speedi Sleeve", Chicago Rawhide Part Number 99300 is available to repair a damaged drum shaft. Lubricate the drum shaft and push it into the winch case so that it engages the bearing in the drum. Tighten the four capscrews to 100 N.m (75 lbf ft).

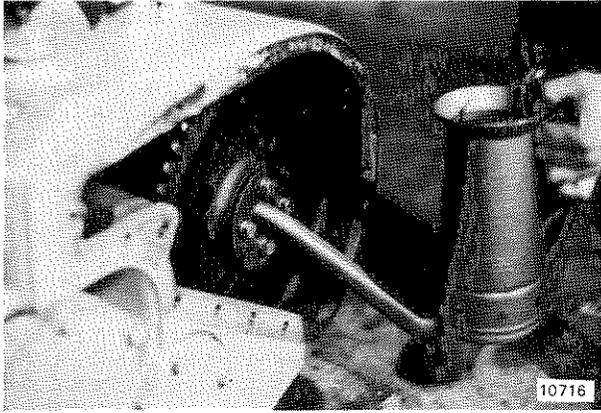


2. Install a new oil seal in the right side of the drum. The lip of the oil seal is towards the outside of the drum. Use a crane to lift the drum into position in the winch case. Align the bolt holes in the drum and drum adapter. Install these seven bolts, but do not tighten them.

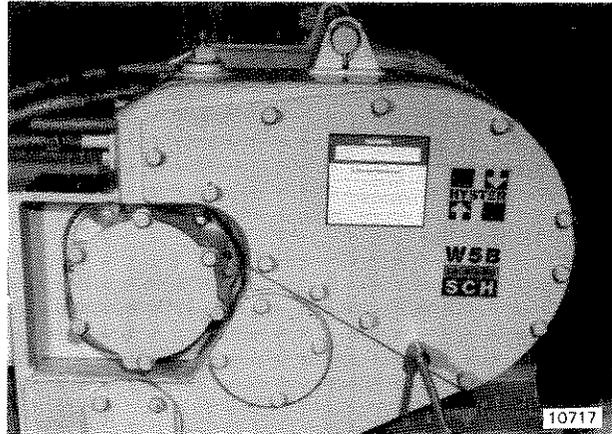


4. Tighten these seven drum bolts evenly to 200 N.m (150 lbf ft).

FIGURE 5.36 INSTALLING THE DRUM (Page 1 of 2)



5. Rotate the drum until the receptacle for the cable ferrule is vertical. Add one litre (quart) of hydraulic oil to the drum.



6. Apply a thin layer of liquid sealant to hold the gasket on the access cover. Install the access cover and tighten the capscrews.

FIGURE 5.36 INSTALLING THE DRUM (Page 2 of 2)

HYDRAULIC PUMP

Removal of the Hydraulic Pump

The hydraulic pump will operate in either direction because some PTO gear assemblies turn in the

opposite direction from other PTO gear assemblies. When the pump turns clockwise, the input and output lines are connected to the pump as shown in Figure 5.37. When the pump turns counterclockwise, the input and output lines are connected to the pump as shown in Figure 5.38.

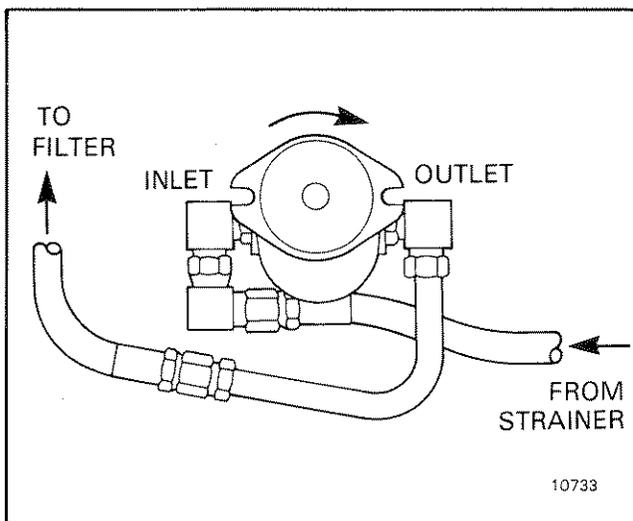


FIGURE 5.37 PUMP WITH CLOCKWISE ROTATION

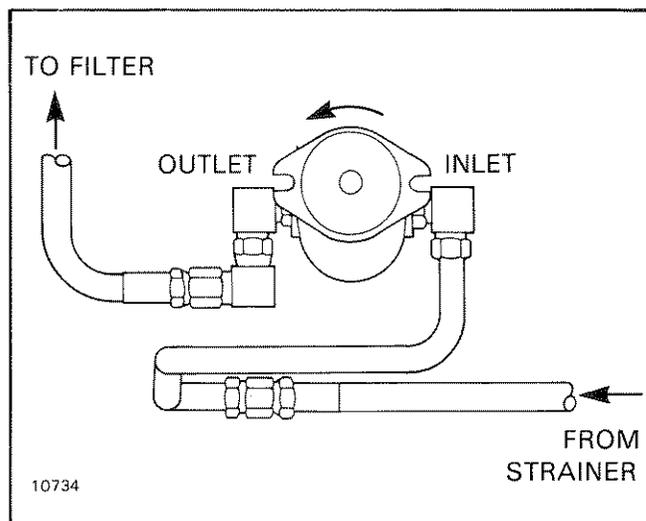
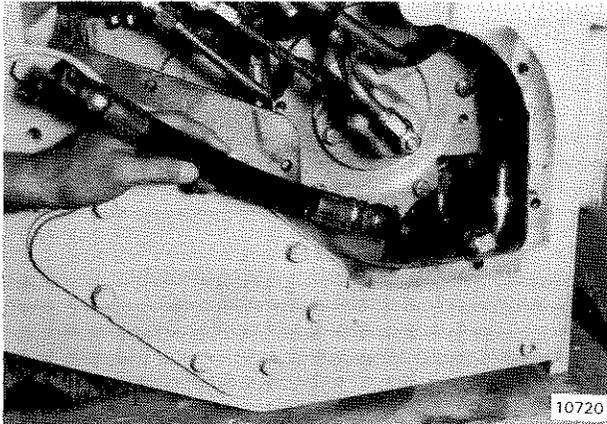
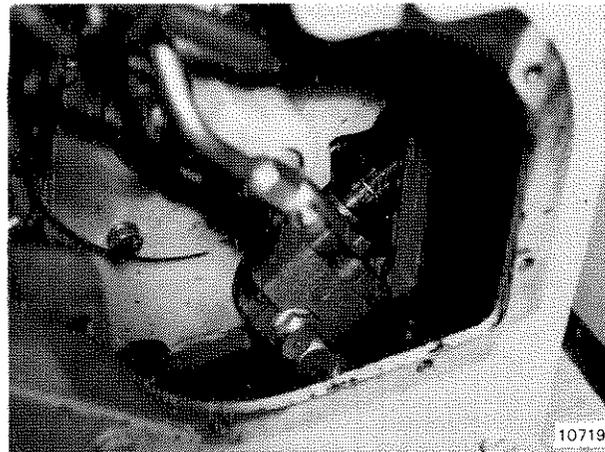


FIGURE 5.38 PUMP WITH COUNTERCLOCKWISE ROTATION

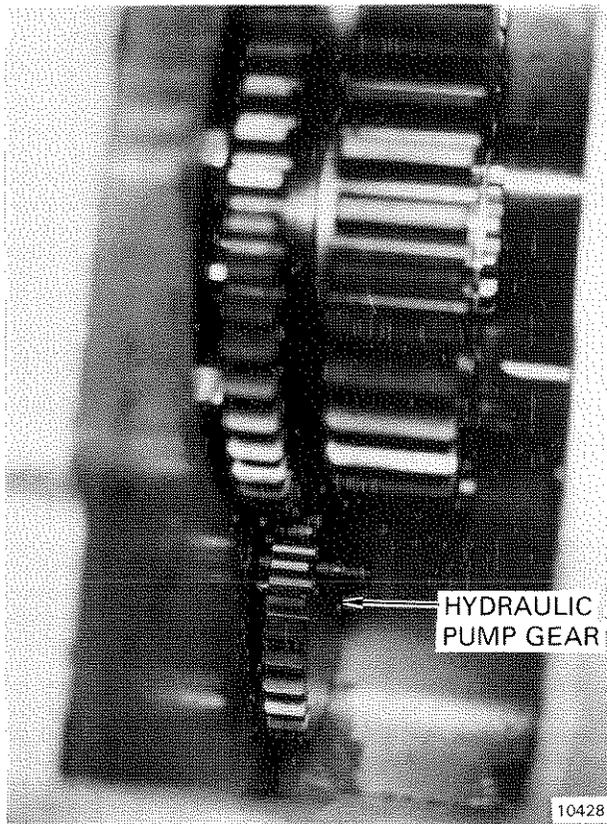


1. Disconnect the suction line from the pump. Disconnect and remove the output line between the pump and the filter. DO NOT remove the 90° elbows from the pump body.

3. Loosen the inner 3/8 UNC x 1 inch capscrew that holds the pump to the winch case. This capscrew is on the side of the pump next to the centerline of the winch case and can be difficult to reach with a wrench.



4. Remove the outer 3/8 UNC x 1 inch capscrew that holds the pump to the winch case. Slide the pump from under the inner capscrew and turn the pump body as required to remove it from the winch case.



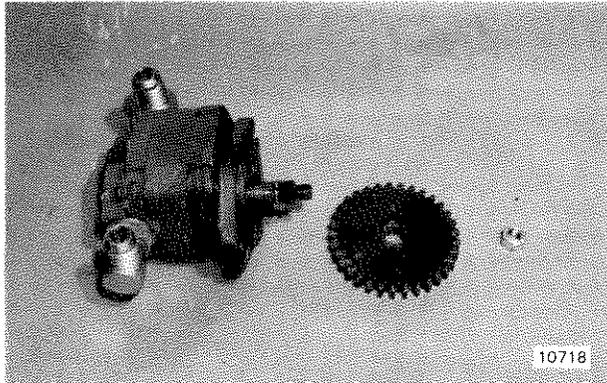
2. Remove the nut that holds the gear to the pump shaft. Use a prybar to remove the gear from the pump shaft.

FIGURE 5.39 REMOVAL OF THE HYDRAULIC PUMP

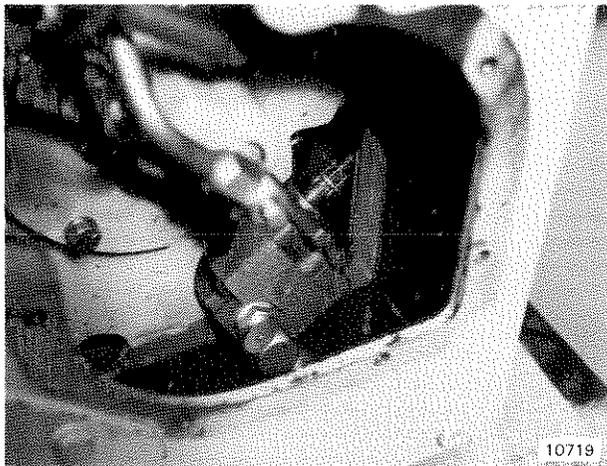
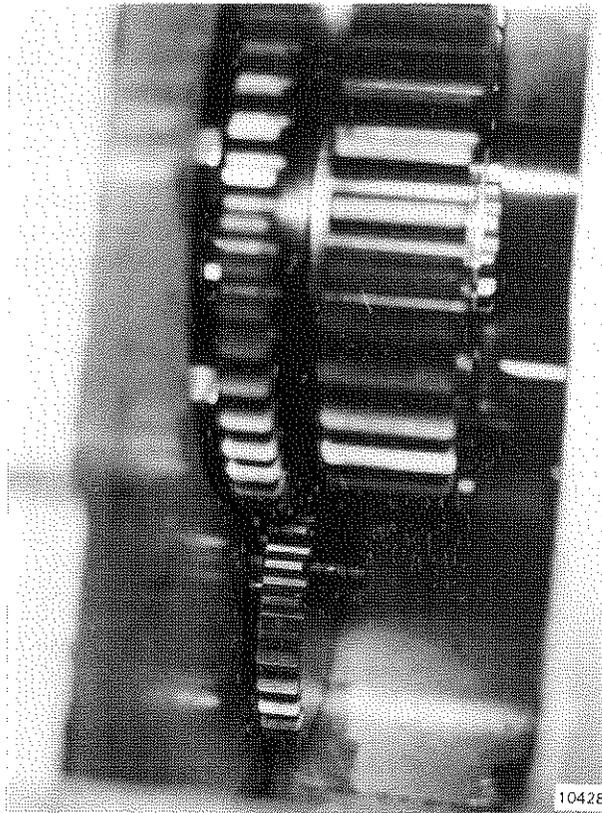
Repairs

Installation Of The Hydraulic Pump

See the description for the direction of the hydraulic pump and the input and output connections in Figures 5.37 and 5.38.

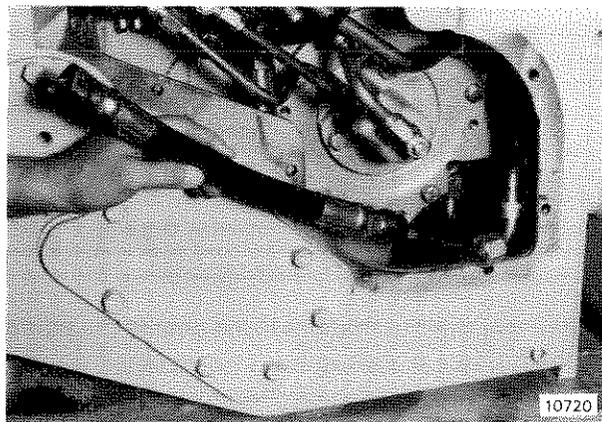


1. Install the two 90° hydraulic fittings in the pump body if they were removed. Install the snap ring on the pump shaft. The square corner on the snap ring must be towards the pump body.
2. If the inner 3/8 UNC x 1 inch capscrew was removed, install the capscrew so that the threads are engaged two turns. Pull the washers against the head of the capscrew.



3. Put the pump into the winch case. Slide the mounting lug of the pump under the 3/8 inch capscrew. Install the outer 3/8 UNC x 1 inch capscrew and washers. Align the pump in the winch case and tighten both capscrews.

4. Install the drive gear on the pump shaft. Tighten the nut on the pump shaft.



5. Connect the hydraulic lines to the pump.

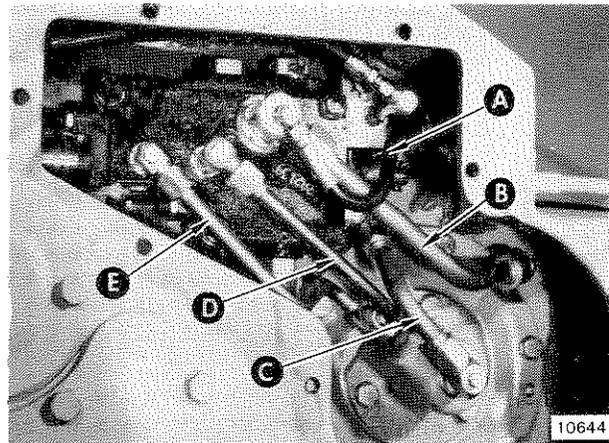
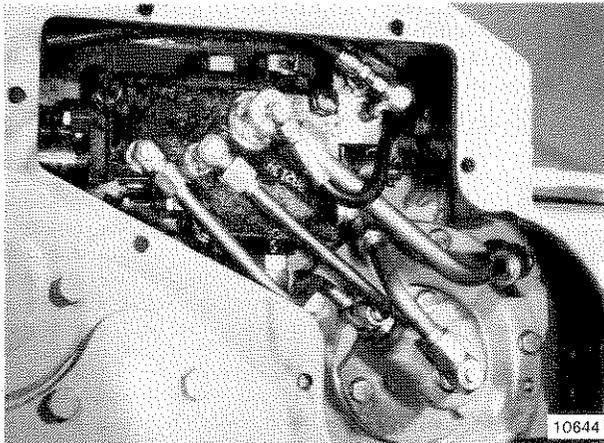
FIGURE 5.40 INSTALLATION OF THE HYDRAULIC PUMP

CONTROL VALVE AND ACCUMULATORS

This section describes the removal and installation of the control valve. Most of the parts of the control valve can be replaced. If the bores of the control valve are damaged so that the performance is changed, the valve must be replaced.

The control valve must be removed if the accumulators must be removed for repair or replacement.

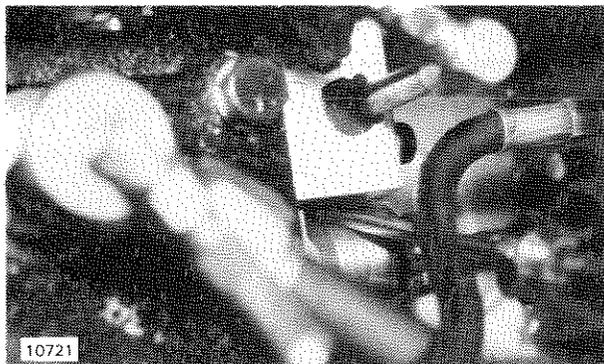
This section is written for these repairs being made with the winch still installed on the tractor. The instructions in this section is also for making repairs if the winch has been removed from the tractor.



1. Put the right side of the tractor on a block or raised surface to tilt the tractor and winch approximately 15°. Drain the oil in the winch below the opening of the large access cover to the hydraulic system. Remove one of the capscrews at the bottom of the access cover to check the oil level.

3. Remove the hoses and tubes in the following order:

- Ⓐ Hose to the pressure gauge
- Ⓑ Tube to the brake
- Ⓒ Tube for the clutch cooling oil
- Ⓓ Tube for the forward clutch pressure
- Ⓔ Tube for the reverse clutch pressure

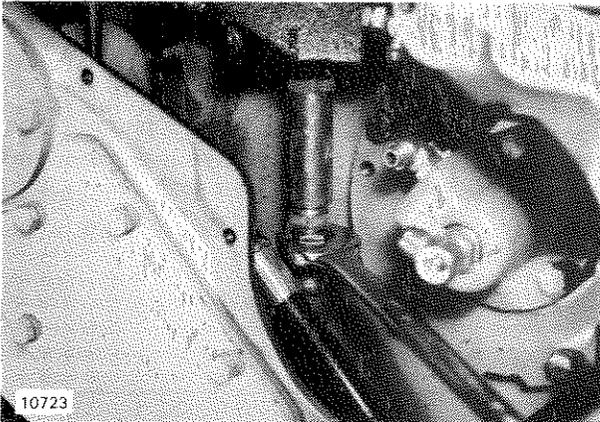


2. Make sure the accumulators are discharged. If the control lever is not connected, put a screwdriver under the pin in the accumulator valve. Lift the pin until the accumulators are discharged.

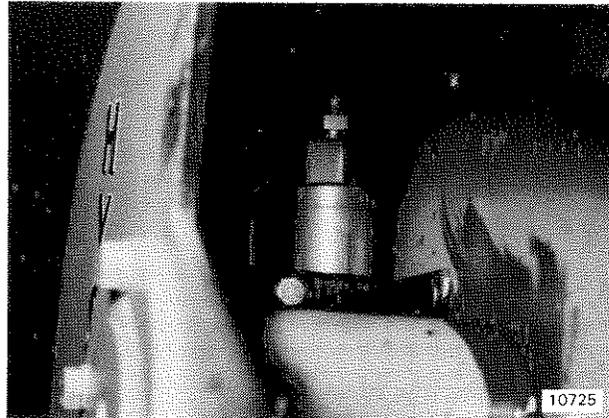


4. Remove the hoses from the accumulator valve.

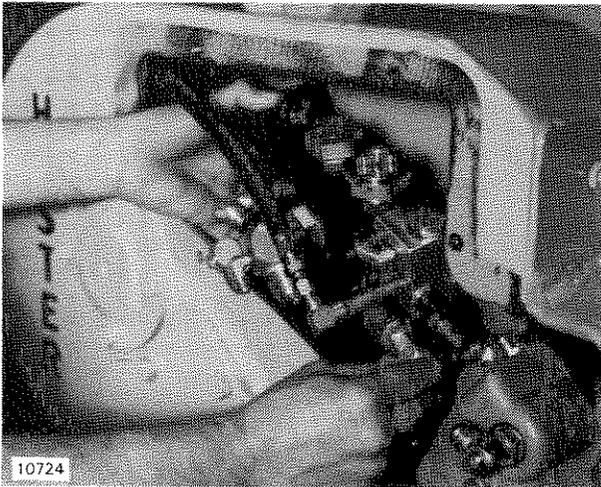
FIGURE 5.41 REMOVAL OF THE CONTROL VALVE AND ACCUMULATORS (Page 1 of 2)



5. Disconnect the hose to the check valve.

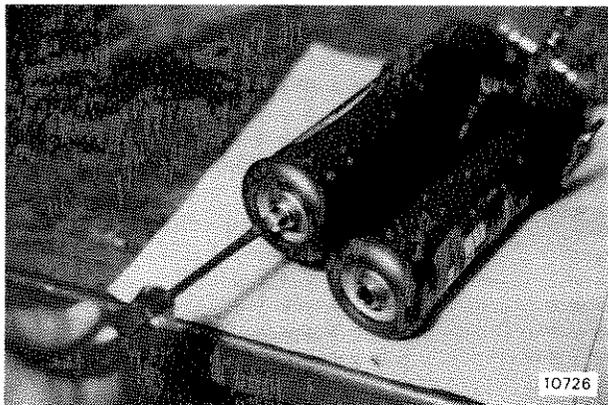


7. If the accumulators must be removed, remove the capscrew that holds the accumulators in the winch case. Lift the accumulators out of the winch case.

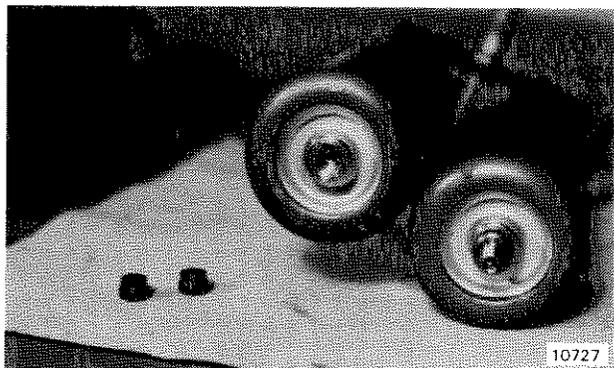


6. Remove the three capscrews and remove the control valve from the winch case.

FIGURE 5.41 REMOVAL OF THE CONTROL VALVE AND ACCUMULATORS (Page 2 of 2)



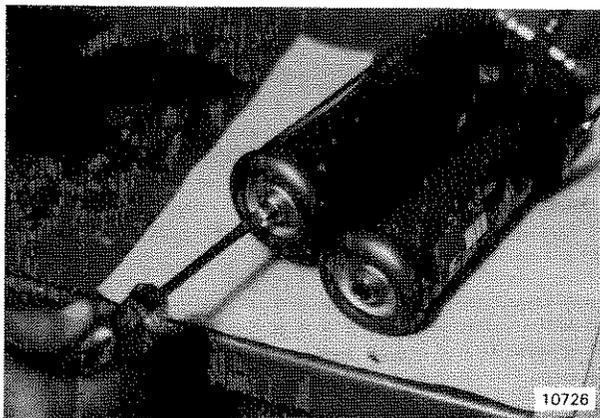
1. See Figure 5.41 to remove the accumulators. Remove the plugs from the end of the accumulators.



2. Install the adaptor to charge the accumulator (part number SKS 6495). If the rubber container inside the accumulator is bad, oil will come out of the adaptor when the valve pin is pushed.

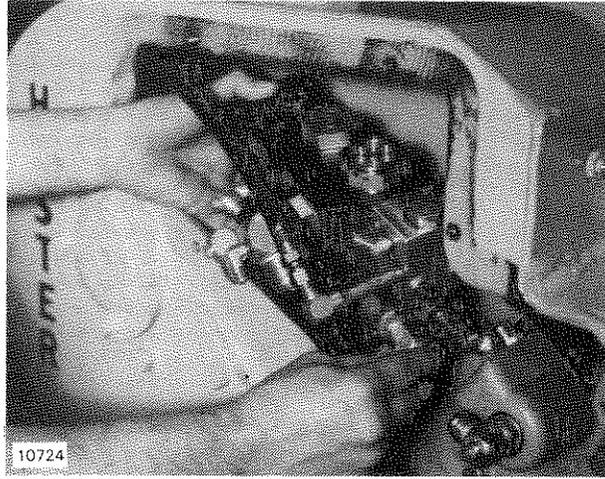
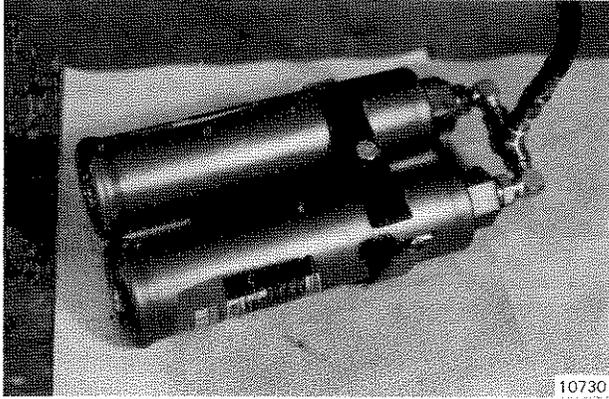


3. Test the pressure in the accumulators. The correct pressure is 690 kPa (100 psi) (6.9 bar) of nitrogen gas. In areas where nitrogen gas is not available, compressed air can be used. Charge the accumulators to the correct pressure. Make sure you do not discharge the accumulators below the correct pressure when you test the pressure with the pressure gauge.



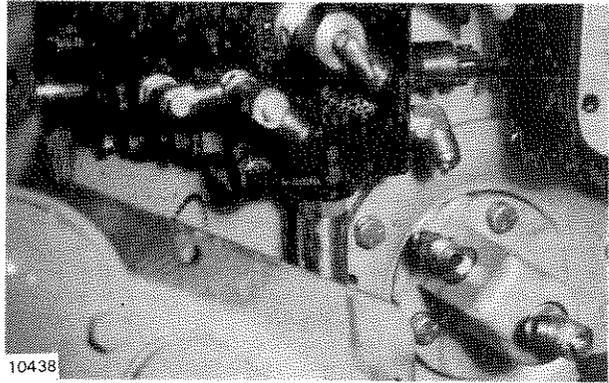
4. Remove the adaptor and install the plugs in the ends of the accumulators.

FIGURE 5.42 REPAIR OF THE ACCUMULATORS

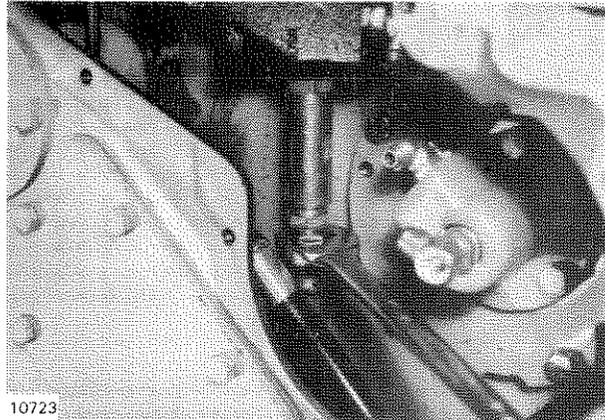


1. If the accumulators were removed, install the accumulators in the winch case. Tighten the cap screw for the bracket that holds the accumulators in the winch.

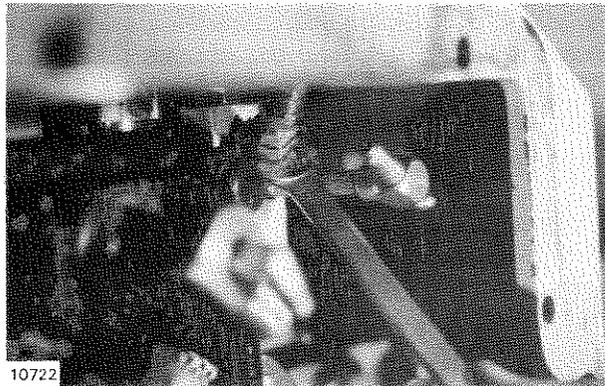
3. Install the control valve in the winch. Tighten the cap screws to 100 N.m (75 lbf ft).



2. If a new control valve is being installed, the spool must be removed so that the 90° elbow can be installed in the front of the valve body. Install all of the 90° elbows as shown in the photograph. Install the control spool in the control valve. Install the cam for the accumulator valve on the control spool. Install the accumulator valve on the control valve.

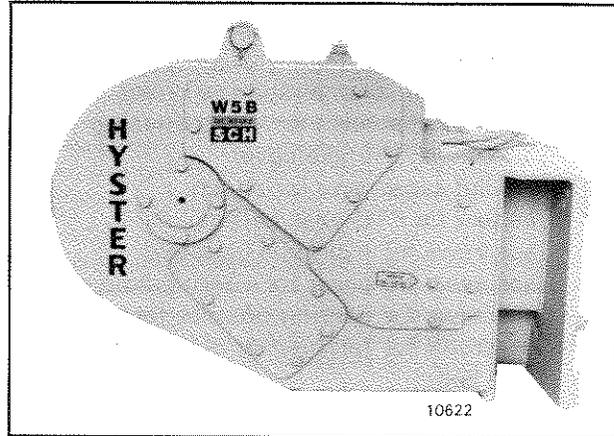
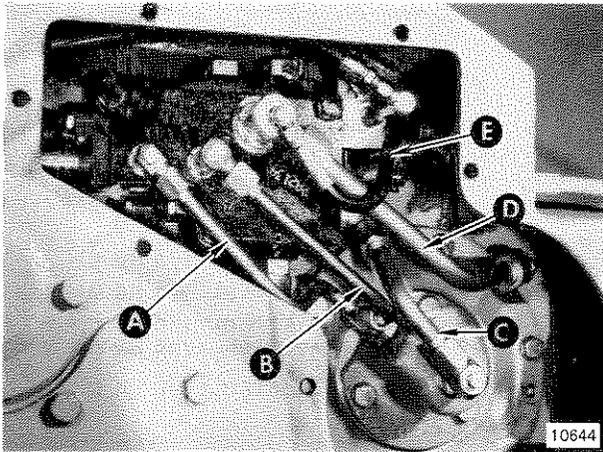


4. Connect the hose to the check valve.



5. Connect the hoses to the accumulator valve.

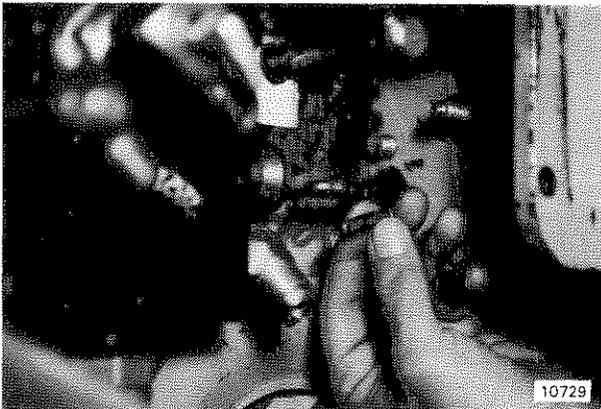
FIGURE 5.43 INSTALLATION OF THE CONTROL VALVE AND ACCUMULATORS
(Page 1 of 2)



6. Connect the hoses and tubes in the following sequence:

- A** Tube for the reverse clutch pressure
- B** Tube for the forward clutch pressure
- C** Tube for the clutch cooling oil
- D** Tube to the brake
- E** Hose to the pressure gauge

8. Install the access covers on the right side of the winch. Use new gaskets as necessary. Move the tractor so that it is not tilted. Add the correct hydraulic oil so that the level is raised to the check plug. See the SERVICE section for the oil specification.



7. Connect the control cable to the control spool. Install the clevis pin and cotter pin.

FIGURE 5.43 INSTALLATION OF THE CONTROL VALVE AND ACCUMULATORS
(Page 2 of 2)

Repairs

Capscrews for retainer for pinion	50 N.m (35 lbf ft)
Capscrew for plungers in the brake	3 N.m (25 lbf in)
12 point capscrews for brake housing	175 N.m (130 lbf ft)
Capscrews for brake cover	100 N.m (75 lbf ft)
12 point capscrews for clutch	40 N.m (30 lbf ft)
See text for PTO gear assemblies	
Capscrews for hydraulic manifold	100 N.m (75 lbf ft)
Capscrews for cover for intermediate shaft	100 N.m (75 lbf ft)
Capscrews for bearing retainer for drum adapter	100 N.m (75 lbf ft)
Capscrews for retainer for drum gear	100 N.m (75 lbf ft)
Drum bolts	200 N.m (150 lbf ft)

TABLE 5.2 TORQUE SPECIFICATIONS

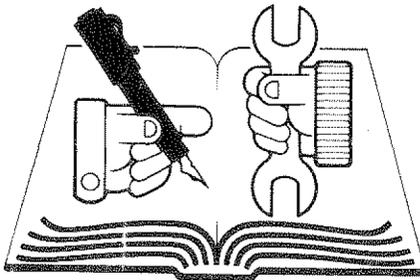
TRACTOR MAKE/MODEL	PUMP ROTATION*	LOCATION OF "LINE IN" CLUTCH†
Case 1150C, D	CW	Right
Cat D4	CCW	Left
Cat D5B	CCW	Left
Cat D6D	CCW	Left
Fiatallis 8B, FL9, 10C	CW	Right
FMC CA220	CCW	Left
IHC TD12, 15C, 175	CCW	Left
JD 655, 750 755	CCW	Left
KOM D45, D41 D53	CW	Right

*See Figures 5.37 and 5.38 for hydraulic pump connections.
 †When standing behind tractor and looking forward.

TABLE 5.3 CLUTCH LOCATION

INTENTIONALLY BLANK

This service manual is written in a controlled English language (Hyster Easy Language Program). The sentence structure is simple and each word has only one meaning. Therefore it is easy to read and understand. Hyster publications written in a controlled language have the following symbol.



Hyster Easy Language Program