



SERVICE MANUAL

**FOR
HYSTER
DIRECT DRIVE
WINCH**

W5F/D4F

SAFETY PRECAUTIONS

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

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

Winch Serial Number _____

Date put in service _____

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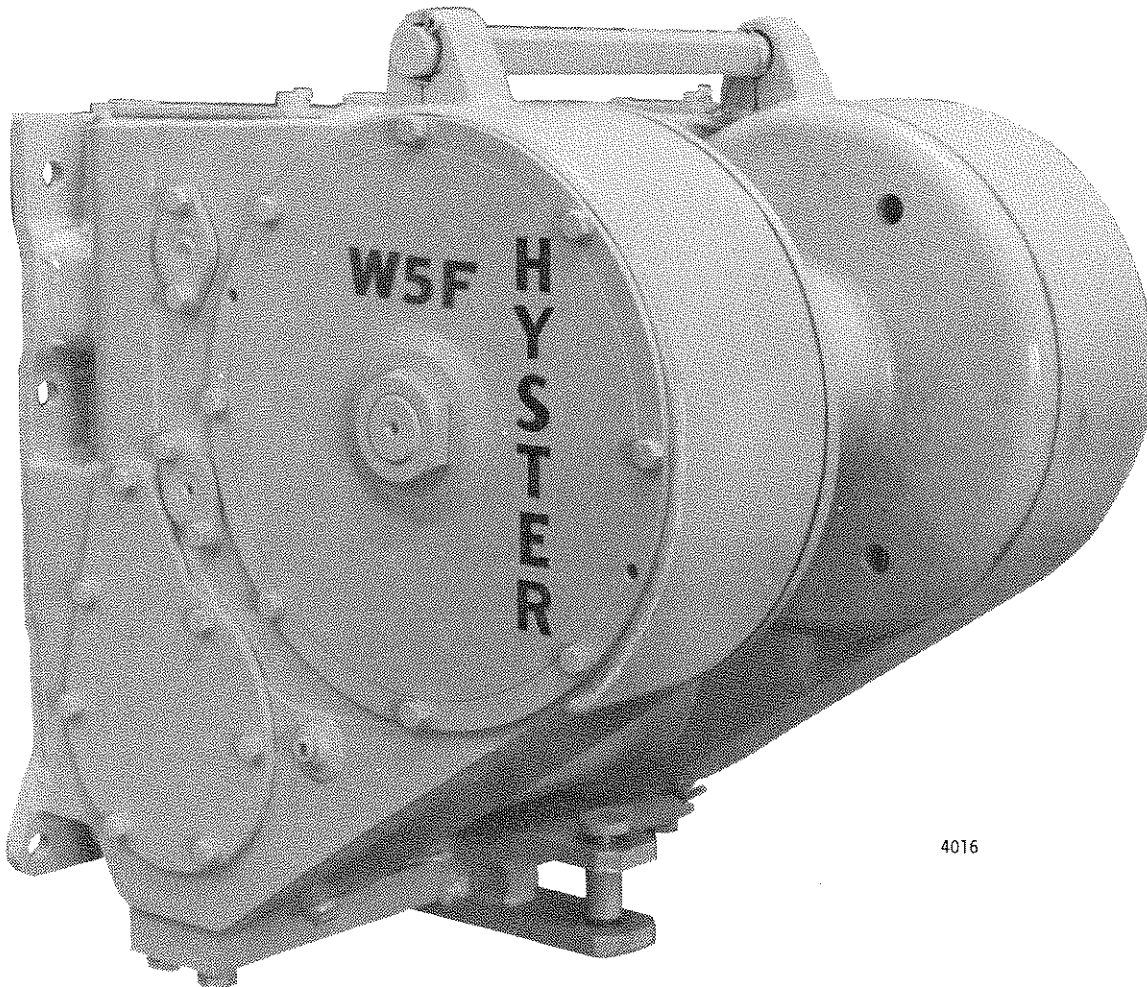
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This Service Manual contains operation, maintenance and repair instructions for the W5F/D4F Direct Drive Towing Winches. All instructions that reference the D4F Towing Winch are also applicable to the W5F Towing Winch unless otherwise stated.

General instructions are also included for the removal and installation of the winch. Specification Tables are provided which contain winch data. Complete physical and functional descriptions of the winch are given to aid the repairman in understanding the operation of the winch components.



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SPECIFICATIONS & DESCRIPTIONS

1-1. GENERAL.

1-2. This section contains a list of specifications for the D4F Towing Winch. Complete physical and functional descriptions of the winch and its sub-assemblies are also given. These descriptions will aid the repairman in understanding the construction

and operation of the winch and its subassemblies. (See figures 1-1 through 1-21.)

1-3. LIST OF SPECIFICATIONS.

1-4. A complete list of specifications for the D4F is given in Tables 1-1 through 1-4.

Table 1-1. Component Specifications (Sheet 1 of 3)

ITEM	DESIGN DATA		REFERENCE FIGURE
	Lo-Speed	Std. Speed	
GEAR RATIOS			
Forward	72.6:1	24.3:1	
Reverse	72.6:1	24.2:1	
NUMBER OF GEAR TEETH			
PTO Shaft	9	17	5-4, Step 7; 5-3, Step 4
Sun Gear			
Internal Teeth	9	None	5-4, Step 8
External Teeth	23	None	5-4, Step 8
Planetary Gear (2 Required)	23	None	5-4, Step 10
Ring Gear			
Internal Teeth (Large Dia.)	15	None	5-4, Step 4
Internal Teeth (Small Dia.)	8	None	5-4, Step 4
Bevel Gear Pinion			
Spline Teeth	15	None	5-4, Step 20
Pinion Teeth	17	None	5-4, Step 20
Brake Shaft			
Brake Wheel	14	None	5-5, Step 2
Bevel Gear (2 Required)	40	None	5-7, Step 13
Intermediate Pinion	14	None	5-7, Step 16
Intermediate Shaft			
Intermediate Driven Gear			
External Teeth	48	48	5-9, Step 11
Internal Teeth	18	18	5-9, Step 11
Drum Pinion Gear	18	18	5-9, Step 3
Drum Shaft			
Drum Gear	54	54	5-8, Step 5
DRUM			
Barrel Diameter	7-1/2	7-1/2	5-8, Step 1
Barrel Length	10-3/4±1/16	10-3/4±1/16	5-8, Step 1
Flange Diameter	18-3/4	18-3/4	5-8, Step 8
RH Seal Bore Diameter	4.9975-5.0005	4.9975-5.0005	5-8, Step 9
LH Bearing Bore Diameter	4.7265-4.7285	4.7265-4.7285	5-8, Step 10
Drive Flange Counterbore Dia.	12.000-12.003	12.000-12.003	5-7, Step 9
Cable Capacity (Allow for loose or unevenly spooled cable)			
5/8-Inch Cable	430	430	
3/4-Inch Cable	298	298	
Ferrule Size			
5/8-Inch Cable	B6	B6	
3/4-Inch Cable	B6	B6	

Table 1-1. Component Specifications (Sheet 2 of 3)

ITEM	DESIGN DATA		REFERENCE FIGURE
	Lo-Speed	Std. Speed	
DRUM SHAFT ASSEMBLY			
Shaft			
Drum Gear Cover Journal Dia.	2.340-2.344	2.340-2.344	5-8, Step 3
Seal Bore Diameter	2.118-2.123	2.118-2.123	5-8, Step 4
Roller Bearing Journal Dia.	2.3612-2.3622	2.3612-2.3622	5-8, Step 4
Adapter Counter Bore Diameter	4.726-4.727	4.726-4.727	5-8, Step 7
RH Roller Bearing Journal Dia.	2.3612-2.3622	2.3612-2.3622	5-8, Step 6
Spacer			
Length	0.870-0.875	0.870-0.875	5-8, Step 10
PTO SHAFT AND CARRIER			
Shaft			
Bearing Journal Diameter	1.3776-1.3783	2.3617-2.3626	5-4, Step 13 5-3, Step 4
Seal Journal Diameter	(In bearing)	2.259-2.271	5-3, Step 4
Carrier			
Bearing Journal Diameter	None	4.3306-4.3318	5-3, Step 4
Seal Journal Diameter	None	2.874-2.876	5-3, Step 4
Planetary Carrier (Cover)			
Shaft Bearing Journal Dia.	1.3776-1.3783	None	5-4, Step 13
Planetary Housing			
Ring Gear Bearing Journal Diameter	2.7554-2.7563	None	5-4, Step 18
Bearing Journal Diameter	2.3617-2.3626	None	5-4, Step 19
BRAKE AND BEVEL GEAR SHAFT			
Shaft			
LH and RH Bevel Gear			
Bearing Journal Diameter	1.9676-1.9681	1.9676-1.9681	5-7, Step 13
RH Bearing Retainer			
Seal Diameter	3.250-3.252	3.250-3.252	5-7, Step 20
Bearing Cup Bore Diameter	3.5432-3.5444	3.5432-3.5444	5-7, Step 19
Spacers			
Long Spacer (3 Required)			
Seal Bore Diameter	2.093-2.098	2.093-2.098	5-7, Step 12
Seal Width	.1875	.1875	5-7, Step 12
Length	1.1875	1.1875	5-7, Step 12
Short Spacer			
Length	.307-.312	.307-.312	5-7, Step 12
Spacer (Internal O-ring)			
Surface Diameter	2.3750	2.3750	5-7, Step 21
Width	1.465-1.470	1.465-1.470	5-7, Step 21
Bevel Gear Backlash	.006-.014	.006-.014	5-10, Step 18
Brake Wheel Diameter	9	9	5-5, Step 2
INTERMEDIATE SHAFT ASSEMBLY			
Bearing Journal Diameter	1.7707-1.7714	1.7707-1.7714	5-9, Step 2
SIDE FRAME (LH)			
Bore Diameter			
Intermediate Shaft	2.000-2.002	2.000-2.002	5-9, Step 4
Drum Shaft Outer Retainer	16.060-16.063	16.060-16.063	5-8, Step 3
Drum Seal	2.346-2.348	2.346-2.348	5-8, Step 9

Table 1-1. Component Specifications (Sheet 3 of 3)

ITEM	DESIGN DATA		REFERENCE FIGURE
	Lo-Speed	Std. Speed	
TRANSMISSION HOUSING (RH)			
Bore Diameter			
Brake and Bevel Gear Shaft Bearing Retainer	8.127-8.130	8.127-8.130	5-7, Step 9
Shifter Shaft (Fwd-Rev)	1.001-1.003	1.001-1.113	5-7, Step 8
Shifter Shaft Seal	1.498-1.500	1.498-1.500	5-7, Step 8
RH Brake and Bevel Gear Shaft Pilot	8.498-8.502	8.498-8.502	5-7, Step 11
LH Brake and Bevel Gear Shaft Pilot	4.3306-4.3318	4.3306-4.3318	None
RH Drum Shaft Pilot	2.346-2.348	2.346-2.348	None
NOTE: All Dimensions Given in inches unless otherwise specified.			

Table 1-2. Torque Specifications

ITEM	DESIGN DATA		REFERENCE FIGURE
	Lo-Speed	Std. Speed	
NOTE: All torque values given in foot-pounds and with threads lubricated.			
DRUM SHAFT ASSEMBLY			
Drum Gear Cover (LH)	75	75	5-12, Step 13
Drum Gear Internal Locknuts	150	150	5-12, Step 12
Drum Capscrews	150	150	5-12, Step 15
Drum Shaft Nuts	400 (approx.)	400 (approx.)	5-12, Step 14
INTERMEDIATE SHAFT ASSEMBLY			
Shaft Retainer Capscrews	75	75	5-11, Step 14
BRAKE & GEAR SHAFT ASSEMBLY			
Side Cover Capscrew (LH and RH)	75	75	None
Retainer Capscrews	75	75	5-10, Step 16
PTO SHAFT ASSEMBLY			
Carrier Capscrew - Drilled Head	None	75	5-3, Step 2
Planetary Cover Capscrews	75	None	5-14, Step 20
Case Capscrews	75	None	5-14, Step 18

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1-5. SERIAL NUMBER DATA (See Figure 1-1)

1-6. The name plate is located on the right hand side of the winch frame and contains the serial number, model number and special application data. The serial number is also stamped just above the nameplate. The serial number indicates the design series, manufacturing plant, serial number and year manufactured. A typical serial number designates the following:

Example: C28 P 0000 M
 (1) (2) (3) (4)

(1) The first letter and number denote the design series and model of the unit. In the example, C28 denotes the D4F Direct Drive series.

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

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

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

(4) The final letter designates the year of unit manufacture, starting with the letter "A" indicating 1957. The letters I, O and Q are not used.

1-7. PHYSICAL DESCRIPTION.

1-8. Towing Winch. (See Figure 1-1.)

1-9. The D4F Towing Winch is manufactured as a Direct Drive winch. The Direct Drive winch has an optional Lo-Speed arrangement. The Direct Drive winch employs a dental clutch with related mechanical linkage to shift the winch gear train to Forward, Neutral or Reverse. A brake wheel and band arrangement with related mechanical linkage provides braking on the D4F Standard and Lo-Speed Direct Drive winches. A free-spooling arrangement is standard

with the D4F Direct Drive winch. The D4F winch is designed for use on direct drive and torque converter tractors equipped with an interruptable power-take-off (PTO). All major gear train components and brake assembly components are mounted inside a fabricated weldment. The gear train includes a PTO shaft assembly, bevel gear and brake shaft assembly (common shaft), intermediate shaft assembly and a drum shaft assembly. The PTO shaft assembly, bevel gear shaft assembly, intermediate shaft assembly, and drum gear are mounted in the center and left-hand section of the weldment. The brake assembly and associated linkage is located in the right hand section. The brake shaft is common with the bevel gear shaft. These components are accessible by removing the top right cover, brake drum cover, and brake adjustment covers on the right side. These covers are bolt mounted to the weldment. The drum gear, intermediate shaft, intermediate drive pinion, and free spool shaft are accessible by removing the top, left hand cover and left hand side mounted covers. Mechanical linkage is used to control the operation of the D4F Direct Drive winch.

1-10. Direct Drive Gear Train (See Figure 1-2).

The gear train used in the D4F winch consists of a PTO shaft assembly, bevel gear and brake shaft assembly (common shaft), intermediate shaft assembly, free spool shaft and drum shaft assembly. The D4F Lo-Speed winch uses a planetary gear set integral within the PTO assembly to provide the necessary gear reduction. The planetary gear set consists of a PTO shaft, sun gear, planetary gears, ring gear, bevel pinion gear and case. The bevel gear and brake shaft assembly contains two straight-cut pinion gears, one dental clutch, one brake wheel, five spacers, six ball bearings, (four for bevel gear rotation and two for shaft rotation) and an intermediate gear. The PTO bevel pinion drives the two bevel gears in opposite directions at all times. Movement of the dental clutch left or right locks one of the bevel gears to the shaft and drives the shaft either clockwise or counterclockwise. Torque is transferred to the intermediate shaft by an intermediate pinion gear which is splined to the bevel gear and brake shaft. The intermediate shaft assembly contains a large intermediate gear, a dental clutch and a smaller drum pinion gear which rotates around the shaft on four single row ball bearings. The drum pinion rides around the shaft on a double row and a single row ball bearing. The intermediate gear rides around the shaft on two single row ball bearings. The dental clutch is controlled mechanically from the free spool lever. The dental clutch locks the intermediate gear and drum pinion gear together to transfer torque to the drum gear in the drum shaft assembly. In a free spool condition, the dental clutch is moved out of engagement with the drum pinion gear, stopping the torque transfer to the drum shaft. By dis-

engaging the drum gear pinion from the winch gear train, the drum can rotate freely and cable can be payed out by hand. The drum shaft assembly is aligned between two matched, double taper roller bearings. The drum shaft is secured to the winch weldment and, therefore, **Does Not Rotate**. The

drum gear is bolted to an adapter plate that is bolted to the drum. This allows the drum, adapter and drum gear to rotate around the drum shaft. All drive train gears are heat-treated to provide maximum service life.

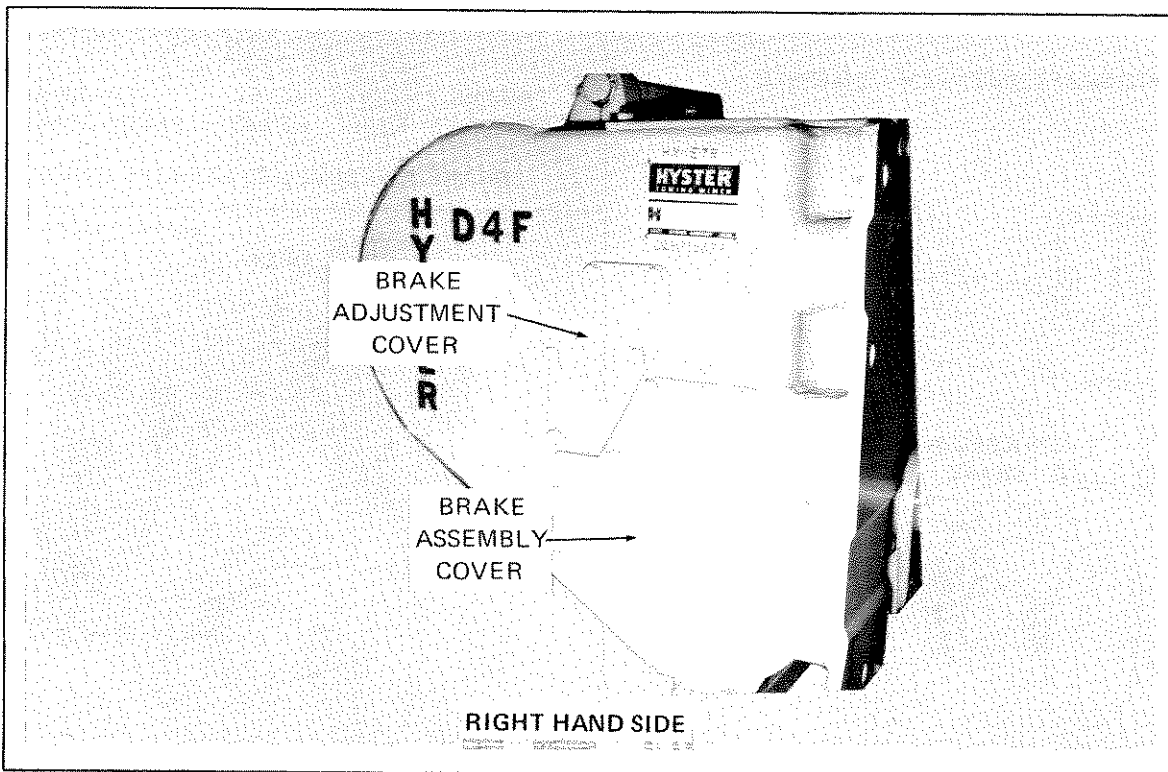
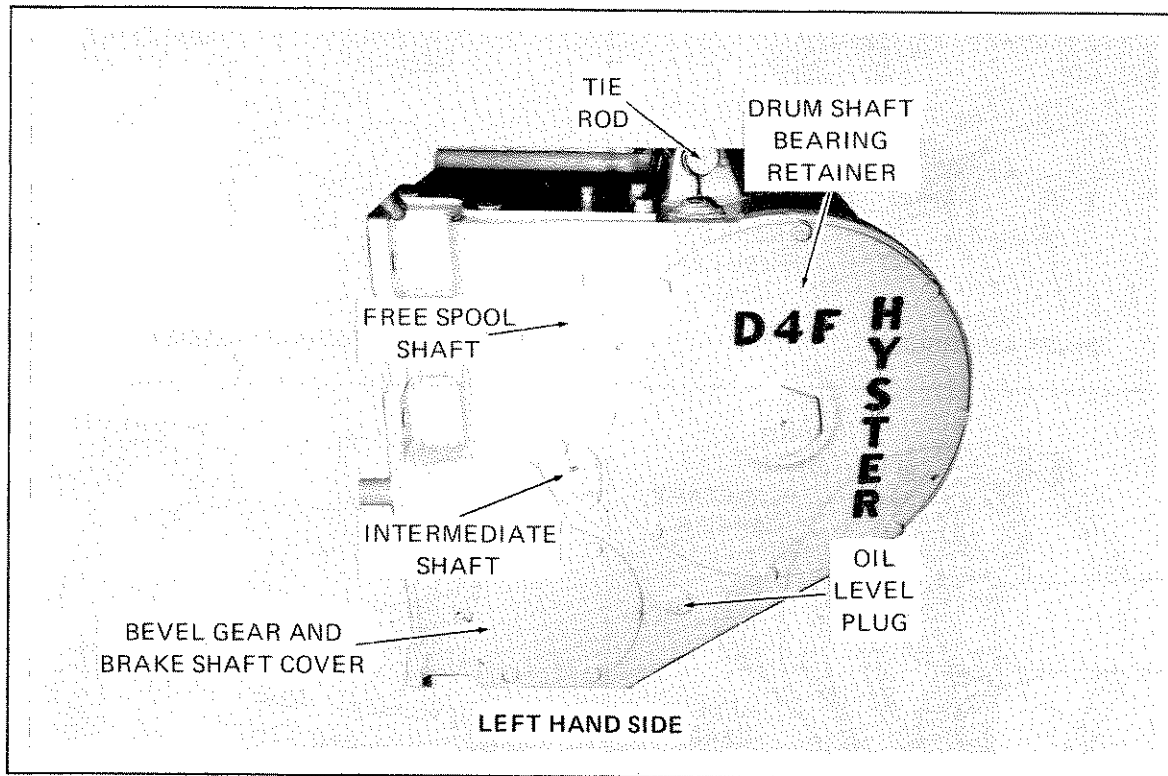


Figure 1-1. D4F Towing Winch

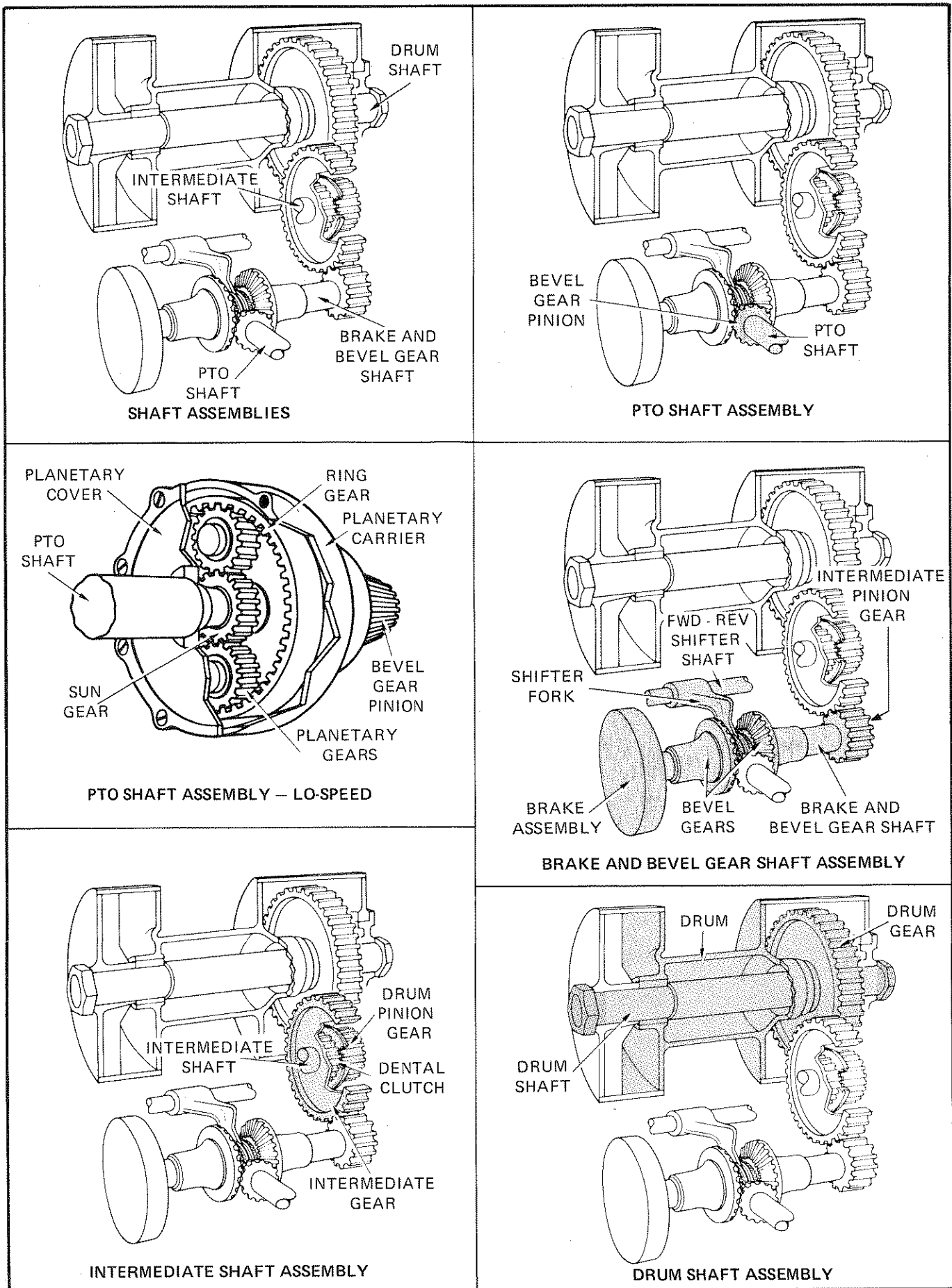


Figure 1-2. D4F Gear Train

1-11. Dry Brake Assembly (See Figure 1-3) The dry brake assembly consists of a brake wheel, band assembly, two crank assemblies and connecting linkage. The cast iron brake wheel is splined to the right hand side of the bevel gear and brake shaft and is held in place by the shaft locknut. A segmented lining is riveted to the brake band. The upper crank assembly is connected to the control linkage and a turn buckle, and rotates on a shaft. The lower crank assembly is connected to the other end of the turnbuckle and brake band, and rotates about a shaft. Pre-lubricated bushings are installed in the shaft bores of the two crank assemblies to prevent wear. When the control cable is pulled, the upper crank assembly rotates up and forces the lower crank assembly up. This pulls the brake band against the brake wheel, applying the brake.

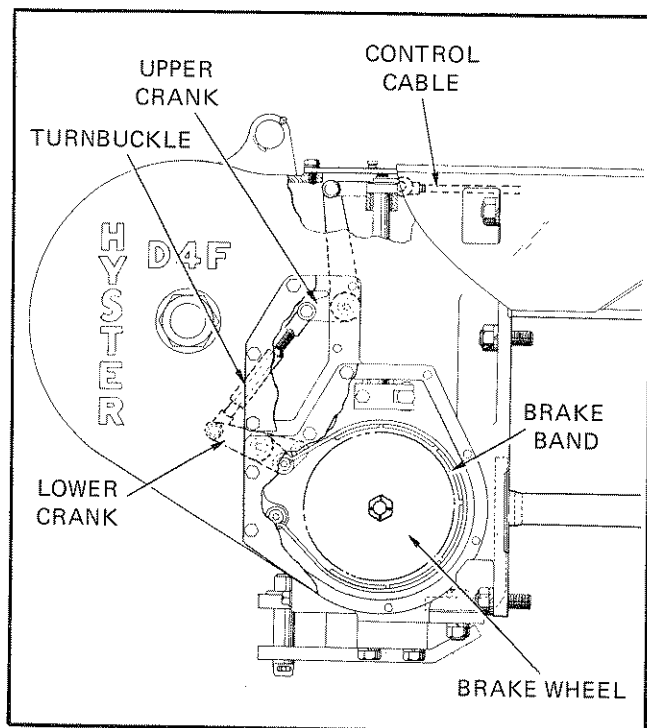


Figure 1-3. Dry Brake Assembly

1-12. Automatic Brake (Optional) (See Figure 1-4). The automatic brake assembly consists primarily of a brake wheel, hub, pawl assembly, drag rings, oil seals, bearings, and cover. The hub is splined to the right hand side of the brake shaft and is held in place by the shaft locknut. The brake wheel is designed with an internal ratchet ring and rotates on two ball bearings. The pawl assembly ratchets toward the hub as the winch drum is turning. When the drum stops, the pawl immediately engages into the brake wheel ratchet.

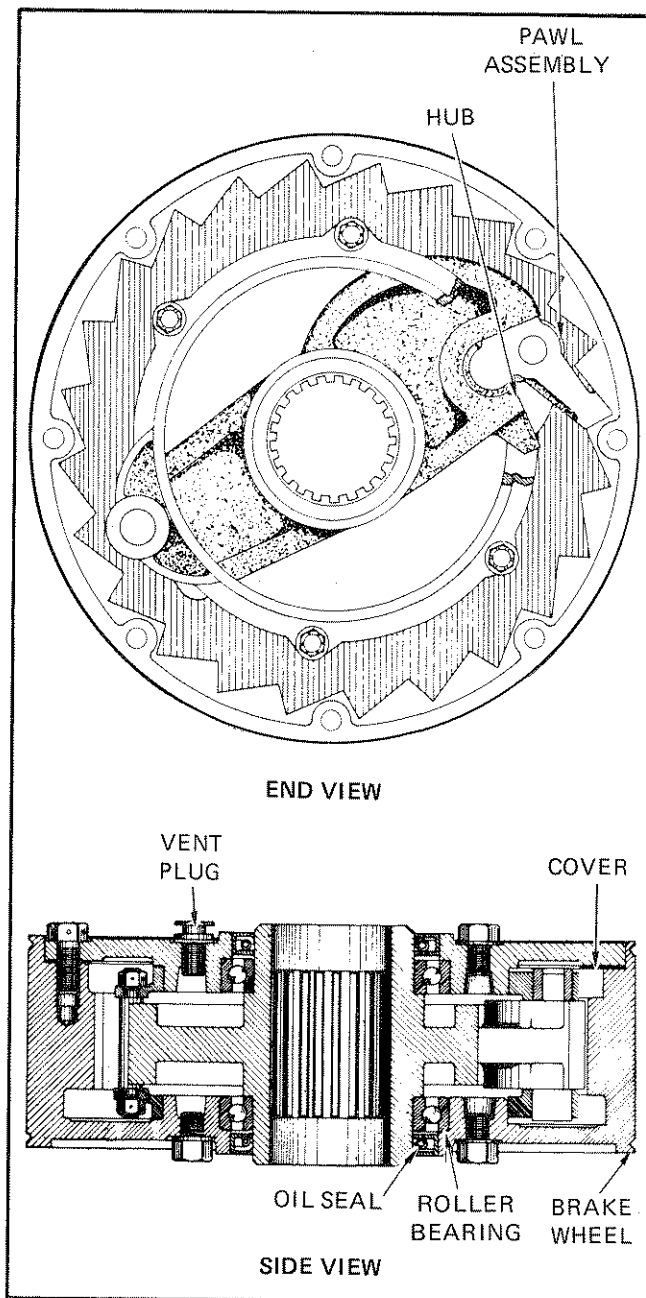


Figure 1-4. Automatic Brake Assembly

1-13. Handling Gear. (See Figure 1-5).

1-14. Direct Drive Winch (See Figure 1-5). The handling gear used to control the operation of the D4F winch consists of a forward-reverse handlever assembly, brake handlever assembly, a free-spooling handlever and mounting bracket with attached quadrant bars. The handling gear is normally mounted at the front, left-hand side of the operators seat. The forward-reverse handlever controls the dental clutch through a control cable attached to the bottom of the handlever. The brake handlever can be positioned and locked at various positions along the

quadrant bar. The position of the handlever along the quadrant bar determines the extent that the brake is applied or released. A release handle on the handlever must be depressed and pulled back slightly before the handlever can be removed forward to release the brake. The free spooling handlever controls the dental clutch on the intermediate shaft through a control cable attached to the bottom of the handlever.

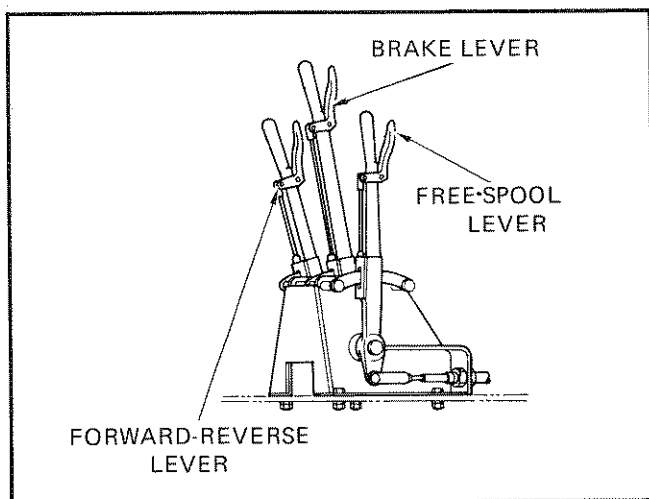


Figure 1-5. Handling Gear – Direct Drive

1-15. Forward-Reverse Shifter Assembly (See Figure 1-6). The forward and reverse shifter assembly consists primarily of a dental clutch, shifter fork, shifter shaft, detent ball and detent spring. The shifter fork is secured to the shifter shaft by means of a lock screw and lockwire. The shifter shaft is connected through a shifter crank assembly to the forward-reverse control cable. The detent ball and spring holds the shifter fork in the Forward, Neutral or Reverse position.

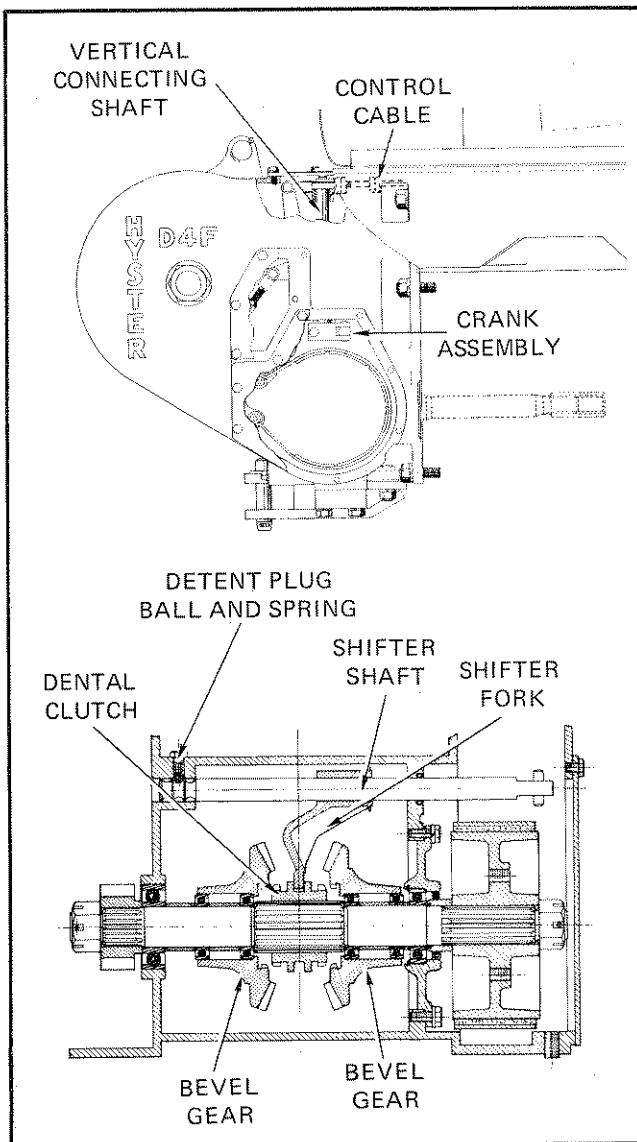


Figure 1-6. Fwd-Rev. Shifter Assembly

1-16. Free-Spool Shifter Assembly (See Figure 1-7). The free-spool shifter assembly consists primarily of a dental clutch, shifter fork, shifter shaft, detent ball and detent spring. The shifter fork is secured to the shifter shaft by a cap screw and lockwasher. The shifter fork is connected to the free-spool cable through two crank assemblies. The detent ball and spring hold the shifter fork in or out of the free-spool position.

1-17. FUNCTIONAL DESCRIPTION

1-18. Direct Drive Gear Train (Standard) (See Figure 1-8).

1-19. The PTO shaft assembly rotates clockwise as viewed from the front of the tractor. Torque is transmitted from the PTO pinion to the bevel gears, driving them in opposite directions. With the

forward-reverse handlever in Neutral, the dental clutch is centered between the bevel gears. In reverse, the dental clutch is moved to the right, engaging the reverse bevel gear driving the bevel gear and brake shaft in a clockwise direction as viewed from the left side of the winch. This will cause torque to be transferred from the intermediate gear, causing the intermediate shaft assembly to rotate counterclockwise. The intermediate shaft drum pinion gear will now turn the large drum gear, adapter and drum in a clockwise direction. In forward, the dental clutch is moved to the left, locking the forward bevel gear to the bevel gear and brake shaft causing it to rotate counterclockwise as viewed from the left hand side of the winch. This will cause torque to be transferred from the intermediate pinion gear to the intermediate gear, driving the intermediate gear assembly in a clockwise direc-

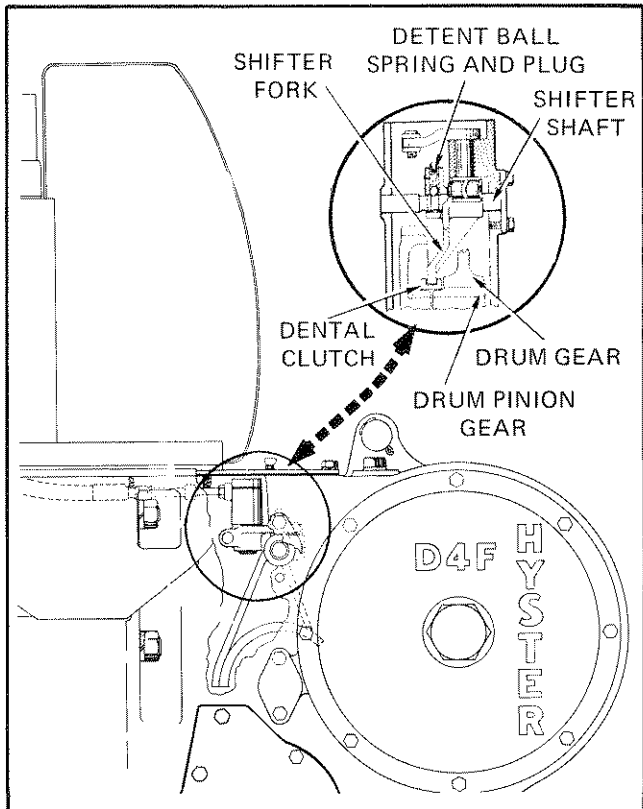


Figure 1-7. Free-spool Shifter Assembly

tion. The intermediate shaft drum pinion will now drive the drum gear, adapter, and drum in a counter-clockwise direction. Free-spooling is standard with the D4F Standard and Lo-Speed, Direct Drive winch. A dental clutch mounted inside the intermediate gear locks and unlocks the drive drum pinion and intermediate gear. In a free-spooling condition, the dental clutch is moved to the right by the shifter fork connected to the free-spool handle lever stopping torque transfer to the drum shaft. By disengaging the drum gear pinion from the winch gear train, the drum can rotate freely and cable can be payed out by hand.

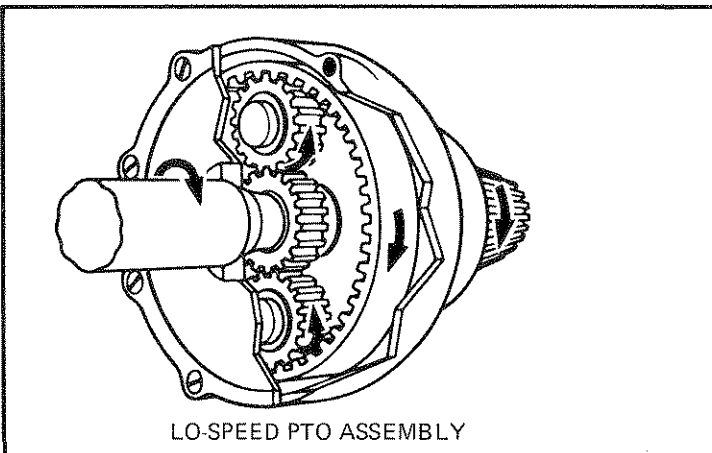
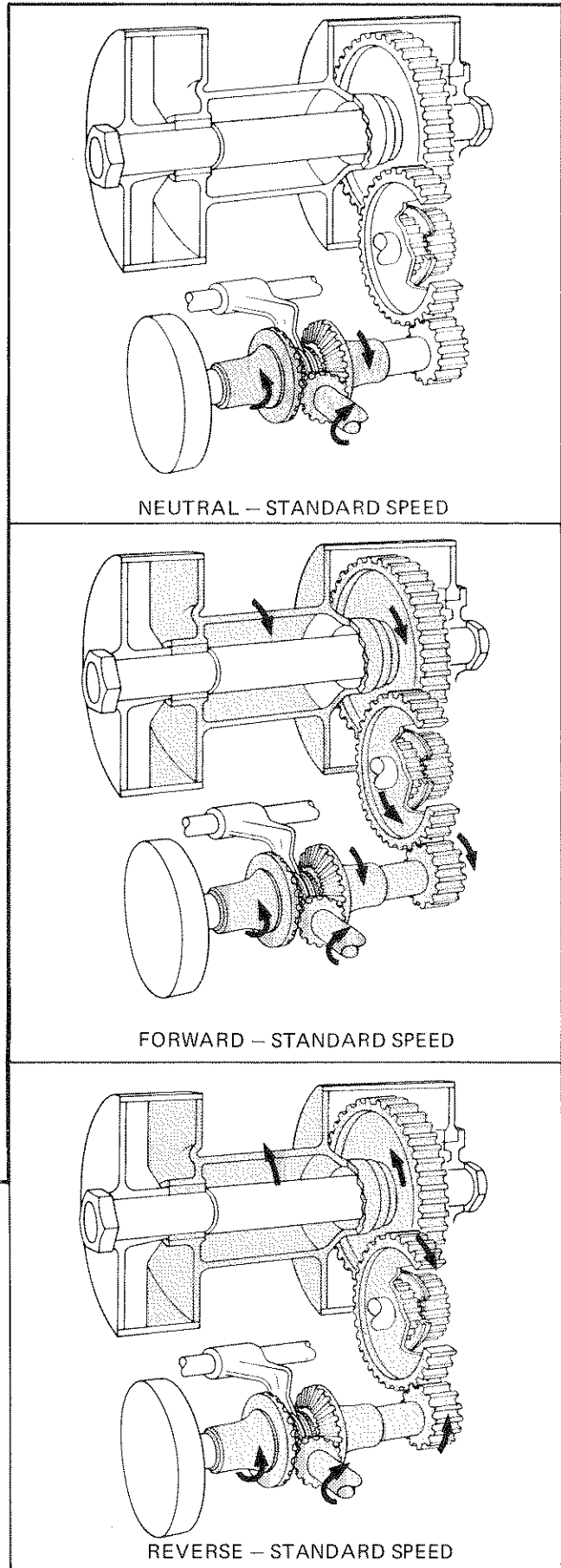


Figure 1-8. Torque Transfer – Direct Drive Winch

1-20. Direct Drive Gear Train (Optional Lo-Speed)
(See Figure 1-8 and 1-9).

1-21. The D4F Lo-Speed winch is the same as a D4F standard winch except for the PTO assembly. The Lo-Speed winch uses a planetary gear set integral with the PTO assembly to provide the necessary gear reduction. The planetary gear set consists of a PTO shaft, sun gear, two planetary gears, ring gear, bevel pinion gear and case. The PTO shaft rotates in a clockwise direction as viewed from the front of the tractor. The sun gear is splined and held in place on the PTO shaft by a snap ring and spacer. The two planetary gears are driven in a counterclockwise direction by the sun gear. The planetary gears rotate on bearings and are straddled by special washers which are held in place by snap rings and the planetary cover assembly. The planetary gears are in mesh and drive the ring gear in a clockwise direction reducing the original PTO speed and multiplying torque. The ring gear is splined to

the bevel gear pinion and held in place by a snap ring. The rotating ring gear drives the bevel pinion gear which is in mesh with the forward and reverse bevel gears on the bevel gear and brake shaft.

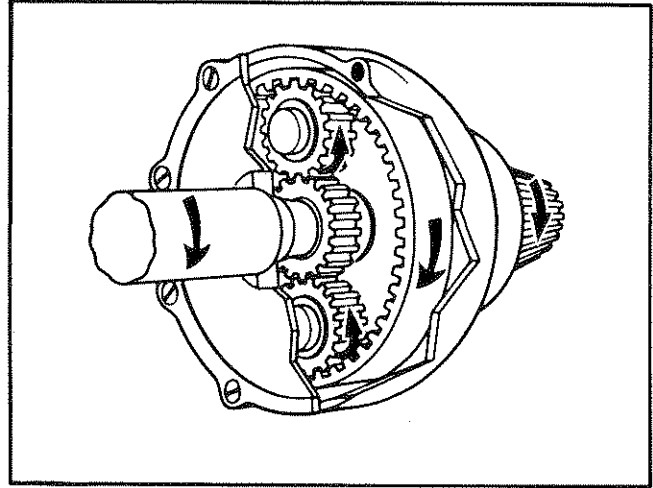


Figure 1-9. Direct Drive – Lo-Speed

2-1. GENERAL.

2-2. The D4F Direct Drive winch uses tractor mounted controls. These controls allow the operator to either pay-out or pull-in line easily without leaving the tractor. Every operator must know the exact operating procedure of these controls prior to operating the winch.

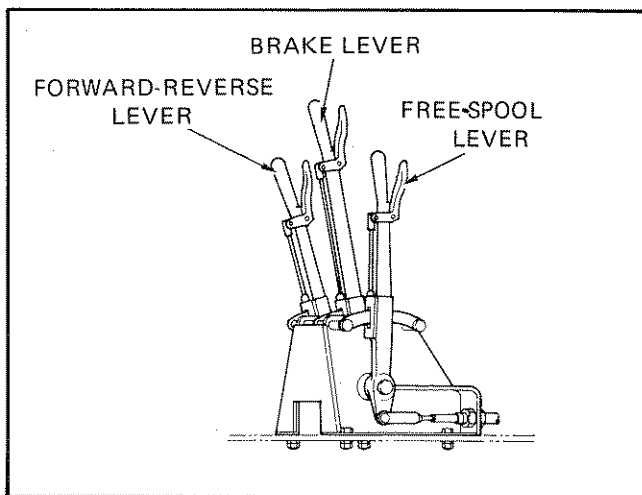


Figure 2-1. Handling Gear

2-3. OPERATION PRECAUTIONS.

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

- a. Report damage or erratic operation of winch immediately.
- b. Do not stand while operating the tractor or the winch.
- c. Make sure that instruments and controls are operative before operating the unit.
- d. Do not use control levers or handles as machine mounting assists.
- e. Do not use control levers or handles as hangers for clothing, water bags, grease guns, lunch pails, etc.
- f. Do not permit personnel in the control area when working or making checks on the machine.

- g. Do not allow riders on the machine or load.
- h. Use extreme care when operating close to other machines.
- i. Avoid operating near other personnel.
- j. Do not stand or permit others to stand in the bight (loop) of a cable.
- k. Do not stand or permit others to stand near the winch or cable when it is under tension.
- l. Do not use a damaged cable (broken wire or strands, or a decrease in the diameter of the cable are warning signs).
- m. Do not leave the tractor while the winch line is under tension.
- n. Do not anchor a double, or two-part line to the winch.
- o. Never attempt to clean, oil, or adjust a machine while it is in motion.
- p. Authorized operators only!

2-5. OPERATING PROCEDURES.

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

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

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

- a. Pull back slightly on the brake handlever.
- b. Depress the release button.
- c. Push the brake handlever forward.

NOTE: If the winch is equipped with the optional automatic brake (See Figure 1-4), the winch may haul in line with the mechanical brake set, but the brake must be released or the winch placed in free-spool in order to pay-out or pull-out the line.

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

- a. Disengage the tractor master clutch.
- b. Place the tractor transmission in Neutral.
- c. Squeeze the release handle on the Selector Handlever and pull the handlever all the way back to the FORWARD position.
- d. Release the Brake Handlever and push it forward (if not equipped with an automatic brake).
- e. Engage the tractor master clutch.

NOTE: Operate both brake release and master clutch together to prevent dropping a load. Line speed is varied by throttling the engine.

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

- a. Throttle down the engine.
- b. Disengage the tractor master clutch and apply the winch brake at the same time (if not equipped with an automatic brake).

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

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

- a. Disengage the tractor master clutch.
- b. Push the winch selector handlever past NEUTRAL and into the REVERSE position.
- c. Release the brake (refer to paragraph 2-8).
- d. Engage the tractor master clutch.

NOTE: Line speed is varied by throttling the engine.

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

- a. Disengage the tractor master clutch.
- b. Move the selector handlever to the NEUTRAL position (straight up) where it locks in place.

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

2-13. PLACING IN FREE-SPOOL. To place the winch in free-spool, proceed as follows:

- a. Shift the selector lever into NEUTRAL.
- b. Squeeze the free-spool release handle and move the free-spool handlever to the vertical position.

NOTE: The drum will turn freely and the cable can be easily pulled out. There is no locking mechanism in the free-spool position. To turn the drum under power, the free-spool handlever must be returned to its extreme forward position.

2-14. D4F ON CATERPILLAR 955H TRAXCAVATOR

2-15. When shifting gears or the free-spool arrangement, proceed as follows:

- a. Disengage the powershift transmission.
- b. Shift the tractor Range Selector handlever into Neutral.
- c. Move the winch selector handlever or free-spool handlever to the desired position.
- d. Engage the powershift transmission to the line speed desired.

2-16. D4F ON D4 PSH (POWERSHIFT) TRACTORS OR 955K TRAXCAVATOR. The 955K Traxcavators are equipped with a final drive disconnect clutch. The transmission design is such that the PTO shaft stops when the powershift lever is in Neutral and rotates in both directions at three different speeds depending on the gear selected by the PSH lever.

2-17. When shifting gears or the free-spool arrangement, proceed as follows:

- a. Shift the powershift transmission into Neutral.
- b. Disengage the tractor final drive clutch.
- c. Move the winch selector handlever or free-spool handlever to the desired position.
- d. Engage the PSH transmission to the line speed desired.

NOTE: To allow the winch to be operated with the tracks stationary, the final drive disconnect clutch must be disengaged. This is done with the PSH lever in Neutral. The winch is shifted into forward or reverse as desired and will operate when the PSH lever is moved into gear. If the application requires that the tractor move at the same time, as in a rescue operation, the final drive disconnect clutch is left engaged and both winch and tractor will move as selected by the PSH lever.

CAUTION: The final drive disconnect lever and the winch selector lever should be engaged or disengaged only when the PSH lever is in Neutral.



TROUBLESHOOTING

3-1. GENERAL.

3-2. Tables 3-1 and 3-2 are trouble analysis charts that include the most common troubles that may be encountered, the probable causes of the trouble, and

the corrective action that should be taken to restore the winch to normal operation condition. The information contained in Table 3-1 applies to the Direct Drive winch. The information contained in Table 3-2 applies to the free-spool operation.

Table 3-1. Trouble Analysis Check Chart (Sheet 1 of 2)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hard to Shift into Forward or Reverse.	Control cable damaged.	Check for pinched, rusted, or broken cable housing. Replace if found defective.
	Control cable improperly adjusted.	Check and adjust as necessary. Refer to paragraph 4-11.
	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Shifting collar too tight on splines or splines rough.	Remove shifting collar, dress splines with fine stone, and replace parts if necessary.
Will not stay in Neutral position.	Detent ball and spring damaged or sticking.	Replace spring if broken, Check that ball is free in the bore. Lubricate ball, spring and bore.
	Annular groove on shifter shaft. Shaft elongated.	Replace shifter shaft.
Jumps out of gear.	Dental teeth worn.	Check for dental teeth wear on: Dental Clutch Forward pinion gear Reverse pinion gear. Replace above components if teeth are rounded.
	Shifter fork improperly positioned on the shifter shaft.	Check for loose anchor screw on shifter fork. Tighten securely and lock with lockwire.
Brake not holding or hard to apply.	Water in brake compartment resulting from condensation or marine use.	Drain water from brake compartment each day if necessary.
	Improper clearance between brake band assembly and brake wheel.	Check that clearance is approximately 1/32-inch. Refer to paragraph 4-13.
	Worn brake lining.	Replace with new lining.
	Brake cable improperly adjusted.	Adjust cable ends so brake handle lever applies brake before it reached end of travel. Refer to paragraph 4-14.

Table 3-1. Trouble Analysis Check Chart (Sheet 2 of 2)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Brake control cable assembly not anchored securely.	Check for loose connection of control cable housing to the: a. Handling gear mounting bracket. b. Winch control housing bracket. Tighten securely and lock with jam nut.
	Control cable damaged.	Check for pinched, rusted, or broken cable housing. Replace if found defective.
	Brake linkage set for overwind operation and winch is used for underwind operation.	Change linkage for underwind operation. Refer to paragraph 4-17.
	Brake linkage set for underwind operation and winch is used for overwind operation.	Change linkage for overwind operation. Refer to paragraph 4-17.

Table 3-2. Trouble Analysis Check Chart For Free-Spool

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hard to shift.	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Shifting collar too tight on splines or splines rough.	Remove shifting collar, dress splines with fine stone, and replace parts if necessary.
Jumps out of gear.	Control linkage improperly adjusted.	Check and adjust as necessary.
	Worn shifter fork.	Replace shifter fork and related parts as necessary.
	Detent ball and spring loose, damaged, or sticking.	Clean or replace as necessary.
Winch will not Free-Spool.	Linkage improperly adjusted.	Check and adjust as necessary.
	Intermediate shaft assembly damaged, rusted, or preloaded.	Adjust or repair as necessary.
	Drum shaft assembly damaged, rusted, or binding.	Adjust or repair as necessary.



SERVICE INSTRUCTIONS

4-1. GENERAL.

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

4-3. SafeGuard MAINTENANCE.

4-4. SafeGuard Maintenance is a planned maintenance program which includes periodic inspection and lubrication. SafeGuard Maintenance should be cor-

related closely with the operating hours recorded on the tractor SERVICE METER.

4-5. SafeGuard Maintenance And Service Inspection Schedule. (Refer to table 4-1.)

4-6. The following table is outlined in two schedules: the hourly schedule and the periodic schedule. If the unit is operated more than eight hours per day, the hourly schedule should be followed. If the unit is operated eight hours or less per day, the periodic schedule should be followed.

Table 4-1. SafeGuard Maintenance and Service Inspection Schedule (Sheet 1 of 2)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period)				QUAN.	TYPE	PROCEDURE
		8/dy	50/wk	200/1 mo	1000/6 mo			
4-1	Oil Level		✓		C H A N G E	3 Gals.	SAE 90, MIL-L-2105B NOTE: In freezing temperatures it may be necessary to use a lighter oil to make shifting easier.	Check winch oil at level plug A on left side of winch. Add oil as required at plug B. Drain oil at plug C. NOTE: When checking winch oil level on winches mounted on powershift tractors, stop engine to obtain correct reading. For winches mounted on direct drive tractors, disengage tractor master clutch to obtain correct reading. CAUTION: If winch is new, drain after 50 hours of operation, then flush and refill.
4-1	Brake Compartment			✓		Variable	Water and/or oil.	Loosen plug D and drain any accumulation of water in transmission compartment. Tighten plug D.
2-1	Handling Gear	✓				Few Drops	SAE 30.	Lubricate fulcrum pin connections and other moving parts at end of each eight hour shift.
5-1; 5-2	Control Cables		✓					Check both ends of each cable housing to see that they are securely anchored. Retighten set screw as necessary.

Table 4-1. SafeGuard Maintenance and Service Inspection Schedule (Sheet 2 of 2)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period)				QUAN.	TYPE	PROCEDURE
		8/dy	50/wk	200/1 mo	1000/6 mo			
4-1	Automatic Brake (Optional)				S E R V I C E		High temperature grease as follows: Atlantic Richfield (Thermogrease) Mobil Oil (Mobil-temp Grease #1) Shell Oil (Darina Grease 1) Standard Oil (Chevron Industrial Grease) Texaco (Thermatex EP #1) Union Oil (Strona HT-1) Sun Oil (Sunaplex 991 EP) BP Australia (Energrease HTB2)	Remove automatic brake assembly. Disassemble and clean automatic brake assembly components. Pack the two bearings with a high temperature grease. Put a heavy film of high temperature grease on ratchet ring, pawl assem- bly, and hub. DO NOT completely fill automatic brake assembly with grease or attempt to grease brake through the vent plug. CAUTION: Always install oil seals so that lips of both seals are pointing inward.

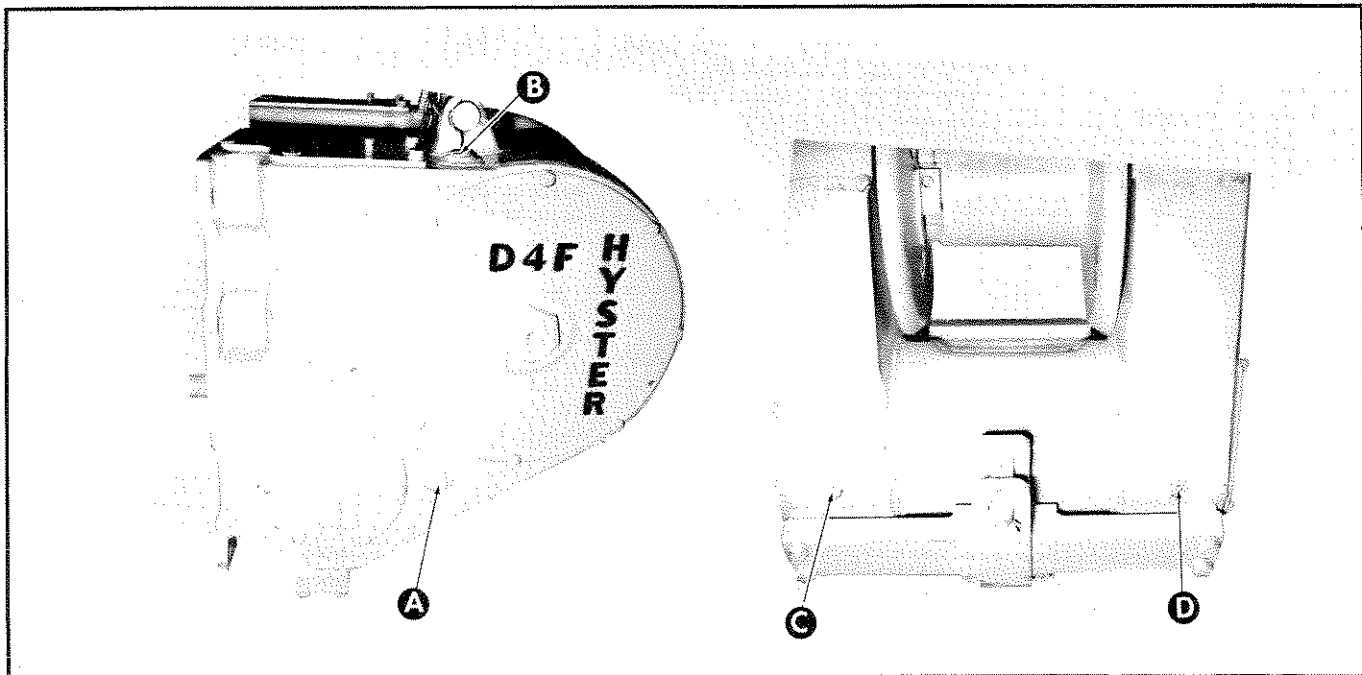


Figure 4-1. SafeGuard Maintenance and Care

4-7. ADJUSTMENT PROCEDURES.

4-8. Adjustment procedures for the Direct Drive winch are limited to minor mechanical linkage adjustments.

4-9. Direct Drive Winch Adjustments.

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

4-11. Forward And Reverse Adjustments (See Figure 4-2). To adjust the forward and reverse handlever proceed as follows:

- Engage the forward and reverse handlever in notch on quadrant.
- Remove the transmission top cover.
- Engage detent ball in the center notch "X" on shifter shaft "H".
- Check dental clutch "A" to see that it is in the exact center between bevel gears "B" and "C".

e. Replace the transmission top cover.

f. To install the push-pull cable, remove the large grommet at the winch end and discard.

g. For 955 Traxcavators (s/n 60A3626 and up only), adjust the cable to 8- $\frac{1}{4}$ inches from the center of rod end pin "Z" to winch mounting face.

h. For all tractors and Traxcavators except 955 (s/n 60A3626 and up), reset with the end of the cable 1- $\frac{5}{8}$ inch to center of pin in rod end "D" and 7- $\frac{5}{8}$ inches from winch mounting face to same center.

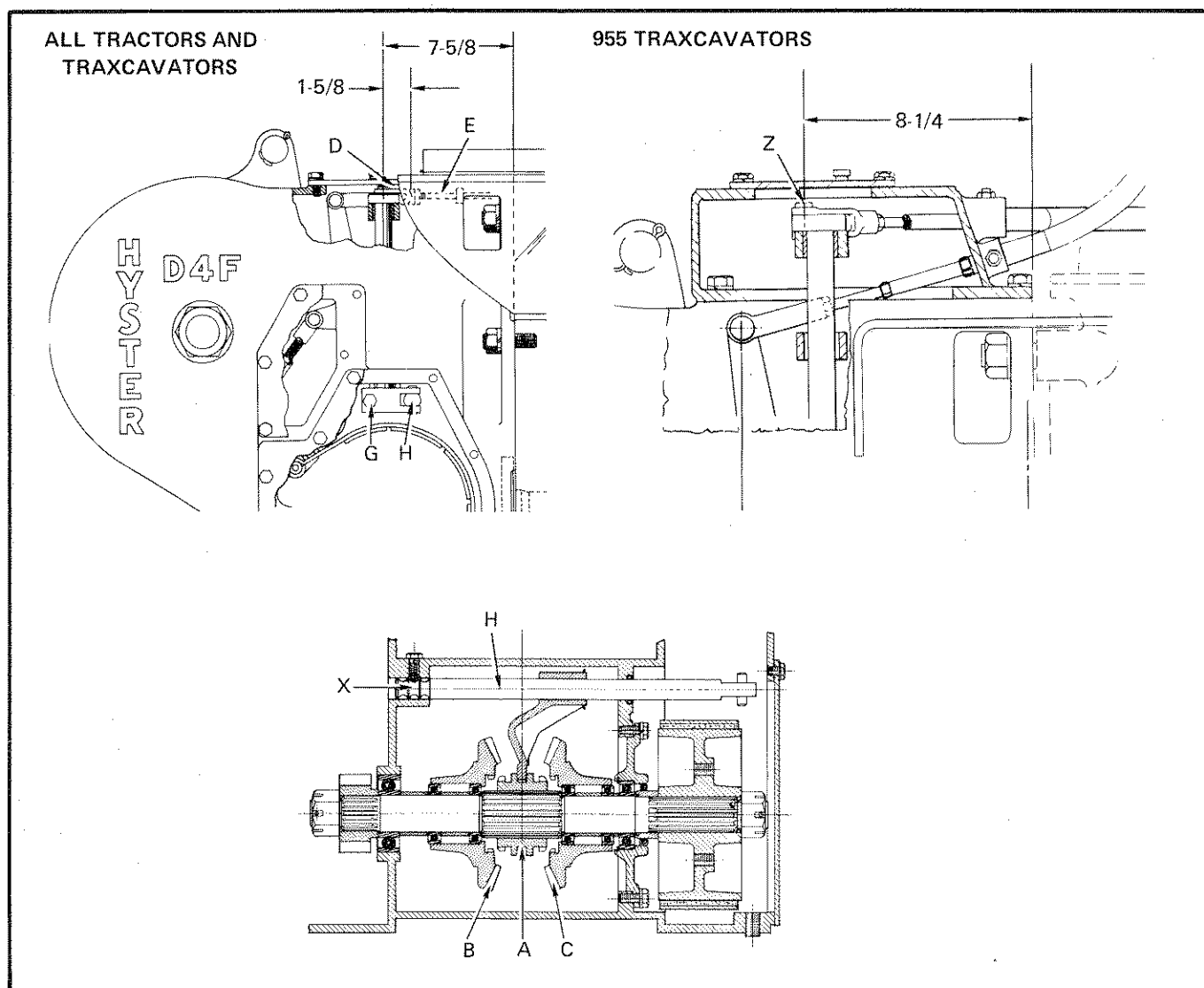


Figure 4-2. Fwd-Rev. Shifter Adjustments

4-12. Adjusting The Brake. The brake handlever (See Figure 2-1) controls the brake through a plastic-lined control cable (identical to the forward-

reverse cable). Two adjustments are required to properly adjust the brake. Refer to paragraphs 4-13 and 4-14.

4-13. Brake Band Adjustment. (See Figure 4-3).

To adjust the brake band, proceed as follows:

- a. Remove the small brake cover from the right-hand side of the winch.
- b. Push the brake handlever (center lever) forward to its full release position.
- c. Loosen jam nut "N" and rotate turnbuckle "A" to the right to tighten, or to the left to loosen, the brake band. Allow approximately 1/32 inch clearance between the brake band and brake wheel or until there is just enough clearance to prevent "brake drag".
- e. Tighten jam nut "n".
- f. Replace brake cover.

4-14. Brake Handlever Adjustment (See Figure 4-3).

To adjust the positioning of the brake handlever, proceed as follows.

- a. Adjust the brake band (Refer to paragraph 4-13).
- b. Loosen cable rod end jam nut "Q".
- c. Adjust the control cable at the winch housing so center line of crank "L" to winch mounting face is 10-3/4 inches and center line of crank "L" to end of cable "J" in rod end "P" is 2-5/8 inches.

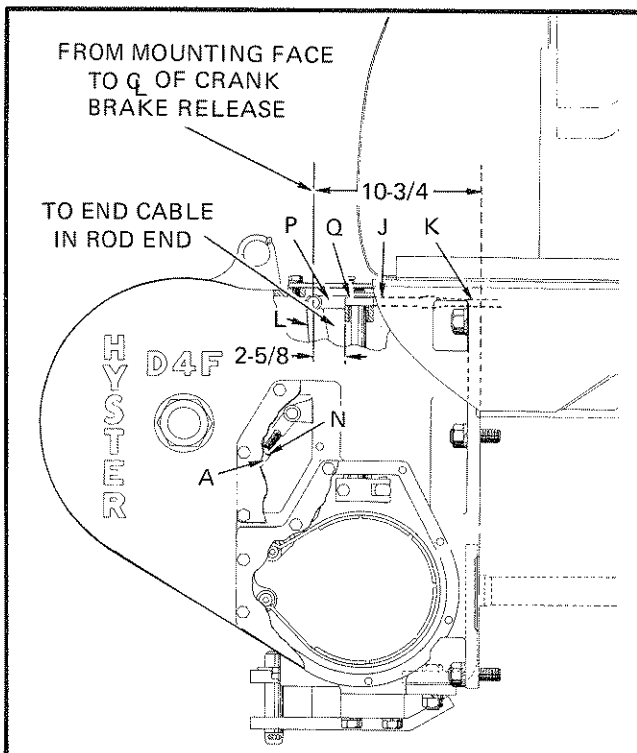


Figure 4-3. Brake Band and Lever Adjustments

NOTE: To install the push-pull cable, remove the large grommet and insert the cable in winch opening and replace grommet on cable.

4-15. Free-Spool Adjustment (See Figure 4-4).

To adjust the free-spool arrangement, proceed as follows:

- a. Remove LH side top cover.
- b. Engage dental clutch "G" with pinion gear "H" and detent ball in second groove of shifter shaft as shown. Hold in this position throughout adjustment.
- c. To install push-pull cable, remove larger grommet, insert cable in winch opening and replace grommet on cable.
 1. For Traxcavators (s/n 60A3626 and up only). Adjust push-pull cable with center of ball joint "A" 7-1/8 inch from mounting face as shown. If required, loosen capscrew on crank "B" and adjust crank "C" (with integral splined shaft).
 2. For all tractors and Traxcavators except s/n 60A3626 and up. Adjust push-pull cable with end of cable in rod end "L" 5-7/8 inch from mounting face. If required, loosen capscrew on lower crank and adjust crank "C" (with integral splined shaft) to match.
- d. Insert rod end pin "K" and cotter, and tighten jam nut "J".
- e. Adjust rod end on free-spooling handlever until handlever is engaged in notch on quadrant.
- f. Replace cover.

4-16. Overwind Adjustment Procedure. When the cable passes over the top of the drum during forward rotation, the drum is said to be overwinding. Unless otherwise specified, the winch is set to overwind at the factory. The brake assembly and drum assembly must be rearranged when using an original underwind winch for overwind operation, or vice versa.

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

- a. Brake Band. (See Figure 4-5). Change the anchoring end of the brake band by changing the position of pins "D" and "H". Remove and position "B" as shown and then adjust turnbuckle "A" so there is approximately 1/32 inch clearance

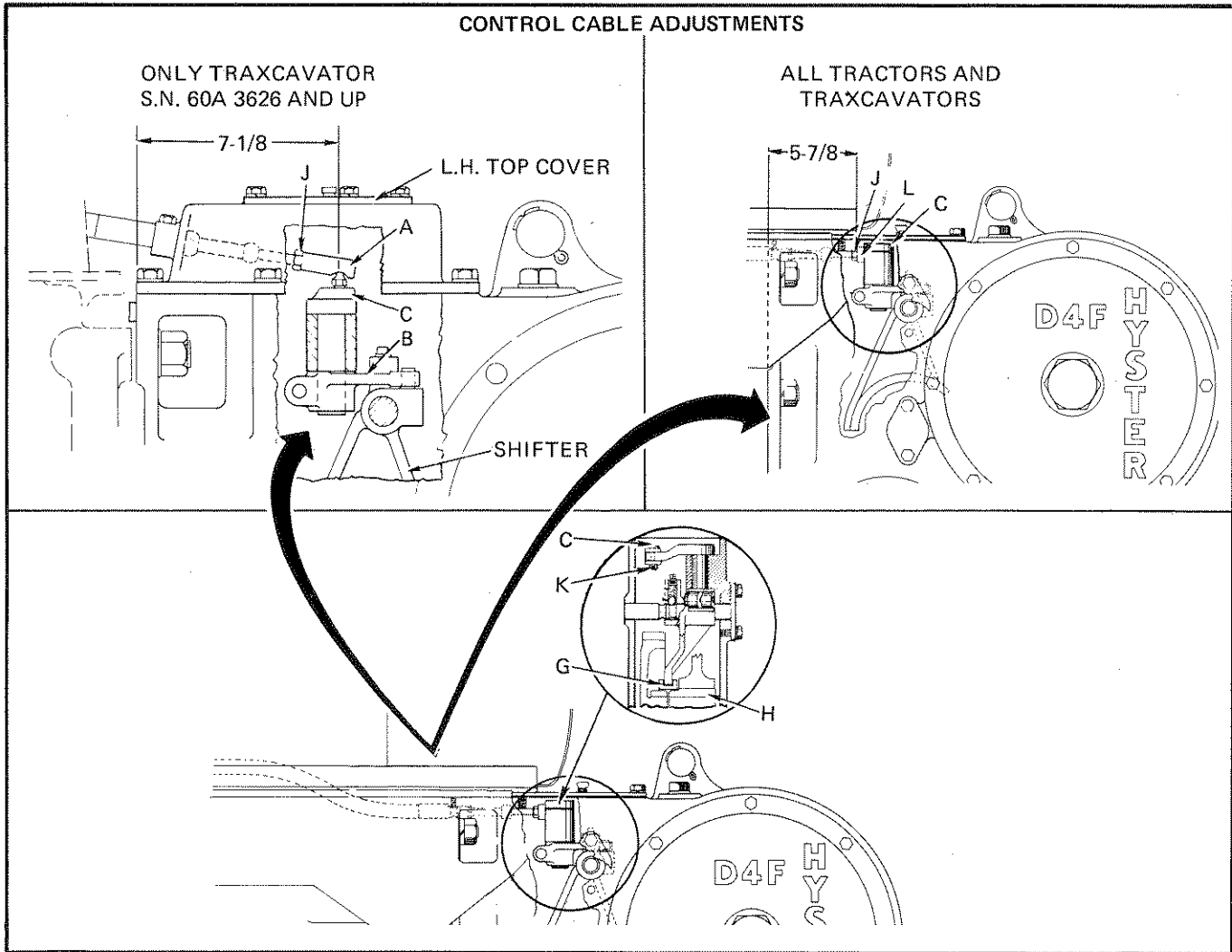


Figure 4-4. Free-spool Adjustment

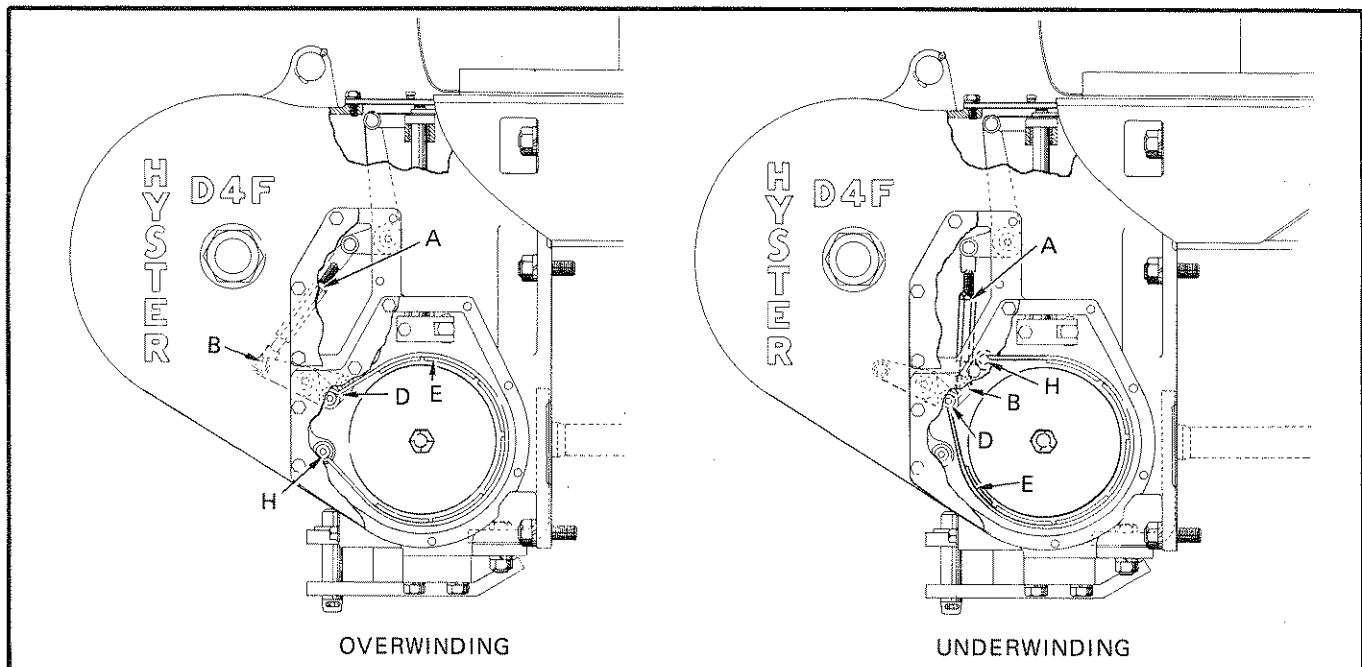


Figure 4-5. Overwind Brake Band Adjustment

between lining "E" and brake drum with hand-lever in fully released position.

b. Automatic Brake (Optional). (See Figure 4-6). Remove the automatic brake assembly and re-install so that the word OVERWINDING is facing to the outside.

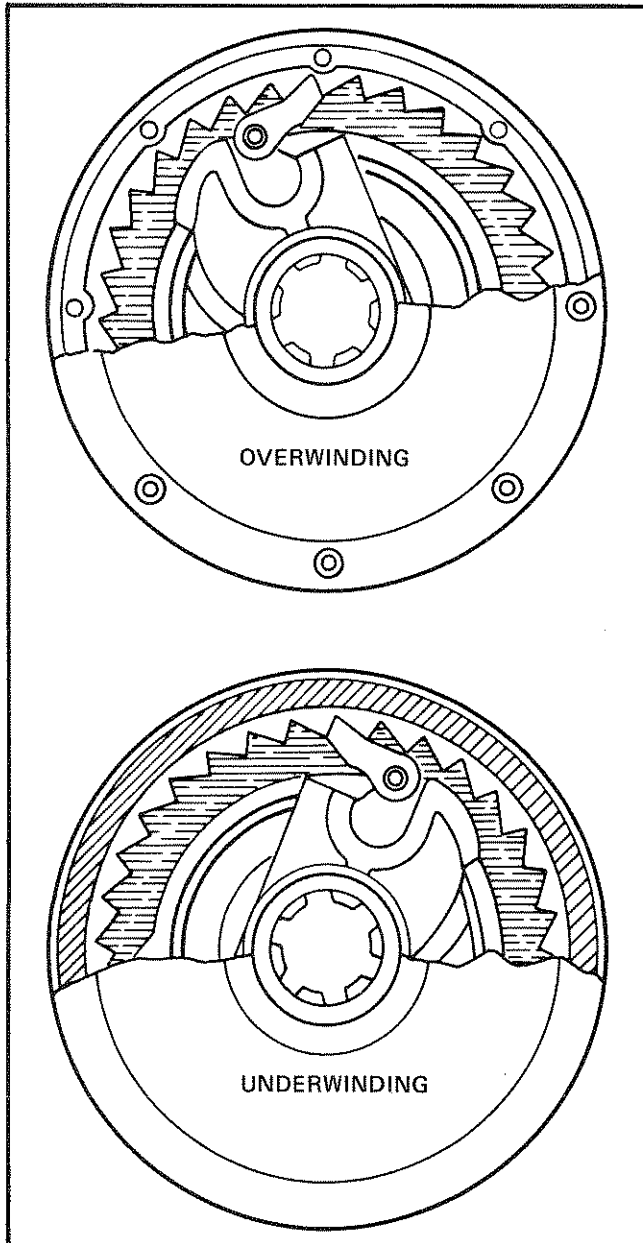


Figure 4-6. Automatic Brake Overwind and Underwind Arrangement

4-18. DRUM ASSEMBLY ARRANGEMENT (See Figure 4-7). The cable on the drum must be anchored and wound in the opposite direction for UNDERWIND operation. To setup the drum for underwind operation, proceed as follows:

a. Unwind the cable.

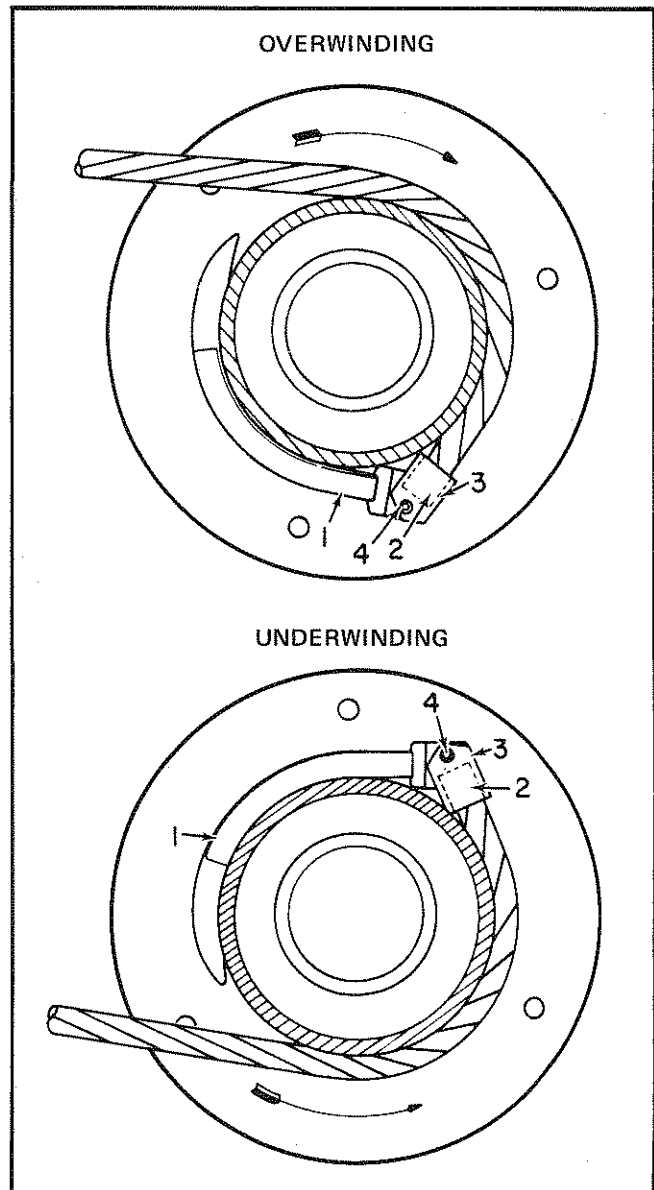


Figure 4-7. Winch Drum Overwind and Underwind Arrangement

b. Unscrew capscrew (4).

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

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

e. Tack weld the filler in the underwind position.

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

4-19. UNIT PAINTING

4-20. Upon completion of unit overhaul or major repairs, paint the exterior sections of the winch as follows:

- a. Remove any corrosion or peeling paint using a stiff wire brush or coarse sandpaper.
- b. Touch-up bare metal surfaces using zinc chromate primer. Allow primer to air-dry for four hours.
- c. Install all bearing retainers and covers. Cover the winch nameplate with masking tape or grease.
- d. Spray paint the entire external surface of the winch with **HYSTER Yellow** enamel.

4-21. NAMEPLATE INSTALLATION.

4-22. The unit nameplate is located on the right-hand side of the winch housing above the drum shaft nut as shown in figure 4-8. Data contained on the nameplate is given in paragraph 1-5. If the nameplate has been damaged, install a new nameplate in the location shown in figure 4-8. Use drive screws for nameplate installation.

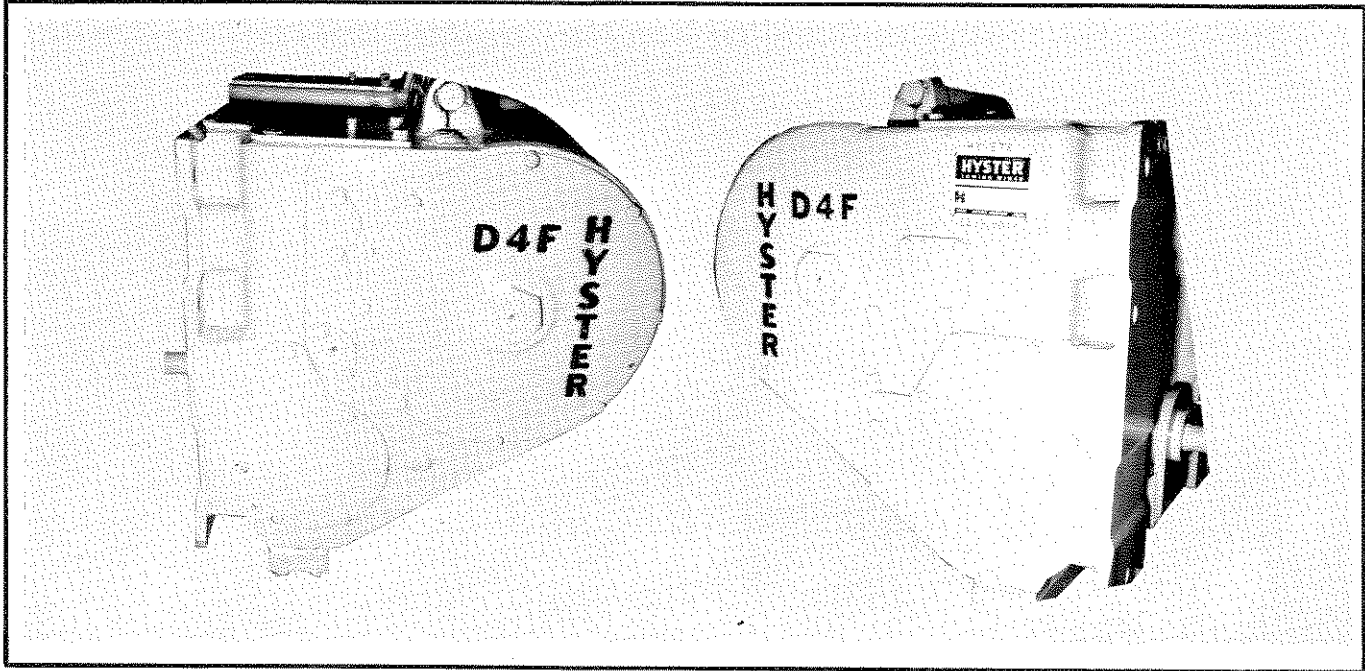


Figure 4-8. Painting and Decal Installation





OVERHAUL INSTRUCTIONS

5-1. GENERAL.

5-2. This section contains overhaul instructions for the D4F Direct Drive, Standard and Lo-Speed winches. Overhaul instructions include removal of the winch from the tractor, removal and disassembly of all major shaft assemblies, inspection of components, reassembly, and installation. Micrometer symbols have been added to the disassembly illustrations to show critical wear points. It is recommended that these measurements be taken at the time of disassembly so that defective parts may be ordered and replaced prior to reassembly. If the winch is to be completely overhauled, perform the removal and disassembly, inspection, and reassembly procedures in the sequence of the following paragraphs. Always use the Troubleshooting procedures given in Section 3 to locate a malfunction before performing major overhaul of the unit. Make all checks in a systematic manner. Haphazard checking wastes time and can cause further damage. Review and perform any adjustments that may be the cause of a malfunction (refer to Section 4).

5-3. REMOVAL INSTRUCTIONS.

5-4. Removal of Winch From Tractor.

5-5. All major assemblies should be removed with the winch off the tractor.

5-6. Removal of Direct Drive Winch. Removal of the Standard Speed winch is shown in Figure 5-1. Removal of the Lo-Speed winch is shown in Figure 5-2. Make sure that the three control cables between the handling gear and winch are removed before separating the winch from the tractor mounting pad.

WARNING: Make sure that the lifting device has a minimum capacity of 2,000 pounds before lifting the winch off of the mounting pad.

5-7. REMOVAL AND DISASSEMBLY OF PTO SHAFT ASSEMBLY (STANDARD SPEED).

5-8. Removal and disassembly of the PTO shaft (Standard Speed) is shown in Figure 5-3. Before removing the PTO shaft assembly, the winch must be removed from the tractor as shown in Figure 5-1.

5-9. REMOVAL AND DISASSEMBLY OF PTO SHAFT ASSEMBLY (LO-SPEED).

5-10. Removal and disassembly of the PTO shaft (Lo-Speed) is shown in Figure 5-4. Before removing the PTO shaft assembly, the winch must be

removed from the tractor as shown in Figure 5-2.

5-11. REMOVAL OF DRY BRAKE AND AUTOMATIC BRAKE.

5-12. Removal of the dry brake (or optional automatic brake) is shown in Figure 5-5. Removal of the dry brake can be accomplished with the winch mounted on the tractor. During disassembly, check all parts for damage and wear.

5-13. REMOVAL AND DISASSEMBLY OF BRAKE AND BEVEL GEAR SHAFT ASSEMBLY.

5-14. Removal and disassembly of the brake and bevel gear shaft is shown in 5-7. See Figure 5-6 for parts identification. Prior to the removal of the shaft assembly, perform the following:

- a. Remove the winch from the tractor. See Figure 5-1 and 5-2.
- b. Drain oil from winch.
- c. Remove PTO shaft assemblies. See Figure 5-3 and 5-4.
- d. Remove brake components as shown in Figure 5-5.

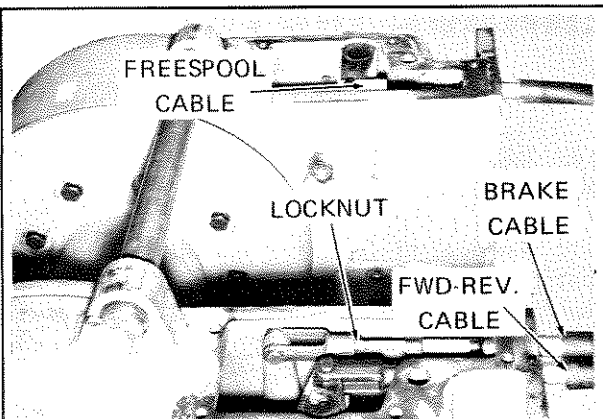
5-15. REMOVAL OF DRUM SHAFT AND DRUM ASSEMBLY.

5-16. Removal of the drum shaft and drum is shown in Figure 5-8. The winch should be removed from the tractor before the drum shaft and drum are removed. During removal of the drum shaft and drum, see the illustration on special tools (Figure 5-16) and locally fabricate the tools if possible.

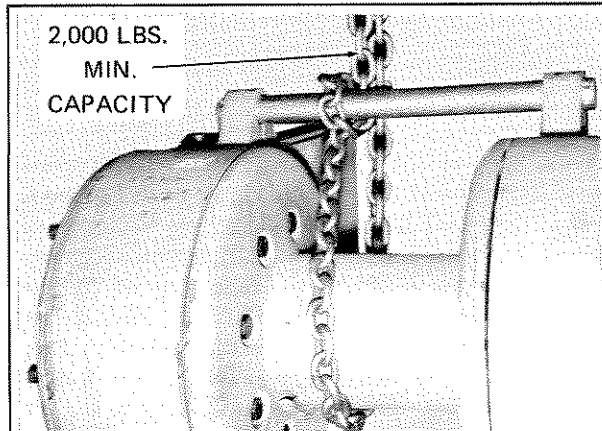
5-17. REMOVAL OF INTERMEDIATE SHAFT ASSEMBLY.

5-18. Removal of the intermediate shaft and associated components is shown in Figure 5-9. The intermediate shaft should be removed with the winch removed from the tractor. Removal of the drum cover, gear and shaft will be necessary to provide clearance for the intermediate gear.

NOTE: Figure 5-9 shows the winch removed from the tractor with the bevel gear and brake shaft removed. This is the normal sequence for complete unit overhaul but is not necessary for removal of the intermediate shaft only.



STEP 1. Remove top left and right hand covers and disconnect the brake, forward-reverse and free-spool control cables.



STEP 2. Attach lifting device to winch. Winch will be balanced when hoist is connected as shown.

STEP 3. Remove the eight nuts and lockwashers attaching winch to mounting pad. Note location of lockwashers for installation.

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

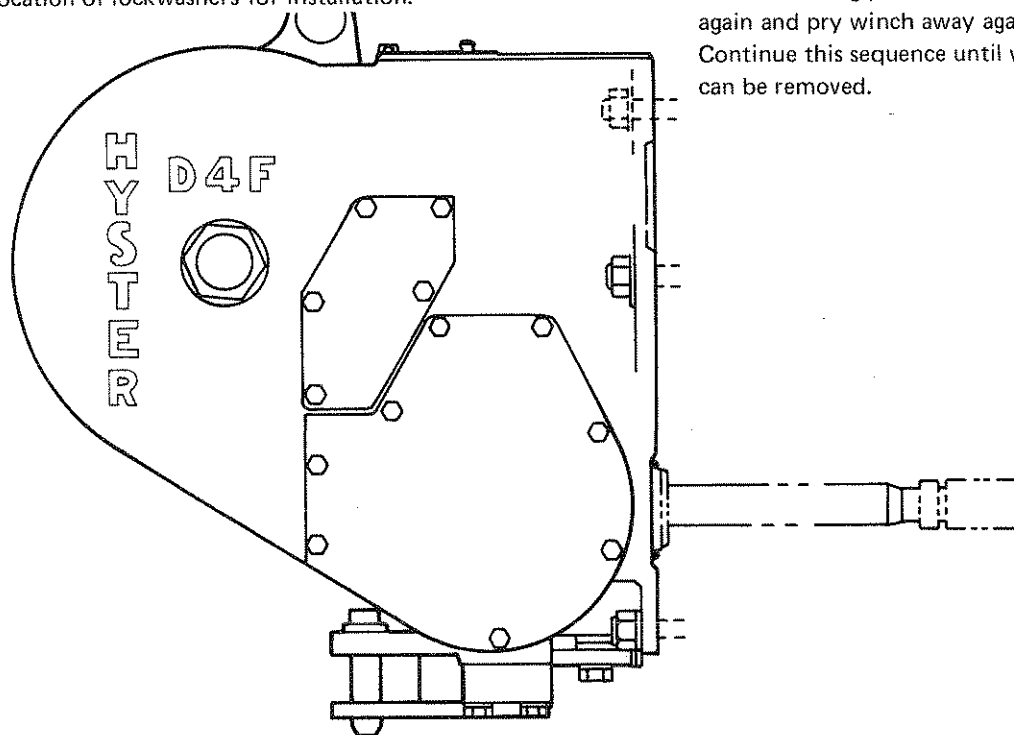


Figure 5-1. Removal of Standard Speed Winch From Tractor.

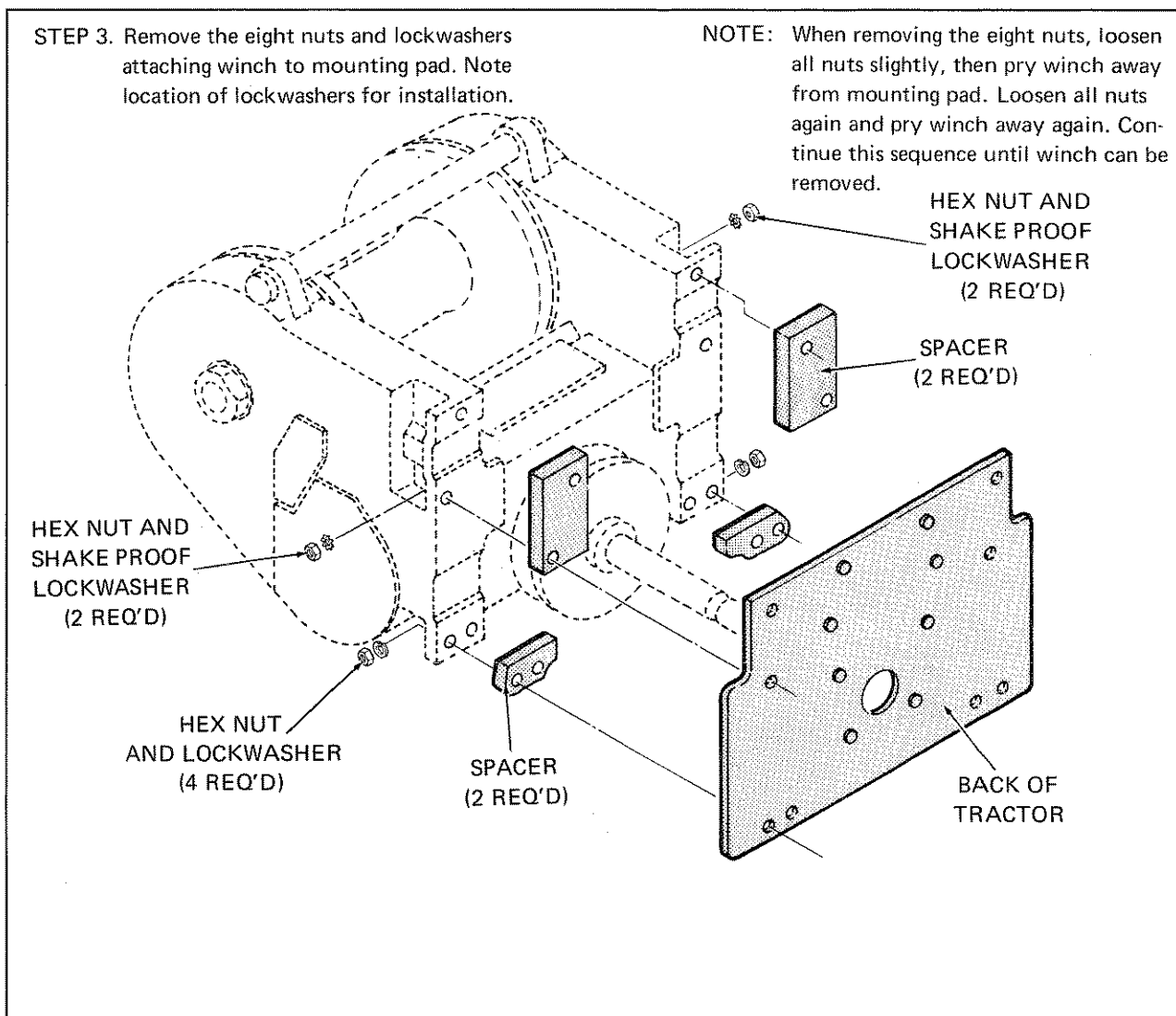
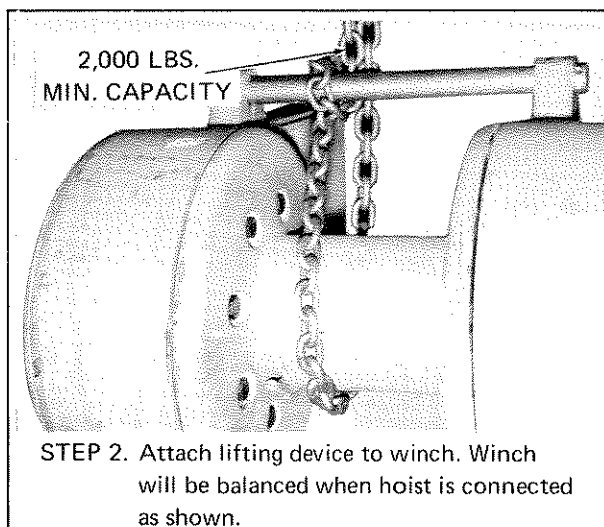
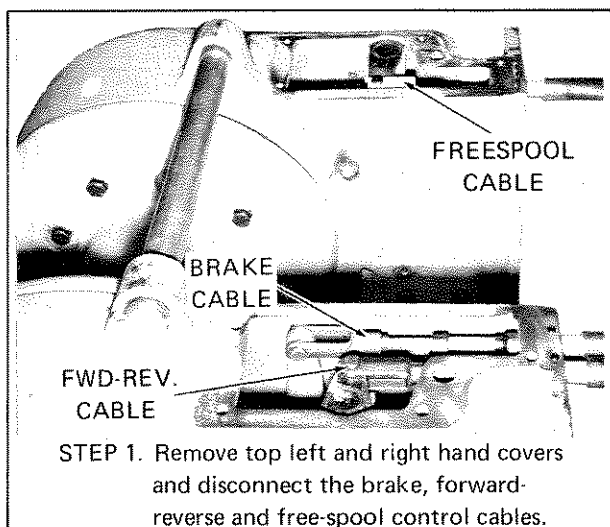
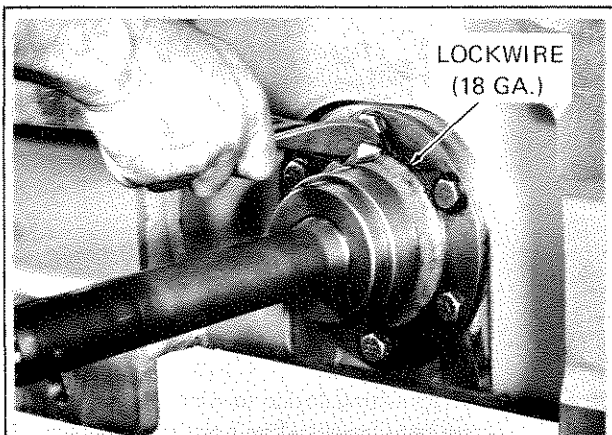
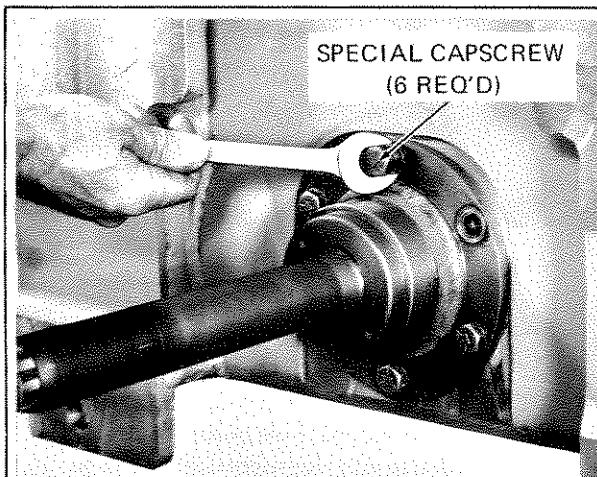


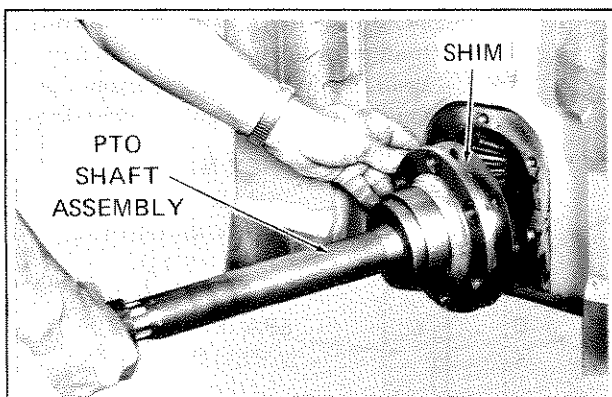
Figure 5-2. Removal of Lo-Speed Winch From Tractor



STEP 1. Remove the wire locking the six special capscrews.



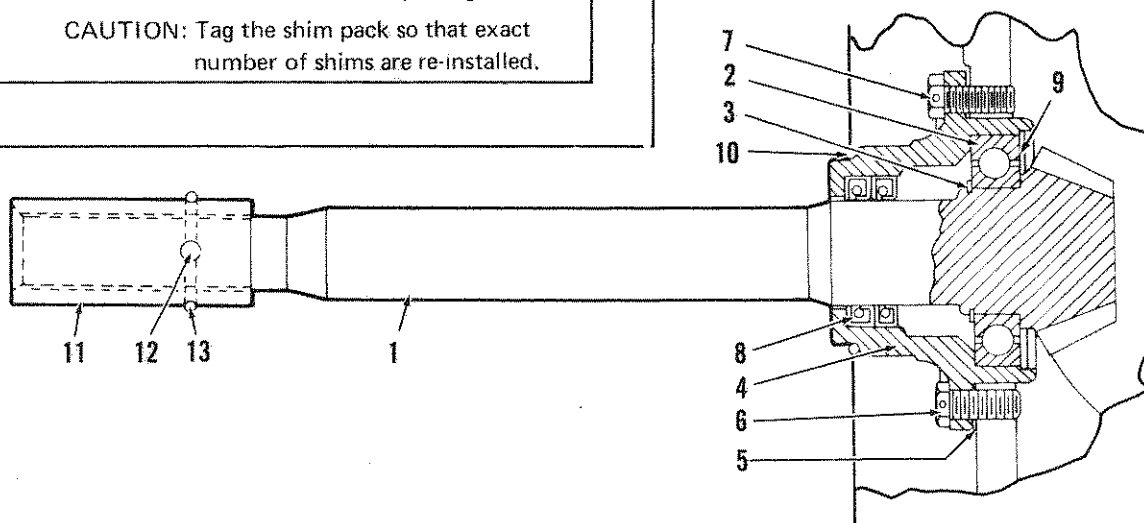
STEP 2. Remove the six capscrews.



STEP 3. Pull PTO shaft assembly straight out.

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

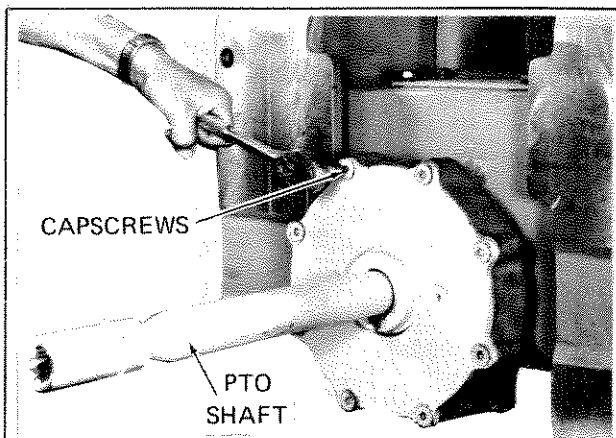
1. BEVEL GEAR SHAFT PINION
2. BALL BEARING
3. SNAP RING
4. PTO CARRIER
5. SHIMS
6. CAPSCREWS (6 REQ.)
7. LOCKWIRE
8. OIL SEALS (2 REQ.)
9. SNAP RING
10. GASKET
11. COUPLING
12. PIN
13. LOCK RING



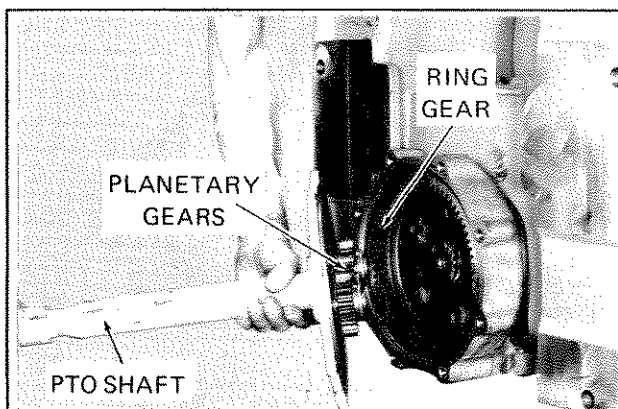
STEP 4. Disassemble PTO shaft as required.

NOTE: On Standard Speed Winches, the PTO shaft and bevel gear pinion are integral.

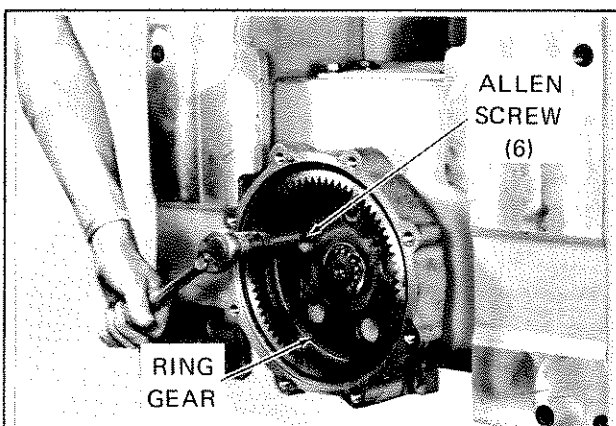
Figure 5-3. Removal And Disassembly Of PTO Shaft Assembly, Standard



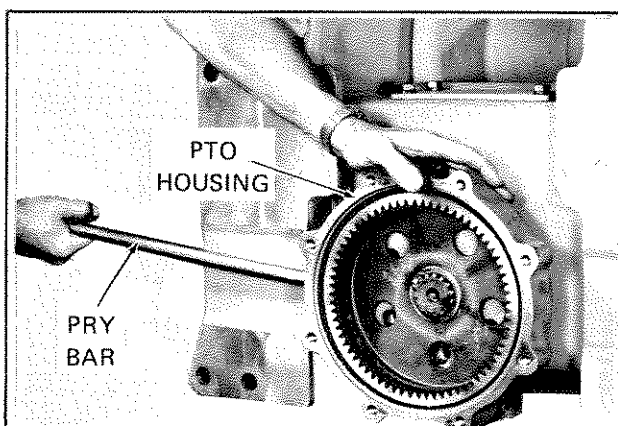
STEP 1. Remove the eight cap screws and lock-washers holding the PTO shaft assembly to the winch.



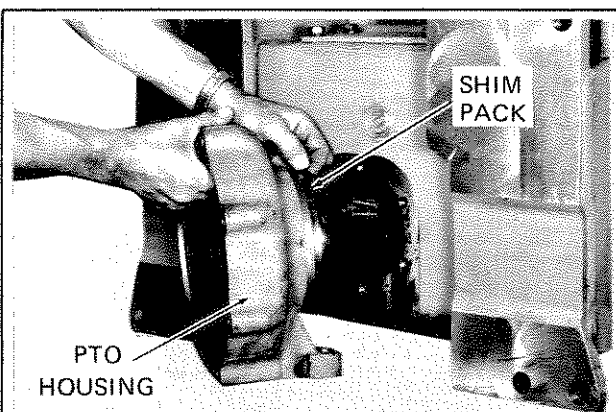
STEP 2. Grasp the PTO shaft and remove from the winch by pulling straight out to disengage the planetary gears from the ring gear.



STEP 3. Remove the six recessed Allen screws, rotating the ring gear for access, holding the ring gear to the winch.



STEP 4. Pry the PTO housing assembly away from the winch to disengage the pinion gear from the bevel gears.



STEP 5. Remove the PTO housing assembly from the winch.
CAUTION: Tag the pack so the exact number of shims are re-installed.

STEP 6. Further disassembly of the PTO shaft assembly and planetary housing assembly need not be performed unless there is obvious damage to these assemblies.

Figure 5-4. Removal And Disassembly Of PTO Shaft Assembly, Lo-Speed (Sheet 1 of 4)

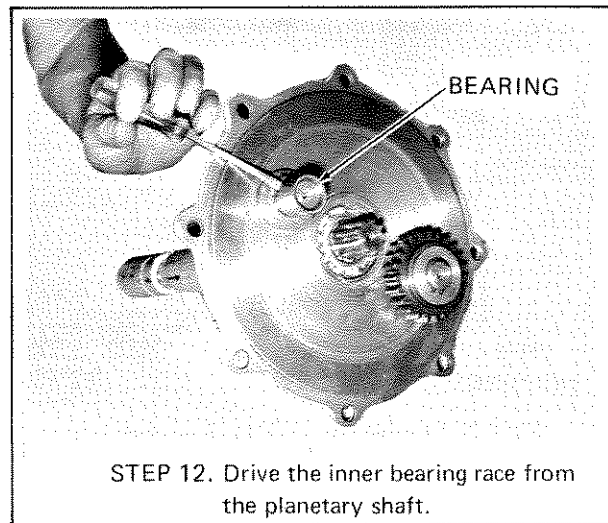
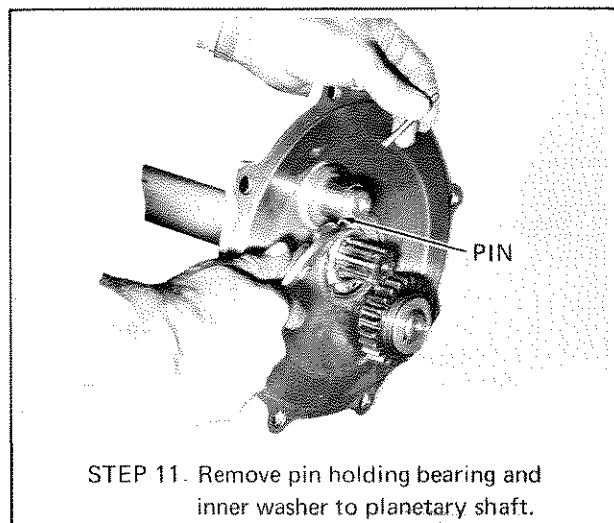
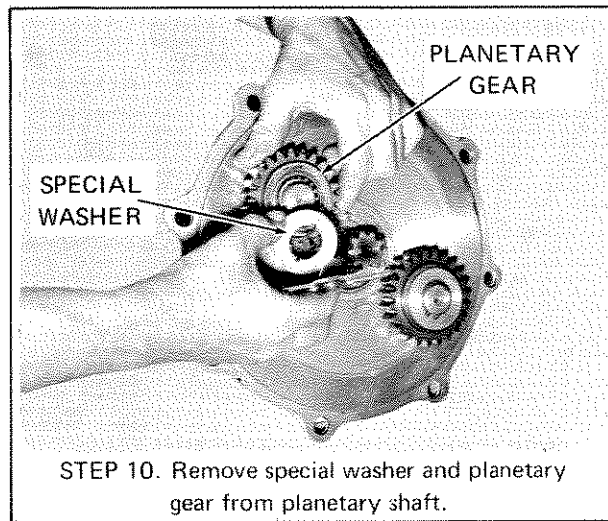
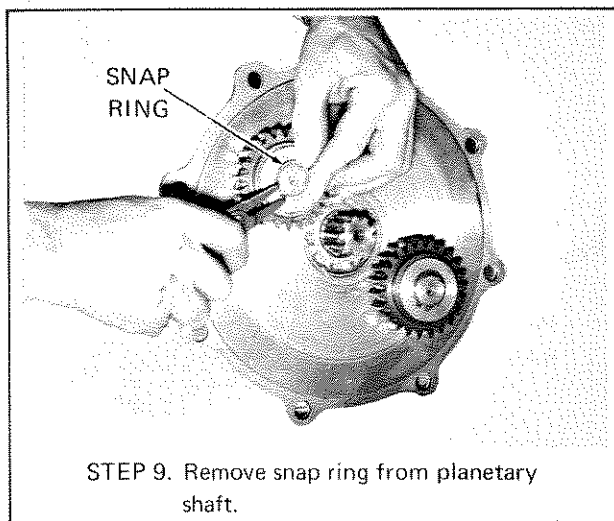
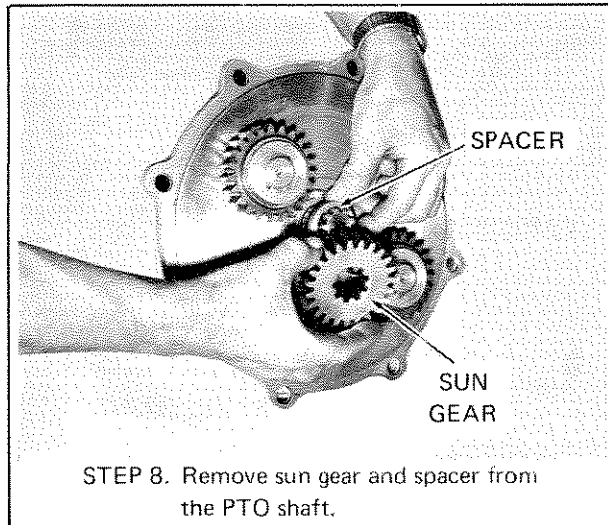
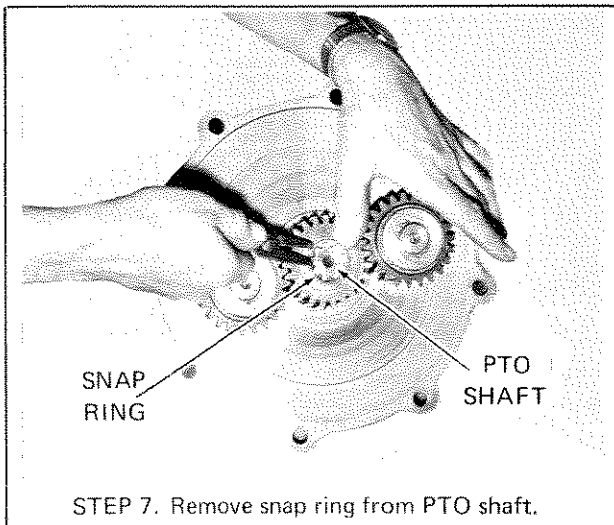


Figure 5-4. Removal And Disassembly Of PTO Shaft Assembly, Lo-Speed (Sheet 2 of 4)

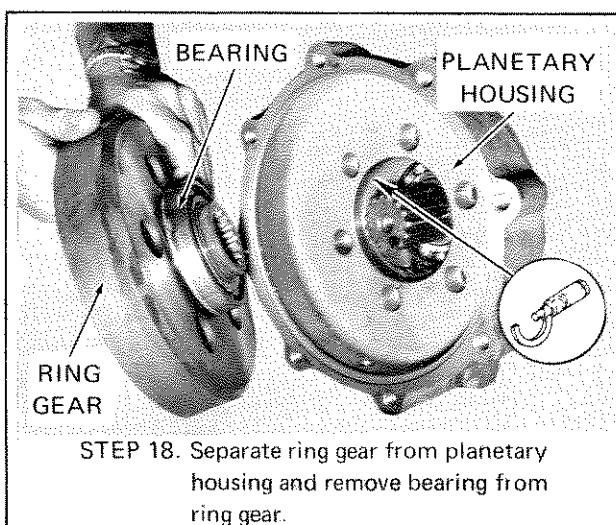
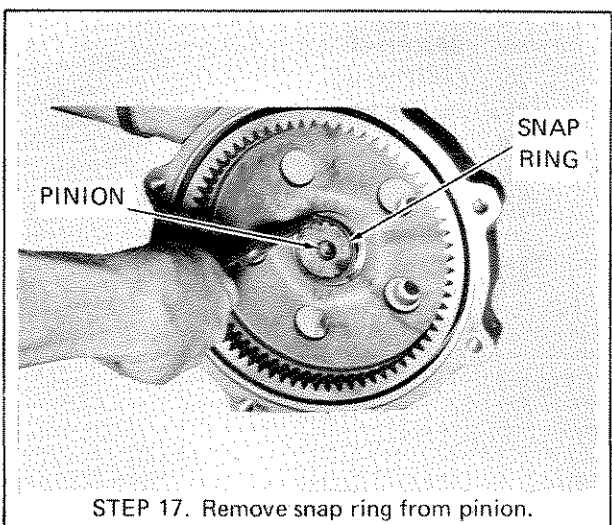
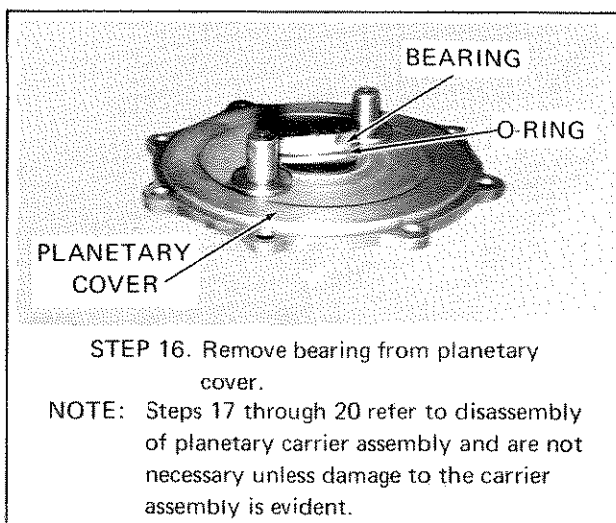
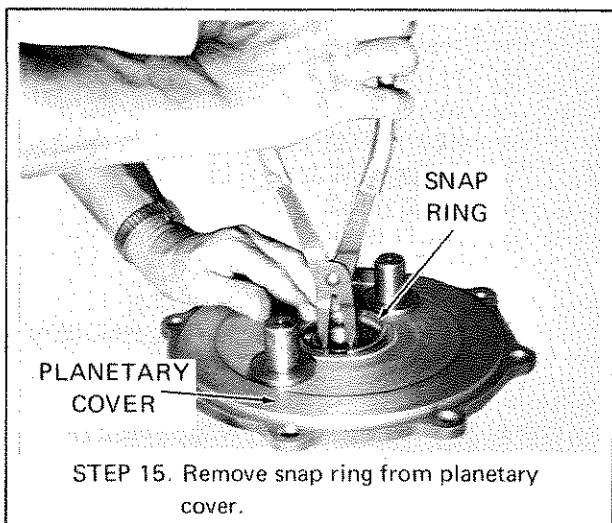
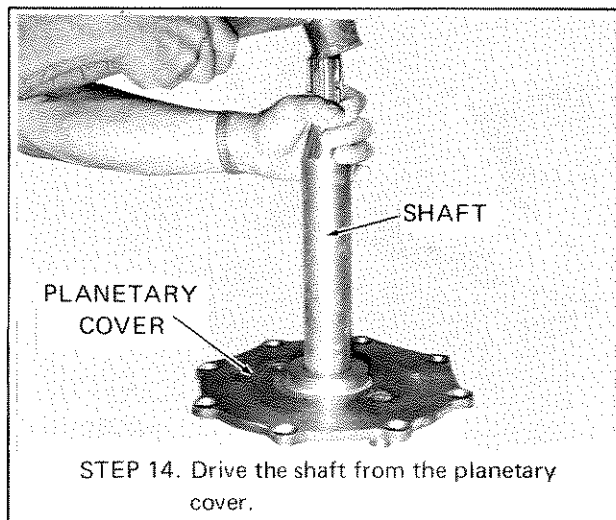
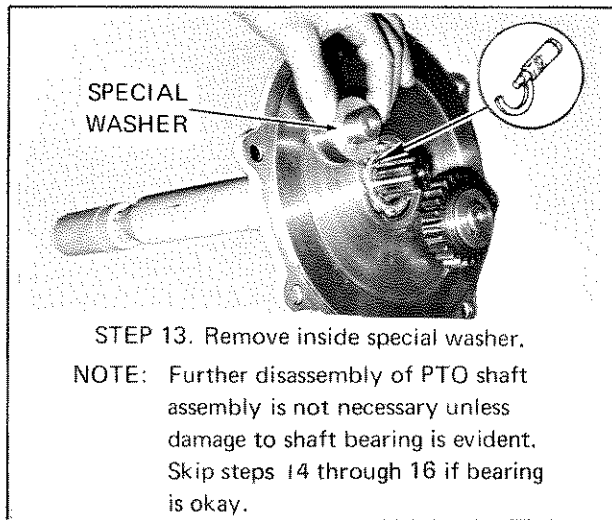
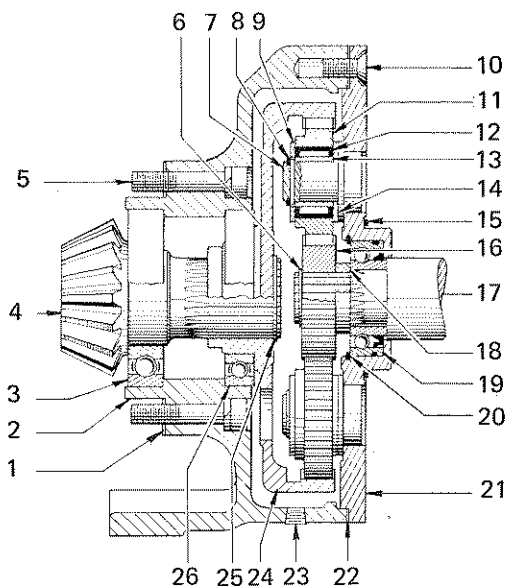
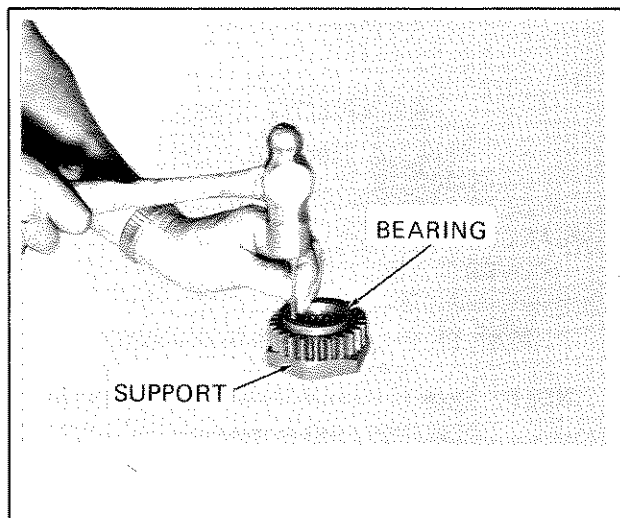
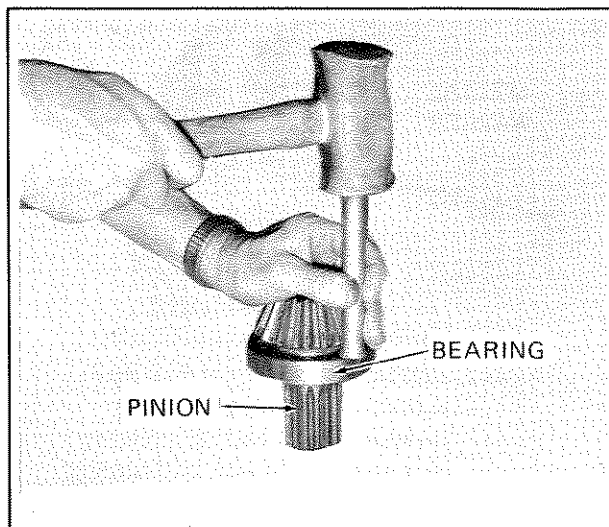
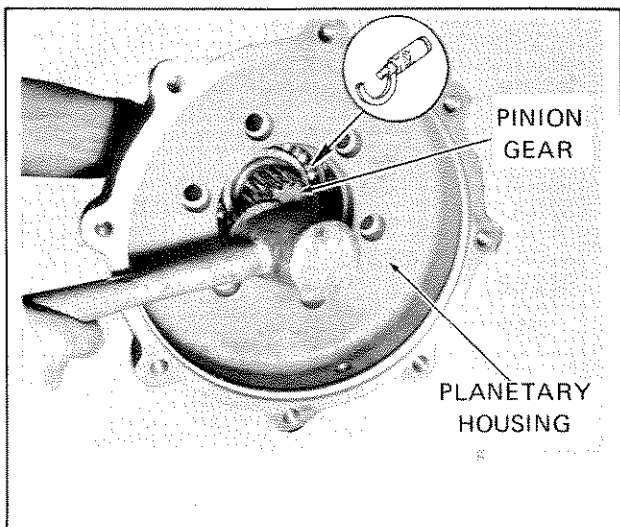
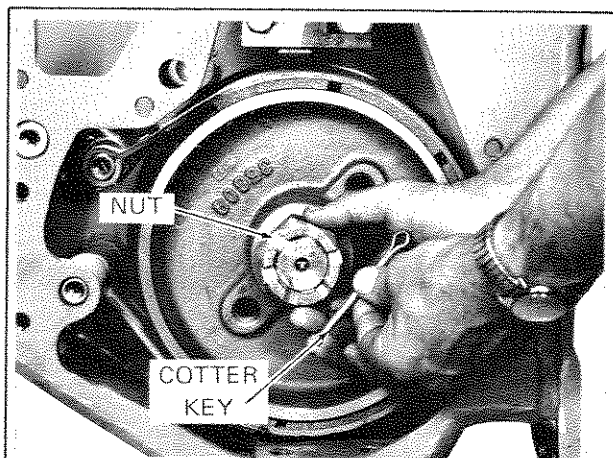


Figure 5-4. Removal And Disassembly Of PTO Shaft Assembly, Lo-Speed (Sheet 3 of 4)

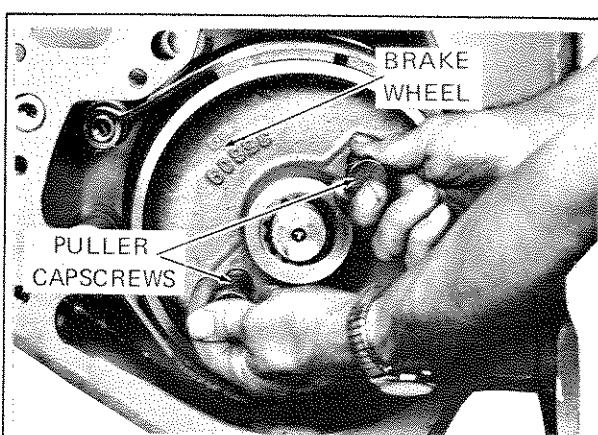


1. SHIM
2. PLANETARY HOUSING
3. BEARING
4. BEVEL PINION GEAR
5. CAPSCREW (6 REQ'D)
6. SNAP RING
7. PIN (2 REQ'D)
8. SNAP RING (2 REQ'D)
9. SPECIAL WASHER (2 REQ'D)
10. CAPSCREW AND LOCKWASHER (8 REQ'D)
11. PLANETARY GEARS (2 REQ'D)
12. BEARING (2 REQ'D)
13. INNER BEARING RACE (2 REQ'D)
14. SPECIAL WASHER (2 REQ'D)
15. GASKET
16. SUN GEAR
17. PTO SHAFT
18. SPACER
19. BEARING
20. SNAP RING
21. PLANETARY COVER
22. GASKET
23. PIPE PLUG
24. RING GEAR
25. SNAP RING
26. BEARING

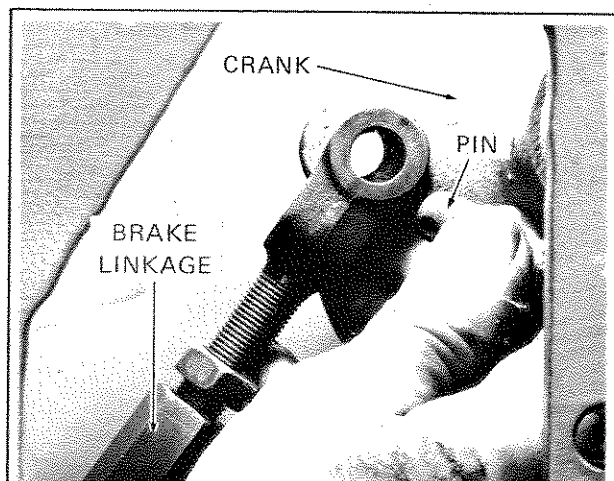
Figure 5-4. Removal And Disassembly Of PTO Shaft Assembly, Lo-Speed (Sheet 4 of 4)



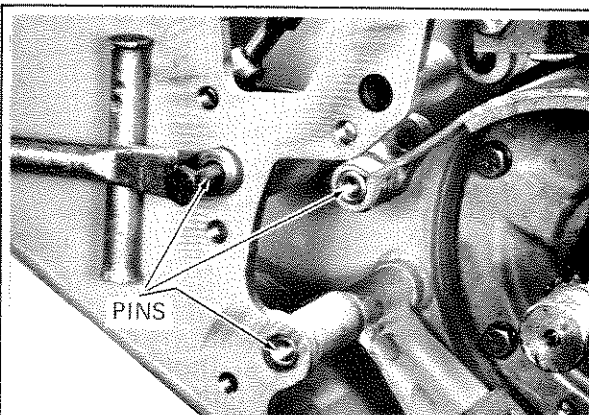
STEP 1. Remove cotter key and nut from brake shaft.



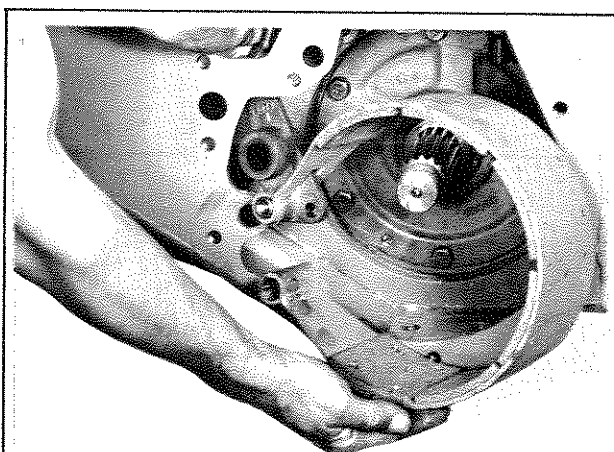
STEP 2. Remove brake wheel from shaft by inserting two capscrews in the holes provided.



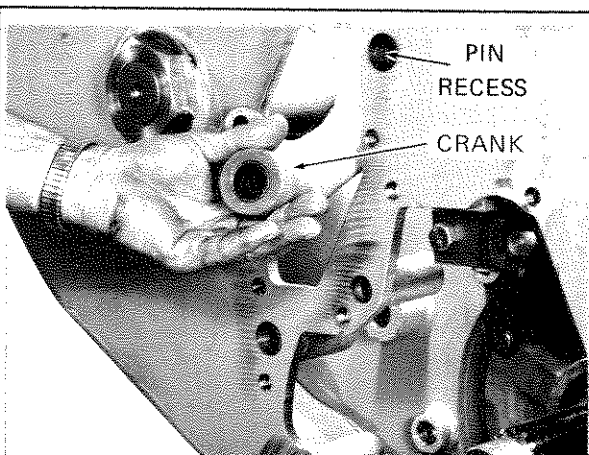
STEP 3. Disconnect brake linkage from crank.



STEP 4. Remove the three pins which anchor the brake band and lower crank to the winch.



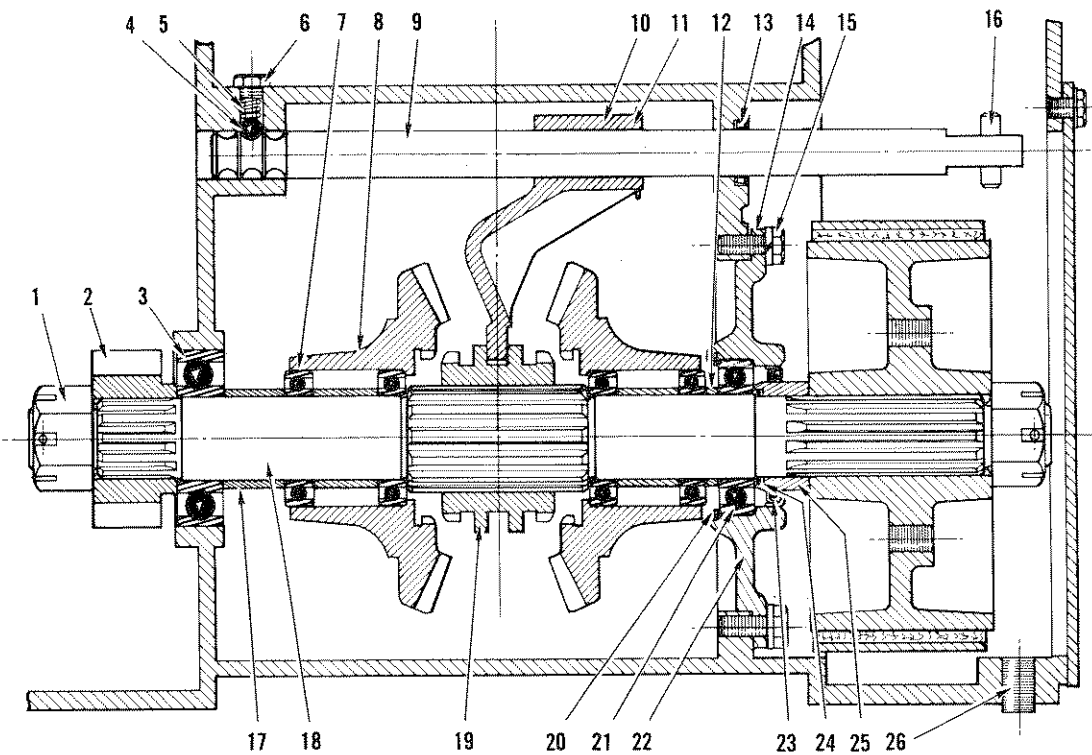
STEP 5. Remove the brake band, lower crank and connecting linkage as one assembly.



STEP 6. Remove upper brake lever crank pin and crank.

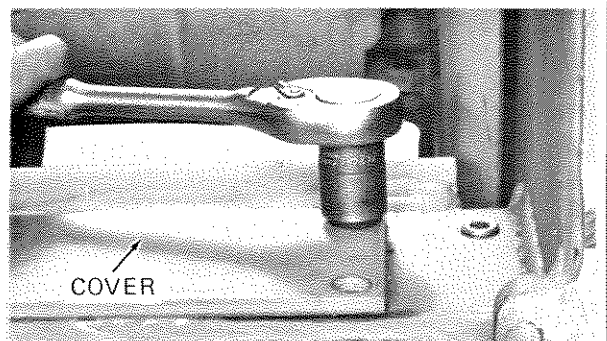
Figure 5-5. Removal Of Dry Brake And Automatic Brake

BRAKE AND BEVEL GEAR SHAFT ASSEMBLIES



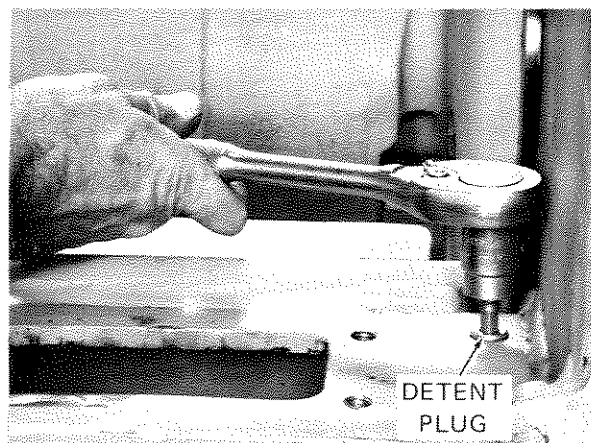
- | | |
|-----------------------------|--------------------------------|
| 1. NUT | 14. SHIMS |
| 2. INTERMEDIATE PINION GEAR | 15. CAPSCREW (11 REQ'D.) |
| 3. BALL BEARING | 16. DOWEL PIN |
| 4. DETENT BALL | 17. SPACER (3 REQ'D.) |
| 5. DETENT SPRING | 18. BRAKE AND BEVEL GEAR SHAFT |
| 6. DETENT PLUG | 19. DENTAL CLUTCH |
| 7. BALL BEARING (4 REQ'D.) | 20. SNAP RING |
| 8. BEVEL GEAR (2 REQ'D.) | 21. BEARING |
| 9. FWD. REV. SHIFTER SHAFT | 22. RETAINER |
| 10. SHIFTER FORK | 23. OIL SEAL |
| 11. SPECIAL CAPSCREW | 24. O-RING |
| 12. SPACER | 25. SPACER |
| 13. OIL SEAL | 26. DRAIN PLUG |

Figure 5-6. Brake and Bevel Gear Shaft — Location of Components

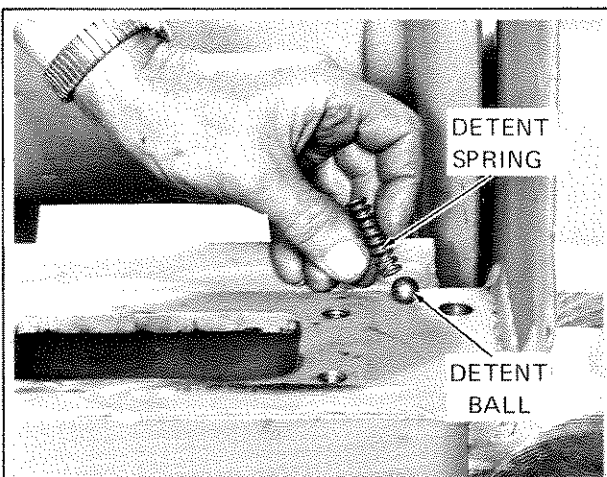


NOTE: Prior to removal and disassembly of bevel gear shaft assembly, perform the procedures in paragraph 5-14.

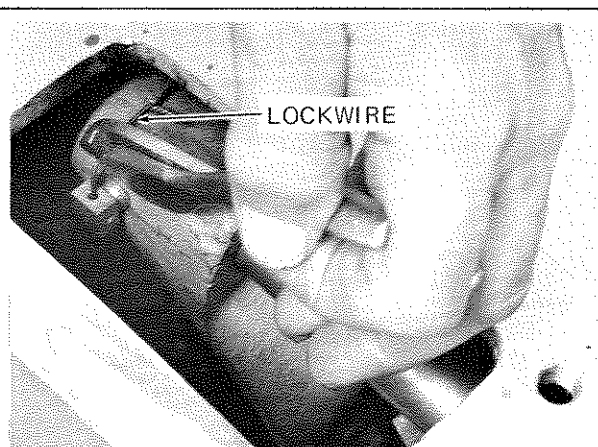
STEP 1. Remove four capscrews holding cover to winch.



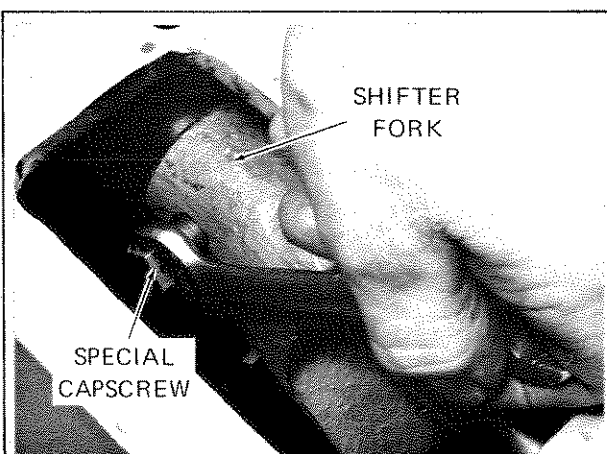
STEP 2. With an Allen wrench remove forward-reverse detent plug.



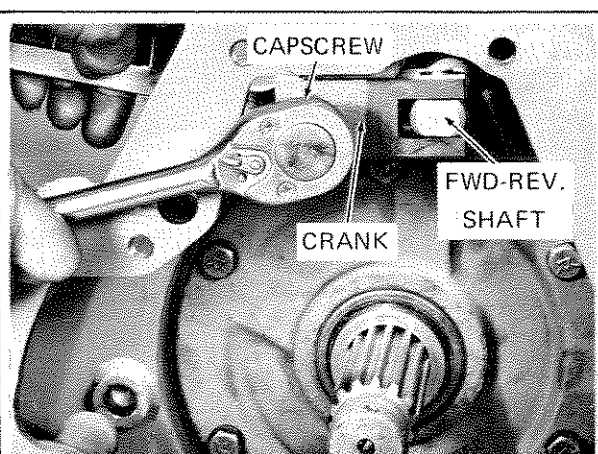
STEP 3. Remove detent spring and ball.



STEP 4. Cut lockwire holding special capscrew to shifter fork.



STEP 5. Remove special capscrew from shifter fork.



STEP 6. Loosen capscrew securing clamp to forward-reverse linkage.

Figure 5-7. Removal And Disassembly of Brake And Bevel Gear Shaft Components (Sheet 1 of 4)

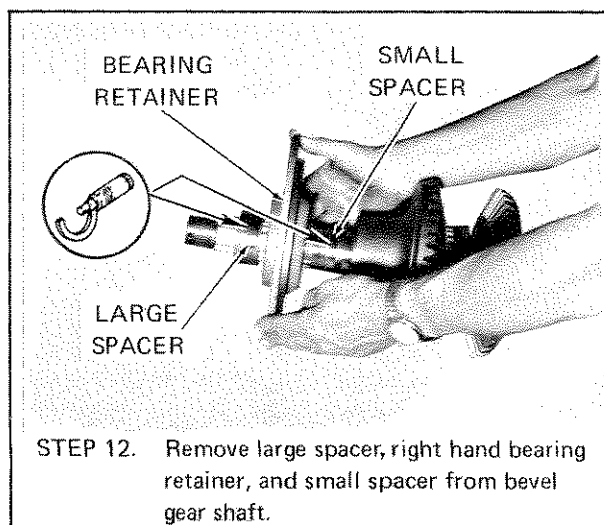
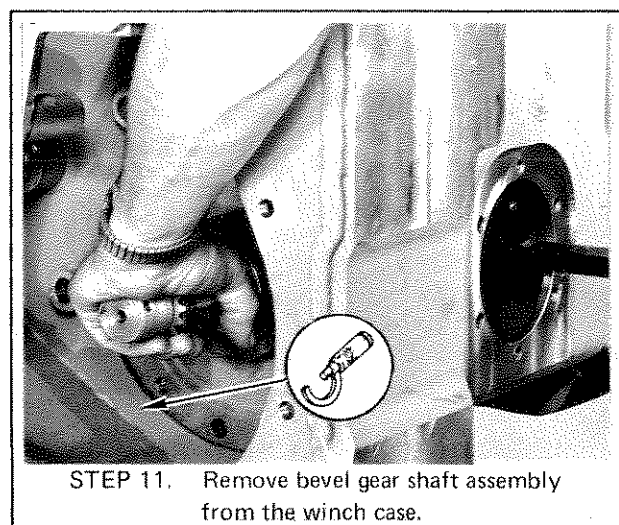
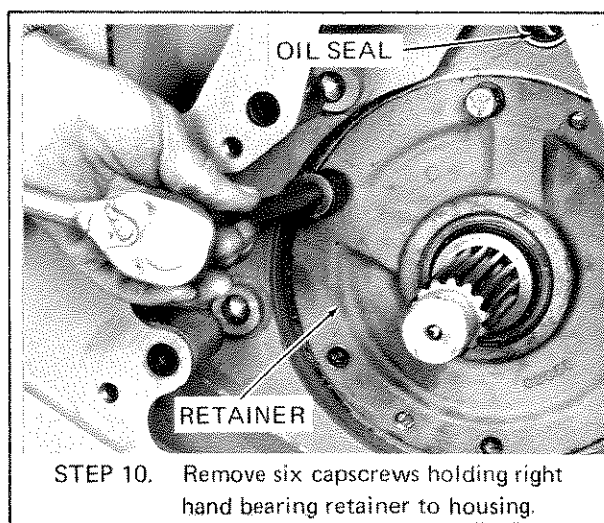
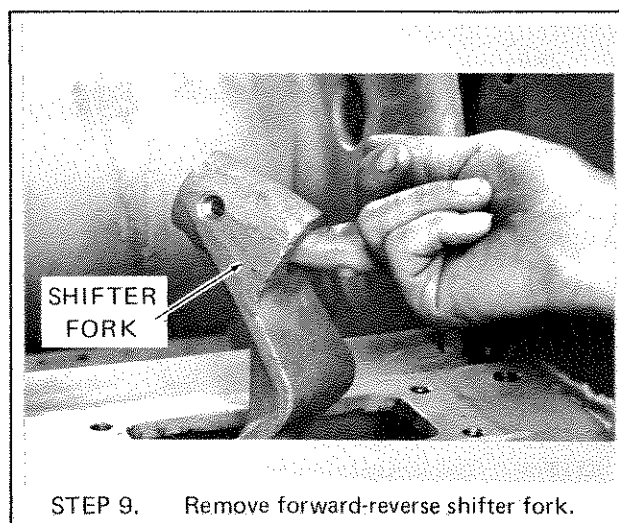
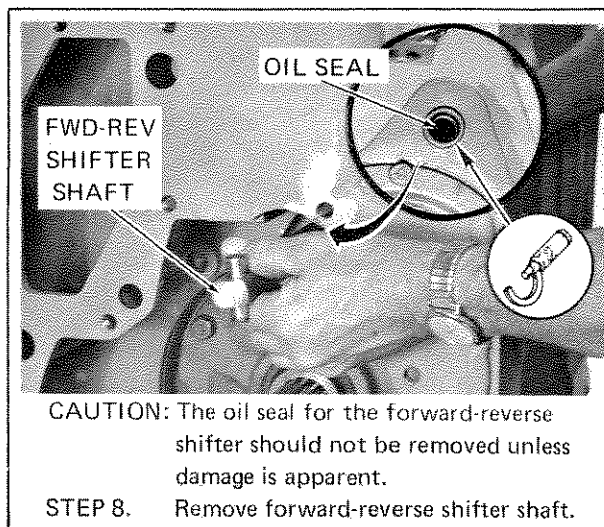
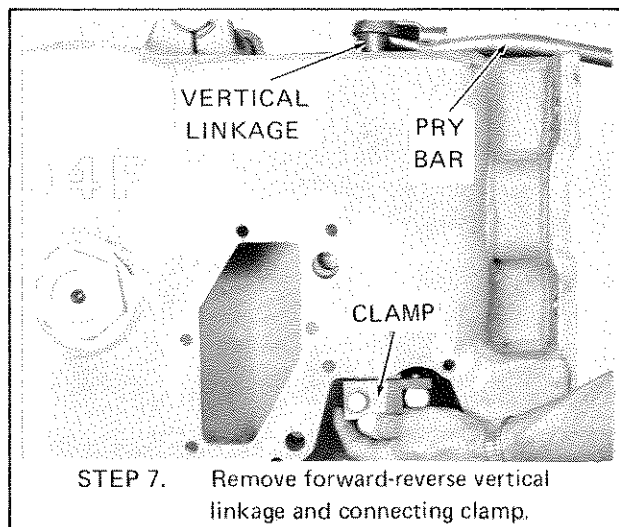


Figure 5-7. Removal And Disassembly of Brake And Bevel Gear Shaft Components (Sheet 2 of 4)

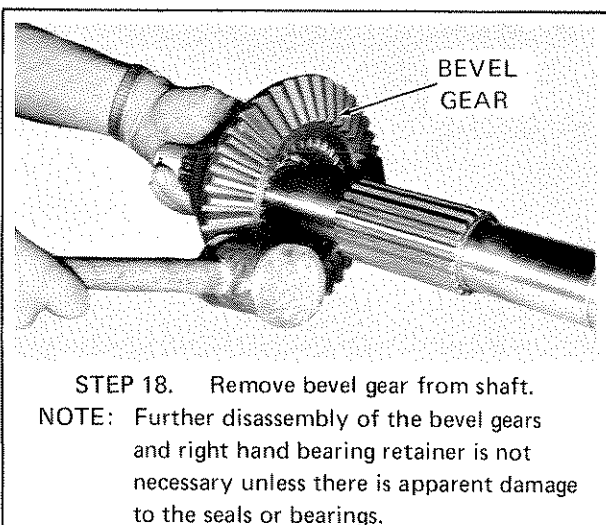
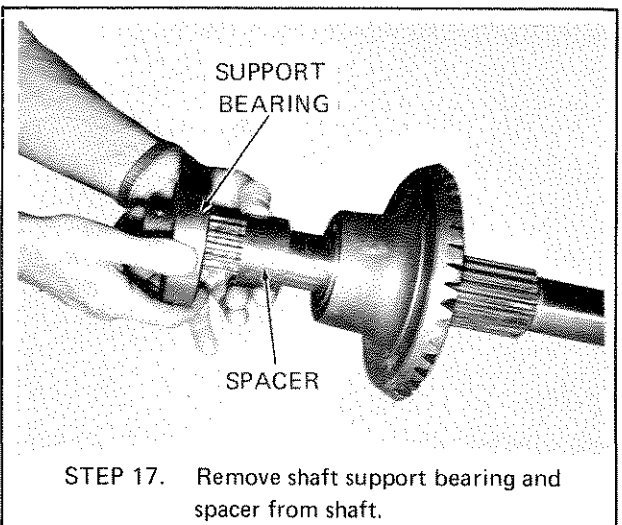
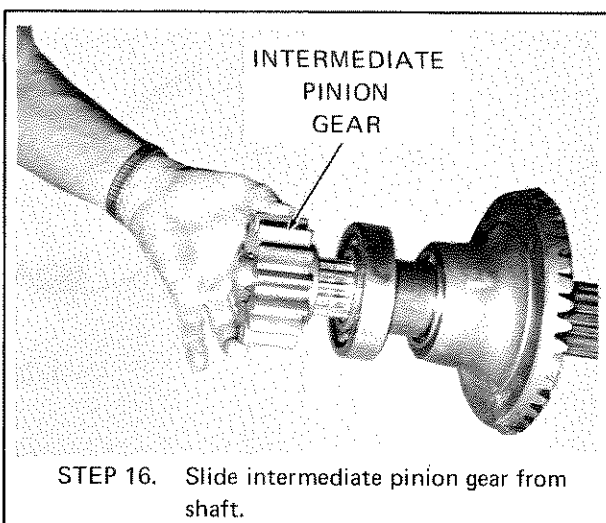
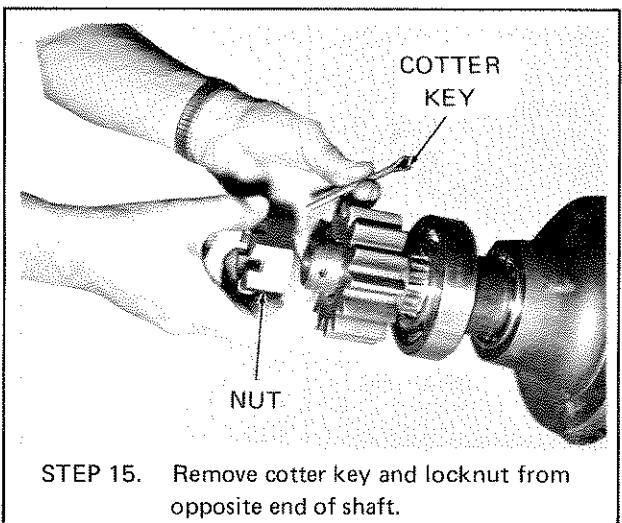
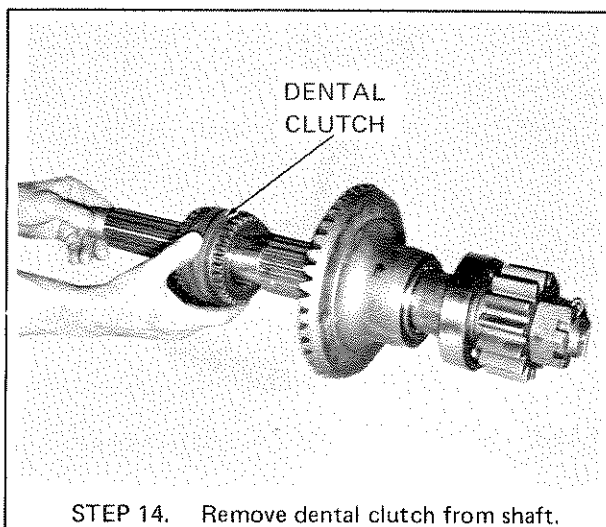
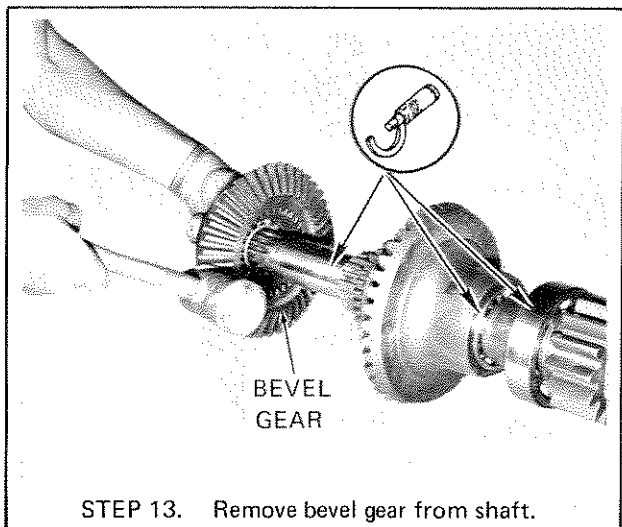


Figure 5-7. Removal And Disassembly of Brake And Bevel Gear Shaft Components (Sheet 3 of 4)

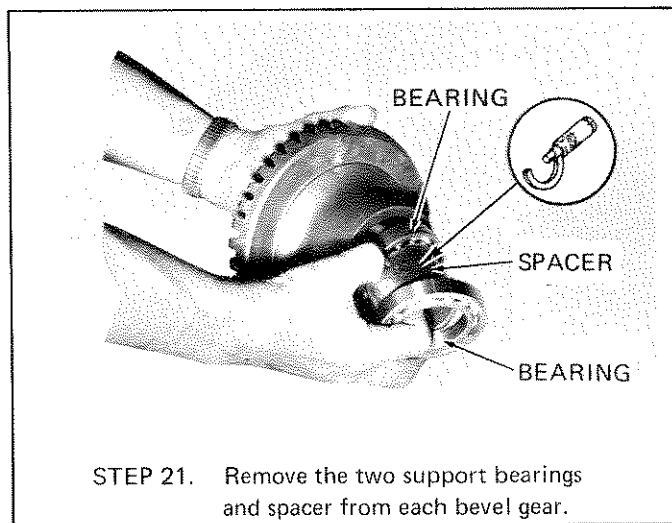
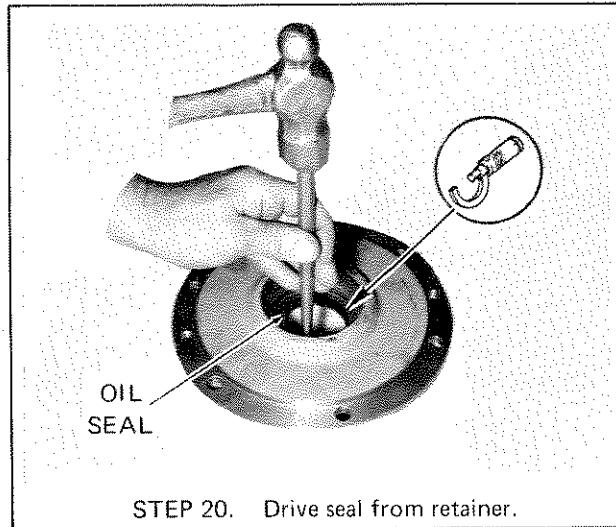
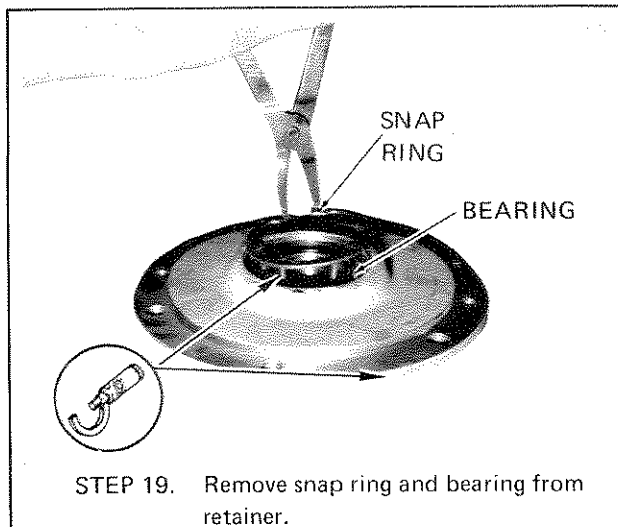
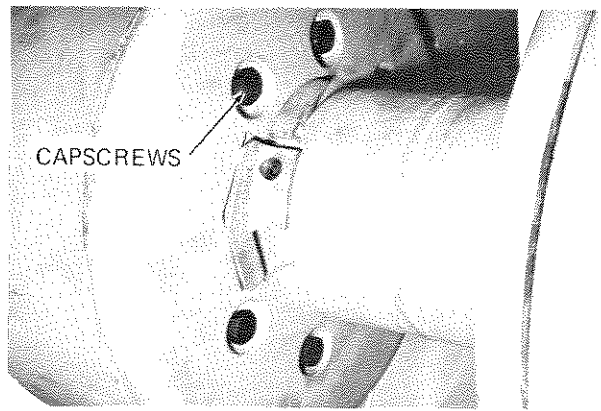
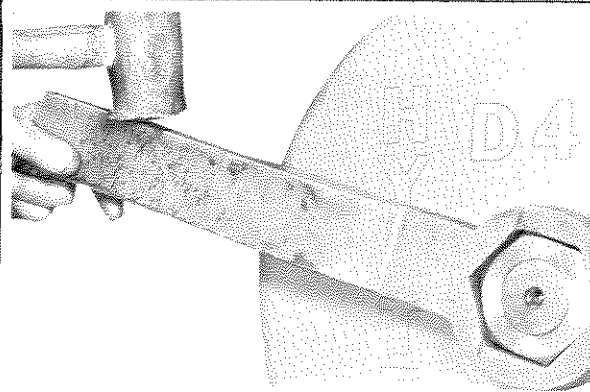


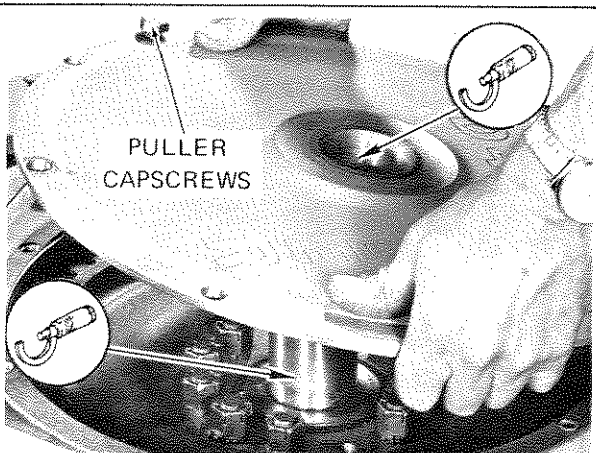
Figure 5-7. Removal And Disassembly of Brake And Bevel Gear Shaft Components (Sheet 4 of 4)



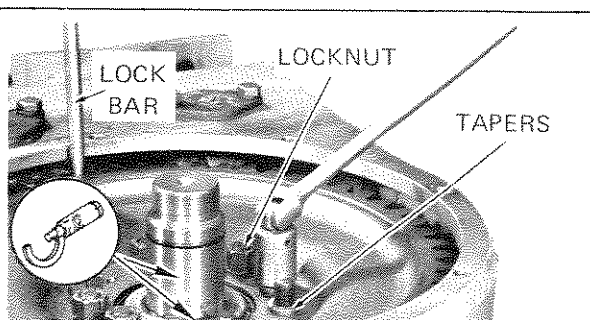
STEP 1. Loosen the 7 drum capscrews, then remove 5 capscrews leaving two located 180 degrees apart.



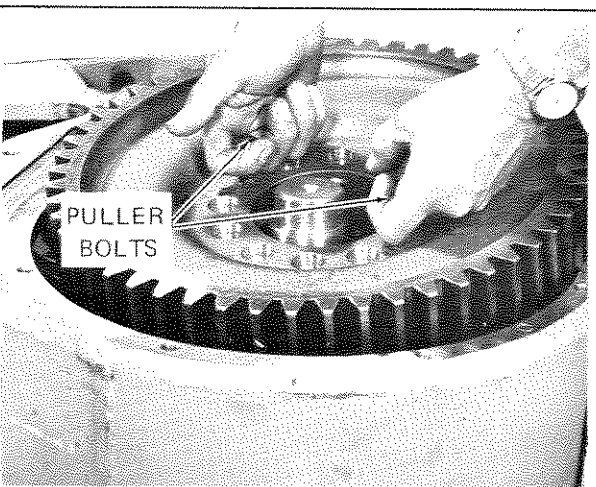
STEP 2. Remove right-hand drum shaft locknut, then turn winch so that left hand side faces upward. Remove second drum shaft locknut.



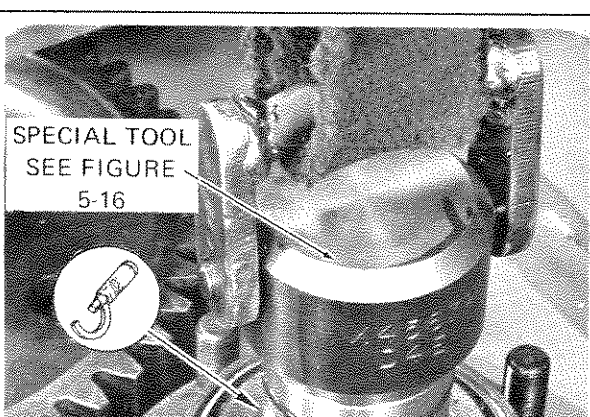
STEP 3. Remove drum gear cover using capscrews in (two) puller holes.



STEP 4. Remove the ten special locknuts and tapers securing the drum gear to the adapter. (Tap on drum gear to free-up tapers.) Insert bar between drum gear and drum pinion to prevent the gear from turning.

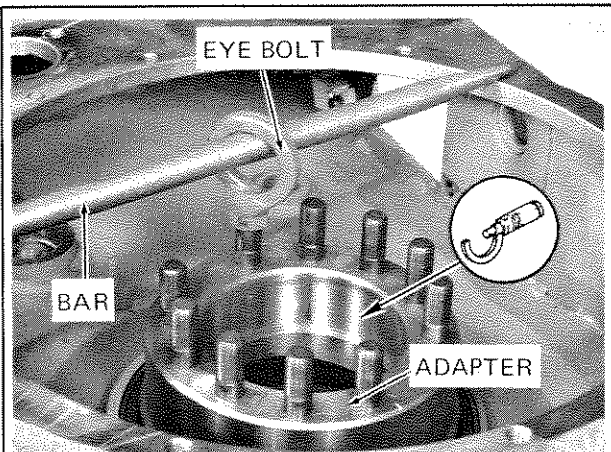


STEP 5. Remove drum gear using puller bolts.

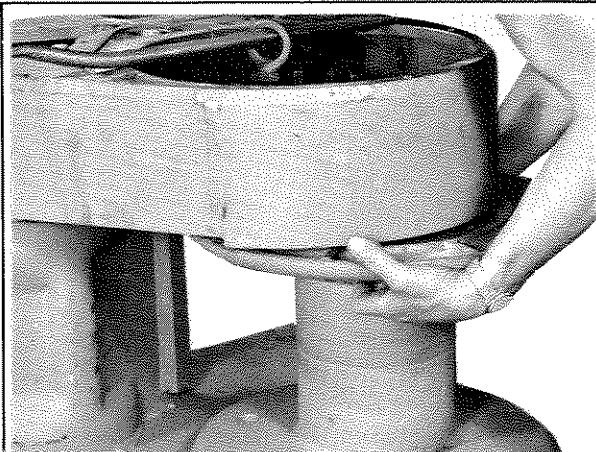


STEP 6. Remove drum shaft using special attachment.
NOTE: Bearing assembly should be removed with the drum shaft.

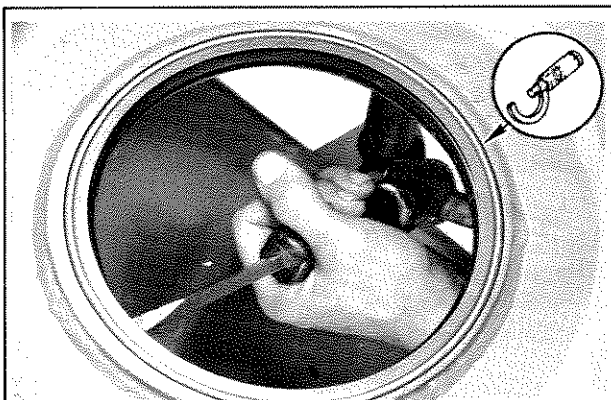
Figure 5-8. Removal Of Drum Shaft And Drum (Sheet 1 of 2)



STEP 7. Support adapter as shown, then remove two remaining drum capscrews.

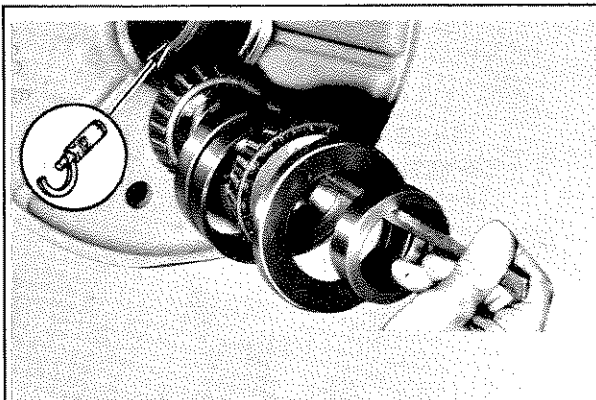


STEP 8. Remove drum from winch frame as shown. Remove adapter.



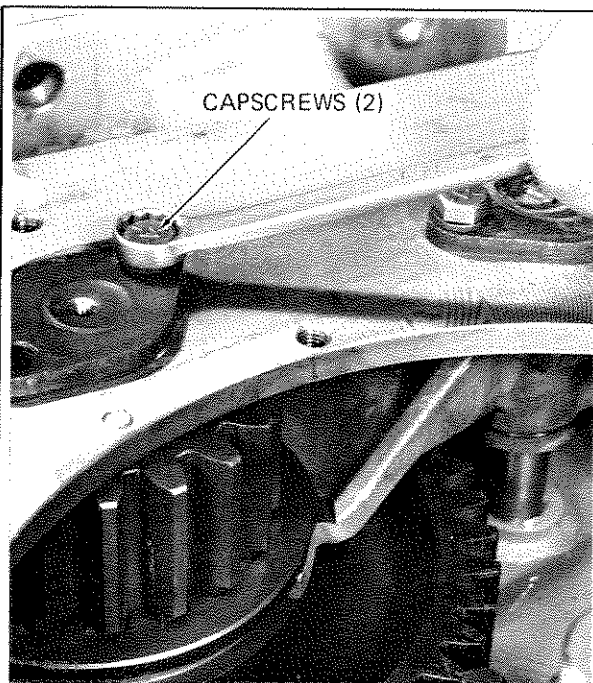
STEP 9. Remove drum seal.

NOTE: This seal must be replaced with a new **HYSTER APPROVED** seal during installation.



STEP 10. Remove the right hand side shaft spacer seal, and double taper roller bearing assembly from the drum.

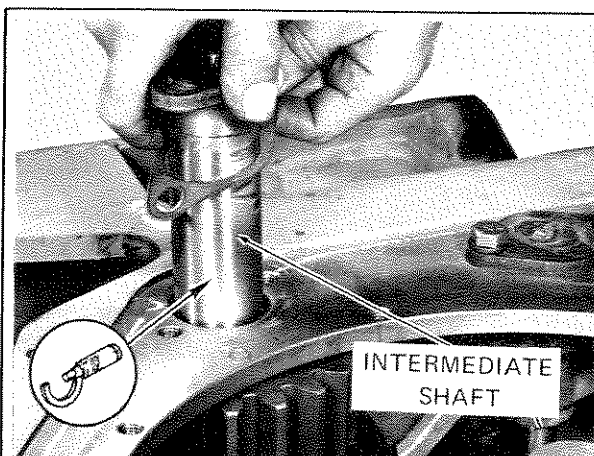
Figure 5-8. Removal of Drum Shaft And Drum (Sheet 2 of 2)



CAPSCREWS (2)

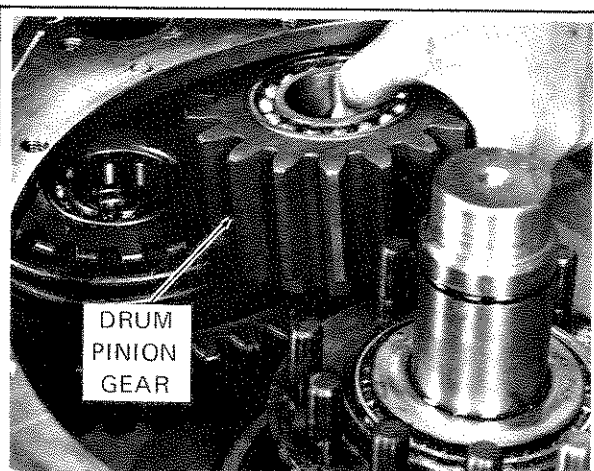
NOTE: The following illustrations show the winch removed from the tractor and positioned on its side with the bevel gear and brake shaft assembly removed. Repair to the intermediate shaft assembly can be made with the bevel gear and brake shaft assembly installed. The drum gear cover, drum gear and drum shaft must be removed before intermediate shaft disassembly.

STEP 1. Remove cap screw holding intermediate shaft to winch case.



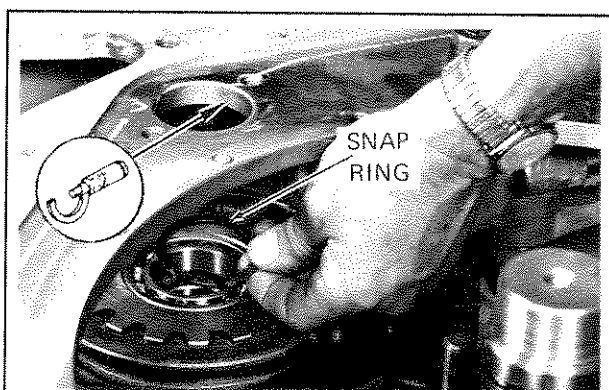
INTERMEDIATE
SHAFT

STEP 2. Remove intermediate shaft and gasket from winch case.



DRUM
PINION
GEAR

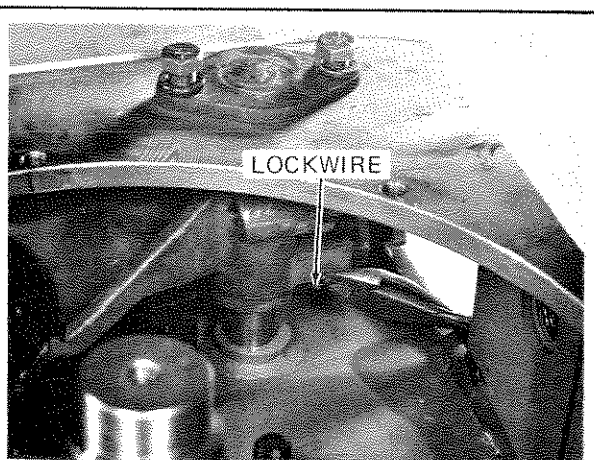
STEP 3. Remove drum pinion gear.



SNAP
RING

NOTE: The intermediate shaft has two snap rings around the shaft which act as spacers. Be sure and note their location for installation.

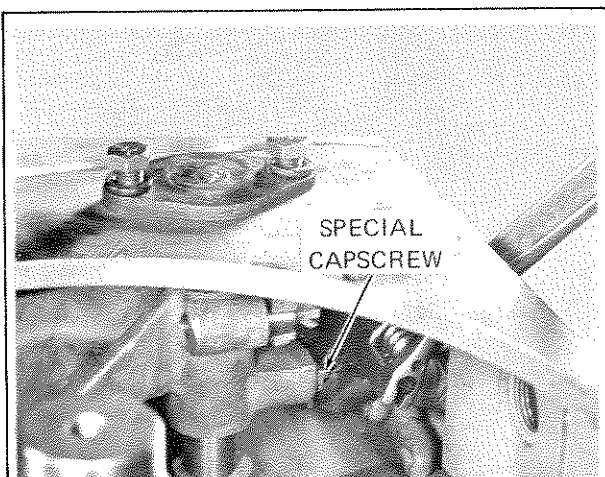
STEP 4. Remove snap ring.



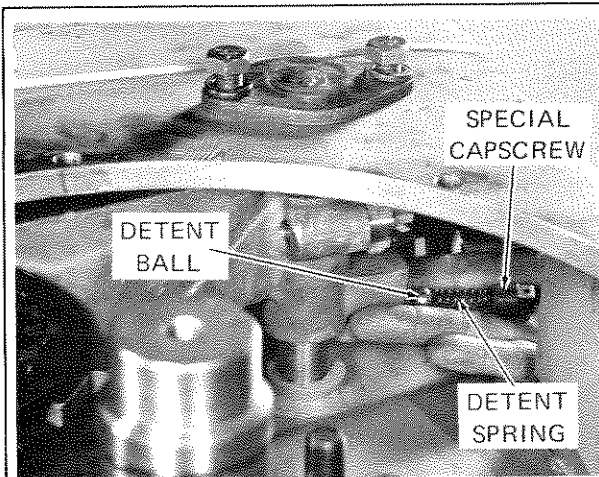
LOCKWIRE

STEP 5. Cut lock wire holding special cap screw to shifter fork.

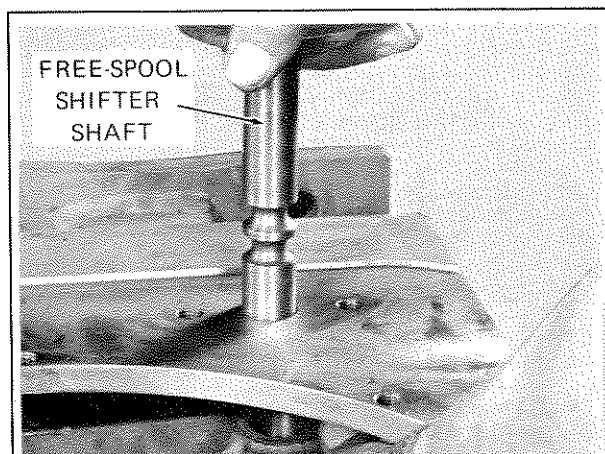
Figure 5-9. Removal of Intermediate Gear Shaft Assembly (Sheet 1 of 3)



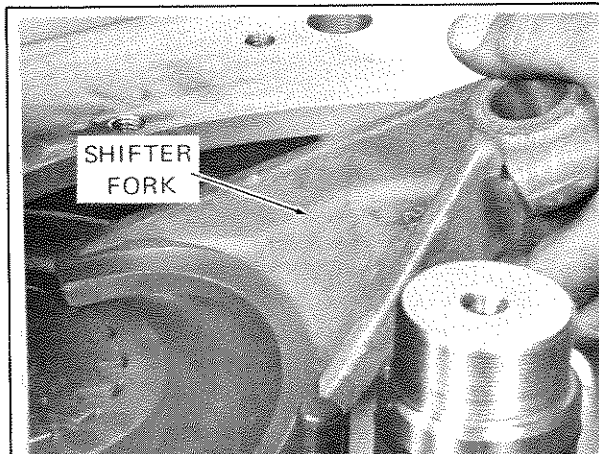
STEP 6. Remove special capscrew.



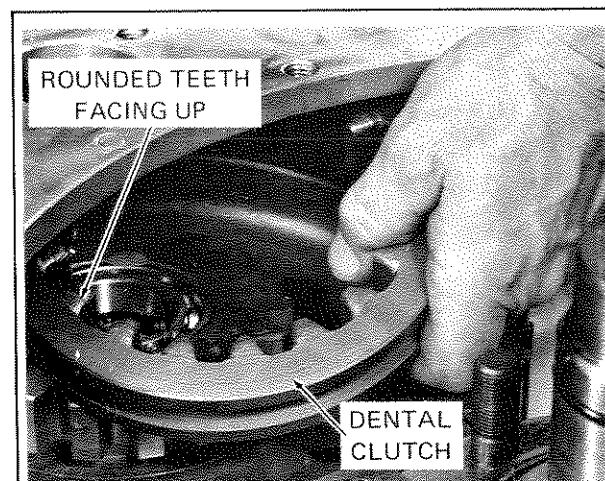
STEP 7. Remove detent ball and spring.



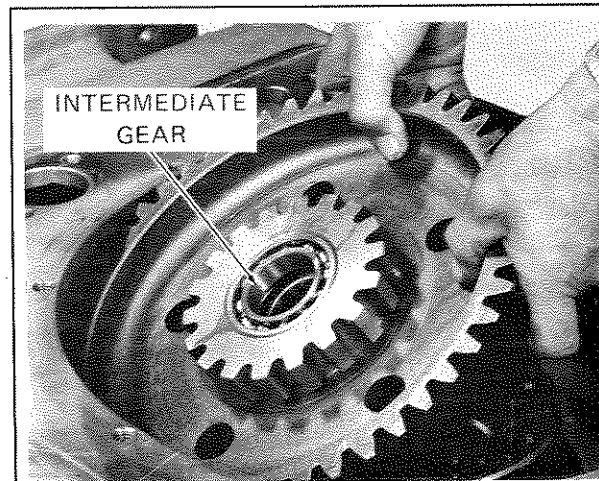
STEP 8. Pull free-spool shifter shaft from winch case.



STEP 9. Remove shifter fork.

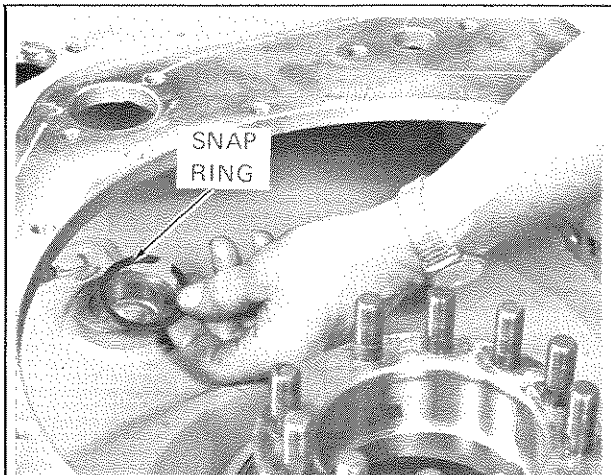


STEP 10. Remove dental clutch.

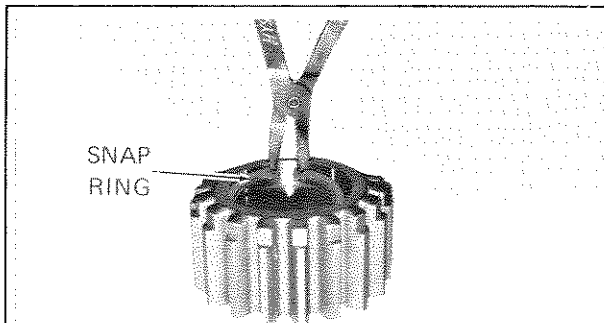


STEP 11. Remove intermediate gear.

Figure 5-9. Removal of Intermediate Gear Shaft Assembly (Sheet 2 of 3)

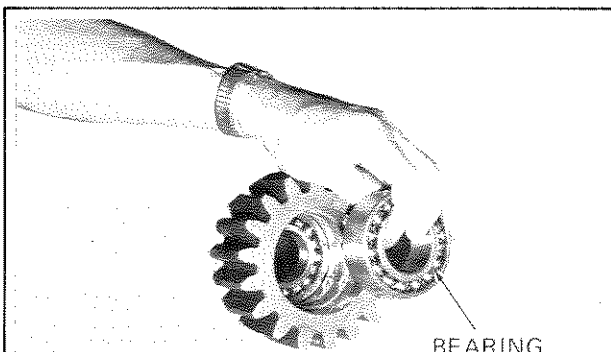


STEP 12. Remove snap ring.

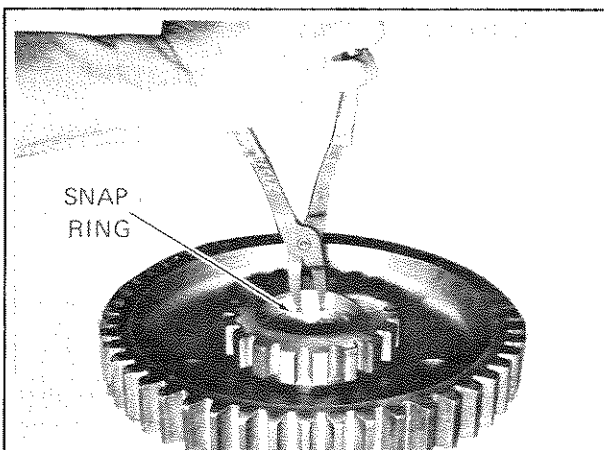


NOTE: Further disassembly of the drum pinion gear and intermediate gear is not necessary unless damage to the bearing or gear is evident.

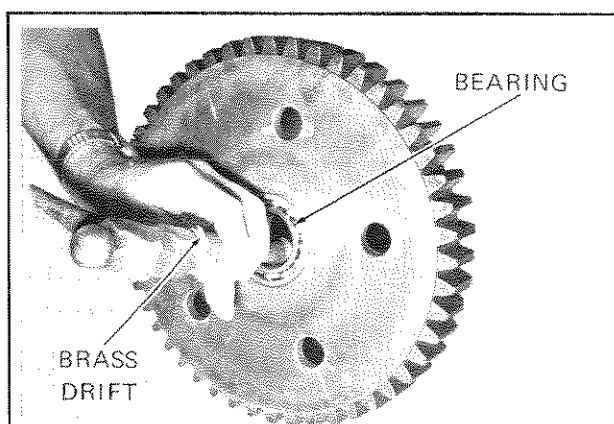
STEP 13. Remove snap ring from drum pinion gear.



STEP 14. Remove bearings from drum pinion gear.



STEP 15. Remove snap rings from intermediate gear.



STEP 16. Remove bearings from intermediate gear.

Figure 5-9. Removal of Intermediate Gear Shaft Assembly (Sheet 3 of 3)

5-19. CLEANING.

5-20. When parts are removed from the winch, remove accumulated grease and dirt using mineral spirits or other suitable cleaning solvent. Never inspect parts coated with excessive amounts of grease or dirt. Damage to a part may not be obvious unless thoroughly cleaned. Steam clean all external surfaces of the winch prior to reassembly.

CAUTION: Do not use oily (dirty) solvents to clean the brake band. Use only clean solvents to remove grease or oil from the brake lining.

5-21. VISUAL INSPECTION.

5-22. Table 5-1 contains procedures for visual inspection of all critical parts of the winch assembly.

Table 5-1. Visual and Dimensional Inspection (Sheet 1 of 2)

ITEM	INSEPTION REQUIREMENTS	CORRECTIVE ACTION
PTO Shaft, Lo-Speed	Check for broken or worn bevel gear teeth. Also check spline for wear or twisting. Check ring gear, planetaries and bevel pinion for worn or broken teeth.	Replace shaft if gear teeth are broken or severely worn or if splines are not true.
PTO Shaft, Standard Speed	Check splines for wear or twisting.	Replace shaft if splines are severely worn or twisted.
PTO Shaft Bevel Gear Pinion Standard Speed	Check for broken or worn bevel gear pinion teeth.	Replace shaft if teeth are broken or severely worn.
Bevel Gear and Brake Shaft	Check for deep scratches or scoring on bearing journals at each end of shaft.	Machine bearing journal as required but do not exceed minimum dimensions given in Table 1-1.
Bevel Gear and Brake Shaft Bearing Retainer	Check retainer seal ring bore for grooves, scoring and rust.	Replace if scored, rusted, or if they are not within specifications given in Table 1-1.
Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Bevel Gear and Brake Shaft Spacers	Inspect spacer ends for scoring, mushrooming, or corrosion.	Replace if damaged in any way or if they are not within specifications given in Table 1-1.
Bevel Gear and Brake Shaft Pinion Gear	Check for broken or worn teeth.	Replace pinion gears if teeth are broken or severely worn.
Bevel Gears	Check for broken or worn teeth.	Replace if teeth are broken or severely worn.
	Inspect gear hub faces for scoring mushrooming, or corrosion.	The gear should be replaced if the hub faces are defective in any way. NOTE: Do not machine gear faces. Overall length of components is critical.

Table 5-1. Visual and Dimensional Inspection (Sheet 2 of 2)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Brake Shaft (End of Bevel Gear and Brake Shaft)	Check for deep scratches or scoring on bearing journals at end of shaft, and oil seal surface.	Machine bearing journal as required but do not exceed minimum dimensions given in Table 1-1.
Brake Shaft Gear	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.
Intermediate Shaft	Check for broken or worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Dental Clutch	Check for deep scratches or scoring on bearing journals at each end of shaft.	Machine bearing journal as required but do not exceed minimum dimensions given in Table 1-1.
Intermediate Gear	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Drum Shaft	Inspect both gears for broken or severely worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Drum Gear	Check for deep scratches or scoring on bearing journal at each end of shaft.	Machine shaft as required but do not exceed minimum dimensions specified in Table 1-1.
Drum	Checks for cross-threaded or damaged threads.	Dress threads with thread chaser.
Drum Adapter	Check for broken or severely worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
	Inspect seal (LH and RH side) ring groove for burrs, scoring, and rust.	Replace drum or rebuild drum groove if a new quad-ring will not seat properly.
	Carefully inspect seal contact surfaces for deep scratches, burrs and rust.	Replace if damaged.

5-23. Reassembly And Installation.

5-24. Before reassembly and installation of the winch, make sure that all removed parts have been inspected as specified in Table 5-1. Check all measurements specified in Table 5-1 and as shown in the disassembly illustrations. Replace any part that is not within the specified limits. Carefully check all bearings that have been removed. Used bearings often appear to be satisfactory, but may

fail when placed under a load. When in doubt, installation of new bearings is recommended. New bearings may prevent future troubles.

CAUTION: Apply a light coat of sealing compound (John Crane or equal) to all external bearing retainers and cover plate cap-screws. To facilitate winch assembly, follow shaft installation order as recommended.

5-25. REASSEMBLY AND INSTALLATION OF BRAKE AND BEVEL GEAR SHAFT ASSEMBLY.

5-26. See Figure 5-10 for service instructions. Preassemble the bevel gear and brake shaft assembly as shown in Figure 5-10, observing the following:

- a. See Figure 5-6 for location of shaft components.
- b. The total bevel gear backlash is adjusted by shimming between LH bearing retainer and winch housing.

5-27. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY.

5-28. See Figure 5-11 for installation procedures. The illustrations show the winch removed from the tractor, with the drum gear cover gear and shaft removed

5-29. INSTALLATION OF DRUM AND DRUM SHAFT

5-30. Reassembly and installation of the drum and drum shaft is shown in Figure 5-12. The intermediate shaft assembly must be installed before the drum assembly. See Figure 5-11.

5-31. INSTALLATION OF DRY BRAKE AND AUTOMATIC BRAKE.

5-32. Installation of dry brake (or optional brake) is shown in Figure 5-13. Installation procedures apply to both dry brake and optional automatic brake.

5-33. INSTALLATION OF LO-SPEED PTO SHAFT ASSEMBLY. Installation is shown in Figure 5-14.

5-34. INSTALLATION OF WINCH ON TRACTOR.

5-35. The D4F winch is attached to the tractor by using the parts listed in Figure 5-15. When installing the winch, observe the following:

WARNING: Make sure that the lifting device has a minimum capacity of 2,000 pounds before lifting the winch. Carefully check the cable or chain for damage.

- a. Make sure that all shipping plugs are removed before mounting the winch.
- b. Install the forward-reverse cable in the outside hole on the right hand side frame. Install the brake cable in the inside hole on the right hand side frame. Install the free-spool cable in the hole on the left hand side of winch.
- c. Make sure locknuts on cable ends are in place and that setscrews are in groove at cable ends and are tight.

d. Install gaskets over PTO carrier and place gaskets for right and left hand winch frames in position.

NOTE: The D4F Lo-Speed winch uses four (two upper and two lower) spacers to facilitate mounting. Position these spacers on the installed studs. See Figure 5-2.

e. Clean the mounting surfaces of the winch and tractor. Check mounting face of winch and remove any high spots, especially near mounting studs where winch pads make contact.

f. Lift the winch and position it on the rear face of tractor. Align the PTO splines with the tractor power take off splines. Route the three cables as the winch is moved against the rear face of the tractor.

g. When the winch is in place, install nuts and lockwasher on all studs.

NOTE: Refer to Figure 5-15 for correct hardware location.

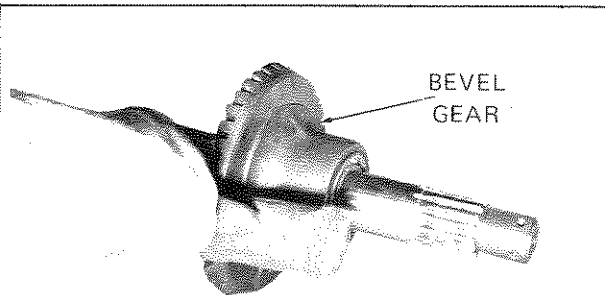
h. Tighten all nuts on studs in tractor rear face (A and B) so the winch is securely fastened to the tractor. Tighten the nuts on the two top studs (C) just enough that the nuts are tight and the studs in tension.

CAUTION: On some units, a clearance of 3/32-inch between winch case and stud boss on top cover may be found. Do not attempt to close this gap. Excessive tightening will distort the winch case.

i. Assemble handlebars and brackets. Refer to Figure 4-9 for control cable adjustments.

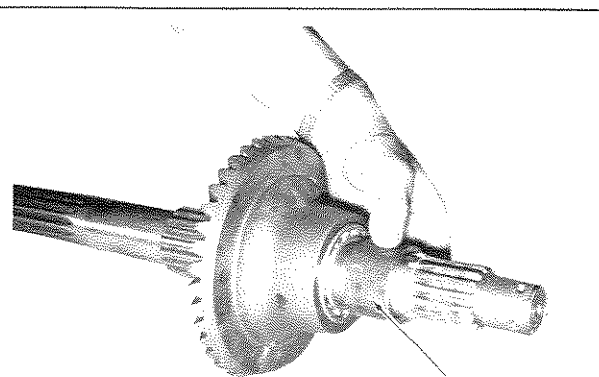
5-36. SPECIAL TOOLS.

5-37. Figure 5-16. contains a listing of tools required during repair of winch.

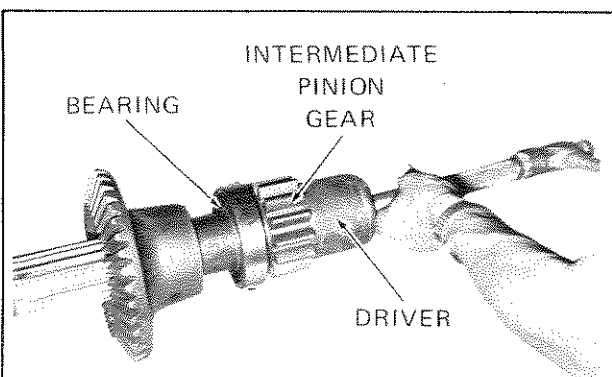


STEP 1. Install bevel gear on left end of shaft.

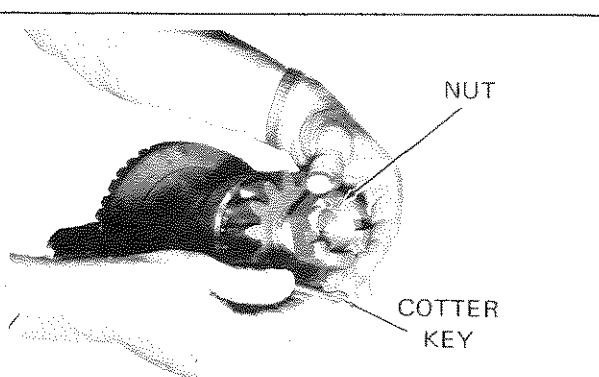
NOTE: If it was necessary to disassemble the bevel gears, preassemble the two internal bearings and dividing spacer before installing the bevel gear on the shaft.



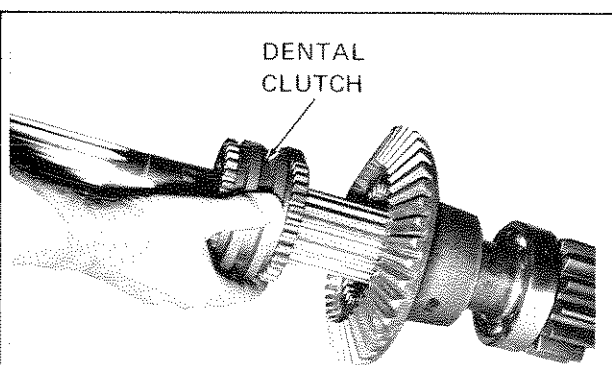
STEP 2. Slide long spacer into place next to the bevel gear.



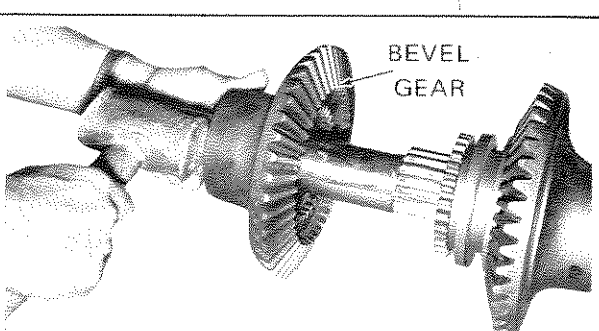
STEP 3. Position shaft support bearing and the intermediate pinion gear, on the shaft.



STEP 4. Secure assembled components into place with locknut. Tighten locknut and insert cotter key after bench assembly is complete.

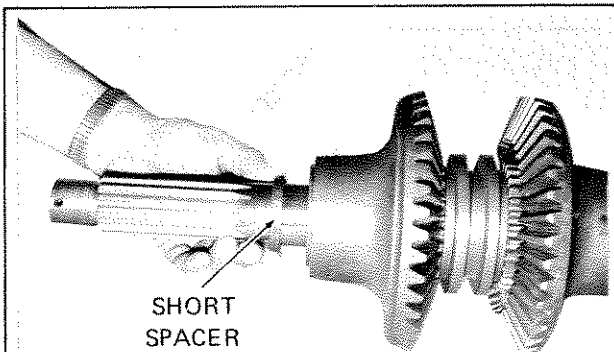


STEP 5. Slide dental clutch into place from opposite (R.H.) end of shaft.



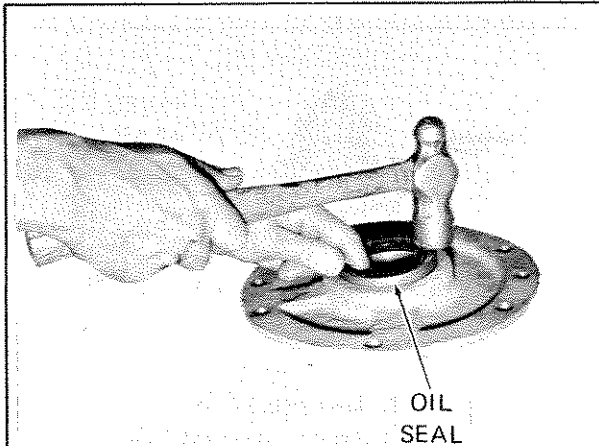
STEP 6. Install bevel gear on right end of shaft.
NOTE: If it was removed, preassemble the two internal ball bearings and dividing spacer before installing the bevel gear on the shaft.

Figure 5-10. Reassembly And Installation of Brake And Bevel Gear Shaft Assembly (Sheet 1 of 4)

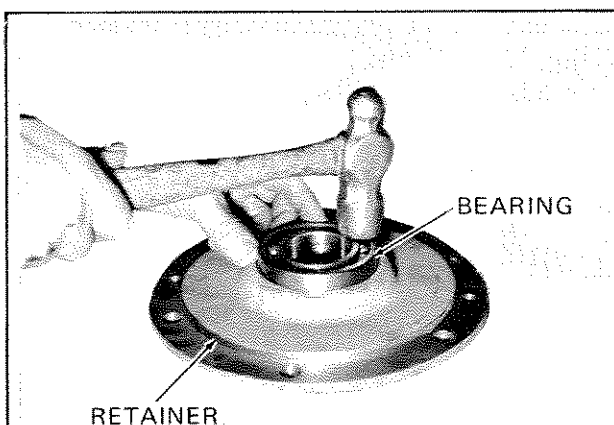


STEP 7. Slide short spacer next to the bevel gear.

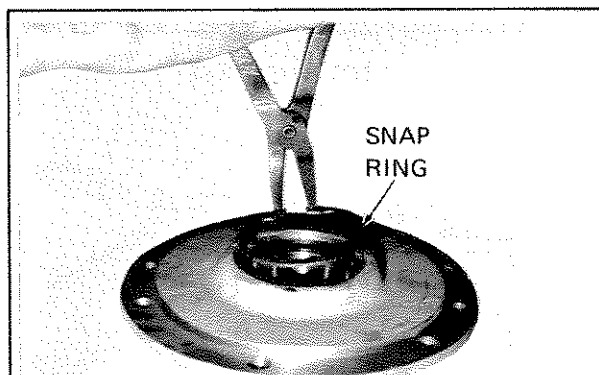
NOTE: Step 8 through 10 pertain to reassembling the bearing retainer. Skip to Step 11 if disassembly was not necessary



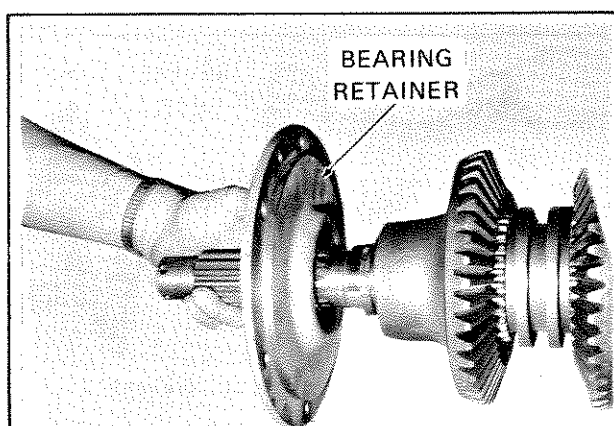
STEP 8. Tap seal into place in the retainer.



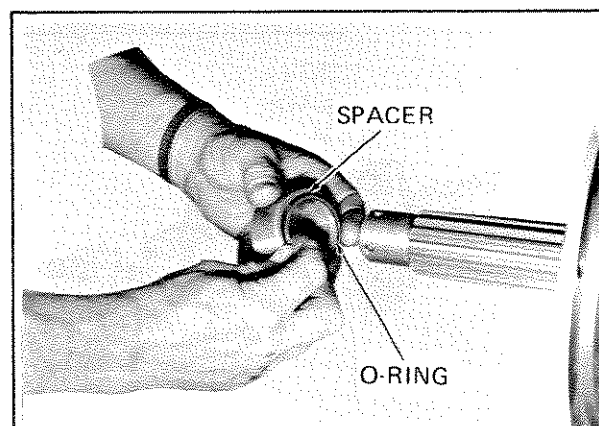
STEP 9. Turn retainer over and tap bearing into place.



STEP 10. Lock bearing into place with a snap ring.

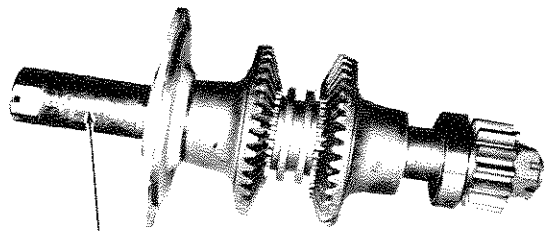


STEP 11. Install the bearing retainer onto the shaft.



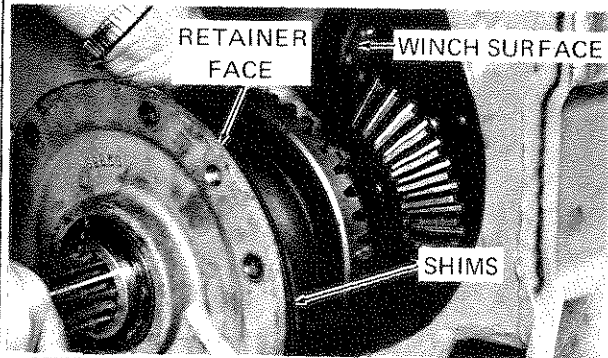
STEP 12. Position medium spacer (with internal O-ring) next to the retainer support bearing.

Figure 5-10. Reassembly And Installation of Brake And Bevel Gear Shaft Assembly (Sheet 2 of 4)

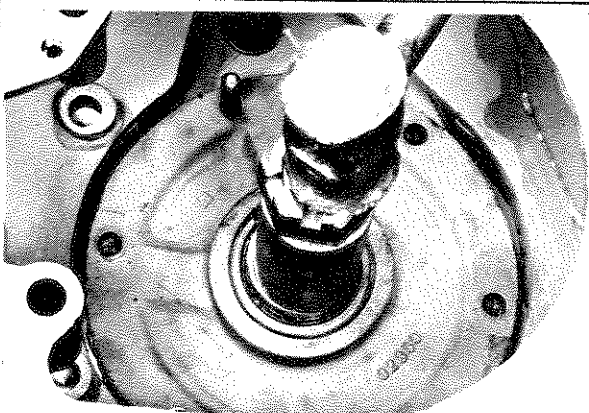


SPECIAL TOOL
SEE FIGURE
5-16

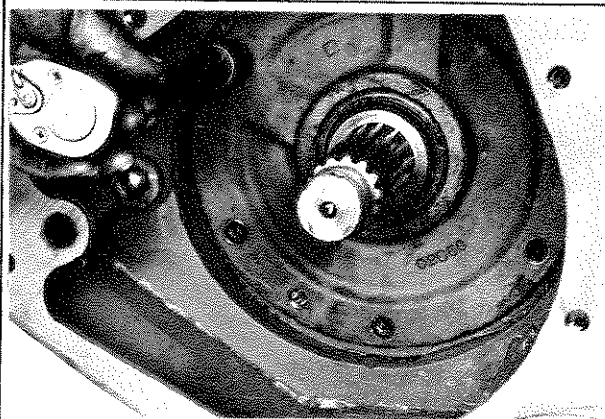
STEP 13. Lock component in place with temporary special tool and lock nuts.



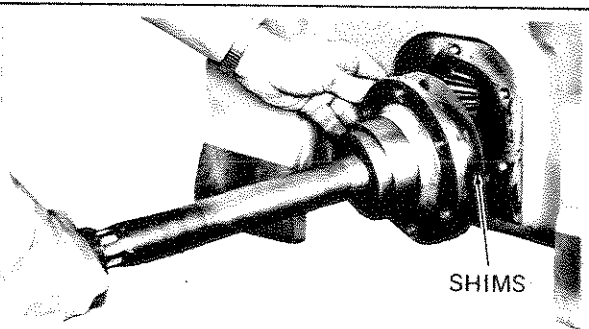
STEP 14. Apply retainer face and winch surface with John Crane or some other suitable sealant. Install shim pack previously removed and position bevel gear assembly into the winch housing.



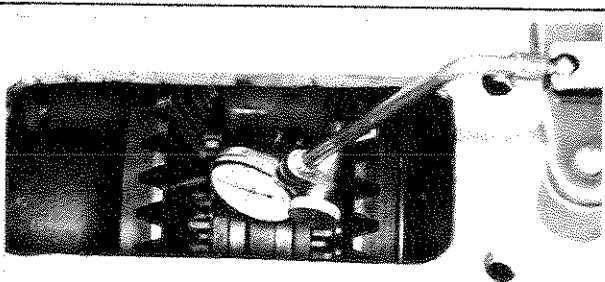
STEP 15. Seat left hand support bearing into housing by tapping on end of bevel gear shaft.



STEP 16. Using six sealing capscrews, bolt the bevel gear and brake shaft into place in the winch housing.

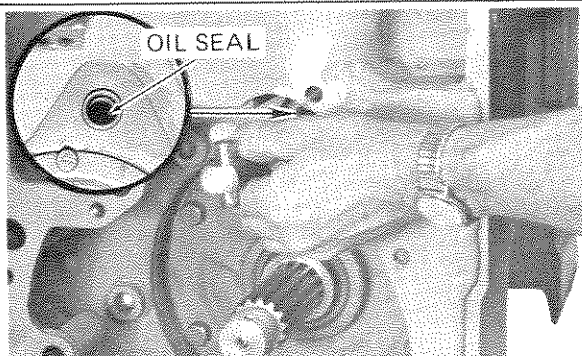


STEP 17. Install approximately 0.036 inch shim pack on PTO shaft and install shaft. Tighten capscrews securely. Check that the edge of the PTO teeth and bevel gear teeth are flush. This will provide complete tooth contact.



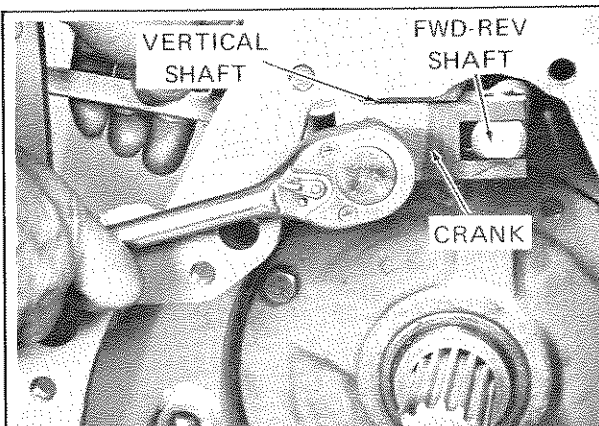
STEP 18. Connect dial indicator as shown to check pinion-to-bevel gear back lash. Backlash should be 0.006-0.014 inch. If less than 0.006, remove shims from right hand bearing retainer. If greater than 0.014, add shims to right hand bearing retainer.

Figure 5-10. Reassembly And Installation of Brake And Bevel Gear Shaft Assembly (Sheet 3 of 4)

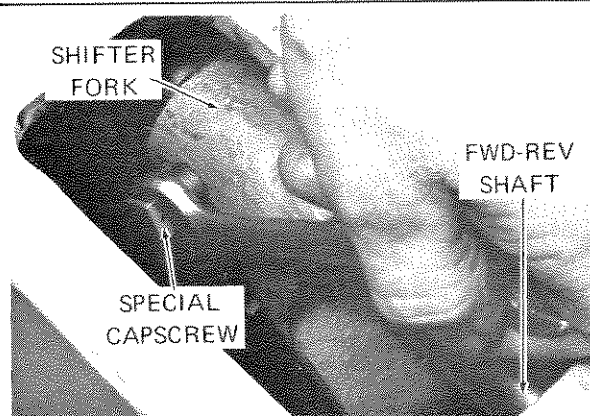


STEP 19. Push shifter shaft through hole in inner wall (between brake compartment and transmission case) with shifter fork in place.

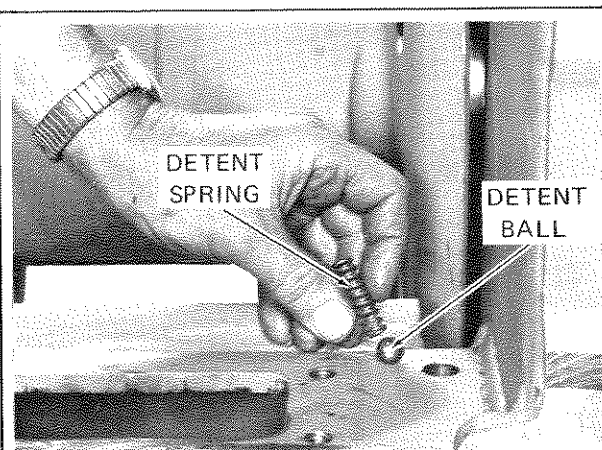
CAUTION: Be careful not to damage oil seal.



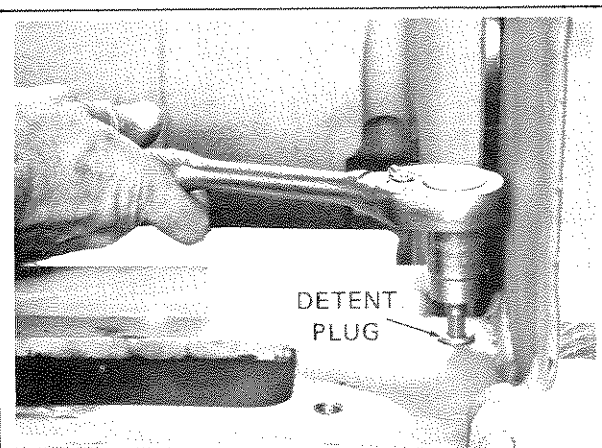
STEP 20. Position crank on shifter shaft and bolt vertical connecting linkage into place.



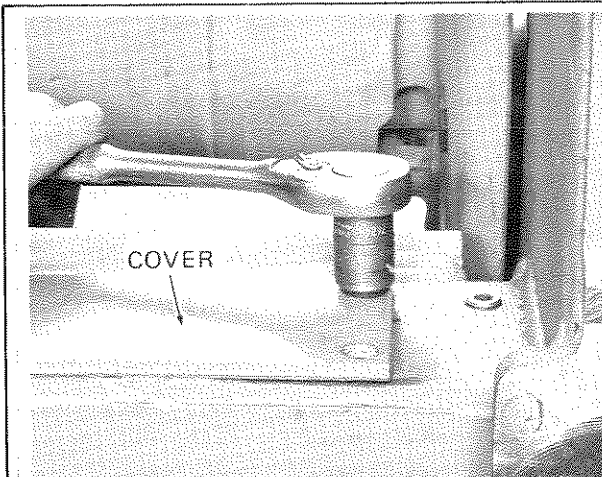
STEP 21. Secure shifter fork to shifter shaft with special capscrew. Lockwire assembly.



STEP 22. Insert detent ball and spring into place.

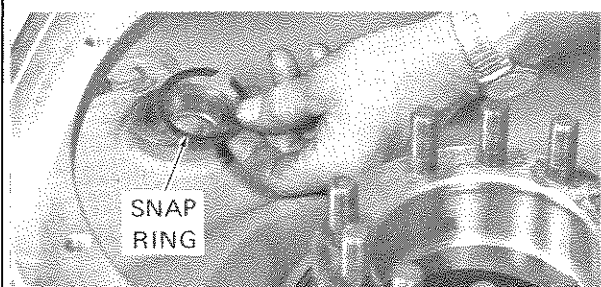


STEP 23. Tighten detent plug in place with Allen wrench.



STEP 24. Replace cover.

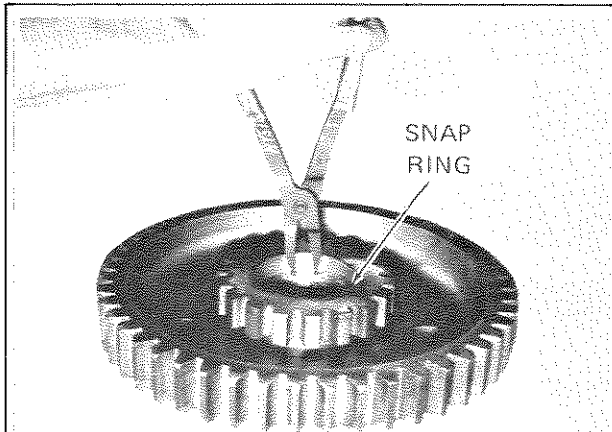
Figure 5-10. Reassembly And Installation of Brake And Bevel Gear Shaft Assembly (Sheet 4 of 4)



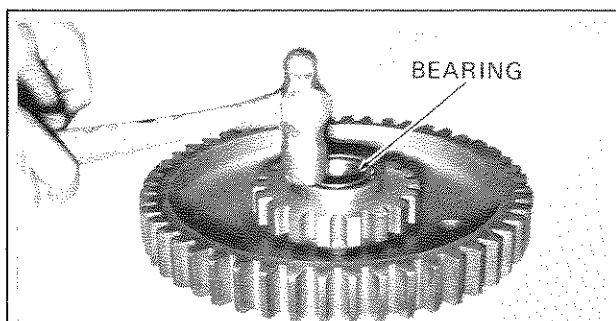
NOTE: The following illustrations are with the bevel gear shaft assembly installed. Intermediate shaft assembly is possible with the bevel gear assembly removed. The drum gear cover, drum gear and drum shaft must be removed before the intermediate shaft assembly can be installed.

STEP 1. Position snap ring over intermediate shaft recess.

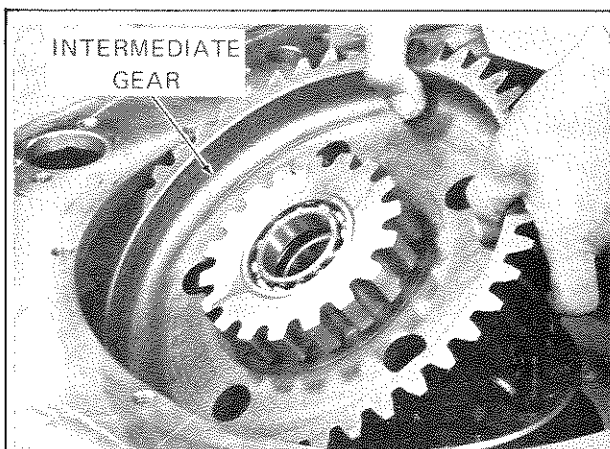
NOTE: Skip steps 2 and 3 if the intermediate gear was not disassembled.



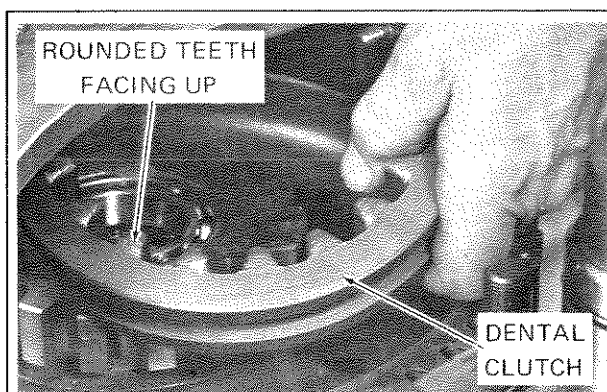
STEP 2. Position two snap rings in groove inside gear.



STEP 3. Tap two bearings into place inside the gear.

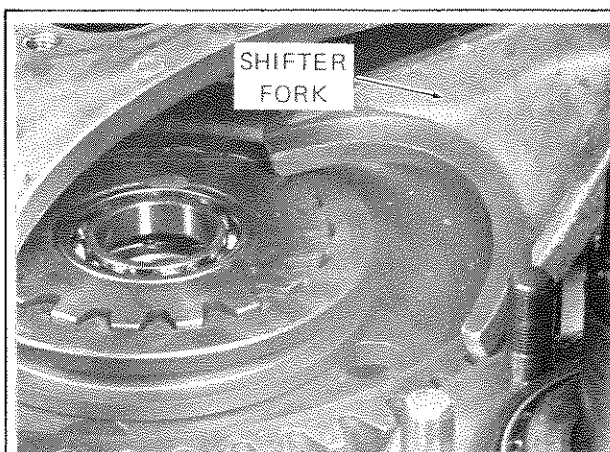


STEP 4. Position intermediate gear over snap ring.



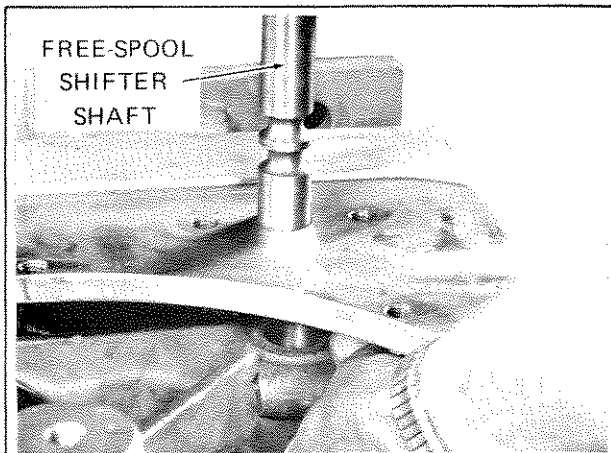
STEP 5. Place dental clutch over inside gears of the intermediate gear.

NOTE: Position dental clutch so the rounded face the drum pinion gear.

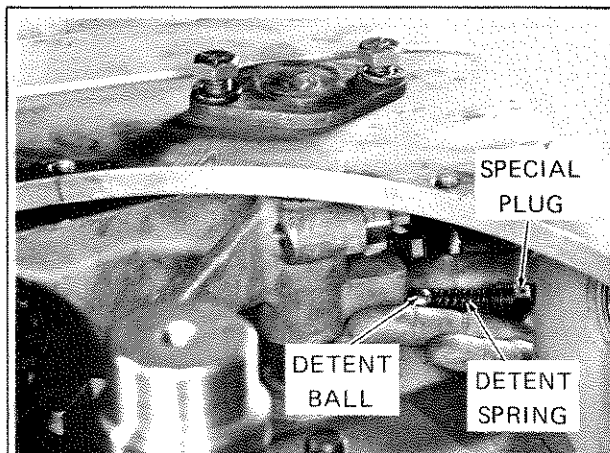


STEP 6. Slide shifter fork into position in the dental clutch.

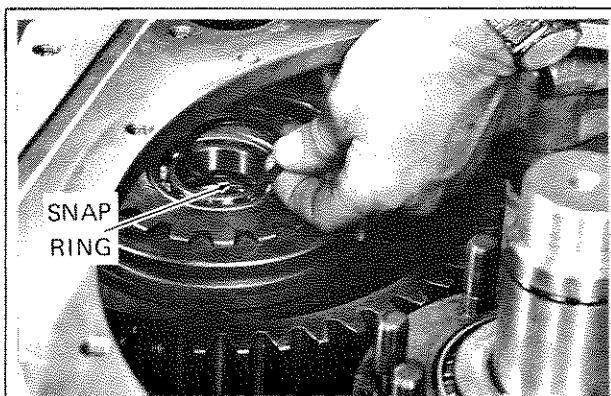
Figure 5-11. Installation of Intermediate Shaft Assembly (Sheet 1 of 3)



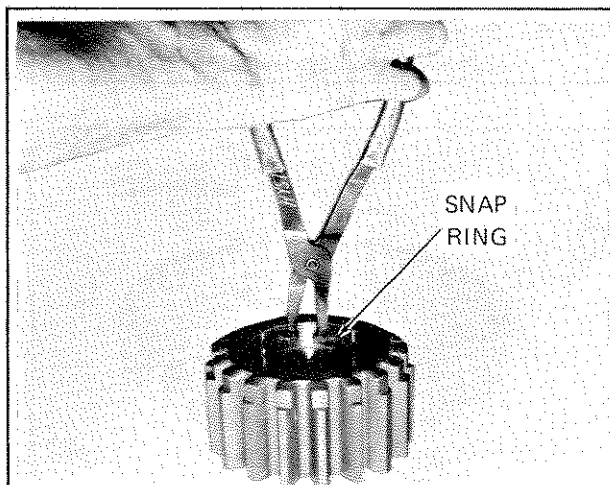
STEP 7. Push free-spool shaft through shifter fork, secure with capscrews.



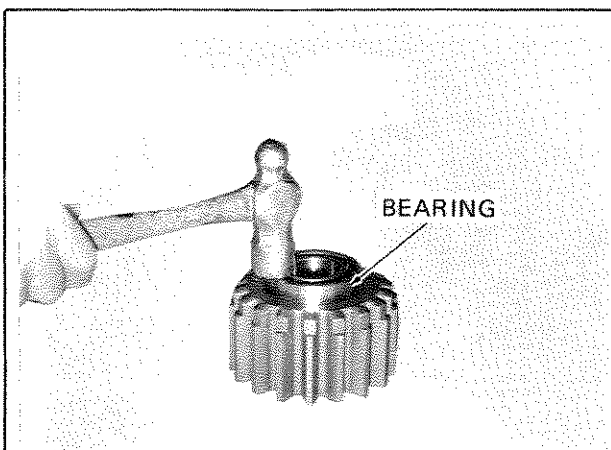
STEP 8. Install detent ball, spring and special plug. Lockwire securely.



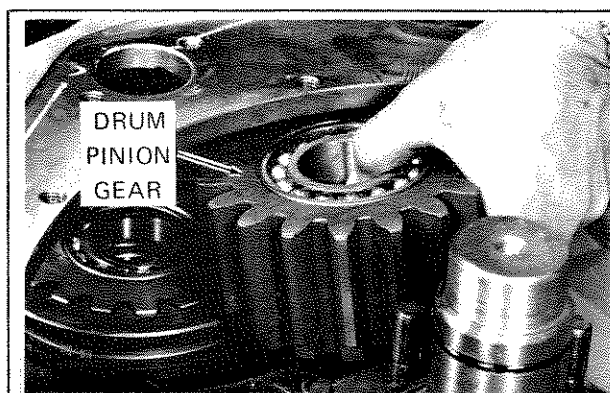
STEP 9. Position snap ring on top of intermediate gear.
NOTE: Skip steps 10 and 11 if the drum pinion gear was not disassembled.



STEP 10. Install two snap rings inside gear

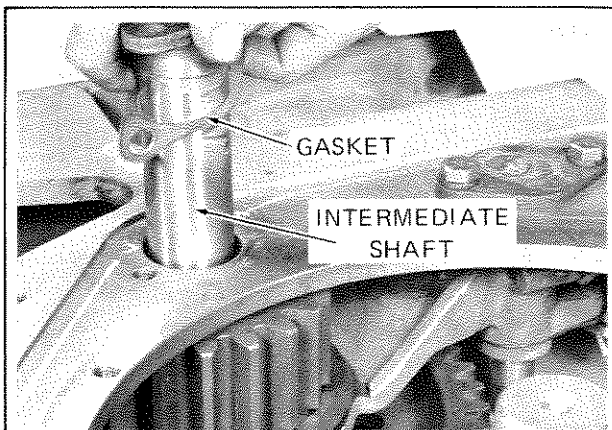


STEP 11. Tap two bearings into place against the snap rings.

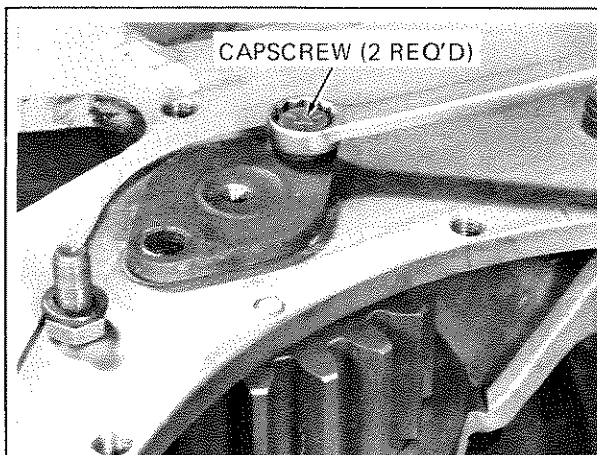


STEP 12. Position drum pinion gear on top of intermediate gear.
CAUTION: Do not dislodge the position of the snap rings.

Figure 5-11. Installation of Intermediate Shaft Assembly (Sheet 2 of 3)

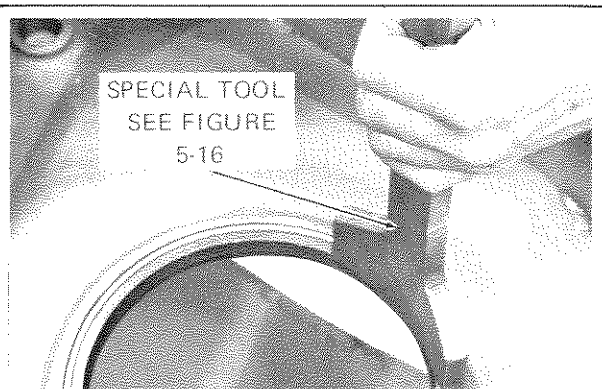


STEP 13. Tap intermediate shaft and gasket through component previously stacked.



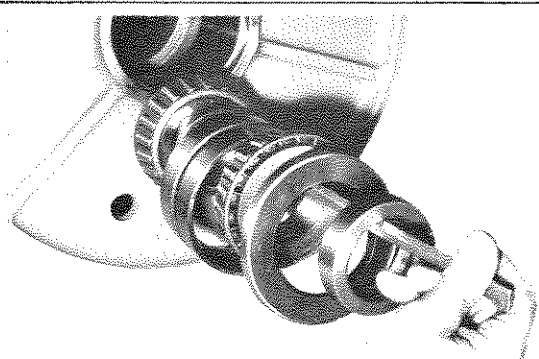
STEP 14. Bolt intermediate shaft into place with capscrews.

Figure 5-11. Installation of Intermediate Shaft Assembly (Sheet 3 of 3)



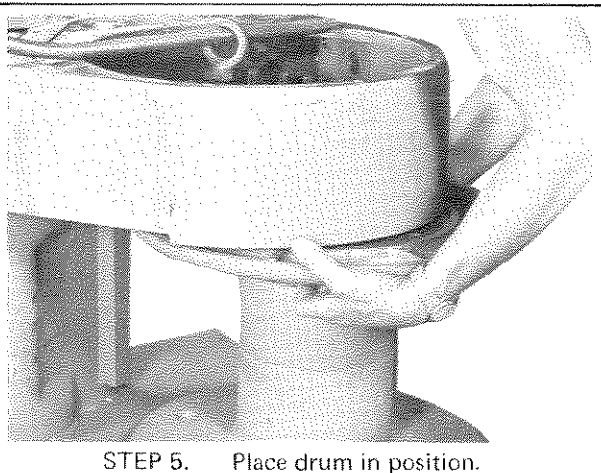
NOTE: The intermediate gear must be installed before the drum gear and cover.

STEP 1. Lubricate seal bore with petrolatum or other suitable lubricant. Install double-lip seal with smooth side down. Use seal driver as shown to prevent seal distortion.

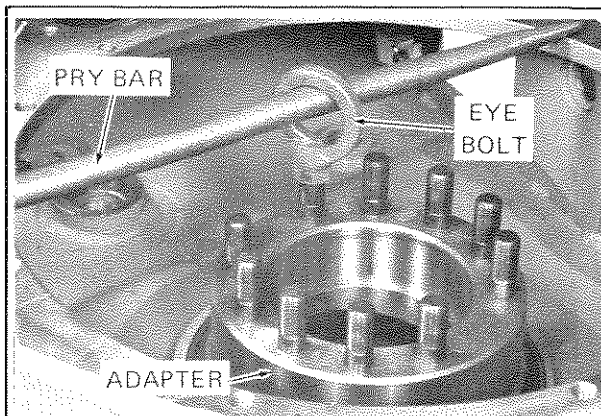


STEP 3. Lubricate left side drum bore with petrolatum, then install double-taper roller bearing seal, and spacer as shown.

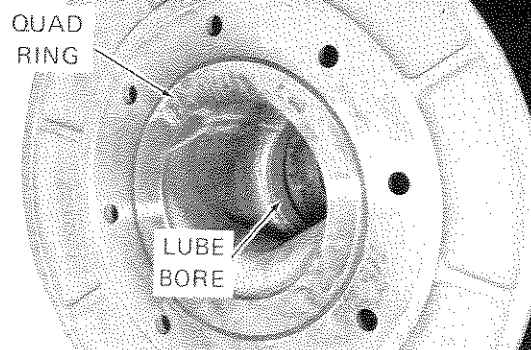
NOTE: Smooth side of seal must face down.



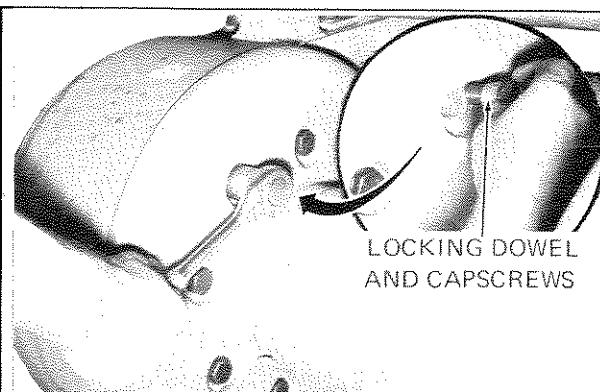
STEP 5. Place drum in position.



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

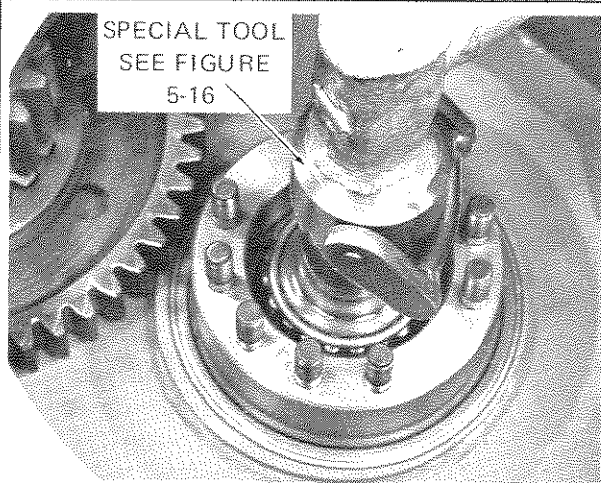


STEP 4. Lubricate right-hand drum shaft bore. Coat quad ring and groove with permatrix or other suitable compound. Install quad ring.



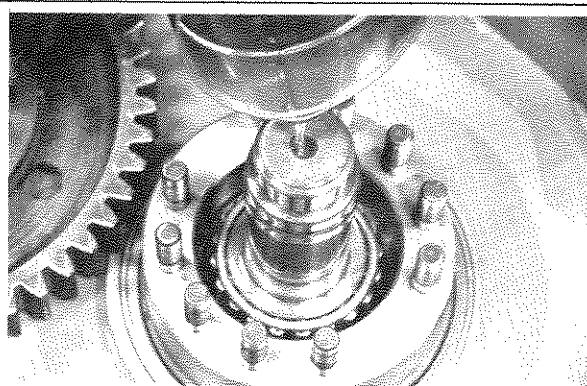
STEP 6. Align adapter and drum holes, then install the 7 locking dowels and cap screws. Tighten securely to prevent quad ring from shifting.

Figure 5-12. Installation of Drum And Drum Shaft (Sheet 1 of 3)

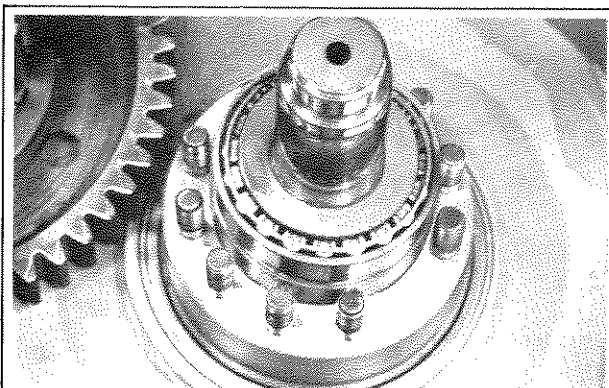


STEP 7. Drive shaft down through drum gear until shaft bottoms solidly against lower taper roller bearing.

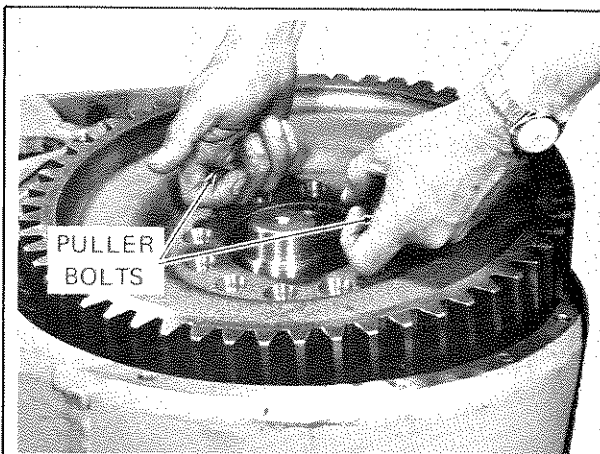
CAUTION: Hammer on special attachment only. Do not hammer on drum shaft surface.



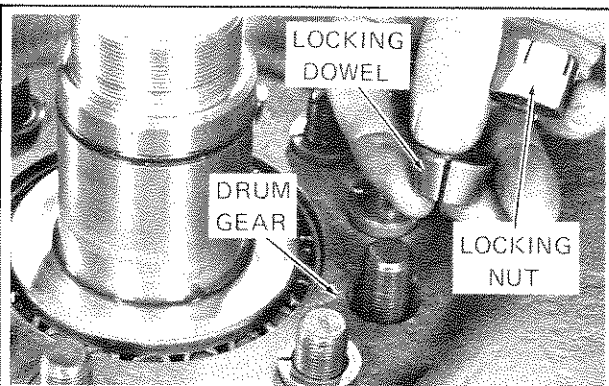
STEP 8. Prior to installing bearing, pour 1 quart SAE 90 oil over drum shaft. This will provide initial lubrication for the lower bearing assembly.



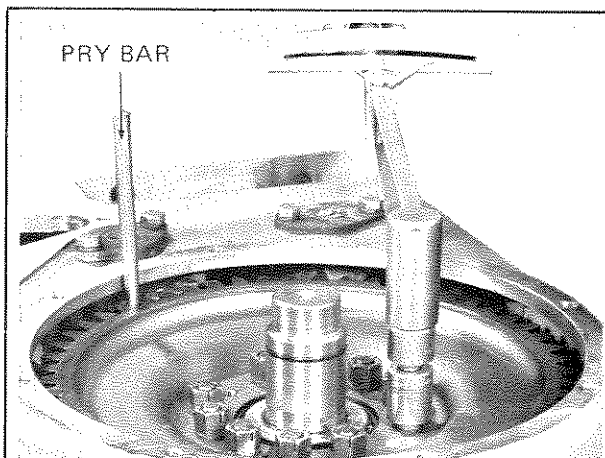
STEP 9. Install bearing assembly. Install bearing parts in sequence shown. Tap into place.



STEP 10. Install drum gear using puller bolts as hand holds.

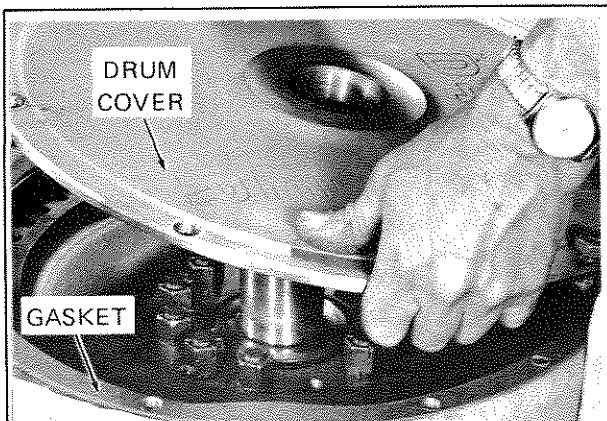


STEP 11. Lock drum gear to adapter with the ten locking dowels and nuts.



STEP 12. Torque nuts to 150 foot pounds using a bar to prevent drum gear movement.

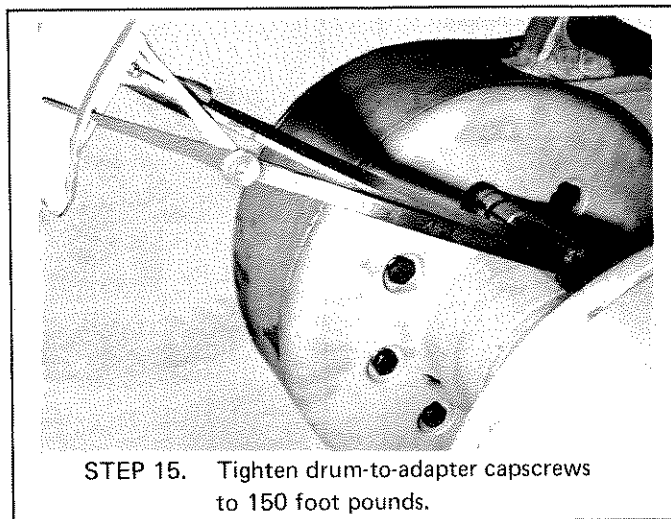
Figure 5-12. Installation of Drum And Drum Shaft (Sheet 2 of 3)



STEP 13. Lock drum gear cover with gasket in place with eight sealed capscrews and lockwashers.

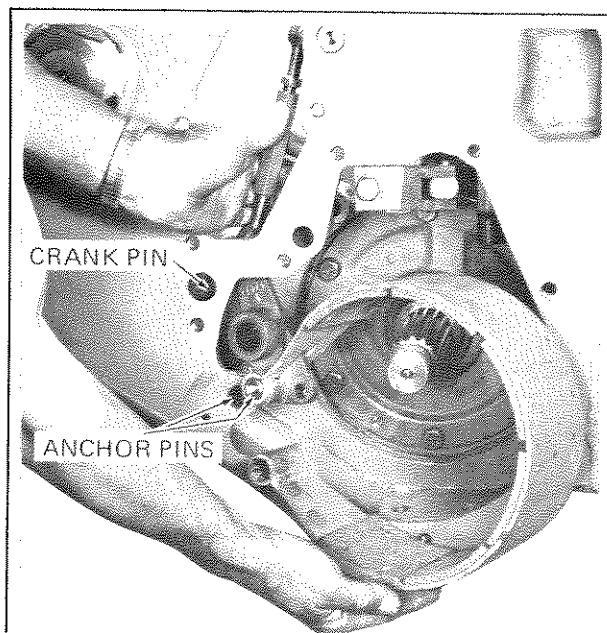
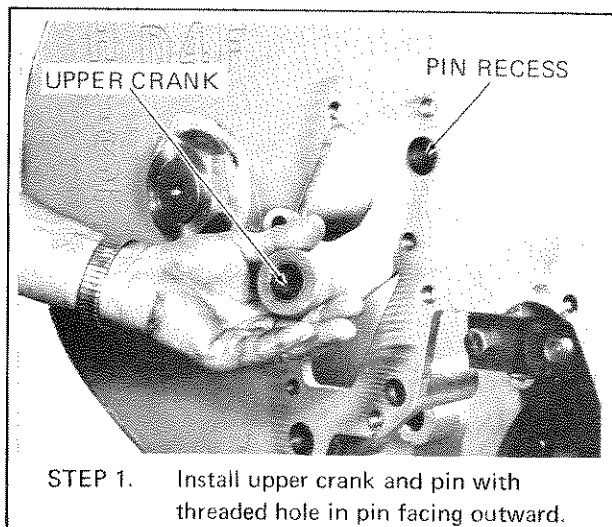


STEP 14. Coat locknut threads with permatex or other suitable sealing compound. Install nut and tighten securely as shown. Place winch in normal operating position and install locknut on opposite end of drum shaft.



STEP 15. Tighten drum-to-adaptor capscrews to 150 foot pounds.

Figure 5-12. Installation of Drum And Drum Shaft (Sheet 3 of 3)



CAUTION: Refer to paragraph 4-17 for correct pin and band arrangement (overwind or underwind).

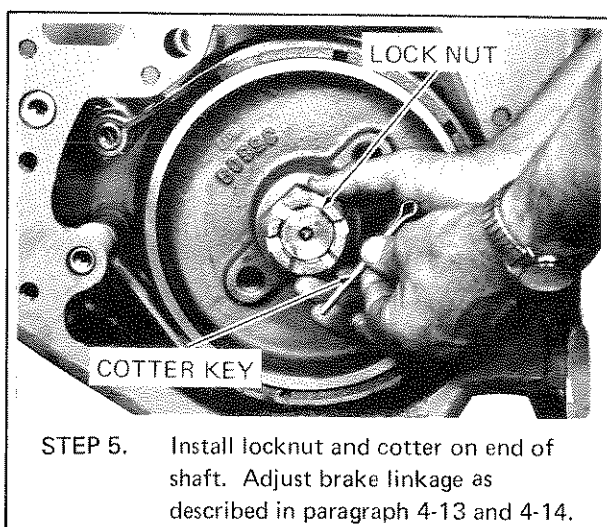
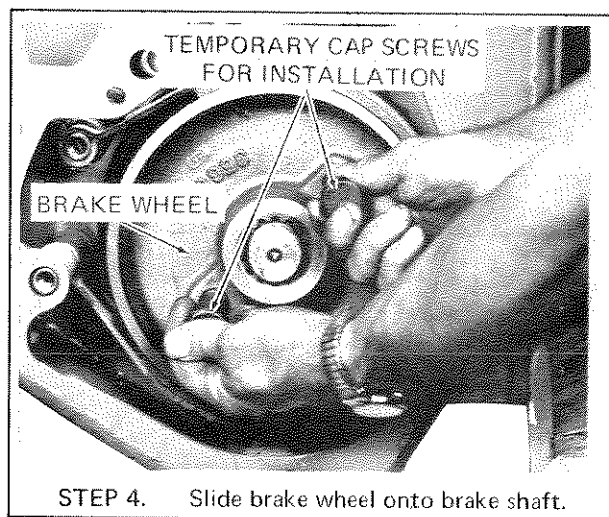
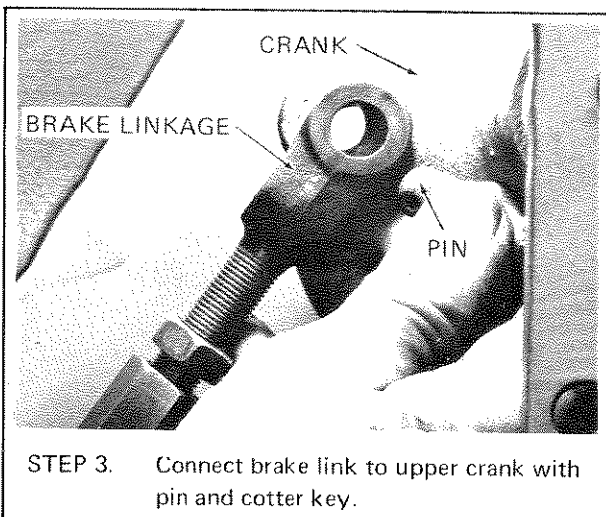
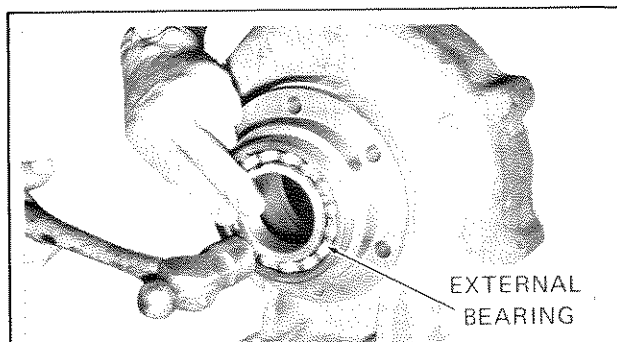
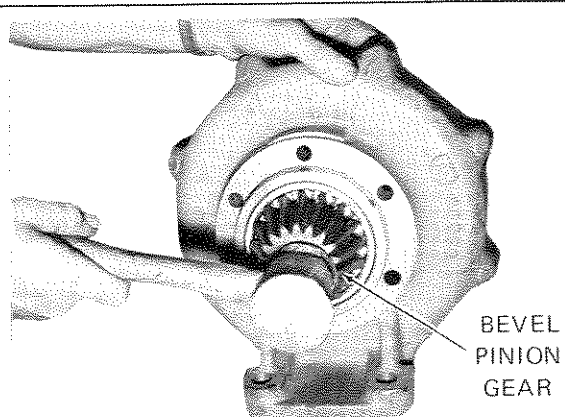


Figure 5-13. Installation Of Dry Brake And Automatic Brake

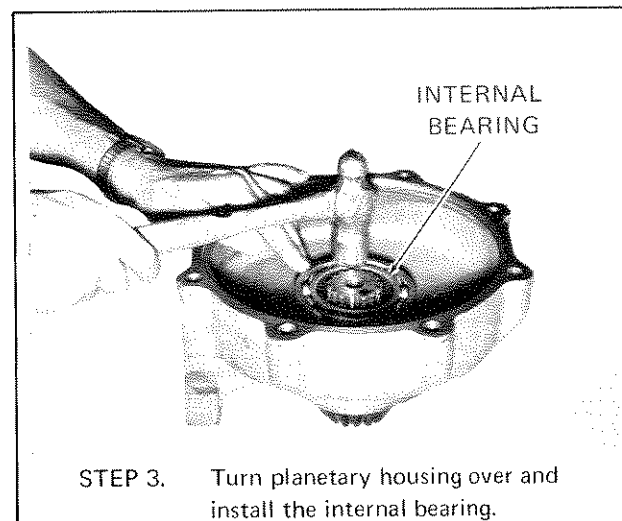


NOTE: Skip Steps 1 through 16 if it was not necessary to disassembly the PTO shaft and cover assembly or the planetary housing.

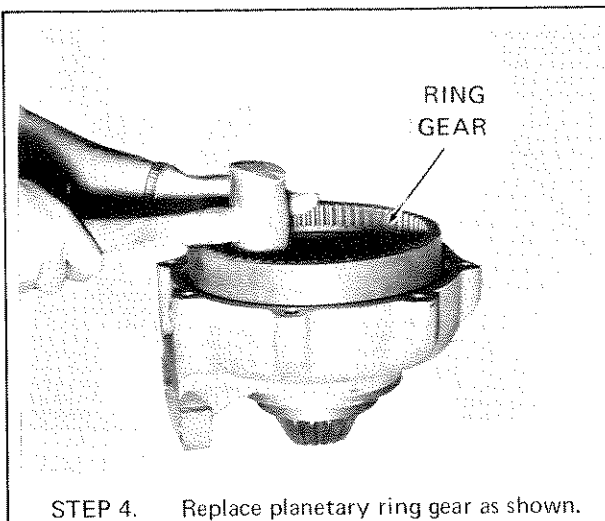
STEP 1. Tap external bearing into place in the planetary housing.



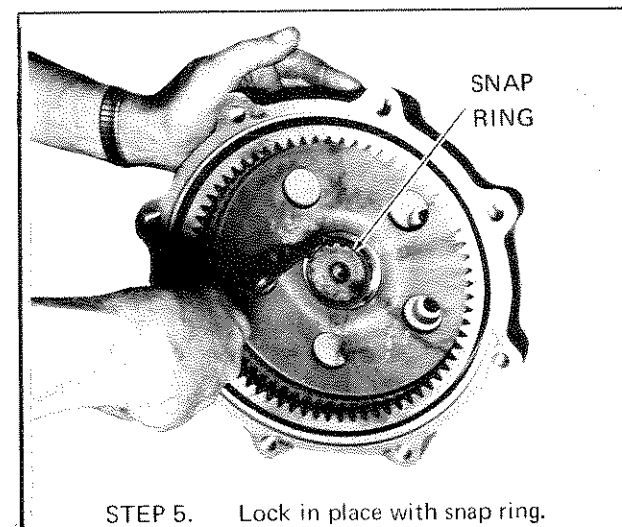
STEP 2. Tap bevel pinion gear into place in the planetary housing until it bottoms against the bearing.



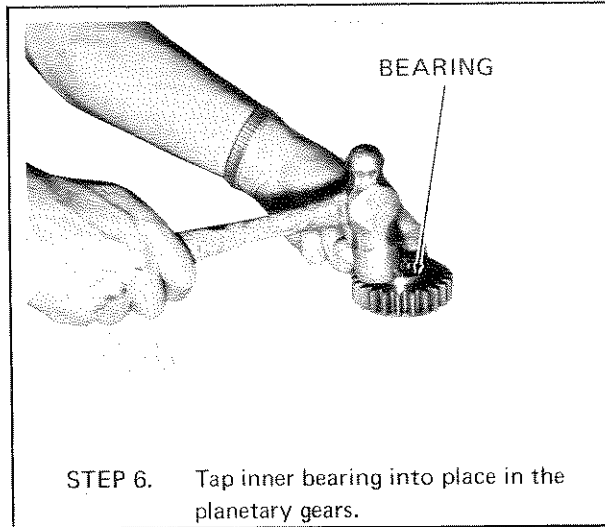
STEP 3. Turn planetary housing over and install the internal bearing.



STEP 4. Replace planetary ring gear as shown.



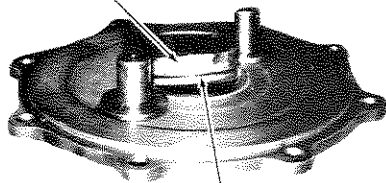
STEP 5. Lock in place with snap ring.



STEP 6. Tap inner bearing into place in the planetary gears.

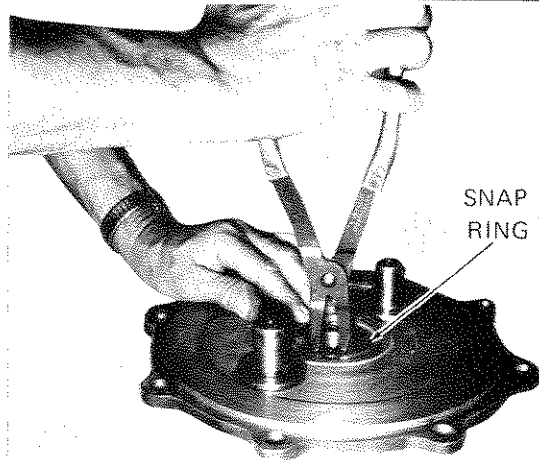
Figure 5-14. Installation of PTO Shaft Assembly — Lo-Speed (Sheet 1 of 4)

BEARING



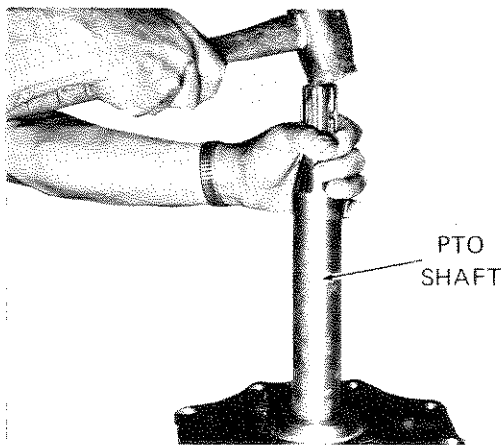
O-RING

STEP 7. Tap bearing into planetary cover.
NOTE: The external O-ring must face toward the PTO shaft as shown.



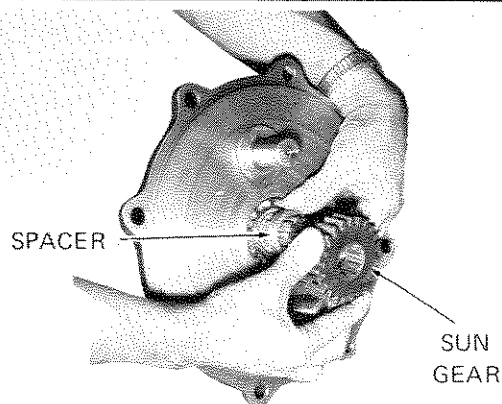
SNAP RING

STEP 8. Lock bearing in place with snap ring.



PTO
SHAFT

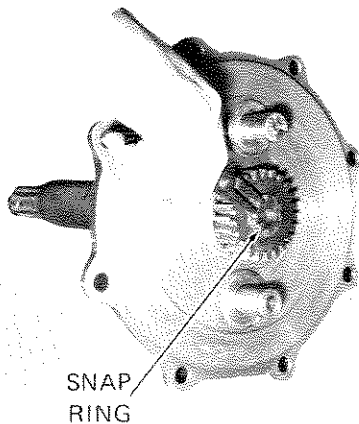
STEP 9. Drive PTO shaft through bearing until it bottoms.



SPACER

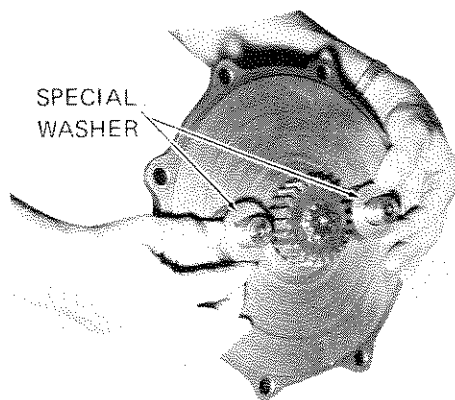
SUN
GEAR

STEP 10. Slide spacer and sun gear onto PTO shaft.



SNAP RING

STEP 11. Lock in place with snap ring.



SPECIAL
WASHER

STEP 12. Slide inside special washer over planetary gear stud.

Figure 5-14. Installation of PTO Shaft Assembly – Lo-Speed (Sheet 2 of 4)

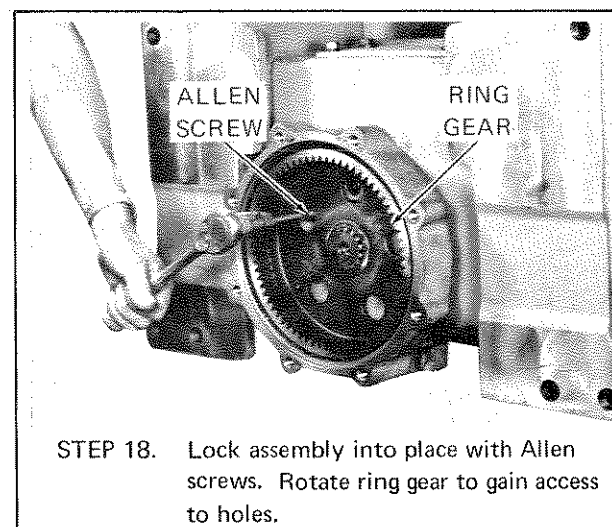
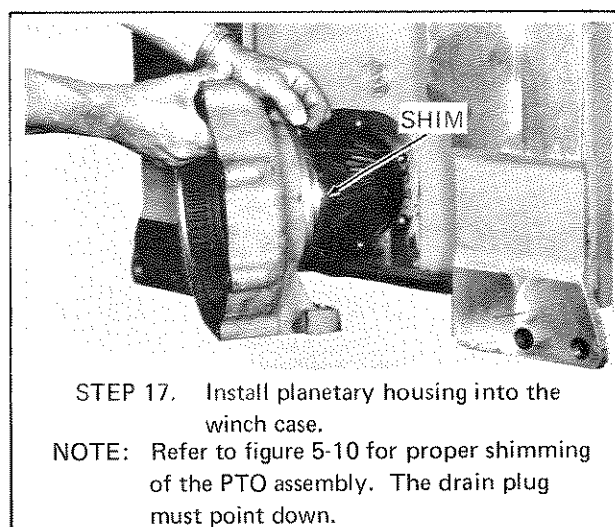
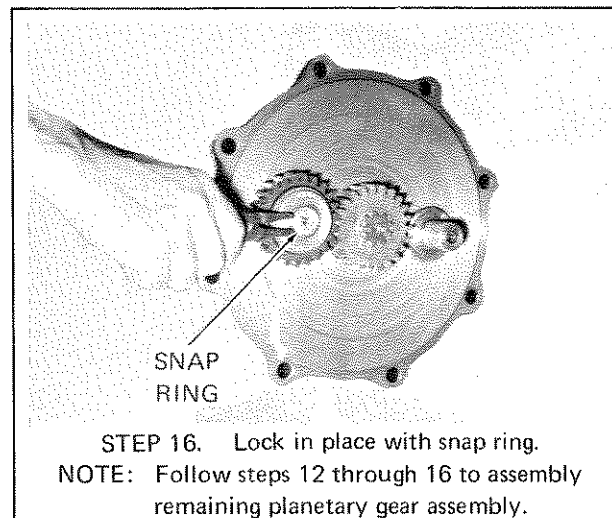
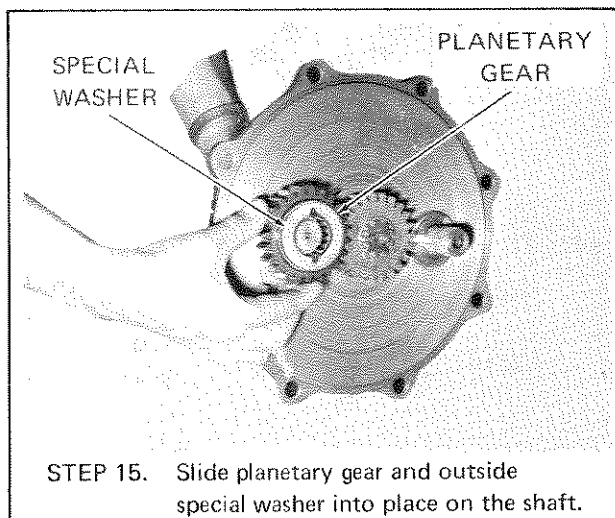
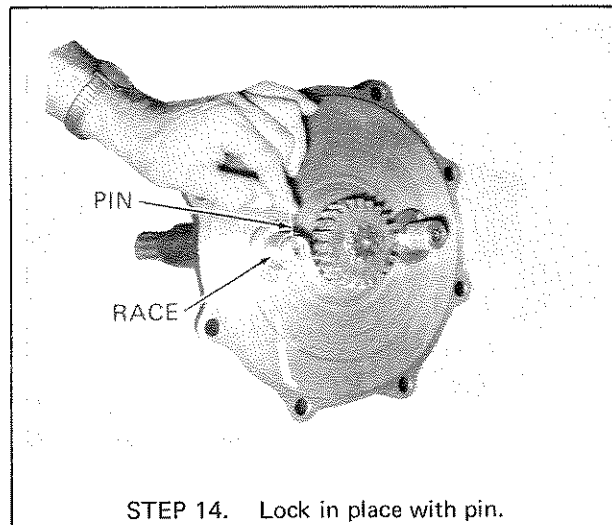
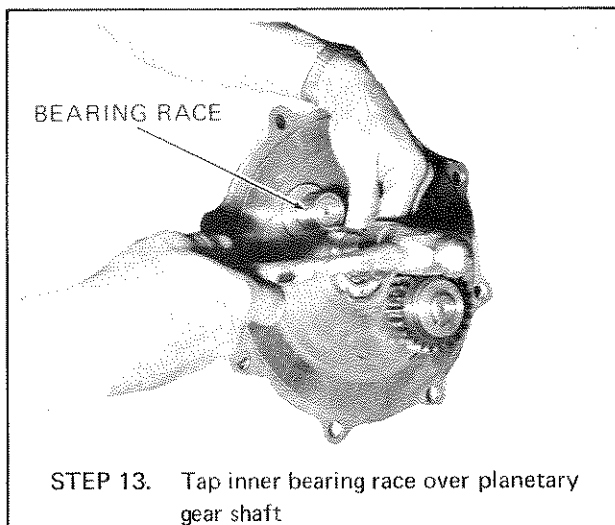
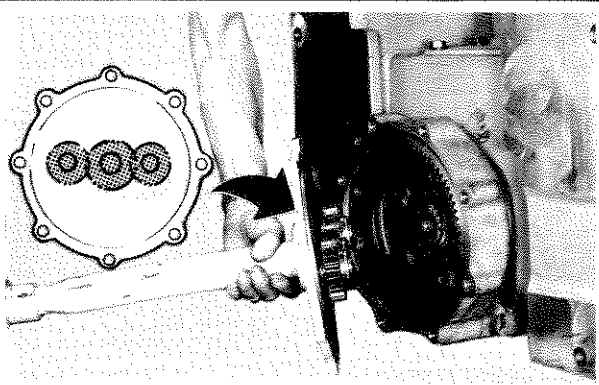
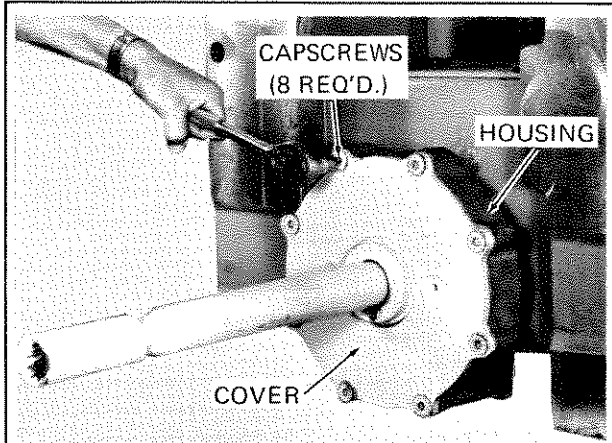


Figure 5-14. Installation of PTO Shaft Assembly — Lo-Speed (Sheet 3 of 4)



STEP 19. Position PTO shaft assembly into planetary housing.

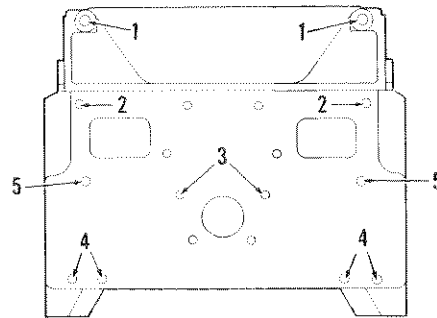
NOTE: The planetary gears must be installed on an imaginary horizontal line as shown.



STEP 20. Lock cover to housing with the eight cap screws and lockwashers.

Figure 5-14. Installation of PTO Shaft Assembly — Lo-Speed (Sheet 4 of 4)

MOUNTING STUDS



KEY

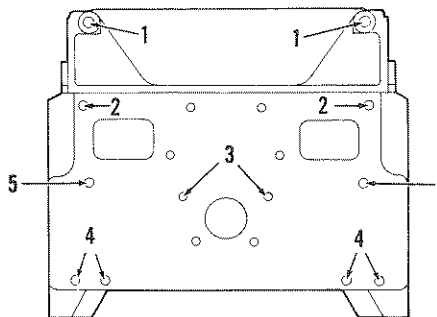
- A—FOR 955 TRAXCAVATOR SERIAL NO. 60A7642 & UP, 61H1 & UP
85J1 & UP, 48H1 & UP AND 951 TRAXCAVATOR SERIAL NO. 89A1 & UP.
B—FOR D4 TRACTOR SERIAL NO. 23A1 & UP, 39A235 & UP,
40A1095 & UP AND 955 TRAXCAVATOR SERIAL NO. 45A1 & UP.
C—FOR D4 TRACTORS SERIAL NO. 78A1 & UP AND 82J1 & UP.

REF. NO.	NAME OF PART	QTY.		
		A	B	C
1	STUD-TAPERLOCK	2	2	2
	LOCKWASHER — 7/8	2	2	2
	NUT — 7/8 UNF	2	2	2
2	STUD-TAPERLOCK	2	—	—
	*STUD-TAPERLOCK	—	2	2
	LOCKWASHER — 7/8	2	2	2
3	NUT — 7/8 UNF	2	2	2
	CORK — NO. 9	2	—	—

REF. NO.	NAME OF PART	QTY.		
		A	B	C
4	STUD-TAPERLOCK	2	—	—
	*STUD-TAPERLOCK	—	4	4
	LOCKWASHER — 7/8	4	4	4
5	NUT — 7/8 UNF	4	4	4
	CORK — NO. 5	—	—	8

*THE SAME STUDS THAT HOLD DRAWBAR
BRACKET TO TRACTOR ARE USED TO
HOLD WINCH TO TRACTOR.

MOUNTING STUDS



KEY

- A—FOR D4 TRACTORS SERIAL NO. 39A1 TO 39A234 AND 40A1 TO
40A1094, INCLUSIVE.
B—FOR D4 POWERSHIFT TRACTORS SERIAL NO. 22C1 & UP AND
83J1 & UP
C—FOR 955 TRAXCAVATORS SERIAL NO. 60A1 TO 60A3625 INCLUSIVE.

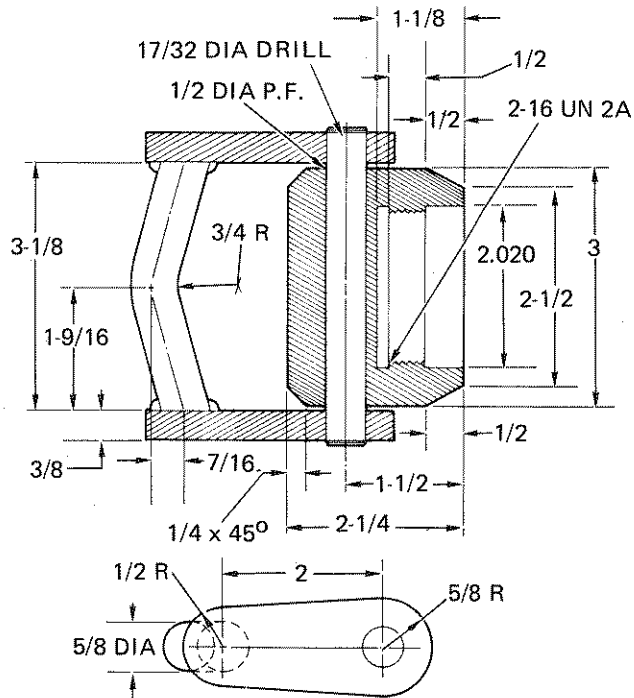
REF. NO.	NAME OF PART	QTY.		
		A	B	C
1	STUD-TAPERLOCK	—	2	—
	STUD-TAPERLOCK	—	—	2
	STUD-TAPERLOCK	2	—	—
	NUT — 7/8 UNF	2	2	2
	LOCKWASHER — 7/8	2	2	2
2	STUD-TAPERLOCK	—	2	—
	*STUD-TAPERLOCK	2	—	2
	NUT — 7/8 UNF	2	2	2
3	LOCKWASHER — 7/8	2	2	2
	CORK — NO. 9	4	4	—
	CORK — NO. 5	—	—	4

REF. NO.	NAME OF PART	QTY.		
		A	B	C
4	STUD-TAPERLOCK	—	2	—
	*STUD-TAPERLOCK	4	—	4
	NUT — 7/8 UNF	4	4	4
5	LOCKWASHER — 7/8	4	4	4
	CORK — NO. 5	—	4	—

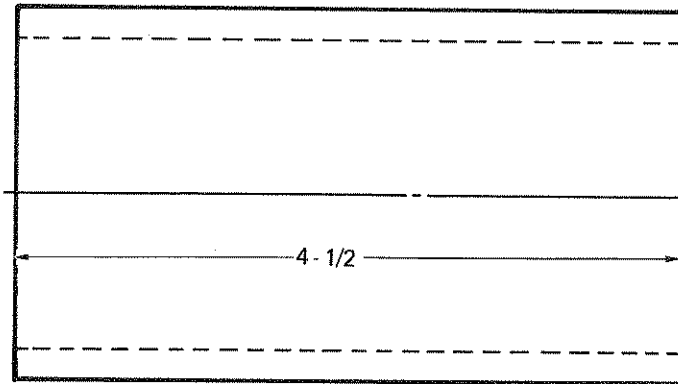
NOTE—FOR 933 TRAXCAVATOR, USE
CATERPILLAR STUDS, NUTS AND
LOCKWASHERS.

*THE SAME STUDS THAT HOLD DRAWBAR
BRACKET TO TRACTOR ARE USED TO
HOLD WINCH TO TRACTOR.

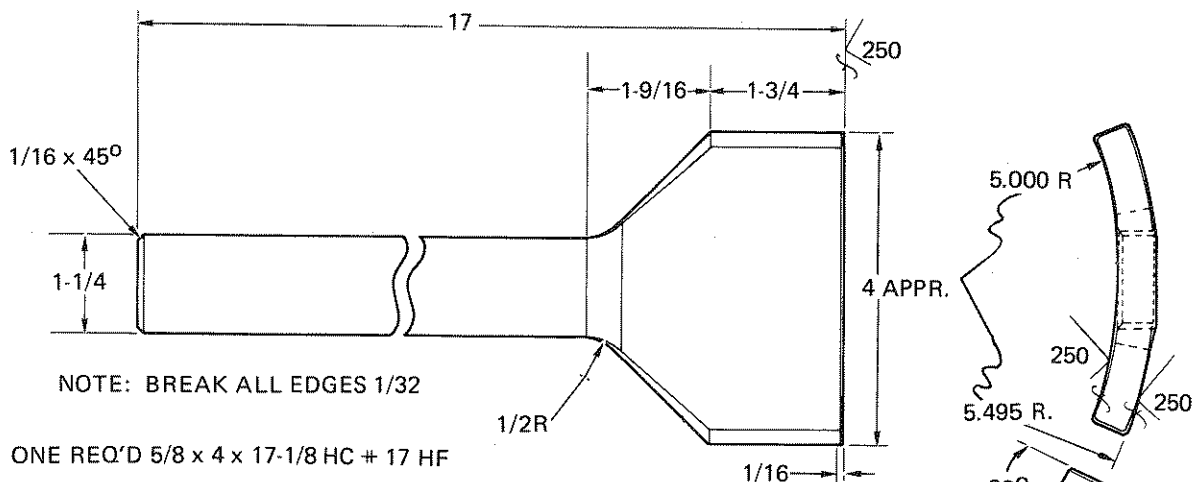
Figure 5-15. Installation of Winch On Tractor



DRUM SHAFT REMOVAL AND INSTALLATION



BRAKE AND BEVEL GEAR SHAFT INSTALLATION



NOTE: BREAK ALL EDGES 1/32

ONE REQ'D 5/8 x 4 x 17-1/8 HC # 17 HF

DRUM OIL SEAL INSTALLATION

Figure 5-16. Special Tools

**“THE
QUALITY
KEEPERS”**

**HYSTER
APPROVED
PARTS**



HYSTER COMPANY

TRACTOR ATTACHMENT OPERATIONS