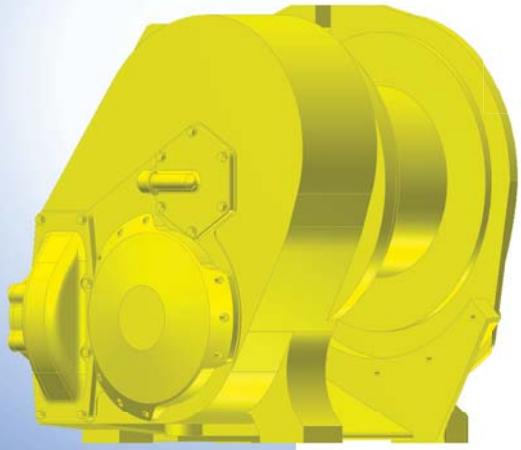
Allied WINCH

Service Manual

Allied W300 & 400 Series Winch



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CUSTOMER EDITION

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Safety Precautions

Read, understand and observe the precautions on the following pages to prevent injury to personnel and damage to equipment.

Winch serial number _____

Date put into service _____

NOTE: This publication may be translated to different languages for sole purpose of easy reference in non-English speaking locations. Should there be differences in interpretations to the text, please refer to the English language edition published by Allied Systems Company as the controlling document.

Safety Summary

General Safety Notices

The following pages contain general safety warnings which supplement specific warnings and cautions appearing elsewhere in this manual. All electrical and hydraulic equipment is dangerous. You must thoroughly review and understand the Safety Summary before attempting to operate, troubleshoot or service this winch.

The following symbols/terms are used to emphasize safety precautions and notices in this manual:

⚠ DANGER

The "DANGER" symbol indicates a hazardous situation which, if not avoided, will result in death or serious injury. Carefully read the message that follows to prevent serious injury or death.

⚠ WARNING

The "WARNING" symbol appears wherever incorrect operating procedures or practices could cause serious injury or death. Carefully read the message that follows to prevent serious injury or death.

⚠ CAUTION

The "CAUTION" symbol appears where a hazardous situation which, if not avoided, could result in minor to moderate injury and equipment damage.

NOTICE

This signal word alerts to a situation that is not related to personal injury but may cause equipment damage.

NOTE: …

The term "NOTE" highlights operating procedures or practices that may improve equipment reliability and/or personnel performance.

Safety Regulations

Each country has its own safety legislation. It is in the operator's own interest to be conversant with these regulations and to comply with them in full. This also applies to local bylaws and regulations in force on a particular worksite.

Should the recommendations in this manual deviate from those in the user' country, the national regulations should be followed.

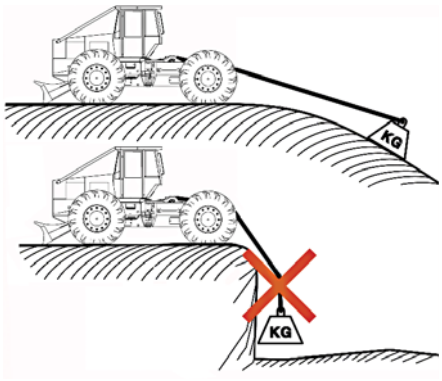
NOTE: All possible safety hazards cannot be foreseen so as to be included in this manual. Therefore, you must always be alert to potential hazards that could endanger personnel and/or damage the equipment.

Operation, Inspection, and Maintenance Warnings

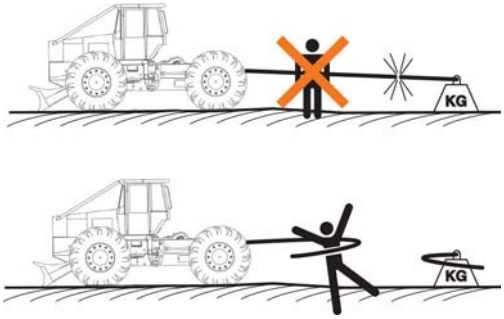
Obey the following cautions and warnings before using your winch to avoid equipment damage, personal injury or death.

- Do not operate the winch unless you are authorized and trained to do so.
- Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the wire rope breaks.
- Read, understand, and follow the operating, inspection, and maintenance instructions in this manual.
- Do not use the control levers for hand holds when entering or leaving the vehicle.
- Do not permit other people near the control area when you inspect or repair a machine.
- Never inspect, repair, or perform maintenance on a machine that is in motion.
- Inspect the winch before each use:
  - » Make sure that the controls and instruments operate correctly.
  - » Report the need for repairs immediately.
  - » Do not work with a damaged or worn wire rope.
  - » Do not use a winch that needs repairs.

  - » If the wire rope and ferrule must be removed from the drum, make sure the end of the wire rope and ferrule are controlled when the ferrule is released. The end of the wire rope can suddenly move from the drum like a compressed spring when the ferrule is released and cause an injury.
- Stay in the operator's seat when operating the winch.
- Do not stand on the vehicle when operating the winch.
- Avoid winch operation near people or other machines.
- Never stand nor permit others to stand in the bight (loop) of a wire rope.
- Do not stand nor permit others to be near the winch or wire rope when there is tension on the wire rope.
- Observe jobsite rules.
- Be in complete control at all times.
- Do not use the control levers as hangers for clothes, water bags, grease guns, lunch pails, etc.
- Do not leave the vehicle when the winch wire rope is under tension.
- Do not permit riders on the vehicle or load.
- Do not use the winch as an anchor for a double or two-part line.
- Do not pull the hook through the throat or over the drum, which will cause damage.
- When the winch is not in use, make sure the control lever is in **BRAKE-ON** position and the winch brake is applied.
- Do not use winch as a hoist. Tractor and skidder mounted winches are designed for towing.



- Always inspect wire rope, tail chain and other rigging components for wear, damage, broken strands or abuse before use.
- Never use wire rope, tail chain or other rigging that is worn-out, damaged or abused.
- Never overload wire rope, tail chain or rigging.
- Wire rope and tail chain will fail if worn-out, overloaded, misused, damaged, improperly maintained or abused. Wire rope or tail chain failure may cause serious injury or death!



- Do not terminate wire rope to tail chain by the use of a knot.
- Do not handle wire rope if the hook end is not free. A load could break away, suddenly tensioning the wire rope, resulting in serious injury or death.
- Stay clear of wire rope entry areas (fairlead or arch rollers, winch drum etc).
- Make sure that ground personnel are in plain view of the operator, and at a distance of at least 1½ times the working length of the wire rope.
- Make sure that any hand signals used by ground personnel are clearly defined and understood by everyone involved.
- Do not attempt to "jerk" or "shock" a load free. Doing so can cause loads in excess of the rated capacity of the wire rope, winch, or mounting hardware.
- Replace any parts only with genuine Allied Winch parts.
- Maintain **a minimum of three (3) complete wraps of wire rope** on the drum for normal operation. It may help to paint the last five (5) wraps of wire rope a contrasting color, to serve as a visual indicator.
- Do not handle wire rope with bare hands. Wear leather gloves at all times.
- Align the tractor with the load to prevent side loading the winch, and to maintain even spooling of the wire rope.
- If applying tension to the wire rope manually during spooling:
  - » ensure that the operator is winching in slowly,
  - » keep your hands and clothing well clear of any rollers or the winch drum,

  - » do not maintain tension by letting the wire rope to slip through your hands,
  - » use a hand-over-hand technique to maintain tension.
- Be aware of the ground conditions, and make sure the ground and tractor are stable enough to pull the intended load.
- Do not attempt to pull loads in excess of the rated capacity of the winch.
- Keep yourself informed of any applicable codes, regulations and standards for the job.
- Your winch may have temperature shut-off system for protection of tractor and winch. Manual override of high temperature shut-off will cause damage to tractor and winch.
- This winch is neither intended, designed, nor rated for any application involved in the lifting or moving of personnel.
- Use only the lubricants listed in the section of Hydraulic Requirement on page 51.
- Do not weld on any part of the winch. Contact Allied Systems if weld repairs are needed.
- The hydraulic system must be kept clean and free of contamination at all times.
- Be aware of the hazards of pressurized hydraulics:
  - » Wear personal protective equipment, such as gloves and safety glasses, whenever servicing or checking a hydraulic system.
  - » Assume that all hydraulic hoses and components are pressurized. Relieve all hydraulic pressure before disconnecting any hydraulic line.
  - » Never try to stop or check for a hydraulic leak with any part of your body; use a piece of cardboard to check for hydraulic leaks.
  - » Small hydraulic hose leaks are extremely dangerous, and can inject hydraulic oil under the skin, even through gloves.
  - » Infection and gangrene are possible when hydraulic oil penetrates the skin. See a doctor immediately to prevent loss of limb or death.

Notes

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TROUBLE SHOOTING GUIDE
For The
W & WD 300 & 400 Series Winch

The following data is presented as an aid to locating the source of difficulty in a malfunctioning unit. It is necessary to consider the torque converter charging pump, transmission, oil cooler (if applicable) and connecting lines as a complete system when running down the source of trouble since the proper operation of any unit therein depends greatly on the condition and operations of the others. By studying the principles of operation together with data in this section, it may be possible to correct any malfunction which may occur in the system.

TROUBLE SHOOTING PROCEDURE BASICALLY CONSISTS OF TWO CLASSIFICATIONS: MECHANICAL AND HYDRAULIC.

MECHANICAL CHECKS

Prior to checking any part of the system from a hydraulic standpoint, the following mechanical checks should be made:

1. A check should be made to be sure all control lever linkage is properly connected and adjusted at all connecting points.
2. Check control levers and rods for binding or restrictions in travel that would prevent full engagement. Shift levers by hand at control valve; if full engagement cannot be obtained, difficulty may be in control valve assembly.

HYDRAULIC CHECKS

Before checking hydraulic system for pressures and rates of oil flow, it is essential that the following preliminary checks be made:

Check oil level in transmission or reservoir. This should be done with oil temperatures of 180 to 200° F. (82, 2-93, 3° C). DO NOT ATTEMPT THESE CHECKS WITH COLD OIL. To bring the oil temperature to this specification, it is necessary to either work the machine or "stall" out the converter. Where the former means is impractical, the latter means should be employed as follows:

Engage shift levers in forward and high speed and apply brakes. Accelerate engine half to three-quarter throttle.

Hold stall until desired converter outlet temperature is reached. **CAUTION:** FULL THROTTLE STALL SPEEDS FOR AN EXCESSIVE LENGTH OF TIME WILL OVERHEAT THE CONVERTER.

PROBLEM	REASON	REMEDY
The winch does not have enough power.	The oil is too low.	Add transmission oil to the correct level.
	The hydraulic pump does not work.	Replace the pump.
	There is a leak in the hoses, tubes or fittings. Air is entering the system.	Make a check of the hoses. Repair, replace or tighten them where necessary.
	The transmission suction screen is plugged.	Clean the suction screen. Determine cause.
	The input clutch discs are worn.	Replace the disc. Determine cause.
	The freespool clutch is slipping. Oil seals are leaking to the clutch discs.	Replace the oil seals and clutch discs.
	The input clutch is slipping. Pressure at the input clutch is below normal.	Make a pressure check on the transmission, if applicable. Determine the cause of low pressure and correct.
	The input clutch is slipping. The piston seals are damaged and oil does not actuate the clutch.	Replace the inner and outer piston seals.

PROBLEM	REASON	REMEDY
The winch will not pull in the load. Winch operation is slow or uneven.	The clutch oil pressure is low.	Make a pressure check on the transmission, if applicable. Determine the cause of low pressure and correct.
	The hoses are not correctly installed.	Make a check of all hoses and connections.
	There is a malfunction in the control valve.	Make a check of the control valve.
	The pinion sprag is installed backwards.	Remove the sprag, reverse it and install it.
	The discs for the free spool clutch are worn.	Replace the clutch discs.
	The free spool clutch is slipping. Oil seals are leaking oil to the clutch discs.	Replace the oil seals and clutch discs. Discs must be clean and dry to function properly.
	The pinion brake will not disengage.	Make a check of the piston, guide pins and brake disc. Repair or replace parts as necessary.
	The discs for the free spool clutch are installed without the correct shim.	Make a check for the correct shim dimensions. Install the correct shims.
The winch will not hold a load.	The free spool clutch is slipping. The clutch discs are worn.	Replace the clutch discs.
	The free spool clutch is slipping. The oil seals are leaking oil to the clutch discs.	Replace the oil seals and clutch discs. Discs must be clean and dry to function properly.
	The control valve linkage is damaged, worn or incorrectly installed.	Repair or replace the linkage as necessary.
	The hoses from the control valve to the winch are incorrectly installed.	See that the hoses are correctly installed.
	The cable is slipping and will not wind onto the drum.	The ferrule is not fastened to the drum correctly. Install the ferrule in the drum.
	The pinion sprag does not hold.	Remove any foreign matter from the sprag. See if the sprag is assembled correctly.
The winch will not operate in the free spool position.	There is a leak or restriction in the hose to the free spool clutch.	Make a check for leaks or restructions in the hose.
	There is damage or wear to the piston shaft seals in the free spool clutch.	Replace the seals.
	The handle for adjusting free spool tension is too tight.	See if the wear button is in good condition and free. Adjust the handle.

PROBLEM	REASON	REMEDY
The winch will not operate in the free spool position (continued).	The piston assembly for the free spool clutch is not correctly assembled.	See that the drum support is correctly aligned with the clutch piston.
	The control lever will not remain in the free spool position.	Make a check of the detent ball and spring.
	The separator springs are not installed correctly in the piston assembly for the free spool clutch.	Install the springs correctly.
	The discs of the free spool clutch do not move freely.	Make a check of the clutch discs and separator springs.
	Clutch pack end plate out of position (dropped down behind disc hub).	Disassemble and correctly reassemble.
	The discs of the free spool clutch are too tight.	Make a check for the correct quantity of discs. Make a check of the shim dimensions.
	Clutch pressure is low.	Make a pressure check on the transmission. Determine the cause of low pressure and correct.
	The steel clutch discs are magnetic.	Remove the magnetic field from the plates.
The oil pressure is low at the input clutch. All other pressures are correct.	There is a leak in the input clutch.	Make a check of the seals for input clutch.
	Restriction in input clutch supply line.	Remove line and inspect.
	The control valve is not functioning correctly.	Adjust or repair the valve or linkage.
The oil pressure is low at the winch input clutch and transmission clutches.	The clutch pressure regulator valve does not work.	Inspect valve. Clean or replace.
	There is wear or damage to the charging pump.	Replace the pump, if necessary.
	The transmission or reservoir oil level is low.	Fill the transmission or reservoir with oil to the correct level.

OPERATION OF THE WINCH

The **ALLIED** winch is mechanically driven. Several hydraulic and mechanical components control the operation of the winch.

The "Input Clutch" delivers engine power to the cable drum through all other winch drive components.

The "Pinion Brake" stops the drum from rotating after you wind in the cable without a load. This feature allows better drum control.

The "Pinion Sprag" holds the load in conjunction with the free spool clutch; this prevents reverse rotation of the drum.

The "Free Spool Clutch" separates the drum from all other drive components. This permits the cable to unwind freely.

The operator controls the winch through a single lever and control valve with three positions.

The "winch in" position permits the valve to actuate the "input clutch". For the purpose of safety, the lever will not remain in the "winch in" position when released by the operator.

The "neutral" or center position actuates the pinion brake.

The "free spool" position permits the valve to actuate the free spool clutch and release the drum to rotate freely. This position includes a detent which holds the lever in the free spool position when released by the operator. This feature permits the operator to get off the machine and pull the cable off the drum.

NOTES

MAINTENANCE AND SERVICE

The instructions contained herein cover the disassembly and reassembly of the winch in a sequence that would normally be followed after the unit has been removed from the machine and is to be completely overhauled. It must also be understood that this is a basic winch with many options. Procedures in this manual cover the W and WD winch. The units are very similar to trouble shoot, disassemble, repair and reassemble.

CAUTION: Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

NOTE: Before disassembly of the winch, determine if the winch has counterclockwise input rotation or clockwise input rotation as viewed from the input side of the winch.

DISASSEMBLY

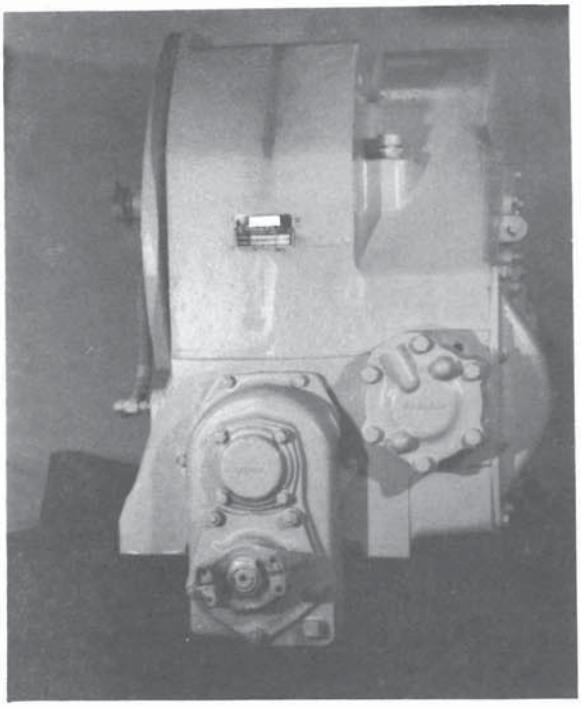


Figure 1

Input side of a WD series winch.

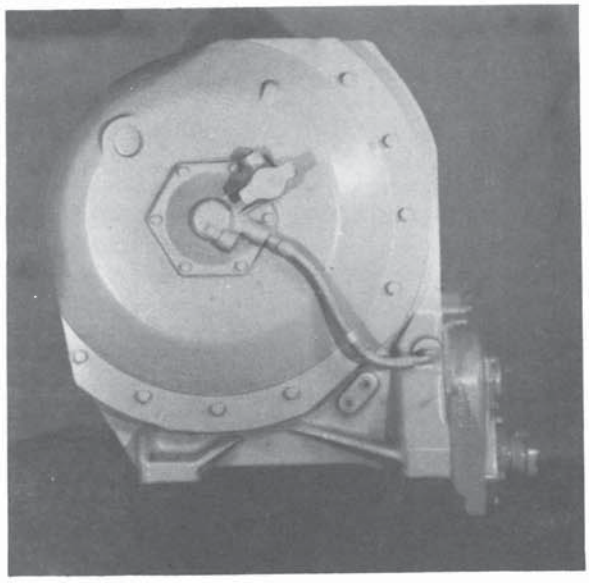


Figure 2

Winch from the right side of the machine.

HOW TO REMOVE THE CABLE DRUM COVER.

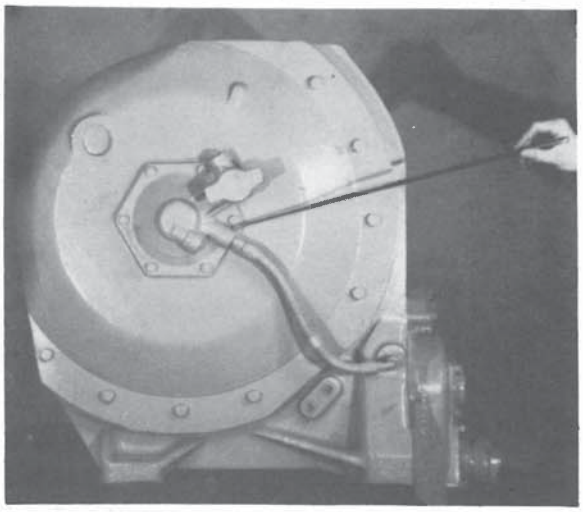


Figure 3

Remove the drain hose assembly and the bearing cap.

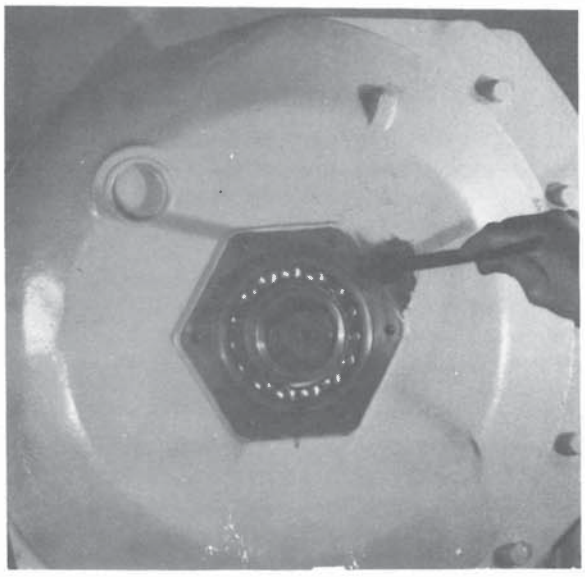


Figure 4

Remove the wear button from the cable drum cover.

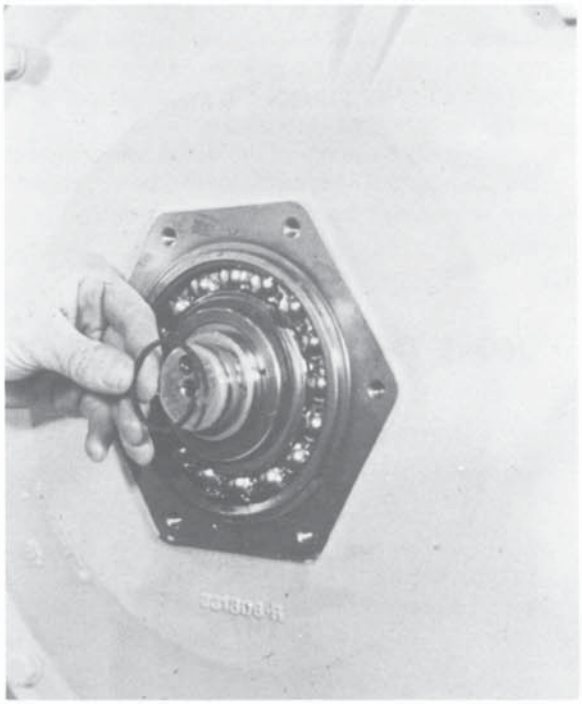


Figure 5

Remove the lock type oil sealing ring from shaft.

Figure 6

Remove the snap ring that holds the bearing.

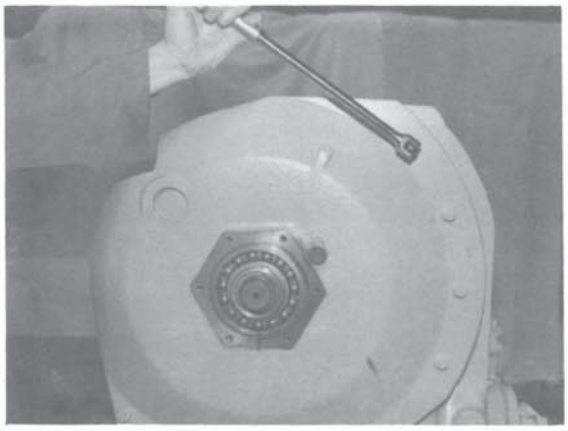


Figure 7

Remove the capscrews that hold the cable drum cover. Use a pry bar to pull the cover 3/8" (9.4 mm) away from the winch housing.

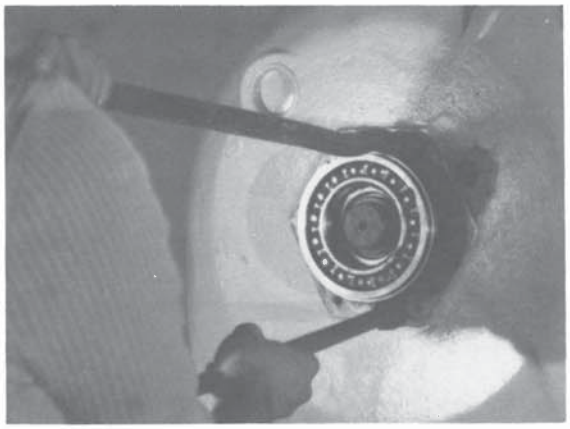


Figure 8

Give support to the cable drum with a hoist and chain or cable. Push the cover back in place so you can see the snap ring around the bearing. Remove the bearing with two pry bars or a bearing puller tool.

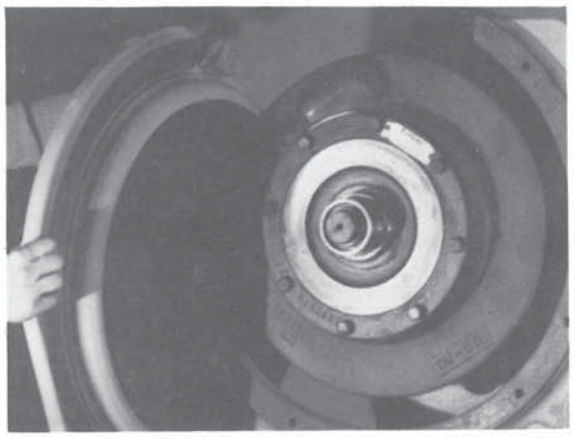


Figure 9

Remove the cable drum cover.

HOW TO REMOVE THE FREE SPOOL CLUTCH.

DANGER: The free spool clutch is under approximately 10,000 lbs. (4,600 kg.) of force. Use caution and follow these instructions when you remove or disassemble this component. Incorrect procedure will cause personal injury.

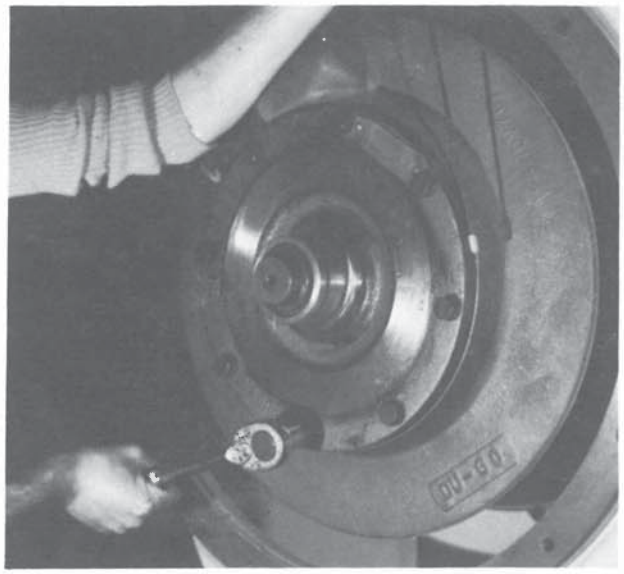


Figure 10

Loosen each capscrew for the free spool assembly one turn at a time until the support plate is 1/2" (12.5 mm) away from the cable drum. See if there is spring tension in the free spool assembly. NOTE: Some free spool clutch housings will have 8 bolts like the one shown and some will have 15 bolts. Use extreme caution on either housing.

DANGER: Spring tension can mean a broken clutch shaft or split rings. Removal of all existing capscrews can release the pressure in he free spool clutch causing personal injury.

If there is no spring tension, and the free spool assembly is loose on the capscrews, remove the capscrews. **IF THERE IS SPRING TENSION, STAND TO ONE SIDE OF THE WINCH AND REPLACE THE EXISTING CAPSCREWS, ONE AT A TIME, WITH CAPSCREWS TWICE AS LONG. AFTER YOU INSTALL ALL THE LONGER CAPSCREWS, LOOSEN EACH, ONE TURN AT A TIME, AND REMOVE THEM.**

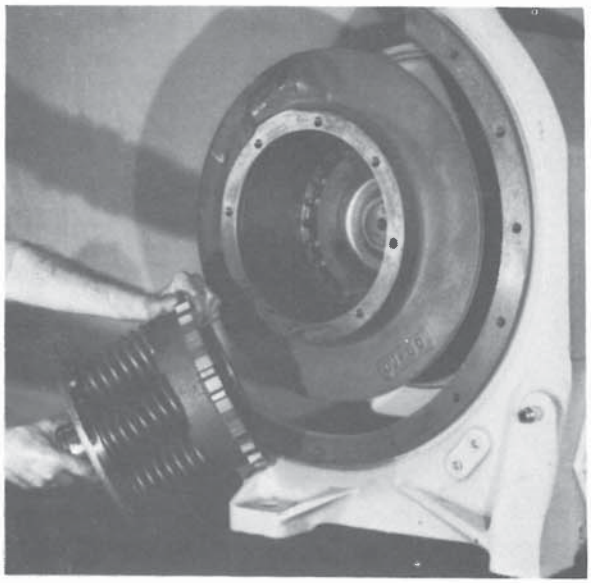


Figure 11

Remove the free spool piston assembly.

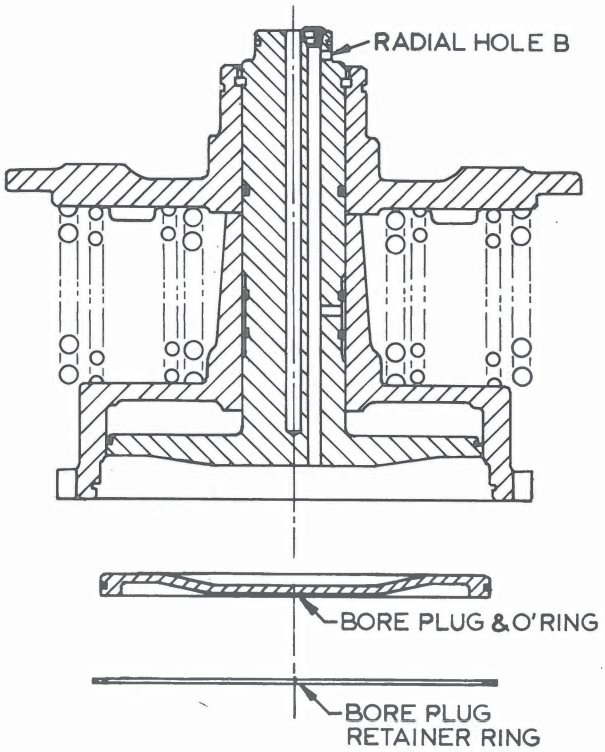


Figure 12

Remove bore plug retainer ring. Apply low pressure air to the small radial hole next to the oil sealing ring groove on the opposite end of the piston shaft. This will remove the bore plug and "O" ring.

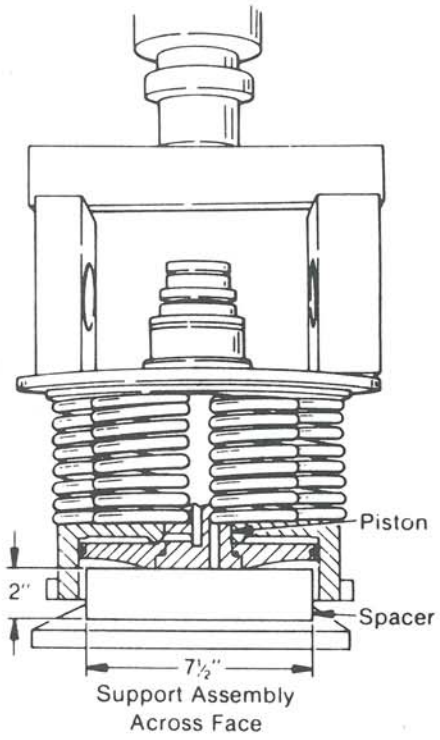


Figure 13

Put a cylindrical spacer inside the bore between the piston and the press bed. The spacer must be 2 to 2.5 in. (5 to 6 cm.) thick and 7.5 inc. (19 cm.) in diameter. You can make a spacer from brass or hardwood. Use the press to slowly apply pressure on the drum support plate. Increase the pressure until the drum support passes the split rings.

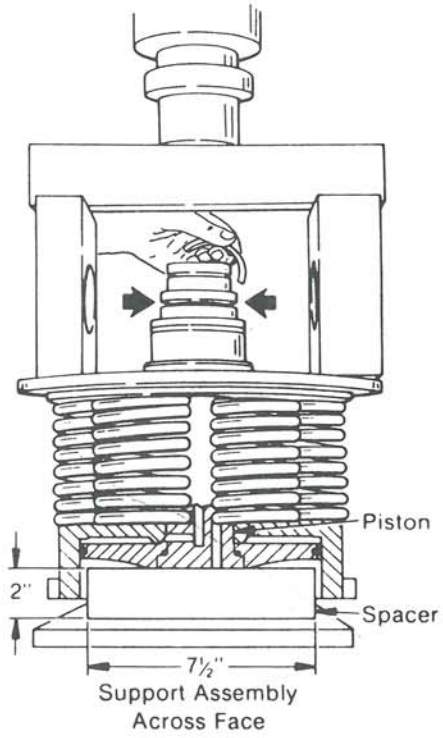


Figure 14

Remove the split rings. Slowly decrease pressure on drum support plate.

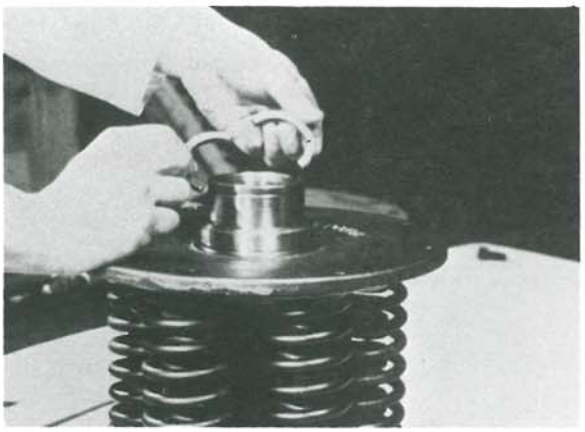


Figure 15

Split ring removed.

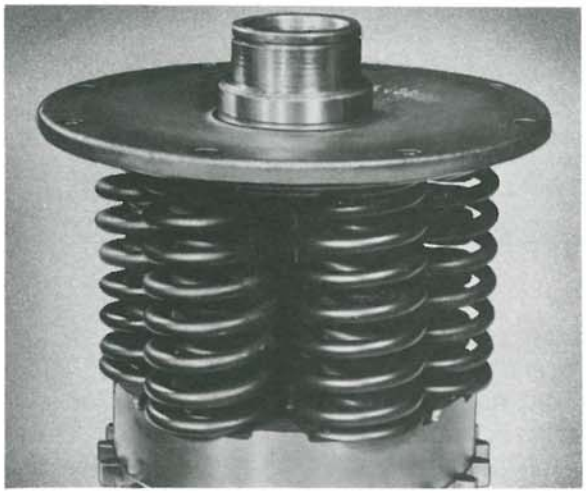


Figure 16

Tension released on the free spool piston assembly.

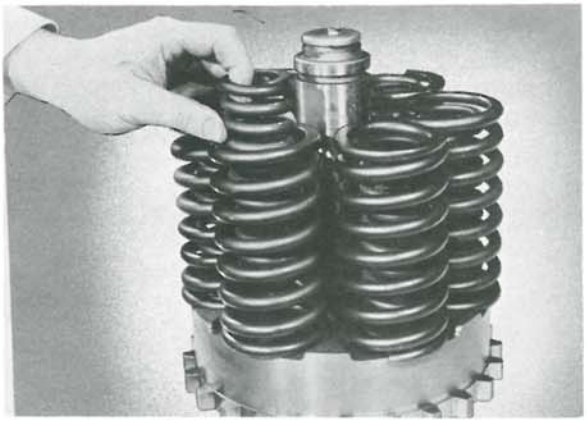


Figure 17

Remove the inner and the outer springs.

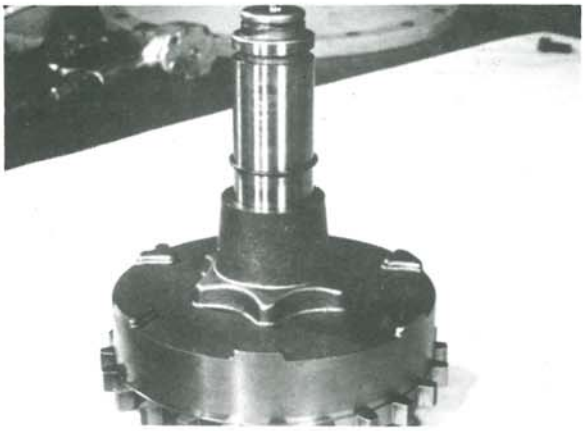


Figure 18
Remove the clutch piston from the clutch shaft and the plate assembly.

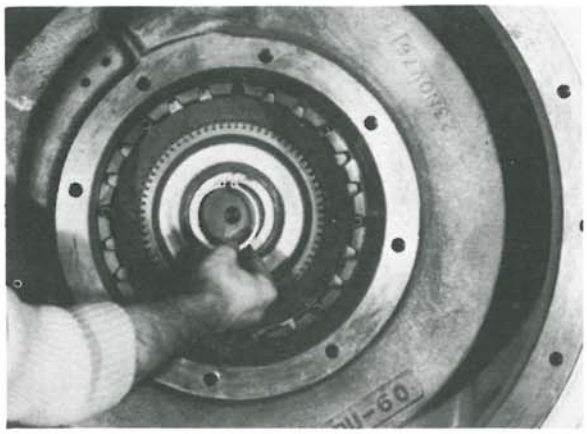


Figure 19
Remove the disc hub snap ring from the shaft.

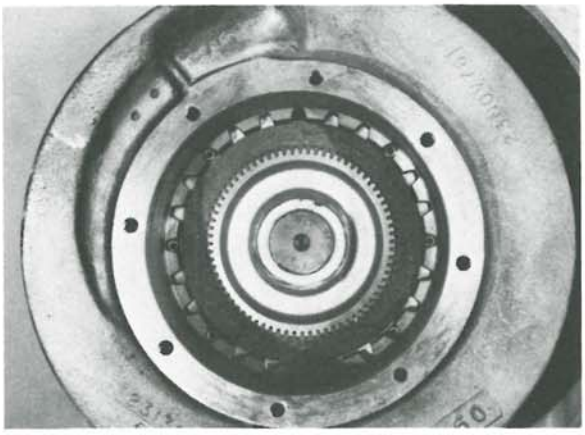


Figure 20
Remove clutch disc hub, clutch discs and separator springs in the channels of the clutch disc teeth.

Figure 21
Remove the drum and the hub support from the winch housing. Remove the hub carefully in a straight line.

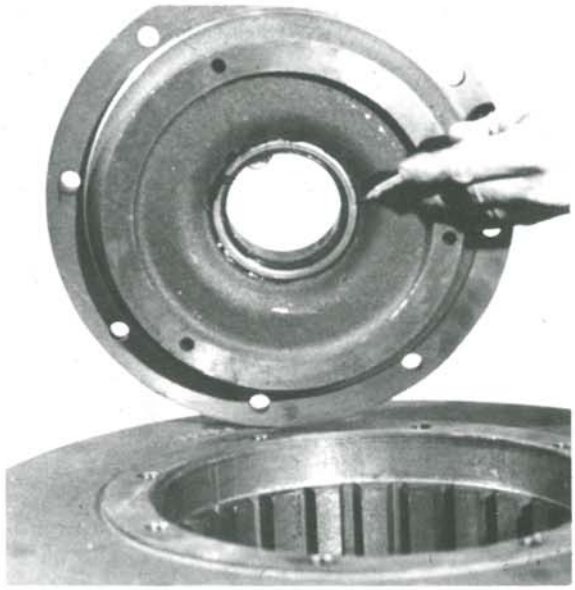


Figure 22
Remove the assembly that gives support to the drum hub.

HOW TO REMOVE THE DRIVE GEAR FOR THE CABLE DRUM FOR ALL MODEL WINCHES.

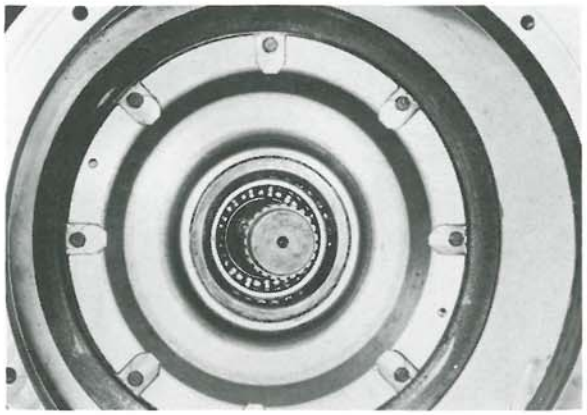


Figure 23

Remove bolts and washers from cable drum support. Put puller bolts into the two threaded holes. Remove the drum support.

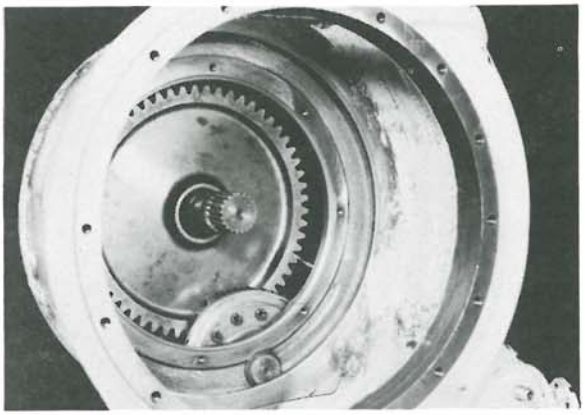


Figure 24

This is the drum drive gear with the ring gear shown on the inside of the drive gear.

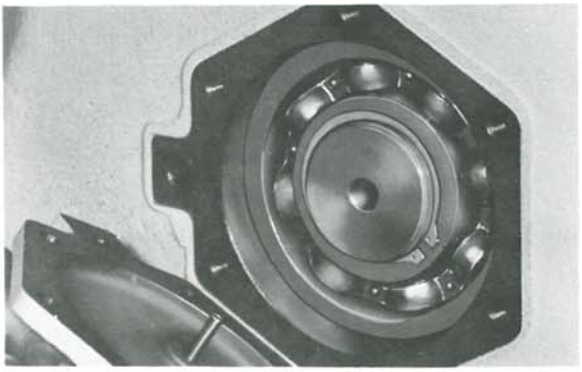


Figure 25

Remove the drum shaft cover and bearing snap ring. Push the shaft through the bearing and the drive gear. You cannot remove the drive gear without removing the inside mounted ring gear as shown in Fig. 24. On an outside mounted ring gear, proceed to Fig. 26. On an inside mounted ring gear, see Steps 1 and 2.

STEP 1. Remove two bolts holding the ring gear shaft to ring gear cover. Remove stud nuts and bolts holding ring gear cover to winch housing. Using pry slots provided, remove ring gear cover and shims. Wire shims to cover for reassembly.

STEP 2. From outside (ring gear cover side), drive the ring gear shaft out of ring gear. NOTE: Use a brass bar a little longer than the ring gear shaft to hold the ring gear inner taper bearing in place. With pinion moved as explained in Figures 41 thru 46, lower ring gear to the bottom the case as far as it will go.

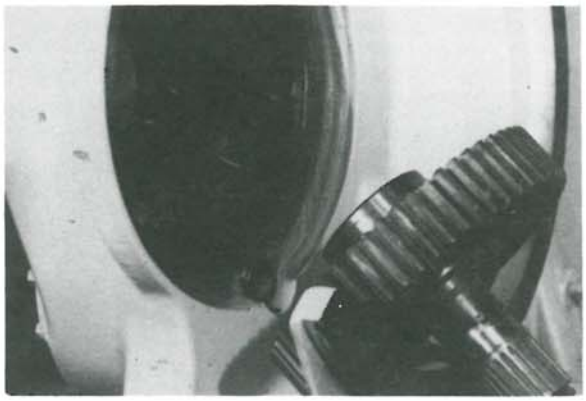


Figure 26

Remove the drive gear and its shaft. Remove the bearing to shaft retainer ring. Remove the shaft outer bearing and drive gear.

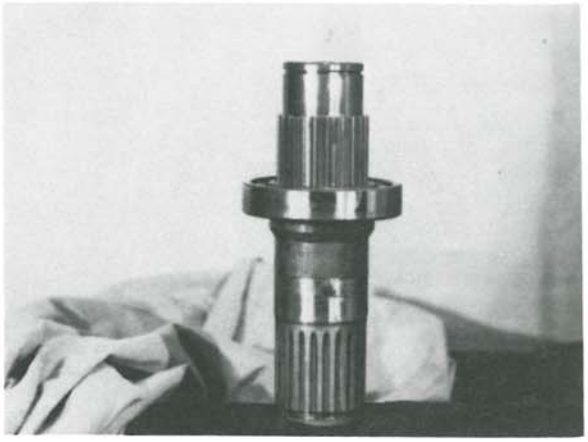


Figure 27

Cable drum drive shaft and inner bearing.

HOW TO REMOVE THE PINION SHAFT AND BRAKE FOR THE W AND WD 300 SERIES WINCH.

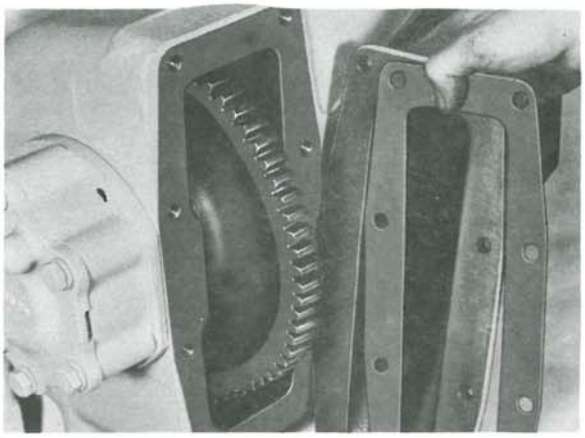


Figure 28
Remove the pinion drive gear cover and gasket.

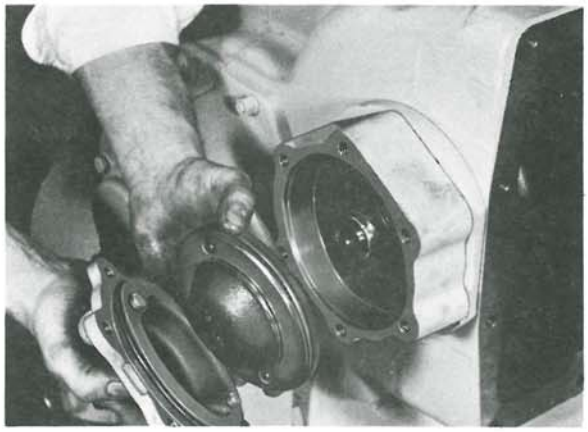


Figure 29
Remove the pinion brake cover and piston.

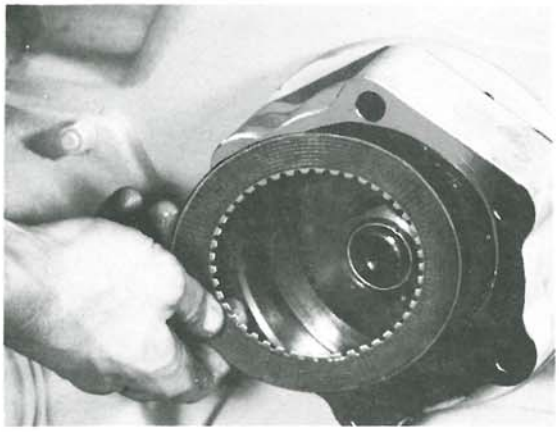


Figure 30
Remove the brake disc and housing.

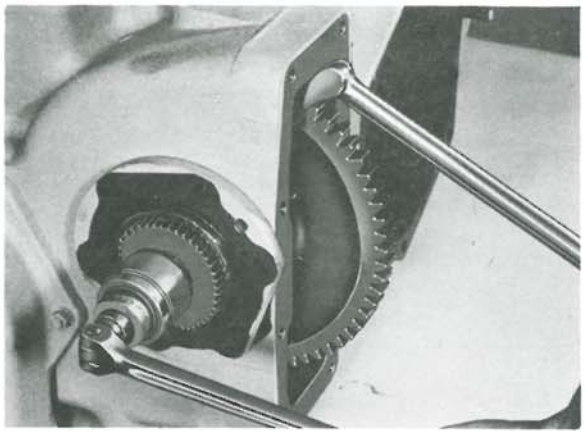


Figure 31
Remove the pinion shaft nut.

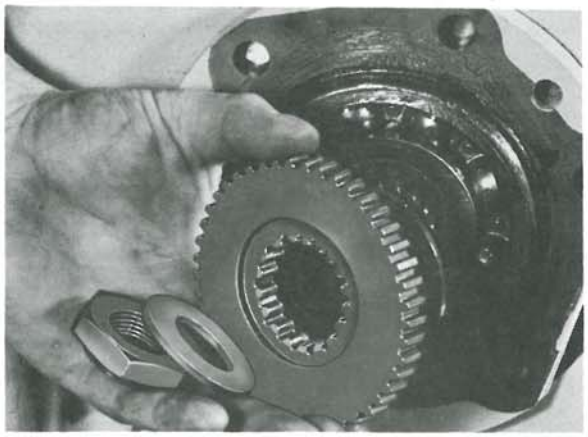


Figure 32
Remove the washer and disc hub.

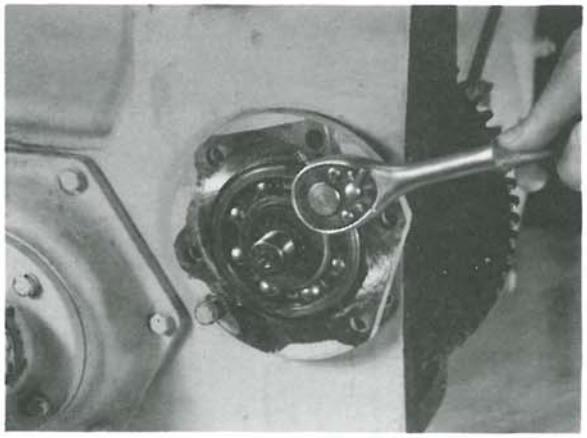


Figure 33
Use two screws in the threaded holes to pull the outer race a small distance from the housing.

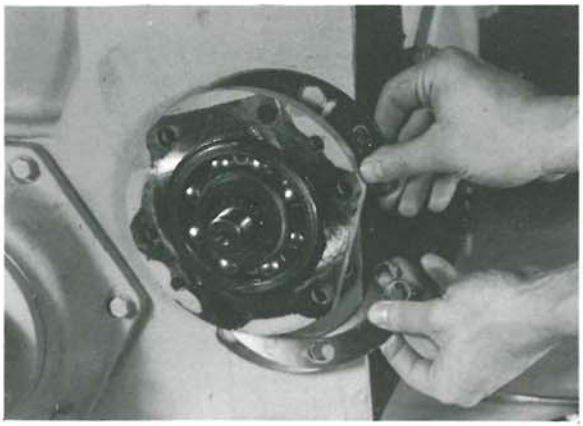


Figure 34
Remove the split shim packs and tag them separately.

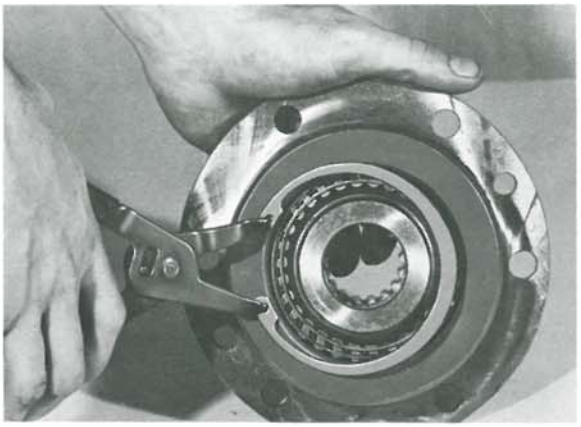


Figure 37
Remove the sprag retaining ring.

HOW TO DISASSEMBLE THE PINION SPRAG FOR THE W AND WD 300SERIES WINCH.

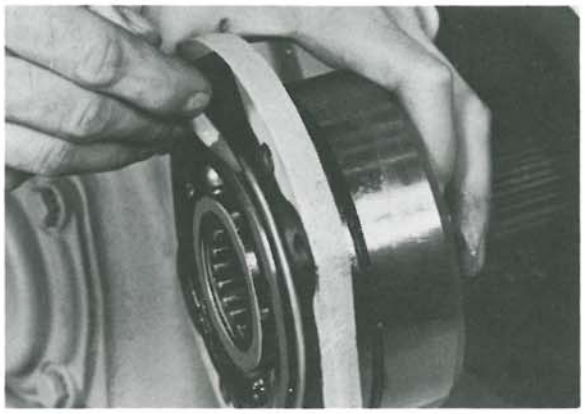


Figure 35
Remove the pinion sprag assembly.

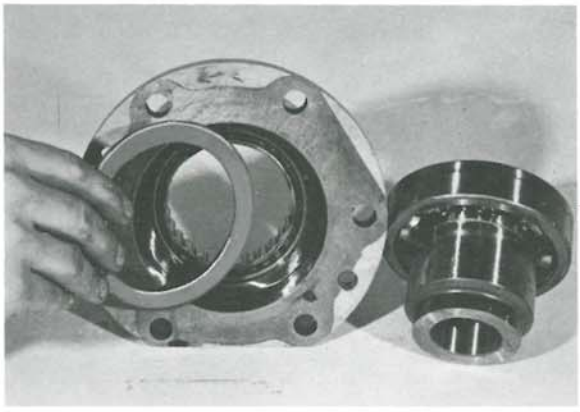


Figure 38
Remove the sprag retaining washer.

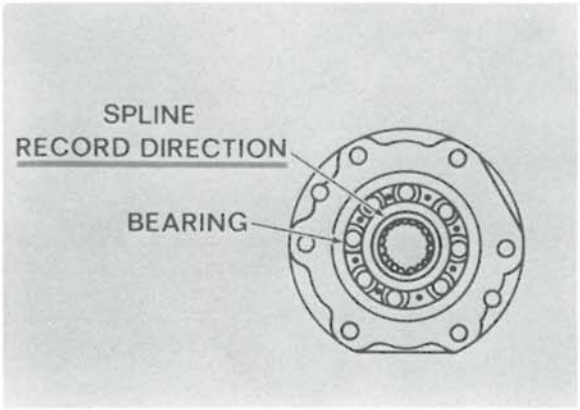


Figure 36
Make a note of the direction the inner race rotates when the outer race is stationary.

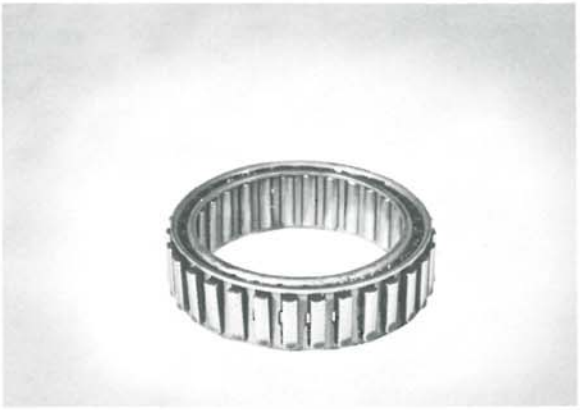


Figure 39
Slide the sprag assembly from the outer race.

HOW TO REMOVE THE PINION SHAFT AND BRAKE FOR THE W AND WE 311, AND ALL 400 SERIES WINCHES.

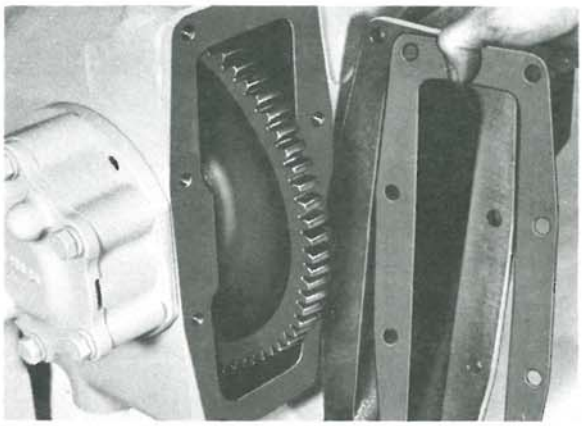


Figure 40
Remove pinion drive gear cover and gasket.

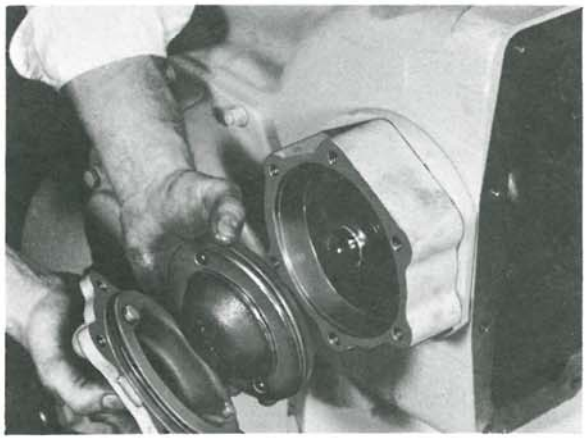


Figure 41
Remove pinion shaft piston and cover.

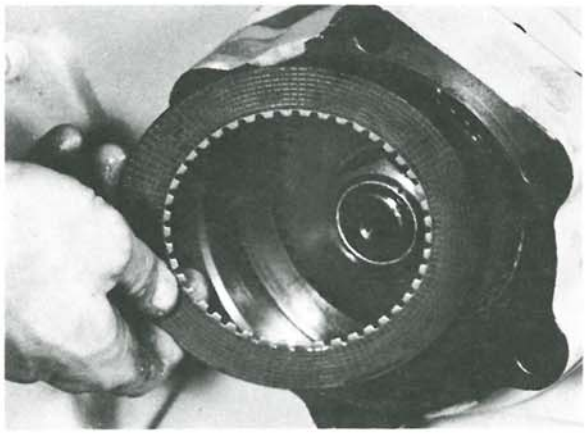


Figure 42
Remove the brake disc.

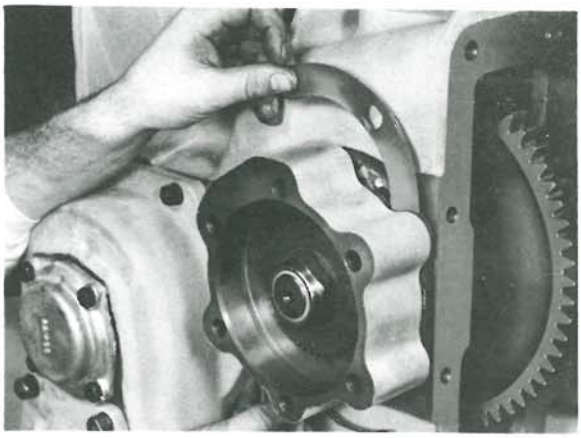


Figure 43
Remove the brake housing and split shim pack.

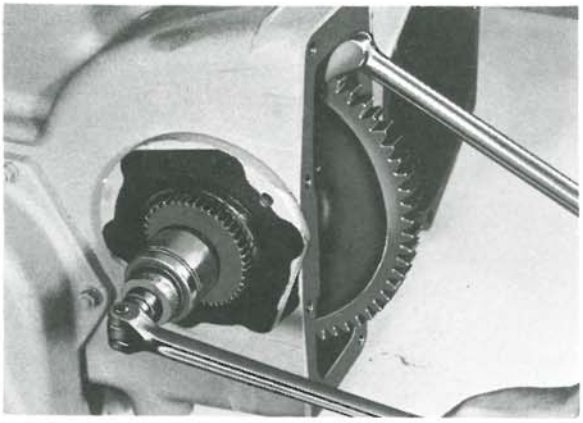


Figure 44
Remove the pinion shaft nut.

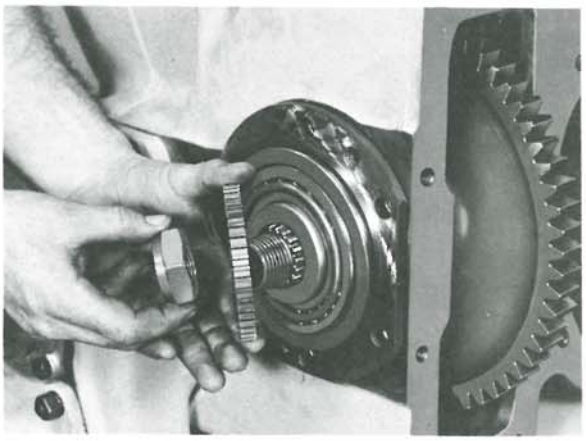


Figure 45
Remove the disc hub and nut from the pinion shaft.

HOW TO DISASSEMBLE THE PINION SPRAG FOR THE W AND WD 311 AND ALL 400 SERIES WINCHES.

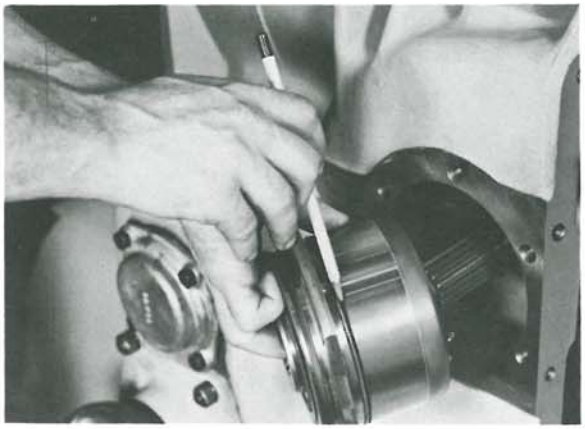


Figure 46

See Figures 33 and 34. Remove the pinion sprag assembly. NOTE: On units that have an inside mounted ring gear (as shown in Fig. 24), tap the pinion from inside the ring gear area as far as it will go. This will allow clearance to remove ring gear as explained in Fig. 25 - Step 2.

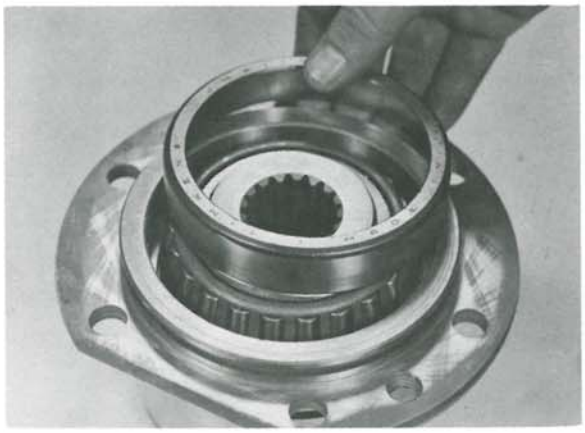


Figure 47

Remove the front bearing cup.

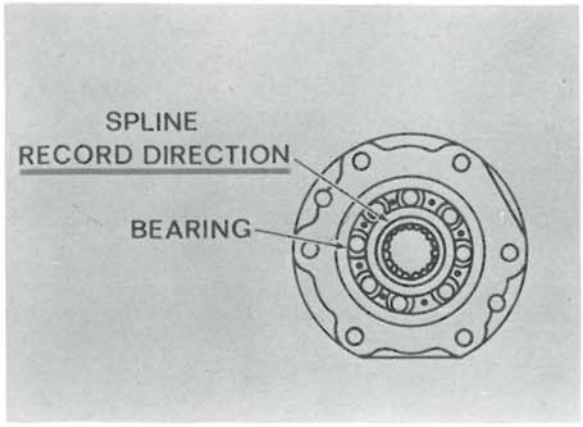


Figure 48

Make a note of the direction the inner race rotates when the outer race is stationary.

Figure 49

Remove the front bearing cone.

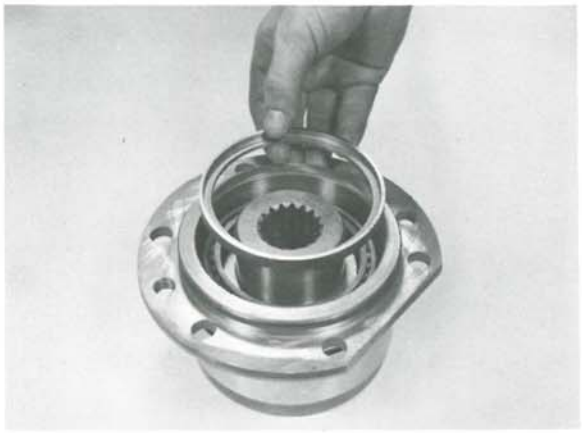


Figure 50

Remove the sprag retainer.

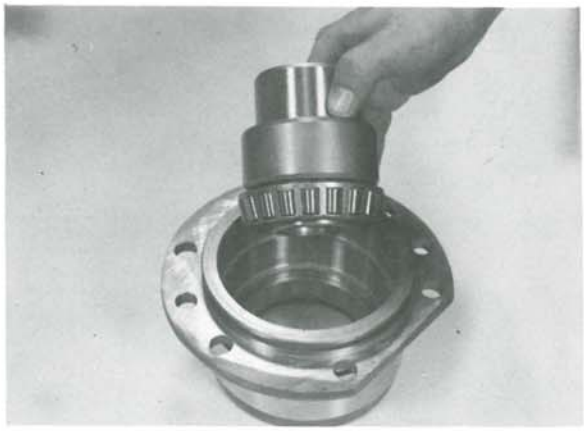


Figure 51

Remove the sprag, the inner race of the sprag, and the rear bearing cone.

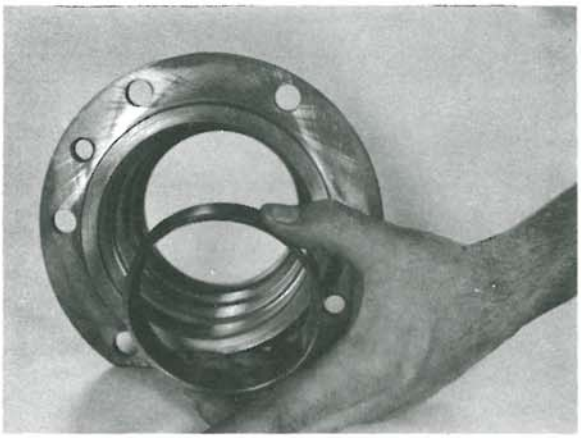


Figure 52
Remove the rear bearing cup.

Figure 53
This is the inner race of the sprag with the front and rear bearing cones.

HOW TO REMOVE THE PINION SHAFT FOR ALL MODEL WINCHES. NOTE: Ring gear and ring gear cover must be removed before pinion can be removed.

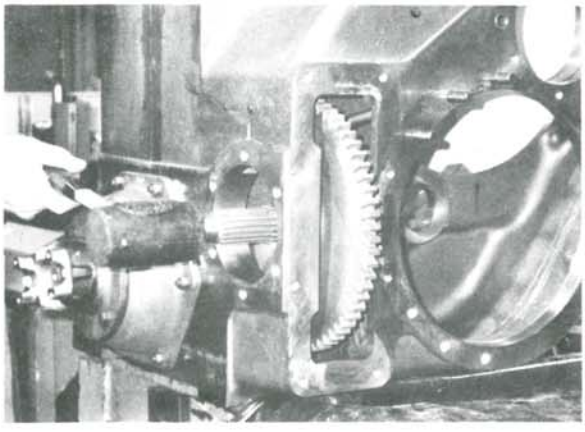


Figure 54
Tap the pinion shaft carefully with a soft headed mallet to push it through the drive gear. Do not damage the shaft.

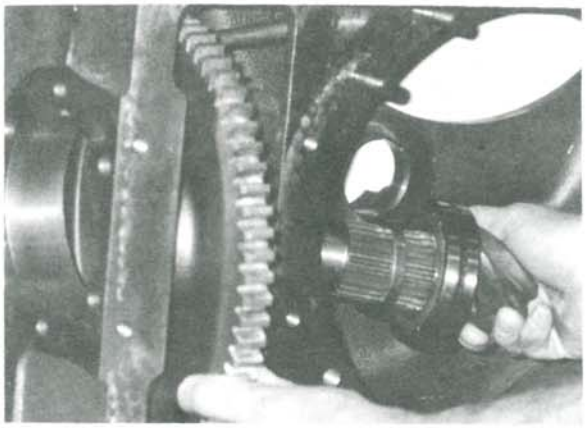


Figure 55
Hold the pinion drive gear. Remove the pinion shaft and its bearing assembly through the ring gear opening.

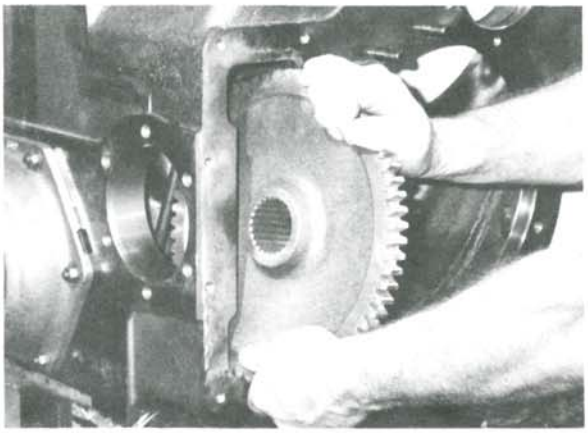


Figure 56
Remove the pinion shaft drive gear.

HOW TO REMOVE THE RING GEAR FOR ALL MODEL WINCHES WITH OUTSIDE MOUNTED RING GEAR. (RING GEAR NEXT TO RING GEAR COVER)

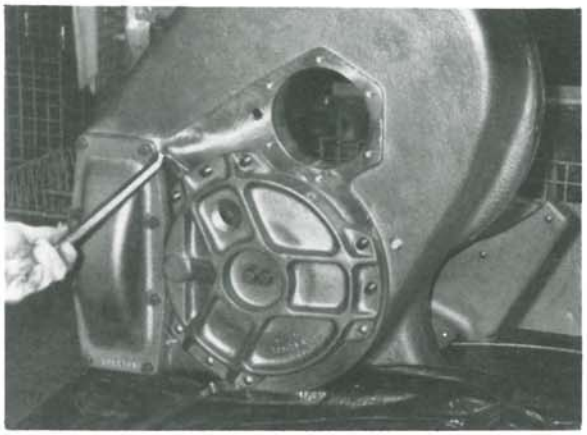


Figure 57

Remove the screws from the ring gear cover. Use pry bars in the pry slots to pull the assembly from the housing. Approximately 1/2 gallon (2.77 liters) of oil will flow out of the opening.

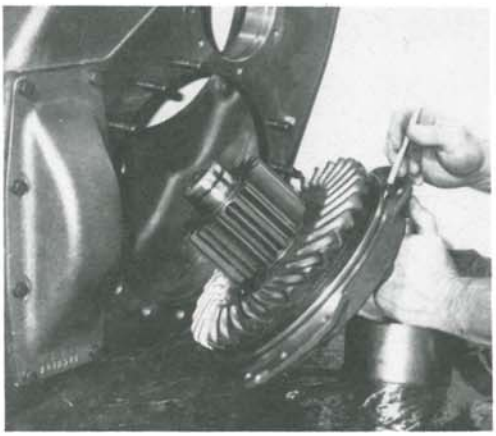


Figure 58

Remove the ring gear and cover from the housing.

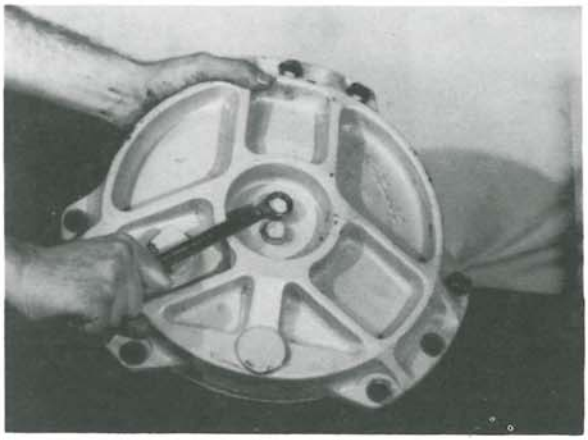


Figure 59

Loosen the two bolts in the cover approximately 1/2 inch (1.27 cm.). Hold the cover. Tap the screw heads carefully to overcome the friction caused by the o-rings.

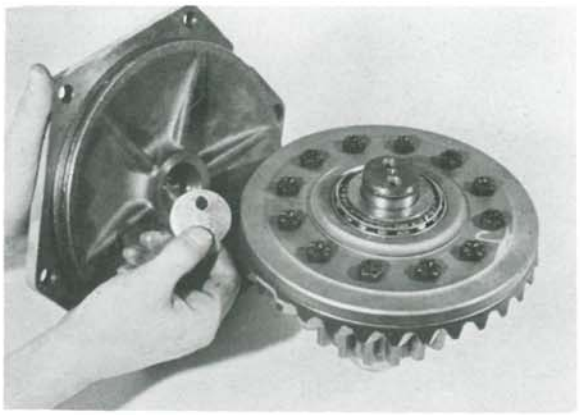


Figure 60

Cover and bearing adjustment shims. Fasten the shims together with wire.

Figure 61

Support the ring gear assembly. Tap the shaft out carefully with a brass rod and hammer. This is the ring gear assembly with the shaft and bearings removed.

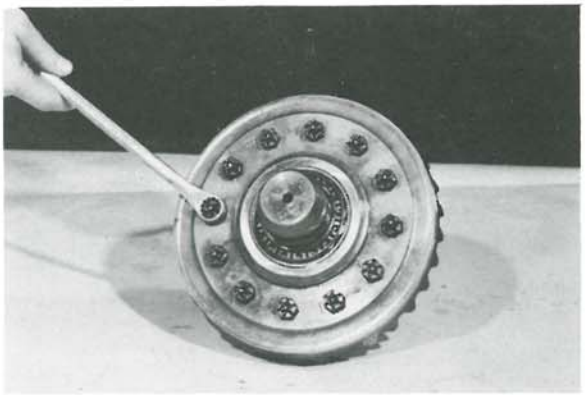


Figure 62

Remove the screws as shown. Remove the ring gear.

NOTE: On some models, the ring gear is riveted to the hub. Do not separate them. If damaged, replace with new ring, pinion and hub.

HOW TO REMOVE THE INPUT CLUTCH FOR ALL W SERIES WINCHES.

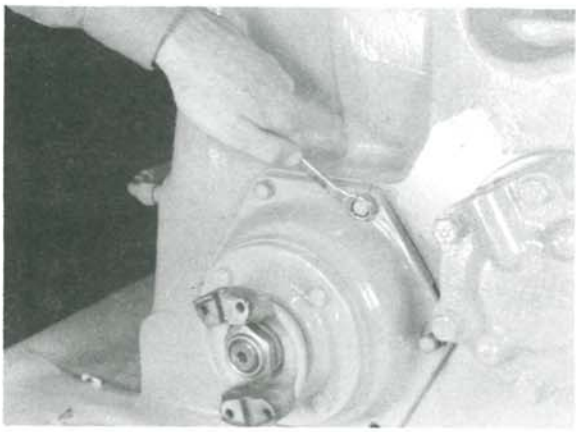


Figure 63
Remove input clutch housing cap screws and washers.

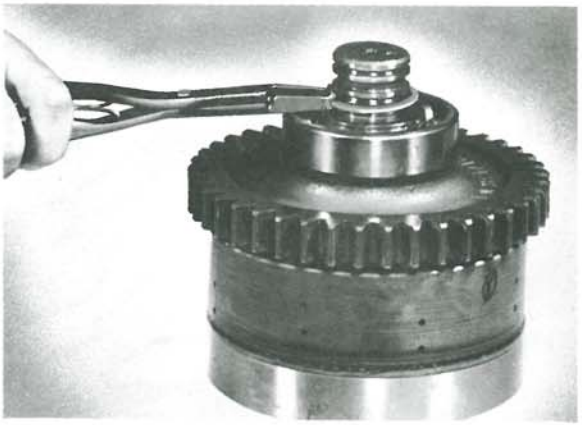


Figure 66
Remove the snap ring that holds the bearing.

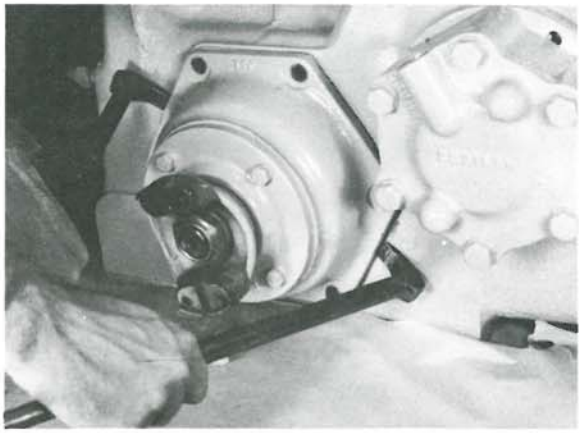


Figure 64
Loosen the assembly in the housing with pry bars in the pry slots. Remove input clutch, bearing cap and input flange as an assembly.

Figure 67
Remove the bearing from the shaft.

Figure 65
Remove the piston rings from the shaft.

Figure 68
Remove the inner snap ring.

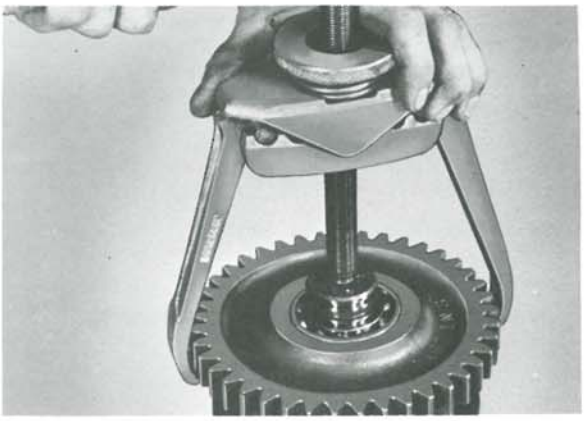


Figure 69
Remove the input gear and its bearing from the shaft.

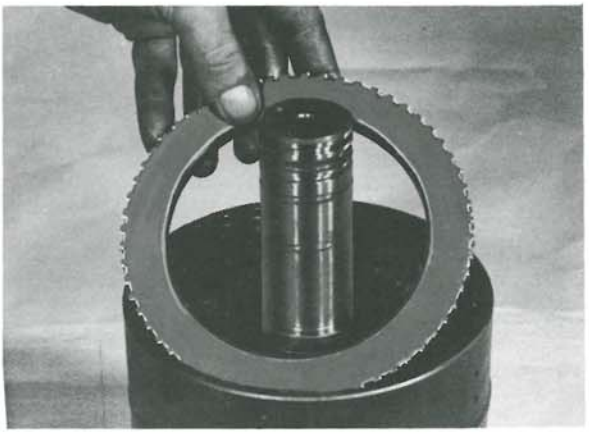


Figure 70
Remove the clutch disc backing plate retainer ring. Remove backing plate.

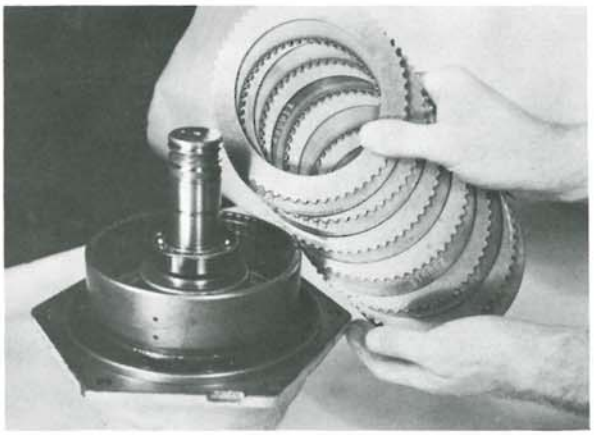


Figure 71
Remove the inner and outer clutch discs.

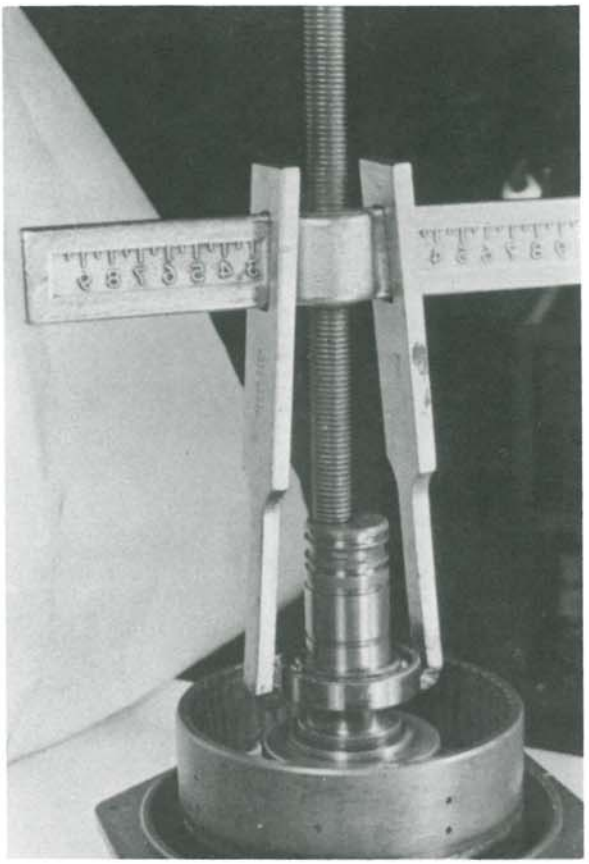


Figure 72
Remove the inner bearing with a bearing puller tool.

Figure 73
Compress the return spring and remove the snap ring. Remove the spacer, spring retainer, spring and piston assembly. NOTE: Some units will not have a spacer.

CAUTION: Be careful when you remove the snap ring and release spring. The spring is under compression.

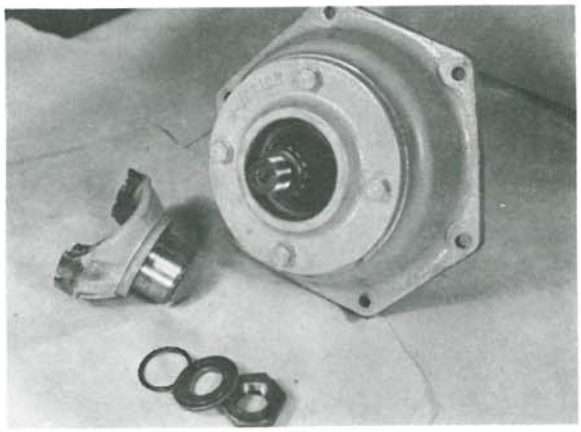


Figure 74
Remove the nut, washer and "O" ring from the pinion shaft. Remove input flange.

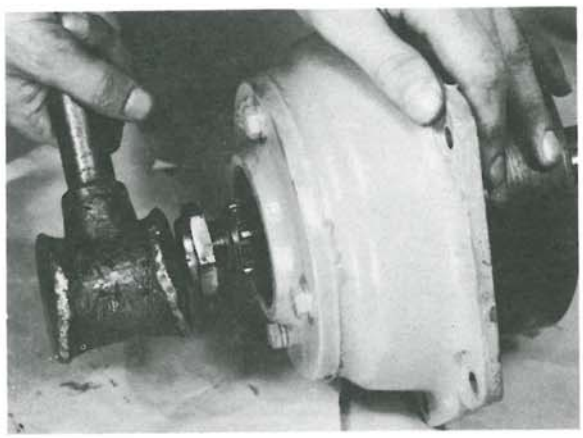


Figure 75
Remove the input shaft and clutch drum.

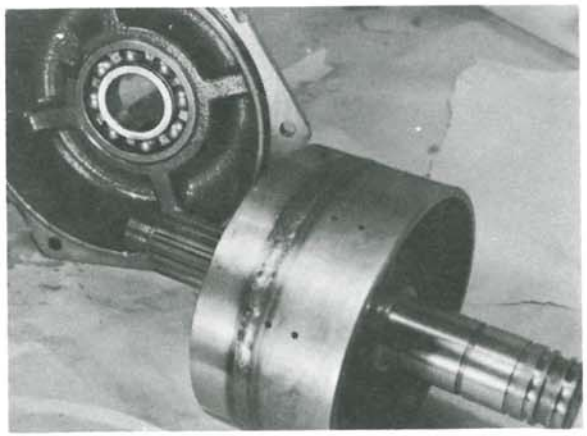


Figure 76
Input shaft and clutch drum removed from clutch housing.

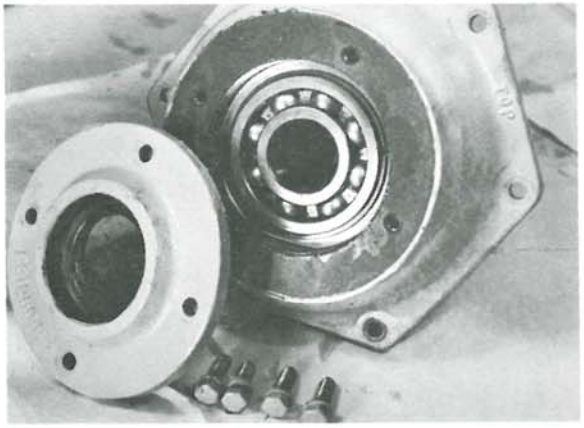


Figure 77
Remove the input clutch shaft bearing cap.

HOW TO REMOVE THE INPUT CLUTCH AND DROP GEAR FOR ALL WD SERIES WINCHES.

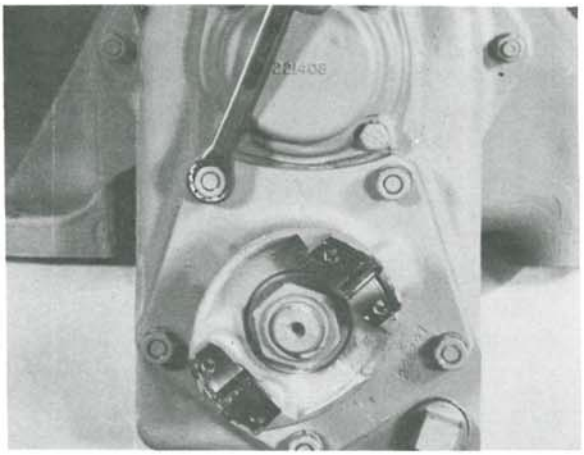


Figure 78
Remove the nuts from the bearing cap of the input shaft. Remove the bearing cap from the drop box.

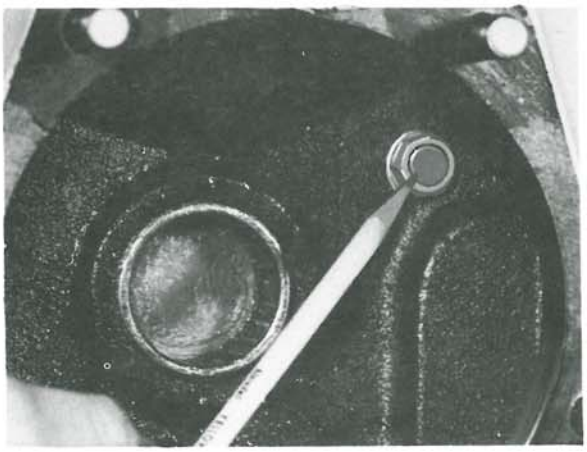


Figure 79
Remove the stud nuts and washers from the inner drop box.

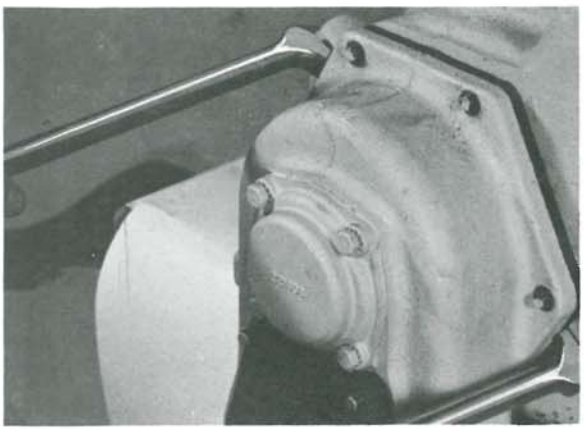


Figure 80
Remove the stud nuts and washers from the drop gear housing. Use pry bars to remove the input clutch and housing assembly.

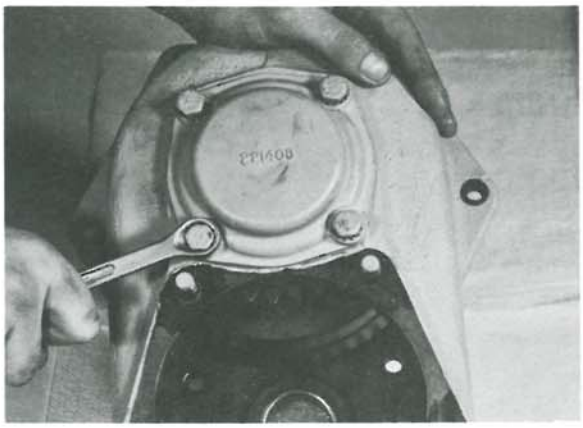


Figure 83
Remove bearing cap bolts and washers. Remove cap.

Figure 81
Input clutch and housing removed from the winch.

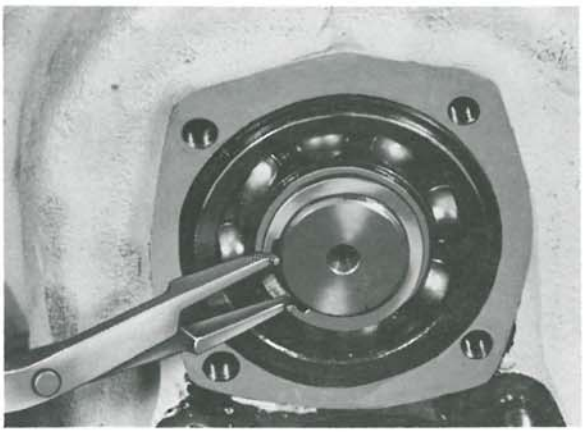


Figure 84
Remove clutch shaft to bearing retainer ring. Tap clutch assembly from drop gear housing.

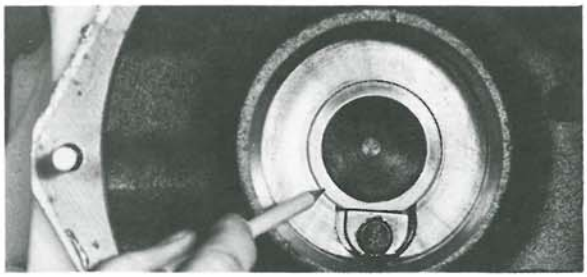


Figure 82
Input clutch shaft inner piston ring race.

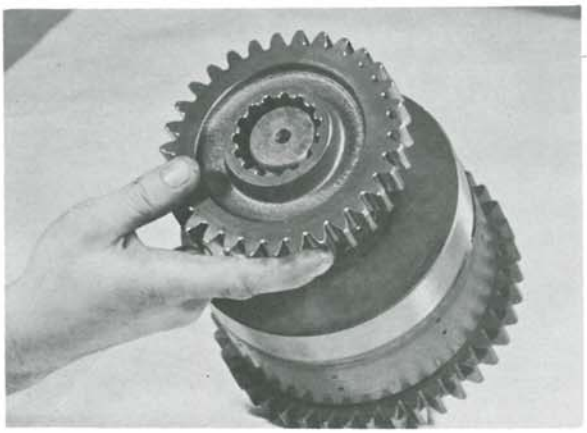


Figure 85
Remove the drive gear from the input clutch shaft.

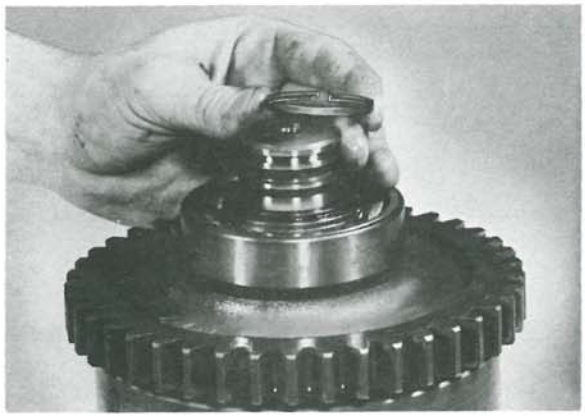


Figure 86
Remove the piston rings from the shaft. See Figures 66 thru 69 and proceed to Figure 87.

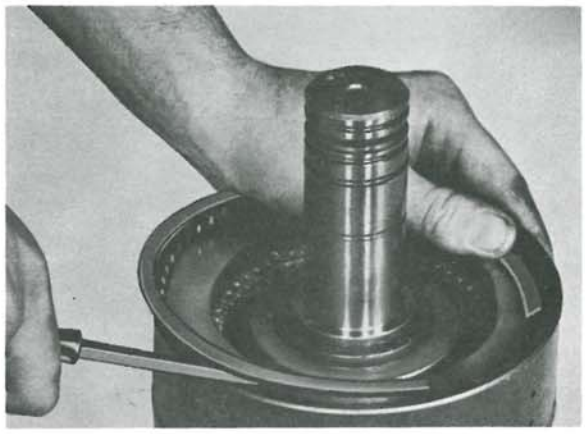


Figure 87
Remove the clutch disc backing plate snap ring.

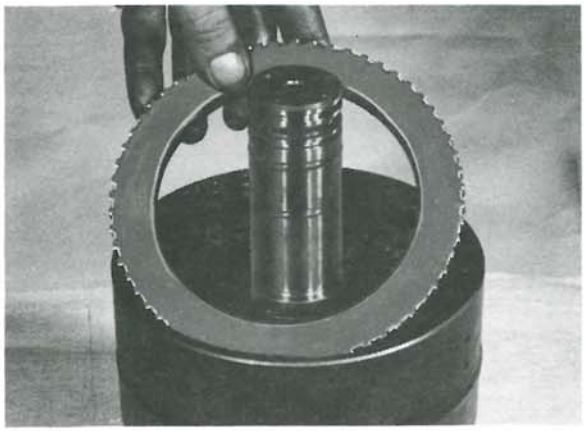


Figure 88
Remove the backing plate.

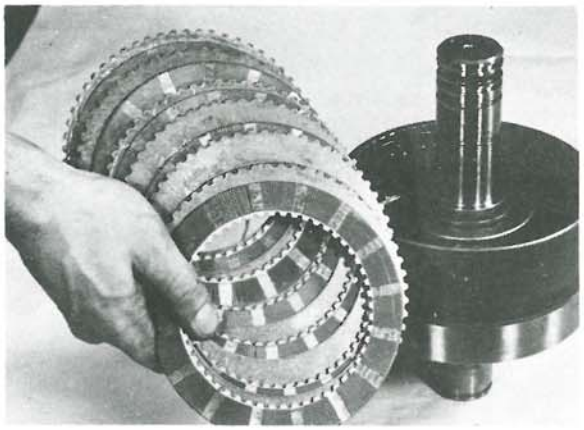


Figure 89
Remove the inner and outer clutch discs.

Figure 90
Remove the inner bearing.

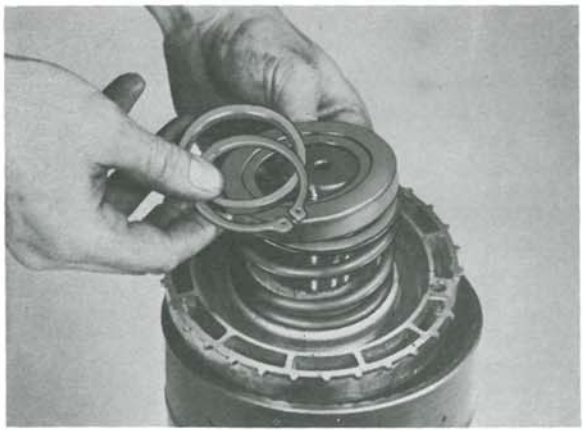


Figure 91
Compress the return spring and remove the snap ring. Remove the ring, the spring retainer, the spring, and the piston assembly. NOTE: Some units will have a snap ring spacer.

CAUTION: Be careful when you remove the snap ring. The spring is under compression.

Figure 92
Remove the one-way check valve breather from the winch housing. (Breather not as shown.)

DISASSEMBLY OF THE CONTROL VALVE. R231200

NOTE: There are two types of control valves. They are basically the same. See pages 58 and 59 for cross sections.

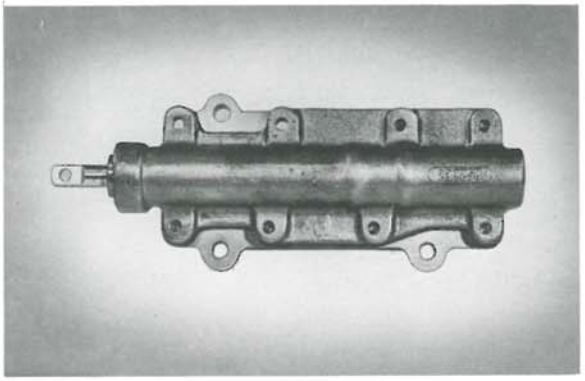


Figure 93
Control valve assembly. See page 58 and page 59 for control valve part identification.

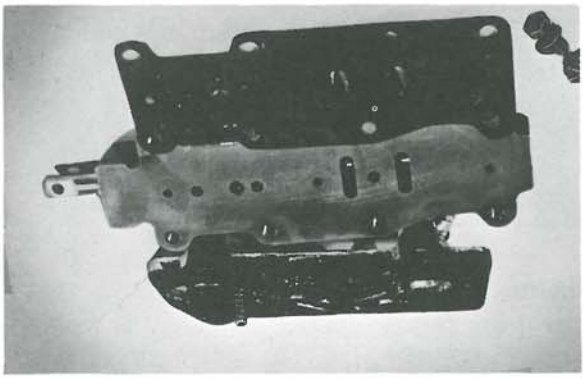


Figure 94
Remove the bolts that fasten the cover to the valve body.

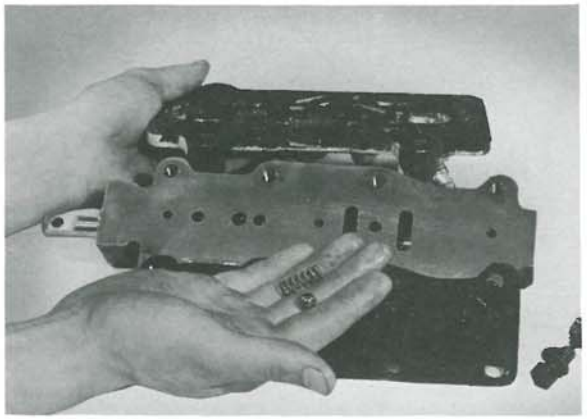


Figure 95
Remove the detent spring and ball.

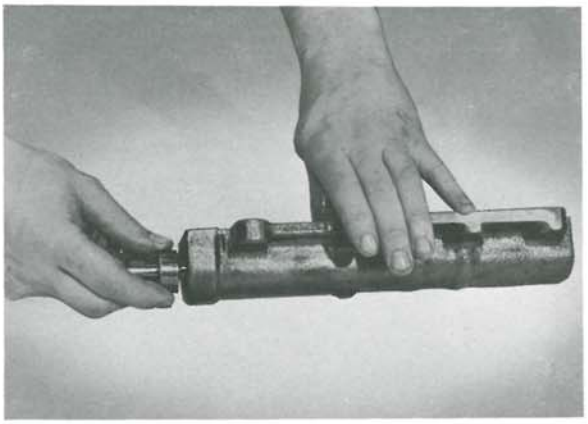


Figure 96
Remove the oil seal with a pointed tool. This procedure will damage the seal and it cannot be used again.

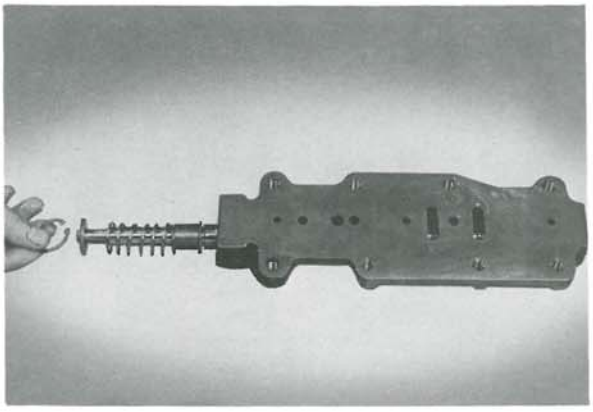


Figure 97
Remove the snap ring on the spring washer. Remove the valve spool, spring, spacer and washer.

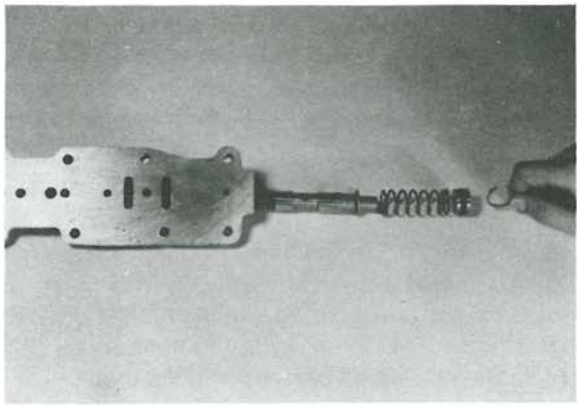


Figure 98

From the opposite end of the control valve, remove the retaining ring for the valve stop. Remove the valve stop, centering spring, regulating spool, spacer and sleeve.

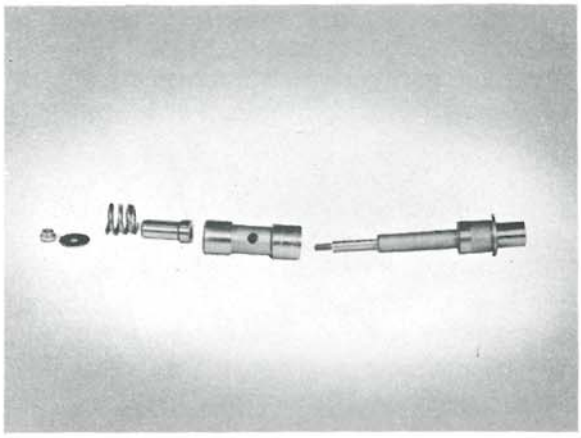


Figure 99

This is the regulating spool disassembled.

DISASSEMBLY OF THE CONTROL VALVE R242044

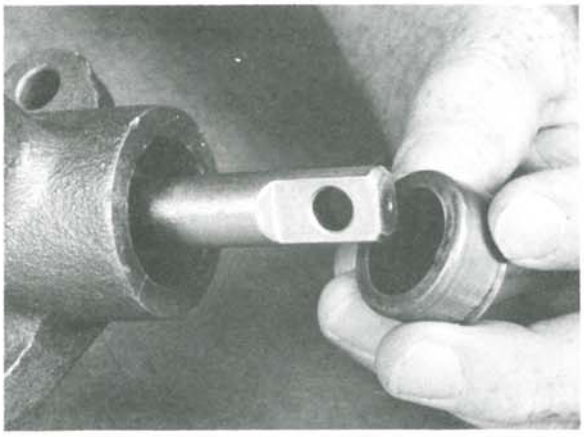


Figure 100

Remove the oil seal. This procedure may damage the seal and the seal cannot be used again.

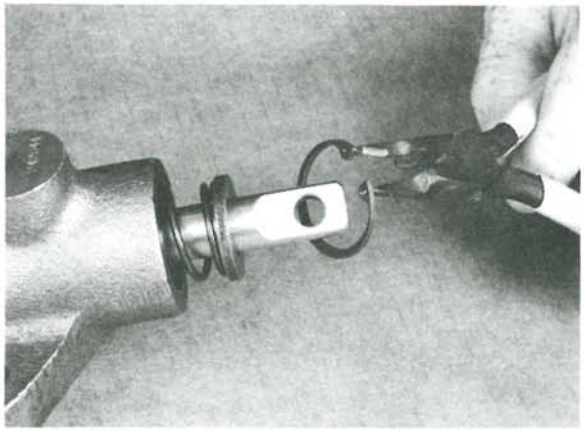


Figure 101

Remove the snap ring.

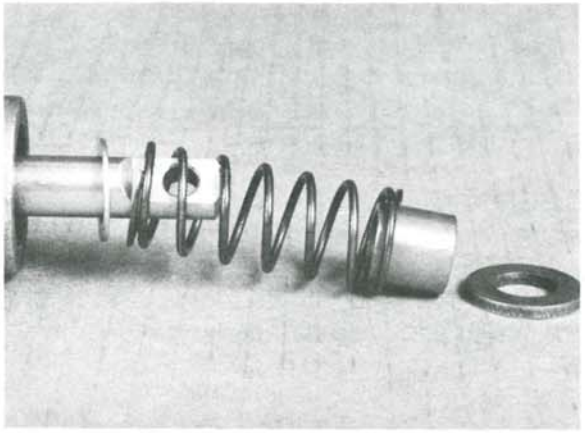


Figure 102

The washer, spacer, spring and retainer on the valve spool can then be removed.

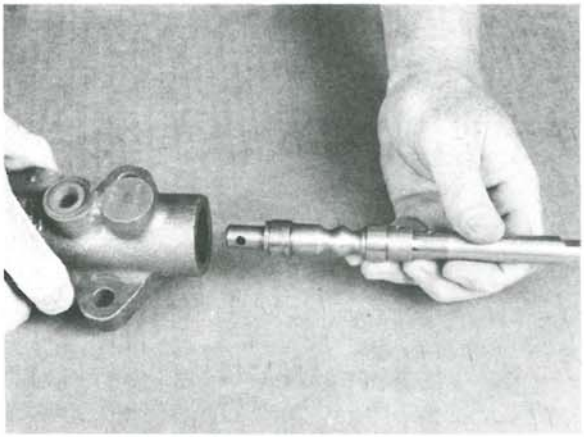


Figure 103

Remove the valve spool as shown.

Figure 104
The detent spring and ball can then be removed.

CLEANING AND INSPECTION

Clean parts with solvent. Inspect them carefully. Replace all parts showing wear or stress. Early replacement of parts with defects will reduce the chance of failure later.

CAUTION: Solvents can damage skin and eyes. Solvent vapors can damage lungs; solvent vapors are flammable, and a concentration of vapor will burn. Use solvents only in a well ventilated area. Do not smoke while cleaning parts and do not use solvents near an open flame.

BEARINGS

Put bearings in a container filled with solvent. Move them around in the solvent to remove old lubricant and foreign matter. Remove the bearing from the solvent and carefully hit the larger side against a block of wood to remove foreign matter. Do not damage the bearing. Repeat this procedure until the bearing is completely clean.

Dry bearings with air under pressure. Do not spin bearings while drying them.

Make an inspection of rollers, cages and cups for wear or damage. Lubricate bearings with the correct oil and wrap them in clean paper until you are ready to install them.

GEARS AND SHAFTS

Make an inspection of gear teeth and shaft splines for wear or damage. Look for bent shafts. Use the "Magna-flux" process whenever possible to look for cracks. Replace any part with wear through the case hardening.

GASKETS AND OIL SEALS

Replace all gaskets, oil seals, o-rings, snap rings and metal sealing rings whenever you disassemble the winch. Install sealing parts carefully. Any damage to a sealing part will cause it to leak. Put a thin layer of Permatex No. 2 to the outside surface of oil seals before you install them. This procedure will prevent leakage between the seal and its retainer.

Lubricate metal sealing rings with chassis grease to help you install parts more easily. Lubricate all rubber parts with the correct oil before installing them.

HOUSING

Cast parts with polished surfaces can be cleaned with solvent or steam. They must not be cleaned with a hot alkali solution.

Other housings, caps and covers can be cleaned in a hot solution tank until completely heated. Remove all alkali solution from parts with clean water. Dry them immediately with air under pressure or a clean, lint-free cloth.

CAUTION: Alkali solutions and vapor can damage skin, eyes and lungs. Steam will burn skin and eyes.

NOTE: Free spool clutch discs must be flat and not worn. Friction discs must be changed if oily, as cleaning will not remove oil from friction material. Free spool clutch discs must be installed **DRY.**

SEE ASSEMBLY INSTRUCTIONS ON PAGES 71, 72 AND 73.

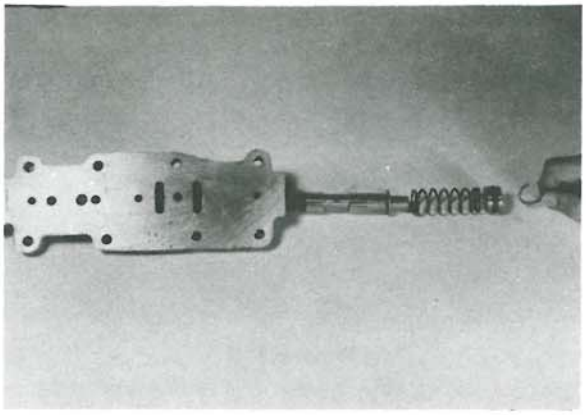


Figure 105
Install the valve stop, centering spring, regulating spool, spacer and sleeve. Install retainer ring.

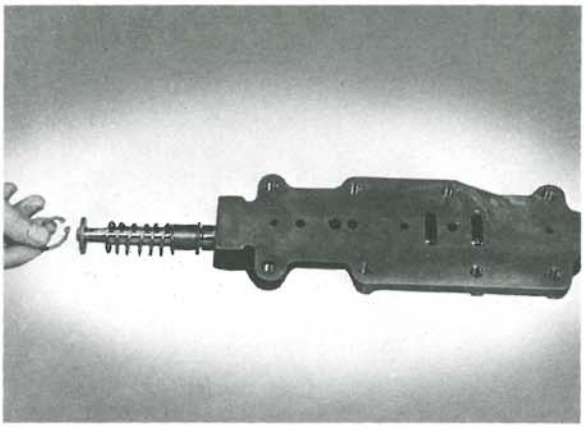


Figure 106
Install the valve spool, spring, spacer and washer. Compress spring and install retainer ring.

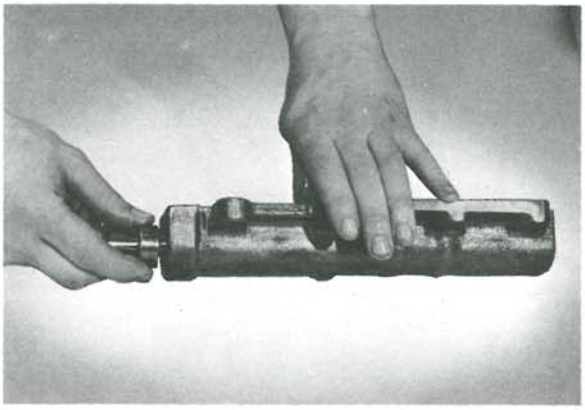


Figure 107
Apply a light coat of Permatex #2 to the outer diameter of the valve spool oil seal. Install with lip of seal in.

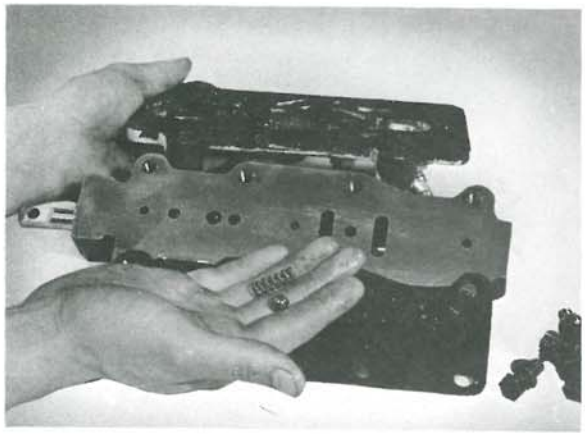


Figure 108
Replace the detent ball and spring.

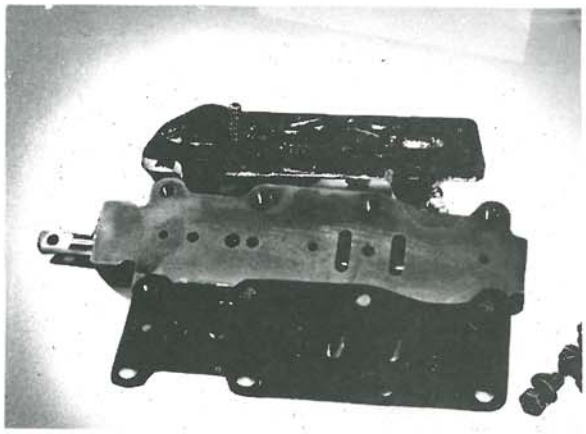


Figure 109
Replace the bolts that fasten the cover to the valve body. Tighten to specified torque. (See torque chart.)

Figure 110
Insert the ball and detent spring into its location in the housing.

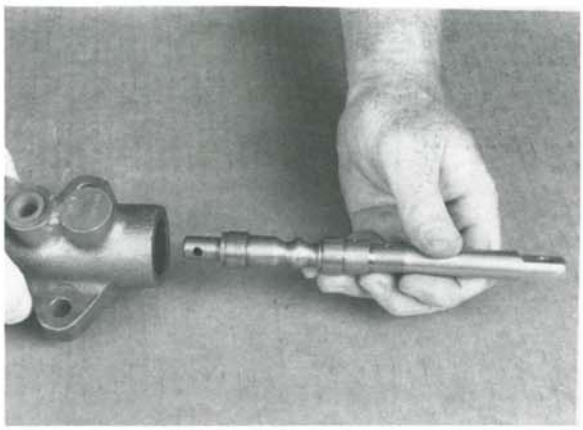


Figure 111
Insert the spool into the valve housing.

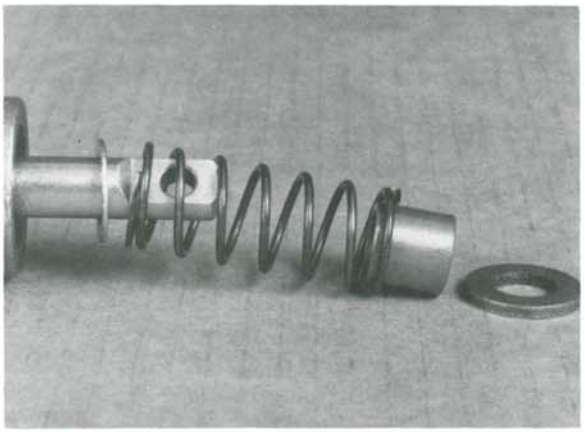


Figure 112
Slide the washer, spacer, spring and retainer onto the spool.

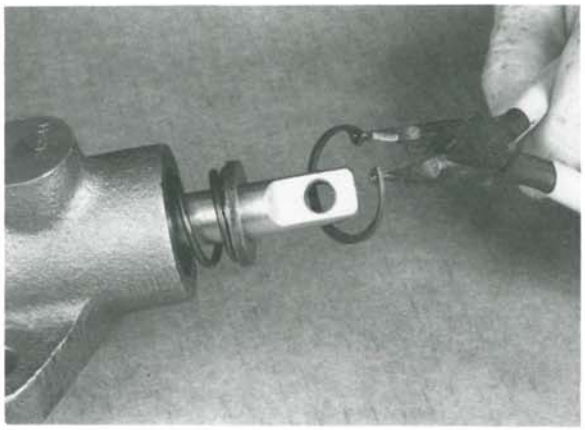


Figure 113
Compress the spring assembly and install the snap ring.

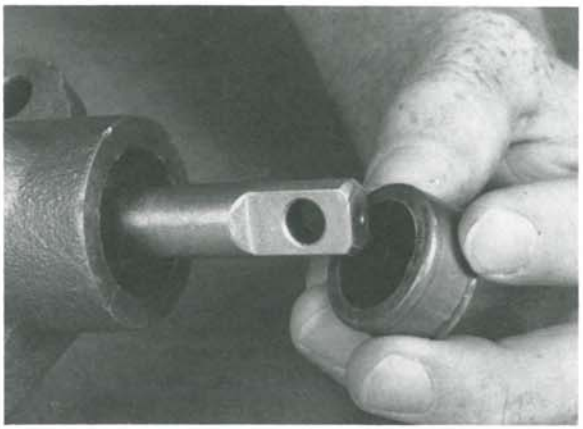


Figure 114
Apply a light coat of Permatex to the outer diameter of the valve spool oil seal. Install the lip of the seal in.

Figure 115
Install the check valve breather in the winch housing.

REASSEMBLY OF THE INPUT CLUTCH FOR ALL MODEL WINCHES.

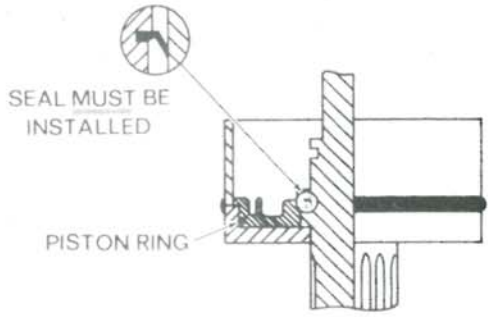


Figure 116
Install the lip seal on the input shaft, and the piston ring on the piston.

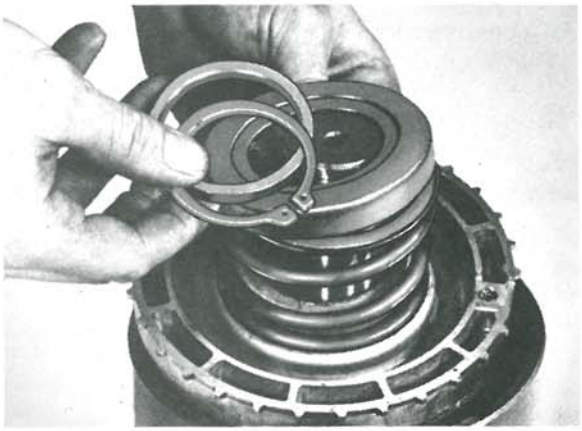


Figure 117
Install the piston, spring, spring retainer and snap ring. NOTE: Some units will have a snap ring spacer.

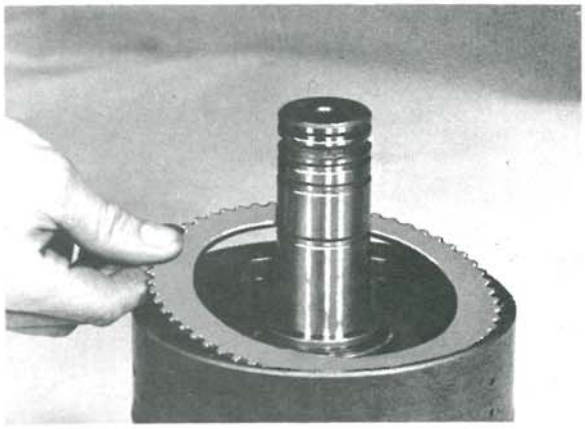


Figure 118
Install the first outer steel disc (teeth on the outer diameter) into the clutch drum.

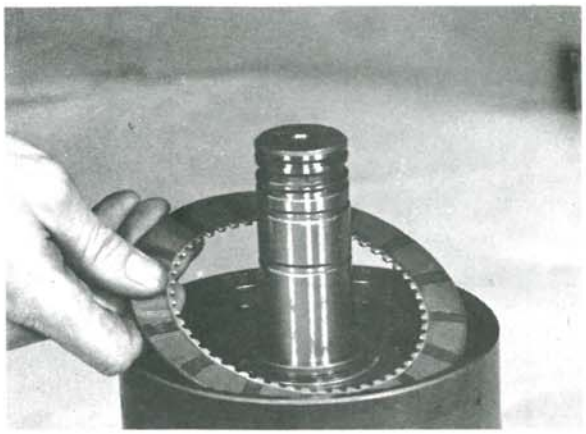


Figure 119
Install the first inner friction disc (teeth on the inner diameter). Add another steel outer disc followed by another friction inner disc. Alternate discs until the proper amount is installed. You start with a steel disc and end with a friction disc.

Figure 120
Install the clutch disc backing plate and retainer ring. Install the clutch gear inner bearing.

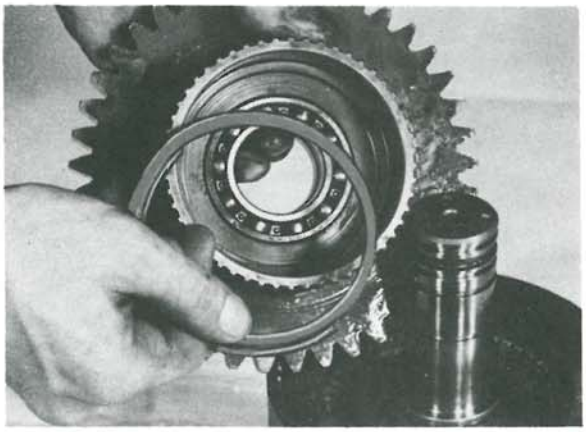


Figure 121
Install the oil baffle ring in the clutch hub gear.

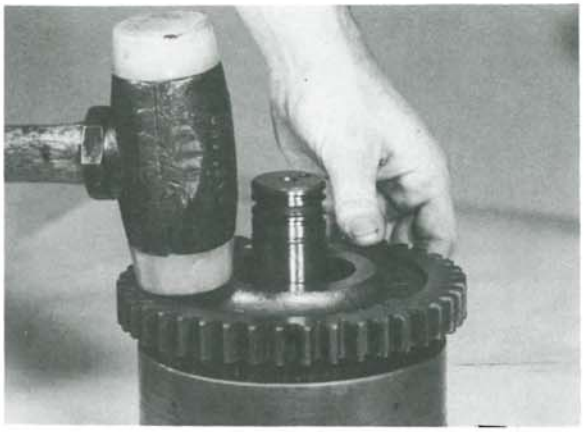


Figure 122

Install clutch driven gear into clutch drum. Align splines on clutch gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

Figure 123

Install clutch gear outer bearing.

Figure 124

Install bearing retainer ring.

Figure 125

Install outer bearing and retainer ring. Install piston rings on clutch shaft.

HOW TO INSTALL THE INPUT CLUTCH ASSEMBLY FOR ALL W SERIES WINCHES.

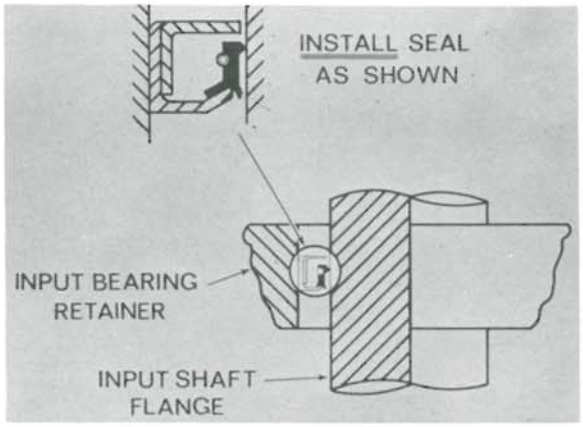


Figure 126

Apply a light coat of Permatex #2 to the outer diameter of the input shaft oil seal. Install the seal in the input bearing retainer. Press seal to depth shown on assembly instruction drawing. (Page 71)

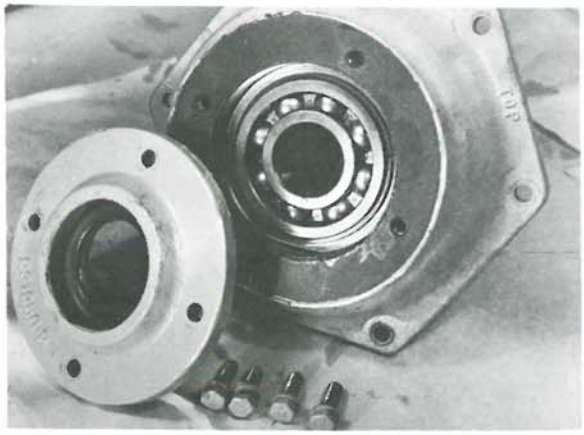


Figure 127

Install the front bearing. Install the retainer and bolts. Tighten the bolts to the specified torque. (See torque chart.)

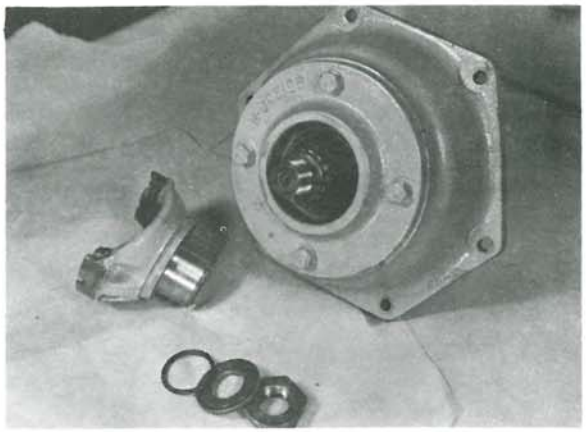


Figure 128

Install the clutch assembly in the clutch housing. Install the input flange, o-ring, washer and nut. Tighten nut 175 to 200 ft. lbs. of torque (25-27 kgf• m, 237-271 N.m.). Install the input clutch and bearing cap assembly on the winch. Install the bolts and tighten 26 to 29 ft. lbs. of torque (3.4-4 kgf• m, 36-39 N.m.).

HOW TO INSTALL THE INPUT CLUTCH AND DROP GEAR ASSEMBLY IN ALL WD SERIES WINCHES.

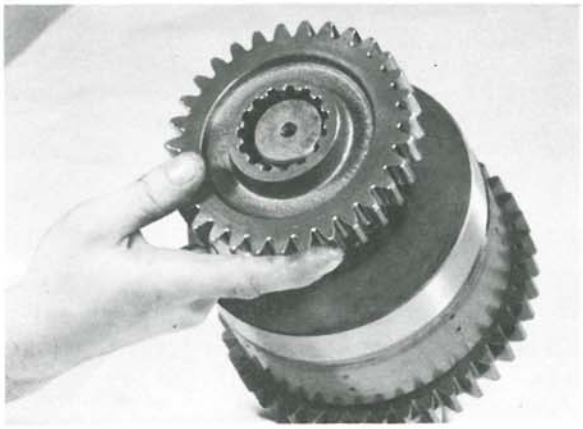


Figure 129

Install the drop gear on the input clutch shaft.

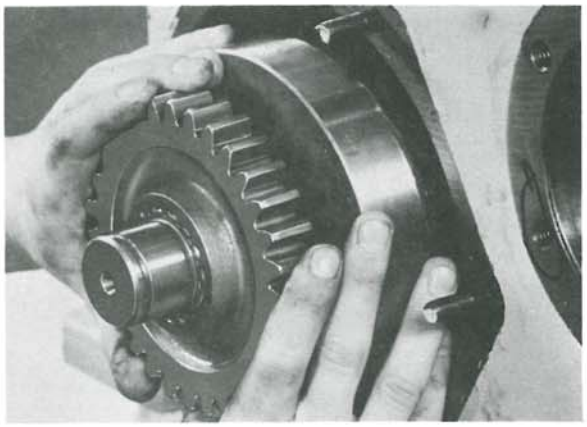


Figure 130

Install the input clutch assembly in the winch housing. Use caution as not to damage clutch shaft piston rings.

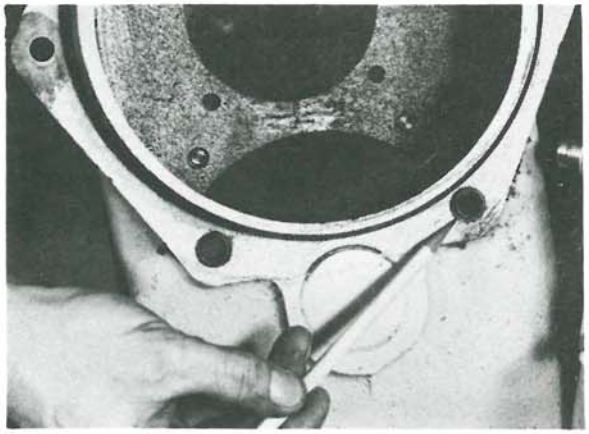


Figure 131

With new "O" rings on stud holes, position the drop gear housing on the studs. Be careful that you do not damage the two o-rings.

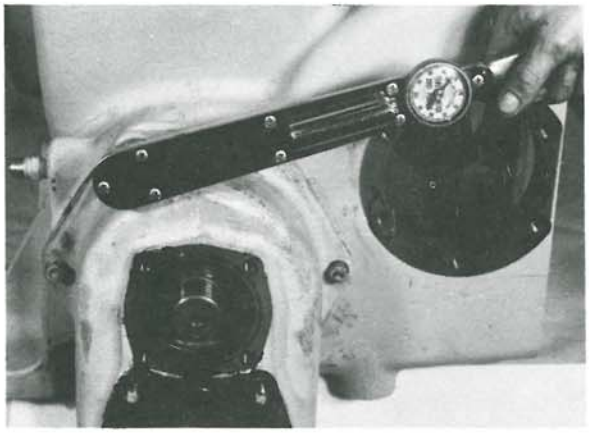


Figure 132

Tighten the nuts on the mounting studs to specified torque. (See torque chart.)

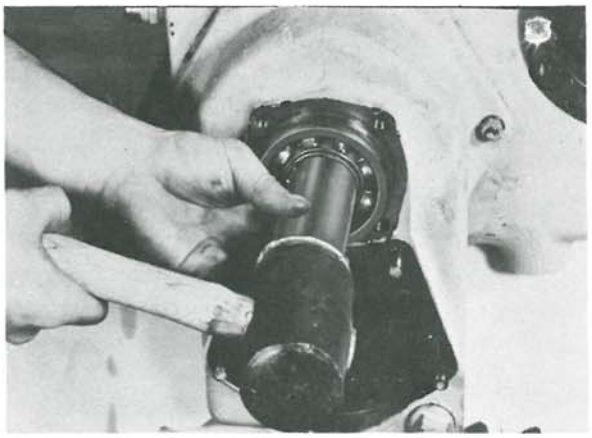


Figure 133

Install the front bearing on the clutch shaft.

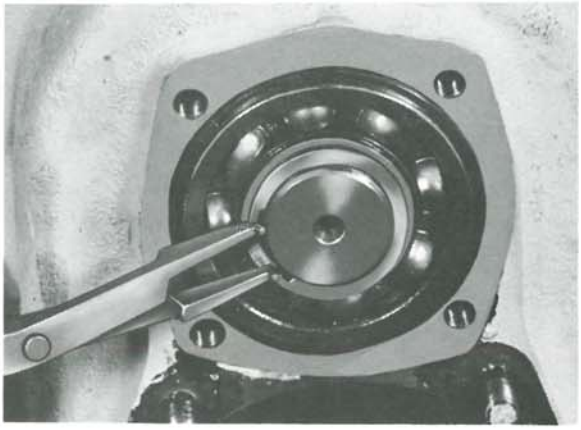


Figure 134
Install bearing to clutch retainer ring. Install bearing cap.

Figure 135
Install capscrews and washers. Tighten to specified torque. (See torque chart.)

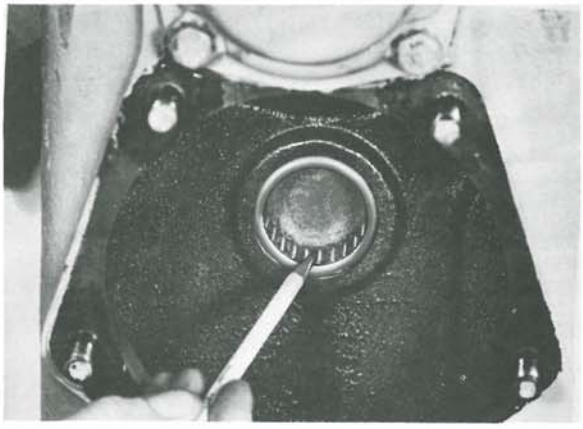


Figure 136
Install the input pilot bearing in the drop housing.

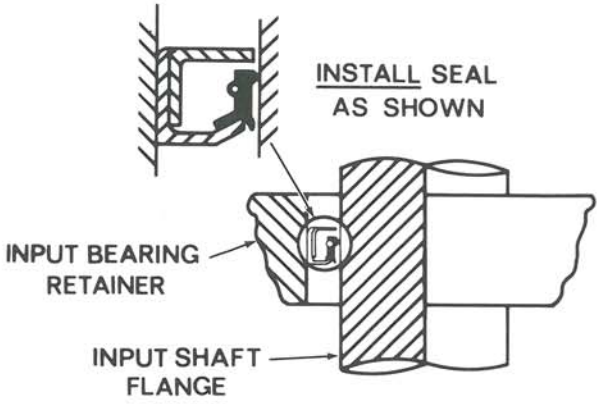


Figure 137
Apply a light coat of Permatex #2 to the outer diameter of the input seal. Install the seal in the input shaft bearing retainer.

Figure 138
Install input shaft and bearing in bearing retainer. Install bearing retainer ring. Install input shaft gear and retainer ring on shaft. Install input flange, o-ring, washer and flange nut. Tighten nut 175 to 200 ft. lbs. torque (2.0-2.3 kgf• m, 237-271 N.m.). Position assembly in drop gear housing. Install washers and stud nuts.

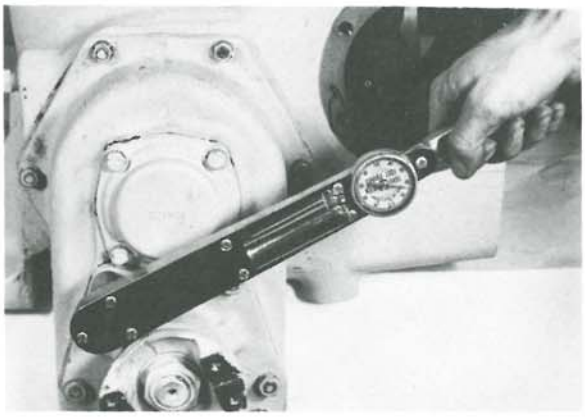


Figure 139
Tighten stud nuts to specified torque. (See torque chart.)

HOW TO INSTALL THE PINION SHAFT FOR ALL MODEL WINCHES.

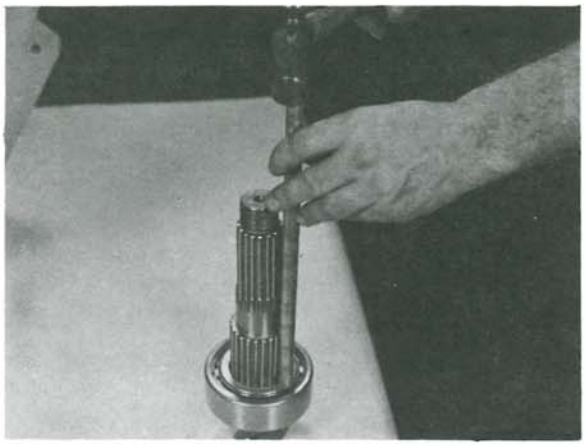


Figure 140
Install inner bearing on pinion shaft.

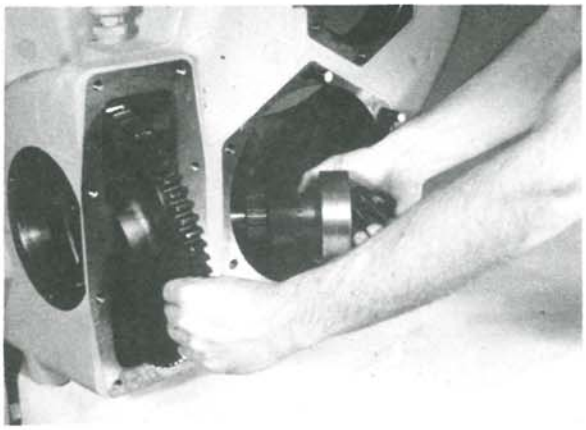


Figure 141
Install the pinion and drive gear in the winch. All 300 and 400 series winches are currently manufactured with spacer between the pinion inner bearing and drive gear. **NOTE: IF PINION IS MATCHED WITH A RING GEAR THAT IS MOUNTED ON THE INSIDE OF THE CABLE DRUM DRIVE GEAR (AS SHOWN IN FIG. 24) DO NOT PROCEED ANY FARTHER WITH THE PINION INSTALLATION UNTIL THE RING GEAR IS INSTALLED.**

HOW TO ASSEMBLE THE PINION SPRAG FOR W AND WD 300 SERIES WINCHES.

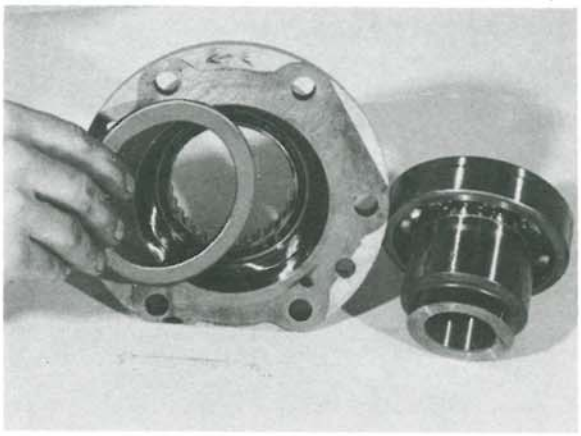


Figure 142
Install the sprag assembly and retaining washer in the outer race. Install the bearing in the inner race of the sprag. Install the inner race and the bearing in the outer race.

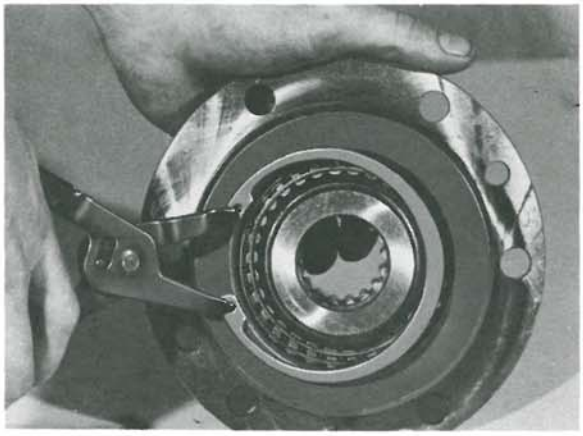


Figure 143
Install the sprag retaining ring.

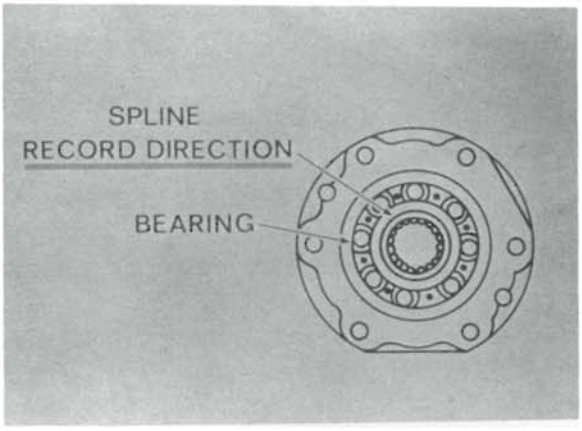


Figure 144
Make a check that the sprag turns in the correct direction. If you did not make a note of the direction of sprag rotation during disassembly, see the chart on page 52.

HOW TO ASSEMBLE THE PINION SPRAG FOR W AND WD 311, AND ALL 400 SERIES WINCHES.

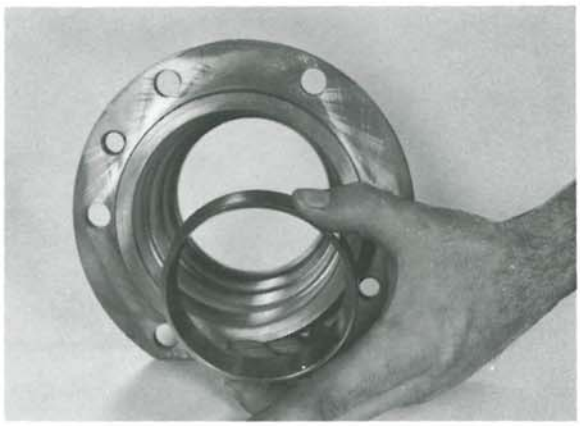


Figure 145
Install the rear bearing cup in the sprag outer race.

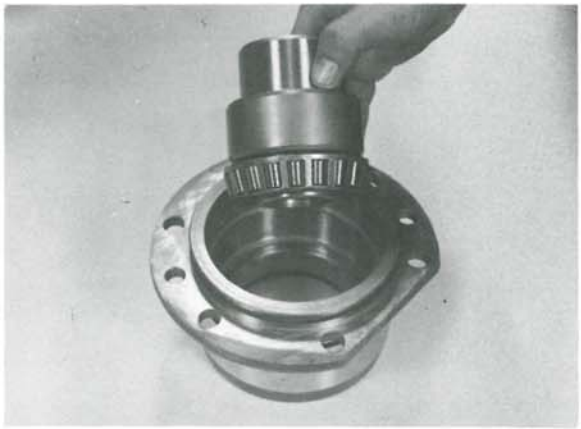


Figure 146
Install the rear bearing cone and sprag inner race.

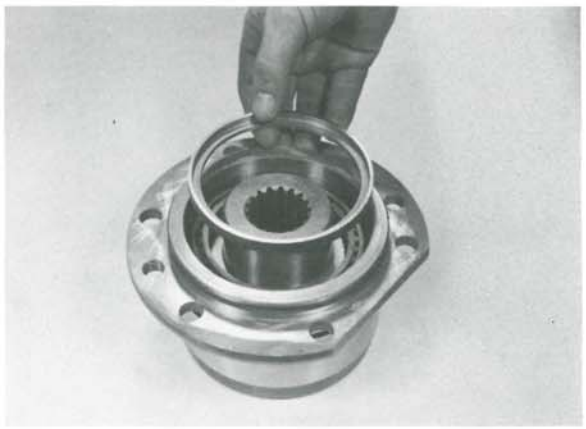


Figure 147
Install the sprag assembly and retainer in the outer race.

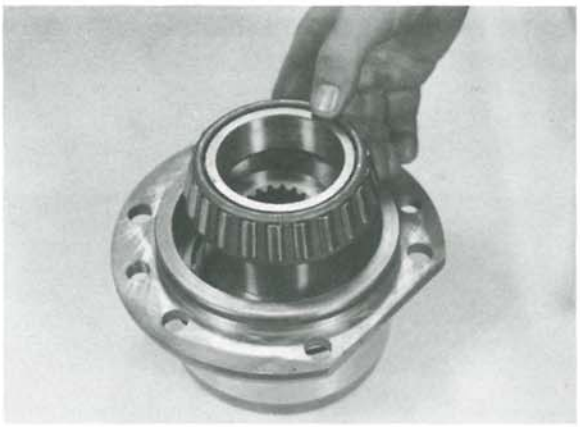


Figure 148
Install the front bearing cone in the outer race.

Figure 149
Install the front bearing cup in the outer race.

See note in Fig. 141.

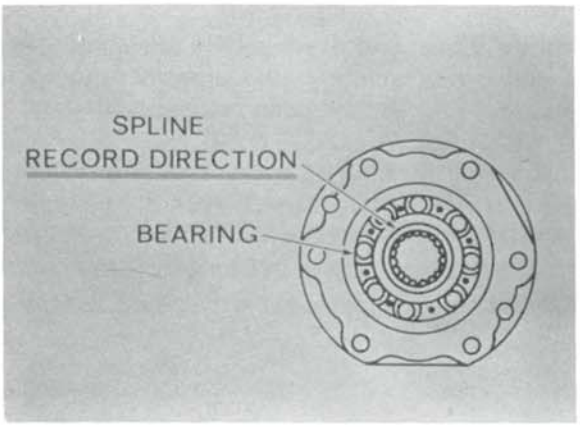


Figure 150
Make a check that the sprag turns in the correct direction. If you did not make a note of the direction of sprag rotation during disassembly, see the chart on page 52.

HOW TO INSTALL THE PINION FOR ALL MODEL WINCHES. NOTE: Some models will have taper bearings instead of ball bearings. **SEE NOTE IN FIGURE 141.**

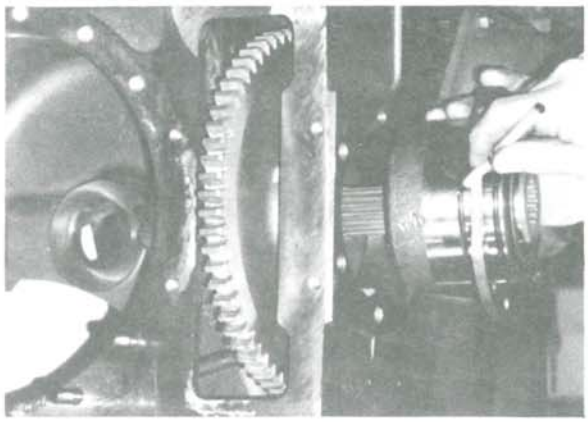


Figure 151
Position new "O" rings on the sprag outer race. Install the sprag assembly on the pinion shaft.

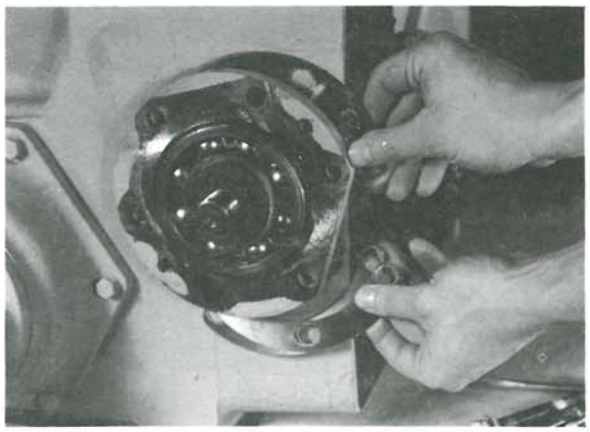


Figure 152
Install the shims on the outer race of the sprag. These shims affect the tooth contact between the ring and pinion gears.

Figure 153
Install the disc hub, washer and nut.

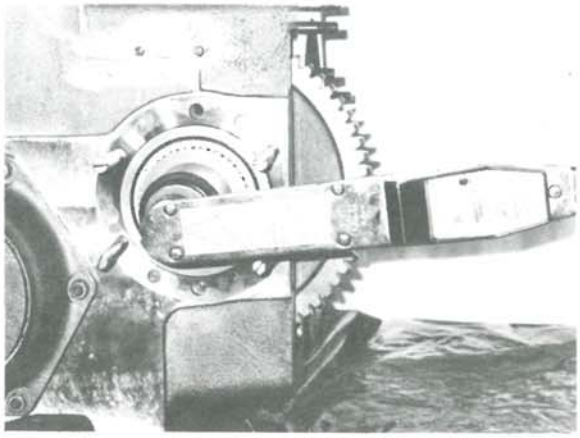


Figure 154
Put a block under the pinion gear to prevent it from turning. Tighten the pinion shaft nut 175 to 200 ft. lbs. torque (2.0-2.3 kgf• m, 237-271 N.m.).

HOW TO ASSEMBLE THE RING GEAR MOUNTED INSIDE THE DRUM DRIVE GEAR. (LIKE SHOWN IN FIGURE 24)

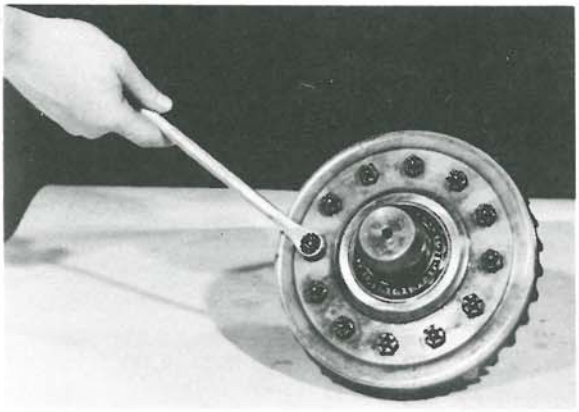


Figure 155
Assemble the ring gear and hub. Tighten the bolts to specified torque. (See torque chart.)

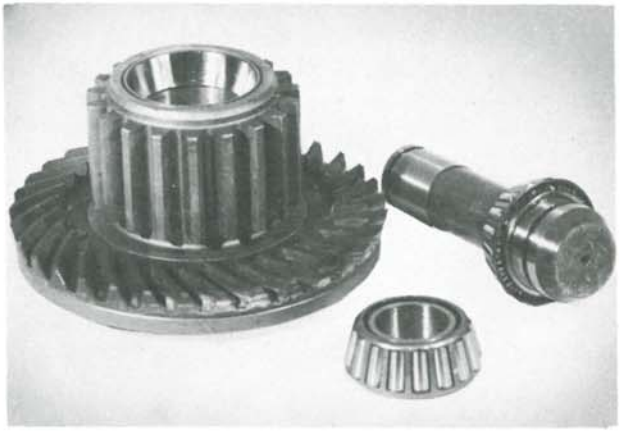


Figure 156
Position the inner tape bearing on ring gear shaft. Install shaft and bearing in ring gear. Install outer bearing.

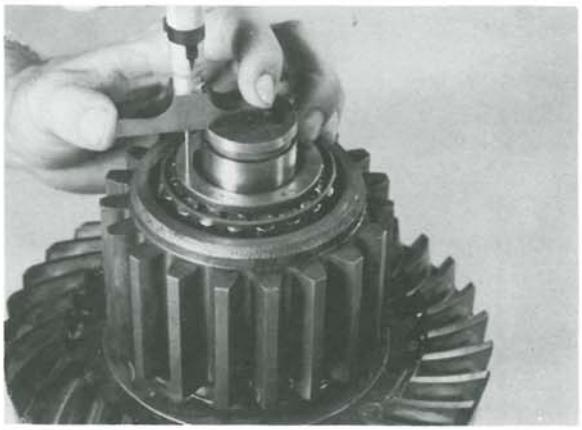


Figure 157

Measure the distance from the inner race of the bearing to the end of the shaft. Make a note of this distance.

Figure 158

Measure the distance from the face of the cover to the bottom of the bore. Make a note of this distance. Subtract the distance from the inner race to the end of the shaft from this distance. Subtract .005 inch (.1270 mm) from the difference.

EXAMPLE: If the first distance is .740 inch (18.79 mm) and the second distance is .801 inch (20.32 mm), the difference is .061 inch (1.53 mm). Subtract .005 inch (.1270 mm) and the answer is .056 inch (1.4 mm). You need shims with a total thickness of .056 inch (1.4 mm).

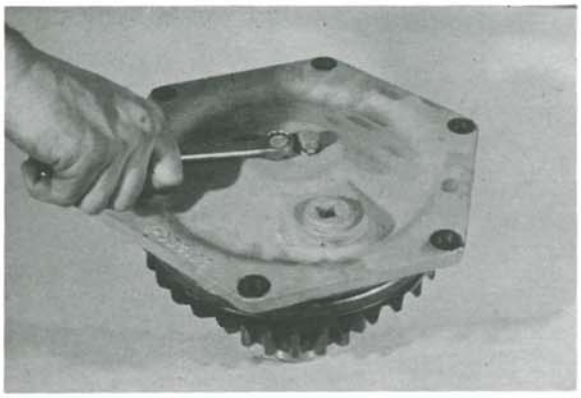


Figure 159

Install selected shims between ring gear shaft and ring gear cover. Install cover to shaft bolts and washers. Tighten bolts to specified torque. (See torque chart.)

Install ring gear cover in a vise equipped with soft jaws as shown in Figure 160.

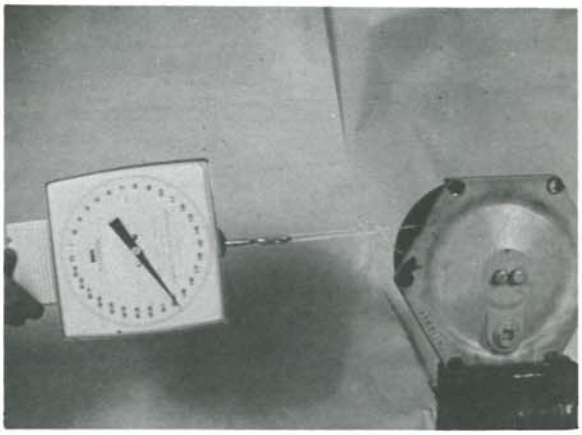


Figure 160

Use a cord and scale to find the preload tension on the bearing. Tie a cord around the splines on the gear as shown. Fasten the end of the cord to the scale. Pull the scale away from the gear. Make a note of the number shown by the scale when the assembly begins to rotate. The scale must show between 19.5 lbs. and 23 lbs. (8.8-10.4 kg). This equals 50-60 lbs./in. (0.57-0.69 kgf/m, 5.64-6.77 N.m.) preload tension on the bearing.

If the scale shows less than 19.5 lbs. (8.8 kg), remove shims. If the scale shows more than 23 lbs. (10.4 kg), add shims. See Steps 1 and 2.

STEP 1. After proper preload on taper bearings is made, remove ring gear cover and shims. Remove ring gear shaft and taper bearings.

STEP 2. Position the inner taper bearing in the inner taper bearing cup in the ring gear. (This is the bearing and cup on the inside next to the ring gear.) Hold bearing in place with a loose fitting rod or bar through inner ring gear shaft bore.

Position ring gear inside the pinion. Insert ring gear shaft from inside cable drum housing making sure inner bearing remains in inner bearing cup. Tap shaft into position in housing. Continue to install the pinion sprag as explained in Figure 151 thru Figure 154. Position ring gear shaft outer bearing on shaft. To facilitate assembly of the ring gear cover and pre-selected shims, install two aligning studs in the end of the ring gear shaft. Position pre-selected shims on studs. Align studs with holes in cover.

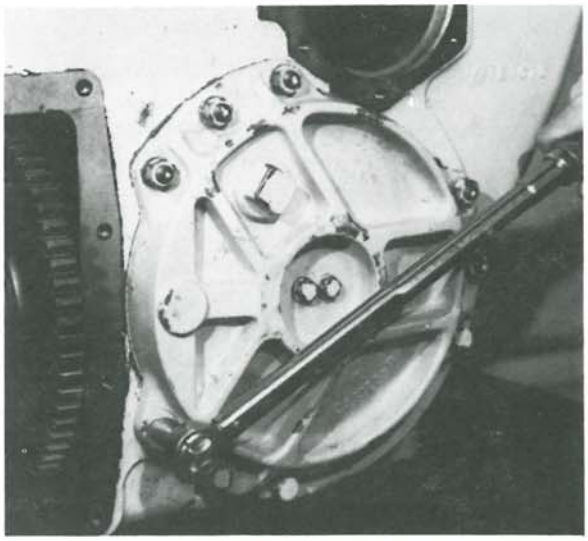


Figure 161

Position the ring gear cover on housing to cover studs leaving enough space to install ring gear cover to housing shims. Use the same shims or equivalent thickness shims that were removed at disassembly. Position shims under ring gear cover. Install cover with inspection hole plug in location shown (about 11 o'clock). Install bolts, washers and stud nuts. Tighten bolts and nuts to specified torque. (See torque chart.)

Remove one aligning stud from ring gear shaft and install one cover to shaft bolt and washer. Remove other stud and install bolt and washer. Tighten bolts to specified torque. (See torque chart.)

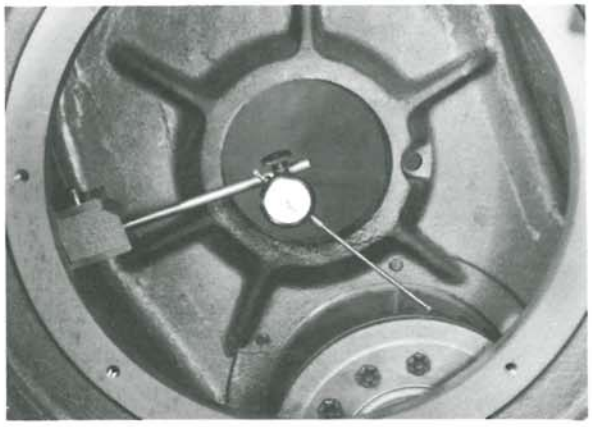


Figure 162

Fasten an indicator in the position shown in the photograph. Hold the pinion so that it cannot move. From the drum side of the housing as shown, rotate the ring gear assembly in a clockwise direction until it stops against the teeth of the pinion. Place the end of the indicator stem against the face of a tooth of the ring gear. It must rest at 90 ° to the tooth face. Adjust the indicator to show zero. Rotate the ring-gear in a counter-clockwise direction until it stops against the teeth of the pinion. Make a note of the number shown by the indicator. It must show between .006 and .011 inches (.152 and .249 mm). See the tooth contact chart on pages 53 and 54.

If the indicator shows more than .011 inches (.279 mm) add shims between the ring gear cover and the winch housing. If it shows less than .006 inches (.152 mm) remove shims.

Paint the teeth of the ring gear with a mixture of red lead and linseed oil. Rotate the pinion against the ring gear. Make a check of the tooth contact as shown by the red lead. See the tooth contact chart on pages 53 and 54. Add or remove shims from between the outer race of the pinion sprag and the winch housing or ring gear cover to housing shims to adjust tooth contact. Repeat this procedure until tooth contact is correct.

After pinion bearing preload, ring gear backlash and ring gear to pinion tooth contact is set, use following procedure:

Remove two bolts holding the ring gear shaft to ring gear cover. Remove stud nuts and bolts holding ring gear cover to winch housing. Using pry slots provided, remove ring gear cover and shims. Wire shims to cover for reassembly.

From outside (ring gear cover side A) drive the ring gear shaft out of ring gear. NOTE: use a brass bar a little longer than the ring gear shaft to hold the ring gear inner taper bearing in place. With pinion moved as explained Figures 40 thru 45, let ring gear drop to the bottom of the case as far as it will got but keep inner bearing in place in inner cup.

Position the cable drum drive gear in the housing with long hub of gear in toward outside (rear) bearing bore. See assembly instructions on page 71 for position of drive gear hub for inside mounted ring gear. Use a bar or rod through outside bearing bore and into cable drum area. Use a chain and hoist and pull drive gear up as far as it will go against the top of the winch housing.

Repeat procedure explained after Figure 160 - Step 2 and Figure 161.

After ring gear and pinion are fully reassembled, lower cable drum drive gear in position on ring gear. Install inner (front) bearing on drive shaft as shown in Figure 27.

Remove chain and bar from drive gear. Insert shaft and bearing thru drive gear into outer (rear) bearing bore. Block shaft from inside and install rear bearing on drive shaft. Install rear bearing locating ring into winch housing. Proceed with Figure 173.

HOW TO ASSEMBLE THE RING GEAR MOUNTED OUTSIDE THE DRUM DRIVE GEAR.

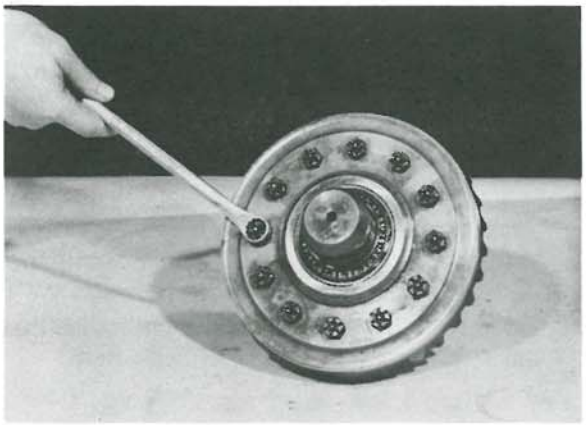


Figure 163
Assemble the ring gear and hub. Install ring gear bolts. Tighten bolts 40 to 60 ft. lbs. of torque (5.53-8.29 kgf• m, 54.23-81.35 N.m.).

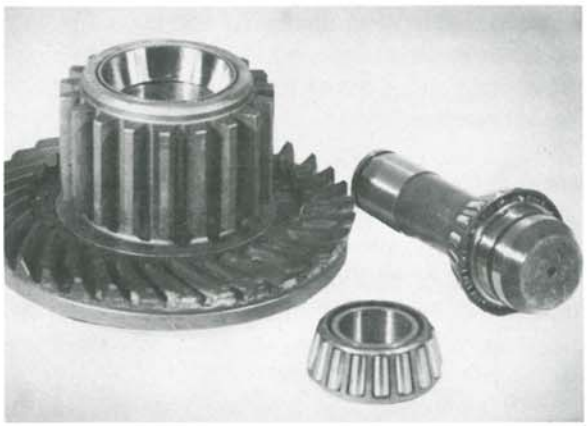


Figure 164
Position the inner taper bearing on ring gear shaft. Install shaft and bearing in ring gear. Install outer bearing.

Figure 165
Measure the distance from the inner race of the bearing to the end of the shaft. Make a note of this distance.

Figure 166
Measure the distance from the face of the cover to the bottom of the bore. Make a note of this distance. Subtract the distance from the inner race to the end of the shaft from this distance. Subtract .005 inch (.1270 mm) from this difference.

EXAMPLE: If the first distance in .740 in. (18.79 mm) and the second distance is .801 in. (20.32 mm), the difference is .061 in. (1.53 mm). Subtract .005 inch (.1270 mm) and the answer is .056 inch (1.42 mm). You need a shim with a thickness of .056 inch (1.42 mm).

Figure 167
Install selected shims in cover.

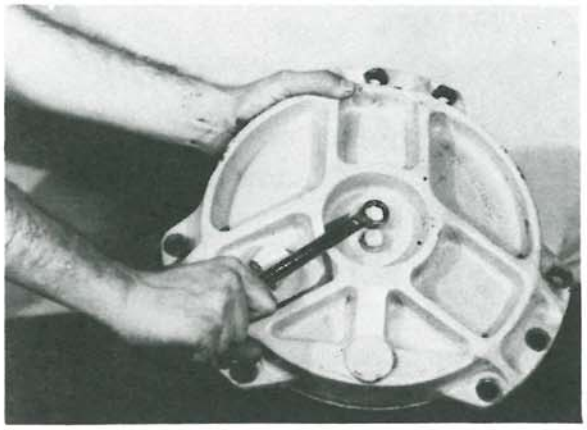


Figure 168

Assemble the ring gear cover to the shaft with bolts and washers. Tighten to specified torque. (See torque chart.)

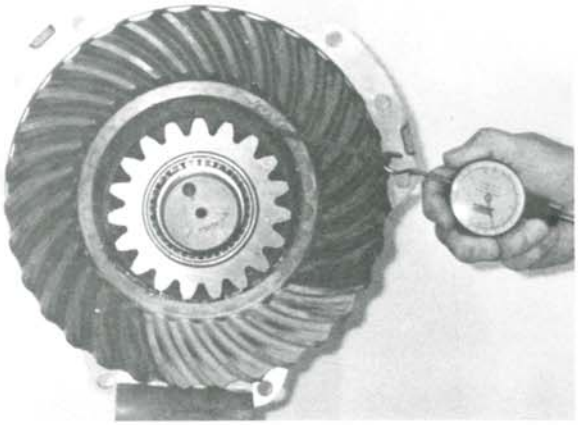


Figure 169

Use a cord and a scale to find the preload tension on the bearing. Wind a cord around the splines on the gear as shown. Fasten the end of the cord to a scale. Slowly pull the scale away from the gear. Make a note of the number shown by the scale when the assembly begins to rotate. The scale must show between 19.5 lbs. and 23 lbs. (8.8 and 10.4 kg). This equals 50-60 lbs.-in. (0.57-0.69 kgf• m) preload tension on the bearing. If the scale shows less than 19.5 lbs. (8.8 kg), remove shims. If the scale shows more than 23 lbs. (10.4 kg), add shims.

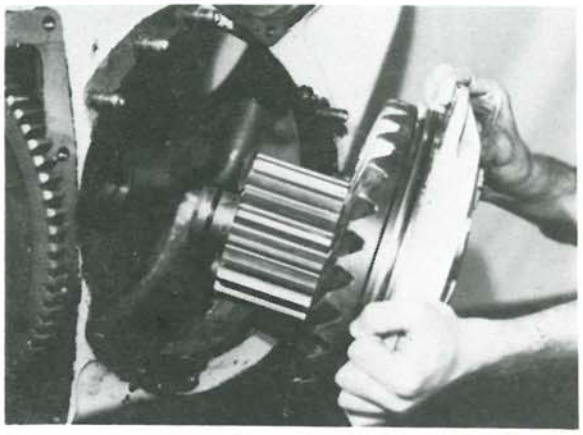


Figure 170

To check ring and pinion gear for proper tooth contact, paint ring gear teeth with a mixture of red lead and linseed oil. When ring and pinion gears are rotated, the red lead is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts. As a rule, painting about 10 or 12 teeth is sufficient for checking purposes.

With new "O" ring installed on ring gear cover, position the ring gear cover on housing to cover studs leaving enough space to install ring gear cover to housing shims. Use the same shims or equivalent thickness shims that were removed at disassembly. Position shims under ring gear cover. Install cover with inspection hole plug in location shown (about 11 o'clock). Install bolts, washers and stud nuts. Tighten bolts and nuts to specified torque. (See torque chart.)

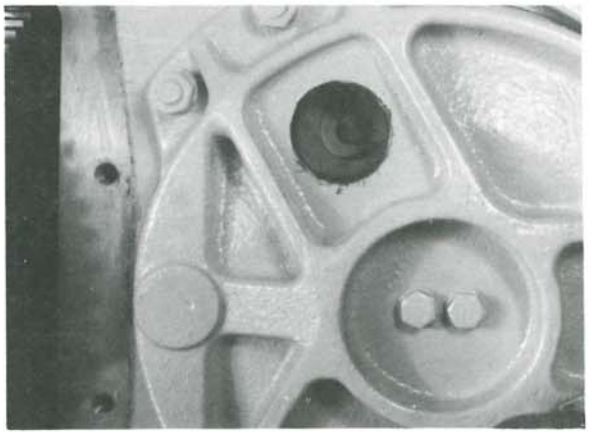


Figure 171

Remove the check plug from the ring gear cover. Rotate ring gear assembly in a clockwise direction until a bolt, rivet or counter sunk hole appears in the plug hole.

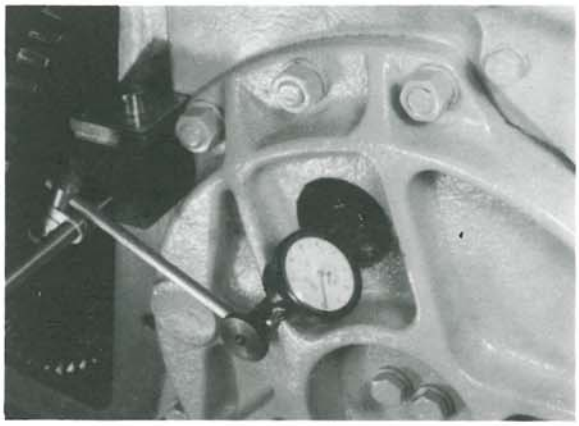


Figure 172

Hold the pinion so it cannot move. Move the ring gear assembly in a clockwise direction until it stops against the teeth of the pinion. Fasten an indicator in the position shown in the photograph. Put the right angle adapter for the indicator at an angle of 90 ° against the side of the nut or rivet. Adjust the indicator to zero. Move the ring gear assembly in a counter-clockwise direction until it stops against the teeth of the pinion. Make a note of the number shown on the indicator. It must show between .006 and .011 inches (.15 and .28 mm). If the indicator shows more than .011 inches (.28 mm), remove shims from between the ring gear cover and the winch housing.

If it shows less than .006 inch (.15 mm), add shims.

Rotate ring gear and pinion. Check tooth contact pattern on drive side (convex side) of ring gear teeth. Coast side will automatically be correct when drive side pattern is correct. Refer to gear tooth contact chart. If proper tooth contact pattern is not as shown, readjust backlash or, add to or subtract from shim pack between ring gear cover and winch housing or between the pinion sprag outer race and winch housing.

Addition of or subtraction of shims should be made in small increments until proper contact is established. Split shims are provided to permit removal or insertion. Note: It may be necessary to remove or add shims between the pinion sprag.

HOW TO INSTALL THE PINION BRAKE

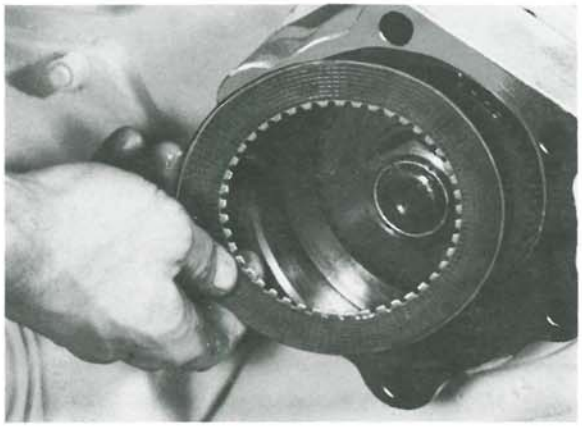


Figure 173

Install pinion shaft brake disc housing. Install brake disc.

NOTE: Make sure that the teeth on the brake disc align with the disc hub.

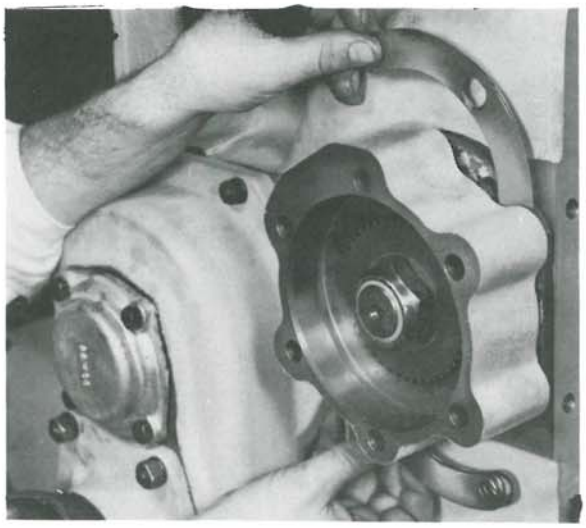


Figure 174

Install the shims behind the housing. Put an inch/lb. (kgf• m) torque wrench on the hub nut. Turn the pinion with the torque wrench. Make a note of the number shown by the wrench when the pinion begins to turn. Install two bolts in the brake housing and tighten them to the correct torque. Put the torque wrench on the hub nut again.

Turn the pinion. Make a note of the number shown by the wrench when the pinion begins to turn. Compare the two measurements. The second measurement must be 15 to 25 lbs.-in. (0.17-0.28 kgf• m, 1.69-2l82 N.m.) greater than the first. Add or remove shims to change this measurement. Repeat this procedure until the measurement is correct. Remove two bolts holding the brake disc housing.

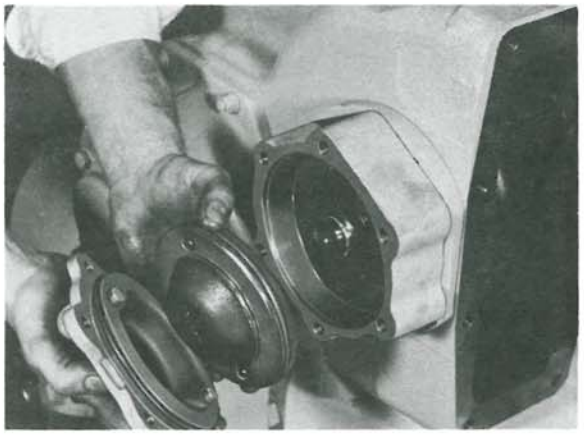


Figure 175

Install new brake piston ring expander spring and piston ring on brake piston. NOTE: Expander spring gap to be 180 ° from piston ring hook joint. Install new "O" ring on end cap. Install piston and end cap on brake disc housing. If cast iron ring is used on piston, do not install expander spring.

NOTE: The dowel pins must protrude .188-.250 in. (47.7 mm) beyond the lip of the cover.

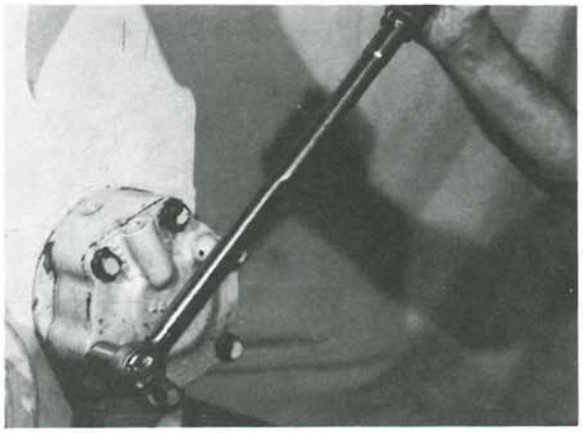


Figure 176

Install bolts and washers. Tighten to specified torque. (See torque chart.)

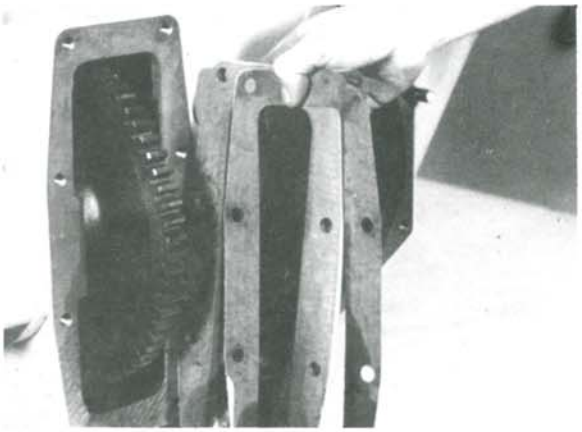


Figure 177

Install the cover and the gasket for the pinion drive gear. Install bolts and washers.

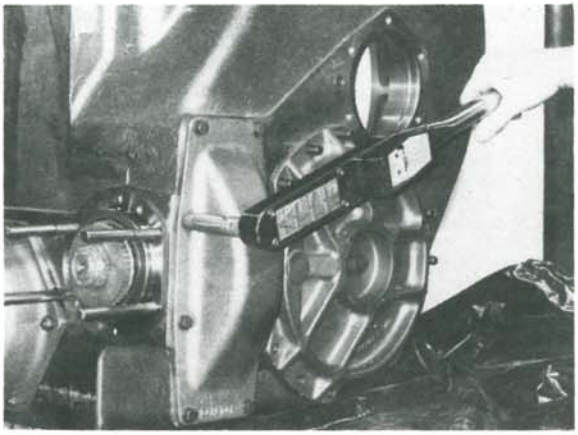


Figure 178

Tighten cover bolts to specified torque. (See torque chart.)

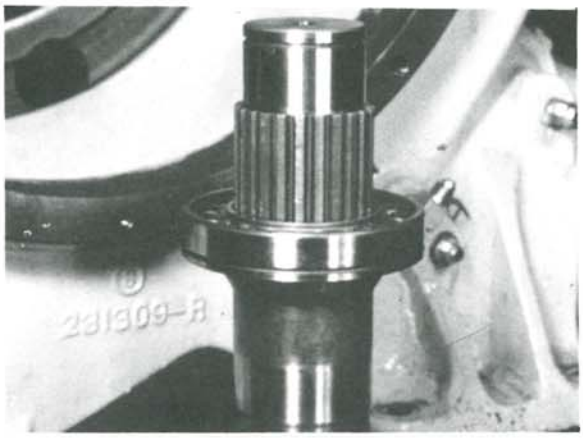


Figure 179

Install the cable drum drive shaft inner bearing on shaft. Install drive gear on shaft with long hub of gear away from inner bearing. Install outer bearing on shaft and bearing to shaft retainer ring.

HOW TO INSTALL THE CABLE DRUM AND DRIVE GEAR

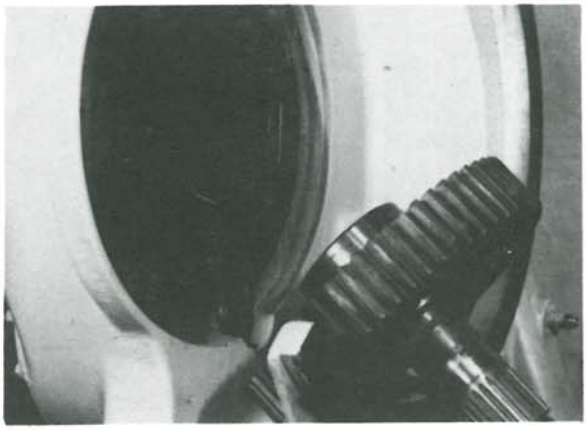


Figure 180

Install the drum drive gear, shaft and bearing assembly in housing. Install bearing locating ring in housing.

Figure 181

With new drive shaft cover gasket and oil tube in place, install cover on housing. Install cover bolts and washers.

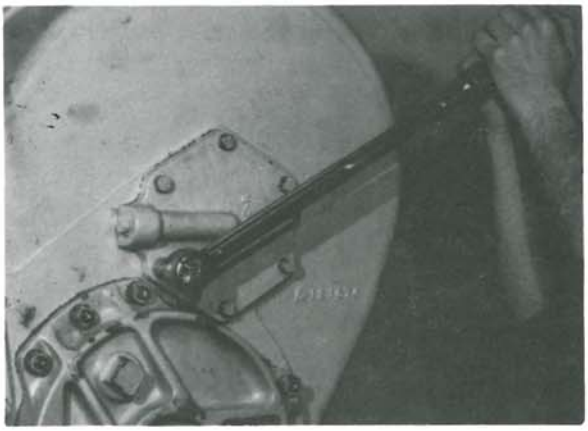


Figure 182

Tighten the cover mounting bolts to specified torque. (See torque chart.)

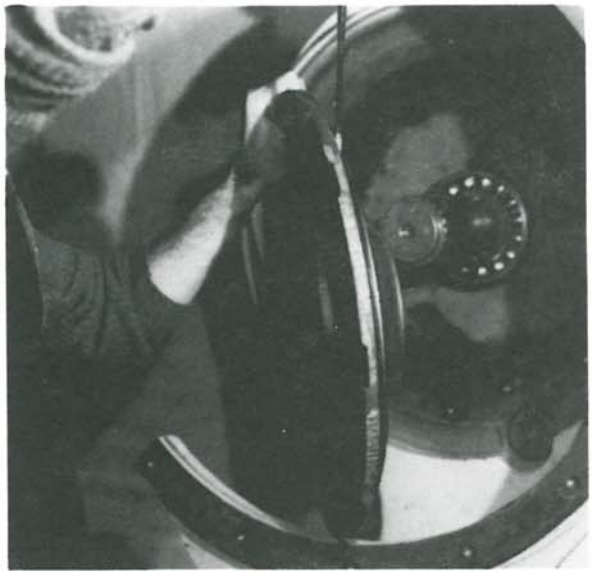


Figure 183

Install cable drum support bearing in support. Install bearing retainer. Coat outer diameter of support oil seal with a light coat of Permatex #2. Install seal in support with lip of oil seal toward bearing. Press seal flush with outer seal bore surface. (See assembly instruction drawing.) Position new "O" ring on support. Install drive shaft inner bearing locating ring in support. Position support on housing and drum drive shaft. Install support to housing bolts and washers.

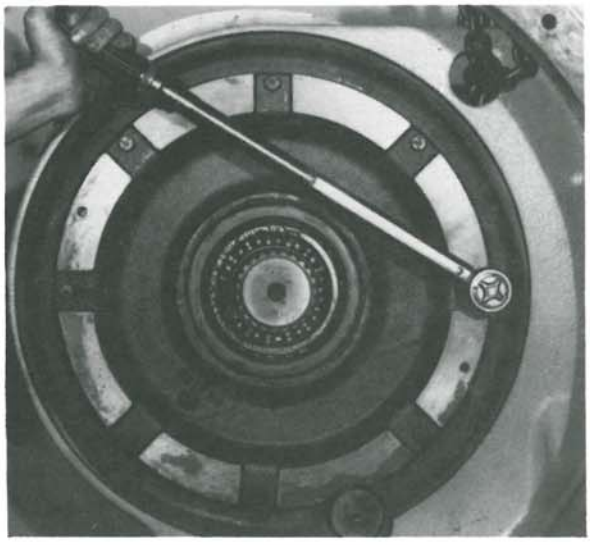


Figure 184

Tighten the support mounting bolts to specified torque. (See torque chart.)

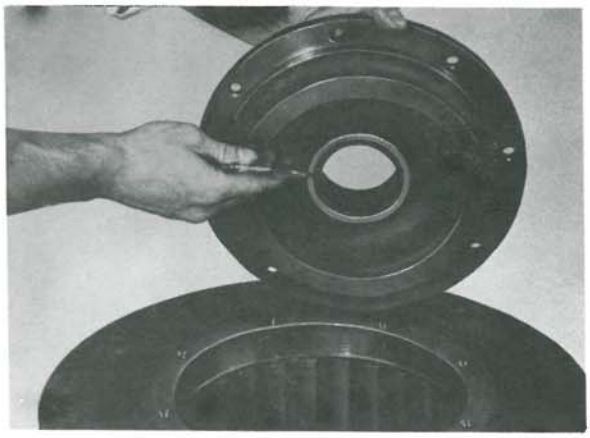


Figure 185

Install new oil seal wear sleeve on drum hub support as shown on assembly instruction page. Install the drum hub support on the cable drum. NOTE: The drum shaft oil seal shown must not be installed until after the cable drum and support is in position on drum shaft. See Fig. 188 and Fig. 189 for oil seal installation. Install drum hub support to cable drum bolts and washers.

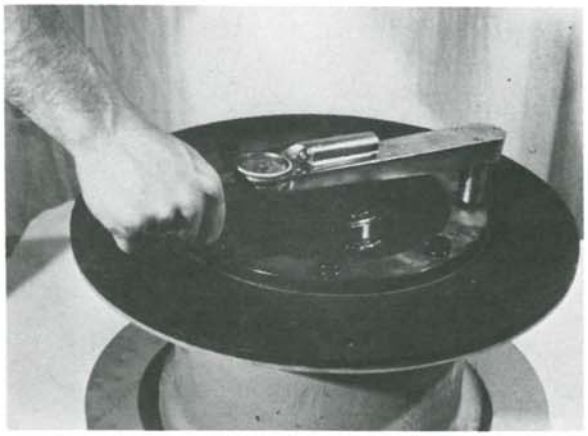


Figure 186

Tighten the hub support bolts to specified torque. (See torque chart.)

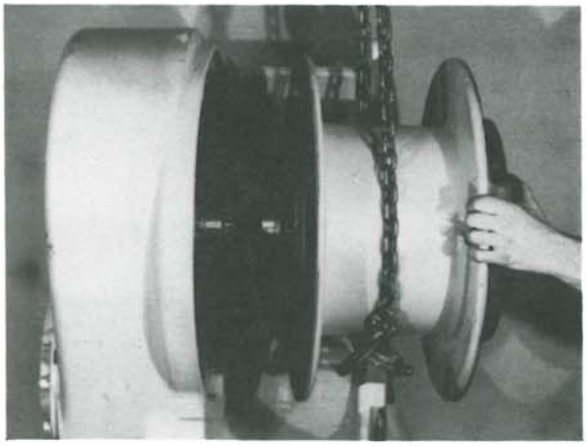


Figure 187

Position the cable drum and support assembly on the drum drive shaft and into the winch housing. **Do not install the cable drum to its full position.** When the inner edge of the cable drum is just entering the winch housing, do not install drum on shaft any farther at this time.

Installing the drum to its limit will allow the first inner clutch disc of the drum clutch to fall behind the clutch disc hub and will require disassembly of drum and support from the drive shaft to retrieve clutch disc.

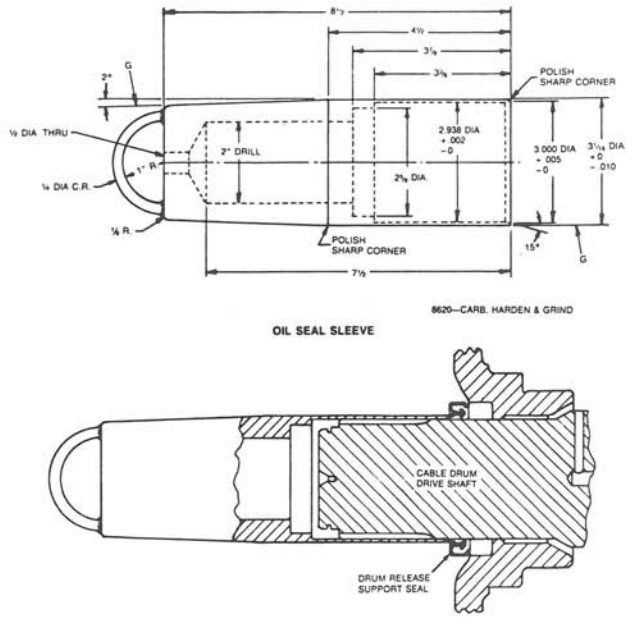


Figure 188

Apply a light coat of Permatex #2 to the outer diameter of the drum release support seal. (A fabricated seal sleeve and driver as shown in Figures 188 and 189 will facilitate support seal assembly.) Position seal on oil seal sleeve with lip of seal in as shown. Install sleeve on cable drum drive shaft. Push seal off sleeve and on drive shaft and up against oil seal bore in support. Remove sleeve.

See Page 57 for support sleeve and seal driver details.

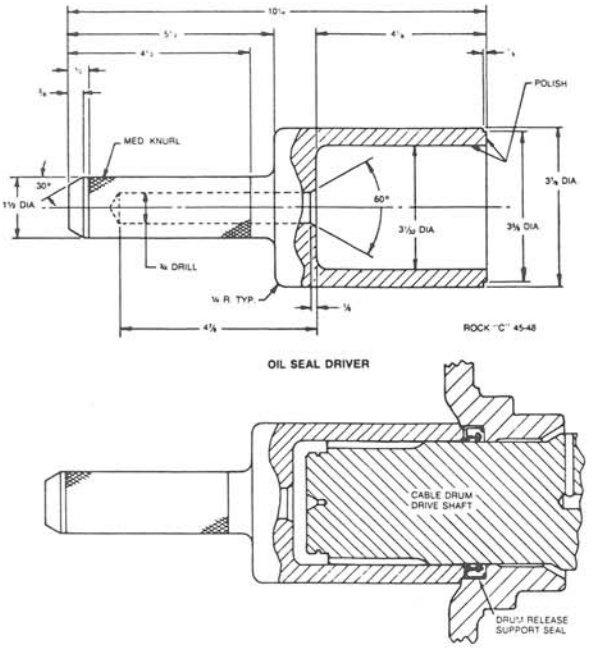


Figure 189
Using a seal driver as shown tap oil seal into position in drum release support.

ASSEMBLY OF THE FREE SPOOL CLUTCH
See your parts list for proper amount of clutch discs. **See note after cleaning and inspection page 24.**

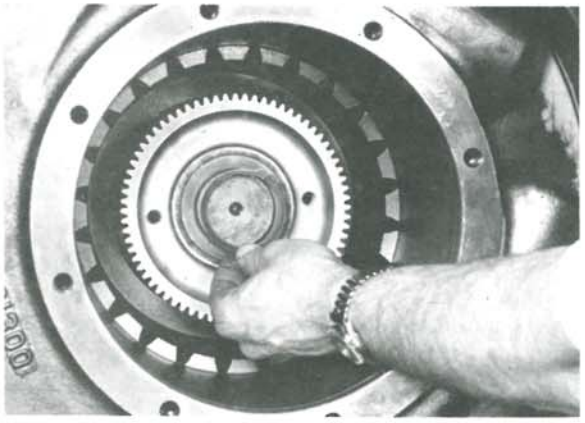


Figure 190
Position clutch disc hub on drum drive shaft. Install disc hub retainer ring.

NOTE: A measurement must be made of the overall free spool clutch disc pack after assembly into cable drum. (See Figure 203) This measurement should be made before the separator springs are installed, then after proper quantity of discs are determined, remove entire clutch pack and reassemble with springs as explained in Figures 191 thru 202.

Some older units did not use separate springs. If springs were not used, install first steel disc, then friction disc and alternate steel and friction until proper amount of discs are installed. Make measurement from last steel disc as explained in Fig. 203.

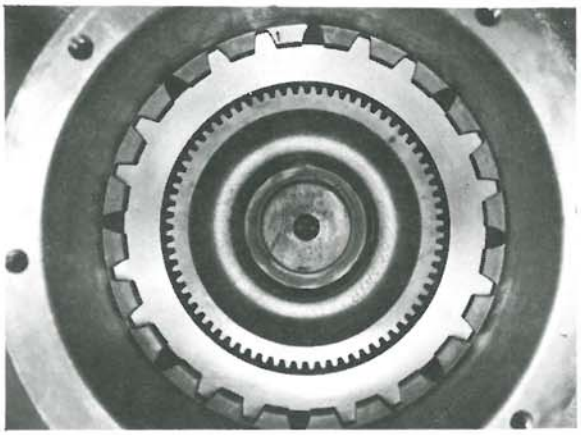


Figure 191
Install one steel disc with teeth on the outer diameter. NOTE: The steel disc has teeth missing on the outer; diameter. This is to allow passage for the clutch disc separator springs. Note location of outer teeth of first steel disc. This is important as the next steel disc installed must be moved one tooth over from the first steel disc. See Figure 202.

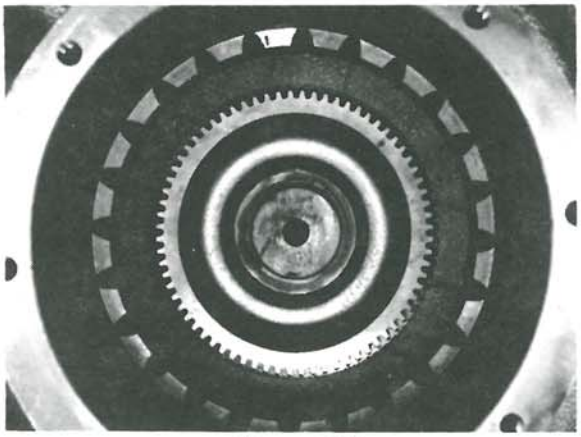


Figure 192
Install a friction clutch disc with teeth on the inner diameter.

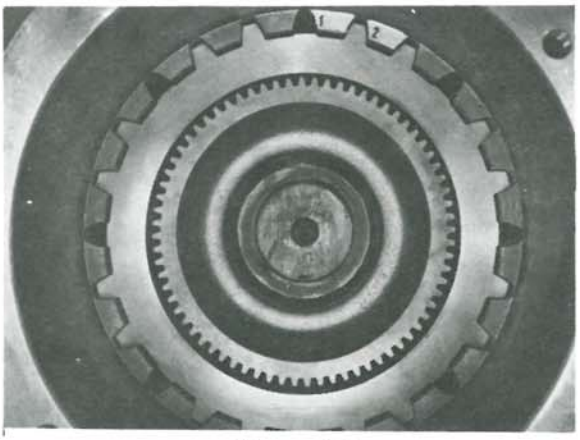


Figure 193
Rotate a second steel disc one tooth in a counter-clockwise direction from the position of the first steel disc. Install disc.

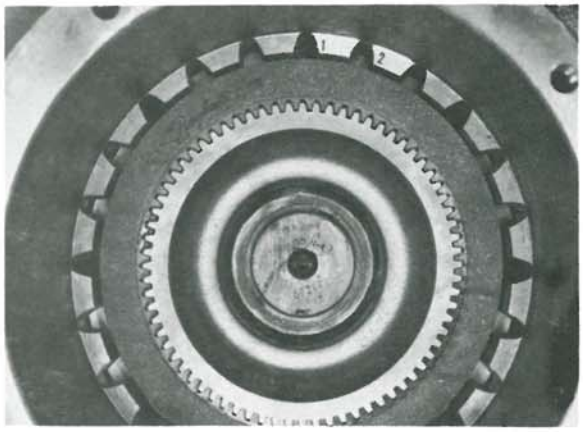


Figure 194

Install next friction disc. Alternate clutch discs, steel against friction and always align the teeth on each steel disc with the teeth on the preceding steel disc until half of the friction discs are installed. You start with a steel disc and end with a friction disc.

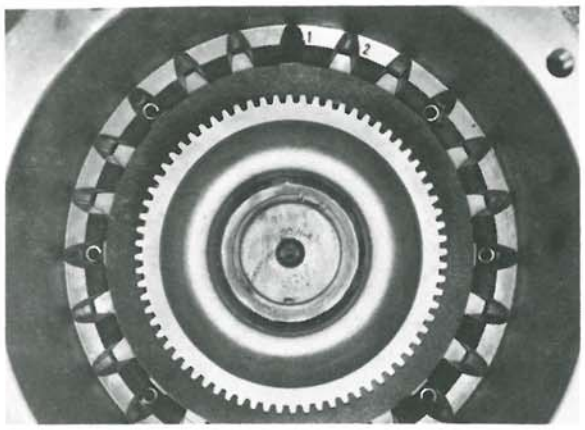


Figure 195

Install three separator springs, one after the other, in a clockwise direction. Do not put a spring in the next channel. See assembly instruction page for proper spring location and assembly.

Install three more springs in the following three channels. If assembly is correct, you will have three springs and a space and three more springs and a space. (See assembly instruction page.)

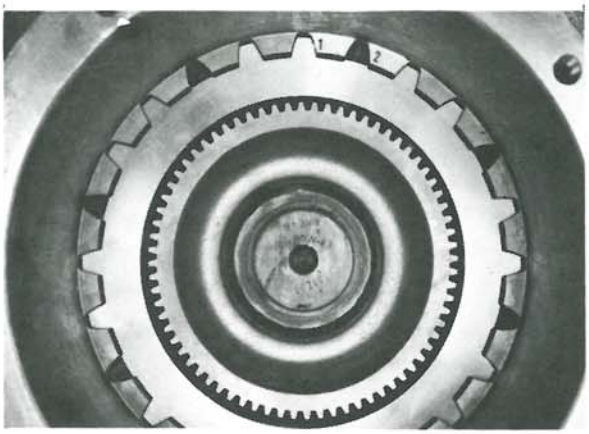


Figure 196

Rotate a steel disc in a clockwise direction one tooth from the position of the last steel disc. The teeth in this steel disc will be in the same channel as the very first steel disc installed and will cover the ends of the separator springs.

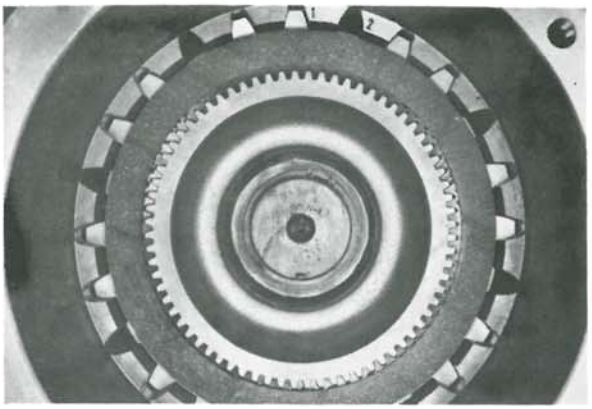


Figure 197

Install one friction disc.

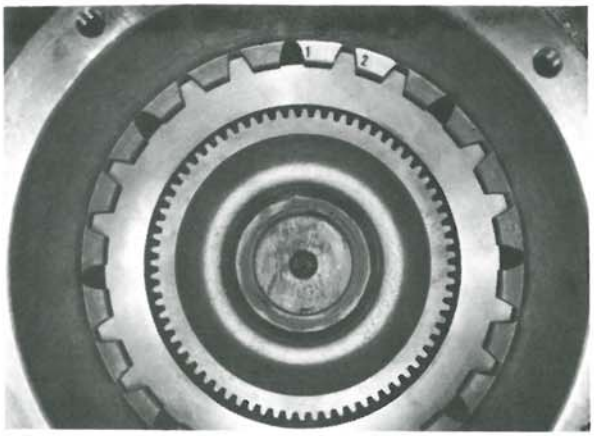


Figure 198

Rotate a second steel disc in a counter-clockwise direction one tooth. Install disc and note location of teeth as explained in Figure 191.

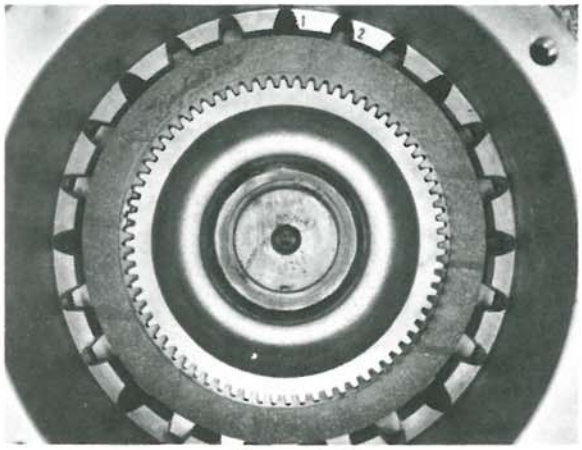


Figure 199

Install next friction disc followed by a steel disc in the same position as the second until all the discs are installed. The last disc must be friction. From the separator springs out, you start with a steel disc and end with a friction disc.

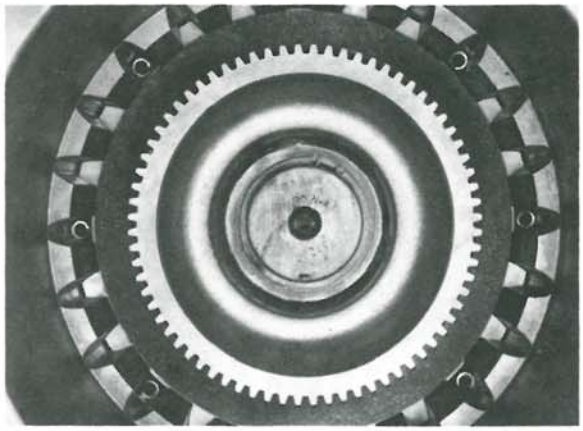


Figure 200

Install three separator springs, one after the other, in a clockwise direction. Do not put a spring in the next channel. (See assembly instruction page.)

Install three more springs in the following three channels. If assembly is correct, you will have three springs and a space and three more springs and a space. (See assembly instruction page.)

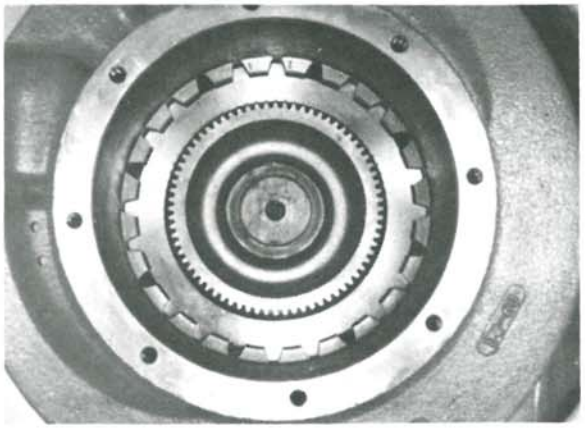


Figure 201

Install last outer steel disc rotating disc clockwise one tooth from position of preceding steel disc. The teeth on this steel disc will be in the same channel as the very first steel disc installed and will cover the ends of the separator springs.

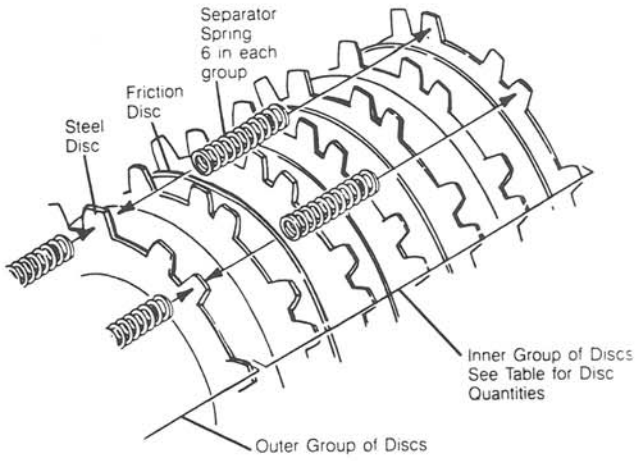


Figure 202

Detail of Separator Spring Installation.

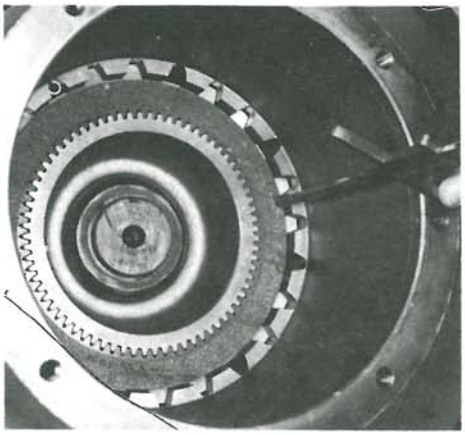


Figure 203

After complete assembly of clutch pack and separator springs, compress clutch pack and springs and measure clutch pack again. Measurement must be within distance explained below.

Measure the distance from the last steel (not as shown - as last disc must be a steel outer disc with teeth covering the separator springs) clutch disc to the outer face of the cable drum. This distance must be between 6.691 and 6.768 inches (169.9-171.7 mm). If it is more or less, make a check that the correct quantity of clutch discs are used. See the free spool clutch disc chart on the assembly instruction drawing. Install another steel disc as a shim to decrease distance, if necessary. NOTE: If another steel disc is used as a shim, be sure the teeth on the steel disc match the teeth on the last steel disc installed and cover the ends of the separator springs.

Figure 204
Install o-rings and lip seals on the clutch shaft and release plate. See Fig. 205 for the correct position of the lip seals.

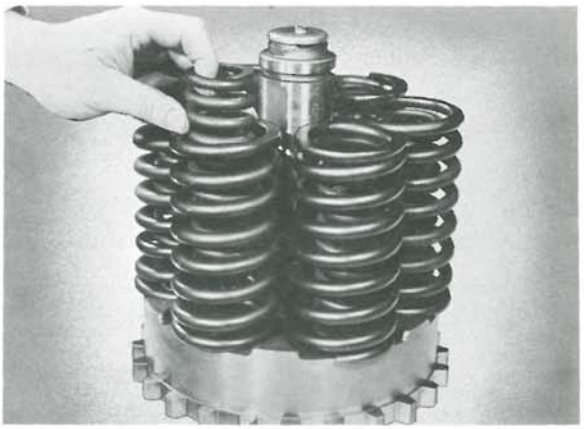


Figure 207
Position the inner and outer springs on the drum release clutch position. Put a small amount of grease in the split ring grooves to hold split rings after support is compressed.

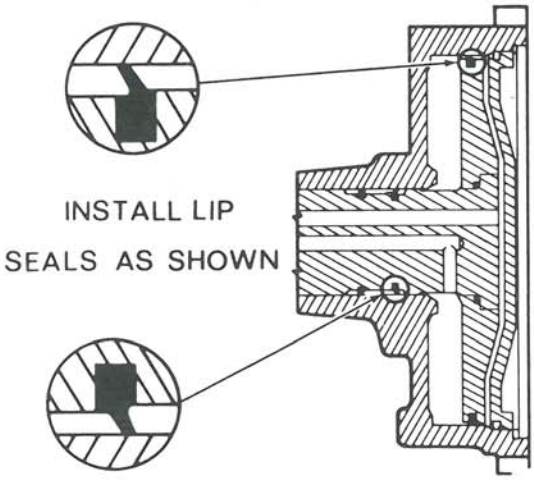


Figure 205
This is a view of the correct position of the lip seals.

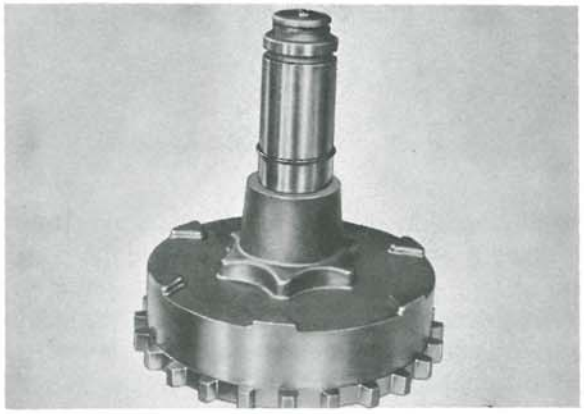


Figure 206
Install the drum release clutch piston on the clutch shaft. Do not install bore plug at this time.

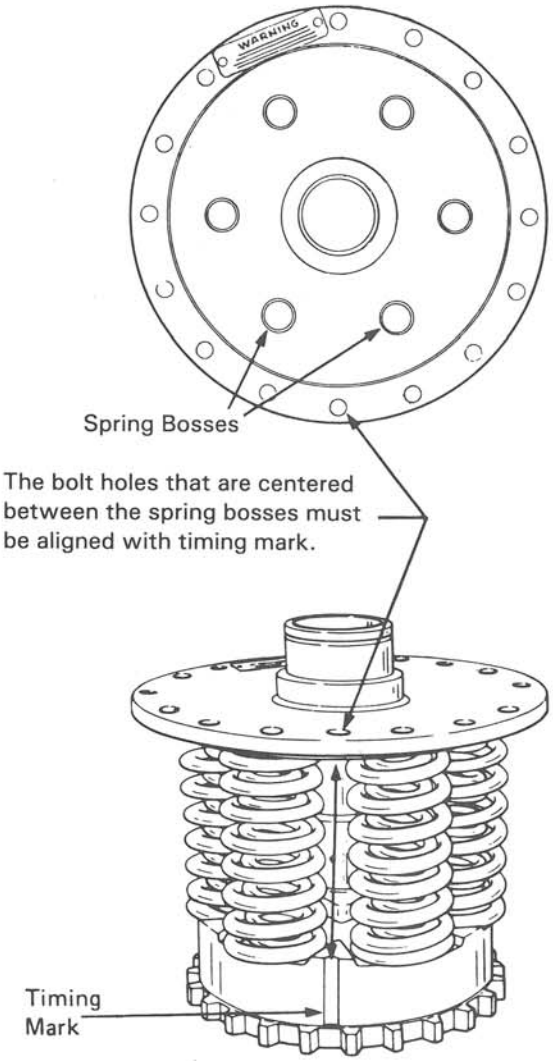


Figure 208
Install the cable drum support on the shaft. Align it with the timing mark as indicated in the drawing. Make a check that the springs are centered and are not on the raised bosses.

DANGER - When assembled, the free spool clutch is under approximately 10,000 lbs (4.600 kg) of force. Use caution and follow these instructions when you assemble the clutch. Incorrect procedure will cause personal injury.

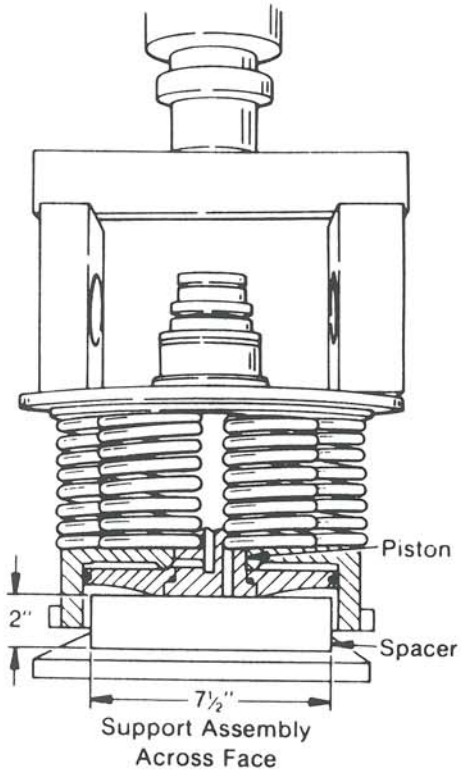


Figure 209

Place the assembly in the press as shown. Put a cylindrical spacer inside the drum between the piston and the press bed. The spacer must be 2 to 2.5 inches (5 to 6.5 cm) thick and 7.5 inches (19 cm) in diameter. You can make it from hardwood or brass. Keep the entire bottom surface of the piston drum in contact with the press bed. Use the press to slowly put pressure on the flange part of the drum support. Increase the pressure until the drum support passes the split ring groove.

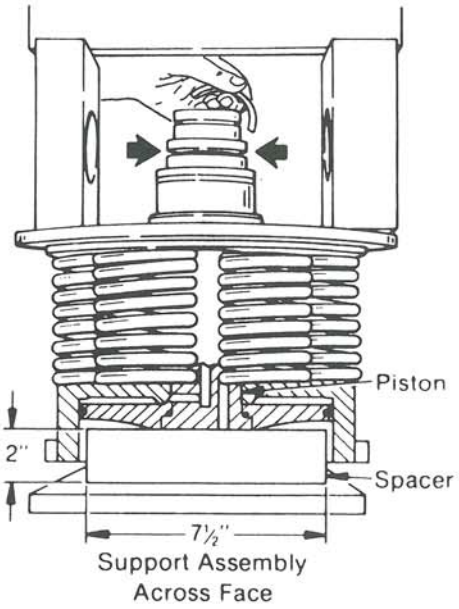


Figure 210

Put a small amount of heavy grease in the split ring grooves to hold the split rings. Install the split rings. Slowly release the pressure from the clutch assembly so the split rings will center in the grooves.

CAUTION: Be certain split rings are in full position in clutch shaft. Release press **slowly.**

Remove assembly from press. Install new "O" ring on the piston bore plug. Install bore plug in drum release clutch piston. Install bore plug retainer ring.

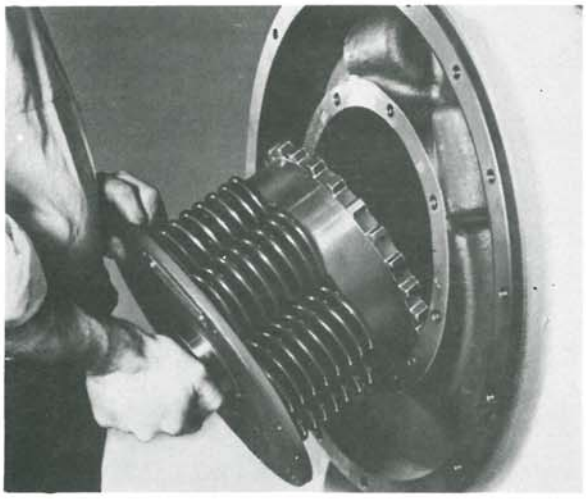


Figure 211

Install the free spool assembly in the cable drum. The bolt holes in the drum support plate and the drum face must line up directly. If the bolts will not enter the threaded holes in the drum, the drum support plate and the clutch piston are not aligned (timed) correctly. **DO NOT** attempt to twist or pry the piston assembly to align with the holes. Remove and disassemble the piston assembly. Align the drum support plate and piston as explained in Figure 208. Assemble and install the piston assembly and bolts.

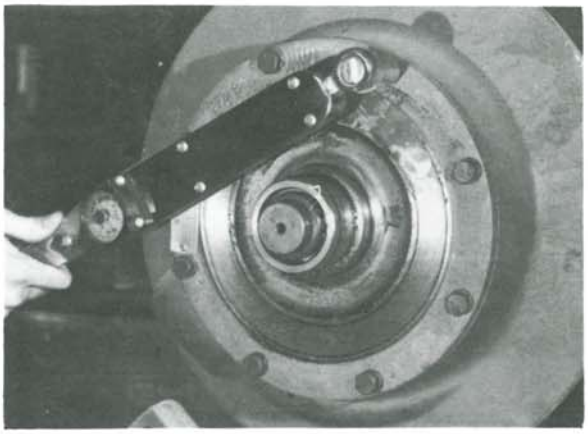


Figure 212

NOTE: Some free spool clutch housings will have 8 bolts like the one shown and some will have 15 bolts. Tighten the mounting bolts to specified torque. (See torque chart.)

A check can be made at this time to see if the free spool seals are installed correctly. See Figures 218 and 219 for procedures.

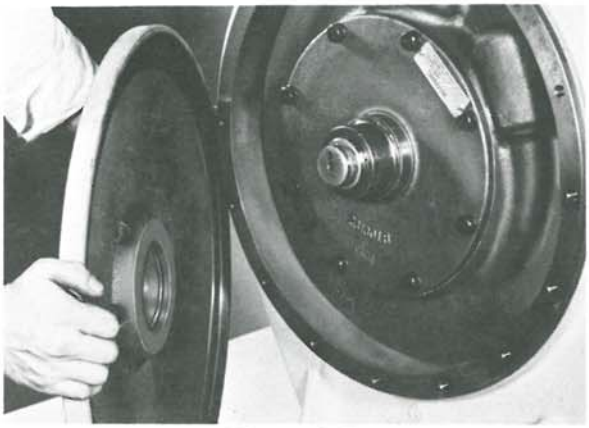


Figure 213

Apply a light coat of Permatex #2 to the outer diameter of the cable drum cover oil seal. Press seal in cover with lip of seal in. Press drum cover outer support bearings in cover.

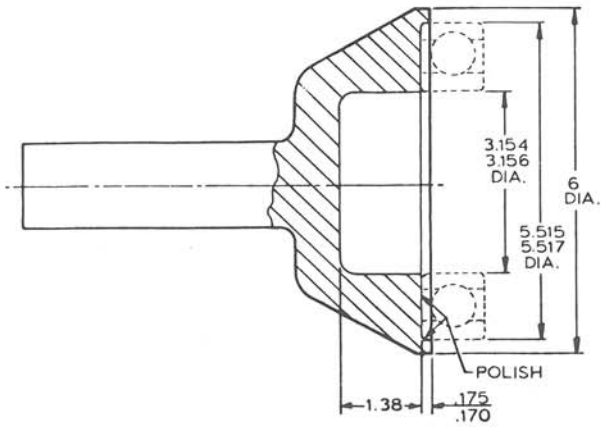


Figure 214

A bearing driver like the one shown can be made to facilitate assembly of the cable drum cover and support bearing to the free spool and winch housing. The bearing driver is designed to axially drive against both the inner and outer race of the bearing.

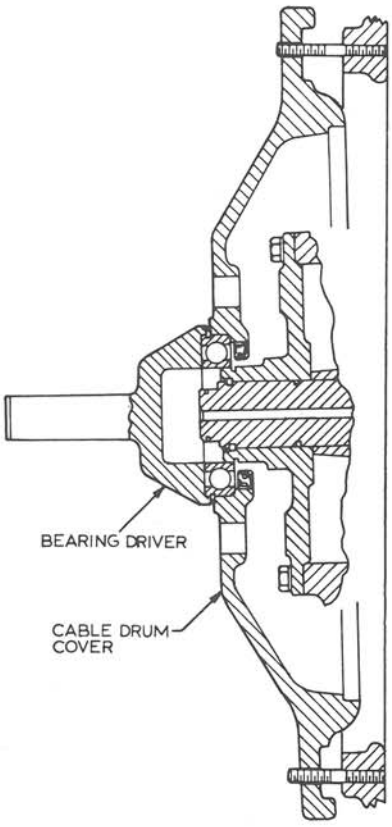


Figure 215

Install two undersize guide studs or rods in the bottom and top winch housing to drum cover threaded holes as shown. Position drum cover, bearing and oil seal on studs as shown. Bearing will slip on support up to bearing retainer ring groove. Using a bearing driver as shown, drive cover and bearing to full position on support. Install cover to winch housing bolts and washers.

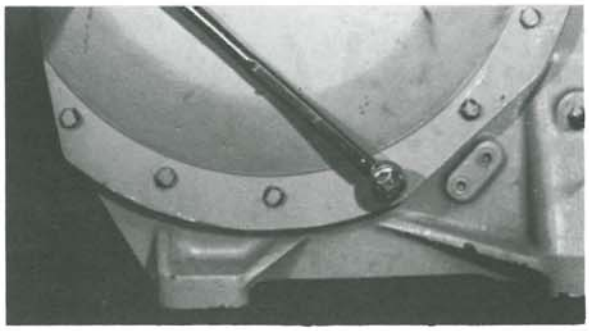


Figure 216

Tighten cover bolts to specified torque. (See torque chart.)

Figure 217
Install bearing to free spool hub retainer ring.

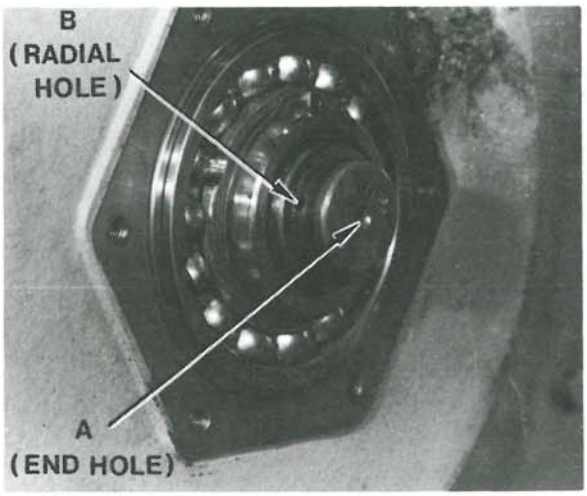
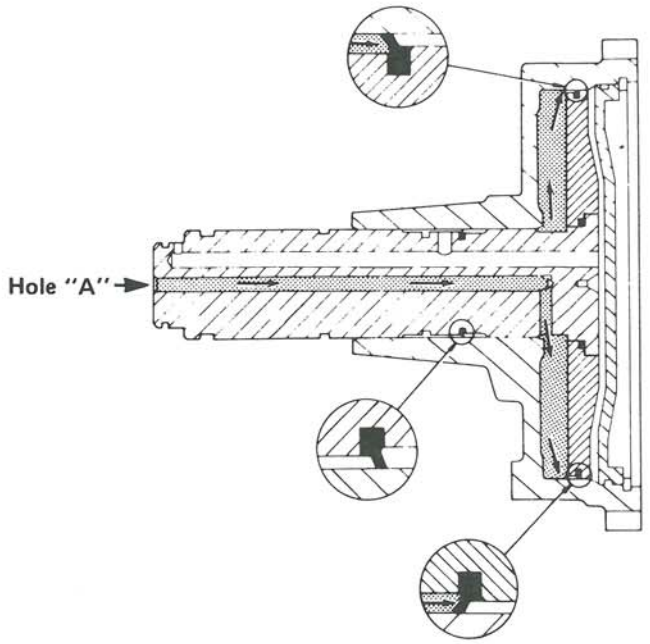


Figure 218
You must now make a check to see if all the seals in the free spool clutch are installed correctly. Make the following tests.



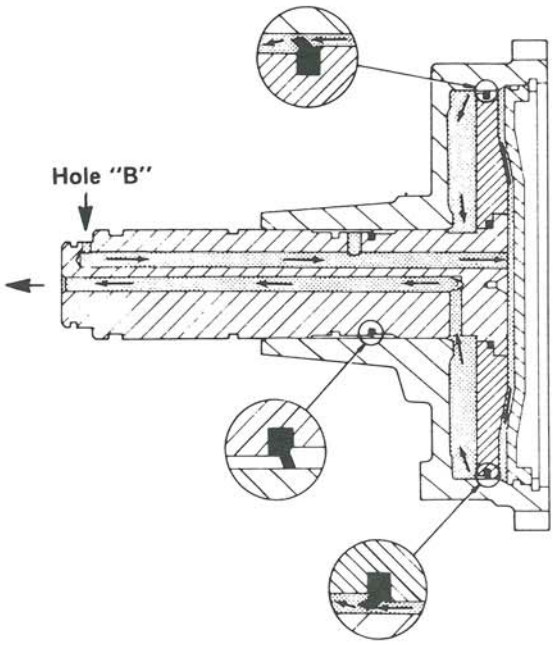


Figure 219

1. Put air pressure less than 100 p.s.i. (7,030.70 kgf/cm^2, 689.4 kpd) to the center hole "A" in the end of the shaft. Air must not come out of radial hole "B".

2. Put air pressure in hole "B". Air must come out of hole "A".

3. Repeat "step 2" and put your finger over hole "A". Air must not come out of any part of the assembly. If the assembly leaks air, disassemble and check seals. See if the seals are damaged or installed backwards.

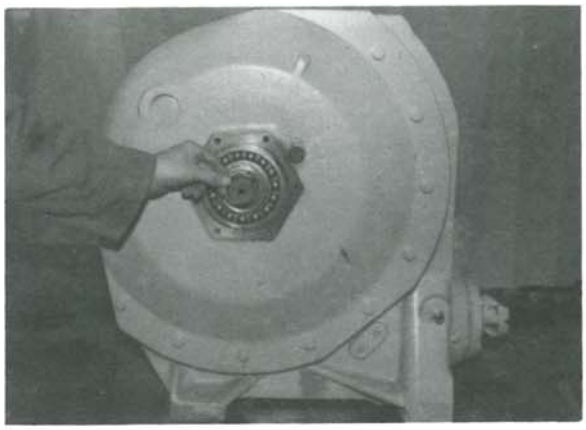


Figure 220

Install the piston ring on the drum shaft.

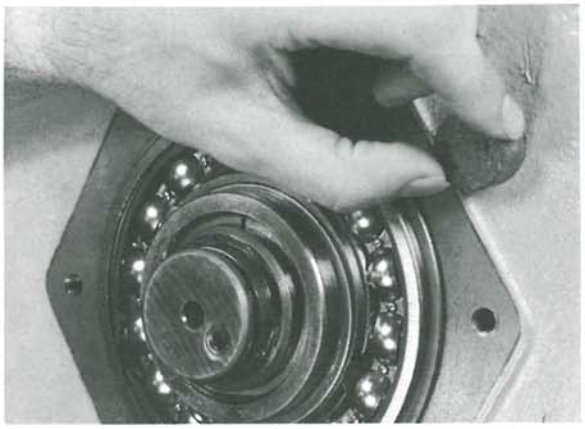


Figure 221

Install the free spool wear button. NOTE: A new wear button is .875 (22,2) thick. When worn to .625 (13,9) replace button.

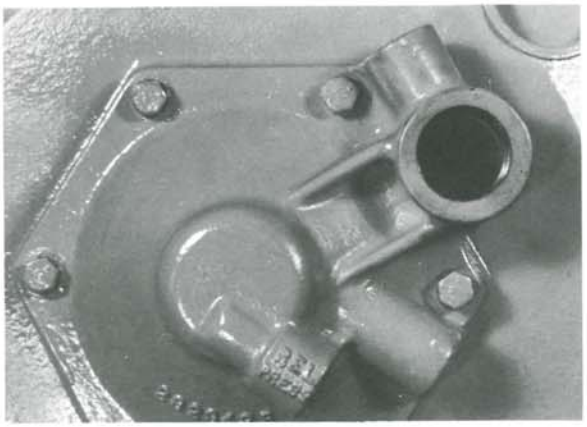


Figure 222

Install the bearing cap and the drain hose. Install bolts and washers. Tighten bolts to specified torque. (See torque chart.)

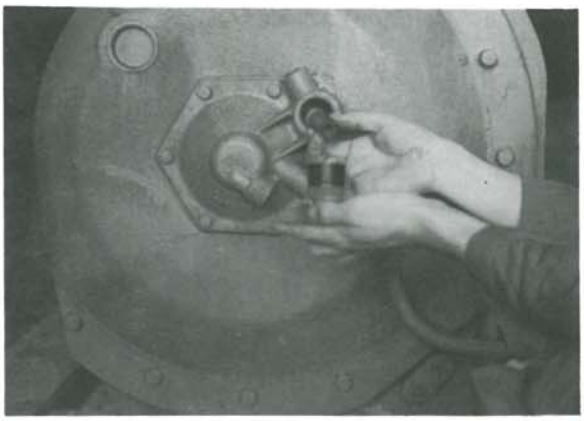


Figure 223

Apply a light coat of grease to the adjusting handle threads. Install the free spool adjusting handle and spring. Turn handle so it just contacts spring.

Figure 224

Install the lock button and the lock spring.

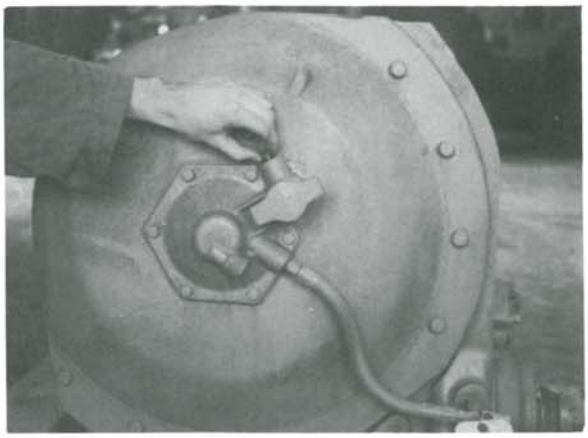


Figure 225

Install the lock screw and tighten to specified torque. (See torque chart.)

MACHINE SERVICE AFTER WINCH OVERHAUL
IF THE WINCH FAILURE CONTAMINATED THE SYSTEM

After you make repairs to the winch and install it in the machine, you must clean the torque converter and transmission hydraulic system. This maintenance procedure removes foreign material that can cause damage to important components.

Follow these steps to clean this system.

1. Remove all oil from the system and its components.
2. Disconnect and clean all hydraulic hoses.
3. Clean all filter cases carefully and replace the elements.
4. Carefully clean the oil cooler at the bottom of the radiator by flushing the cooler with a reverse flow of oil. Only a reverse flow of oil can remove all foreign material. After you do this, remove the oil with compressed air. Repeat this procedure until all foreign material is removed. If necessary, remove the radiator and cooler assembly for easier service. Do not use "flushing compounds" to clean the oil cooler.
5. Remove torque converter, disassemble and clean it. This procedure is necessary because foreign material will cause damage to the converter parts, and early failure.
6. Make an inspection of the transmission sump screen. Clean the screen carefully.
7. Install all the system's components. Use new gaskets where necessary.
8. Use the lubrication chart to learn the correct type of oil for your machine. Fill the transmission sump to the correct level with new oil.
9. Operate the engine for two minutes at a speed between 500 and 600 revolutions per minute. This procedure fills the system with oil.
10. Make a check of the transmission oil level with the engine running. Use caution near revolving prop shafts. If the oil is now below the correct level, add more oil until the level is correct. Make a final check of the level when the oil reaches the normal temperature of operation, between 180 and 200 degrees Fahrenheit (80 and 90 degrees Celsius).
11. Make a check for leaks for all drain plugs and hose connections. Tighten them where necessary.

LUBRICATION

Use the lubrication chart in the transmission maintenance and service manual for the correct type of oil for your machine.

Use the operator's manual for your specific machine to learn the oil capacity of the system.

Make a check of the oil level every day before starting the machine.

Keep the transmission reservoir filled to the correct level.

CHANGING THE TRANSMISSION OIL AND FILTER:

1. Operate the machine until the transmission oil reaches a temperature between 150 and 250 degrees Fahrenheit (65 and 90 degrees Celsius).
2. Remove the oil from the system at the transmission. Use your operator's manual to learn the correct method for removing the transmission sump screen. Remove the screen and clean it carefully. Install it with new gaskets.
3. Remove the oil filter element. Clean the filter casings. Install new filter element.
4. Fill the transmission reservoir to the correct level with new oil.
5. Operate the engine at a speed between 500 and 600 revolutions per minute for two minutes. This procedure sends oil through the system.
6. Make a check of the oil level with the engine running. Use caution near revolving prop shafts. If the oil is now below the correct level, add more oil until the level is correct.
7. Make a final check of the oil level when the oil reaches the normal temperature of operation. Add more oil if necessary.

PRESSURES

The following chart shows the correct operating pressures in the winch for each of its operations. The pressure must be taken at a low idle speed with an oil temperature of between 180 ° F (82 ° C) and 200 ° F (93 ° C) or normal operating temperature. All of the pressures listed are "pounds per square inch."

See transmission maintenance and service manual for clutch pressure check procedure.

FUNCTION	PRESSURE LOCATION		
	Free Spool Clutch Pressure	Input Clutch Pressure	Input Brake Pressure
FREE SPOOL	240-280	0	240-280
WINCH IN	0	240-280	0
HOLD	0	0	240-280

HYDRAULIC REQUIREMENT

HYDRAULIC SYSTEMS

1. The winch was originally designed to operate with the hydraulic system on a transmission with pressure at 280 p.s.i.

2. An alternate hydraulic system was developed to operate the winch using an auxiliary engine mounted pump and the case as its own hydraulic sump.

Fluid oil works properly down to -10 ° F. Call **ALLIED** Engineering Department for oils to operate at lower temperatures.

1. Transmission fluid (Dexron I or II) Grade 10, 150 VG 46

LINE SIZES

1. The winch functional supply lines should have a minimum size of 3/8" ID. hose or tubing.

2. The control valve drain lines should have a minimum size of 1/2" ID. hose or tubing.

HYDRAULIC PRESSURES

1. The **ALLIED** winch requires hydraulic pressures in a range from 240 to 280 p.s.i. Below this range will now allow the free spool function to operate correctly and above the range could effect the winch's sealing capacity.

FLOWS

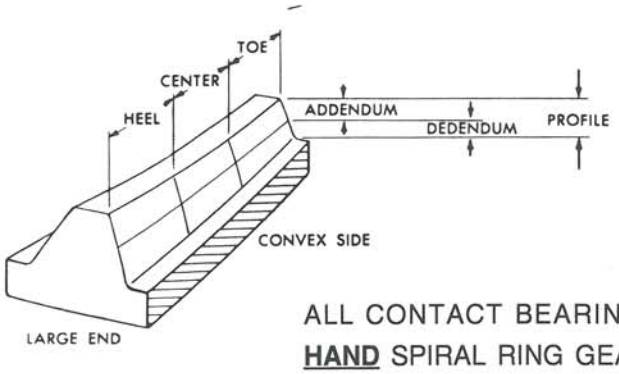
1. **ALLIED** requires a minimum hydraulic flow of 3 gallons/minute. Any additional fluid should be relieved into the system's hydraulic reservoir.

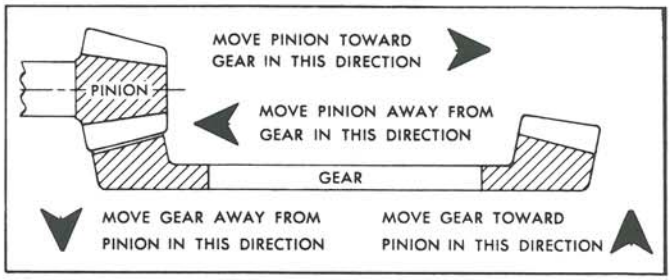
SPRAG ROTATION

Make a check of the operation of the sprag before you connect the input prop shaft. Apply air to the input clutch. With clutch engaged, turn the input flange several revolutions in the normal direction of rotation. See that the drum rotates so as to wind the cable over the top of the drum. The winch drivetrain should move smoothly and evenly. Listen for any unusual noises.

	INPUT	RING GEAR LOCATION	SPRAG ROTATION
W SERIES	Clockwise Counter Clockwise	Toward Cover Away from Cover	Counter Clockwise Clockwise
WD SERIES	Clockwise Counter Clockwise	Away from Cover Toward Cover	Counter Clockwise Closewise

SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART





ALL CONTACT BEARINGS SHOWN BELOW ARE ON **RIGHT HAND** SPIRAL RING GEAR — THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

FIG. 1

TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD.

FIG. 2

TOE BEARING ON BOTH SIDES OF TOOTH — GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL, INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

FIG. 3

HEEL BEARING ON BOTH SIDES OF TOOTH — GEARSET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE, DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION.

FIG. 4

LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR (INCREASE MOUNTING DISTANCE.)

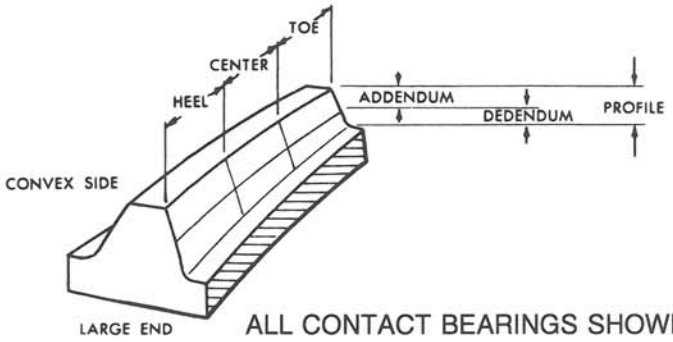
FIG. 5

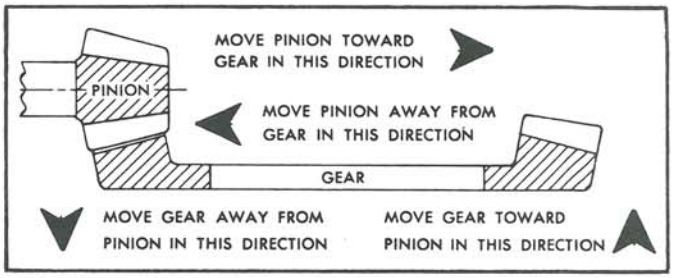
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION IN TOWARD GEAR (DECREASE MOUNTING DISTANCE.)

BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL.

SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART





ALL CONTACT BEARINGS SHOWN BELOW ARE ON **LEFT HAND** SPIRAL RING GEAR — THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

FIG. 1

TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

FIG. 2

TOE BEARING ON BOTH SIDES OF TOOTH — GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL, INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

FIG. 3

HEEL BEARING ON BOTH SIDES OF TOOTH — GEARSET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE, DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION.

FIG. 4

LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR (INCREASE MOUNTING DISTANCE.)

FIG. 5

HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION IN TOWARD GEAR (DECREASE MOUNTING DISTANCE.)

BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL.

GRADE 8

TORQUE SPECIFICATIONS

	Dry Type Threads			Lubricated or Plated Type Threads		
COARSE THREADS	lbf. ft.	kgm f/m	N.M.	lbf.ft.	kgm f/m	N.M.
1/4" - 20	11 - 12	1.5	15 - 16	8 - 10	1	11 - 13
5/16" - 18	20 - 28	3 - 4	27 - 38	26 - 30	3.5 - 4	35 - 40
3/8" - 16	44 - 48	6 - 6.5	60 - 65	33 - 36	4.5 - 5	45 - 49
7/16" - 14	70 - 77	10 - 11	95 - 104	52 - 57	7 - 8	71 - 77
1/2" - 13	106 - 117	14 - 16	144 - 158	80 - 88	11 - 12	109 - 119
9/16" - 12	153 - 168	21 - 23	208 - 228	115 - 127	16 - 18	156 - 172
5/8" - 11	212 - 233	29 - 32	288 - 316	159 - 175	22 - 24	216 - 237
3/4" - 10	376 - 414	52 - 57	510 - 561	282 - 310	39 - 43	393 - 420
7/8" - 9	606 - 667	84 - 92	822 - 904	455 - 501	63 - 69	617 - 679
1" - 8	909 - 1000	126 - 138	1233 - 1355	682 - 750	94 - 104	925 - 1016
1-1/8" - 7	1288 - 1417	178 - 196	1746 - 1921	966 - 1062	135 - 146	1310 - 1441
1-1/4" - 7	1817 - 1999	251 - 277	2464 - 2710	136 - 1496	188 - 207	1844 - 2027
FINE THREADS						
1/4" - 28	13 - 14	2	18 - 19	10 - 13	1 - 2	14 - 17
5/16: - 24	23 - 28	2 - 4	31 - 38	18 - 25	2.5 - 3.5	25 - 33
3/8" - 24	49 - 54	7 - 7.5	67 - 73	37 - 41	5 - 5.5	50 - 55
7/16" - 20	78 - 86	11 - 12	106 - 116	58 - 64	8 - 9	79 - 86
1/2" - 20	120 - 132	16 - 18	163 - 179	90 - 99	12.5 - 13.5	122 - 134
9/16" - 18	171 - 188	24 - 26	232 - 255	128 - 141	18 - 19	174 - 191
5/8" - 18	240 - 264	33 - 36	326 - 258	180 - 198	25 - 27	244 - 268
3/4" - 16	420 - 262	58 - 64	570 - 626	315 - 247	44 - 48	427 - 470
7/8" - 14	668 - 735	92 - 102	906 - 996	501 - 550	69 - 76	679 - 745
1" - 12	995 - 1096	137 - 150	1359 - 1486	746 - 821	103 - 113	1012 - 1613
1-1/8" - 12	1445 - 1590	200 - 220	1960 - 2155	1083 - 1191	150 - 165	1469 - 1613
1-1/4" - 12	2012 - 2213	278 - 305	2728 - 2997	1509 - 1660	208 - 229	2046 - 2250

GRADE 5

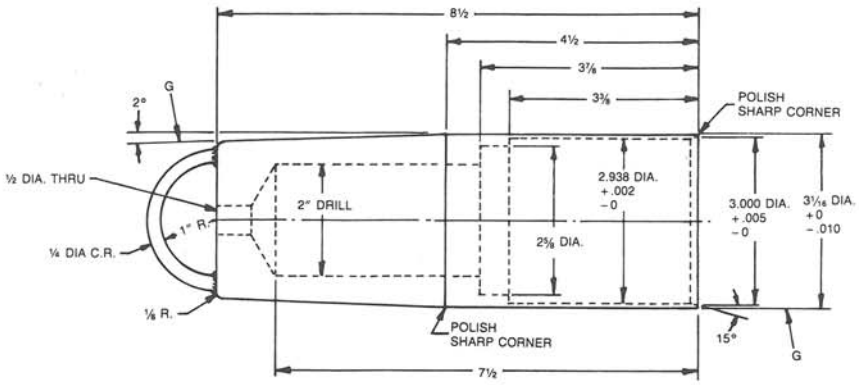
TORQUE SPECIFICATIONS

	Dry Type Threads			Lubricated or Plated Type Threads		
COARSE THREADS	lbf.ft.	kgm f/m	N. M.	lbf.ft	kgm f/m	N. M.
1/4" - 20	7 - 8	1	10 - 11	8 - 10	1	11 - 13
5/16" - 18	14 - 18	2 - 2.5	19 - 24	10 - 15	1 - 2	13 - 20
3/8" - 16	31 - 34	4 - 4.5	42 - 46	23 - 25	3 - 4	31 - 34
7/16" - 14	49 - 54	7 - 8	66 - 73	37 - 41	5 - 6	50 - 55
1/2" - 13	75 - 83	10 - 11	102 - 112	57 - 63	8 - 9	77 - 85
9/16" - 12	109 - 120	15 - 16	148 - 162	82 - 90	12 - 13	111 - 122
5/8" - 11	150 - 165	21 - 23	204 - 223	113 - 124	16 - 17	152 - 168
3/4" - 10	266 - 293	37 - 40	360 - 397	200 - 220	28 - 30	271 - 298
7/8" - 9	394 - 433	54 - 60	535 - 586	296 - 326	41 - 45	402 - 441
1" - 8	591 - 649	82 - 90	802 - 879	443 - 489	61 - 67	601 - 663
1-1/8" - 7	794 - 873	110 - 121	1077 - 1183	596 - 656	82 - 90	808 - 889
1-1/4" - 7	1120 - 1232	155 - 170	1519 - 1670	840 - 924	116 - 128	1139 - 1252

GRADE 5

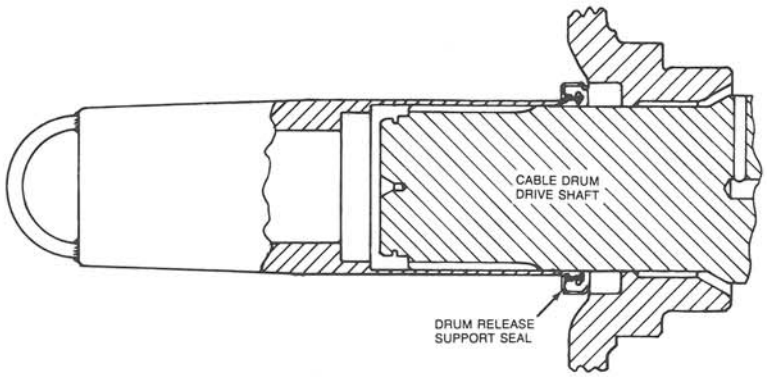
TORQUE SPECIFICATIONS

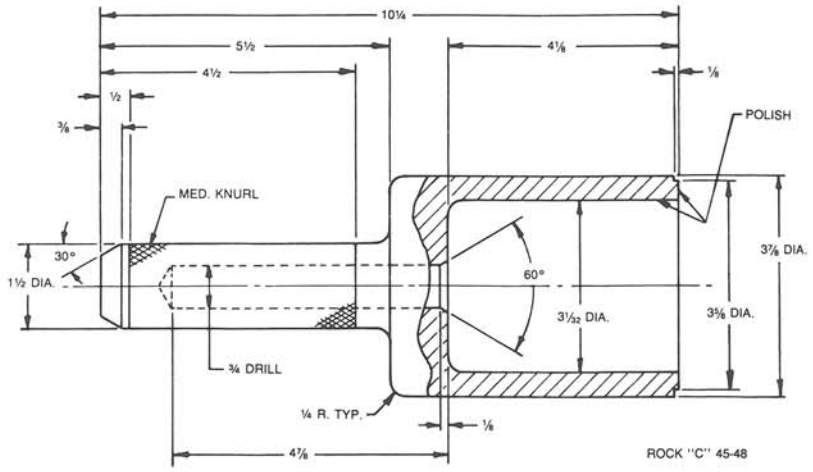
FINE	Dry Type Threads			Lubricated or Plated Type Threads		
THREADS	lbf. ft.	kgm f/m	N.M.	lbf.ft.	kgm f/m	N.M.
1/4" - 28	9 - 10	1	12 - 13	9 - 10	1	12 - 13
5/16" - 24	17 - 22	2 - 3	23 - 29	16 - 20	2 - 3	21 - 27
3/8" - 24	35 - 39	4 - 5	48 - 53	26 - 29	3 - 4	35 - 39
7/16" - 20	55 - 61	7 - 8	75 - 83	41 - 45	5 - 6	56 - 61
1/2" - 20	85 - 94	12 - 13	116 - 127	64 - 70	9 - 10	87 - 95
9/16" - 18	121 - 133	17 - 18	164 - 180	91 - 100	12 - 13	124 - 135
5/8" - 18	170 - 187	23 - 26	231 - 253	128 - 141	18 - 19	174 - 191
3/4" - 16	297 - 327	41 - 45	403 - 443	223 - 245	31 - 33	303 - 332
7/8" - 14	434 - 477	60 - 66	589 - 646	326 - 359	45 - 49	442 - 486
1" - 12	646 - 711	89 - 98	876 - 712	484 - 534	66 - 73	657 - 724
1-1/8"	891 - 980	123 - 135	1208 - 1328	668 - 735	92 - 101	906 - 996
1-1/4" - 12	1240 - 1364	171 - 189	1682 - 1849	931 - 1024	129 - 132	1262 - 1387



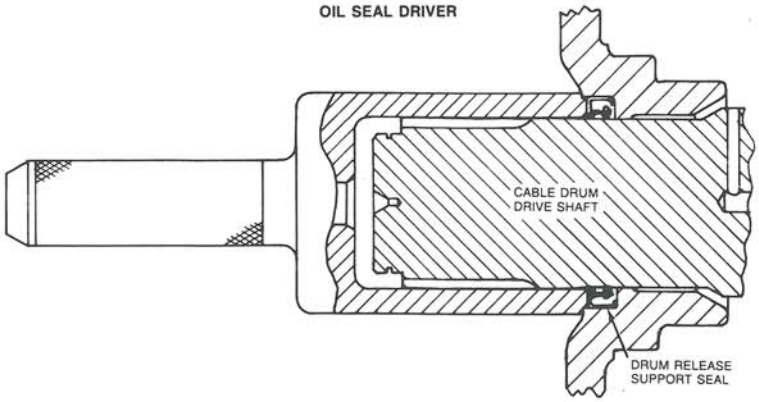
8620—CARB. HARDEN & GRIND

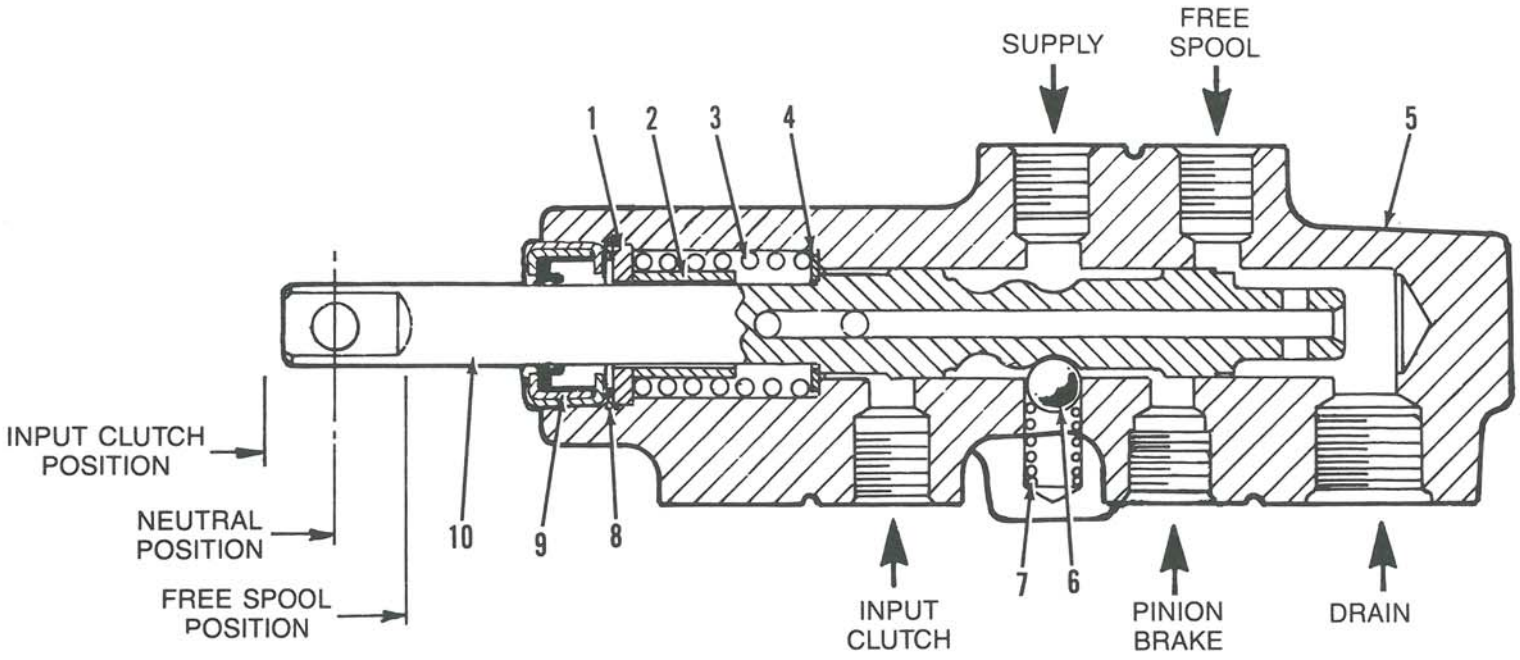
OIL SEAL SLEEVE





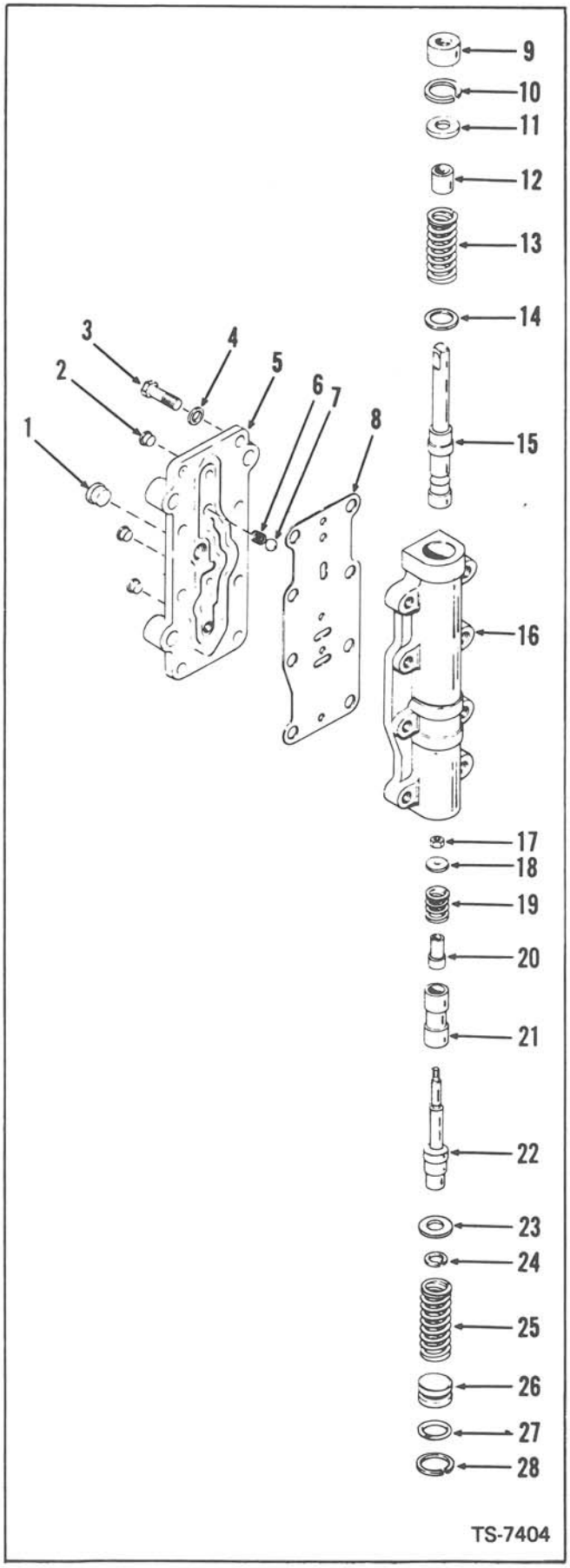
OIL SEAL DRIVER





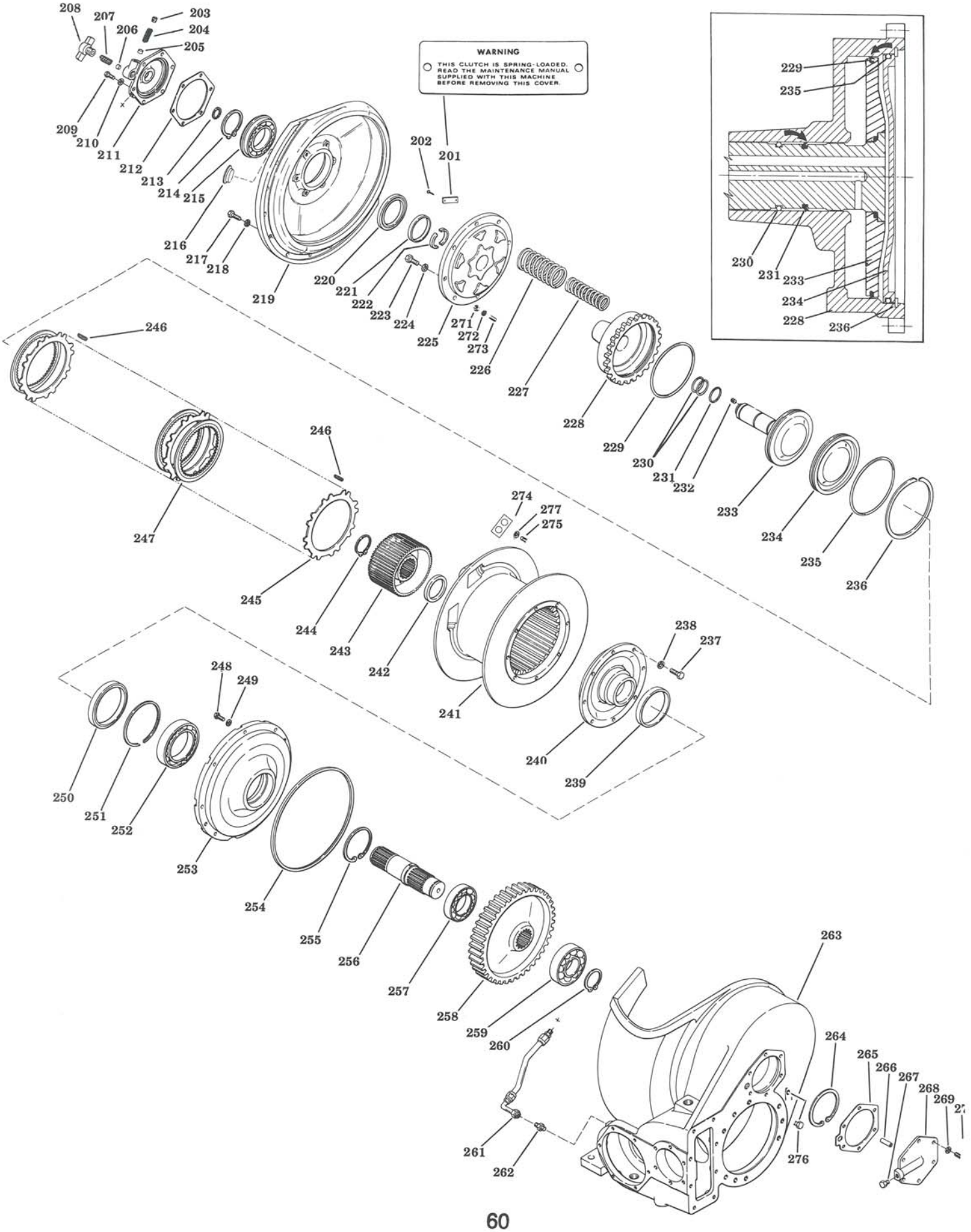
CONTROL VALVE

Item	Description	Qty.
1	Centering spring retaining washer	1
2	Valve stop spacer	1
3	Centering spring	1
4	Centering spring retainer	1
5	Control valve body	1
6	Detent ball	1
7	Detent spring	1
8	Spring retaining washer snap ring	1
9	Valve spool oil seal	1
10	Valve spool	1



CONTROL VALVE

Item	Description	Qty.
1	Plug (for shipping only)	-
2	Plug (for shipping only)	-
3	Bolt, mounting, valve cover	8
4	Lkwshr, mounting, valve cover	8
5	Cover, valve body	1
6	Spring, detent	1
7	Ball, detent	1
8	Gasket, valve body cover	1
9	Seal, oil, valve spool	1
10	Ring, snap, spring washer	1
11	Washer, spring retaining	1
12	Spacer, valve stop	1
13	Spring, centering	1
14	Retainer, centering spring	1
15	Spool, valve	1
16	Body, control valve	1
17	Nut, regulating spool stop	1
18	Washer, retaining	1
19	Spring, regulating	1
20	Spacer, regulating spool	1
21	Sleeve, regulating	1
22	Spool, regulating	1
23	Retainer, centering spring	1
24	Ring, snap, centering spring retainer	1
25	Spring, centering	1
26	Stop, valve	1
27	O-Ring, valve stop	1
28	Ring, snap, valve stop	1


WARNING
THIS CLUTCH IS SPRING-LOADED. READ THE MAINTENANCE MANUAL SUPPLIED WITH THIS MACHINE BEFORE REMOVING THIS COVER.
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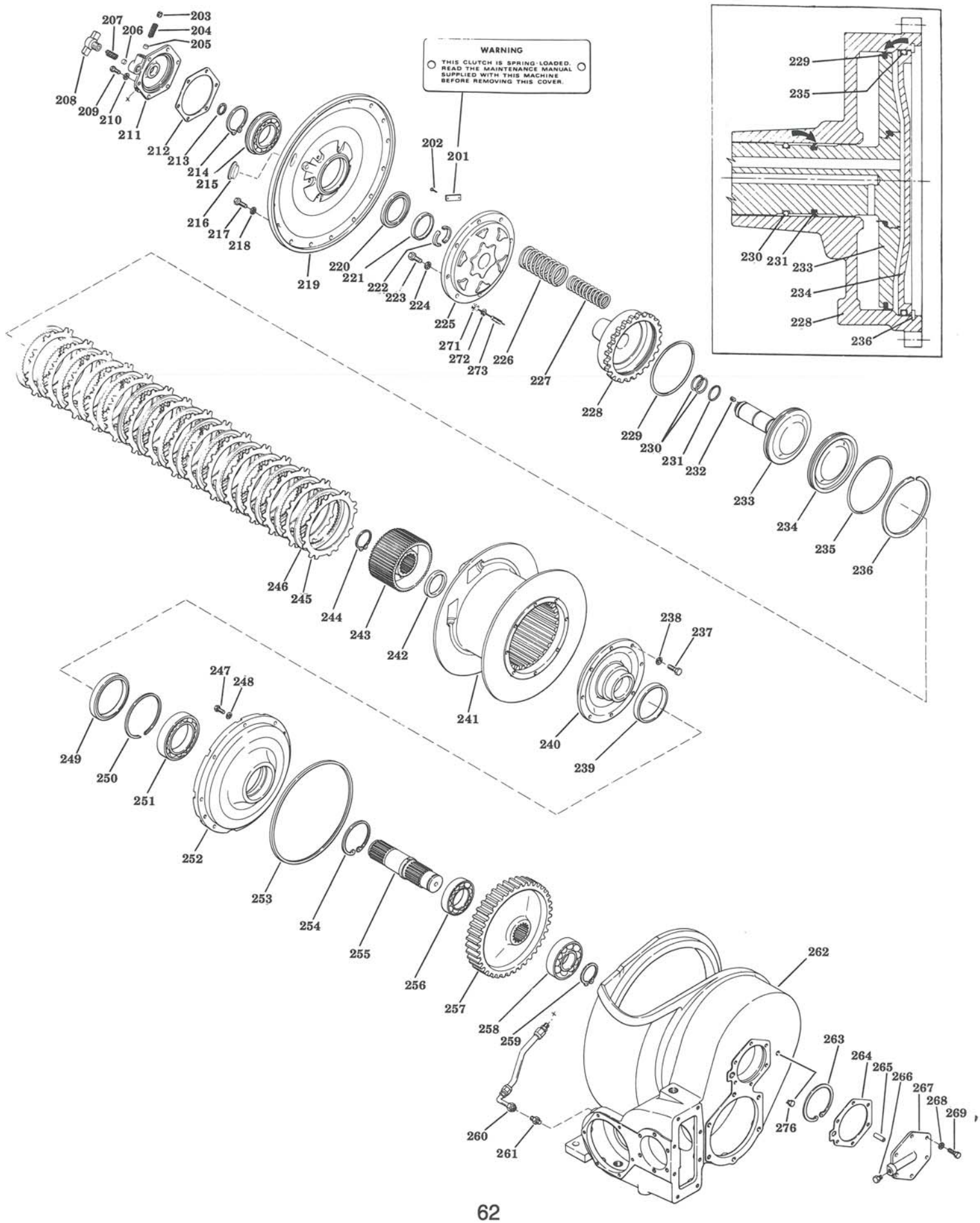
WINCH CABLE DRUM DRIVE SHAFT AND CLUTCH
W AND WD 311 AND 400 SERIES WINCHES

Item	Description	Qty.
201	Tag, warning	1
202	Screw, mounting, tag	2
203	Set Screw	1
204	Spring, lock, adjusting bolt	1
205	Lock, bolt, adjusting	1
206	Wear, button, free spool spring	1
207	Spring, adjusting free spool, bolt	1
208	Bolt, adjusting, free spool	1
209	Bolt, mounting, bearing cup	6
210	Lkwshr., mounting, bearing cup	6
211	Cap, bearing, clutch release support	1
212	Gasket, clutch release support bearing cap	1
213	Ring, piston drum release support	1
214	Ring, retaining, bearing	1
215	Bearing, cable drum support	1
216	Plug, housing	1
217	Bolt, mtg., cable drum cover	10
218	Lkwshr., mtg., cable drum cover	10
219	Cover, cable drum	1
220	Seal, oil, cable drum cover	1
221	Sleeve, wear (See Item 225)	1
222	Split ring, clutch shaft support	2
223	Bolt, mtg., cable drum to support	8
224	Lkwshr, mtg., cable drum to support	8
225	Support, cable drum (Incl. 221)	1
226	Spring, clutch drive - outer	6
227	Spring, clutch drive - inner	6
228	Piston, drum release clutch	1
229	Seal, clutch shaft & release plate	1
230	O-Ring, piston	2
231	Seal, drum release support	2
232	Plug, pipe, clutch shaft	1
233	Clutch shaft & release plate assy (Incl.232)	1
234	Plug, piston bore	1
235	O-Ring, piston bore plug	1
236	Ring, retaining, piston bore plug	1
237	Bolt, mtg., cable drum to hub	8
238	Lkwshr, mtg., cable drum to hub	8
239	Sleeve, wear, cable drum hub support	1
240	Support, cable drum hub (Incl.239)	1
241	Drum, cable	1
242	Seal, oil, drum hub bearing retainer	1
243	Hub & washer assy	1
244	Ring, retaining, clutch hub	1
245	Disc, clutch - outer	18
245A	Disc, clutch - outer	19
246	Spring, separator, free spool clutch	12
247	Disc, clutch - inner	16
247A	Disc, clutch - inner	18
248	Bolt, mtg., cable drum support	8
249	Lkwshr, mtg., cable drum support	8
250	Seal, oil, drum hub	1
251	Ring, snap, bearing	1
252	Bearing, hub, cable drum	1
253	Support, cable drum	1
254	O-Ring, cable drum	1
255	Ring, snap, cable drum support	1
256	Shaft, cable drum support	1
257	Bearing, drive shaft front	1
258	Gear, cable drum drive	1
259	Bearing, drive shaft rear	1
260	Ring, retaining, front bearing	1
261	Drain hose assy	1
262	Adapter, drain hose	2
263	Case, winch	1
263A†	Nameplate	1
263B†	Screw, nameplate	2
264	Ring, locating, rear bearing	1
265	Gasket, cable drum drive shaft cover	1
266	Tube, drive shaft oil	1
267	Plug, pipe, cable drum drive shaft cover	1
268	Cover, cable drum drive shaft	1
269	Lkwshr, mtg., drive shaft cover	6
270	Bolt, mtg., drive shaft cover	6
271	Nut, hex 3/8", steel, unf.	2
272	Lkwshr, 3/8"	2
273	Stud, 3/8" x 1-9/16"	2
274	Retainer, cable, 400 Series	1
275	Screw, countersunk head, 400 Series	2
276	Plug, check	1
277	Lkwshr, 1/4"	2

† not illustrated


WARNING
THIS CLUTCH IS SPRING-LOADED. READ THE MAINTENANCE MANUAL SUPPLIED WITH THIS MACHINE BEFORE REMOVING THIS COVER.
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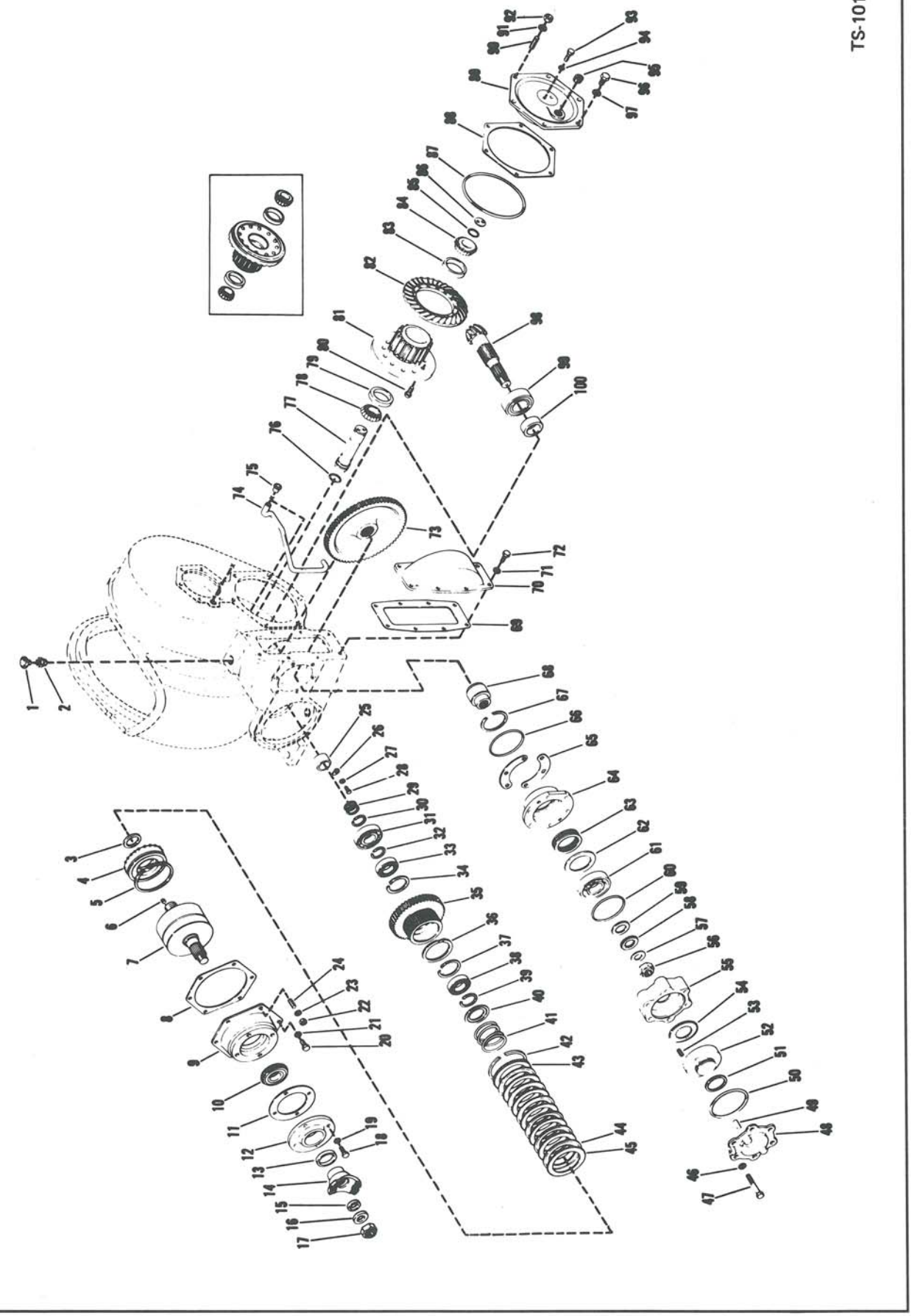
WINCH CABLE DRUM DRIVE SHAFT AND CLUTCH
MODEL W AND WD 300 SERIES

Item	Description	Qty.
201	Tag, warning	1
202	Screw, mounting, tag	2
203	Screw, set	1
204	Spring, lock, adjusting bolt	1
205	Lock, bolt, adjusting	1
206	Wear, button, free spool spring	1
207	Spring, adjusting free spool, bolt	1
208	Bolt, adjusting, free spool	1
209	Bolt, mounting, bearing cap	6
210	Lkwshr., mounting, bearing cap	6
211	Cap, bearing, clutch release support	1
212	Gasket, clutch release support bearing cap	1
213	Ring, piston drum release support	1
214	Ring, retaining, bearing	1
215	Bearing, cable drum support	1
216	Plug, cover, cable drum	1
217	Bolt, mtg., cable drum cover	15
218	Lkwshr., mtg., cable drum cover	15
219	Cover, cable drum	1
220	Seal, oil, cable drum cover	1
221	Sleeve, wear, cable drum support	1
222	Split ring, clutch shaft support	2
223	Bolt, mtg., cable drum support	8
224	Lkwshr, mtg., cable drum support	8
225	Support, cable drum (Incl. 221)	1
226	Spring, clutch drive - outer	6
227	Spring, clutch drive - inner	6
228	Piston, drum release clutch	1
229	Seal, clutch shaft & release plate	1
230	O-Ring, piston	2
231	Seal, drum release support	2
232	Plug, pipe, clutch shaft	1
233	Clutch shaft & release plate (Incl.231)	1
234	Plug, piston bore	1
235	O-Ring, piston bore plug	1
236	Ring, retaining, piston bore plug	1
237	Bolt, mtg., cable drum to hub	8
238	Lkwshr, mtg., cable drum to hub	8
239	Sleeve, wear, cable drum hub support	1

Item	Description	Qty.
239	Sleeve, wear, cable drum hub support	1
240	Support, cable drum hub (Incl.236)	1
241	Drum, cable	1
242	Seal, oil, drum hub bearing retainer	1
243	Hub & washer assy	1
244	Ring, retaining, clutch hub	1
245	Disc, clutch - outer	14
246	Disc, clutch - inner	11
247	Bolt, mtg., cable drum support	8
248	Lkwshr, mtg., cable drum support	8
249	Seal, oil, drum hub	1
250	Ring, snap, bearing	1
251	Bearing, hub, cable drum	1
252	Support, cable drum	1
253	O-Ring, cable drum support	1
254	Ring, snap, cable drum support	1
255	Shaft, cable drum support	1
256	Bearing, drive shaft - front	1
257	Gear, cable drum drive	1
258	Bearing, drive shaft - rear	1
259	Ring, retaining, front bearing	1
260	Drain hose assy.	1
261	Adapter, drain hose	1
262	Case, winch	1
262A	†Nameplate	1
262B	†Screw, mounting nameplate	2
263	Ring, locating, rear bearing	1
264	Gasket, cable drum drive shaft cover	1
265	Tube, drive shaft oil	1
266	Plug, pipe, cable drum shaft cover	1
267	Cover, cable drum drive shaft	1
268	Lkwshr, mtg., drive shaft cover	6
269	Bolt, mtg., drive shaft cover	6
270		
271	Nut, hex 3/8", steel, nf	2
272	Lockwasher, 3/8"	2
273	Stud	2
274		
275		
276	Plug, check	1

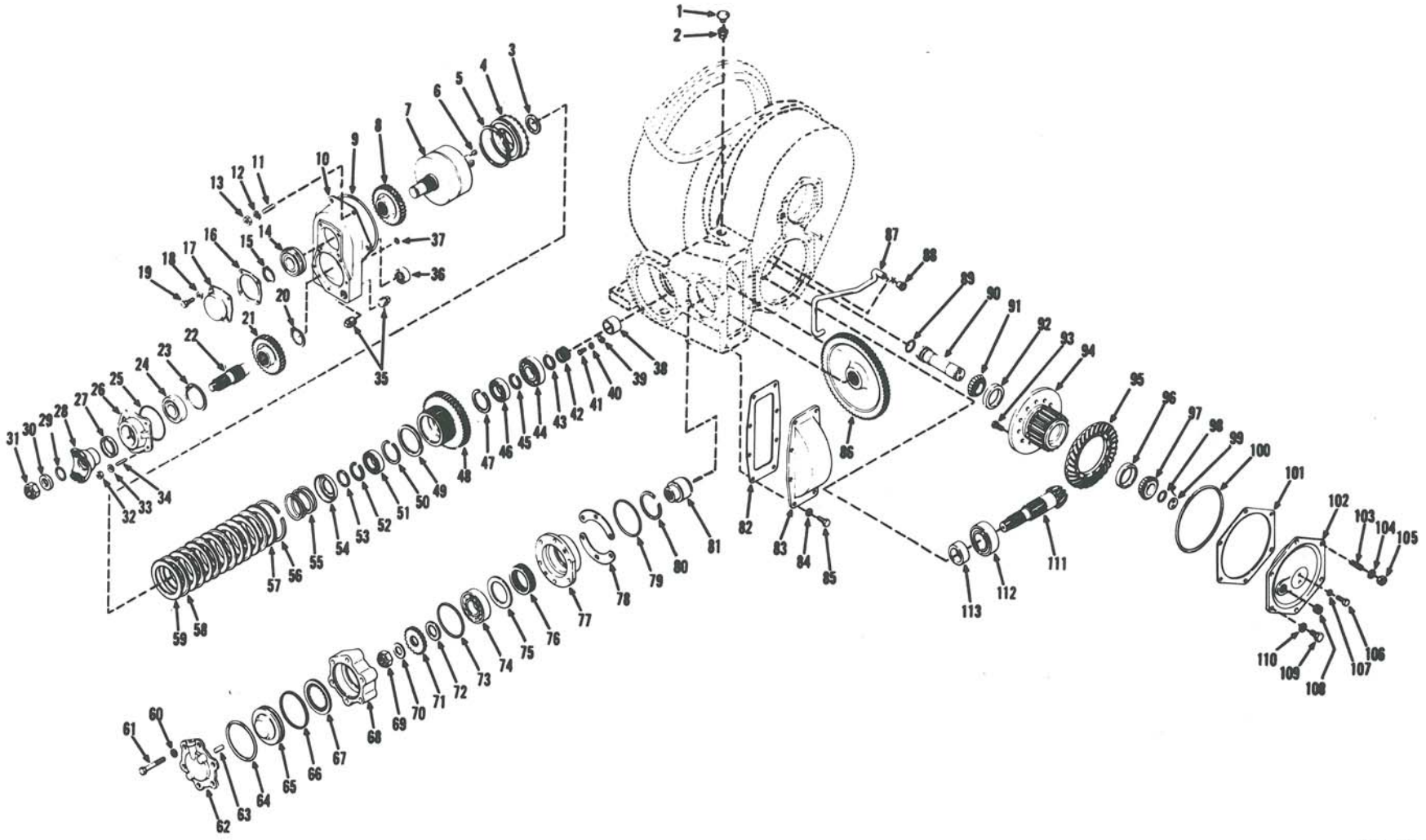
† not illustrated


TS-10172

WINCH - INPUT CLUTCH, PINION SHAFT & RING GEAR SHAFT
W 300 SERIES WINCH

Item	Description	Qty.
1	Air breather, check valve assy. (Incl.2)	1
2	Included in Item 1	1
3	Seal, clutch piston - inner	1
4	Piston, clutch	1
5	Ring, piston - outer	1
6	Plug, input shaft	1
7	Input shaft drum & plug assy.	1
8	Gasket, input bearing cap	1
9	Cap, input bearing	1
10	Bearing input clutch - front	1
11	Gasket, input bearing retainer	1
12	Input bearing retainer & oil seal assy (Incl13)	1
13	Seal, oil	1
14	Flange, input	1
15	O-ring, input flange	1
16	Washer, input flange	1
17	Nut, input shaft	1
18	Bolt, mounting, bearing retainer	4
19	Lkwshr, mounting, bearing retainer	4
20	Bolt, mounting, bearing cap	5
21	Lkwshr, mounting, bearing cap	5
22	Nut, bearing cap stud	1
23	Lkwshr, bearing cap stud	1
24	Stud, bearing cap	1
25	Race, input shaft piston ring	1
26	Lock, race	1
27	Lkwshr, race lock	1
28	Bolt, race lock	1
29	Ring, piston, input clutch	2
30	Ring, snap, clutch rear bearing rtg.	1
31	Bearing, rear, input clutch	1
32	Ring, snap, clutch rear bearing rtg	1
33	Bearing, clutch driven gear	1
34	Ring, snap, bearing, clutch driven gear	1
35	Gear, clutch hub	1
36	Ring, clutch hub oil baffle	1
37	Ring, snap, bearing, clutch driven gear	1
38	Bearing, clutch driven gear	1
39	Ring, snap, spring retainer	1
40	Retainer, spring	1
40A	Spacer, spring retainer	1
41	Spring, piston return	1
42	Ring, snap, backing plate	1
43	Plate, clutch disc backing	1
44	Disc, clutch - inner	6
45	Disc, clutch - outer	6
46	Lkwshr, mounting, pinion shaft brake cover	6
47	Bolt, mounting, pinion shaft brake cover	6
48	Cover, pinion shaft brake (incl. 49)	6
49	Pin, dowel	2
50	O-ring, pinion shaft brake cover	1
51	Ring, piston, pinion shaft brake	1
52	Piston, brake, pinion shaft	1
53	Not used on this assembly	6
54	Disc, pinion shaft brake	1
55	Housing, pinion shaft brake	1
56	Nut, pinion shaft	1
57	Washer, pinion shaft	1
58	Hub, pinion shaft brake disc	1
59	Washer, pinion shaft brake disc hub	1
60	O-ring, pinion shaft brake housing	1
61	Bearing, pinion shaft	1
62	Washer, sprag retaining	1
63	Sprag assembly	1
64	Race, sprag outer	1
65	Shim, sprag outer race - .004"	‡
65A	Shim, sprag outer race - .007"	‡
65B	Shim, sprag outer race - .010"	‡
65C	Shim, sprag outer race - .020"	‡
66	O-ring, sprag outer race	1
67	Ring, sprag retaining	1
68	Race, sprag inner	1
69	Gasket, pinion drive gear cover	1
70	Cover, pinion drive gear	1
71	Lkwshr, mounting, pinion drive gear cover	8
72	Bolt, mounting, pinion drive gear cover	8
73	Gear, pinion shaft drive	1
74	Tube, lubrication	1
75	Sleeve, lubrication tube	1
76	O-ring, ring gear shaft	1
77	Shaft, ring gear	1
78	Cone, bearing, ring gear shaft front	1
79	Cup, bearing, ring gear shaft front	1
80	Screw, mounting, ring gear	12
81	Ring gear hub	1
82	Gear, ring	1
83	Cup, bearing, ring gear shaft rear	1
84	Cover, bearing, ring gear shaft rear	1
85	O-ring, ring gear shaft	1
86	Shim, ring gear shaft - .004"	‡
86A	Shim, ring gear shaft - .007"	‡
86B	Shim, ring gear shaft - .010"	‡
87	O-ring, ring gear cover	‡
88	Shim, ring gear cover - .004"	‡
88A	Shim, ring gear shaft - .007"	‡
88B	Shim, ring gear cover - .010"	‡
89	Cover, ring gear	1
90	Stud, ring gear cover	2
91	Lkwshr, ring gear cover stud	3
92	Nut, ring gear cover stud	2
93	Bolt, mounting, ring gear shaft	2
94	Lkwshr, mounting, ring gear shaft	2
95	Plug, pipe	1
96	Bolt, mounting, ring gear cover	4
97	Lkwshr, ring gear cover stud	3
98	Gear, pinion	1
99	Bearing, pinion shaft	1
100	Spacer, pinion shaft bearing	1

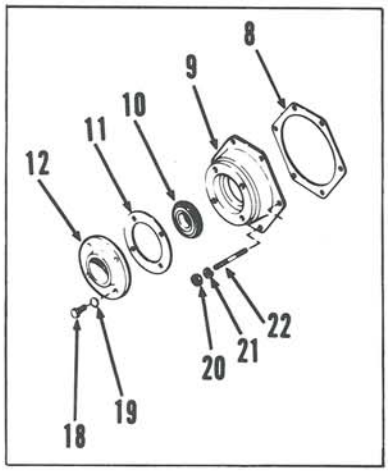
‡ As required

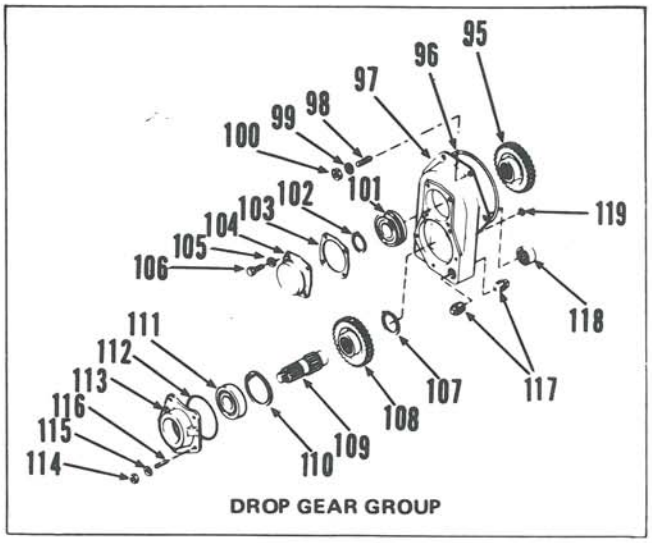

TS-7479

WINCH - INPUT CLUTCH, PINION SHAFT, RING GEAR SHAFT AND DROP GEAR ASSEMBLY - WD 300 SERIES WINCH

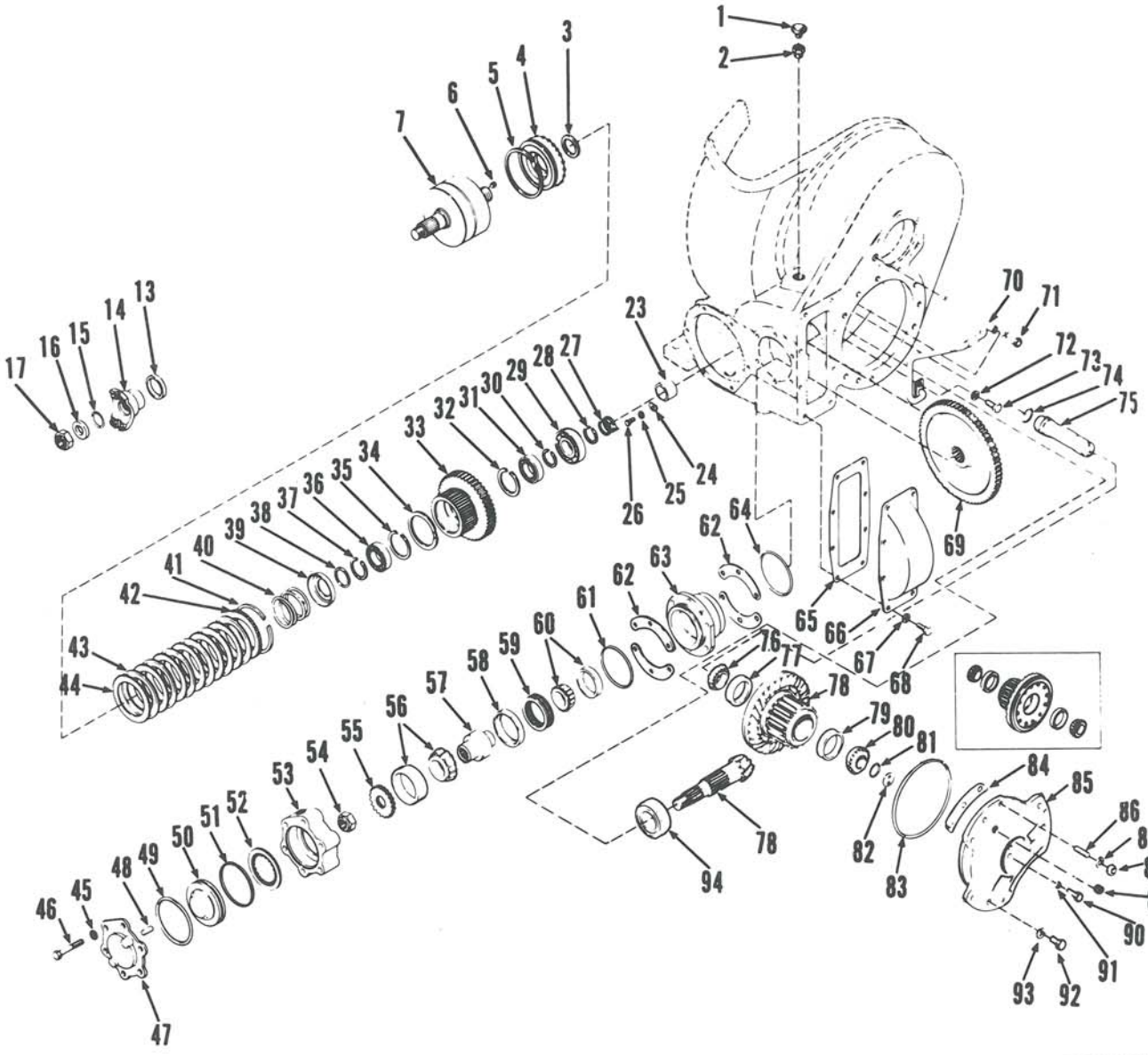
Item	Description	Qty.
1	Air breather, check valve assy. (Incl.2)	1
2	Included in Item 1	1
3	Seal, clutch piston - inner	1
4	Piston, clutch	1
5	Ring, piston - outer	1
6	Plug, input shaft	1
7	Input shaft drum & plug assy.	1
8	Gear, drop	1
9	O-ring, drop gear housing	1
10	Housing, drop gear	1
11	Stud, drop gear housing	6
12	Lkwshr, drop gear housing stud	6
13	Nut, drop gear housing stud	6
14	Bearing, front, clutch shaft	1
15	Ring, retaining front bearing	1
16	Gasket, bearing cap	1
17	Cap, clutch, shaft front bearing	1
18	Lkwshr, mounting, bearing cap	4
19	Bolt, mounting, bearing cap	4
20	Ring, gear retaining	1
21	Gear, input shaft	1
22	Shaft, input	1
23	Ring, bearing retaining	1
24	Bearing, input shaft - front	1
25	O-ring, input shaft bearing cap	1
26	Cap, input shaft bearing	1
27	Seal, oil	1
28	Flange, input	1
29	O-ring, input flange	1
30	Washing, input flange	1
31	Nut, input shaft	1
32	Nut, bearing cap stud	5
33	Lkwshr, bearing cap stud	5
34	Stud, bearing cap	5
35	Plug, pipe	2
36	Bearing, input shaft - rear	1
37	O-ring, housing stud	2
38	Race, input shaft piston ring	1
39	Lock, race	1
40	Lkwshr, race lock	1
41	Bolt, race lock	1
42	Ring, piston, input clutch	2
43	Ring, snap, clutch rear bearing retaining	1
44	Bearing, rear, input clutch	1
45	Ring, snap, clutch rear bearing retaining	1
46	Bearing, clutch driven gear	1
47	Ring, snap, bearing, clutch driven gear	1
48	Gear, clutch hub	1
49	Ring, clutch hub oil baffle	1
50	Ring, snap, bearing, clutch driven gear	1
51	Bearing, clutch driven gear	1
52	Ring, snap, spring retainer	1
53	Spacer, spring retainer	1
54	Retainer, spring	1
55	Spring, piston return	1
56	Ring, snap, backing plate	1
57	Plate, clutch disc backing	1
58	Disc, clutch inner	6
59	Disc, clutch outer	6
60	Lkwshr, mtg, pinion shaft brake cover	6
61	Bolt, mtg, pinion shaft brake cover	6
62	Cover, pinion shaft brake	1
63	Pin, dowel	2
64	O-ring, pinion shaft brake cover	1
65	Piston, brake, pinion shaft	1
66	Ring, piston, pinion shaft brake	1
67	Disc, pinion shaft brake	1
68	Housing, pinion shaft brake	1
69	Nut, pinion shaft	1
70	Washer, pinion shaft	1
71	Hub, pinion shaft brake disc	1
72	Washer, pinion shaft brake disc hub	1
73	O-ring, pinion shaft brake housing	1
74	Bearing, pinion shaft	1
75	Washer, sprag retaining	1
76	Sprag assy.	1
77	Race, sprag - outer	1
78	Shim, sprag outer race - .004"	‡
78A	Shim, sprag outer race - .007"	‡
78B	Shim, sprag outer race - .010"	‡
78C	Shim, sprag outer race - .020"	‡
79	O-ring, sprag outer race	1
80	Ring, sprag retaining	1
81	Race, sprag - inner	1
82	Gasket, pinion drive gear cover	1
83	Cover, pinion drive gear	1
84	Lkwshr, mounting, pinion drive gear cover	8
85	Bolt, mounting, pinion drive gear cover	8
86	Gear, pinion shaft drive	1
87	Tube, lubrication	1
88	Sleeve, lubrication tube	1
89	O-ring, ringer gear shaft	1
90	Shaft, ring gear	1
91	Cone, bearing, ring gear shaft - front	1
92	Cup, bearing, ring gear shaft - front	1
93	Screw, mounting, ring gear	12
94	Ring gear hub & seal	1
95	Gear, ring	1
96	Cup, bearing, ring gear shaft - rear	1
97	Cone, bearing, ring gear shaft - rear	1
98	O-ring, ring gear shaft	1
99	Shim, ring gear shaft - .004"	‡
99A	Shim, ring gear shaft - .007"	‡
99B	Shim, ring gear shaft - .010"	‡
100	O-ring, ring gear cover	1
101	Shim, ring gear cover - .004"	‡
101A	Shim, ring gear cover - .007"	‡
101B	Shim, ring gear cover - .010"	‡
102	Cover, ring gear	1
103	Stud, ring gear cover	2
104	Lkwshr, ring gear cover stud	3
105	Nut, ring gear cover stud	2
106	Bolt mounting, ring gear shaft	2
107	Lkwshr, mounting, ring gear shaft	2
108	Plug pipe	1
109	Bolt, mounting, ring gear cover	4
110	Lkwshr, ring gear cover stud	3
111	Gear, pinion	1
112	Bearing, pinion shaft	1
113	Spacer, pinion shaft bearing	1

‡ As required





DROP GEAR GROUP



TS-12285

WINCH - INPUT CLUTCH, PINION SHAFT, RING GEAR AND DROP GEAR ASSEMBLY
W AND WD 311 AND 400 SERIES WINCH

Item	Description	Qty.
1	Air breather, check valve assy. (Incl.2)	1
2	Included in Item 1	1
3	Seal, clutch piston - inner	1
4	Piston, clutch	1
5	Ring, piston - outer	1
6	Plug, input shaft	1
7	Input shaft & drum assy. (Incl. 6)	1
8	Gasket, input bearing	1
9	Cap, input bearing	1
10	Bearing, input	1
11	Gasket, input	1
12	Retainer & oil seal (Incl13)	1
13	Seal, oil	1
14	Flange, input	1
15	O-ring, flange	1
16	Washer, flange	1
17	Nut, flange	1
18	Bolt, mtg, retainer	4
19	Lkwshr, mtg.	4
20	Nut	6
21	Lkwshr, mtg.	6
22	Cap stud	6
23	Race, shaft, ring	1
24	Lock, race	1
25	Lkwshr, mtg.	1
26	Bolt, mtg, lock	1
27	Ring, piston	2
28	Ring, snap	1
29	Bearing, input - rear	1
30	Ring, snap,	1
31	Bearing, clutch, driven	1
32	Ring, snap	1
33	Gear, hub (41T)	1
34	Ring, clutch, bearing	1
35	Ring, snap, bearing	1
36	Bearing, clutch - rear	1
37	Ring, snap	1
38	Spacer, spring	1
39	Retainer, bearing	1
40	Spring, piston, bearing	1
41	Ring, snap, plate	1
42	Plate, disc, bearing	1
43	Disc, clutch - inner	6
44	Disc, clutch - outer	6
45	Lkwshr, mtg.	6
46	Bolt, mtg, cover	6
47	Cover, pinion brake (Incl. 47)	1
48	Pin, dowel	1
49	O-ring, cover	2
50	Ring, brake	1
51	Ring, piston	1
52	Disc, brake	1
53	Housing, brake	1
54	Nut, pinion shaft	1
55	Hub, pinion shaft	1
56	Bearing, assy. - cup	1
56A	Bearing, race - cone	1
57	Race, spring - inner	1
58	Retainer, sprag	1
59	Sprag assy.	1
60	Bearing assy.	1
61	O-ring - front	1
62	Shim, outer - .004	‡
62A	Shim, outer - .007	‡
62B	Shim, outer - .010	‡
62C	Shim, outer race - .020	‡

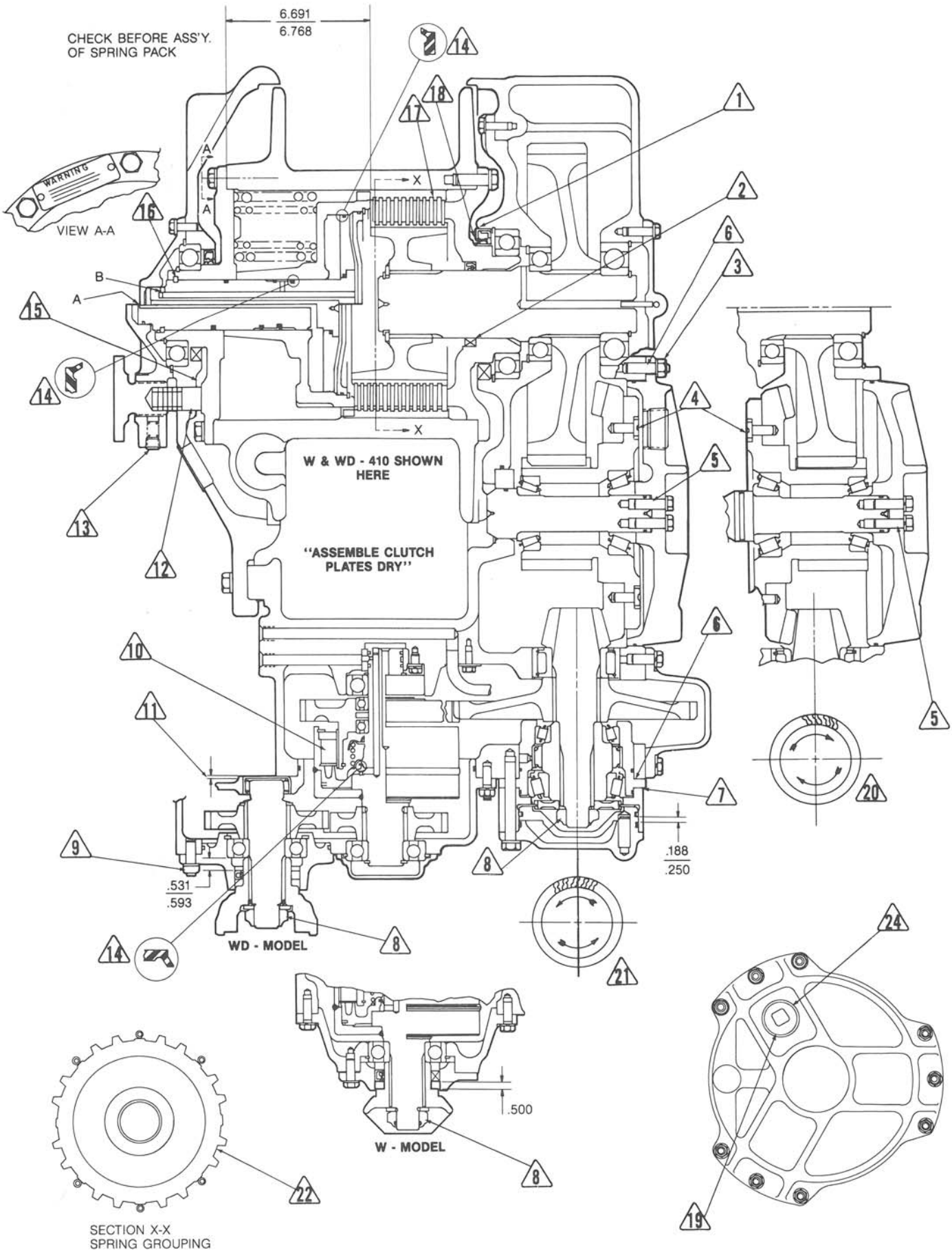
‡ As required

WINCH - INPUT CLUTCH, PINION SHAFT, RING GEAR AND DROP GEAR ASSEMBLY
W AND WD 311 AND 400 SERIES WINCH Cont'd.

Item	Description	Qty.
63	Sprag outer race	1
64	O-ring, sprag outer race	1
65	Gasket, outer cover	1
66	Cover, pinion shaft	1
67	Lkwshr, mtg	8
68	Bolt, mtg, cover	8
69	Gear, pinion drive (67T)	1
70	Tube, lubrication	1
71	Sleeve, tube	1
72	Lockwasher	1
73	Bolt	1
74	O-ring, shaft	1
75	Shaft, ring gear	1
76	Cone, ring gear	1
77	Cup, ring gear - inner	1
78	Ring gear and pinion set	1
78A	Hub, ring gear (19T)	1
78B	Bolt, mtg, ring gear	12
79	Cup, ring gear - outer	1
80	Cone, ring gear - outer	1
81	O-ring, shaft	1
82	Shim, shaft - .004	‡
82A	Shim, ring gear shaft - .007	‡
82B	Shim, shaft - .010	‡
83	O-ring, cover	1
84	Shim, cover - .004	‡
84A	Shim, cover - .007	‡
84B	Shim, cover - .010	‡
85	Cover, ring gear	1
86	Stud, mtg, cover	1
87	Lkwshr, mtg, cover	5
88	Nut, mtg. cover	1
89	Plug, cover	1
90	Bolt, mtg, shaft	2
91	Lkwshr, mtg	2
92	Bolt, mtg, cover	4
93	Lkwshr, mtg	4
94	Bearing, pinion	1
95	Gear, drop (31T)	1
95A	Gear, drop (32T)	1
96	O-ring, housing	1
97	Housing, drop gear	1
98	Stud, mtg, cover	6
99	Lkwshr, mtg	6
100	Nut, mtg, housing	6
101	Bearing, front	1
102	Ring, retaining	1
103	Gasket, cap	1
104	Cap, clutch shaft	1
105	Lkwshr, mtg, cap	4
106	Bolt, mtg, cap	4
107	Ring, retaining	1
108	Gear, input (31T)	1
108A	Gear, input (29T)	1
109	Shaft, input	1
110	Ring, retaining	1
111	Bearing - front	1
112	O-ring, shaft	1
113	Cap, input	1
114	Nut, cap	5
115	Lkwshr, mtg	5
116	Stud, cap	5
117	Plug, pipe	2
118	Bearing - rear	1
119	O-ring, housing	2

‡ As required

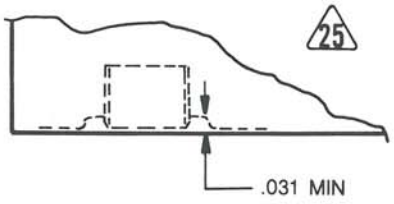
NOTES

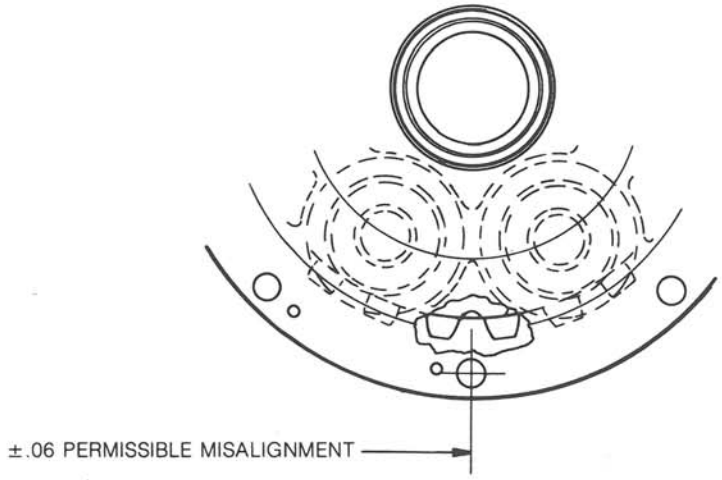

CHECK BEFORE ASS'Y. OF SPRING PACK
6.691
6.768
WARNING
VIEW A-A
W & WD - 410 SHOWN HERE
"ASSEMBLE CLUTCH PLATES DRY"
.531
.593
.188
.250
WD - MODEL
W - MODEL
.500
SECTION X-X
SPRING GROUPING

1. Assemble seal flush with face casting Lbs. Ft. of torque.
2. Assemble oil seal after winch drum is installed in winch housing.

   3. Torque nut to 64-70 Lbs. Ft.
4. Torque bolts to 85-100 Lbs. Ft.
5. Shim to adjust ring gear bearings to 50-60 Lbs. in. of rolling torque.
6. Shim as required to set ring and pinion contract and backlash.
7. Shim to adjust bearings - 15 Lbs. in. to 25 Lbs. in. pinion rolling torque.
8. Tighten flange nut to 175-200 Lbs. Ft.
9. Torque to 41-45 Lbs. Ft.
10. Input clutch - 6 outer steel plates, 6 inner bronze plates, alternately assembly starting with outer steel plate.
11. Press bearing to this dimension, $\frac{000}{.020}$
12. Apply grease on the cable drum plunger puck and bearing cap area that contains it.
13. Assemble self locking plug with 30-40 as shown.
14. Seal must be installed as shown.
15. Assemble seal flush with face of casting as shown.
16. 2-split rings.
17. W 7 WD-310 shown here.
18. Press wear sleeve with load not to exceed 200 Lbs.
19. Assemble ring gear cover with inspection hole above center.
20. Clockwise Pinion. Shaft freewheel direction.
21. Counter Clockwise Pinion. Shaft freewheel direction.
22. Section X-X Spring Grouping.
23. 2 groups of springs required. 6 springs per group as shown in section X-X. When tolerances require shimming of the clutch pack, assemble the shim in line with the center and bottom shim for proper spring compression.
24. Outside mounted ring gear backlash should be measured thru ring gear cover access hole with a dial indicator rigidly mounted with the stem perpendicular to the ring gear mounting screws or toe of pinion. The amount should vary from .006 to .011. See tooth contract chart.

    NOTE: If mounting information is etched on ring gear, this takes precedence over chart data.
25. Install drain plug in bottom of winch housing to this dim. shown out of position.





PARTIAL VIEW OF FREE SPOOL CLUTCH ASSEMBLY

Alignment between mounting bolt in cable drum release support and timing groove in drum release clutch piston must not exceed .06 either side of center line.

Bolt alignment into cable drum must be accomplished without pry bar or other rotating force.

DANGER

THIS CLUTCH IS SPRING-LOADED.
READ THE MAINTENANCE MANUAL SUPPLIED WITH THIS MACHINE BEFORE REMOVING THIS COVER.

View A-A

ASSEMBLY OF FREE SPOOL CLUTCH

To check assembled free spool clutch:

1. Apply air pressure, 100 PSI max., to center hole "A" in end of shaft. Air must not come out .500 from same end of shaft.
2. Apply air pressure to radial hole "B". Air must come out of center hole "A".
3. Repeat Step 2 and place finger over center hole. Air must not come out at any part of assembly. If assembly does not pass this test, disassemble and check for cut lip seals, or lip seals placed backward.

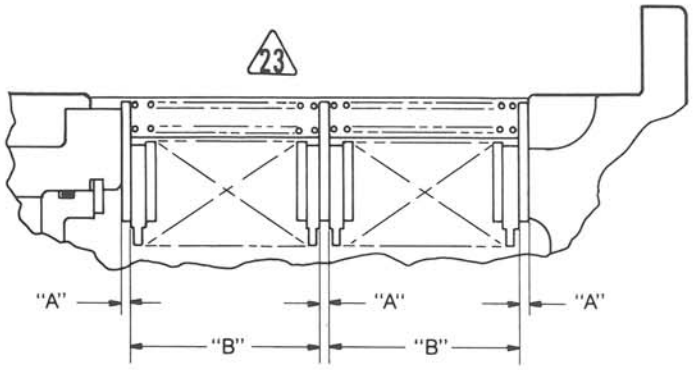
GENERAL NOTES

1. Assemble to parts list as to flange size, gear ratios and input rotation.
2. All lead-in chambers for oil seals, piston rings and "O" rings must be smooth and free from burns. Inspect at assembly.
3. Lubricate all piston rings and oil rings at assembly.
4. Use Permatex and Crane Sealer only where specified.
5. Apply a very thin coat of Permatex No. 2 to O.D. of all oil seals before assembly.
6. Apply Crane Sealer to all pipe threads.
7. After assembly of parts using Permatex No. 2, there must not be any free or excess material that could enter the oil circuit.
8. Lubricate all bearings with Type "A" oil in assembly.
9. After assembling seating rings into grooves, coat with Type "A" oil.
10. Apply Permatex to all studs prior to assembly.
11. Install both cap mounting screws when seating ring gear cover.
12. Insure seating of bearings and related parts by seating ring gear cover without using shims.
13. "O" rings should be assembled after shimming of bearings to prevent damage to various parts.
14. Gear should be rotated and cover rapped each time assembly is made to insure the proper alignment of bearings.
15. Measure 6.691/6.768 clutch drum spring plate dimension and record actual dimension on assembly line card.
16. Prior to building cable drum clutch, remove all residual storage oil from separator plates.
17. Stamp name plate at assembly.

CHART 1		
MODEL	INPUT FLANGE ROTATION	PINION SHAFT FREEWHEEL ROTATION
WD	Clockwise	Clockwise
WD	Counter Clockwise	Counter Clockwise
W	Clockwise	Counter Clockwise
W	Counter Clockwise	Clockwise

WHEN TOLERANCES REQUIRE SHIMMING OF THE CLUTCH PACK, ASSEMBLE THE SHIM INLINE WITH THE CENTER AND BOTTOM SHIM FOR PROPER SPRING COMPRESSION.

2 - GROUPS OF SPRINGS REQUIRED 6 - SPRINGS PER GROUP AS SHOWN.



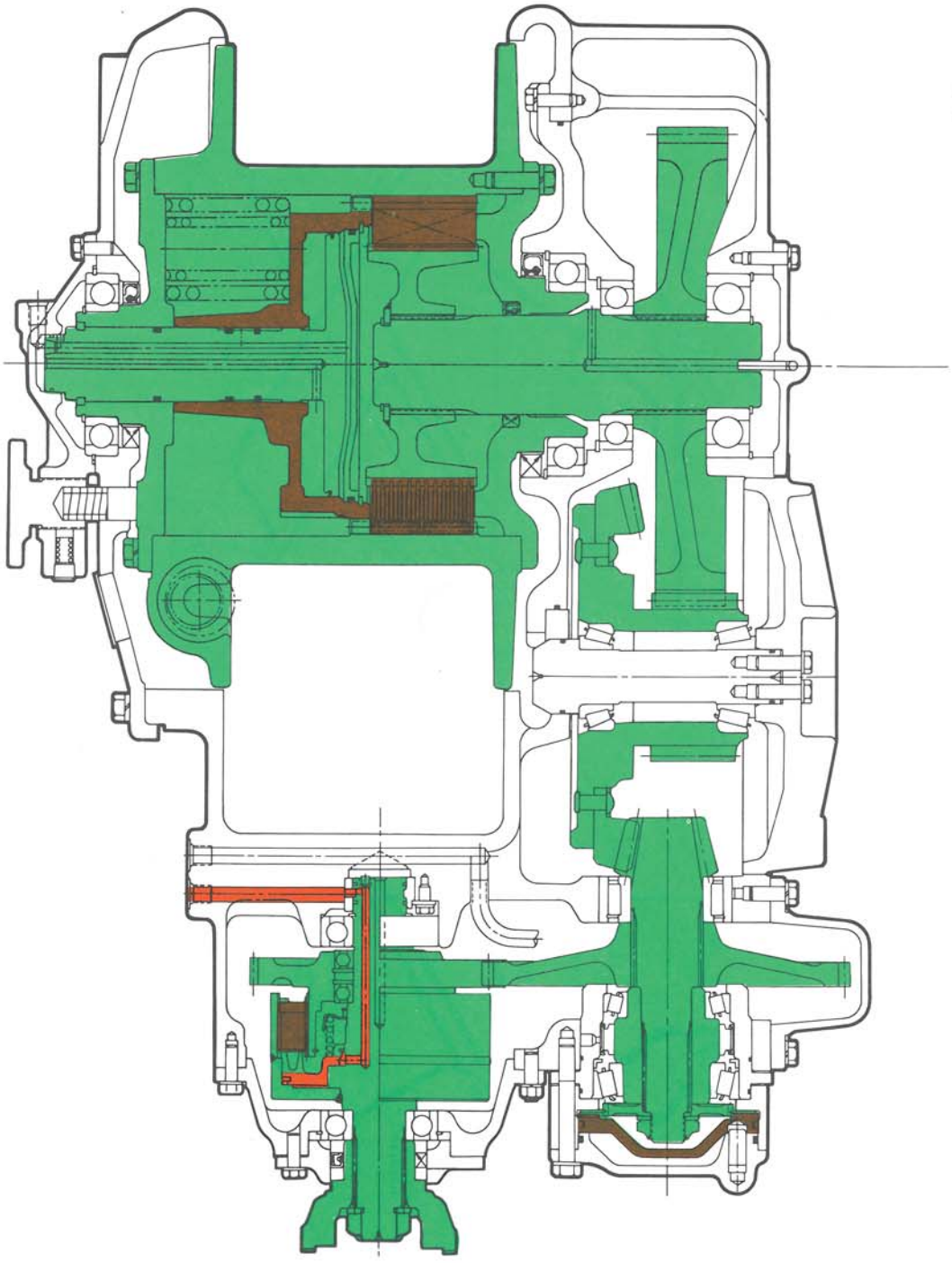
* Shimming Plate Not Included.

FREE SPOOL CLUTCH			
MODEL	"A"	"B"	NO PLATES*
W&WD-410	ONE STEEL PLATE	8 STEEL 9 FIB ER	19 STEEL 18 FIBER
W&WD-411			
W&WD-412			
W&WD-310		5 STEEL 6 FIBER	13 STEEL 12 FIBER
W&WD-311			

Alternately assemble plates, see parts list, starting with steel outer plate. Shim at final assembly with steel outer plates per parts list to maintain 6.691 - 6.768 dim.

POWER FLOW

(WITH INSIDE MOUNTED RING GEAR)

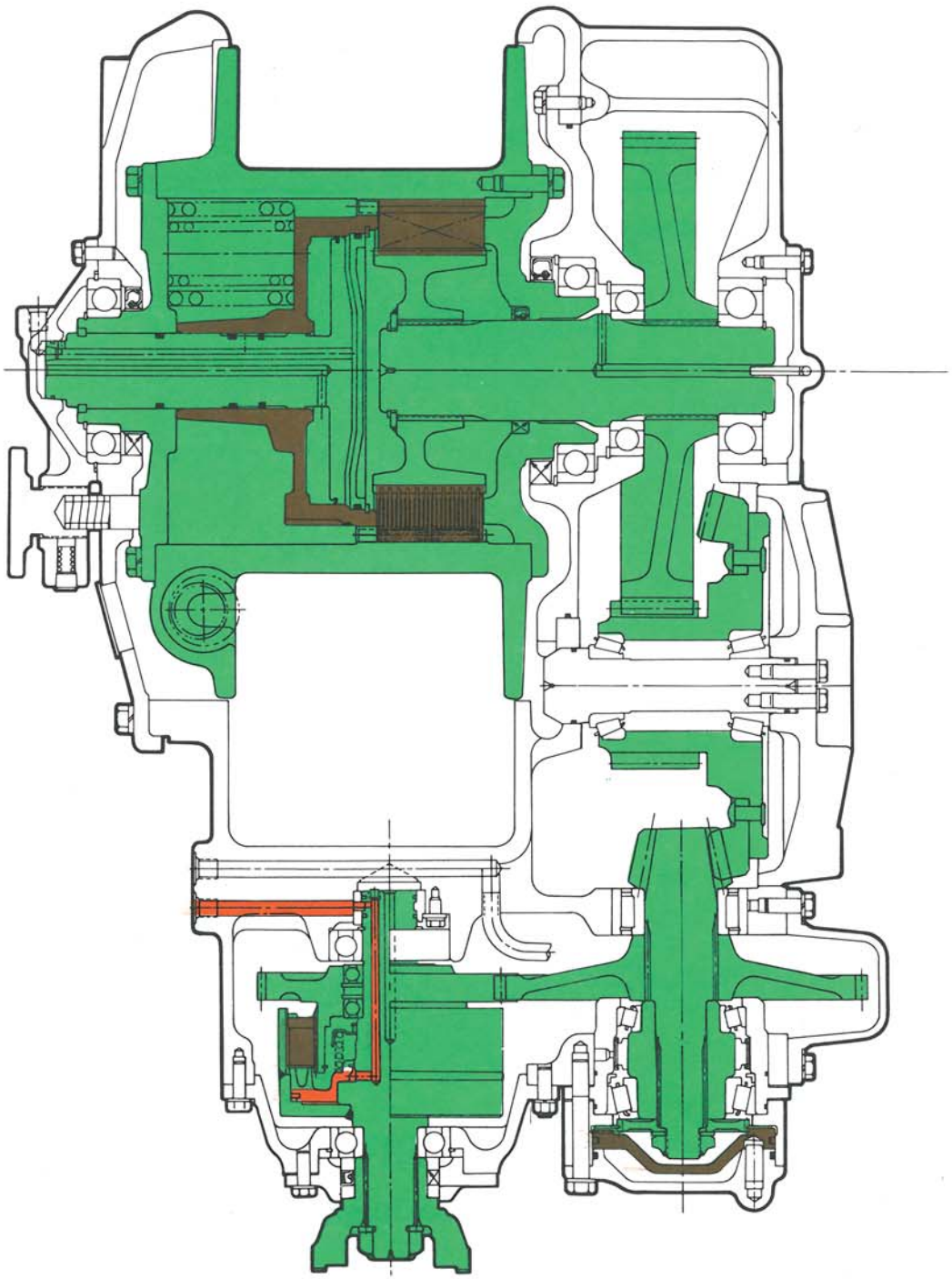


WINCH IN POSITION

PRESSURE ON ROTATING PARTS SLIDING PARTS

POWER FLOW

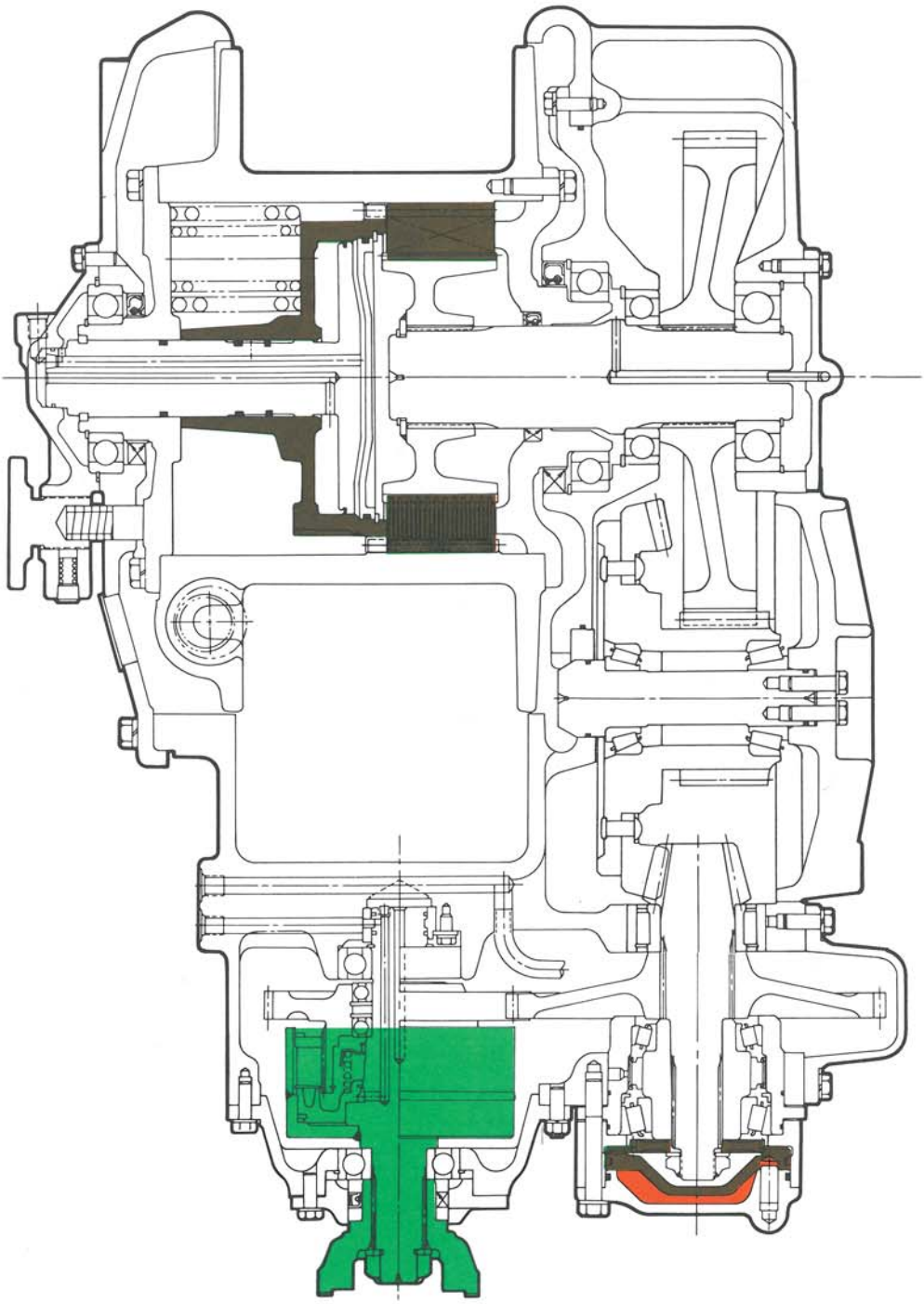
(WITH OUTSIDE MOUNTED RING GEAR)



WINCH IN POSITION

PRESSURE ON ROTATING PARTS SLIDING PARTS

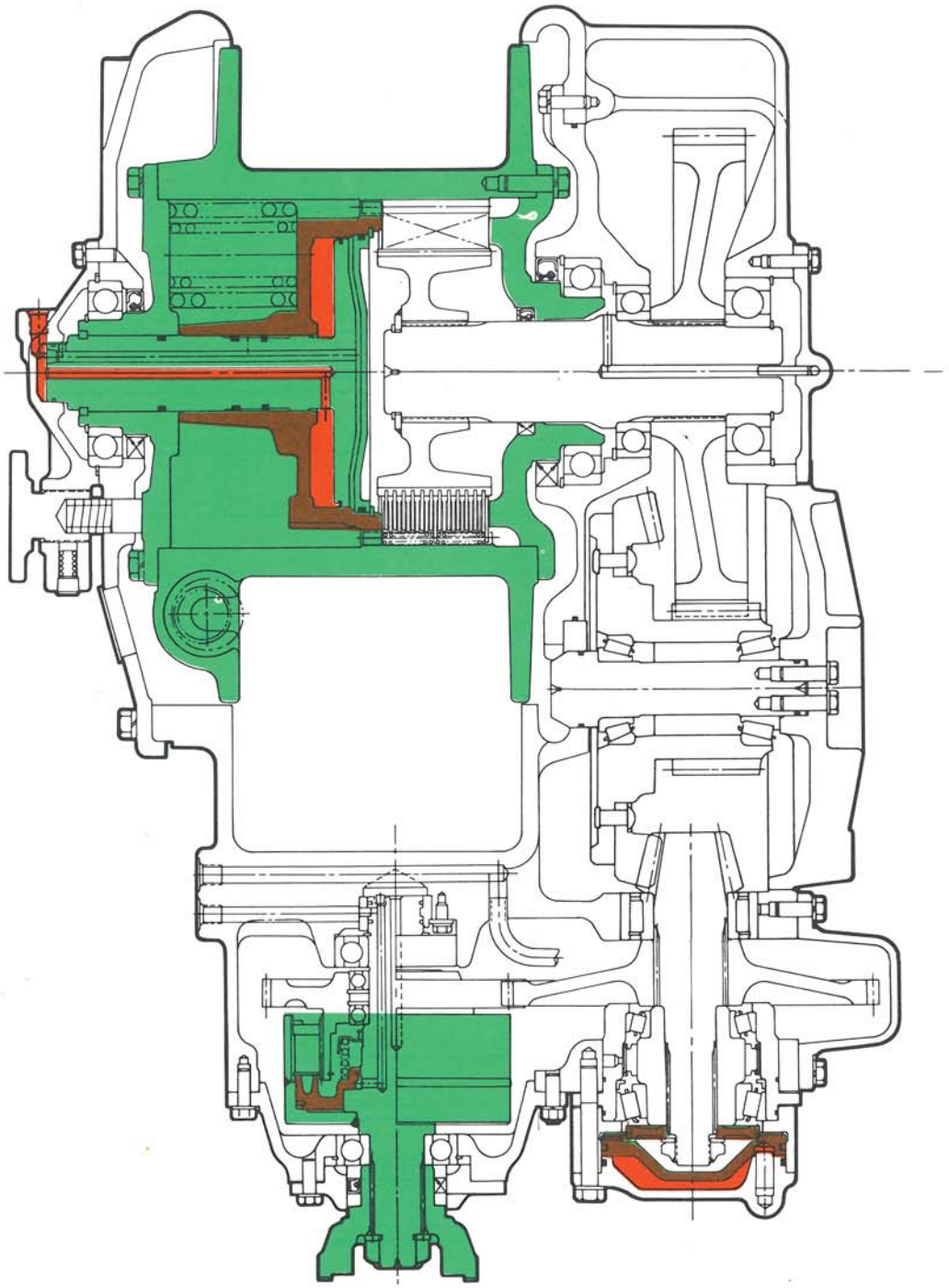
POWER FLOW



HOLD POSITION

PRESSURE ON ROTATING PARTS SLIDING PARTS

POWER FLOW



FREE SPOOL POSITION

PRESSURE ON ROTATING PARTS SLIDING PARTS

NOTES

NOTES

NOTES

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