REPAIR MANUAL

MASTER ONLY

FUNK

reversomatic®

DRIVES

SERIES RC

Funk MFG. CO.

ENGINEERS AND MANUFACTURERS OF POWER TRANSMISSION EQUIPMENT

P. O. Box 577 Telephone 251 3400 1211 W. 12 St.

COFFEYVILLE, KANSAS

The part names and numbers called out in this repair manual are amply described and illustrated in the Revers-O-Matic Drive Instruction Book provided with your unit at time of purchase.

Should repair parts be required, please specify the model, specification, and serial numbers of your unit as well as the name and number of the parts accompanying your purchase order.

The above information will greatly facilitate the handling of your service order.

Thank you,
THE FUNK MFG. COMPANY

REVERS-O-MATIC DRIVE

Assembly and Disassembly Instructions

The Revers-O-Matic Drive is a rather simplified piece of equipment and in most cases could be disassembled and reassembled without the use of an instruction book with the possible exception to the following details:

The countershaft and idler gear shaft (Part #7147 and 7149) are .002 of an inch larger at the rear end and therefore they must be removed and re-installed through the rear face of the case as shown in Figs. 29 and 37. Driving the enlarged end on through and out the front end of the case would probably ruin the bearings and possibly the case also.

The countershaft gear (Part #7141) when in place, traps the shaft and clutch assembly (Part #7120) shown in Figs. 31 thru 37. Therefore it is necessary to drop the countershaft gear down into the bottom of the case in order to remove the shaft and clutch assembly. Conversely, when the unit is being assembled the countershaft gear must be placed in the lower part of the case and after the shaft and clutch assembly is reinstalled, raise up to its proper position. It is advisable to use a piece of safety wire through the gear and countershaft case holes while it is resting in the lower part of the case in order to keep the thrust washers from getting lost. The above details are fully covered elsewhere in this manual.

Parts incorporating bushings should be replaced if total radial clearance exceeds .0035. Parts incorporating roller bearings should be replaced if total radial clearance exceeds .0025.

In addition to the ordinary line of tools, the following items are required:

No. 1 Snap ring pliers.
No. 2 Double solvent cleaning tank; one for preliminary cleaning and the other for final cleaning of parts.
No. 3 Air pressure hose with squirt nozzle (approximately 100# pressure.)
No. 4 A closely graduated scale rule or a depth mike to check the end clearance in final assembly.
No. 5 Oil can filled with automatic transmission fluid, use type "A" only.
No. 6 Small arbor press.

DISASSEMBLY

Disassembly can be accomplished by simply following the assembly steps in the reverse order, except that it is not necessary to string the wire through the countershaft gear when disassembling. It can simply be permitted to drop to the bottom of the case. Also the clutch pistons can be removed from the clutch cylinders by applying an air pressure nozzle to the oil holes in the bore of the cylinders and forcing the pistons out with air pressure.

The various parts of the oil pump are a matched assembly and cannot be separately serviced. If any damage has resulted in the oil pump it is necessary to replace the entire pump. However the oil seal at the head end of the pump can be replaced. The control valve and the control valve body are also matched assemblies and should not be interchanged.

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

After disassembly, all of the parts should be thoroughly cleaned in a solvent tank, then they should be cleaned again with clean solvent before reassembling.

BOLT TORQUE VALUES

Control Valve Attaching Bolts	19 ft. lbs.
Oil Pump Attaching Bolts	14 ft. lbs.
5/16" Dia. Bolts	19 ft. lbs.
3/8" Dia. Bolts	25 ft. lbs.
7/16" Dia. Bolts	40 ft. lbs.
9/16" Dia. Bolts	90 ft. lbs.
Regular Caps	25 ft. lbs.

ASSEMBLY HINTS

— When assembling ball bearings, pressure should be applied against the member being assembled (inner ring on shaft or outer ring in housing). Bearing must be started squarely on shaft or in housing, and seated squarely against shoulder. Check housing and shaft for nicks and scratches prior to bearing installation. Always lubricate bearings and bushings during assembly.

— Before installing oil seals, check the shaft and bore for nicks and scratches. Make sure that the seal is started squarely. Always press the seals on the outside diameter; using a thin piece of shim stock around the shaft to protect the sealing edge of the seal against possible damage from keyways and splines. Prelubricate all seals and "O" rings immediately before installation.

— Check all snap rings after installation to see that they are securely seated in their grooves.

— Check all cap screws and bolts for tightness.

— Read the instructions thoroughly before attempting any repairs.

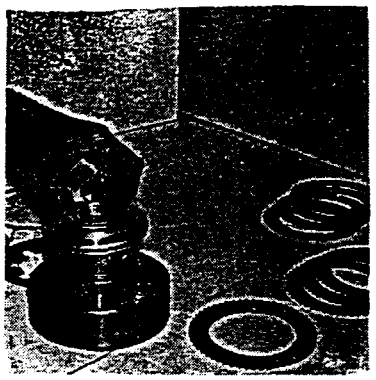

Fig. 1 (Applies To Models With Four-Plate Clutches Only) Install the outer seal (Part #7167) on the clutch piston (Part #7165) and the inner seal (Part #7168) in the clutch cylinder assembly (Part #7160), prelubricating the seals immediately before installation. Lower the piston into the clutch cylinder to the bottom of its travel, using an arbor press if necessary.

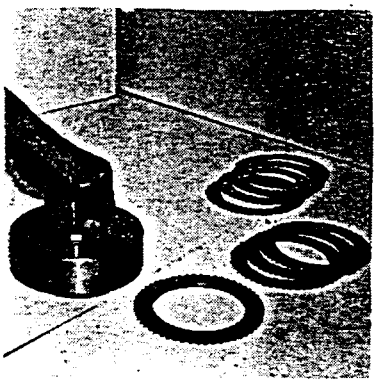

Fig. 2 (Applies To Models With Four-Plate Clutches Only) Drop the pressure ring (Part #7166) on the piston and insert the clutch spring (Part #7169) so that the inner edge presses against the pressure ring and install the inner snap ring (Part #7171). Make sure that the snap ring is securely seated in its groove.

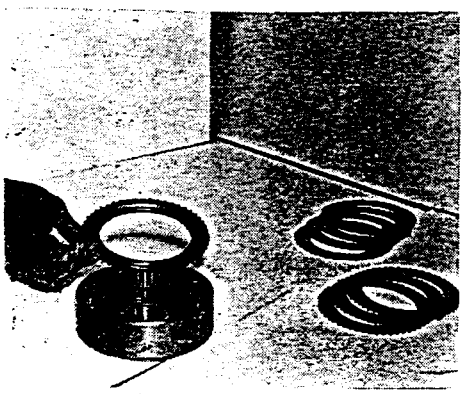

Fig. 3 (Applies To Models With Four-Plate Clutches Only) Lower the pressure plate (Part #7172) into the clutch cylinder, smooth side up.

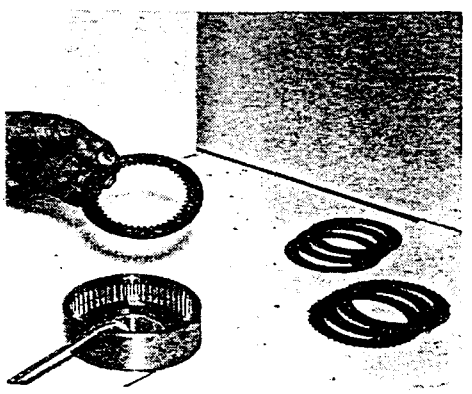

Fig. 4 (Applies To Models With Four-Plate Clutches Only) Oil the top face of the pressure plate and lower a full complement of four clutch plates (Part #7174) and three separator plates (Part #7173) into the clutch cylinder: alternating first a clutch plate (bronze plate with internal teeth), then a separator plate (steel plate with external teeth). The last plate in should be an internal tooth bronze clutch plate. The steel plates are sligatly conical (not flat) and the slope on these plates when installed in the unit should be parallel with the "dished" side toward the workman.

Note!

In all cases, the missing teeth on the steel separator plates must align with the oil drain holes in the clutch cylinder.

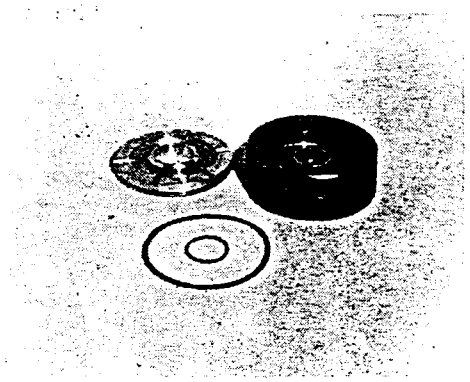

Fig. 5 (Applies To Models With Six-Plate Clutches Only) Place the quarter inch ball bearing (Part #7176) into the oil drain hole in the back face of the clutch cylinder assembly (Part #7160). Install the outer seal (Part #7167) on the clutch piston (Part #7165) and the inner seal (Part #7168) in the clutch cylinder, prelubricating the seals immediately before installation. Lower the piston into the clutch cylinder to the bottom of its travel, using an arbor press if necessary.

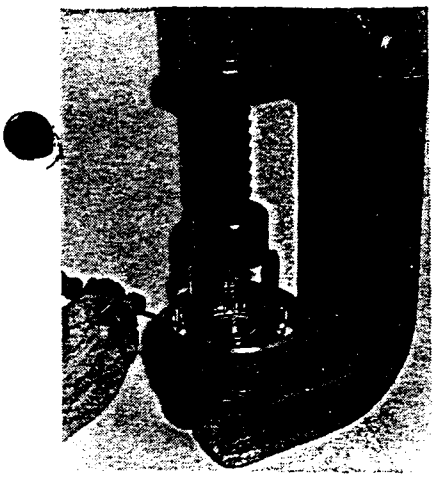

Fig. 6 (Applies To Models With Six-Plate Clutches Only) Insert the coil clutch spring (Part #7169) into the piston. Place the spring retainer (Part #7172) in position and depress the spring with a pair of bars under an arbor press so that the snap ring (Part #7166) may be installed to retain the spring. Make sure that the snap ring is securely seated in its groove.

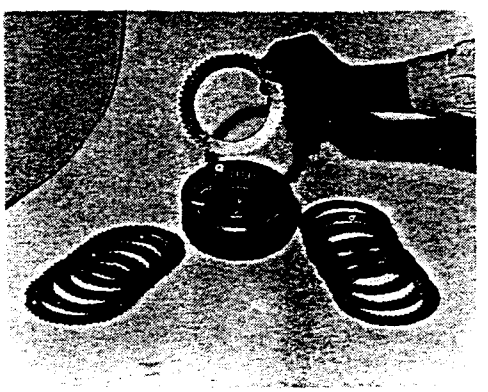

Fig. 7 (Applies To Models With Six-Plate Clutches Only) Lower a full complement of six clutch plates (Part #7174) and six separator plates (Part #7173) into the clutch cylinder; alternating first a separator plate (Steel plate with external teeth), then a clutch plate (Bronze plate with internal teeth). Alternate the plates until the full complement is installed. It is very important that a smooth steel separator plate be installed against the aluminum piston. Do not, under any circumstances place a bronze plate in first against the aluminum piston. The steel plates are slightly conical (not flat) and the slope on these plates when installed in the unit should be parallel, with the "dished" side toward the workman.

Note!

The remaining illustrations and data apply to both four-plate and six-plate models of the Revers-O-Matic Drive.

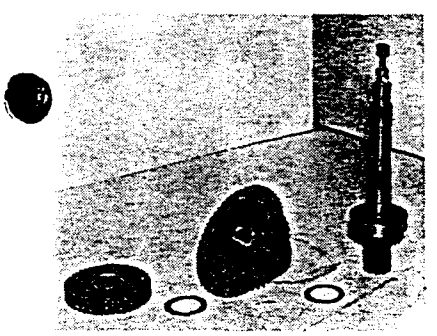

Fig. 8

Press the output bearing (Part #7137) on the output shaft assembly (Part #7150). On models with attached transmissions, units are equipped with a double sealed bearing (Part #7138) and oil slingers (Part #7138-1) on both sides of the bearing. The above is retained on the output shaft by a snap ring (Part #7139). Thrust washer (Part #7175) should now be installed on the output shaft, then the output gear assembly (Part #7140), then another thrust washer (Part #7175).

Serial No. 7940 and up equipped with attached transmissions, have rear cover assembly RCP 7114. This assembly uses an oil seal instead of a double seal bearing. The seal retainer RCP 7116-2 and seal RCP-7116-4 must be installed on the shaft after part #7138 is installed.

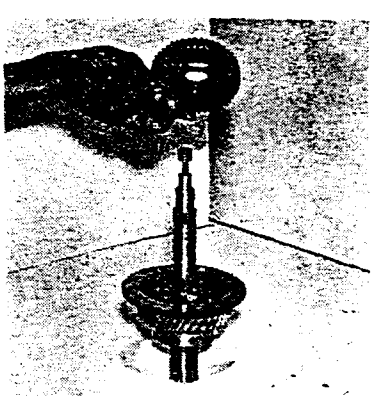

Fig. 9

Lower the rear clutch hub (Part #7155) on the output shaft, thrust face down.

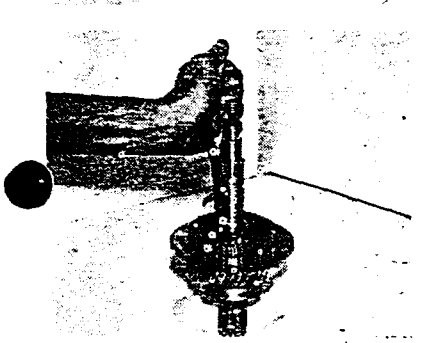

Fig. 10

Install the snap ring (Part #7157) on the output shaft to retain the rear clutch hub, making sure that the ring is securely seated in its groove. Check the output gear for free motion.

Fig. 11
Prelubricate and install the two seal rings (Part #7159) in the lower two grooves on the output shaft.

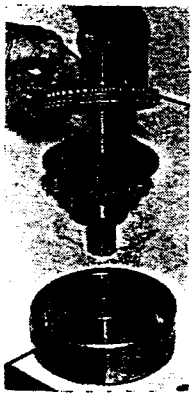

Fig. 12
Remove the clutch plate stack (and pressure plate on models with four plate clutches) from one of the clutch assemblies and lower over the rear clutch hub.

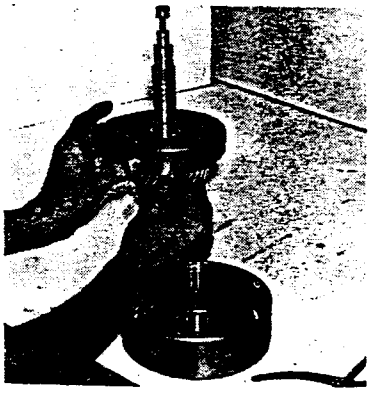

Fig. 13
Check the alignment of the missing teeth in the separator plates.

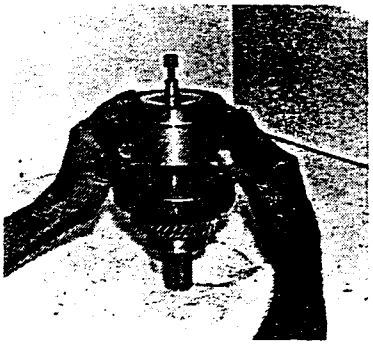

Fig. 14
Lower the clutch cylinder assembly over the clutch stack, aligning the oil drain holes with the missing teeth on the separator plates. Caution: Center the seal rings (Part #7159) in the shaft grooves so that they are not damaged when the clutch cylinder assembly is lowered into place.

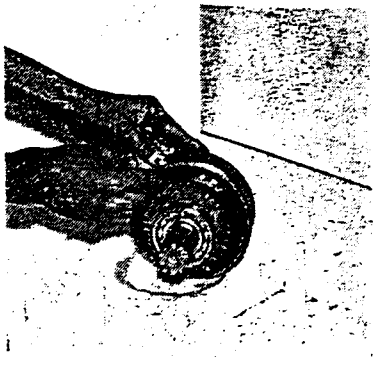

Fig. 15
Install the outer snap ring (Part #7171) into the rear clutch cylinder, making sure that the ring is securely seated in its groove.

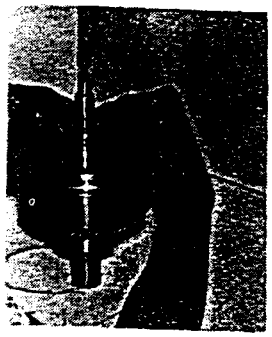

Fig. 16
Prelubricate and install the two seal rings (Part #7159) in the upper two grooves on the output shaft.

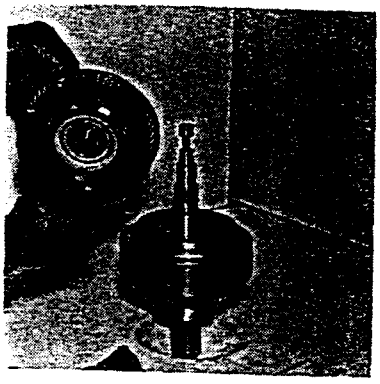

Fig. 17
Lower the front clutch cylinder assembly on the output shaft, checking first that the missing teeth on the separator plates align with the oil drain holes in the clutch cylinder.

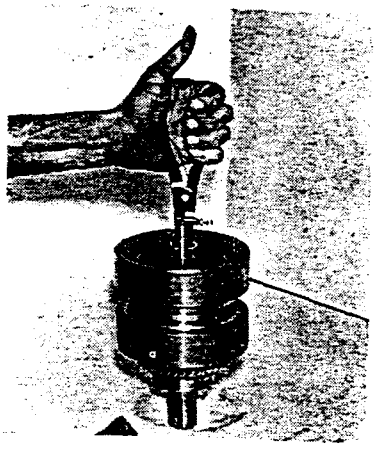

Fig. 18
Install the snap ring (Part #7158) on the output shaft, making sure that the ring is securely seated in its groove.

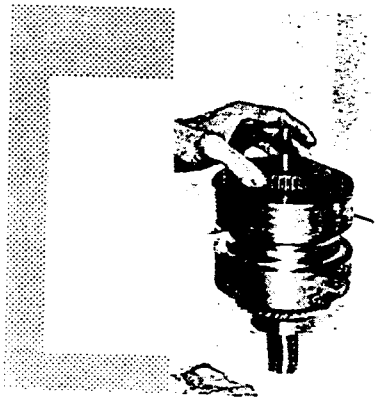

Fig. 19
Lower the front clutch hub (Part #7156) on the splined output shaft and into the clutch plate teeth, thrust face up.

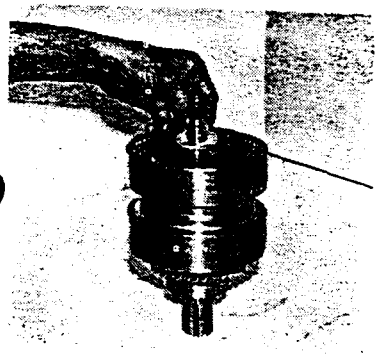

Fig. 20
Install the thrust washer (Part #7163) on top of the front clutch hub.

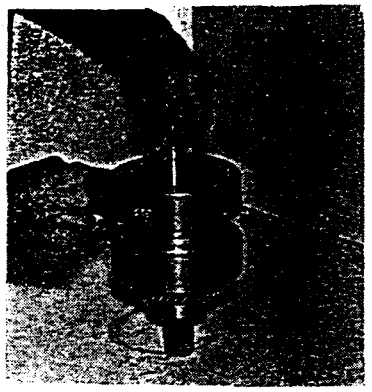

Fig. 21
Prelubricate and install the two seal rings (Part #7154) on the oil tube and oil sleeve at the inner end of the output shaft assembly.

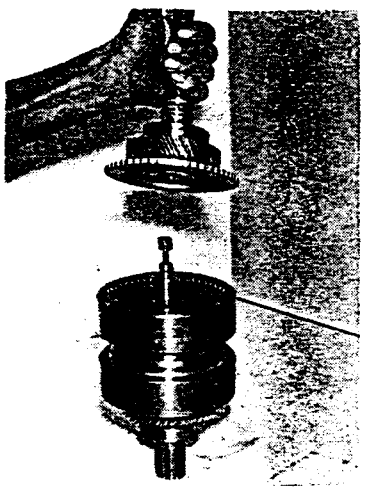

Fig. 22
Install the input bearing (Part #7137) on the input shaft assembly (Part #7130) and lower the assembly into the front clutch cylinder. Caution: Center the seal rings (Part #7154) in their grooves before lowering the input shaft assembly into place, to avoid damaging the seal rings.
Serial No. 10,001 and up have input shafts which are equipped with caged roller bearings TRC-7134 in place of the bronze bushings. The roller bearing may be replaced in the field, whereas the bushing cannot.

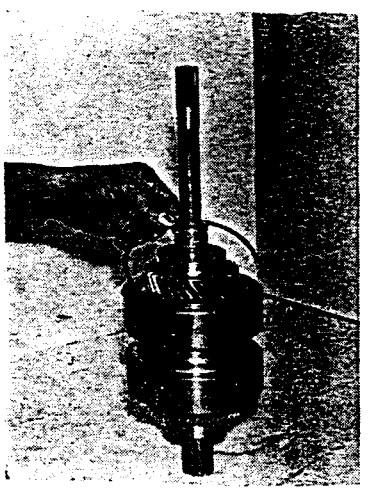

Fig. 23
Install the outer snap ring (Part #7171) into the front clutch cylinder, making sure that the ring is securely seated in its groove.

Fig. 24
Prelubricate and install the three seal rings (Part #7136) in the grooves on the input shaft.

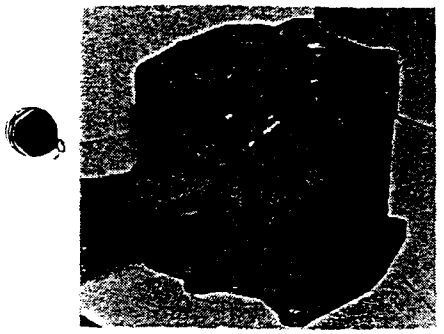

Fig. 25
Install the 160# pressure regulator in the upper hole on the left hand side of the case. Use regulator valve 7227, regulator spring 7223 (2-¼" long), regulator guide pin 7227-2, "O" ring 7226-2, and regular cap 7225. Early models were equipped with a 7226 gasket in place of the "O" ring listed above. In addition, models with early serial numbers are not provided with a regulator guide pin and require a 7224 spring (2" long) in place of the one listed above for an operating pressure of 150#.

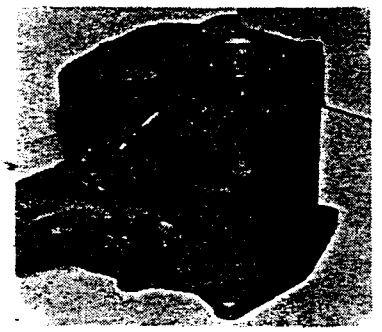

Fig. 26
Install the 80# pressure regulator in the lower hole on the left hand side of the case. Use regulator valve 7227, regulator spring 7223 (2-¼" long), regulator guide pin 7227-2, "O" ring 7226-2, and regulator cap 7225. Early models were equipped with a 7226 gasket in place of the "O" ring listed above. In addition, models with early serial numbers are not provided with a regulator guide pin and require a TRC-7223 spring (2-¼" long-.187 coil spacing) in place of the one listed above for an operating pressure of 60#.

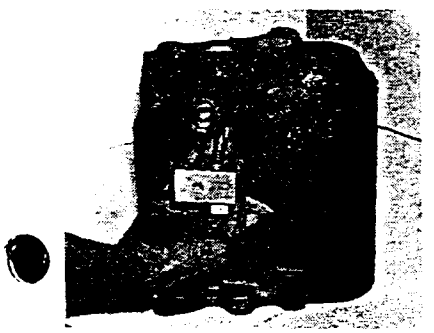

Fig. 27 Install the 10# pressure regulator in the hole on the right hand side of the case. Use regulator valve 7221, regulator spring 7222A (1-¾" long), "O" ring 7226-2, "O" ring 7233-2, regulator block 7231, and regulator cap 7232. Early models were equipped with a 7226 gasket in place of the 7226-2 "O" ring listed above. Early models were also provided with a 7222 spring (1-½" long) in place of the one listed above for an operating pressure of 25#.

Note! When repair springs are ordered for units with early serial numbers a "Replacement Kit" will be sent to convert these older models to the latest 160# - 80# and 10# pressure regulator set-ups as described in figs. 25, 26, and 27.

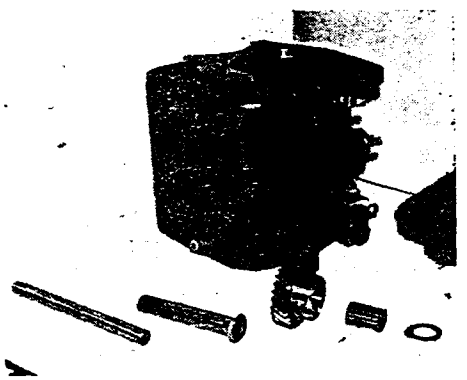

Fig. 28
Install the idler gear in the case to the left of center in the following order: First, thrust washer (Part #7163); followed by the idler gear bearing (Part #7147); idler gear, hub down (Part #7142); and idler gear spacer (Part #7143). On later models the 7143 spacer is composed of a 7143-1E spacer and a 7143-2E washer in place of the flared end spacer shown. Later models are equipped with two rolls of loose roll bearings (Part #7148) in the idler gear. There are sixteen rollers in each roll, a total of 32 required. Three spacer washers (Part #7148-2) are also required for this installation. Pre-assemble the loose roll bearings into the idler gear as follows: First a steel spacer washer, then one row of loose roll bearings, then insert another spacer washer and another row of loose roll bearings, and finally a third spacer washer.

NOTE! Always oil the bearings during assembly as this will assure lubrication during the first few moments of operation.

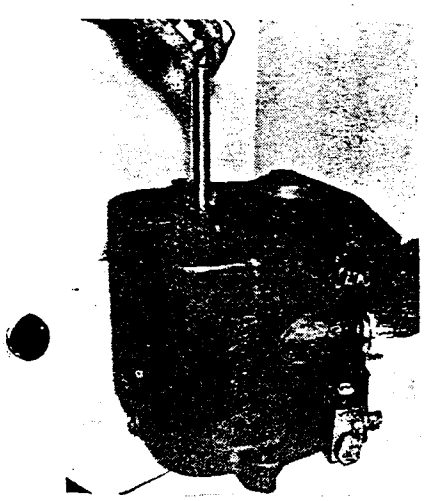

Fig. 29
Lower the idler gear shaft (Part #7149) through the case and idler gear assembly. Caution: Make certain that the large end of the shaft is up. The shaft should slip freely through until it starts to enter the front end of the case. In this position, there exists a press fit between the large end of the idler gear shaft and the top or rear face of the case. Using a hammer and drift, drive the idler gear shaft down into place, just slightly below the rear surface of the case.

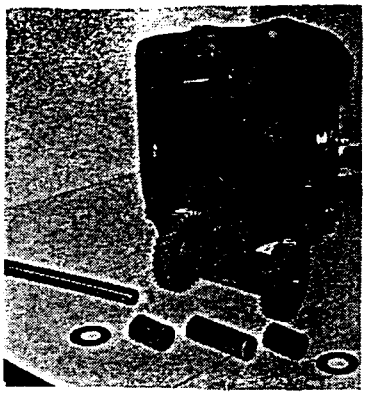

Fig. 30

Insert the bearings (Part #7147) into the countershaft gear (Part #7141) with the countershaft bearing spacer (Part #7146) between the bearings, and thrust washers (Part #7163) at ea h end of the countershaft gear.

Later models are equipped with four rolls of loose roll bearings (Part #7148) in the countershaft gear. There are seventeen rollers in each roll, a total of 68 required. Six bearing spacer washers (Part #7146-2) and one bearing spacer (Part #7146-1) are also required for this installation. Pre-assemble the loose roll bearings into the countershaft gear as follows: Place the gear on end with the countershaft (Part #7147) inserted down through the hole. Lower one bearing spacer washer, then 17 loose rolls, another spacer washer, followed by 17 loose rolls, then another spacer washer. The next item installed is the bearing spacer (sleeve), followed by a spacer washer, 17 loose rolls, a spacer washer, 17 loose rolls, and the final spacer washer. The shaft may now be removed from the gear as the rolls will keystone. Extreme care must be exercised during installation to keep the bearings from falling out the end of the gear.

NOTE! The loose roll bearings used on the countershaft gear are identical to those used on the idler gear.

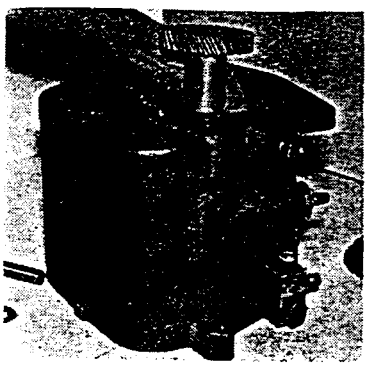

Fig. 31

Lower the countershaft gear (including bearings, washers, and spacer) with a thrust washer at each end, into the case with the smallest diameter gear at the bottom or front end of the case, and the larger diameter gear at the top or rear end of the case.

Fig. 32

Align the countershaft gear and thrust washers with the countershaft bore in the case and insert a piece of safety wire through so that the wire projects at both faces of the case. With this safety precaution taken, shove the countershaft gear down into the lower corner of the case so that it will be out of the way of future assembly operations.

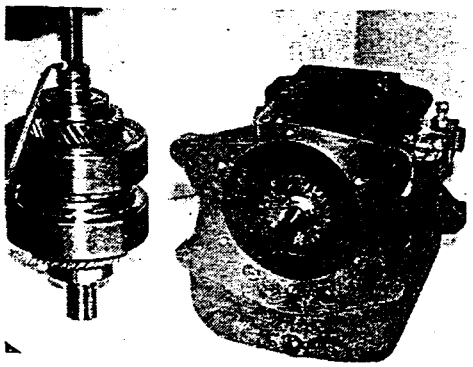

Fig. 33

Oil the seal rings, bearings, and clutch plates in the shaft and clutch assembly prior to installation in the case.

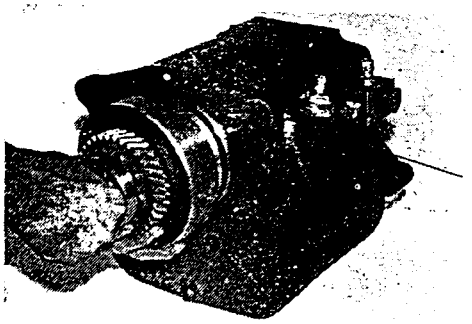

Fig. 34

Slide the shaft and clutch assembly into the case, being very careful not to damage the three seal rings at the head end of the assembly.

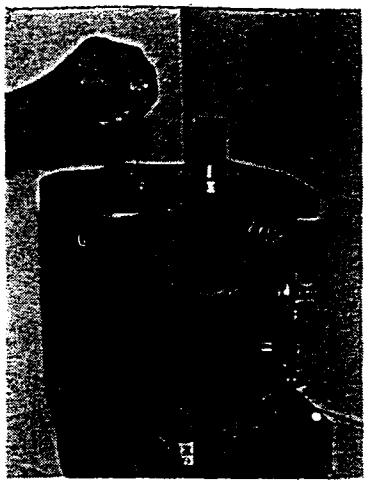

Fig. 35
Using a pair of long screwdrivers, work the countershaft gear back into its proper position and remove the safety wire; checking first that the thrust washers are in approximately the correct position at the ends of the countershaft gear.

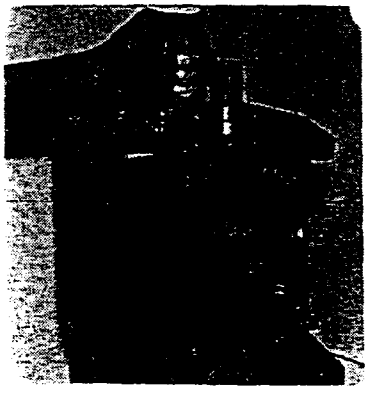

Fig. 36
Align the countershaft gear, bearings, and thrust washers from each end of the case to allow the countershaft to drop freely through.

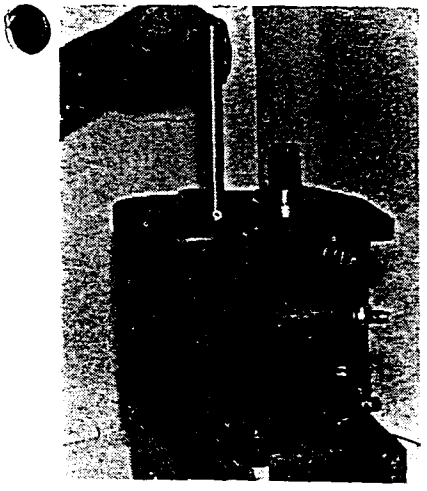

Fig. 37
Lower the countershaft (Part #7147) through the case and countershaft gear assembly. Caution: Make certain that the large end of the shaft is up. The shaft should slip freely through until it starts to enter the front end of the case.

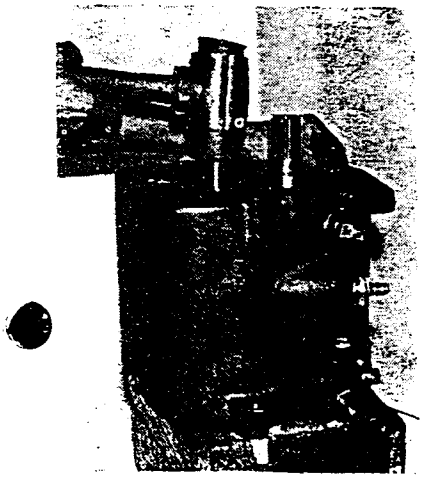

Fig. 38
In this position, there exists a press fit between the large end of the countershaft and the top or rear face of the case. Using a hammer and drift, drive the countershaft down into place, just slightly below the rear surface of the case.

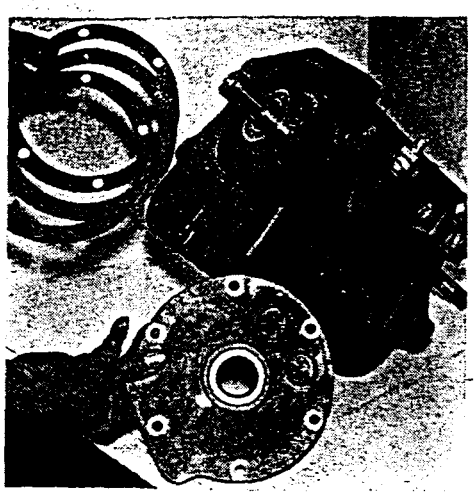

Fig. 39

If the rear gaskets (Part #7118) are in need of replacement, be sure that the same number or total thicknesses are used that were originally installed. Lower the rear cover (Part #7115) into place, using a thin piece of shim stock to protect the oil seal (Part #7116) from the spline teeth, and attach with the capscrews and washers provided. On models equipped with sealing washers, care should be taken to install these washers on the lower three capscrews as originally. The end clearance of the shaft and clutch assembly should now be checked. The input shaft should be free to move in and out .015 minimum to .030 maximum. Add or remove gaskets to get the proper clearance. On units with attached transmissions, the number of gaskets (Part #7117) between the Revers-O-Matic case and the transmission spacer (Part #7115) will determine the end clearance of the shaft and clutch assembly. After attaching the transmission, remove the transmission cap and using a pry bar on the input gear, pull the input bearing back against the snap ring at the head end of the transmission case before checking the end clearance in the shaft and clutch assembly.
Serial No. 7940 and up with attached transmissions, are equipped with assembly #7114. The seal retainer #7116-2 must be attached to #7115-A with (2) two screws #7116-5. This assembly is shown in the instruction manual and the same end play requirements are used as above.

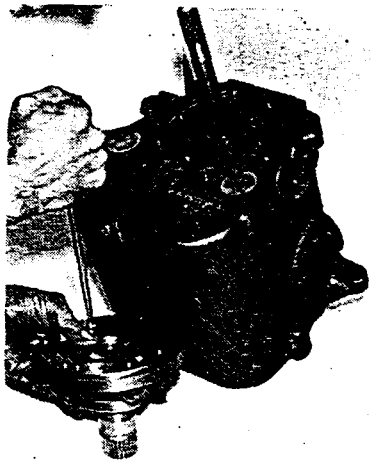

Fig. 40

Reassemble the oil pump (Part #7006), making sure that the two flathead screws in the rear face of the pump are securely tightened.

Fig. 41

Soak the oil pump gasket (Part #7009) in oil and install in the front face of the case.

Fig. 42

Lower the oil pump into place and attach to the case with the four capscrews (Part #7006-3 and 7006-4) and sealing washers (Part #7006-5) provided. These washers are of a special type, having a bonded rubber seal.

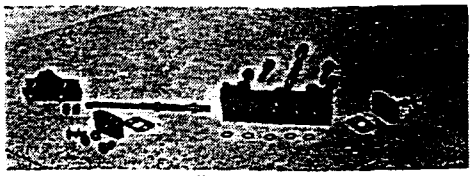

Fig. 43 Control Valve Parts

1	Valve	7201	4	Capscrew ¼x¾" NC	7209
1	Body	7202	4	External star washer ¼	7209-1
1	Cap, Closed	7203	1	Cage	7251
1	Cap, Open	7204	2	Roller	7252
2	Gasket	7205	1	Spring	7253
2	Oil seal	7206	2	Jam Nut, Thin hex 5/16"NF	7254
5	"O" ring	7207	2	Capscrews #10-32x1"	7255
			2	Nut, Fibre #10-32	7256

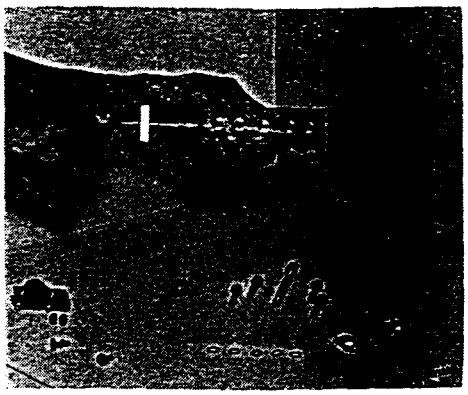

Fig. 44

Install the two oil seals (Part #7206) in the open cap (Part #7204), with the inner seal lip in and the outer seal lip out, and slide the cap over the threaded end of the control valve stem (Part #7201). Slide valve into valve body and attach the cap to the end of the body with two slotted head cap screws (Part #7209) and external star washers Part #7209-1) using gasket (Part #7205) between the body and cap. Attach the closed valve cap (Part # 7203) to the opposite end of the valve body using gasket, screws, and washers as before.

Attach the cage assembly to the end of the control valve stem with jam nuts (Part #7254) inside and outside the end of the cage (Part #7251).

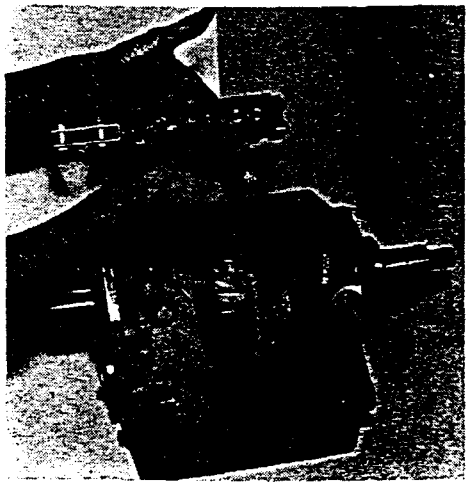

Fig. 45

Place the control valve assembly (Part #7200) on top of the case in the proper position, using five "O" rings (Part #7207) between the valve body and case.

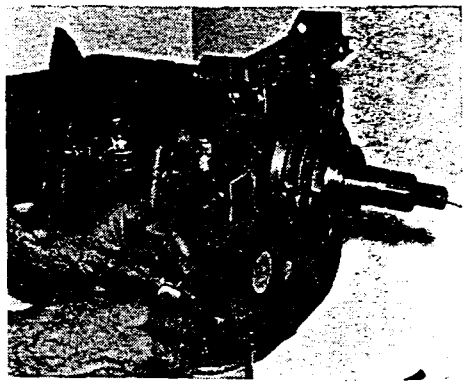

Fig. 46

Place the base (Part #7269) on top of the control valve and secure to the case with the four capscrews (Part #7208) and external star washers (Part #7208-1) provided. Use Permatex Super 300 type gasket seal on the threads of the capscrews.

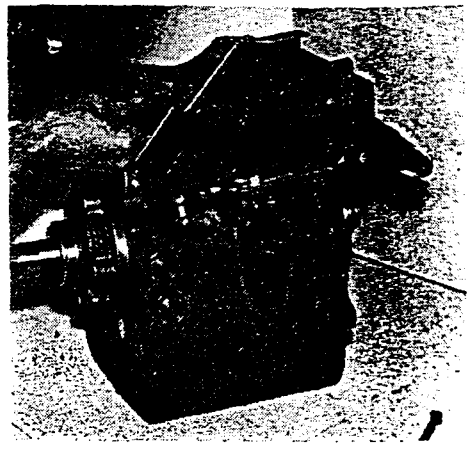

Fig. 47

Lower the control system (Part #7250) into place, making sure that the tongue on the bellcrank (Part #7261) enters between the rollers (Part #7252) on the control valve assembly. Place the long bolt (Part #7273) through the control system and base (that was just previously attached to the top of the control valve). The nut on the end of this bolt should be tightened at 14 to 16 foot pounds of torque. Fasten the other end of the control system to the rear face of the unit with the capscrews and washers provided. Install the two throttle lever springs (Part #7279) on the control system.

Control adjustments are very essential to the proper operation of the Revers-O-Matic Drive. The necessary control adjustment instructions may be found in the Revers-O-Matic Drive Instruction Book, Figure 4.

TORQUE CONVERTER INSTRUCTIONS

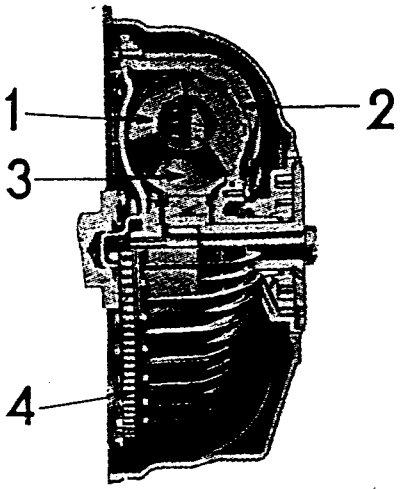

FIG. 1 CONVERTER SECTION

The torque converter consists of three ma or components: a Turbine Assembly "1" and Impeller (or pump) Assembly "2", and a Stator and Sprag (or One Way Clutch) Assembly "3". In most installations the assembled converter is bolted to a Front Cover Assembly (or Flywheel) "4". (See Figs. 1 & 2.)

The principal cause of faulty operation is leaking due to failure of the Oil Seal Rings. As the 11-¾" and 12" aluminum types and the 12" steel types are of bolted construction; these can be disassembled and repaired by the mechanic. The 12-$\frac{5}{16}$" welded steel type requires special fixtures and it is not advisable to try to overhaul these without such equipment.

FIG. 3 REMOVING FRONT COVER

DISASSEMBLY

Disassembly of the bolted type requires some means of supporting the Converter Assembly on the bench.

The simplest form is a hole in the bench top slightly larger than the Impeller Hub, or a hollow square approximately 8" inside made of two by four's. The Front Cover Assembly "4" will then be uppermost so that the Lock Nuts "13" can be removed from the Cover Bolts "12" and the Front Cover Assembly and "O" Ring Gasket "11" can be removed. (Fig. 3.) Next remove Turbine Forward Thrust Washer "17", from the Turbine Assembly "1". The Turbine Assembly can then be removed. (Fig. 4 - Page 15.)

In removing the Stator and Sprag Assembly, care should be exercised in order that the Thrust Washers and Races are not allowed to drop onto the bench, as the highly machined surfaces may be damaged. The Stator Thrust Washers "8", the Sprag (or One-Way Clutch) "5" and the Inner and Outer Races "6" and "7" are held in the Stator Assembly "3" by Snap Rings "10", thus this can be removed as a unit. Further disassembly is accomplished by compressing the Snap Ring so that it can be removed from the groove in the Stator.

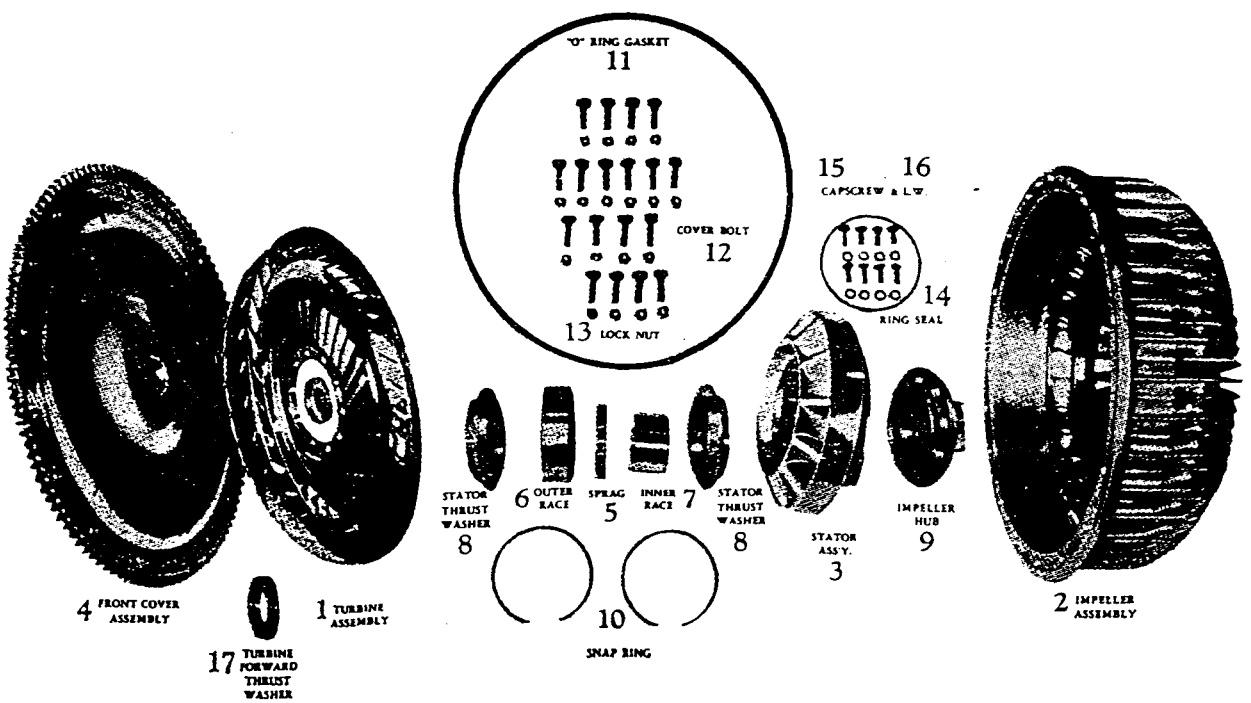

FIG. 2 CONVERTER PARTS

FIG. 4 REMOVING TURBINE ASSEMBLY

If the Impeller Hub "9" has been damaged, or the Ring Seal "14" is faulty, it will be necessary to remove the Impeller Hub. Turn the Impeller Assembly over and remove the eight screws and lock washers which fasten the Hub to the Assembly, thus making the Ring Seal "14" available for inspection.

REASSEMBLY

If required, a new Ring Seal "14" should be placed on the flange of the Impeller Hub "9". The Hub should then be placed in the machine recess of the Impeller Assembly with the tapped holes lined up so that the Lock Washers and Cap Screws "15" and "16" can be tightened. The complete assembly should then be placed on the bench with the Hub down.

If it is necessary to replace a worn or damaged Sprag, it is also advisable to replace the inner and outer race, as there is no means of compensating for unequal wear on these parts. Extreme care should be used that these parts be free from dirt, dust, and fingerprints. It is impossible to exercise too much care in this respect, and the original assembly is so carefully controlled that these operations are performed in a dust free room.

Lay the Stator on the bench with the side marked "Front" up and insert one snap ring "10" in the lower groove. Next lay one Stator Thrust Washer "8" on top of this with the counterbored side up. Insert the Outer Race "6", and the Sprag "5" which must have either the flanged edge or that marked "front" facing up. The inner race is set in this (Fig. 5) with the splined end up. The second Stator Thrust Washer (counterbore down) and the Snap ring complete the assembly. (Fig. 6)

FIG. 5 ASSEMBLING STATOR

Then replace the Turbine Assembly "1" resting the Turbine Hub on the Stator Thrust Washer "8". (Fig. 5.) Place Front Cover "O" Ring Gasket "11" around cover just inside the bolt holes (Fig. 7.) and lay the Front Cover Assembly "4" on the flange of the Impeller Assembly "2" and insert the Cover Bolts

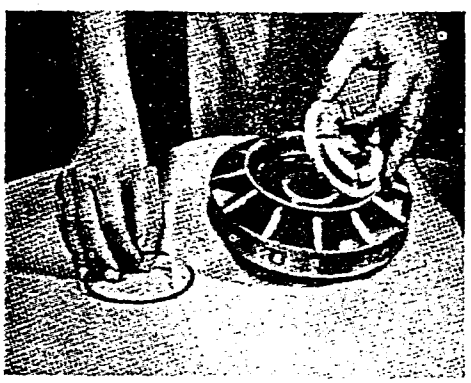

FIG. 6 INSERTING THRUST WASHER

"12" from below. The Lock Nut "13" being on top can be tightened in sequence to avoid distortion. The torque wrench setting is 22 lbs. ft.

The functioning parts of the seam welded converter are similar and are serviced in a like manner after cutting the weld in a lathe.

CAUTION: *When the transmission is refilled, and after the engine has been started, additional oil must be added to compensate for that pumped into the converter.*

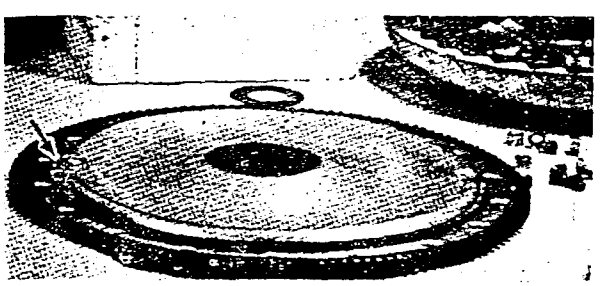

FIG. 7 PLACING "O" RING

For Converter Installation Data see Figures 1, 2, and 3 in the Revers-O-Matic Drive Instruction Manual.