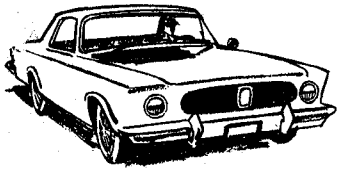
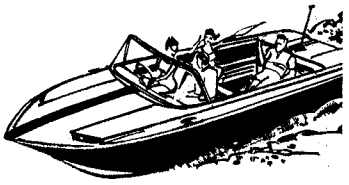
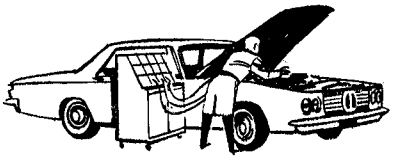
E-30-PS WINCH

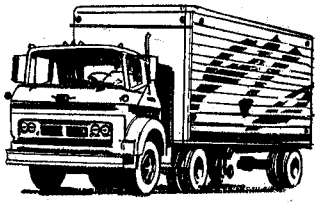
AUTOMOTIVE MECHANICS





AM-1 thru AM-5





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OPERATOR'S SECTION

FOR CARCO SERVICE AND PARTS MANUAL

Carco Model E-30-PS Winch

(POWER SHIFT FRICTION CLUTCH)

CONTENTS

GENERAL DESCRIPTION

The Carco Model E-30-PS Winch, with power controls, is a single-drum, single-speed unit that mounts on the rear face of the tractor main frame. The winch gear train receives power from the tractor power take-off.

Two power-operated, disc-type clutches and a spring-applied, power-released brake actuator provide finger-tip control of the winch. One clutch is for forward cable drum rotation to wind in wire rope, and the other is for reverse rotation to pay out wire rope.

A two-spool hydraulic control valve mounts near the tractor controls for operator convenience. A hydraulic pump, driven by the tractor engine, supplies power to operate the clutches and brake actuator.

The lubricating oil in the winch gear case is used also by the hydraulic system. The hydraulic pump circulates the oil through two filters to remove foreign matter. This protects the hydraulic system components and the winch gears and bearings.

A free-spool mechanism in the winch permits the cable drum to turn independently of the winch gear train.

The E-30-PS Winch can be converted from overwound to underwound cable drum rotation without additional parts.

OPERATION

The E-30-PS controls include a manually operated, two-spool control valve and a free-spool control knob. The left-hand, three-position, spring-centered valve spool routes hydraulic pressure to the brake actuator and winch clutches. The right-hand, three-position, detent-held spool routes pressure to the brake actuator only.

Moving the left-hand valve handle toward the operator applies hydraulic pressure to the brake-release piston in the actuator and the forward clutch in the winch to wind in wire rope. Releasing the handle permits it to return to center position, releasing the hydraulic pressure.

Moving the left-hand valve handle

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1387-F-9-1-62

OPERATING INSTRUCTIONS

away from the operator applies hydraulic pressure to the brake release piston and the reverse clutch to pay out wire rope.

WARNING: Never use the reverse clutch to lower a load.

Moving the right-hand valve handle from center position into either control position applies pressure to the brake-release piston in the actuator. Moving the handle back to center position releases the pressure and sets the winch brake. This brake-release spool in the valve permits the operator to drop a load and move the tractor to firmer footing without stopping forward motion.

CAUTION: Do not operate tractor with brake-release spool left needlessly in control position, or damage to relief valve will result.

The winch free-spool control knob is located at the winch left side. The mechanism is engaged when the knob is in. A detent assembly holds the mechanism in either engaged or released position. When the mechanism is engaged, the gear train will turn the cable drum, and the winch brake will hold the drum from turning.

CAUTION: Never operate winch with free-spool mechanism only partially engaged, or serious damage to winch will result.

To release free-spool mechanism, be sure cable drum is not under load, and pull control knob out as far as it will go.

To engage free-spool mechanism, push control knob in as far as it will go. It may be necessary to turn cable drum or winch gears slightly so splines will mate.

LUBRICATION

Gear Case Oil

Before operating winch, be sure it is filled to oil level plug with proper grade and weight of oil as instructed below and on winch identification plate.

After one week or 40 hours of operation, whichever occurs first, drain oil from winch and hydraulic system. Remove and clean magnetic drain plug at bottom right side of winch, and remove pipe plug from cover on suction filter. Allow oil to drain out of filter into winch case, and remove cover and element. Clean suction filter element and replace pressure filter element as instructed under Oil Filter Service.

Install plugs and refill winch and hydraulic system to proper level with clean oil of recommended grade and weight. Run tractor engine at idle speed for approximately five minutes to remove air from hydraulic system, and add sufficient oil to winch to bring oil to proper level.

NOTE: Fill winch through plug opening in bevel gear cover, or, if this opening is concealed when winch is installed, fill through oil level opening in right side of winch by installing temporarily a 1-1/4-inch NPT street elbow into opening.

Use weight of oil as follows for various temperatures:

OPERATING INSTRUCTIONS

1. Oil recommended by tractor manufacturer for power-shift transmission.

or

2. Below 32° F -- torque converter fluid, Type A.
   Above 32° F -- S.A.E. 10, S.A.E. 10W, or torque converter fluid, Type C. (Use high-quality, non-foaming oil.)

Change oil in winch and hydraulic system every 600 hours or three months of operation, whichever occurs first. Service suction and pressure filters whenever oil is changed. When operating in extreme humidity and temperature or dust conditions, change oil more often. Change oil at recommended intervals even if winch is not used.

NOTE: High humidity causes condensation inside the winch. Remove magnetic drain plug and drain water from bottom of case periodically before starting day's operation to prevent corrosion and rusting of internal parts.

Oil Filter Service

Service both oil filters when oil in winch case is changed.

To clean suction filter element, remove pipe plug from cover and wait a few minutes for oil to drain into winch. Loosen hose clamp and disconnect hose from cover. Provide a pan to catch any oil remaining in housing, remove nuts, lock washers, and cap screws securing cover, and remove cover with filter element attached. Clean element in solvent, clean inside of housing, and install element and cover, making certain gasket is in place. Install cap screws, lock washers, nuts, and plug. Reconnect hose, making certain clamp is tight.

To replace pressure filter element, remove screws securing filter to tractor. Disconnect inlet and outlet lines from filter, catching oil that leaks out in appropriate container.

CAUTION: Plug open end of each line to prevent entry of foreign matter, or failure of the system may result.

Remove filter from tractor. Remove two-piece clamping ring, cover (with relief valve attached), and filter element. Discard element and rubber sealing ring around top of housing. Wash all other parts in solvent ending with clean solvent rinse. Install new sealing ring furnished with new element into groove at top of filter housing. Install new element, making certain rubber gasket at each end is seated in its groove, and element is properly positioned over hollow stem at bottom of housing. Install cover being careful to seat spring and relief valve properly, and install clamping ring. Connect inlet line from pump to side of housing and outlet line to bottom, and secure filter to tractor.

Brake Shaft Lubrication

Every 200 hours or one month of operation, whichever occurs first, grease three points along brake shaft with water-repellent pressure grease.

Remove hex-head plug from bearing guard, install grease fitting, and pump in grease until clean grease shows around bearing guard. Wipe excess

OPERATING INSTRUCTIONS

grease from around guard, remove fitting, and install plug. To expose one grease point, remove brake drum as follows:

Remove protective cap from brake actuator piston rod. Remove tension from brake cable by method A or method B below.

Method A: Insert screwdriver into slot in end of control cable extension rod at center of actuator adjustment nut to hold rod from turning. Turn adjustment nut counterclockwise to loosen cable. When extension rod is in as far as it will go, and adjustment nut begins to back out of piston rod, proceed with brake drum removal and brake shaft lubrication as directed below.

Method B: Disengage winch free-spool mechanism. Start tractor engine. Move control valve brake-release handle into control position to release brake, and turn actuator adjustment nut counterclockwise to loosen control cable. Move control handle back to center position, and stop tractor engine. Proceed with brake drum removal and brake shaft lubrication as directed below.

Remove brake cover and gasket from winch, being careful not to damage gasket. Remove cap screws, and retaining washer securing brake drum on shaft, and slide brake drum and spacer or spacers off shaft. Remove plug exposed by removing drum, install grease fitting, and pump in grease until clean grease shows around bearing guard.

Remove fitting, replace plug, and wipe inside of brake compartment clean of all lubricant. Install brake drum and related parts in reverse order of removal. Tighten cap screws securing retaining washer only enough to draw them snug. Do not distort washer.

Refer to BRAKE ADJUSTMENT, Adjustment at Actuator and Winch, and adjust brake.

BRAKE ADJUSTMENT

NOTE: If 1/2 inch of threads (12 threads) on the control cable extension rod are exposed beyond the brake actuator adjustment nut outer end, adjust brake as directed under Adjustment at Actuator and Winch. If cable extension rod is flush with outer end of adjustment nut, or if less than 1/2 inch of threads are exposed, adjust brake as directed under Adjustment at Actuator Only.

Adjustment at Actuator Only

Refer to NOTE above for conditions permitting adjustment at actuator only.

Disengage winch free-spool mechanism.

Remove protective cap from actuator piston rod.

Start tractor engine, move winch control valve brake-release spool into either control position to release the brake, and turn adjustment nut clockwise to tighten brake band.

Move brake-release handle into center position occasionally, and check distance from face of actuator cylinder to point where actuator piston

OPERATING INSTRUCTIONS

rod begins to taper smaller. Turn adjusting nut clockwise until this taper point is 1/2 inch from cylinder face when control valve is in center position, or until adjustment nut bottoms out on threads on control cable extension rod.

NOTE: The knurled band on the protective cap is 1/2 inch wide.

Install protective cap, and engage free-spool mechanism.

CAUTION: Be sure brake-release handle does not remain in control position longer than necessary to make adjustment, or damage to relief valve will result.

Adjustment at Actuator and Winch

Disengage winch free-spool mechanism.

Remove protective cap from actuator piston rod.

Start tractor engine, move winch control valve brake-release spool into either control position to release brake, and turn adjustment nut counterclockwise until end of control cable extension rod is just flush with outer end of nut. Push nut in against piston rod.

Move control valve brake-release handle into center position, and install protective cap onto piston rod.

Remove brake cover and gasket from winch, being careful not to damage gasket.

Make sure control cable rod end is threaded into yoke inside winch to full thread depth of yoke, and jam nut is tight against yoke. Check tightness of setscrews and jam nuts securing control cable armor in winch case and actuator.

NOTE: Brake adjustment jam nut is left-hand thread.

Loosen jam nut against adjustment nut, move control valve brake-release handle into control position to release brake, and tighten adjustment nut until actuator piston rod travel is 1/2 inch from brake-release position to brake-applied position.

NOTE: The knurled band on the protective cap over the end of the actuator piston rod is 1/2 inch wide.

Operate control valve left-hand handle in forward and reverse positions several times to make certain piston rod travel is correct. When band is tight enough, hold adjustment nut and tighten jam nut.

Install gasket and brake cover onto winch, and engage free-spool mechanism.

OPERATING INSTRUCTIONS

CONTROL VALVE RELIEF PRESSURE ADJUSTMENT

Adjust relief valve pressure setting as follows:

Pull out spool control knob on winch to disengage cable drum from gear train.

Remove acorn cap on relief valve, loosen jam nut, and back out adjusting screw until all threads are exposed.

Remove outside plug over brake release spool, and install pressure gauge rated at 600 psi or more. Move brake release handle to position nearest the operator.

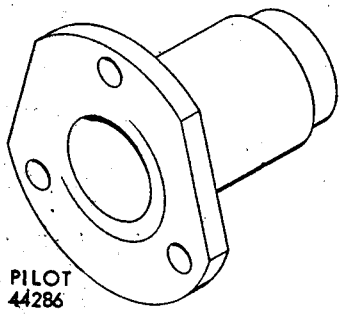
With engine running at low idle, pull clutch control handle toward the operator to engage the forward clutch. Turn the relief valve adjusting screw clockwise until the pressure gauge shows 180-200 psi. Hold adjusting screw in position and tighten jam nut. Recheck pressure reading. Install acorn nut.

Push control handle away from the operator to engage the reverse clutch, and observe pressure gauge. Pressure should be approximately 230 psi.

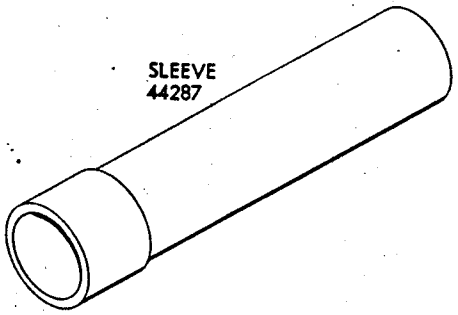
Move clutch control handle to neutral position, and observe pressure gauge. Pressure should be approximately 250 psi.

Stop tractor engine, and move brake release handle into its opposite position. When gauge pressure has dropped to zero, move brake control handle to neutral. Remove gauge, and install plug. Push in spool control knob to engage the cable drum.

SERVICE INSTRUCTIONS



PILOT
44286



SLEEVE
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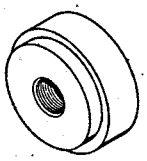
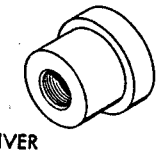


DRIVER
44289



DRIVER
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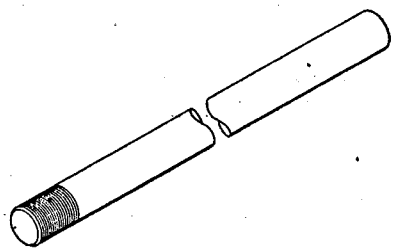
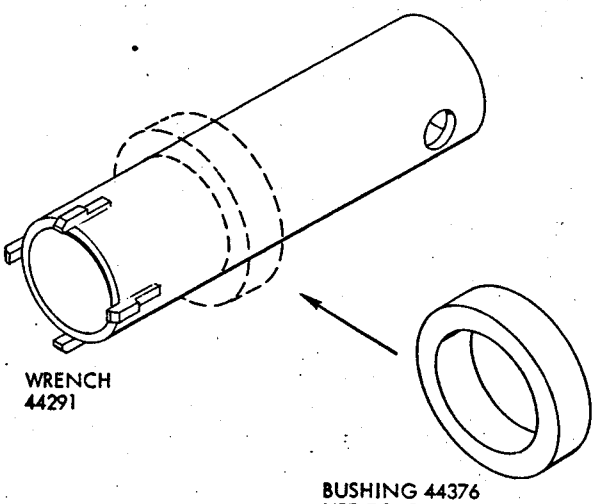


ROD
44290

SEAL REPLACER T-9
(GRESEN MFG. CO.)



WRENCH
44291

BUSHING 44376
USE TO CENTER WRENCH
44291 IN WINCH CASE BORE

SPECIAL TOOLS

SERVICE SECTION

FOR CARCO SERVICE AND PARTS MANUAL

Carco Model E-30-PS Winch

(POWER SHIFT FRICTION CLUTCH)

CONTENTS

GENERAL INSTRUCTIONS

This manual contains procedures for complete disassembly and assembly of the winch. Some parts may be replaced without disassembly of related parts; in these instances certain disassembly and assembly steps included here will not be necessary.

During disassembly, care should be taken not to damage gaskets, shims, O-rings, and oil seals that are to be reused. Replace any of these parts that become damaged.

CAUTION: Do not run tractor engine after oil is drained from winch unless winch hydraulic pump is first disconnected from tractor engine.

During assembly, coat threads of all cap screws that penetrate gear and clutch compartments with 3-M Mastic EC-979, or equal.

During servicing, protect all exposed hydraulic ports and fittings with caps or plugs to prevent contamination of hydraulic system.

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SUPERSEDES
1400-F-11-15-62

PREPARATION FOR DISASSEMBLY

Disengage winch free-spool mechanism.

Remove wire rope from cable drum, and clean outside of winch.

Release brake tension as follows:

Remove protective cap from brake actuator piston rod. Start tractor engine and let run at idle speed. Move control valve brake-release handle into control position, and turn actuator adjustment nut counterclockwise to remove nut from end of control cable extension rod. Move control handle to center position, and stop tractor engine.

If hydraulic system is not operative, insert screwdriver through actuator adjustment nut into slot in end of control cable extension rod, hold to prevent turning, and turn nut counterclockwise to remove.

Loosen jam nut and setscrew securing control cable armor in brake actuator. Remove cable and extension rod from actuator.

Drain oil from winch and hydraulic system. Remove magnetic drain plug from winch case and pipe plug from cover on suction filter, allowing oil to drain out of filter into winch.

Disconnect inlet and outlet hoses from suction filter, and remove filter from tractor.

Disconnect two pressure lines at collector ring cap and return line at elbow on bevel gear cover.

Support winch with chain block or hoist of not less than one-ton capacity, and remove cap screws, nuts, and washers securing winch to tractor. Move winch back while threading brake control cable back out of tractor.

When winch and P.T.O. shaft are clear of tractor, cover P.T.O. opening in rear of tractor to protect internal parts and oil.

CABLE DRUM, BULL GEAR, AND FREE SPOOL MECHANISM

Disassembly

See Figure 1.

Remove cap screws, washers, drum shaft bearing cap, and shims.

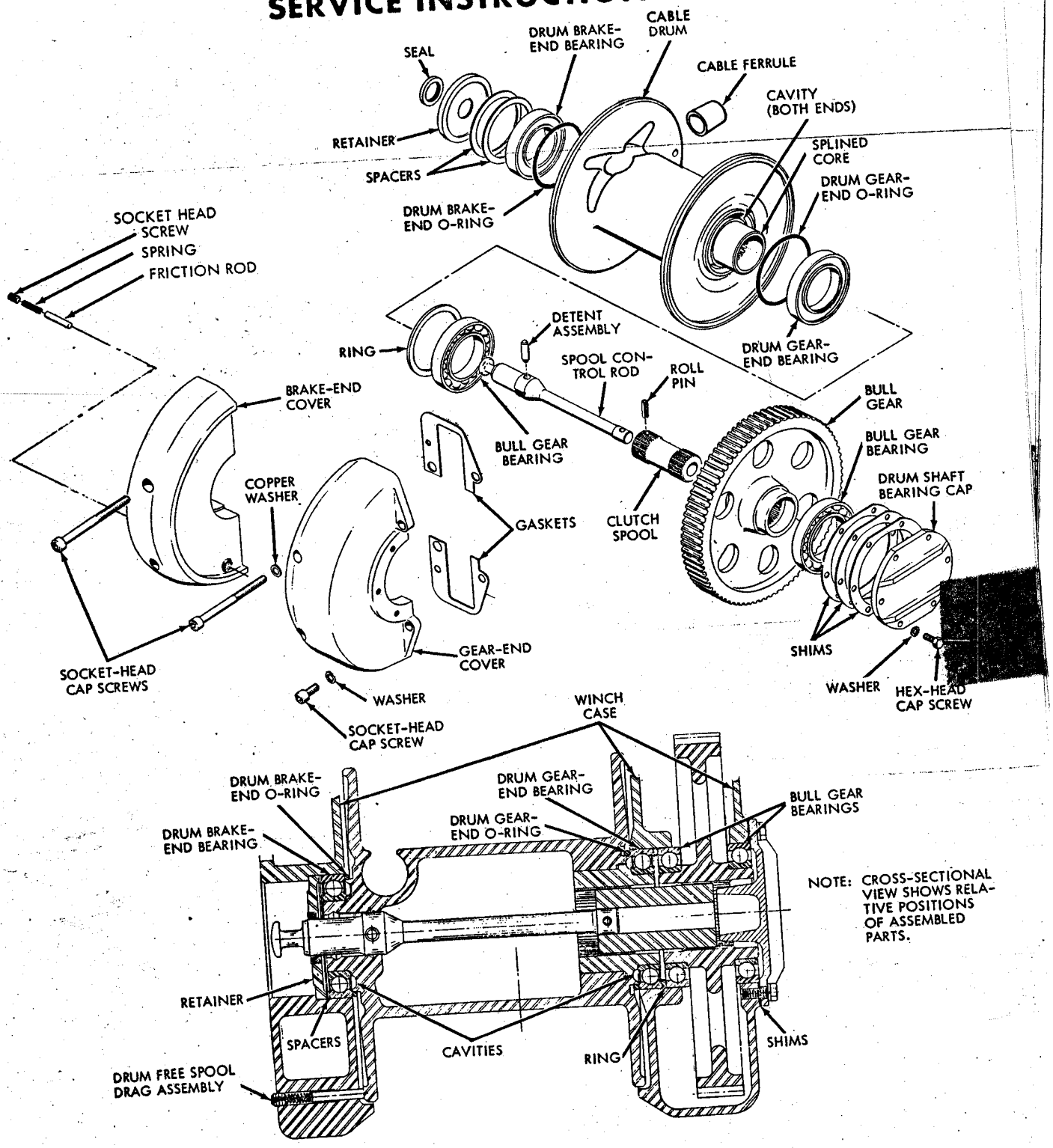
Push free-spool control knob into drum, and slide clutch spool assembly out of gear end of cable drum. Drive roll pin from spool and rod, and remove spool from rod. Press detent assembly from rod.

Use Allen wrench to remove cap screws and copper washers, and cap screws and washers securing gear-end cover. Remove cover and gaskets.

Use Allen Wrench to remove drag brake adjusting screw. Remove spring and friction rod.

Support cable drum and remove cap screws and brake-end cover. Remove drum, bull gear, and related parts from winch case. Use lacquer thinner to clean sealing compound from covers, winch case, retainer, and bearings.

SERVICE INSTRUCTIONS



NOTE: CROSS-SECTIONAL VIEW SHOWS RELATIVE POSITIONS OF ASSEMBLED PARTS.

FIGURE 1

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SUPERSEDES
1401-F-11-15-62

SERVICE INSTRUCTIONS

Remove bull gear with bearings, and remove ring. Remove bearings from bull gear.

Remove retainer with seal and spacer or spacers. Replace seal if leaking or damaged. Seal lip is to be adjacent to retainer.

Remove O-rings from drum, and discard if worn or damaged. Using puller, remove bearings from drum.

NOTE: Do not attempt to remove splined core from cable drum. Drum and core must be replaced as an assembly if either is damaged.

Assembly

See Figure 1.

Fill cavity in each end of cable drum with water-repellent grease, and install sealed bearings onto drum. Lubricate O-rings and tapered seats, and install O-rings.

Press bull gear bearings onto bull gear.

Tilt winch forward, enabling cable drum and bull gear to remain in position in winch case without brake end or gear end covers.

Align holes in gaskets with drilled holes in gear end cover, and trim gaskets to match bearing bore.

On brake end cover and brake end of winch case, coat following areas with 3M Mastic EC-979, or equal: counterbore for retainer and bearing, and mating surfaces of cover and case two inches above and below counterbore. Using same compound, coat threads on the four long socket head cap screws that secure brake end and gear end covers. Also coat gasket surfaces and bores of gear end cover and gear end of case.

Install retainer, cable drum, ring, and bull gear. Install spacers between retainer and cable drum so that when all parts are pressed against retainer, drum flange will clear winch case, and outer bearing on bull gear will protrude between .005 inch and .080 inch beyond winch case.

Install both covers. As each is installed, verify that cable drum flange clears cover. If there is interference, add or remove spacers as required. Tighten socket head cap screws until gasket surfaces are in contact. Do not torque heavily.

Install spool control rod in spool, and secure with roll pin. Ensure that pin is recessed below splines, coat detent with heavy grease, and install in spool control rod. Lubricate machined surfaces of rod, and lip of seal in retainer.

With detent horizontal, insert spool control rod through bull gear, cable drum, and retainer seal. Use bar or punch to guide knob end of rod through brake end of drum. Insert spool sufficiently for detent balls to enter first detent groove. Considerable force may be required to slide rod into detent position.

Select shims approximately .005 inch thicker than bull gear bearing protrusion. Coat shim surface on winch case and drum shaft bearing

SERVICE INSTRUCTIONS

cap with mastic, and install shims and drum shaft bearing cap. Torque socket head screws in covers to 400 to 450 lb-ft.

Insert drag brake friction rod and spring, and install socket head set screw. See Operator's Manual for adjustment.

BRAKE SHAFT AND RELATED PARTS

Disassembly

Release brake tension. Refer to PREPARATION FOR DISASSEMBLY.

Remove drum shaft bearing cap and shims, gear end cover and gaskets, free spool mechanism, bull gear, and ring. Refer to CABLE DRUM, BULL GEAR, AND FREE SPOOL MECHANISM, Disassembly.

See Figure 2.

Remove cap screws and washers securing brake cover, and remove cover and gasket.

Remove cap screws and retaining washer securing brake drum on shaft, and slide drum off shaft. Remove spacer or spacers from shaft.

Remove cap screws and washers securing brake shaft bearing cap, and remove cap.

Remove cap screws and retaining washer from gear end of shaft.

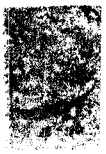
Using soft bar, drive shaft toward brake end of winch.

As end of shaft clears bull pinion and reduction gear, remove these gears from winch case.

Slide shaft and related parts out brake-end of winch. Remove outer bearing guard, sealed bearing, and inner bearing guard from shaft.

If required, remove open bearing and seal from shaft, and discard seal.

NOTE: Do not attempt to remove ring or bearing guard from gear end of shaft. If any of these parts is damaged, replace entire brake shaft assembly.



Using soft bar, drive bearing assembly from winch case.

Assembly

See Figure 2.

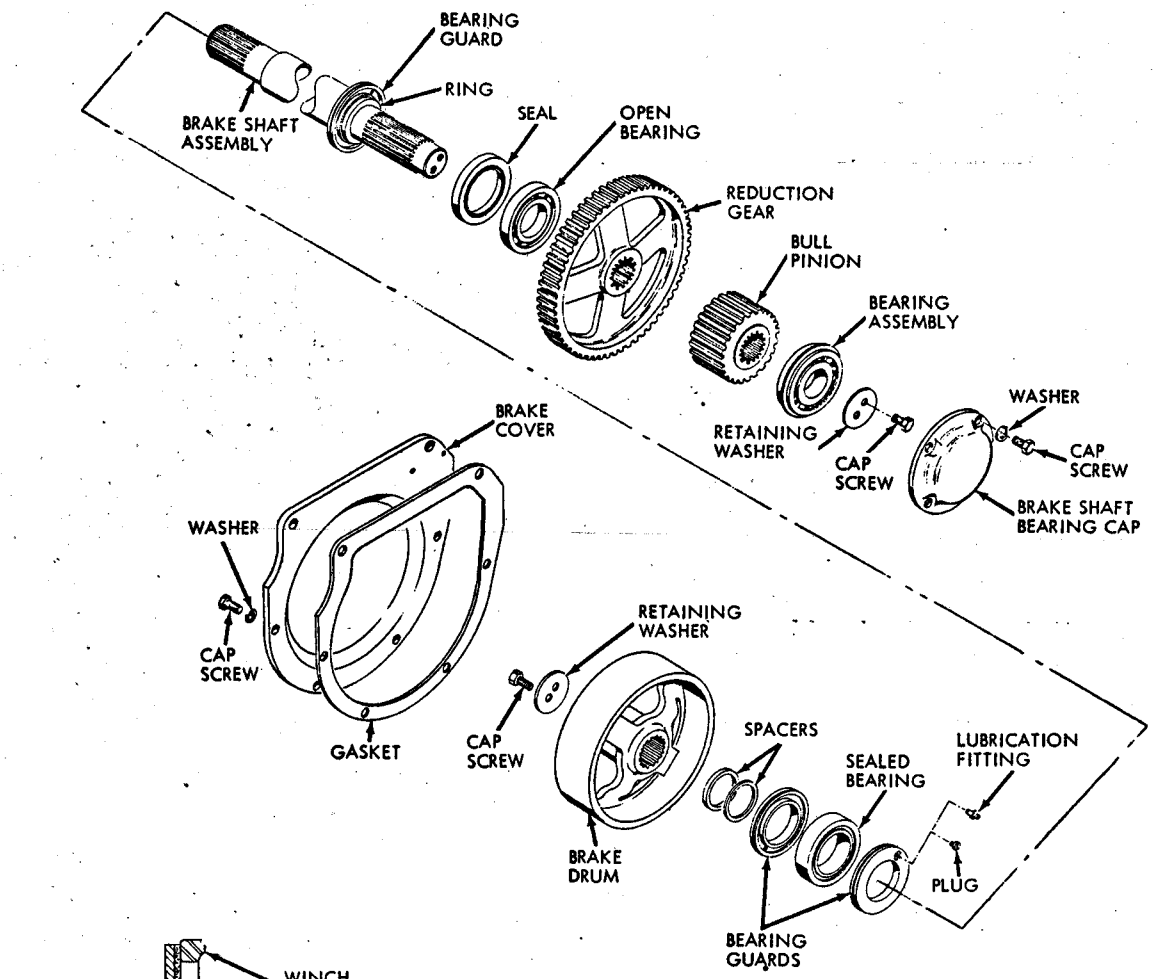
Working from gear end, install seal in inner wall of winch case, with lip of seal pointing toward gear compartment. Take care not to damage seal housing or lip.

Install open bearing adjacent to seal.

Install plug in bearing guard on brake shaft assembly. Fill grooves in guard with waterproof grease.

Insert reduction gear in case, and feed brake shaft through seal and bearing, and into gear. Insert bull pinion, and feed shaft through pinion.

Install plugs in both bearing guards, and fill grooves with waterproof grease. Slide bearing guards and sealed bearing over brake end of shaft. Grease filled grooves are to be adjacent to bearing.


BEARING GUARD
RING
BRAKE SHAFT ASSEMBLY
SEAL
OPEN BEARING
REDUCTION GEAR
BULL PINION
BEARING ASSEMBLY
RETAINING WASHER
CAP SCREW
WASHER
CAP SCREW
BRAKE SHAFT BEARING CAP
BRAKE COVER
WASHER
CAP SCREW
GASKET
RETAINING WASHER
CAP SCREW
BRAKE DRUM
SPACERS
SEALED BEARING
LUBRICATION FITTING
PLUG
BEARING GUARDS

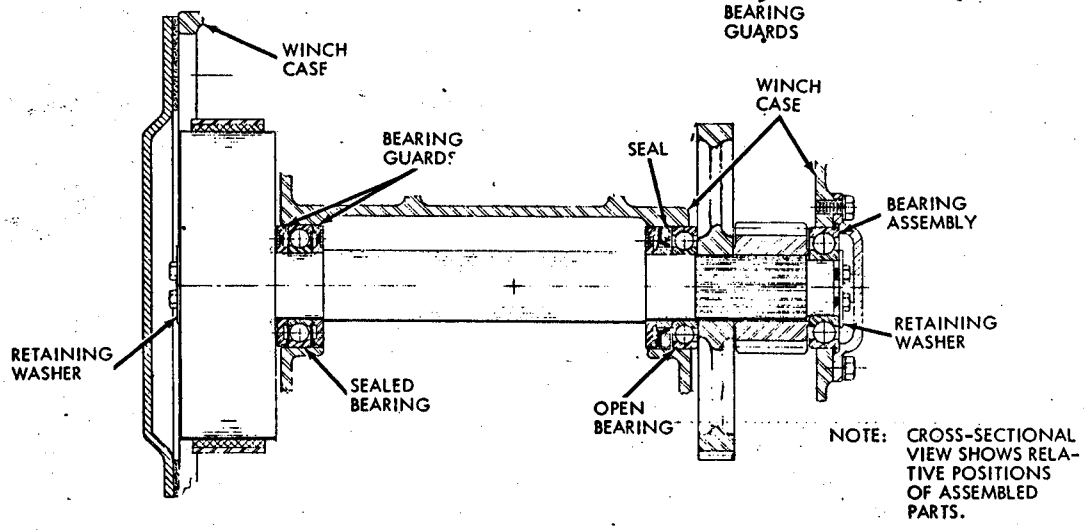

WINCH CASE
BEARING GUARDS
SEAL
WINCH CASE
BEARING ASSEMBLY
RETAINING WASHER
RETAINING WASHER
SEALED BEARING
OPEN BEARING
NOTE: CROSS-SECTIONAL VIEW SHOWS RELATIVE POSITIONS OF ASSEMBLED PARTS.

FIGURE 2

SERVICE INSTRUCTIONS

Using a tubular driver with an inside diameter slightly larger than the shaft, drive shaft and related components into position.

Install bearing assembly over gear end of shaft, into winch case, and against bull pinion. Verify that there is no end play in gear or pinion. Install retaining washer, and secure with cap screws.

Coat flange of brake shaft bearing cap with mastic, and install with cap screws and washers.

On brake end of shaft, wipe excess grease from shaft and bearing guard. Install in sequence spacer or spacers, brake drum, retaining washer, and cap screws.

BRAKE LINKAGE

Disassembly

Disengage winch free-spool mechanism. Release brake.

See Figure 2.

Remove cap screws and washers securing winch brake cover, and remove cover and gasket.

Remove cap screws, and retaining washer securing brake drum on shaft, and slide drum and spacer or spacers off shaft.

If wire rope is on cable drum, wind enough rope off drum to expose hole in drum brake end flange.

See Figure 3.

Line up hole in cable drum flange with end of brake band anchor pin in winch case inner wall, and drive out anchor pin. Remove pin that secures brake band to eye bolt, and remove brake band.

NOTE: The brake band can be reversed to equalize lining wear and increase life of the lining.

If brake lining is to be replaced, remove lining by pressing out rivets securing lining to brake band.

Pull cotter pin and yoke pin from yoke and brake lever. Pull control cable forward.

Remove cap screw, washer, and flat washer securing shaft in winch case. Line up hole in cable drum flange with end of shaft in winch case inner wall and drive out shaft. Remove eye bolt assembly, rod end, brake lever, and related parts from winch as an assembly.

Remove retaining ring securing rod end assembly pin in brake lever, and separate lever from rod end.

Loosen jam nut and remove yoke from control cable.

Loosen set screw securing control cable armor in winch case. Remove cable from winch. Remove jam nut from cable rod end.

NOTE: Do not remove pin from rod end. If either part is damaged, replace complete rod end assembly.

SERVICE INSTRUCTIONS

If Oilite bearings in brake lever require replacement, press bearings from lever.

Unscrew adjustment nut from rod end. Remove eye bolt and jam nut (both left hand thread) from adjustment nut.

Assembly

See Figure 3.

Screw eye bolt through jam nut and into adjustment nut as far as it will go. Screw adjustment nut into rod end as far as it will go. Hold eye bolt and rod end stationary, and unscrew adjustment nut until about 3/8 inch of threads are exposed beyond the rod end.

If Oilite bearings were removed from brake lever, press new bearings into lever so they are just flush with flat face of lever.

The upper pair of holes in the brake lever are identified "O" and "U." The pin in the rod end assembly passes through the hole marked "O" for overwound cable drum rotation, or through the hole marked "U" for underwound rotation. Position rod end on side of brake lever away from letter designations, insert pin through correct hole, and install retaining ring in groove at end of pin.

Install jam nut onto control cable rod end, insert rod end into winch, and tighten set screw to secure cable armor in winch case. With cable core in mid stroke, turn yoke onto cable rod end 7/8 inch, which is full thread depth of yoke. Tighten jam nut against yoke.

Position assembled brake lever, rod end, and related parts in approximate final position in winch, with brake lever adjacent to case inner wall. Extend control cable to full length, pull down slightly, and fasten yoke to brake lever with yoke pin and cotter pin.

Raise brake lever group to final position, and install shaft through case outer wall, curved slot in rod end, lower hole in brake lever, and case inner wall. Secure shaft with flat washer, washer, and cap screw.

If brake lining was removed from brake band, cement new lining in place with Raybestos-Manhattan adhesive R-82021, and secure with rivets.

Place brake band in winch case, and install anchor pin through case outer wall, brake band eye, and case inner wall. Connect other end of brake band to eye bolt with pin.

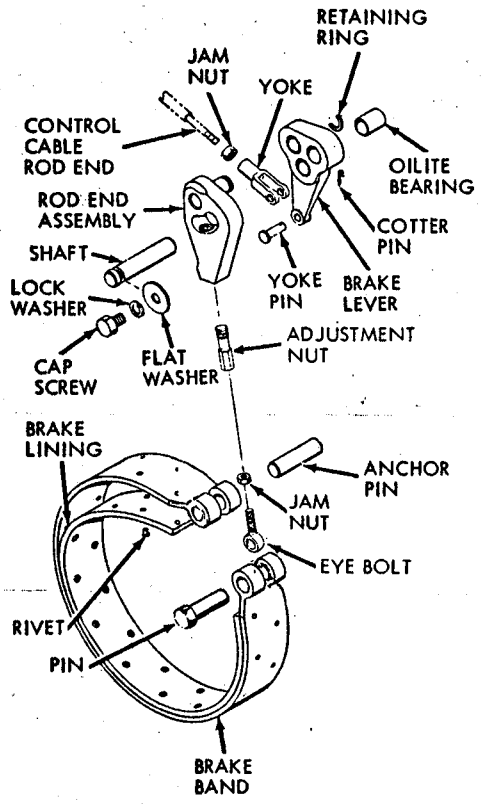
Grease three lubrication points along brake shaft. Refer to BRAKE SHAFT AND RELATED PARTS, Assembly.

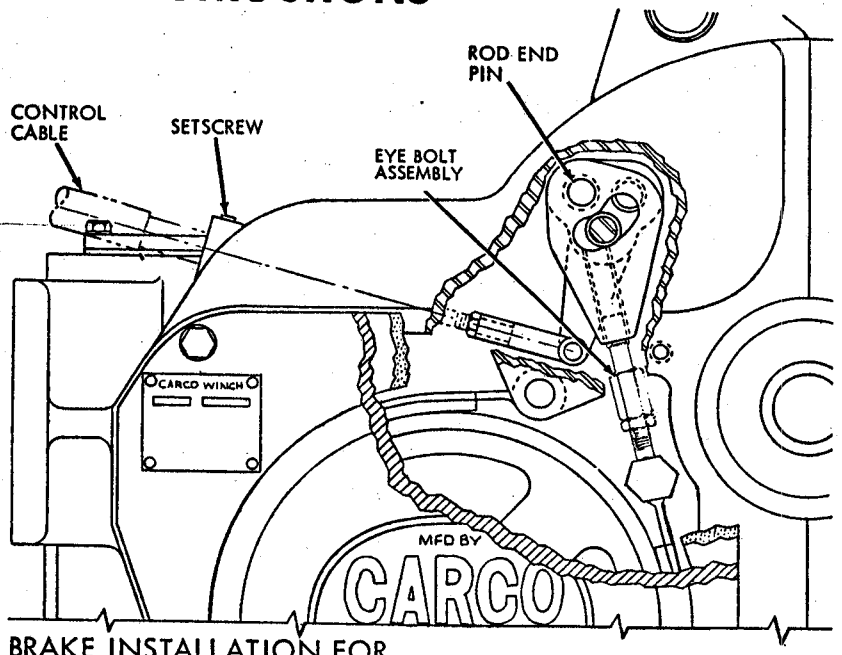
See Figure 2.

Install spacer or spacers to keep brake drum from contacting winch case, and install brake drum. Install retaining washer and cap screws to secure brake drum on shaft.

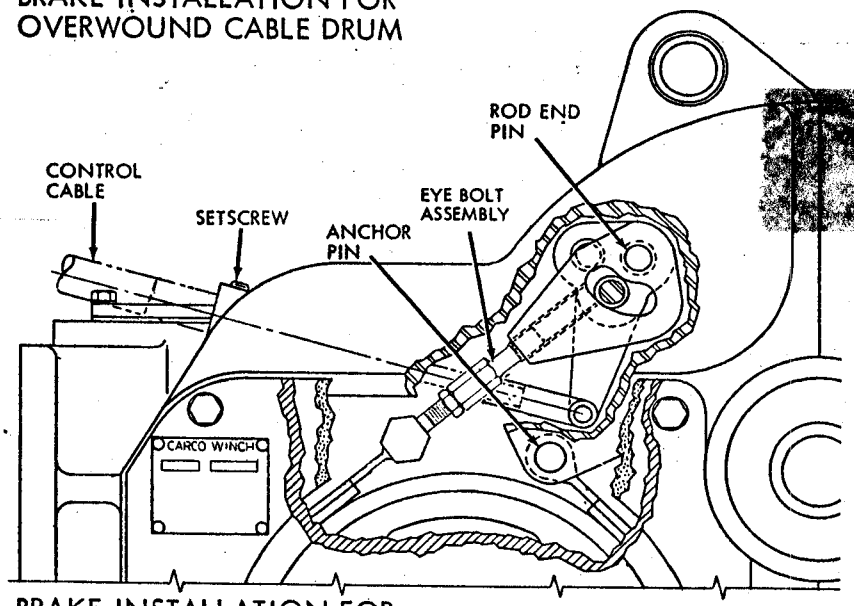
Adjust brake. Refer to Operator's Section.

Install gasket and brake cover on winch with cap screws and washers.





BRAKE INSTALLATION FOR OVERWOUND CABLE DRUM



BRAKE INSTALLATION FOR UNDERWOUND CABLE DRUM

NOTE: THE FOUR VIEWS AT THE RIGHT SHOW RELATIVE POSITIONS OF ASSEMBLED PARTS.

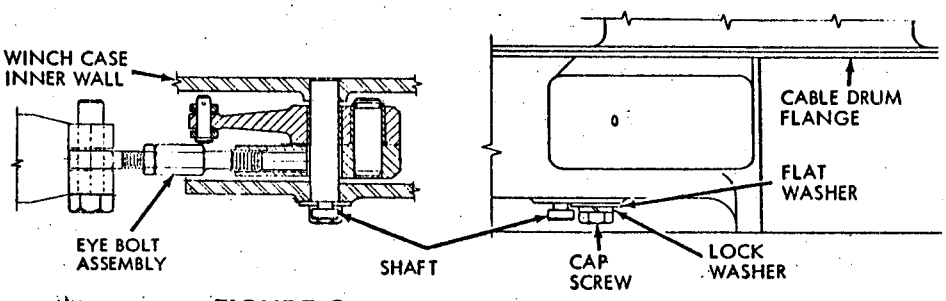


FIGURE 3

1404-F-3-15-66
SUPERSEDES
1404-F-11-15-62

BACK GEAR SHAFT AND RELATED PARTS

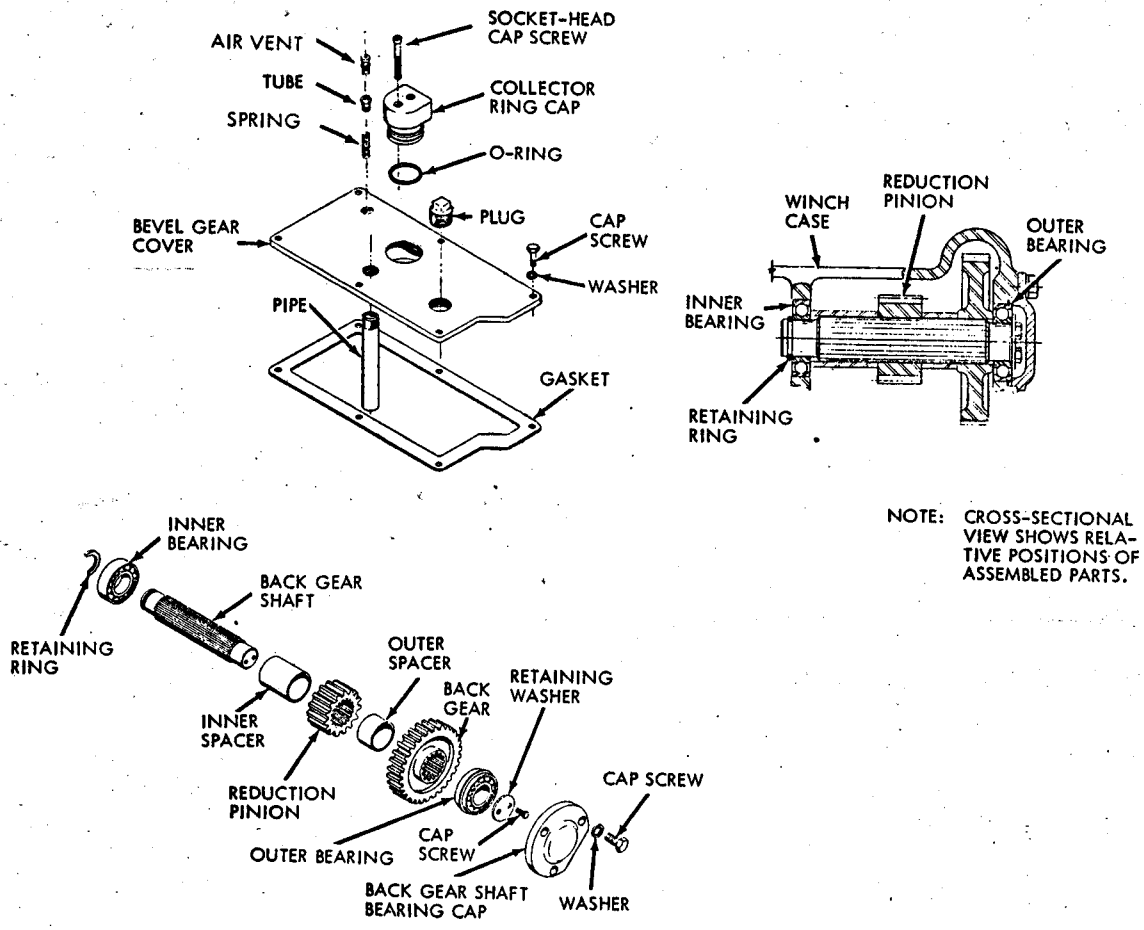
Disassembly

Remove winch from tractor if tractor configuration prevents access to bevel gear compartment. Refer to PREPARATION FOR DISASSEMBLY.

See Figure 4.

Remove socket-head cap screws from collector ring cap, and remove cap with O-ring. Protect cap from damage and contamination. Remove vent, tube, and spring.

Remove cap screws and washers from bevel gear cover, and remove cover with pipe. Remove bevel gear cover gasket to prevent damage to gasket.



NOTE: CROSS-SECTIONAL VIEW SHOWS RELATIVE POSITIONS OF ASSEMBLED PARTS.

FIGURE 4

SERVICE INSTRUCTIONS

Remove cap screws and washers securing back gear shaft bearing cap, and remove cap. Use lacquer thinner to clean sealer from mating surfaces of cap and winch case.

Remove cap screws and retaining washer from end of shaft. Using soft bar, drive shaft toward brake end of winch.

Work shaft up and out of winch case, at the same time removing outer spacer, reduction pinion, and inner spacer. Work back gear out of winch case.

Remove retaining ring and inner bearing from shaft.

Using soft bar, drive outer bearing from winch case.

Assembly

Install inner (plain) bearing and retaining ring on shaft. Press bearing tightly against retaining ring.

Place back gear in winch case. Insert shaft through winch case inner wall, and install inner spacer, reduction pinion, and outer spacer on shaft. Position back gear, and slide shaft through gear.

Back up inner end of shaft with heavy object, and carefully tap outer bearing (with retaining ring) onto outer end of shaft and into winch case outer wall.

Install retaining washer and cap screws. Tighten cap screws only enough to draw them snug. Gently tap outer bearing to remove slack from shaft group, and check tightness of cap screws. Do not tighten cap screws enough to distort washer.

Coat flange of back gear shaft bearing cap with 3-M Mastic EC-979, or equal. Install cap and secure with cap screws and washers.

Install gasket and bevel gear cover with pipe. Secure cover with cap screws and washers. Install spring, tube, and vent.

Install collector ring cap with O-ring, and secure with socket-head cap screws.

Install winch and related parts onto tractor. Refer to Adapter Section.

CLUTCH SHAFT

NOTE: Disassembly and assembly of the clutch shaft should be accomplished in a shop authorized to maintain tractor power shift transmissions. Special tools are required.

Disassembly

Remove winch from tractor.

See Figure 2.

Remove brake cover and gasket, and remove brake drum.

See Figure 3.

Remove brake band-pins, and remove brake band.

See Figure 4.

Remove vent, tube, and spring.

Remove collector ring cap and bevel gear cover and gasket from top of winch. Remove pipe from cover.

See Figure 5.

Remove clutch cover and gasket from front of winch.

Remove cap screws, and washers securing bevel gear shaft bearing cap, and remove cap. Remove split shims from between bearing carrier and case, and mark for correct position at reassembly.

Remove plug and O-ring from inside brake compartment.

Remove hex nut, star washer, and counterbored washer from end of pinion shaft.

Using brass bar, drive brake end of pinion shaft to force shaft out gear side of winch, and remove shaft and related parts.

Remove cap screws, and retaining washer from gear end of shaft. Remove bearing and retainer from shaft, and remove bearing from retainer.

Remove back gear shaft and related parts from winch. Refer to BACK GEAR SHAFT, Disassembly.

Thread two 3/8-inch cap screws at least 2-1/2 inches long into spider hub. Hold spider flange out, tap hub in to free hub from flange, rotate hub one tooth inside flange, and remove hub from flange.

Using wrench 44291, remove lock nut from end of clutch shaft.

Using driver 44288 on rod 44290, drive clutch shaft toward brake side of winch. As end of shaft clears each item, remove reverse clutch and spider, collector sleeve and collector ring, and bevel gear. Remove outer and inner flange bearings from spider. Remove forward clutch.

Remove two retaining rings and pull pinion shaft bearing from brake end of clutch shaft.

Slide collector ring off collector sleeve, and remove splined seal from inside sleeve.

Remove clutch shaft bearings from winch case inner webs.

Assembly

See Figure 5.

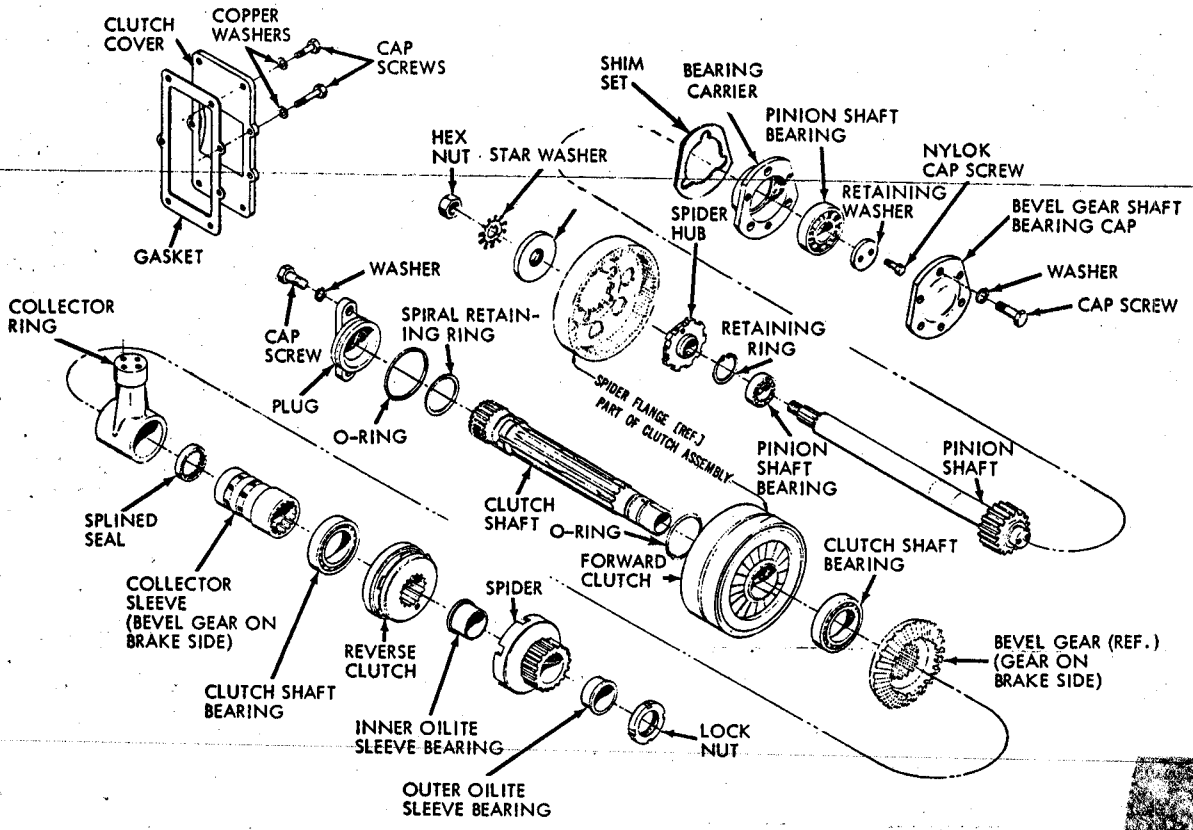
Install clutch shaft bearings into winch case inner webs.

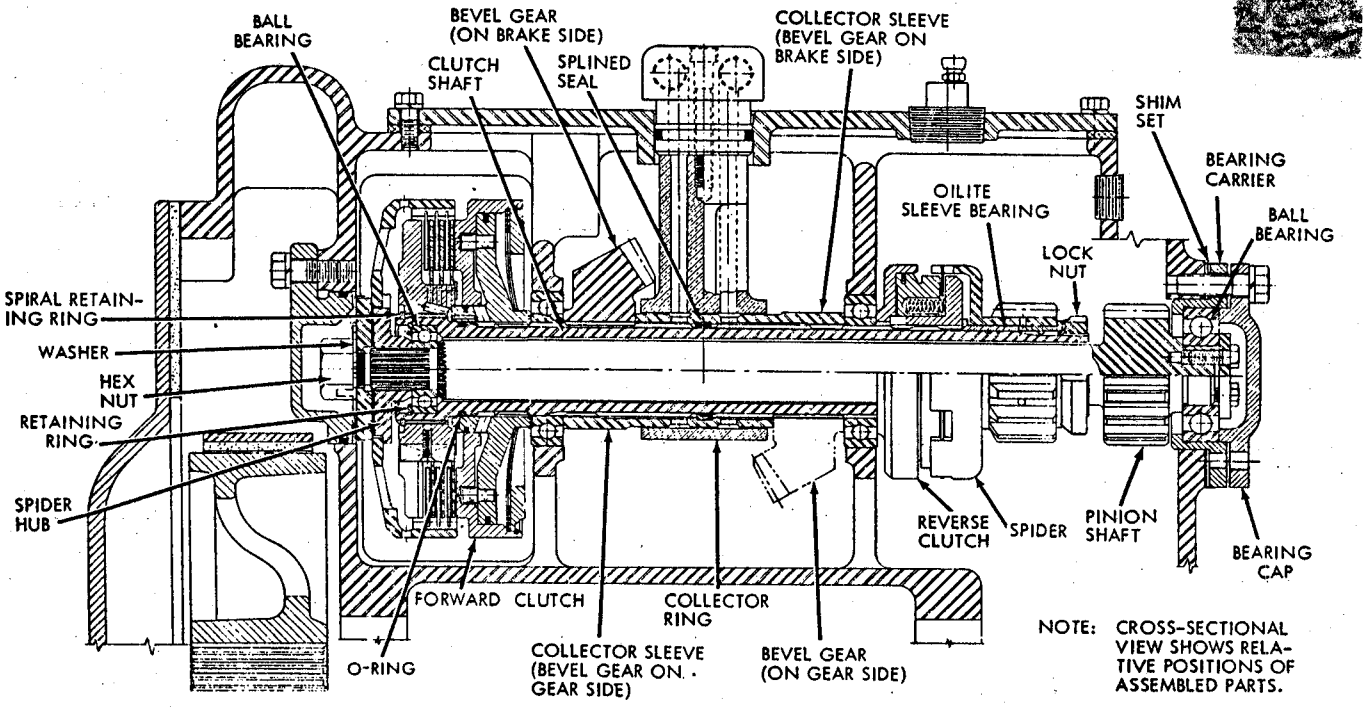
Lubricate splined seal with petroleum jelly and install in collector sleeve. Verify spline alignment by sliding sleeve onto clutch shaft, also lubricated with petroleum jelly. Remove sleeve from shaft and install in collector ring.

Press pinion shaft bearing into brake end of clutch shaft, and install retaining ring into shaft and spiral retaining ring onto shaft.

Install O-ring on clutch shaft.

Place cloth in forward clutch compartment to raise clutch to centerline, and insert clutch into winch.





NOTE: CROSS-SECTIONAL VIEW SHOWS RELATIVE POSITIONS OF ASSEMBLED PARTS.

FIGURE 5

Assemble reverse clutch, spider, and inner flange bearing, and position in winch. Insert pilot 44286 and sleeve 44287 through bearing bore in outer wall of winch case, so that shoulder on pilot enters bore of spider and sleeve enters bore of clutch. Fasten pilot to winch case with three cap screws.

Slide clutch shaft through forward clutch, and install bevel gear and collector ring and sleeve.

Using driver 44289 on rod 44290, drive shaft in, making certain that shaft splines properly enter splines in collector sleeve and reverse clutch. When large diameter splines on shaft approach hub and backplate of forward clutch, carefully align splines and drive shaft in until spiral retaining ring on shaft seats on counterbored recess in hub and backplate.

Remove pilot 44286 and sleeve 44287. Slide outer flange bearing onto shaft, and start lock nut onto shaft.

Remove tape from forward clutch. Using two spacing devices such as screwdrivers, separate spider flange from clutch piston shoulder approximately 1/4 inch. If spider flange is trapped close to the piston, insert small screwdriver through spider flange and rotate inner bronze disc so that disc teeth mesh with flange internal teeth.

Block clutch shaft from turning, and draw locknut tight with wrench 44291. While tightening locknut, continue driving operation on shaft to ensure that all components on the shaft are in complete contact.

Torque lock nut to 175-200 lb-ft.

Install back gear shaft and related parts. Refer to BACK GEAR SHAFT, Assembly.

Press pinion shaft bearing into bearing carrier, and install bearing and retainer onto pinion shaft. Secure bearing to shaft with retaining washer and cap screws.

Coat pilot of carrier with 3-M Mastic EC-979, or equal. Insert pinion shaft and related parts into clutch shaft, and drive shaft into place.

Thread two 3/8-inch cap screws into spider hub, and work spider hub through forward clutch spider flange and onto end of pinion shaft. Rotate hub one tooth and pull it back into flange. Remove spacing devices between spider flange and clutch piston.

Install counterbored washer (with counterbore next to spider), star washer, and hex nut onto end of pinion shaft. Tighten nut, and bend one tang on star washer against a flat on nut.

Coat flange and outside diameter of pilot on bevel gear shaft bearing cap with 3-M Mastic EC-979, or equal, and install cap. Place split shims between bearing carrier flange and winch case, and install cap screws.

With P.T.O. shaft in place at front of winch, adjust backlash between bevel pinion and bevel gear. Refer to BACKLASH ADJUSTMENT.

Install clutch cover and gasket onto front of winch.

See Figure 4.

Install pipe in bevel gear cover. Install bevel gear cover and gasket on winch. Lubricate O-ring with petroleum jelly, install in groove in collector ring cap, and secure cap to collector ring.

Install spring, tube, and vent.

See Figure 5.

Lubricate O-ring with petroleum jelly, install in groove in plug, and install plug in case at brake end of clutch shaft.

See Figure 3.

Position brake band in winch, and install pins.

See Figure 2.

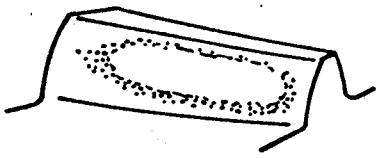
Install brake drum and related parts, and install brake cover and gasket.

BACKLASH ADJUSTMENT

Install bevel pinion. Refer to Adapter Section.

Remove or install shims between pinion carrier and winch case to obtain the correct tooth contact pattern. See Figure 6 for contact patterns.

STRAIGHT BEVEL GEAR



SPIRAL BEVEL GEAR

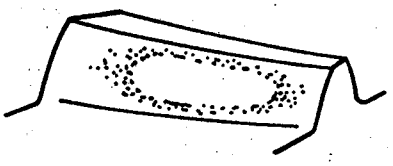


FIGURE 6

Remove or install shims between bevel gear shaft bearing retainer and case to obtain .005-.010 backlash between bevel gear and bevel pinion. Shims may be split for ease of installation.

FORWARD CLUTCH

Disassembly

See Figure 7.

Remove spider flange. Remove hub and backplate with clutch plates.

Remove flat-head pins securing clutch plates to hub and backplate, and remove plates and spacer. Remove screws securing keys to hub and backplate, and remove keys.

Remove outer retaining ring and ring from piston, using hydraulic or arbor press to apply even pressure on ring while removing retaining ring. Remove inner retaining ring and return springs from piston carrier.

Remove piston carrier from piston, and remove piston rings. Remove dowels from carrier.

Assembly

See Figure 7.

Install dowels in piston carrier.

Install one-piece piston ring onto piston carrier. Use small clamps to hold one end and back side of ring in bottom of groove, hook ring together, and remove clamps.

Install five-piece piston ring into groove in piston carrier so that gaps in rings do not line up. Install piston carrier into piston aligning dowels with holes in piston. Place on bed of hydraulic or arbor press so open end of piston is up. Place springs in position. Place ring and outer retaining ring in position on top of springs. Apply even pressure on ring to compress springs, and install retaining ring in groove in piston. Ensure that retaining ring is properly seated before releasing pressure.

Install three keys onto hub and backplate with screws. Stake each screw two places into slot in key. Install bronze and steel clutch plates alternately onto hub and backplate with bronze plate first. Drive three flat-head pins into holes in hub and backplate to secure clutch plates.

Line up teeth on bronze clutch plates, and insert hub and backplate into spider flange.

Position spider flange, hub and backplate, and related parts with relation to piston carrier, and tape spider flange to piston.

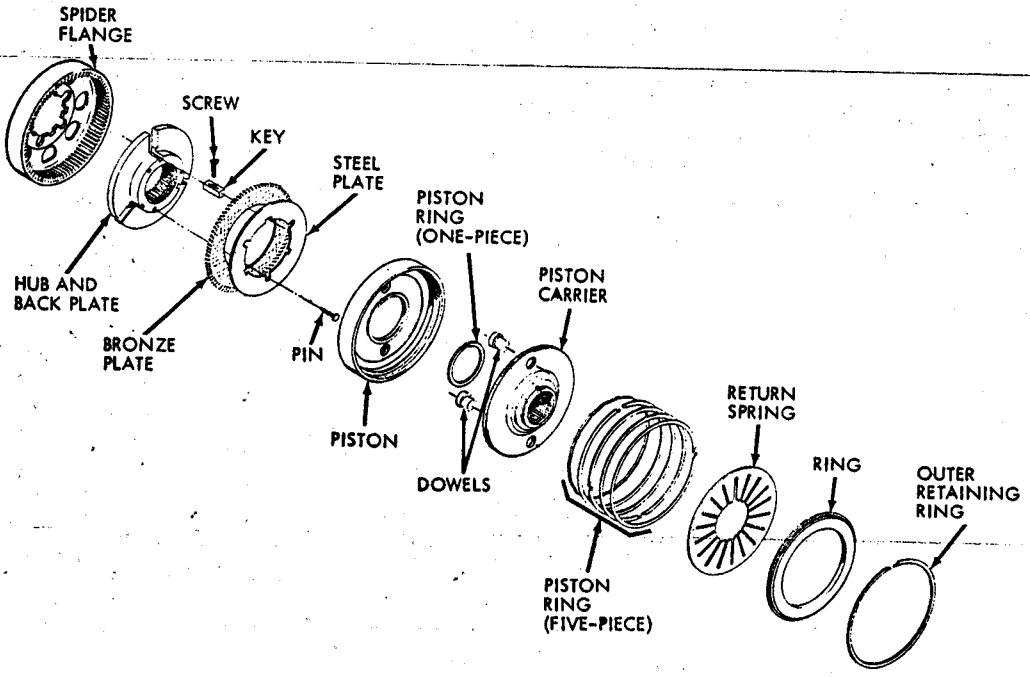
REVERSE CLUTCH

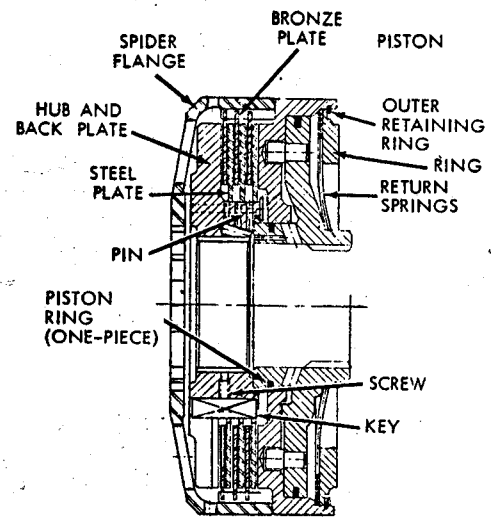
Disassembly

See Figure 8.

Position the clutch on a solid work surface, cylinder end up. Rest lower rim of cylinder on three equally spaced steel blocks, so that bottom surface of hub is at least 1/4 inch

SERVICE INSTRUCTIONS





NOTE: CROSS-SECTIONAL VIEW SHOWS RELATIVE POSITIONS OF ASSEMBLED PARTS.

FIGURE 7

SERVICE INSTRUCTIONS

above work surface. (1" x 1" x 1-1/2" blocks work well.)

Using a brass or aluminum punch, drive on ends of hub splines to force hub out of tight fit recess in cylinder.

Remove driving plate and six springs from piston. Remove piston from cylinder by prying in piston groove against cylinder rim. Remove piston ring from piston.

Drive dowel pin from hub.

Assembly

See Figure 8.

Drive dowel pin in hub so rounded end is flush with outer surface of hub. Install piston ring in piston. Press piston into cylinder. Place springs in equally spaced holes. Position driving plate around springs. Align dowel pin in remaining hole.

Using hydraulic or arbor press, press hub into cylinder, making certain that hub bottoms out in cylinder recess.

BRAKE ACTUATOR

NOTE: Disassembly and assembly of the brake actuator should be accomplished in a shop authorized to work on tractor power shift transmissions.

WARNING: The actuator is spring loaded. Use care to prevent injury during disassembly and assembly.

Disassembly

See Figure 9.

Remove protective cap from piston rod, and remove O-ring from cap. Turn adjustment nut counterclockwise off extension rod, and remove nut.

Loosen jam nut and setscrew securing control cable armor in actuator, and remove control cable and extension rod from actuator. Loosen jam nuts, separate control cable from coupling, and remove coupling and jam nuts.

Remove mounting bracket from each end of actuator.

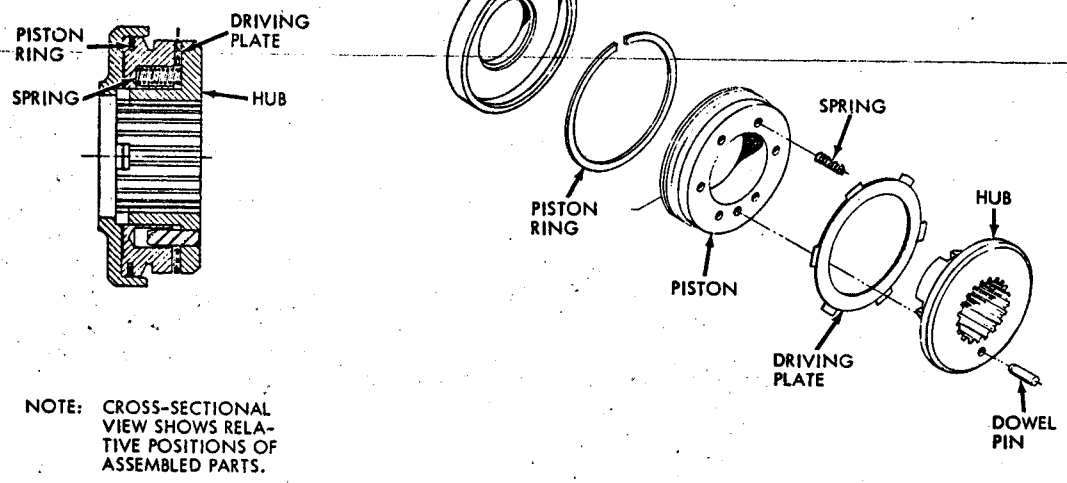
Use a press, as follows, to compress springs: Block up piston rod end of actuator on press so piston rod does not contact press bed. Provide at least three inches of press stroke before press contacts cylinder head, and press cylinder head in to compress springs. Remove retaining ring, and release pressure slowly until springs are fully expanded.

Remove cylinder head, springs, and spacer from inside cylinder. Thoroughly clean inside of cylinder, and apply a light coat of clean oil or petroleum jelly to cylinder wall.

Push piston rod in, forcing piston out head end of cylinder, and remove piston and piston rod. Remove outer O-rings from piston. Remove outer retaining ring from piston rod, slide piston off rod, and remove inner retaining ring. Remove inner O-ring from piston.

Remove O-ring and seal from cylinder.

SERVICE INSTRUCTIONS



NOTE: CROSS-SECTIONAL VIEW SHOWS RELATIVE POSITIONS OF ASSEMBLED PARTS.

FIGURE 8

Assembly

See Figure 9.

NOTE: Ensure that all parts are clean, to prevent damage to components and contamination of the hydraulic system. During assembly, lubricate all mating surfaces, seals, and O-rings with petroleum jelly.

Install O-ring and seal into cylinder, with seal lip pointing to outside.

Install four O-rings in grooves in piston, install inner retaining ring on piston rod, insert piston rod through piston, and install outer retaining ring. Slide piston and piston rod into cylinder.

Position cylinder on press with piston rod down, and raise cylinder on blocks so piston rod will not contact press bed. Install spacer and springs, and place cylinder head and retaining ring onto springs. Position cylinder head so that set screw is approximately parallel with tapped ports at other end of cylinder.

Carefully compress springs by pressing downward on cylinder head. Guide cylinder head into cylinder, and install retaining ring to secure head.

WARNING: Ensure that retaining ring is fully seated in groove before pressure is released on head.

Remove actuator from press.

Install mounting bracket onto each end of actuator. Rotate cylinder head as required to align brackets.

Attach extension rod to control cable rod end with coupling and jam nuts. Insert extension rod into actuator, install adjustment nut into piston rod, and turn nut onto extension rod.

SERVICE INSTRUCTIONS

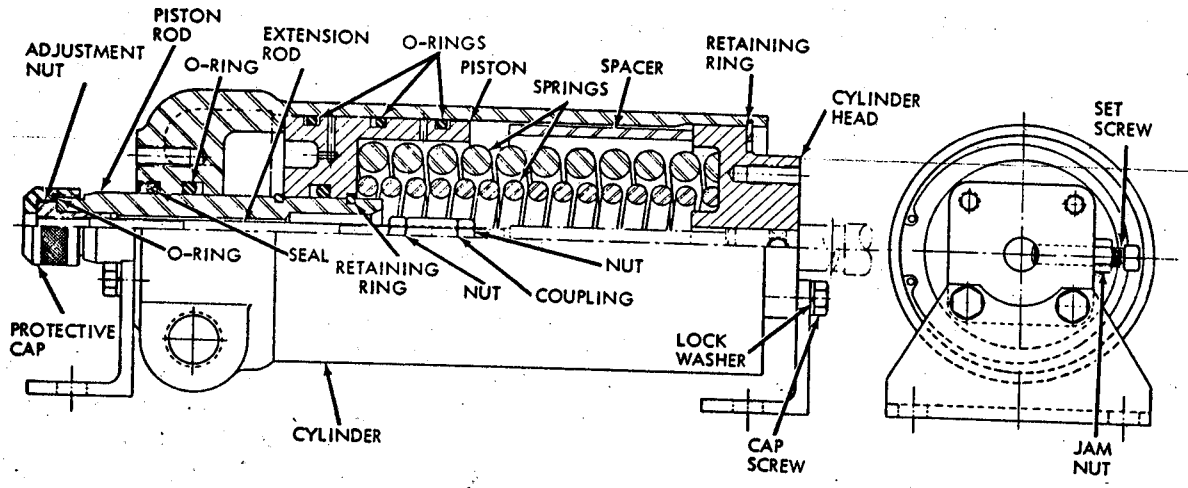


FIGURE 9

Secure control cable armor in actuator with setscrew and jam nut.

Install O-ring into protective cap, and turn cap onto piston rod.

REVERSING CABLE DRUM ROTATION

NOTE: Alteration of a winch from overwound to underwound cable drum rotation, or vice versa, should be accomplished in a shop authorized to maintain tractor power shift transmissions. Special tools are required.

Refer to CLUTCH SHAFT, Disassembly. Disassemble clutch shaft parts to the point of removing collector sleeve and bevel gear. Exchange positions of sleeve and gear as shown in figure 5, and reassemble parts. Refer to CLUTCH SHAFT, Assembly.

Refer to BACKLASH ADJUSTMENT, and adjust backlash between bevel gear and bevel pinion. Complete clutch shaft assembly except installation of brake band and drum.

Refer to BRAKE LINKAGE, Disassembly. Remove brake lever assembly from winch. It is not necessary to remove control cable from brake actuator or winch, or yoke from control cable, or eyebolt assembly from rod end. Assemble and install brake lever assembly for new direction of cable drum rotation. Refer to BRAKE LINKAGE, Assembly, and to Figure 3. Install brake band for new rotation direction, and install brake band and drum.

Refer to Operator's Section of this manual, BRAKE ADJUSTMENT, Adjustment at Actuator and Winch, and adjust brake.

NOTE: Control of the winch to wind in or pay out wire rope, to place the cable drum in free spool, and to release the brake is identical whether the winch is assembled for overwound or underwound cable drum rotation.

CONTROL VALVE ASSEMBLY

See Figure 10 in Parts Section.

Replacing Spool Seals

NOTE: For purposes of orientation of valve parts, the control handle side of the valve is referred to as the "front" of the valve. The numbers in parentheses in the text refer to item numbers in the illustration with the parts list.

To replace spool seals proceed as follows, using special tool T-9.

CAUTION: Do not attempt to replace spool seals without special tool. To do so will cause damage to seals and render them ineffective.

Remove rubber bonnet (24), stop disc snap ring (23), and stop disc (22) from back of valve.

On brake control valve, remove detent end cap retainer spring (25). Remove detent cap (27), detent spring washer (28), detent spring (29), and detent pin (30). Remove spring assembly bolt (21) and centering spring lock washer (20), and remove detent spool adapter (26).

On clutch control valve, remove spring assembly bolt (21) and centering spring lock washer (20) and remove stop collar (19), centering spring (18), and stop washer (17).

Disconnect handle (1) from spool by removing handle cotter pin (35) and handle pin (34).

Push spool (31) into housing from front of valve until front spool seal (16) is exposed, and remove seal.

Pull spool out of housing from front of valve, being careful that spool and housing bore are not scratched or otherwise damaged. Remove rear spool seal.

Clean spool seal grooves thoroughly.

Replace spool (31) through front of housing being sure that end having spring assembly bolt hole enters housing first. Push spool into housing until spool end touches back seal groove.

Insert new spool seal (16) in back groove, being sure U-cup side of seal faces inward.

NOTE: Installation will be facilitated by pinching one side of seal to bend it to a size slightly smaller than seal groove.

Run a smooth rod around exposed surface of installed seal to assure a perfect fit. Check by running finger around exposed edge of seal. There should be a perfectly smooth ridge in seal with no kinks.

Insert special tool T-9 into housing (13) from back of valve and through new seal until shoulder of special tool touches valve housing.

Hold special tool in housing, and push spool into housing from front until front seal groove is visible in front of spool. Twist spool and special tool slightly to facilitate installation.

CAUTION: Do not push spool too far into housing. To do so

may permit back seal to enter grooves of spool and damage new seal.

Install new front seal in same manner as rear seal.

Insert special tool into spool bore from front and, with a twisting motion, carefully push tool through new front seal until tool contacts spool shoulder.

Using a twisting motion, push spool forward against tool until 1/4-inch of polished surface of spool is exposed at front of valve. Remove special tool.

Connect valve control handle to spool by installing handle pin (34) and handle cotter pin (35).

On back of brake control valve, install detent spool adapter (26), and secure with centering spring lock washer (20) and spring assembly bolt (21). Install detent end cap retainer spring (25), stop disc (22), stop disc snap ring (23), and rubber bonnet (24).

Using a coating of grease to hold the parts in place, assemble detent cap (27), detent spring washer (28), detent spring (29), and detent pin (30). Rounded end of detent pin (30) must protrude. Position spool so that center groove in detent spool adapter (26) is centered under tapped hole for detent assembly, and install detent assembly.

On back of clutch control valve, install stop washer (17), centering spring (18), and stop collar (19), and secure with centering spring lock washer (20) and spring assembly bolt (21). Install stop disc (22), stop disc snap ring (23), and rubber bonnet (24).

PARTS LIST SECTION

FOR CARCO SERVICE AND PARTS MANUAL

Carco Model E-30-PS Winch

(POWER SHIFT FRICTION CLUTCH)

NOTE: Purchased parts, such as bearings and oil seals may be substituted with parts of equal quality on the manufacturer's recommendation, and with the approval of Pacific Car and Foundry Company.

ATTENTION: Be sure to give the correct part number and part name, and the complete serial number of the unit, when ordering any parts.

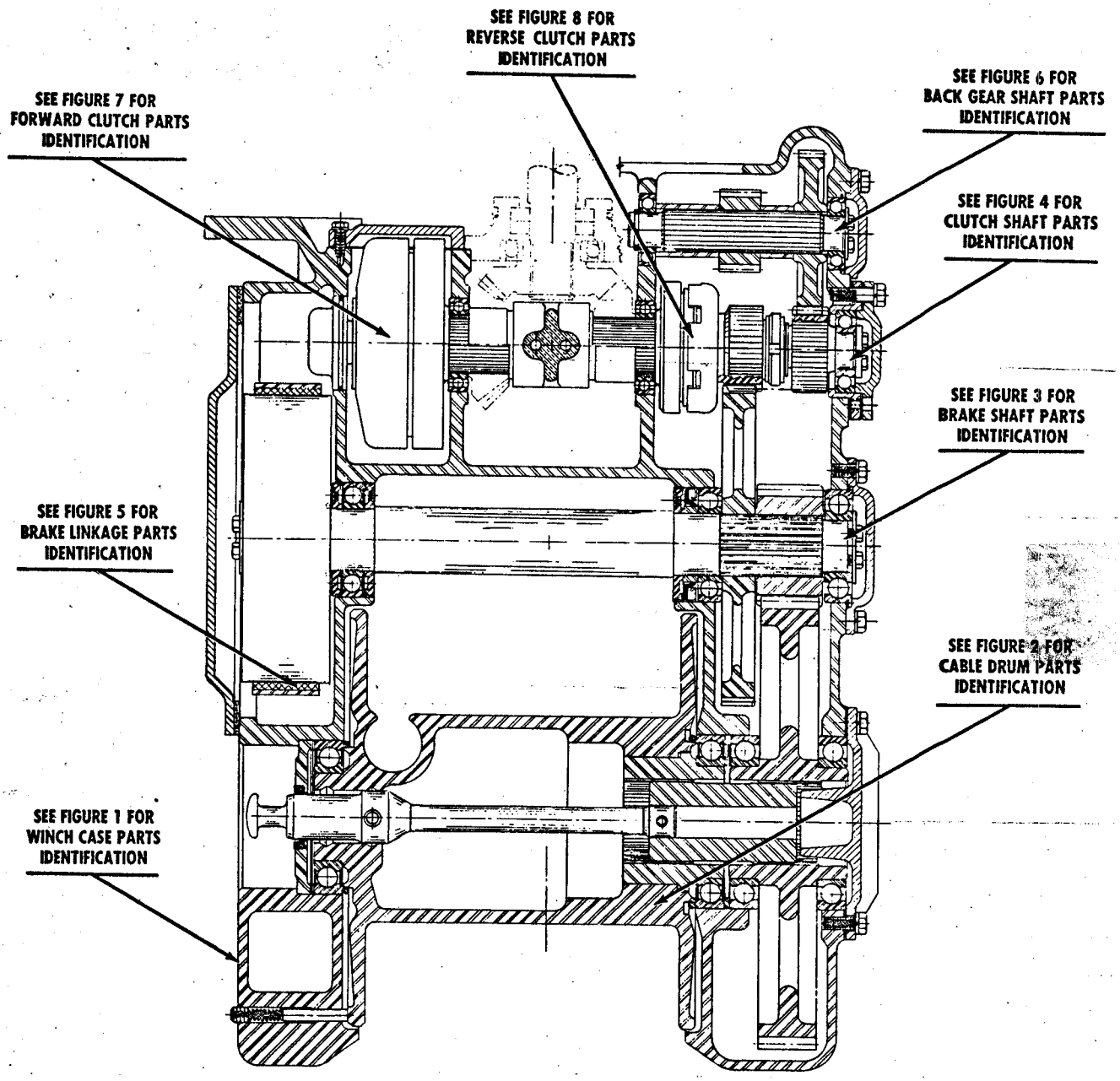
PACIFIC CAR AND FOUNDRY COMPANY

RENTON, WASHINGTON, U. S. A.

1372-F-5-1-62

PARTS IDENTIFICATION INDEX DRAWING

CARCO MODEL E-30-PS WINCH



1373-F-3-15-66
SUPERSEDES
1373-F-5-1-62

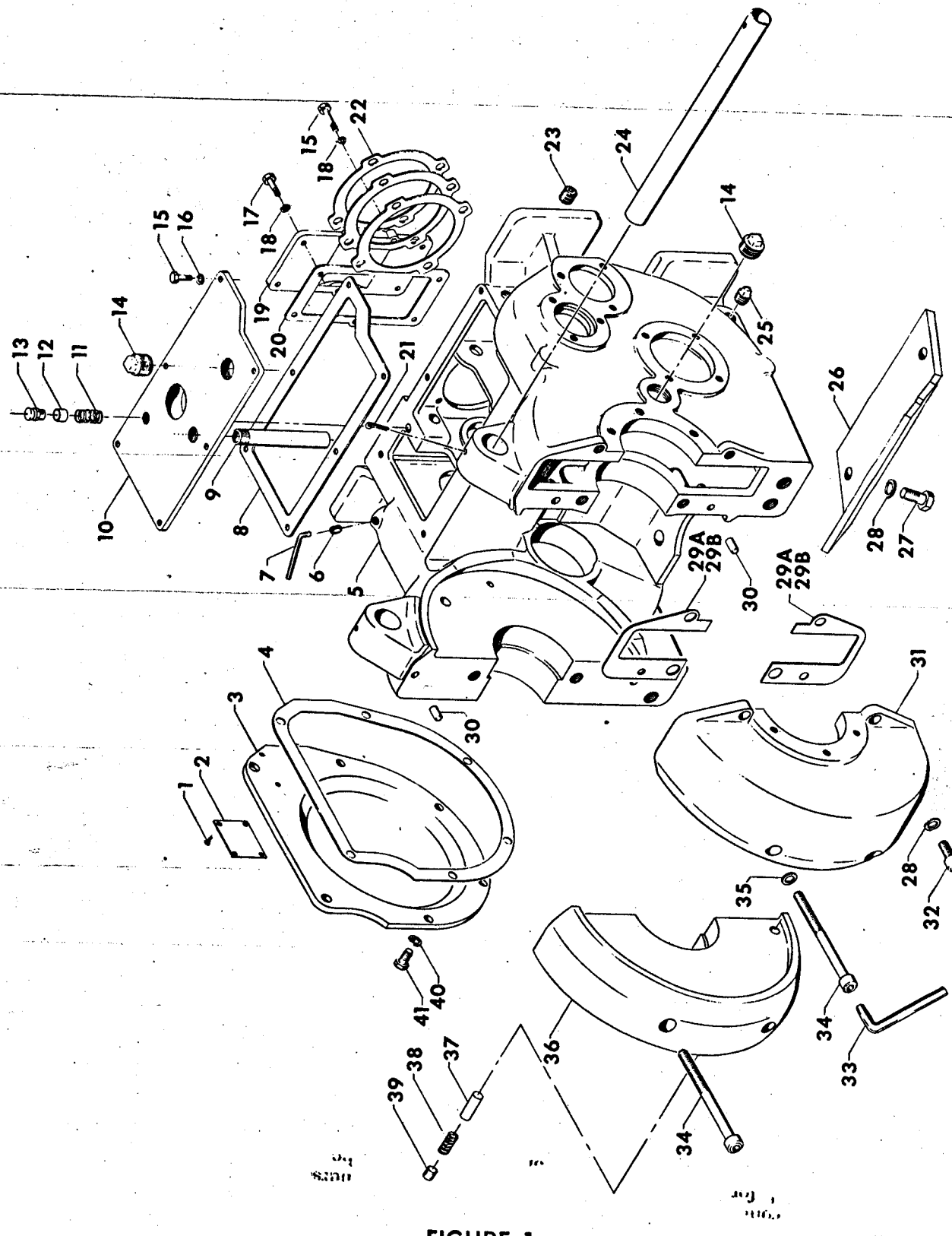


FIGURE 1

1373-B-3-15-66
SUPERSEDES
1373-B-12-15-62

REF.	PART NO.	NAME	Quan. per Unit
1	No. 10 x 3/8"	P-K Type U Drive Screw	4
2	44003	Name Plate	1
3	40359	Brake Cover	1
4	45914-1	Brake Cover Gasket (Length 4'4")	1
5	42144	Case, Additionally Machined	1
6	3/8" UNF x 3/8"	Socket-Head Set Screw, Cup Point	1
7	3/16" Hex	Allen Wrench	1
8	40383	Gasket	1
9	44249	Pipe	1
10	42140	Bevel Gear Cover	1
11	28698-22	Spring	1
12	44987	Tube	1
13	301370	Alemite Air Vent	1
14	1¼" NPT	Square-Head Pipe Plug	2
15	3/8" UNF x 1¼"	Hex-Head Cap Screw, Grade 5	9
16	3/8" Med	Lock Washer	6
17	3/8" UNF x 1"	Hex-Head Cap Screw, Grade 5	4
18	1168-4	Copper Washer	7
19	40958	Clutch Cover	1
20	41813	Gasket	1
21	3/16" x 1¼"	Cotter Pin	1
22	41799	Shim Set	1
23	¼" NPT	Socket-Head Pipe Plug	1
24	40385	Pipe	1

REF.	PART NO.	NAME	Quan. per Unit
25	1" NPT	Square-Head, Magnetic Pipe Plug	1
26	42296	Guard	1
27	¾" UNF x 1½"	Hex-Head Cap Screw, Grade 5	2
28	¾" Med	Lock Washer	4
29A	40381	Gasket { Winch Serial No. 301 thru 449	2
29B	44253	Gasket { Winch Serial No. 450 and up	2
		Dowel Pin { 450 and up	4
30	½" x 1" Std		
31*	40363	Gear End Cover	1
32	¾" UNF x 1¾"	Socket-Head Cap Screw	2
33	9/16" Hex	Allen Wrench	1
34	¾" UNF x 8"	Socket-Head Cap Screw	4
35	Y-1168-2	Copper Washer	2
36*	40364	Brake End Cover	1
37	44966	Friction Rod	1
38	D-2	Die Spring	1
39	5/8" x 5/8"	Socket Head Flat Point Nylok Set Screw	1
40	½" Med	Lock Washer	6
41	½" UNF x 1¼"	Hex-Head Cap Screw, Grade 5	6

* Items 5, 31, & 36 Cannot Be Ordered Separately.

1374-F-3-15-66
SUPERSEDES
1374-F-12-15-62

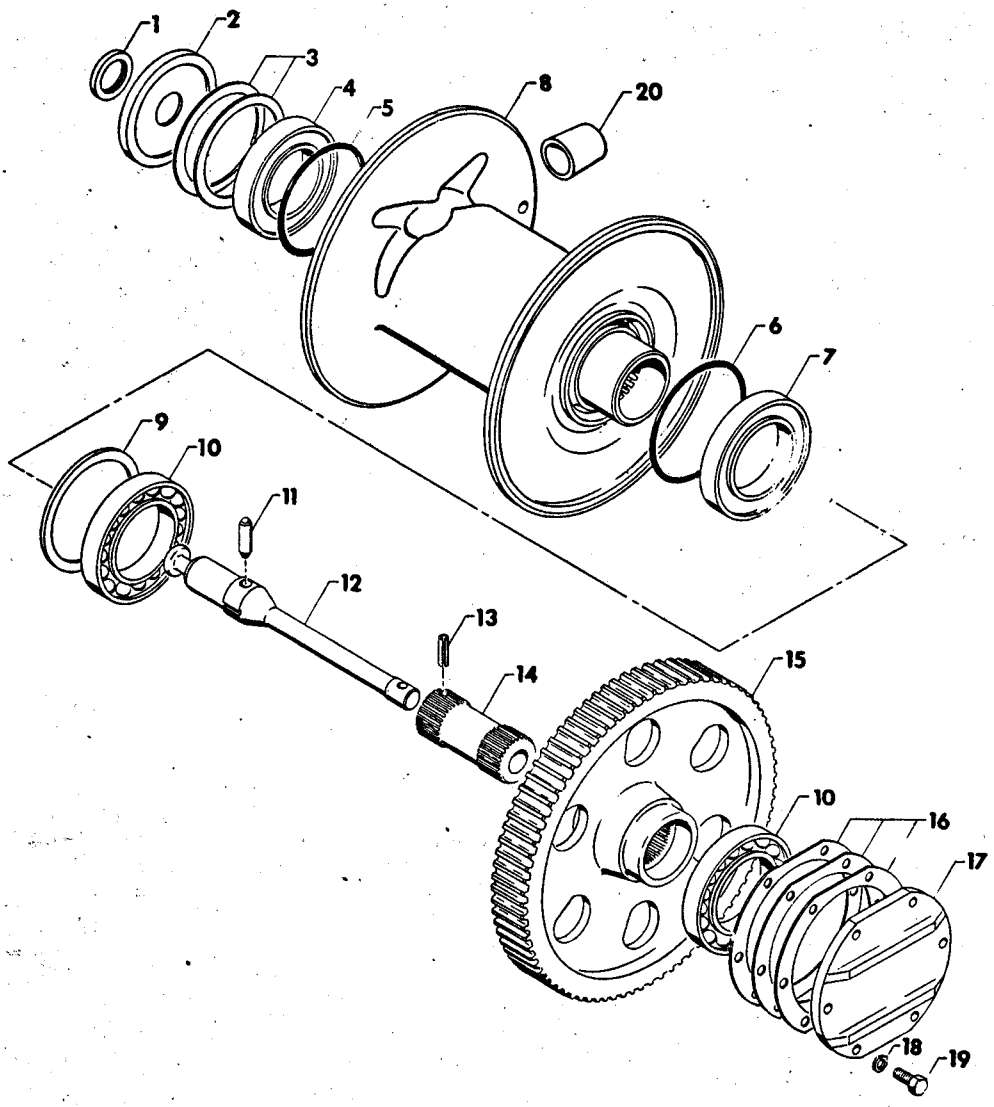


FIGURE 2

CABLE DRUM PARTS

REF.	PART NO.	NAME	Quan. per Unit
1	50351-S	National Seal	1
2	41807	Retainer	1
* 3	32648	Spacer	
	*(Spacer, item 3, used as required to center cable drum.)		
4	15252	Ball Bearing	1
5	622753	National O-Ring	1
6	622759	National O-Ring	1
7	15097	Ball Bearing	1
8	44927	Cable Drum Assembly	1
9	RRT-625	Spirolox Retaining Ring	1
10	15096	Ball Bearing	2
11	41810	Detent Assembly	1
12	40370	Spool Control Rod	1
13	59-077-375-2750	Esna Roll Pin	1
14	40657	Clutch Spool	1
15	40393	Bull Gear	1
16	40377	Shim Set	1
17	40366	Drum Shaft Bearing Cap	1
18	½'' Med.	Lock Washer	6
19	½'' UNF x 1¼''	Hex-Head Cap Screw, Grade 5	6
20	25457-2	Ferrule	1

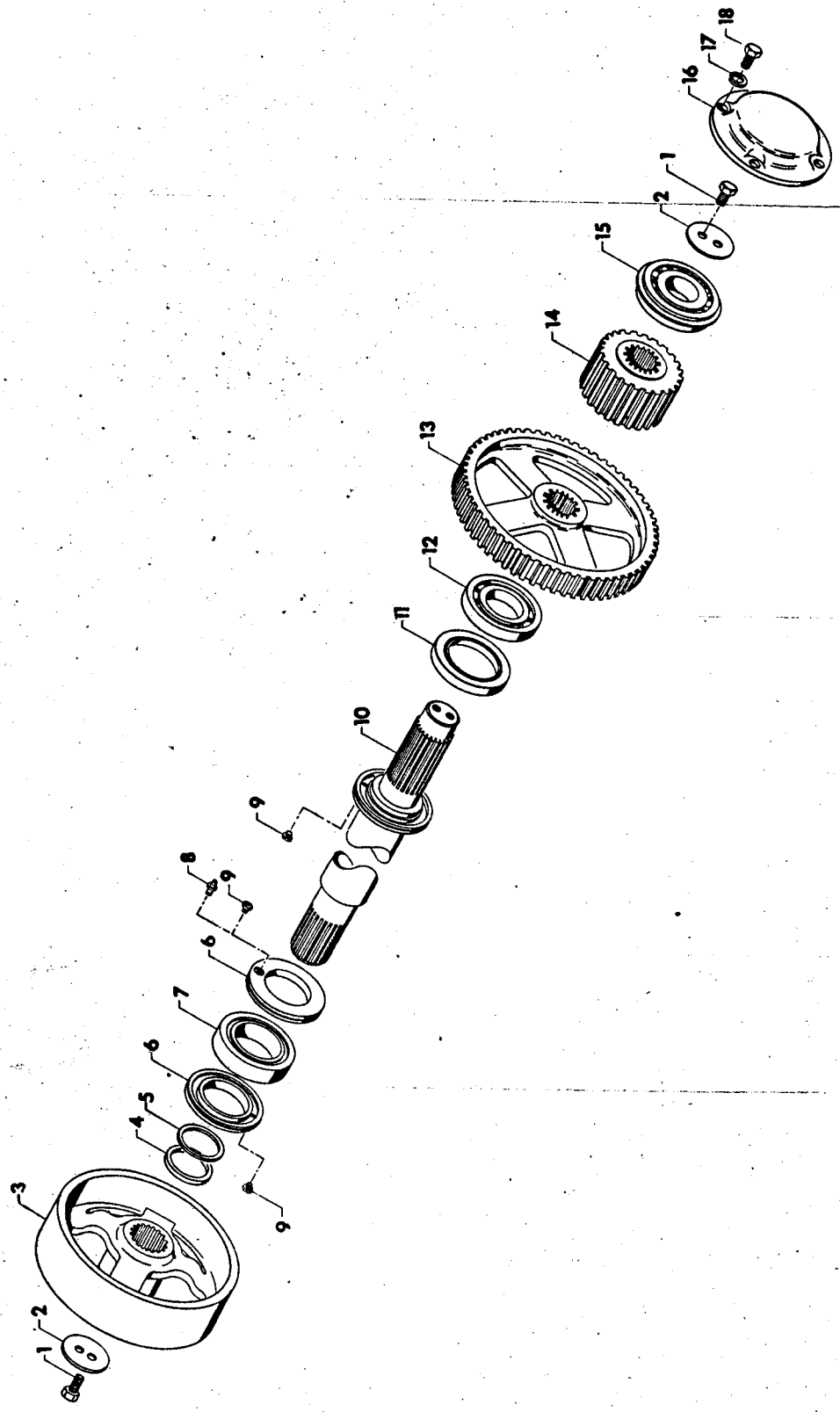


FIGURE 3

REF.	PART NO.	NAME	Quan. per Unit
1	5/16"UNF x 1"	Hex-Head Cap Screw, Grade 5, Nylok	4
2	41805	Retaining Washer	2
3	41830	Brake Drum	1
*4	41800–1	Spacer	1
*5	41800–2	Spacer	1
	*(Spacers, items 4 and 5, used singly or together as required to prevent brake drum from contacting winch case.)		
6	41883	Bearing Guard	2
7	15245	Ball Bearing	1
8	1680B	Alemite Grease Fitting	1
9	328224	Alemite Plug	3
10	40389	Brake Shaft Assembly	1
11	55310	National Seal	1
12	15027	Ball Bearing	1
13	40394	Gear	1
14	40396	Pinion	1
15	15069	Ball Bearing	1
16	40368	Brake Shaft Bearing Cap	1
17	½" Med.	Lock Washer	4
18	½" UNF x 1¼"	Hex-Head Cap Screw, Grade 5	4

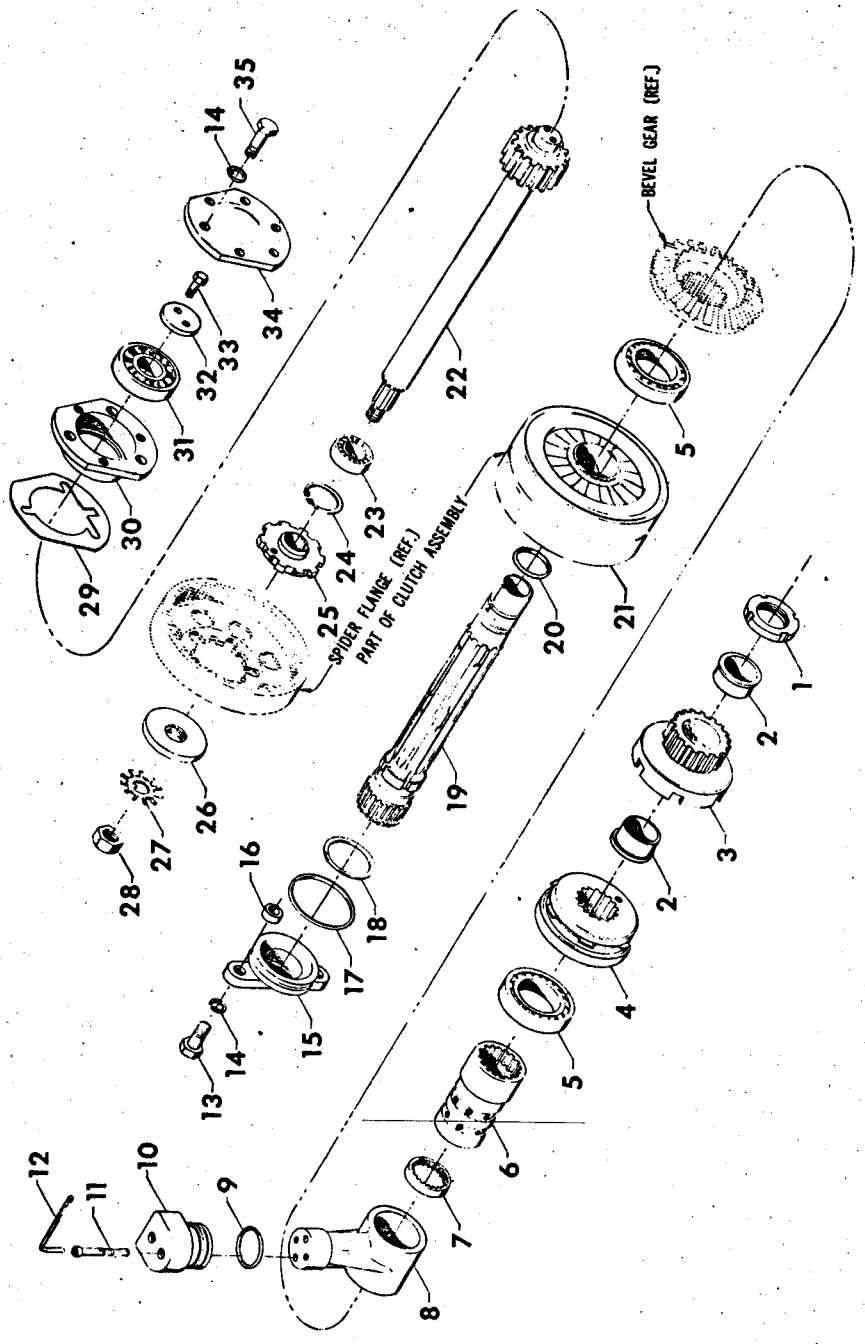


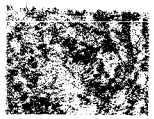
FIGURE 4

1376-B-3-15-66
SUPERSEDES
1376-B-12-15-62

REF.	PART NO.	NAME	Quan. per Unit
1	BL-N-10	Lock Nut	1
2	45748	Flange Bearing	2
3	42133	Spider	1
4	42127	Clutch Assembly (See figure 8)	1
5	15212	Ball Bearing	2
6	42142	Collector Sleeve	1
7	42138	Splined Seal	1
8	42139	Collector Ring	1
9	622731	National O-Ring	1
10	42141	Collector Ring Cap	1
11	3/8" UNC x 2¾"	Socket-Head Cap Screw	2
12	5/16" Hex	Allen Wrench	1
13	½" UNF x 1½"	Hex-Head Cap Screw, Grade 5	2
14	½" Med	Lock Washer	5
15	42137	Plug	1
16	45978	Spacer	2
17	623014	National O-Ring	1
18	RST-243	Spirolox Retaining Ring	1

REF.	PART NO.	NAME	Quan. per Unit
19	44913	Clutch Shaft	1
20	623004	National O-Ring	1
21	44910	Clutch Assembly (See figure 7)	1
22	42134	Pinion Shaft	1
23	15001	Ball Bearing	1
24	5008-206	Truarc Retaining Ring	1
25	42123	Spider Hub	1
26	42294	Washer	1
27	No. 3 Star	Dorman Washer	1
28	5/8" UNF	Hex Nut	1
29	45496	Shim Set	1
30	40374	Retainer	1
31	15053	Ball Bearing	1
32	41803	Washer	1
33	5/16" UNF x 1"	Hex-Head Cap Screw, Grade 5, Nylok	2
34	40367	Bevel Gear Shaft Bearing Cap	1
35	½" UNF x 1¼"	Hex-Head Cap Screw, Grade 5	3

1377-F-3-15-66
SUPERSEDES
1377-F-12-15-62



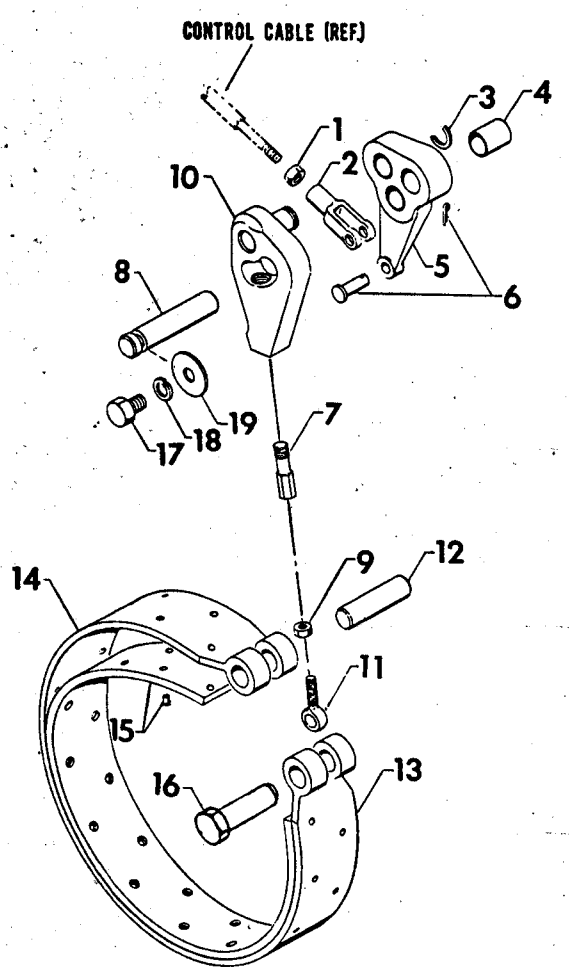


FIGURE 5

REF.	PART NO.	NAME	Quan. per Unit
1	⅜" UNF	Hex Jam Nut, Cadmium Plated	1
2	2708-4A	Cleveland Machined Yoke	1
3	XSO-231	National Retaining Ring	1
4	AA-838-7	Oilite Bearing (Included with Brake Lever Assembly, item 5.)	
5	41779	Brake Lever Assembly (Includes three Oilite Bearings, item 4.)	1
6	2708½-4A	Cleveland Yoke Pin Assembly	1
7	44884	Adjustment Nut	1
8	41793	Shaft	1
* 9	½" UNF LH	Hex Jam Nut, Cadmium Plated, Left Hand	1
10	41785	Rod End Assembly	1
11	44885	Eye Bolt	1
	*Adjustment Nut, Jam Nut, and Eye Bolt, items 7, 9 and 11, can be ordered as Eye Bolt Assembly, part number 44886.		
12	¾" x 3½"	Standard Dowel Pin	1
13	41789	Brake Band Assembly (Includes items 14 and 15.)	1
14	41788	Brake Band	1
15	41789-2	Lining and Rivets	1
16	45706	Pin	1
17	½" UNF x ¾"	Hex-Head Cap Screw, Grade 5	1
18	½" Med.	Lock Washer	1
19	½" x 1⅜" O.D.	Flat Washer	1

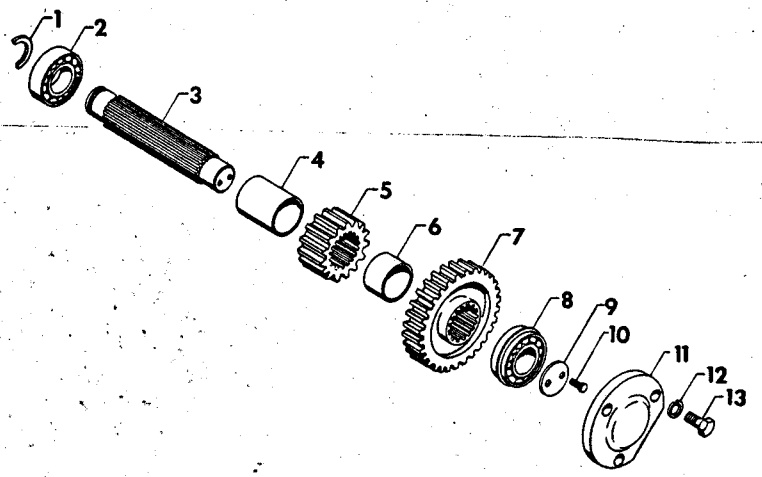


FIGURE 6

REF.	PART NO.	NAME	Quan. per Unit
1	XSO-251	National Retaining Ring	1
2	15003	Ball Bearing	1
3	40391	Back Gear Shaft	1
4	40571-2	Spacer	1
5	40397	Pinion	1
6	40571-1	Spacer	1
7	40395	Back Gear	1
8	15004	Ball Bearing	1
9	41804	Retaining Washer	1
10	5/16'' UNF x 1''	Hex-Head Cap Screw, Grade 5, Nylok	2
11	40369	Back Gear Shaft Bearing Cap	1
12	½'' Med.	Lock Washer	3
13	½'' UNF x 1¼''	Hex-Head Cap Screw, Grade 5	3

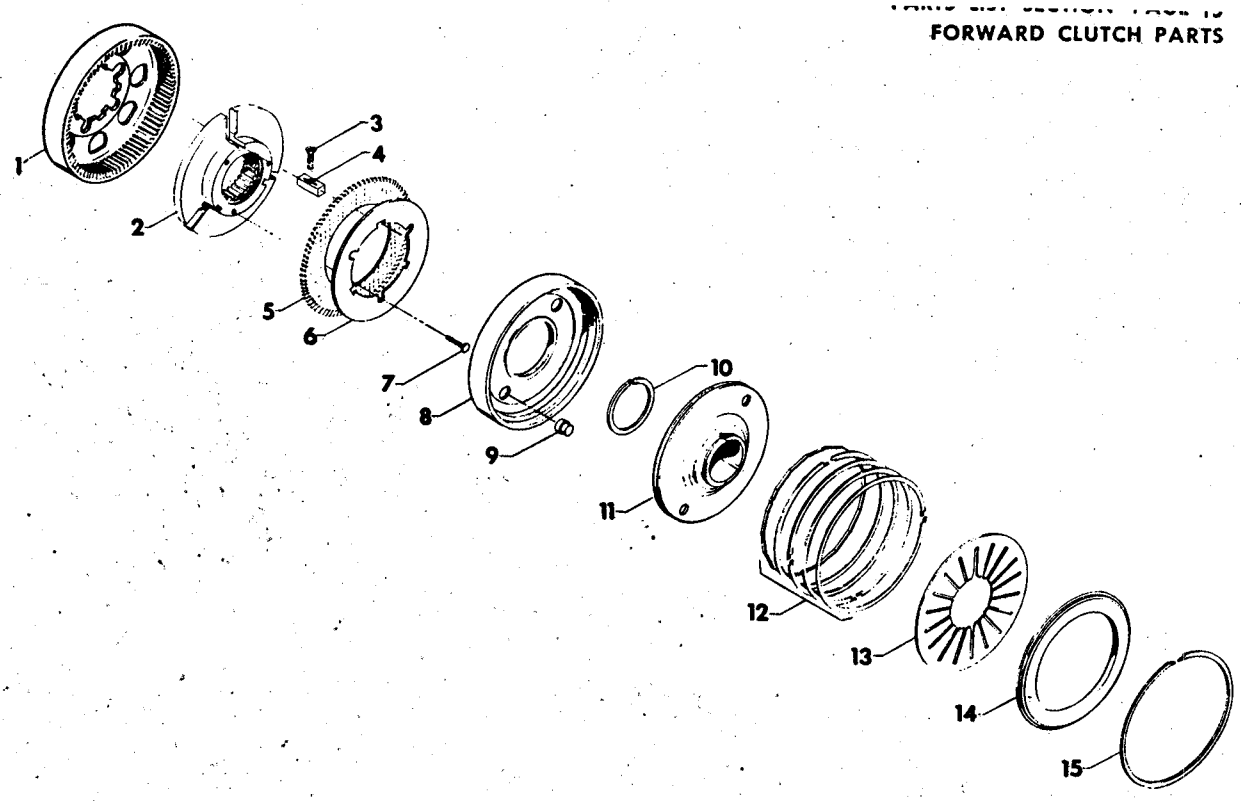


FIGURE 7

REF.	PART NO.	NAME	Quan. per Unit
1	42125	Spider Flange	1
2	44265	Hub & Backplate	1
3	M2020K	Screw	3
4	A2064	Driver Key	3
5	A4488	Bronze Plate	3
6	A3336B	Steel Plate	3
7	42297	Pin	3
8	A4491B	Piston	1
9	B1615G	Pin	2
10	M1904E	Piston Ring	1
11	44899	Piston Carrier	1
12	M2059H	Piston Ring (5 pcs. per set)	1 set
13	42119	Spring	2
14	42120	Ring	1
15	A2669BB	Snap Ring	1

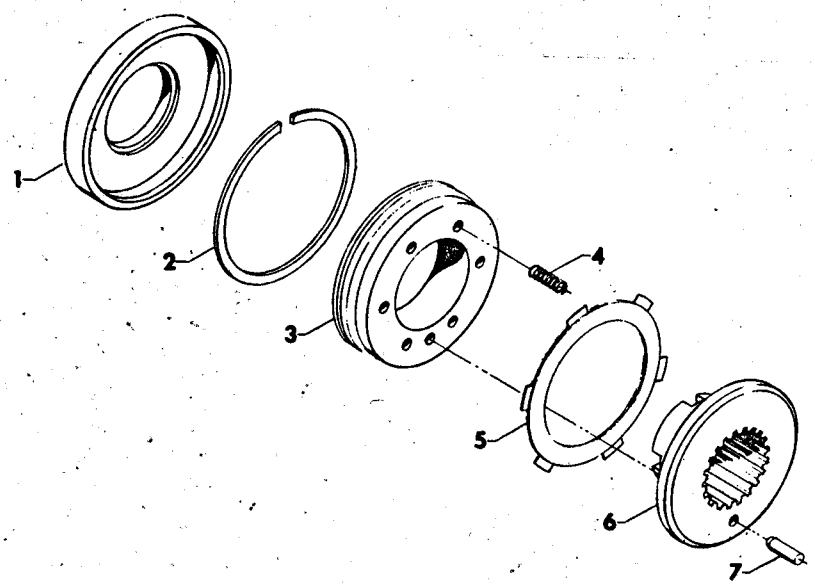


FIGURE 8

REF.	PART NO.	NAME	Quan. per Unit
1	42128	Clutch Cylinder	1
2	42129	Piston Ring	1
3	42131	Clutch Piston	1
4	42130	Clutch Spring	6
5	3764D	Twin Disc Driving Plate	1
6	42132	Clutch Hub	1
7	5/16" x 1" Std	Dowel Pin	1

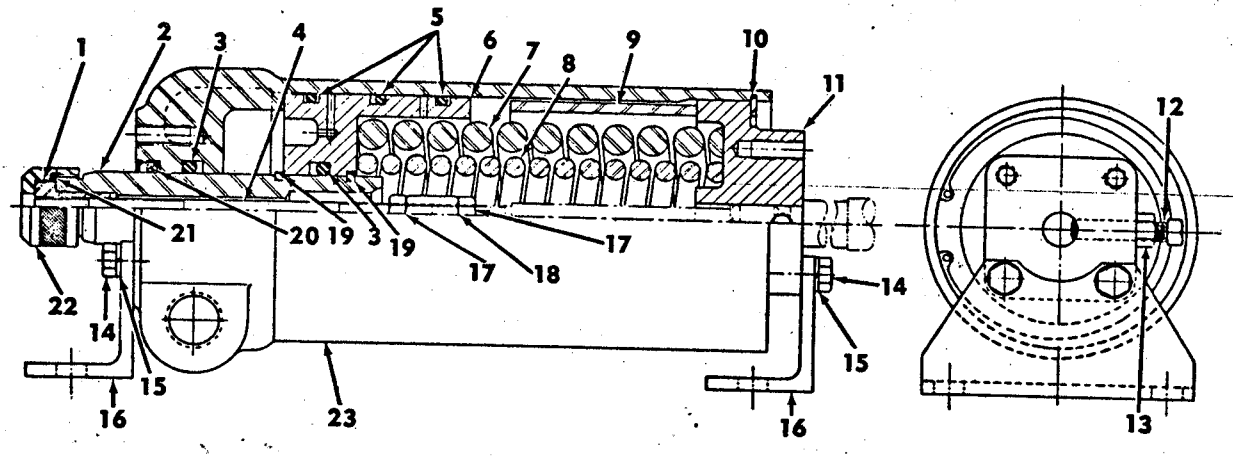
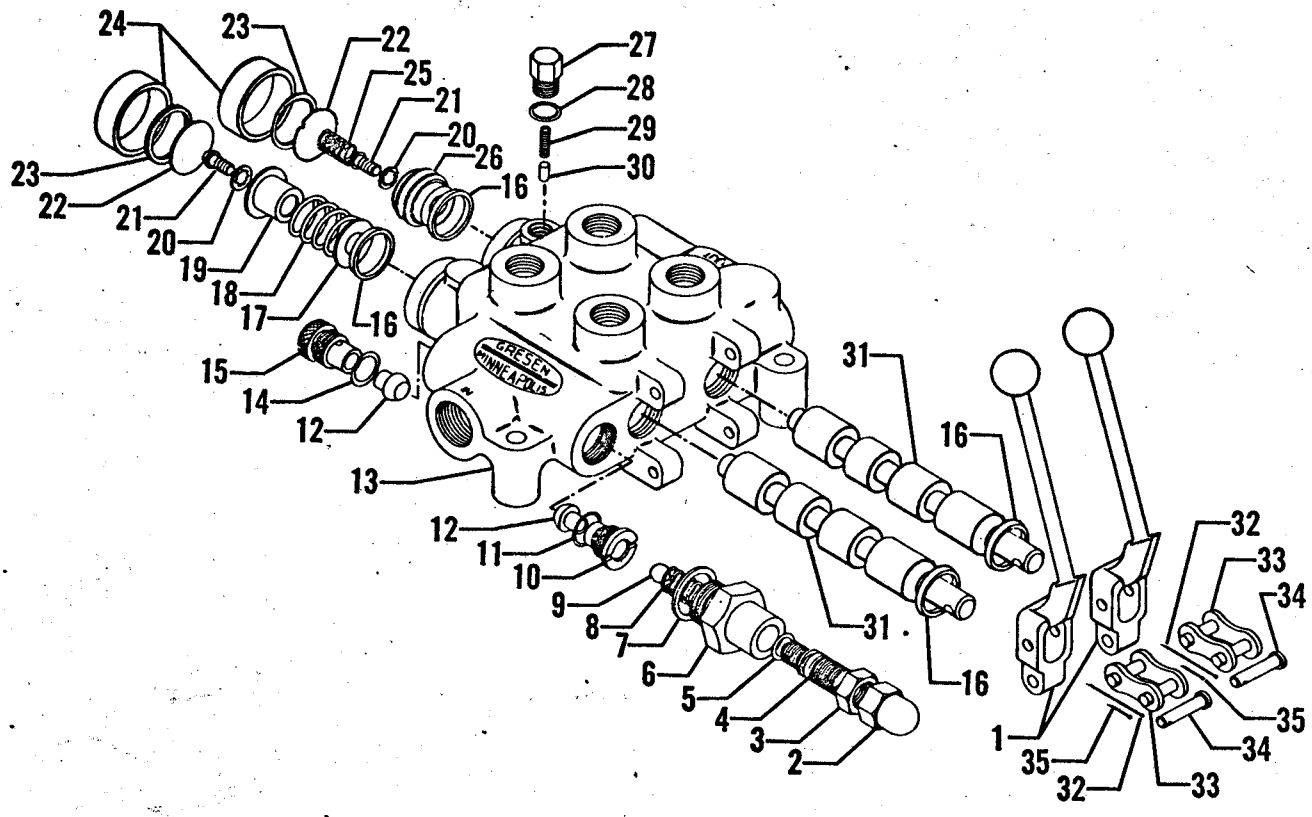


FIGURE 9

BRAKE ACTUATOR COMPLETE . . . PART NUMBER 44025

REF.	PART NO.	NAME	Quan. per Unit
1	44014	Nut	1
2	44020	Piston Rod	1
3	44016	O-Ring	2
4	44012	Rod	1
5	622749	National O-Ring	3
6	44023	Piston	1
7	44017	Spring	1
8	44018	Spring	1
9	44021	Spacer	1
10	5000-462'	Truarc Retaining Ring	1
11	44022	Cylinder Head	1
12	3/8"UNC x 1-1/2"	Square-Head Set Screw	1
13	3/8"UNC	Hex Jam Nut	1
14	3/8"UNC x 1"	Hex-Head Cap Screw, Grade 5	4
15	3/8" Med	Lock Washer	4
16	44019	Bracket	2
17	3/8"UNF	Hex Nut	2
18	44013	Coupling	1
19	XSO-247	National Retaining Ring	2
20	50480S	National Seal	1
21	622720	National O-Ring	1
22	44015	Cap	1
23	44011	Cylinder	1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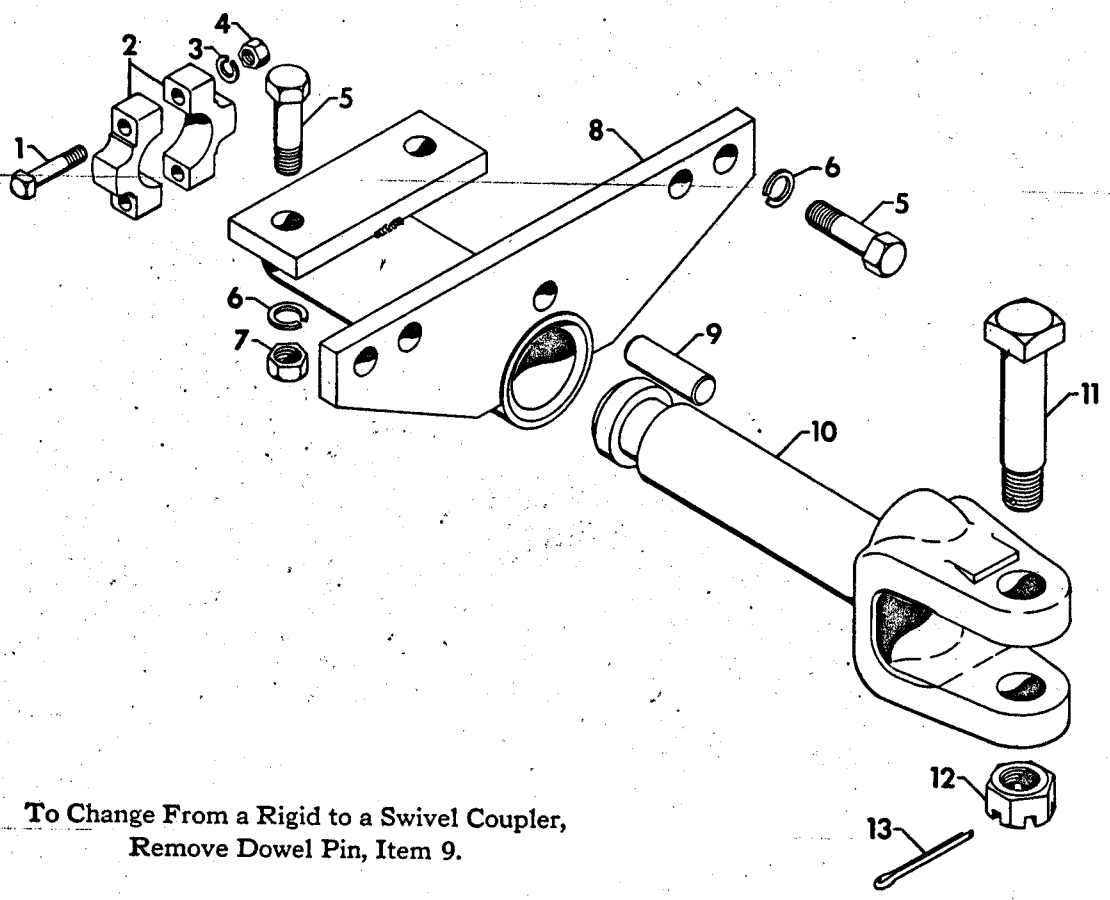
GRESEN
MINNEAPOLIS

FIGURE 10

REF.	PART NO.	NAME	Quan. per Unit
1	**44056	Control Valve Handle	2
2	974	Acorn Cap	1
3	973	Adjusting Screw Jam Nut	1
4	925	Adjusting Screw	1
5	926	Adjusting Screw O-Ring	1
6	924	Relief Body	1
7	923	Relief Body Gasket	1
8	953	Relief Spring	1
9	014	Relief Valve Ball	1
10	2784	Relief Valve Seat	1
11	2706	Relief Valve Seat O-Ring	1
12	2781	Check Poppet	2
13	*2702	Valve Housing	1
14	1141	Check Plug O-Ring	1
15	2783	Check Plug	1
16	932	Spool Seal	4
17	1202	Stop Washer	1
18	913	Centering Spring (Standard)	1
19	911-A	Stop Collar	1
20	2529	Centering Spring Lock Washer	2
21	510	Spring Assembly Bolt	2
22	912	Stop Disc	2
23	914	Stop Disc Snap Ring	2
24	967	Rubber Bonnet	2
25	976	Detent End Cap Retainer Spring	1
26	972	Detent Spool Adapter	1
27	2519	Detent Cap	1
28	970	Detent Spring Washer	1
29	969	Detent Spring	1
30	971	Detent Pin	1
31	*904	4-Way Spool	2
32	929	Handle Link Cotter Pin	2
33	928	Handle Link Assembly	2
34	553	Handle Pin	2
35	086	Handle Cotter Pin	2

*Housing and spools are a matched set, and cannot be ordered separately.

**Control Valve Handles are specially modified parts and carry a Carco part number. All other part numbers listed are Gresen Mfg. Co. numbers.



To Change From a Rigid to a Swivel Coupler, Remove Dowel Pin, Item 9.

COUPLER ASSEMBLY . . . COMPLETE PART NO. 32870

REF.	PART NO.	NAME	Quan. per Unit
1	½'' NC x 2¾''	Square Head Bolt	2
2	45702	Retainer Clamp	1
3	½''	Lockwasher	2
4	½'' NC	Hex Nut	2
5	⅞'' NF x 2½''	Hex Head Capscrew (Heat Treated)	6
6	⅞''	Lockwasher	6
7	⅞'' NF	Hex Nut (Heat Treated)	2
8	32861	Coupler Adapter	1
9	32865	Dowel Pin	1
10	32857	Coupler	1
11	32871-1	Coupler Bolt	1
12	Y-1216-1	Slotted Nut	1
13	¼'' x 2¼''	Cotter Pin	1