FORD

FORD
LAWN AND GARDEN
TRACTOR

HYDROSTATIC
TRANSMISSION

REPAIR MANUAL

40010031

FORD TRACTOR DIVISION

FORD MOTOR COMPANY

Reprinted

FOREWORD

THIS MANUAL HAS BEEN PREPARED TO ASSIST YOU IN SERVICING THE HYDROSTATIC TRANSMISSION USED WITH THE FORD LAWN AND GARDEN TRACTORS. IT PROVIDES INFORMATION ON CLEANING, DISASSEMBLY, INSPECTION AND REPAIR, AND REASSEMBLY. THIS MANUAL MUST BE USED IN CONJUNCTION WITH THE HYDROSTATIC TRANSMISSION PRELIMINARY SERVICE INFORMATION, SE 3030.

KEEP THIS MANUAL, ALONG WITH YOUR OTHER SERVICE LITERATURE, AVAILABLE FOR READY REFERENCE.

SERVICE DEPARTMENT
FORD TRACTOR DIVISION
FORD MOTOR COMPANY

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GENERAL INFORMATION

The extent to which the malfunctioning Hydrogear Transmission must be disassembled will depend upon the characteristics of its operation observed and the mechanics' own interpretation of them. The trouble shooting chart in the Preliminary Service Information or the Mechanic's Reference Book should be used to determine the possible areas of difficulty prior to disassembly of the Hydrogear transmission.

These procedures should be followed for they can save you time and expense involved with unnecessary teardown.

REMOVAL

The removal of the Hydrogear transmission is covered in Preliminary Service Information or the Mechanic's Reference Book on page 14.

After the Hydrogear transmission has been removed from the tractor, separate the Hydrogear from the differential. This information is also covered on page 14 of the reference manual referred to above.

CLEANING

Clean the unit thoroughly by steam cleaning or other suitable means before further disassembly to prevent contamination of the Hydrogear unit. Dirt is the worst enemy of hydraulic units. Do not clean unit with paint thinner, acetone, or other solvent that may harm the "O" rings, gaskets, paint, etc.

DISASSEMBLY

In regard to transmission disassembly, the hydrogear may be considered a sandwich or building block type of construction consisting of three (3) distinct assemblies; variable pump, center section, and fixed displacement motor. Teardown should be initiated at the area pinpointed by the trouble shooting procedure. In many cases, where no determination can be made, teardown of the entire transmission will be necessary.

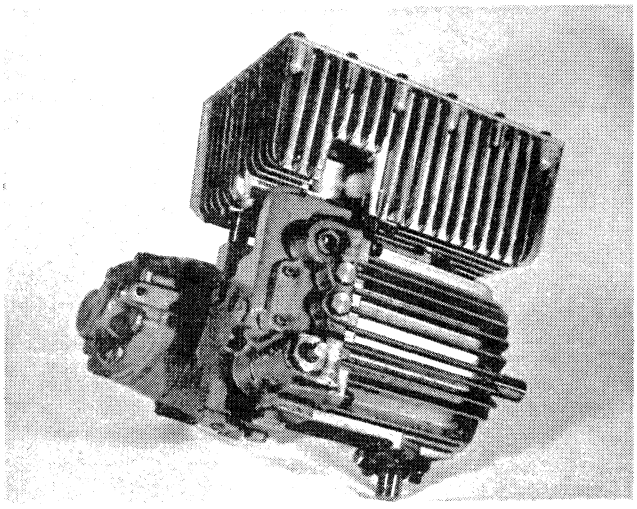

Figure 1

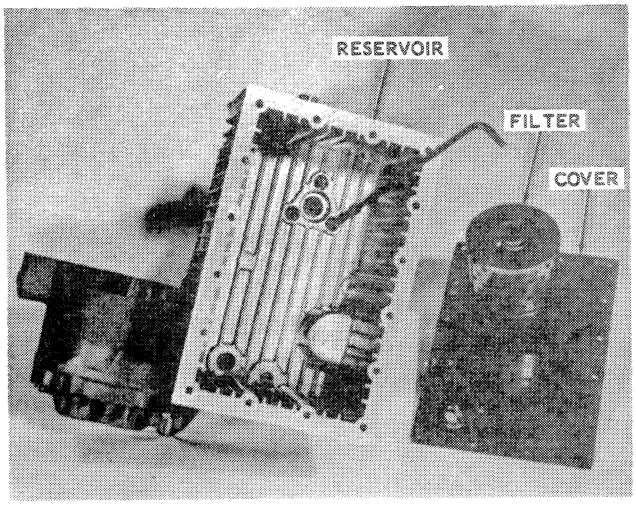

Figure 2

REMOVAL OF RESERVOIR

1. Remove screws, cover, and gasket.
2. Remove filter and spring.
3. Remove oil from reservoir. Discard drained oil.
4. Remove the three Allen head screws holding reservoir to pump housing.
5. With a turning, pulling motion, remove the reservoir from the center section.

PUMP DISASSEMBLY

Removal of the variable pump portion of the transmission should begin with all supplemental hardware: control arm, input pulley, cooling fan, and reservoir stripped from the transmission body.

Use only clean tools and work area.

Loosen the four (4) twelve point cap screws securing the finned aluminum pump housing. Turn the transmission so that the shaft from the finned housing is in a

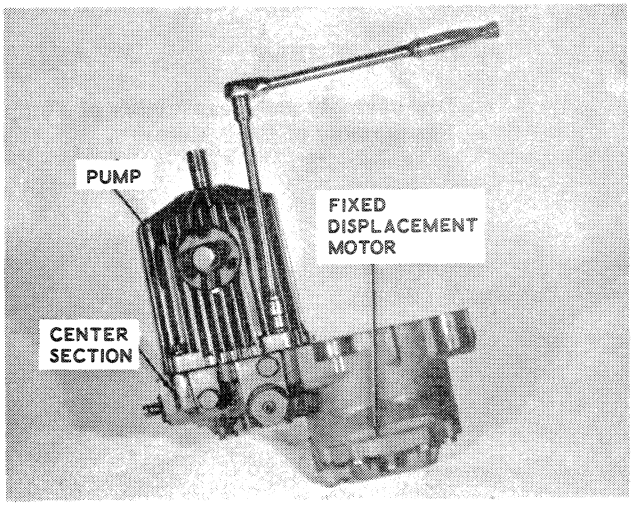

Figure 3

horizontal position, and tap the finned housing on either side with a plastic hammer to break the gasket seal allowing oil to drain in a clean pan. After removing the four (4) twelve point screws, the housing may be removed by lifting carefully.

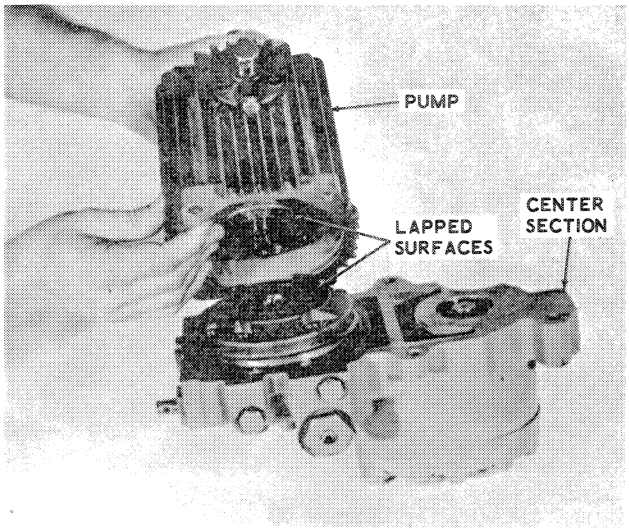

Figure 4

NOTE

Insert fingers between housing and valve plate to prevent the block and piston assembly from falling out, since the main pump drive shaft will be removed with the housing. The block and valve plate mating faces are lapped surfaces. Extreme caution should be exercised during disassembly to prevent damage to these critical parts. With the finned pump housing removed, the cylinder block and piston assemblies may be carefully removed from the drive shaft. The nine (9) pistons may now be removed from the block by lifting upward on the slipper retainer.

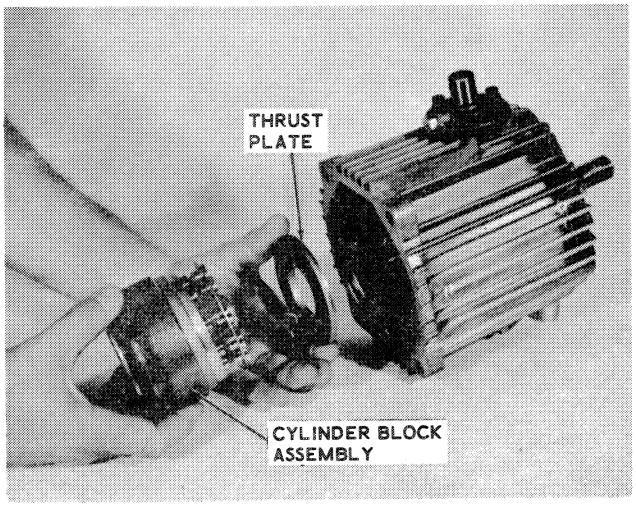

Figure 5

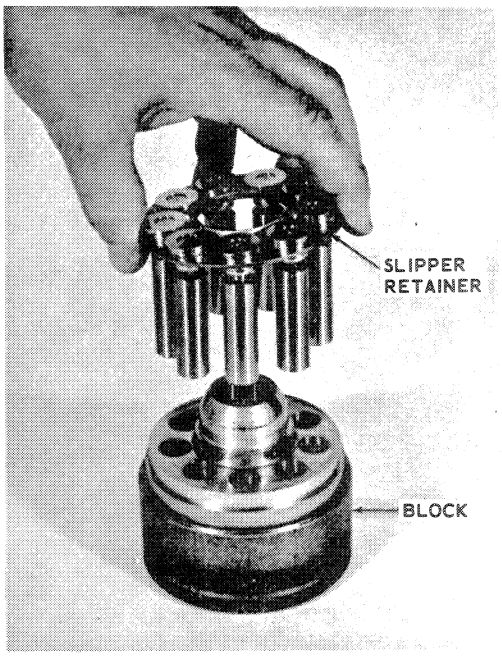

Figure 6

NOTE

Pistons are interchangeable; however, in units with long service, it is a good idea to mark and return each piston to its respective bore.

The next step is removal of the valve plate which is secured by four (4) cap screws. The valve plate may

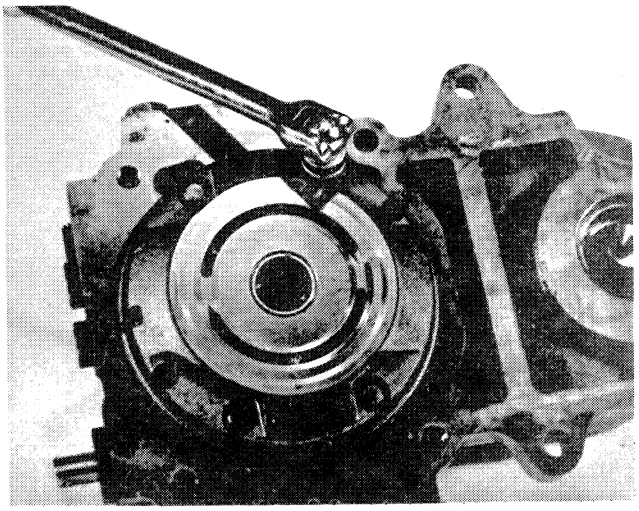

Figure 7

be removed with the aid of two screw drivers used as a pry. Position pry tools as shown in the photo.

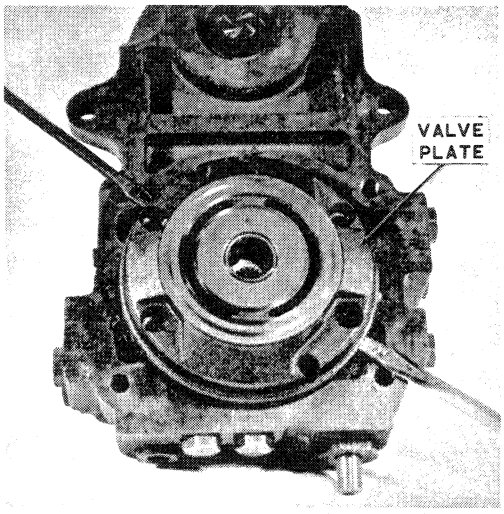

Figure 8

CAUTION

Care must be taken to prevent damage to lapped surfaces. Nestled in a finished bore within the porting plate is the charge pump gerotor set (rotor and roller assembly). Care should be taken when removing the gerotor set. Rotor and roller are lapped assemblies. The use of solvent is often helpful in breaking the hydraulic lock on the gerotor elements.

If it is necessary to remove the swashplate from the pump housing to provide access to the front seal or bearing the following procedure should be followed:

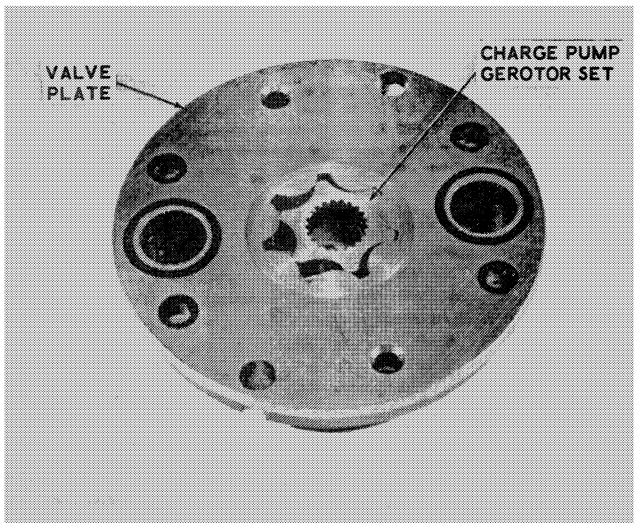

Figure 9

1. Remove the bolts holding the plate, control, trunnion, trunnion shim and "O" ring.

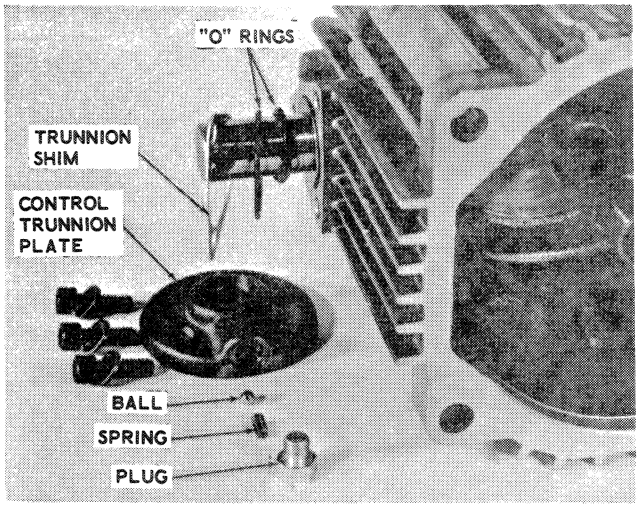

Figure 10

2. Remove the thrustplate from the swashplate using a stiff wire hook. See Figure 5. Place the housing in a disassembly support which will allow pounding without end loading the pump shaft. Pounding without taking this precaution can do irrepairable damage to the main pump bearing. With the housing well supported as below, use a drift pin punch to drive out the roll pins on both sides of the swashplate.

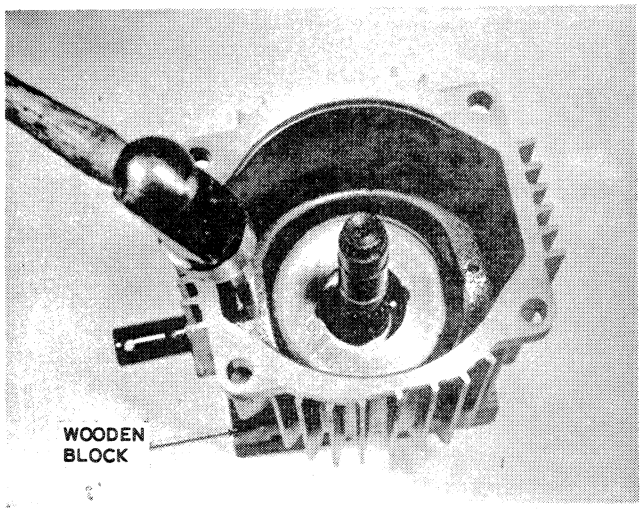

Figure 11

The roll pins will not drop out but will bottom on the housing. With the roll pins bottomed, insert the punch in the hole in the trunnion shaft on the control handle side, and with a turning, pulling motion remove the trunnion. The opposing trunnion may then

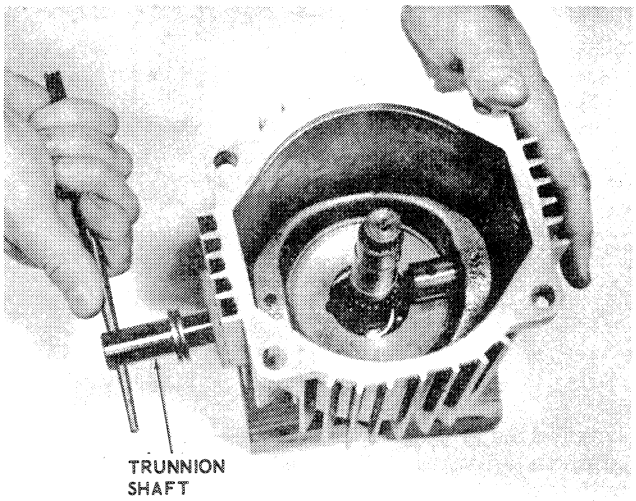

Figure 12

be removed by tapping it into the housing or carefully pulling it out. After the swashplate and associated hardware have been removed from the housing, the shaft bearing retaining ring can be removed using a snap ring pliers. The main pump shaft may

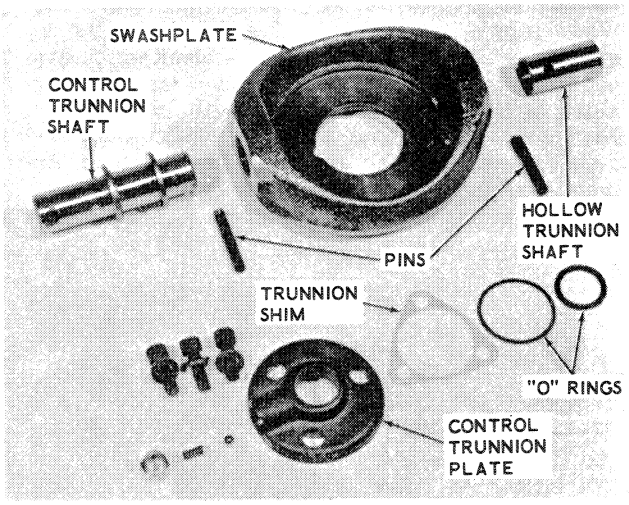

Figure 13

now be removed by tapping carefully on the input end. The front bearing may then be separated from the pump shaft by removing the snap ring and pressing the bearing over the keyed end of the shaft. Make sure that the bearing is pressed off by applying force only on the inner race.

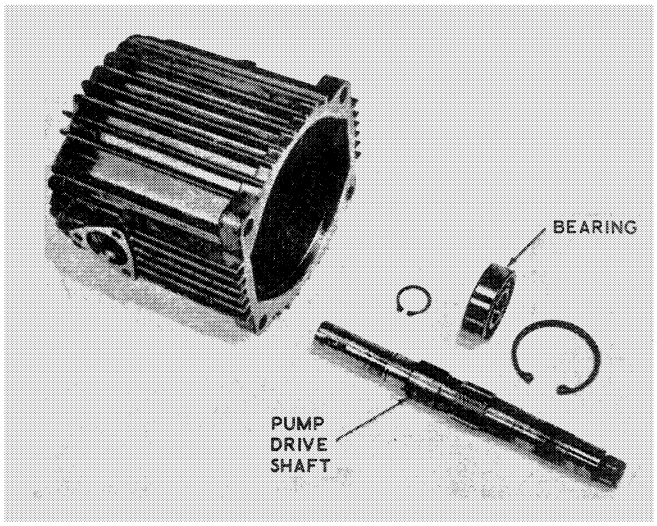

Figure 14

FRONT SEAL REMOVAL

Located in the finned housing is the input shaft seal. Extreme care should be exercised during disassembly or removal of input drive shaft. Be certain there are no rough areas on the drive shaft that will damage the sealing surfaces of this front seal. Polishing the shaft with a crocus cloth will help erase this possibility.

To remove the front seal, place finned housing in a firm stationary position with top of housing in an upright position. Place an item on the seal such as a

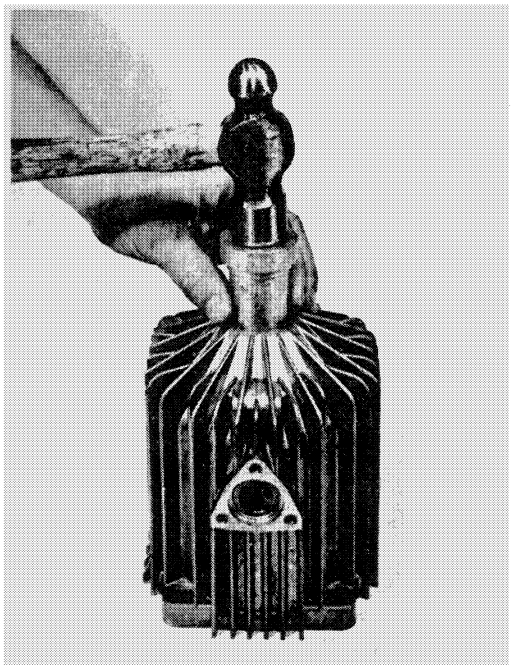

Figure 15

socket with approximately the same O.D. as the seal and tap into the housing. Care should be taken to prevent damage to the housing. Always install new oil seals.

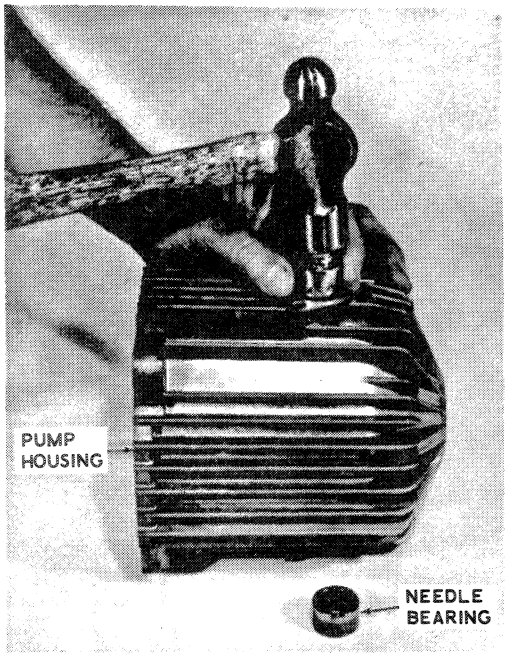

Figure 16

If necessary, the trunnion bearings may be removed and replaced at this time. A tool approximately the same O.D. as the bearing may be used to press the bearing into the pump housing.

When installing new trunnion bearings, make certain the bearing is pressed below recess in pump housing.

INSPECTION OF PUMP PARTS

The valve plate, block balance face, slippers, and thrustplate are lapped surfaces and must be reworked or replaced prior to reassembly to restore pump performance.

SLIPPERS

Slippers are the bronze bonnets crimped to the piston noses. Badly worn or scarred slipper faces are a major pressure leak area in the transmission. All slippers should be touch lapped by hand until superficial scratches are removed. Slippers should be lapped on a lapping plate using 1500 grit compound or 4/0 grit emery paper. Always lap parts with a figure eight motion. Piston assemblies should be replaced if slipper surface damage is deeper than .005 inch. All slippers should be lapped in the same amount -- slipper thickness should not vary over .002 inch for all nine (9) pistons. Care must be taken after lapping to remove all lapping compound from the slipper faces and ball-socket joint. Slipper should be free and should exhibit a maximum of .004 inch end play. When slippers are properly lapped, they should exhibit equal chamfer

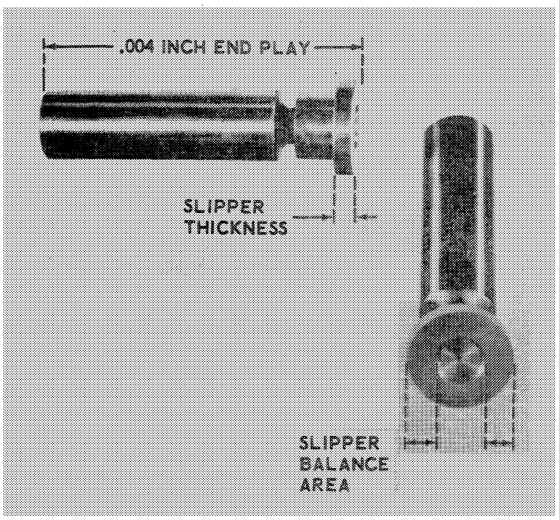

Figure 17

between the slipper face and edges. In some cases, slippers will have rolled or rounded edges; slippers with this condition should be replaced if the rolled portion is greater than 1/8 of the width of the total slipper balance area (Part in contact with thrustplate).

CYLINDER BLOCK

The block should be examined for longitudinal scratches in the bores, and the pistons for longitudinal scratches on the outside diameter. The block should be replaced if severe scarring is evident -- .002 inch or deeper. A block which has been run will exhibit shiny patches on opposing sides of the bores, which is normal. Bores which have suffered extreme wear will exhibit a noticeable egg shaped bore and should be replaced. As mentioned previously, the block face is a lapped surface which must be restored to insure the

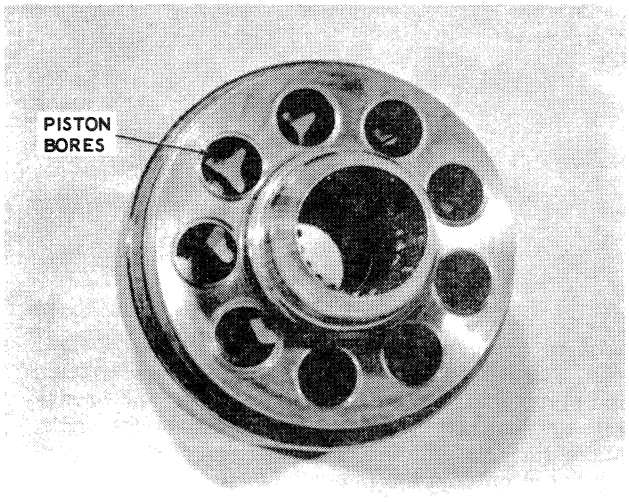

Figure 18

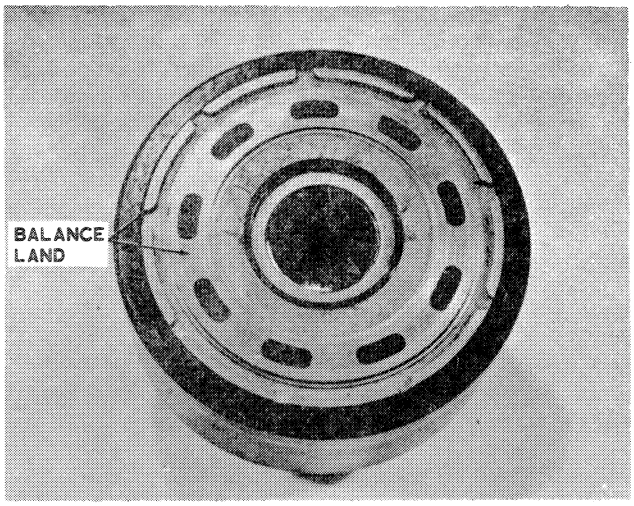

Figure 19

reliability of the rebuilt unit. Blocks exhibiting severe scratches on the outer edge of the balance land (lapped face) have been subjected to contaminated oil. This situation dictates a complete teardown and cleaning of all parts of the hydraulic circuit, motor, center section, filters, strainers, lines, etc. Complete teardown and cleansing is also necessary when any part removed indicates chip generation through failure. The block face may be lapped in a manner similar to the slippers. Blocks which indicate removal of .005 inch or more should be replaced or machine lapped. This is necessary to preserve the perpendicularity between the main block spline and block face. In no case should more than .015 inch be removed from the block face.

THRUSTPLATE

Normal wear pattern will be the polished surface. If lapping is necessary a maximum of .010 inch stock removal may be allowed for rework.

PORTING OR VALVE PLATES

Normal valve plate wear (see Figure 7) will consist of little more than a shiny area similar in configuration to the block balance area. The kidney side of the valve plate is a lapped surface and forms the sealing surface for the rotating block. The kidney side should be restored by re-lapping in a manner similar to that prescribed for the block and slippers. Since the valve plate consists of two large surfaces, flatness and parallelism between them must be maintained during re-lapping and machine lapping or replacement is highly recommended. Superficial scratches and moderate wear may be removed by proper hand lapping as described. The bronze shaft bushing in the valve plate should be inspected and if damaged, valve plate assembly must be replaced.

GEROTOR SET (CHARGE PUMP)

Rotor and Roller Assembly.

Any damage to the gerotor set must be corrected prior to reassembly. If the gerotor sealing surface in the valve plate cavity has been severly scarred or damaged, a new valve plate should be installed.

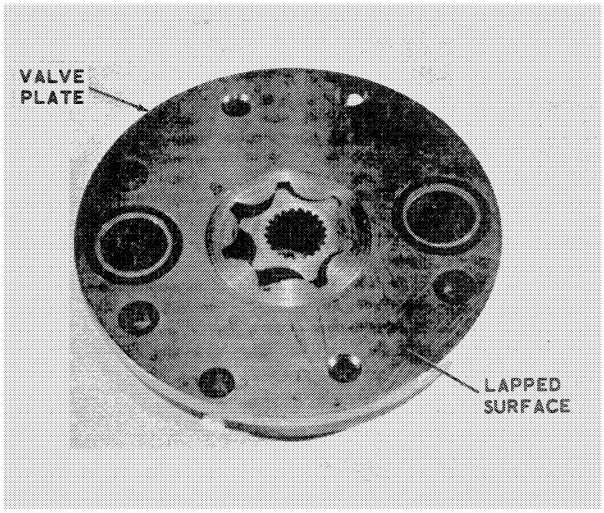

Figure 20

The gerotor set should be touch lapped on both sides to clean up burrs or superficial contaminant scratching. The gerotor set is a fixed clearance type and any excess lapping will decrease charge pump efficiency and make the set more susceptible to further contaminant damage. To preserve the proper charge pump clearance, any amount lapped from the gerotor thickness must also be lapped from the bottom of the valve plate. Since the gerotor set is sealed on one side by the center section, it is also necessary to repair any damage to the center section surface. It is highly recommended that a new gerotor set be installed if severe damage is evident.

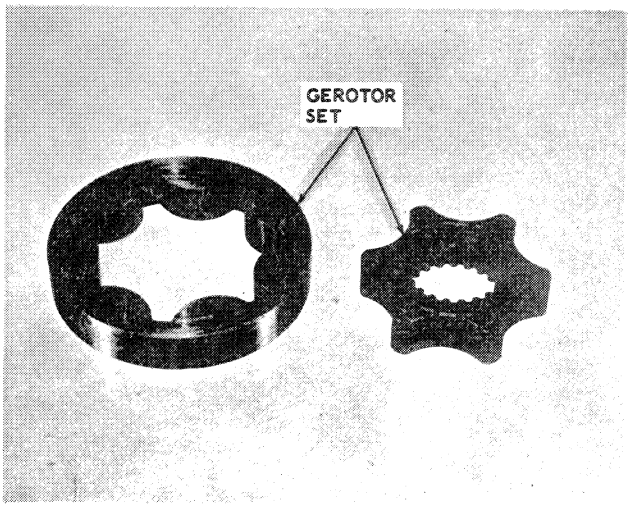

Figure 21

DISASSEMBLY OF GEAR MOTOR

Scribe mark gear motor sections prior to disassembly to aid in repositioning parts during the reassembly operation. The gear motor portion of the Hydrogear may now be disassembled by removing the cap screws from the motor end cap and tapping firmly with a plastic hammer to drive motor sections apart.

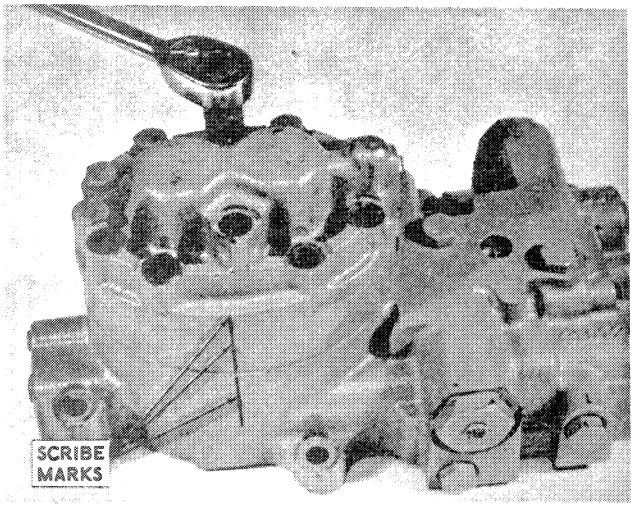

Figure 22

The motor sections are located with two (2) dowell pins at either end of the end cap. Resistance will be encountered when separating the sections. Do not pry apart. The two removable sections are lapped surfaces and should be protected from damage during assembly and disassembly. After removal of the end cap and center section the idler gear and shaft may be lifted out as a unit. Removal of the output shaft is accomplished by removing in succession -- a "C" Ring, gear, woodruff key, and another "C" Ring. Removal of these items will allow the output shaft to be pulled out of the housing. The removed "C" Rings should be discarded and replaced. When reassembling replace oil seal in the pump body.

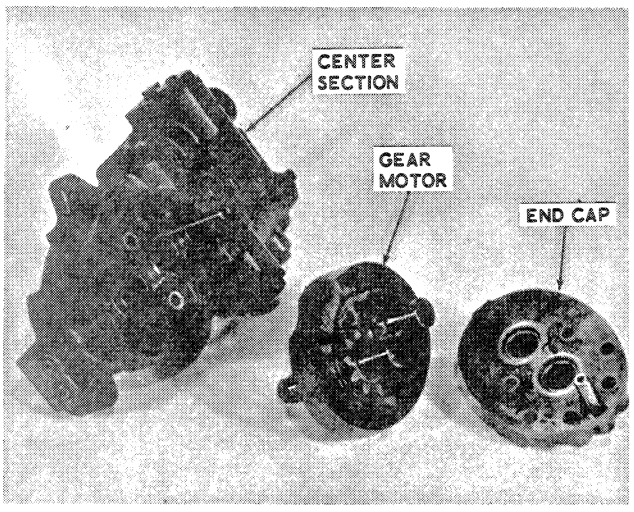

Figure 23

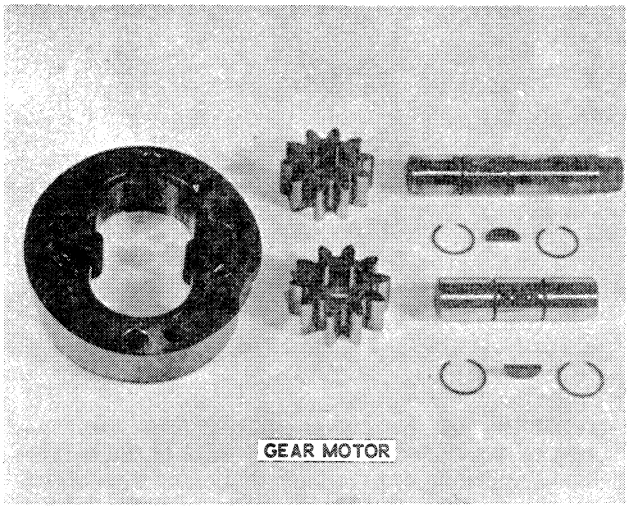

Figure 24

INSPECTION OF GEAR MOTOR COMPONENTS

The gear motor portion of the Hydrogear Transmission consists of three (3) major components: (see Figure 23) end cap, spacer plate, and mounting housing. The mating faces between all of these sections are lapped surfaces flat within .0001 inch. To allow clearance for gear lubrication, the gears are lapped .0012 to .0014 inch thinner than the spacer plate. All of the split line faces may be relapped to remove stock, if necessary, and all should be touch lapped to clean up the faces prior to reassembly. Maximum stock removal from various parts is as follows:

(1)	Spacer Plate & Gears	.005 inch
(2)	Center Section Face	.010 inch
(3)	End Cap	.010 inch

It is not advisable to hand lap these parts to remove stock, as flatness and perpendicularity is extremely critical. If the end cap and mounting housing mating surfaces exhibit evidence of severe scoring or welding by the gear faces, chances are that the damage is too severe to permit rework. In this case, a new end cap and spacer plate assembly should be used. The center section mating face should be re-lapped. Spacer plate assemblies include matched gear sets.

NOTE

Gear sets should never be interchanged, since spacer plate to gear clearance is extremely critical to transmission performance. (Clearance is measured from low on spacer to high on gear.)