CARCO WINCH
(P-60)

SECTION

PARTS & SERVICE SECTION
For (Carco P-60 Winch)

TABLE OF CONTENTS

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

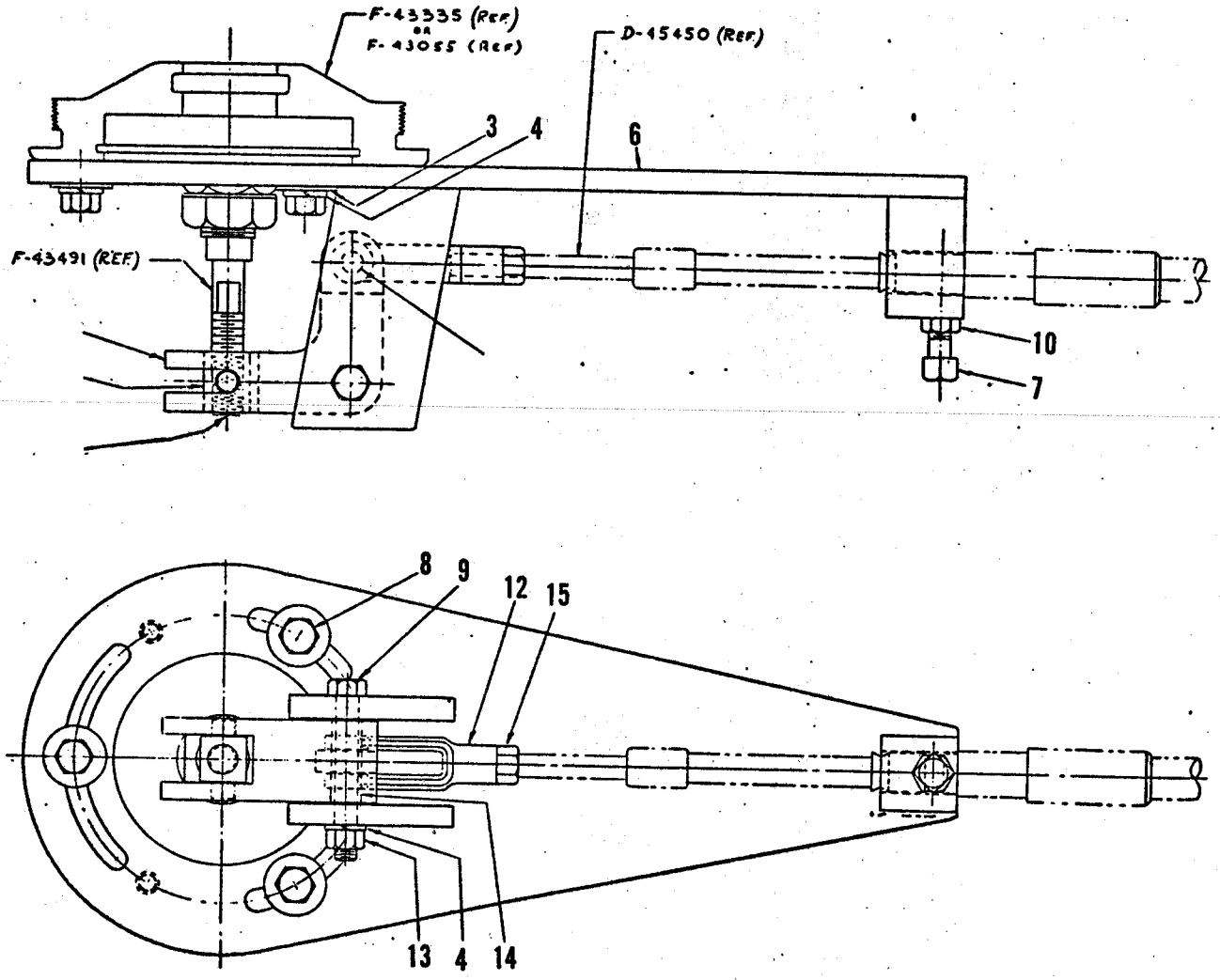


FIG. , SHIFT CONTROL ASSEMBLY, P-60 Winch, 48130

REF.	PART NO.	DESCRIPTION	REQ'D.
1	48126	LEVER, Shift	1
2	48127	TRUNNION	1
3	1604-6	WASHER, 3/8	3
4	1607-6	LOCKWASHER, 3/8	4
5	16056-808	SET SCREW, 1/2 UNC X 1/2 Hex Soc.	1
6	48128	BRACKET, Shift	1
7	16061-616	SET SCREW, 3/8 UNC X 1 Sq. Hd.	1
8	16047-608	CAP SCREW, 3/8 UNC X 1 H.H.	3
9	16047-622	CAP SCREW, 3/8 UNC X 2-3/4 H.H.	1
10	16043-6	NUT, 3/8 UNC Hex Jam	1
11	16246-6	PIN, Cleveland 2708 1/2 - 4A	1
12	16245-6	YOKE, Cleveland 2708-4A	1
13	16033-6	NUT, 3/8 UNC	1
14	48129	SPACER	1
15	16044-6	NUT, 3/8 UNF Hex Jam	1

FIG. , SHIFT CONTROL ASSEMBLY, 48130, (P-60 WINCH)

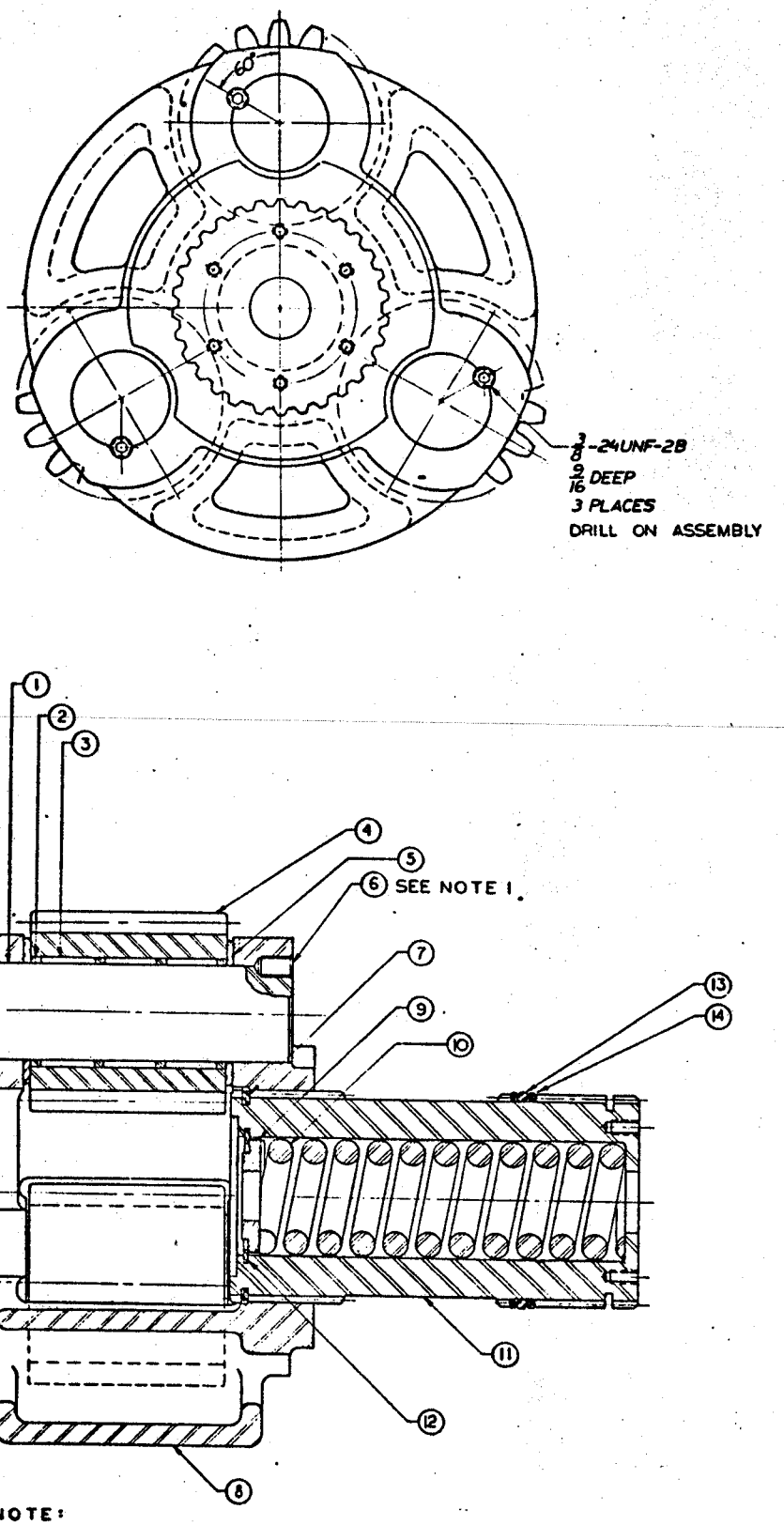
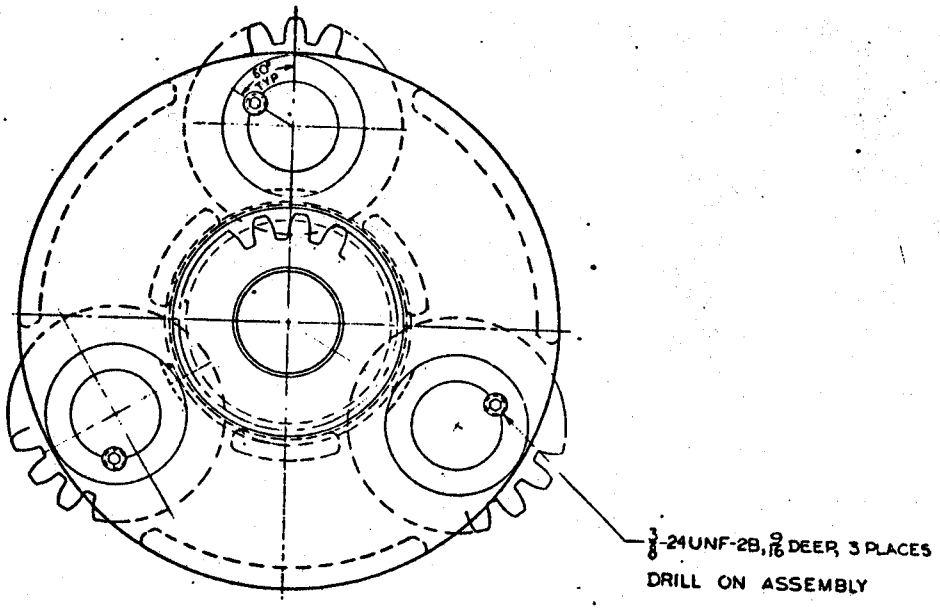
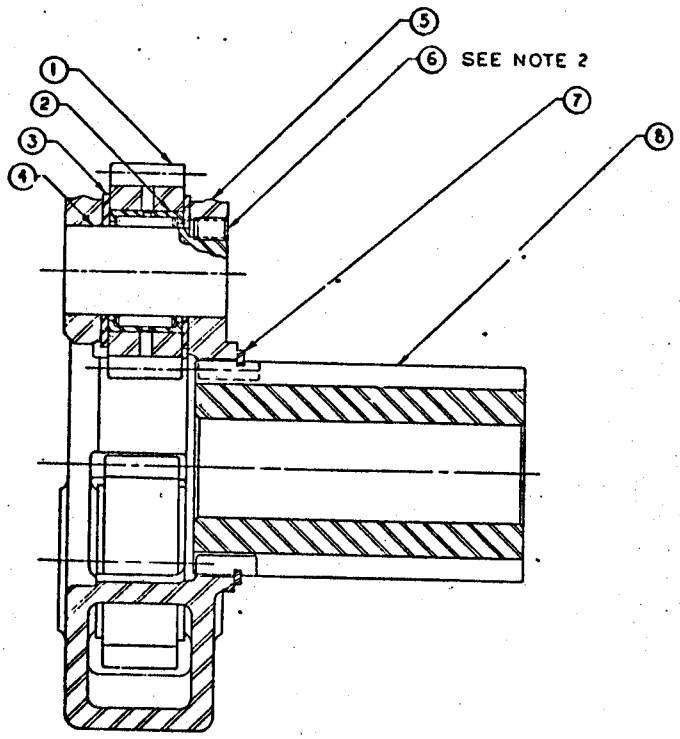


FIG. , CARRIER ASSEMBLY, Stage IV, 41641

REF.	PART NO.	DESCRIPTION	REQ'D.
1	F41558	PIN, Planet	3
2	F41600	WASHER	12
3	Q8306	ROLLER	423
4	F41561	GEAR, Planet	3
5	X41599	WASHER	6
6		SCREW, Set Hex. Socket Cup Point	3
		3/8-24 UNF-2A X 1/2 Lg.	3
7	RST 350	RING, Retainer	1
8	D41570	CARRIER, STAGE IV	1
9	X43105	STOP	1
10	F43044	SPRING	1
11	D41608	SHAFT, Reaction	1
12	5000-218	RETAINER	1
13	622744	PACKING	1
14	624644	BACK UP RING	2

FIG. , CARRIER ASSEMBLY, STAGE IV, 41641





NOTES:

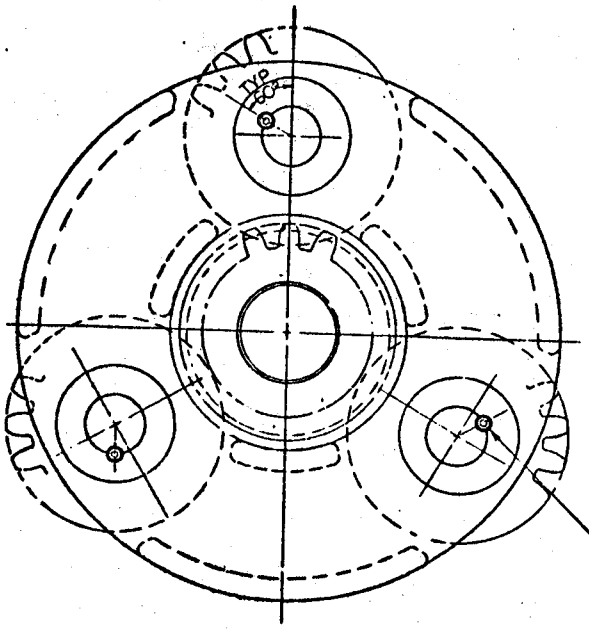
1- ASSEMBLE CARRIER TO SUN GEAR SO SNAP RING SEATS IN BOTTOM OF GROOVE.

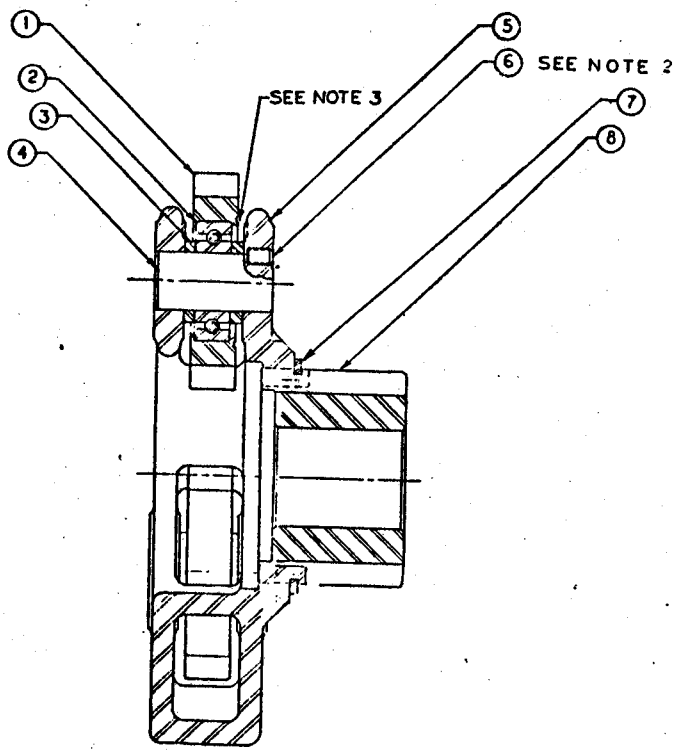
2. STAKE IN PLACE.

FIG. , CARRIER ASSEMBLY, Stage III, 43267

REF.	PART NO.	DESCRIPTION	REQ'D.
1	F41560	GEAR, Planet	3
2	SJ7275	BEARING	3
3	X41577	WASHER	6
4	X41557	PIN, Planet	3
5	D43397	CARRIER, STAGE III	1
6		SCREW, Set, Hex. Socket, Cup Point .... 3/8-24 UNF-3A X 1/2 Lg.	3
7	RST-368	RING, Snap	1
8	F43398	GEAR, Sun	1

FIG. , CARRIER ASSEMBLY, STAGE III, 43267





NOTES:
1. ASSEMBLE CARRIER

IN BOTTOM OF GROOVE.

STAKE IN PLACE

PEEN LIP OF GEAR OVER AT FOUR EQUALLY SPACED PLACES.

FIG. , CARRIER ASSEMBLY, Stage II, 43274

REF.	PART NO.	DESCRIPTION	REQ'D.
1	F41559	GEAR, Planet	3
2	205K	BEARING	3
3	X41595	WASHER, Planet Bearing	6
4	X41556	PIN, Planet	3
5	D43396	CARRIER	1
6		SCREW, Set Hex. Socket, Cup Point ..... 1/4-28UNF-2A X 3/8 Lg.	3
7	RST-	RING, Snap	1
8	F43266	GEAR, Sun	1

FIG. , CARRIER ASSEMBLY STAGE II, 43274

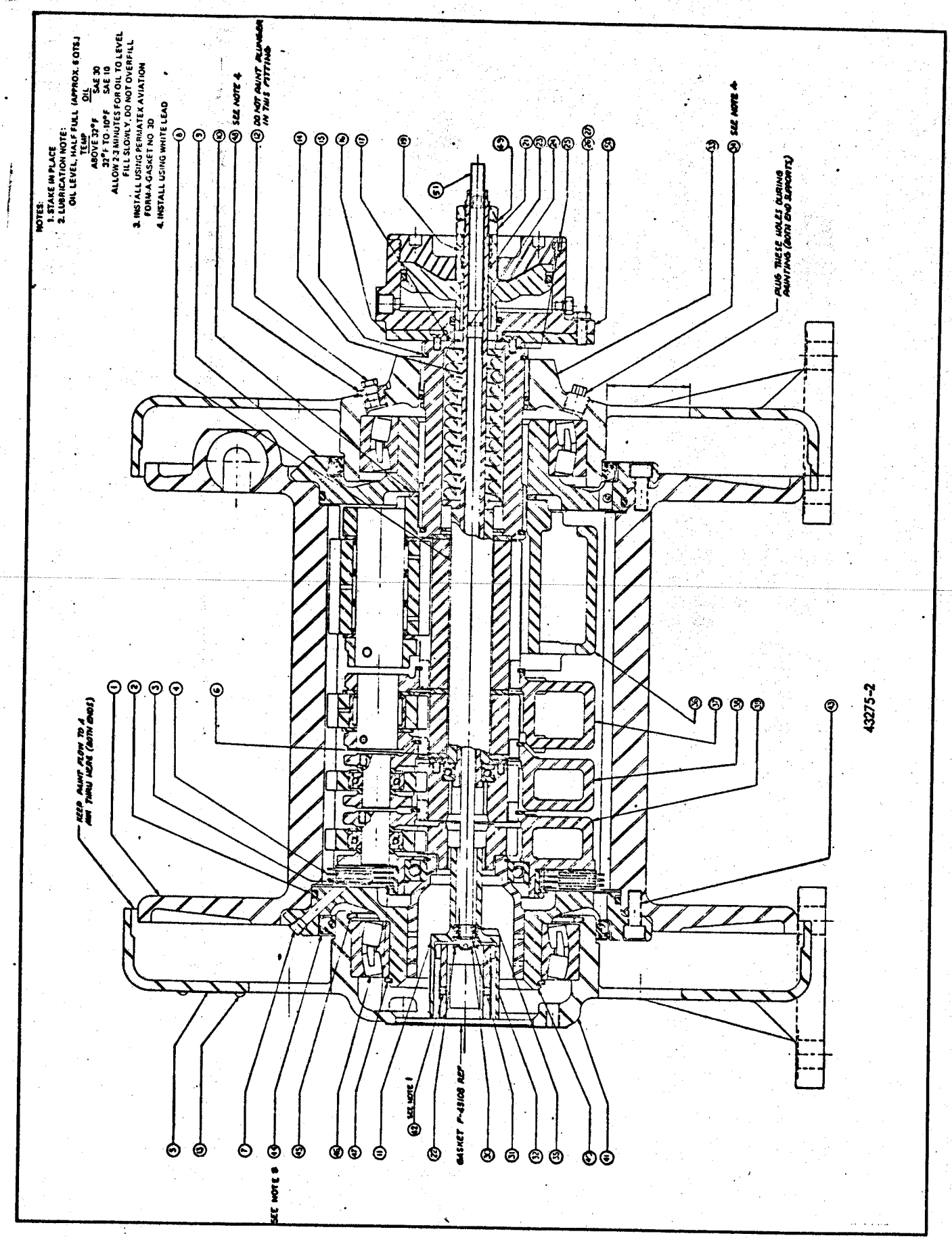
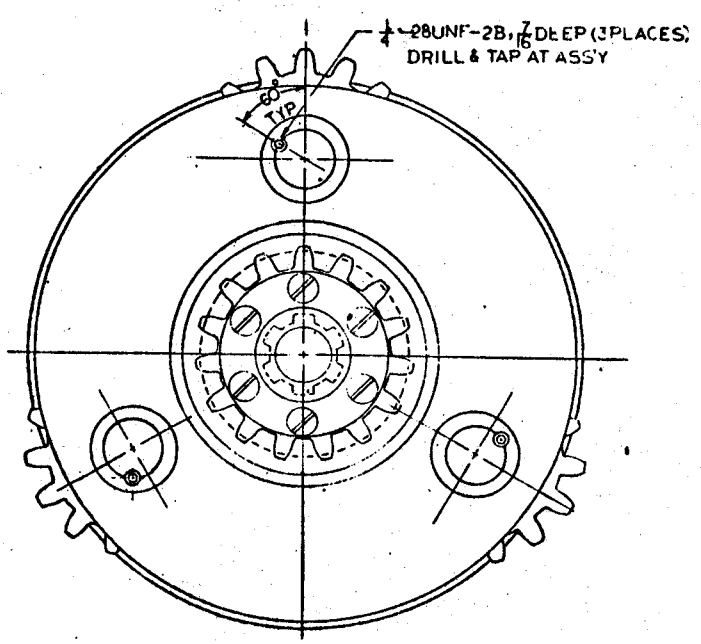
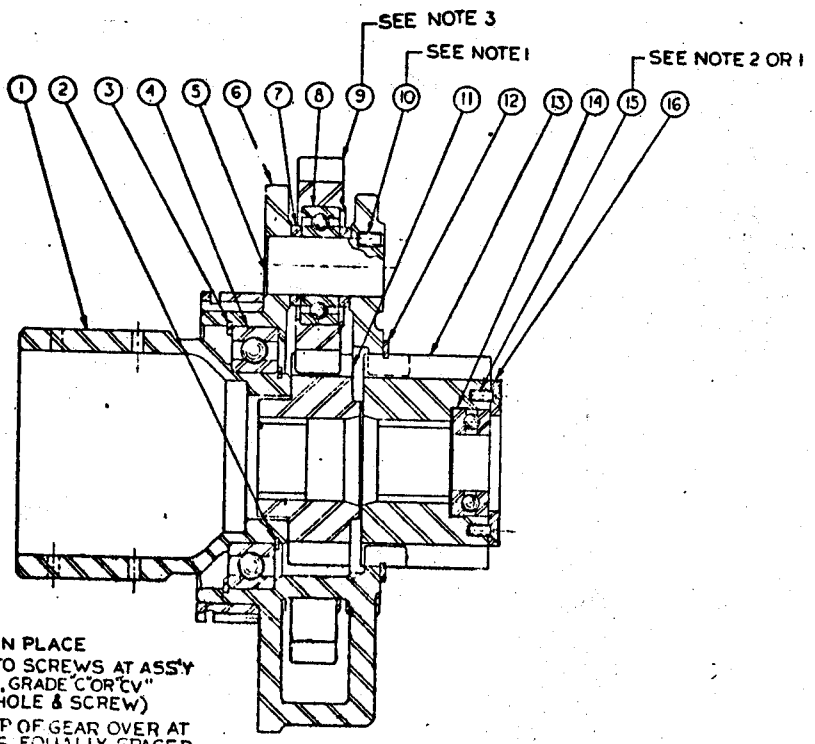


FIG. , CARCO MODEL P-60, PLANETARY WINCH ASSEMBLY, 43275-2

REF.	PART NO.	DESCRIPTION	REQ'D.
1	43265	DRUM	1
2	16262-450	O-RING, Nat'l 622777	2
3	43112	PLATE, Brake	4
4	43111	PLATE, Brake	3
5	43255	PLATE, Name	1
6	41575	WASHER	3
7	16167-2	PLUG, 1/8 NPT Hex Soc.	1
8	41605	TUBE	1
9	43104	BRG. HOUSING	1
10	41582	WASHER, Thrust	1
11	43199	SPOOL	1
12	16249-1	PLUG, Relief, Alemite 317400	1
13	16055-5	SCREW, Drive	4
14	43109	ROD, Brake	1
15	16306-350	RING, Retaining, Spirolox RST 350	1
16	43048	PLATE	1
17	16262-224	O-RING, Nat'l 623002	1
19	41612	SLEEVE	1
21	16043-14	NUT, 7/8 UNF Hex Jam	2
22	16288-316	PIN, Cotter, 3/32 X 1	1
23	16262-212	O-RING, Nat'l 622717	1
24	16262-110	O-RING, Nat'l 622708	1
25	16021-7	SCREW, Machine, 1/4 UNF X 5/8 Fit. Hd.	6
26	16048-608	SCREW, Cap, 3/8 UNF X 1 H.H.	4
27	16067-6	LOCKWASHER, 3/8	4
30	16028-6	NUT, 3/8 UNF Castle	1
31	43006	WASHER	1
32	16314-87	RING, Retaining, Truarc N5000-87	1
33	43353	ANCHOR END SUPPORT	1
34	16169-8	PLUG, 1/2 NPT Sq. Hd.	3
35	15283	BALL BEARING, Fafnir S3K	2
36	41641	CARRIER, STAGE IV	1
37	43267	CARRIER, STAGE III	1
38	43274	CARRIER, STAGE II	1
39	43276	CARRIER, STAGE I	1
40	43277	BEARING HOUSING, (Motor End)	1
41	43369	SUPPORT, (Motor End)	1
42	16057-504	SET SCREW, 1/2 UNF X 1/4 Hex Soc.	2
43	16050-810	CAP SCREW, 1/2 UNF X 1-$\frac{1}{4}$ Hex Soc.	22
44	16356-3	SEAL, Nat'l 55596-S	2
45	16314-825	RING, Retaining, Truarc N5000-825	1
46	15282	ROLLER BEARING, SKF 23028	2
47	16313-550	RING, Retaining, Truarc 5100-550	2
48	16123-82	BUSHING, 1/2 NPT X 1/8	1
49	16069-14	WASHER, Star, 7/8 Ext.	1
50	43494	CYLINDER ASSEMBLY	1
51	43491	ROD, Shift	1



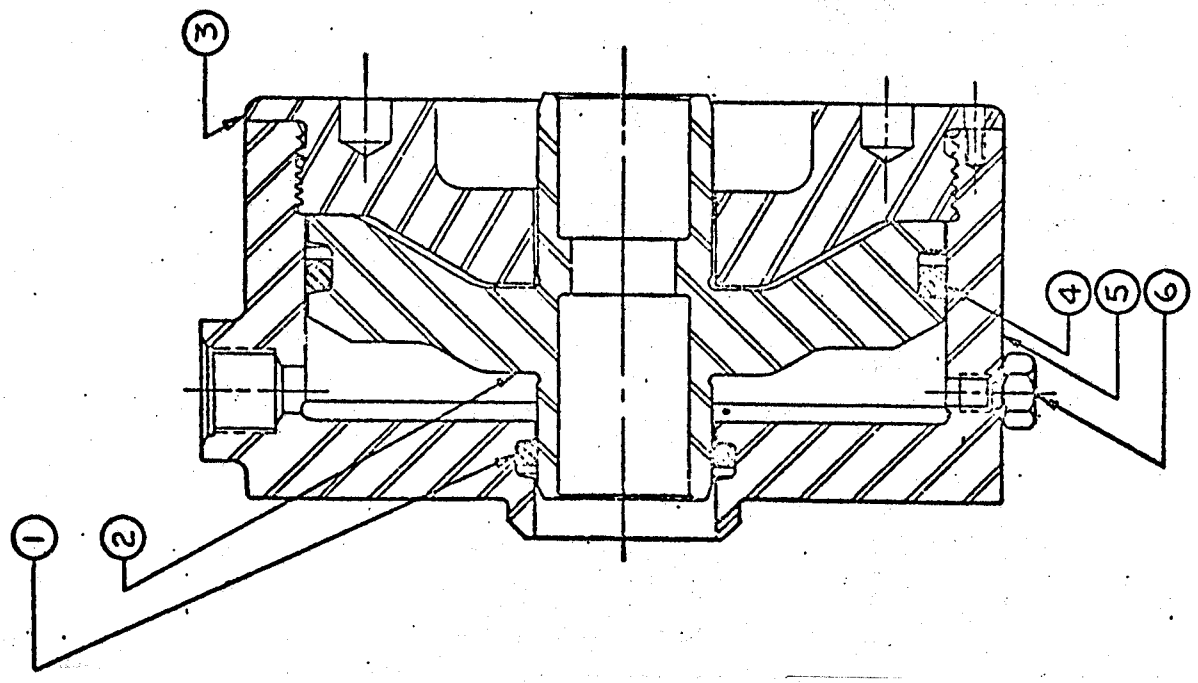


NOTES:
1. STAKE IN PLACE
2. APPLY TO SCREWS AT ASS'Y LOCTITE, GRADE "C" OR "CV" (CLEAN HOLE & SCREW)
3. PEEN LIP OF GEAR OVER AT 4 PLACES, EQUALLY SPACED. USE SPOT-WELDER, BUT DO NOT BURN OR ATTACH TO BALL-RACE. (A)

FIG. , CARRIER ASSEMBLY, Stage I, P-60, 43276

REF.	PART NO.	DESCRIPTION	REQ'D.
1	F43394	BUSHING	1
2	5100-293	RING, Snap	1
3	5000-450	RING, Snap	1
4	SKF6015	BEARING	1
5	X41556	PIN, Planet	3
6	D43242	CARRIER, STAI	1
7	X41595	SPACER	6
8	205K	BEARING	3
9	F41559	GEAR, Planet	3
10		SCREW, SOC. HD. Set CUP PT., $\frac{1}{4}$-28UNF-2A X 3/8 Lg.	3
11	F43399	GEAR, SUN-STAI	1
12	RST-368	RING, Snap	1
13	D43498	GEAR, SUN-STAII	1
14	SKF905	BEARING	1
15		SCREW, F.H. MACH. 1/4-28UNF-24 X 1/2 Lg.	6
16	X41594	RETAINER	1

FIG. , CARRIER ASSEMBLY, STAGE I P-60, 43276



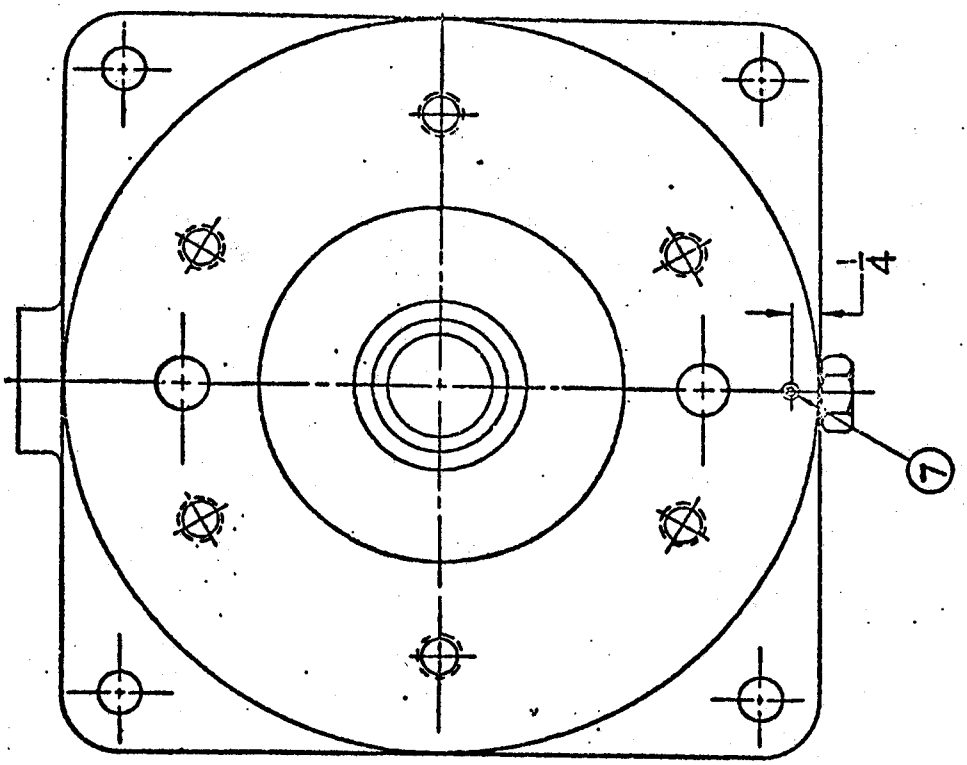


FIG. , BRAKE CYLINDER ASSEMBLY, 43494

REF.	PART NO.	DESCRIPTION	REQ'D.
		BRAKE CYLINDER ASSEMBLY, ...	REF.
1	16262-325	O-RING, National 622728	1
	16300-325	RING, Back-Up, National 624628	1
2	43336	PISTON	1
3	43495	CYLINDER HEAD	1
4	16262-429	O-RING, National 622756	1
	16300-429	RING, Back-Up, National 624656	1
5	43055	CYLINDER	1
6	16352-2	PLUG, (MS-2439-2)	1
	16262-010	O-RING, National 622705	1
7	16057-9016	SET SCREW, 10-32 UNF X 1/2	1

FIG. , BRAKE CYLINDER ASSEMBLY , 43494

SERVICE SECTION

CARCO MODEL P-60 WINCH

CONTENTS

GENERAL INSTRUCTIONS

This manual contains procedures for complete disassembly and assembly of the winch, and also provides adjustment procedures required during and after repair or overhaul.

NOTE: For repair, disassemble the winch only to the extent necessary to accomplish the required replacement of parts.

Before starting any replacement procedures, be sure to clean thoroughly the parts to be removed, and adjacent areas, to prevent entry of dirt and sand into the winch. Do not leave any ports or access openings exposed to the weather. Seal or cap the openings to prevent entry of dust, moisture, or other foreign material. Protect all exposed hydraulic ports and fittings with caps or plugs to prevent contamination of the hydraulic system.

During disassembly, care should be taken not to damage gaskets, shims, seals, and O-rings that are to be reused. Replace any such parts that are damaged or otherwise defective. Certain O-rings and seals specified in the replacement instructions must not be reused. In general, seals and O-rings that work under operating hydraulic pressures, or that require extensive disassembly to replace, should be replaced with new parts at time of reassembly.

During assembly, coat threads of all cap screws that penetrate the gear compartment, using suitable mastic sealing compound. Take care to prevent excess sealing compound from entering the winch case.

Maintain strict cleanliness during rebuild to prevent entry of dirt or moisture into winch case. Hydraulic components should be rebuilt in a clean, controlled atmosphere such as exists in an injector room.

PREPARATION FOR DISASSEMBLY

Remove wire rope from drum.

Clean winch and rear of tractor to prevent entry of dirt into winch or tractor transmission case during removal and disassembly.

Loosen fill plug to permit complete draining of oil.

Working through hole in motor end support housing, remove 1/8" NPT socket pipe plug from bearing housing. Rotate drum to position opening at lowest point to drain oil.

Disconnect hydraulic hoses from hydraulic motor. If practical, motor can be removed and tied off without removing hoses.

Disconnect and remove shift control assembly. Remove brake cylinder hydraulic hose.

Support winch with suitable hoist or chain block, and remove nuts, capscrews, washers securing winch to mounting frame. Remove winch from frame.

If hydraulic pump and drive shaft is removed from tractor transmission, cover opening in rear of tractor to prevent entry of dirt.

CAUTION: Do not run tractor after oil is drained or hydraulic hoses are disconnected from winch unless hydraulic pump is disconnected from tractor.

DISASSEMBLY

Refer to Drawing 43275, Parts Section.

Disassembly and assembly can be best accomplished using an assembly stand which fastens to the barrel of the drum and allows the winch to be positioned vertically and horizontally.

Remove hydraulic motor, if not previously removed.

Remove shift spool and rod from motor end of winch.

Disassemble shift rod and spool by removing cotter key and nut and pressing rod from bearings. Remove retaining ring from spool and press bearings from spool. Inspect bearings.

Work through center opening of motor end support to remove retaining ring from bearing housing.

Using a suitable puller, remove motor end support and bearing from bearing housing. Remove retaining ring and remove and inspect bearing.

Remove jam nuts and spacer from brake rod. Remove brake rod from motor end of winch.

Remove, disassemble, inspect and reassemble brake cylinder. See BRAKE CYLINDER ASSEMBLY.

Remove plate from reaction shaft.

Install tool similar to that shown in Figure 1 to compress brake spring. Be sure shaft is long enough to release spring during disassembly (approximately 2" travel). Nut on tool need only be finger tight for disassembly.

Remove socket head capscrews from motor end bearing housing and release brake spring tool to press bearing housing from drum.

Remove oil seal and O-ring from bearing housing.

Remove retaining ring from 1st planetary carrier and remove brake discs. Mark discs for reassembly in same order as removed.

Remove brake spring tool.

Remove, disassemble, inspect and reassemble 1st stage planetary. See 1ST STAGE PLANETARY ASSEMBLY.

Remove, disassemble, inspect and reassemble 2nd stage planetary. See 2ND STAGE PLANETARY ASSEMBLY.

Remove tube from center of 3rd stage planetary.

Remove, disassemble, inspect and reassemble 3rd stage planetary. See 3RD STAGE PLANETARY ASSEMBLY.

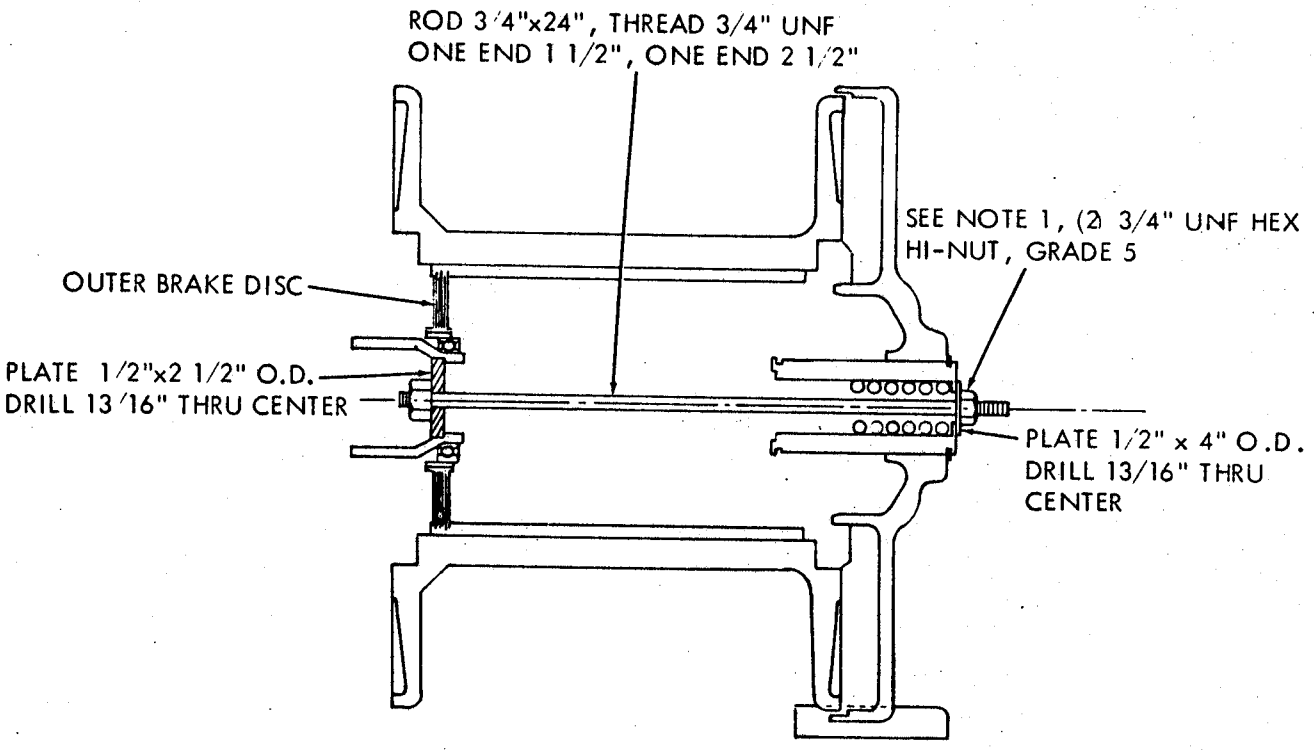
Remove retaining ring from brake cylinder end of reaction shaft. Remove, disassemble, inspect and reassemble 4th stage planetary. See 4TH STAGE PLANETARY ASSEMBLY.

Using suitable puller, remove anchor end support. Remove bearing housing. Pull bearing and seal from housing.

ASSEMBLY

Make sure all parts have been thoroughly cleaned and inspected and necessary repair or replacement has been made.

Install new seal and O-ring in bearing housing on brake cylinder end. Use suitable sealing compound on O.D. of seal when installing.



NOTES:
1. Disassembly: Tighten nut finger tight.
2. Assembly: Tighten nut until outer brake disc is flush with drum teeth. Install brake discs after brake spring is compressed.

Figure 1.

If new bearing is used, clean all manufacturer's grease from bearing and lubricate with light oil. Press bearing on bearing housing.

Lubricate O-ring and mating surface in drum with light oil.

Using 1/2" UNF alignment studs install bearing housing. Make sure all bolt holes line up. Two holes have wider spacing than remainder.

Make sure socket head capscrews and holes in drum are free of dirt, oil and grease. Install and properly torque capscrews using LOCTITE - Grade C.

Lubricate oil seal and mating surface on anchor end support. Press anchor end support on bearing. Secure end support to drum flange evenly with 2 "C" clamps to avoid oil seal damage during subsequent assembly.

Position winch vertically with anchor end housing down.

Install and lubricate new O-ring packing and backup rings on reaction shaft. Lubricate 4th stage thrust washer and place in position on bearing housing.

Lower 4th stage planetary into drum aligning with cable drum gear teeth, thrust washer and bearing housing. Rotate planetary as required to align reaction shaft splines with anchor end support. Install retaining ring on end of reaction shaft.

Lubricate 3rd stage thrust washer and install in 4th stage planetary. Lower 3rd stage planetary into position turning as required to align planet gears with gear teeth in drum and sun gear with 4th stage planet gears.

Install tube in center of 3rd stage sun gear.

NOTE: Be sure tube passes through 3rd stage thrust washer and rests against brake spring stop.

Lubricate and install 2nd stage thrust washer over tube and against 3rd stage sun gear. Install 2nd stage planet.

Lubricate and install 1st stage thrust washer over tube. Install 1st stage.

NOTE: Do not install brake discs until brake spring has been compressed.

Use tool similar to that shown in Figure 1 to compress brake spring.

Install brake discs, 4 friction and 3 steel, starting and ending with friction disc. Be sure last disc is even or below machined end of drum gear teeth. If not, tighten compressor until this has been accomplished. Secure discs with retaining ring.

Install new seal and O-ring in bearing housing. Use sealing compound on O.D. of oil seal.

Lubricate O-ring and mating surface in drum. Lubricate 1st stage planetary bushing and I.D. of bearing housing. Install bearing housing using 1/2" UNF alignment studs. Be sure all bolt holes line up. Holes are not equally spaced.

Clean all grease, dirt and oil from socket head capscrews and tapped holes in drum. Install and tighten capscrews using LOCTITE-Grade C.

Release and remove spring compressor tool.

If new bearing is used, clean all manufacturer's grease from bearing and lubricate with light oil. Press bearing into motor end support and install retaining ring.

Lubricate oil seal and mating surface. Position bearing and support on bearing housing and press bearing on bearing housing. Working through support I.D. install retaining ring on bearing housing.

Position winch horizontally.

Install plate on reaction shaft with flat head machine screws. Stake machine screws to lock.

Install O-ring in I.D. of plate. Install brake release cylinder assembly.

Install brake rod from motor end of winch.

Install O-ring over brake rod and into counterbore of brake release piston. Install sleeve and spacer.

Thread jam nuts on shaft.

CAUTION: If brake adjustment is not made at this time, thread first nut on only far enough to allow second nut to be installed 6 turns on brake rod.

NOTE: Brake adjustment can be made at this time if compressed air or hydraulic pressure of at least 100 psi is available. Follow instructions in Operator's Section under BRAKE ADJUSTMENT.

Press bearings into shift spool and secure with retaining ring. Press bearings on shift rod and secure with nut and cotter key.

Replace O-ring on shift rod and lubricate. Install shift rod and spool in winch from motor end turning spool to line up teeth with 1st stage planetary sun gear.

INSTALLATION

Hoist winch into position and attach to mounting frame.

Install and adjust shift controls. See OPERATOR'S SECTION, Shift Control Adjustment.

Shift winch to high range. Line up hydraulic motor coupling with shift spool and install hydraulic motor with new gasket. Return shift to neutral.

Connect hydraulic hoses to brake release cylinder and hydraulic motor.

Fill winch to proper level with oil as specified in OPERATOR'S SECTION. Refill hydraulic system, if required.

Adjust brake, if not previously adjusted. See OPERATOR'S SECTION.

Operate winch in both shift ranges and directions to check for proper operation.

BRAKE CYLINDER ASSEMBLY

Refer to Drawing F-43338, Parts Section.

Disassembly

Remove socket setscrew locking cylinder head.

Use suitable spanner wrench to remove cylinder head from cylinder.

Pull piston from cylinder. Remove O-rings and back up rings.

Remove and clean vent plug and cylinder plug.

Clean all parts and inspect surfaces of cylinder and piston for wear or scuffing. All sealing surfaces must be free of pits, scoring or grooves.

Assembly

Install and lubricate O-rings and back-up rings.

Refer to illustration for proper position of backup rings.

Install piston and cylinder head. Lock cylinder head with socket setscrew.

Install cylinder and vent plugs.

Be sure all openings are capped or plugged until connected to winch hydraulic hoses.

1ST STAGE PLANETARY ASSEMBLY

Refer to Drawing D-43276, Parts Section.

Remove retaining ring securing 2nd stage sun gear to carrier and remove 2nd stage sun gear.

Remove flat head screws and retainer and press thrust bearing from sun gear.

Align 1st stage sun gear teeth with gear teeth in I.D. of carrier and remove from carrier.

Mark location of planet gears and pins for reassembly in same position.

Remove socket setscrews. Press planet pins out setscrew side of carrier and remove gears and spacers.

Using suitable punch, straighten staked metal to clear outer races of bearings and remove bearings from gears.

Working through I.D. of carrier, remove retaining ring from bushing. Press bushing from bearing.

Remove retaining ring from carrier and press bearing from carrier.

Thoroughly clean and inspect all parts. Bearing balls and races must be free of pitts, cracks and excessive wear. Be sure O.D. of bushing is free of grooves or scoring. Minor roughness can be removed using fine emery cloth.

Assembly

Use light oil to lubricate parts during assembly.

If planet pins or carrier is replaced, install pins in carrier and drill and tap for socket head setscrews. Mark location of pins and remove.

Press bearing into carrier and secure with retaining ring.

Install bearings in planet gears and stake gear to retain bearings.

NOTE: Be sure outer bearing races are not distorted during staking operation. Staking tool should not bottom in groove.

Place planet gears and spacers in carrier, one spacer on each side of bearing.

Install planet pins with setscrew holes in pins and carrier in alignment. Install setscrews and stake to lock.

Insert 1st stage sun gear into carrier.

Press thrust bearing into 2nd stage sun gear. Clean flat head screws and tapped holes in 2nd stage sun gear, thoroughly. Install retainer with flat head screws using LOCTITE Grade C or CV on threads.

Install 2nd stage sun gear in carrier and secure with retaining ring.

2ND STAGE PLANETARY ASSEMBLY

Refer to Drawing D-43274, Parts Section.

Disassembly

Remove retaining ring and remove 3rd

stage sun gear.

Mark location of planet gears and pins for reassembly in same position. Remove socket setscrews and press planet pins out setscrew side of carrier.

Remove planet gears and spacers from carrier. Using suitable punch, straighten staked metal to clear outer races of bearings and remove bearings from gears.

Thoroughly clean and inspect all parts.

Assembly

Use light oil to lubricate parts during assembly.

If planet pins or carrier is replaced, install pins in carrier and drill and tap for socket set screws. Mark location of pins and remove.

Install bearings in planet gears and stake gear to retain bearings.

NOTE: Be sure outer bearing races are not distorted during staking operation. Staking tool should not bottom in groove.

Place gears and spacers in carrier, one spacer on each side of bearing.

Install planet pins with set screw holes in pins and carrier in alignment. Install set screws and stake to lock.

Install sun gear and secure with retaining ring.

3RD STAGE PLANETARY ASSEMBLY

Refer to Drawing D-43267, Parts Section.

Disassembly

Remove retaining ring and remove 4th stage sun gear.

Mark location of planet gears and pins for reassembly in same position. Remove set screws and press planet pins out set screw side of carrier.

Remove planet gears and thrust washers from carrier. Press bearings from gears.

Thoroughly clean and inspect parts.

NOTE: Planet pin is inner race of bearings. Be sure condition is suitable.

Assembly

Use light oil to lubricate parts during assembly.

If planet pins or carrier is replaced, install pins in carrier and drill and tap for socket set screws. Mark location of pins and remove.

Install bearings in planet gears. Be sure bearings are centered in gears.

Place gears and thurst washers in carrier, one thrust washer on each side of gear.

Install planet pins with set screw holes in pins and carrier in alignment. Install set screws and stake to lock.

Install sun gear and secure with retaining ring.

4TH STAGE PLANETARY ASSEMBLY

Refer to Drawing D-41641, Parts Section.

Disassembly

Mark location of planet pins and gears for reassembly in same position.

NOTE: Each planet gear contains 141 needle bearing rollers. Care must be taken to avoid loss. It is suggested that needles, gear and planet pin be maintained as a set.

Remove socket set screws and press planet pins out set screw side of carrier.

Remove gears and thrust washers from carrier and remove needle rollers and spacers from gears.

Remove O-ring and back up rings from reaction shaft and remove reaction shaft from carrier.

To disassemble reaction shaft, place in press with retaining ring up. Compress spring slightly by pressing on spring stop. Remove retaining ring and release press slowly until spring tension is released. Remove spring from reaction shaft.

Thoroughly clean and inspect all parts.

NOTE: I.D. of gears and O.D. of planet pins are bearing races. Be sure condition is suitable.

Assembly

If planet pins or carrier is replaced, install pins in carrier and drill and tap for socket set screws. Mark location of pins and remove.

Place reaction shaft in press, compress spring, and install retaining ring. Install retaining ring on O.D. of reaction shaft and insert shaft in carrier.

Position needle rollers and spacers in gears. Use thin coat of grease to hold rollers in position for assembly.

Place planet gears in carrier and install planet pins. Take care to avoid dislodging rollers. Align set screw holes in pins and carrier and install set screws. Stake carrier to lock screws.