3.40 MAIN HYDRAULIC PUMP (FIGURE 3.81)

RACINE VARIABLE VOLUME OIL HYDRAULIC PUMP:

The following service information is applicable to the Racine Pump currently being used on the Failing Chain Feed Drills and may be used as a guide in determining and correcting most of the improper operation that might occur in these pumps.

Function: The function of the Racine variable volume vane type pump is used for continuous operation at pressures up to 1,000 psi. The pump is equipped with a pressure compensating governor which automatically controls the amount of oil delivered to the hydraulic system so as to maintain a constant pressure on the system within the volume range of the pump. No relief valves are needed with this pump since the pressure compensating governor automatically regulates the maximum pressure and provides safe and adequate over-pressure protection.

NOTE: Operating pump at higher pressure than actually required will cause higher operating temperatures.

Starting Pump in Service: Unless otherwise specified by the customer, the adjusting screw of the automatic governor on the Racine variable pump is set at the factory for the maintenance of a pressure of approximately 600 psi on the system. Before starting the pump, the valves should be positioned so as to permit oil to flow directly either to the reservoir or to an easily moved operating piston. With the direction of rotation carefully checked, the pump may then be started and oil will flow either to the reservoir or to an operating cylinder.

Adjusting Pump Pressure: In the event the operator wishes to adjust the oil pump pressure to required operating pressure, the pressure adjustment should not be changed when the pump is discharging directly into the reservoir.

The pressure developed by the pump may be increased by turning the pressure adjusting screw in a clockwise direction. The pressure may be decreased by turning this screw in a counter-clockwise direction. The desired pressure may be obtained by watching the gauge in the pressure line of the pump while the adjustment is being made. Do not operate the pump at more than 1000 psi.

Maintenance: Properly maintained, the Racine Hydraulic pump will give good service and long life under any normal working conditions. Outlined below are the causes of pump failure which most commonly occur when proper care has not been taken of the hydraulic system.

(1) Gaskets and Shaft Oil Seal: All gaskets on the pump and the shaft oil seal are subject to atmospheric pressure since the pump case is drained to the reservoir through the 3/8" case drainline. If this line is restricted or blocked off, the pump gaskets and oil seal will be put under pressure. Also, the life of the shaft oil seal may be greatly shortened if it is not lubricated before the pump is initially started. Abrasive material on the pump shaft or misalignment of the pump and motor shafts will cause excessive wear on the oil seals.

(2) Lubrication: Oil, which the pump delivers to the system, provides lubrication for the moving parts of the pump. Interference with this supply will stop the lubrication of the pump; and this, in turn, will result in seizure of the moving parts. Lack of oil supply can be caused by rotating the pump in the wrong direction, by having insufficient oil in the reservoir or by blocking the suction line of the pump.

NOTE: Gate valves on hydraulic tanks must be opened before starting drill unit.

(3) Dirty Oil: Abrasive matter in the oil will cause excessive wear on the side plates and ring of the pump. If larger pieces of foreign matter are

drawn into the pump, the side plates will become badly scored or galled. Solid matter may become wedged between the vanes and the port plate, resulting in breakage of the vanes or the rotor.

(4) Air: If air is drawn into the pump, either through a loose joint in the suction side of the pump or by not having the end of the suction line far enough below the oil level, the operation of the pump will be very noisy. This noise indicates that the working parts of the pump are being subjected to excessive vibration and wear.

(5) Operation Pressures: Racine Hydraulic Pumps must not be operated at pressures exceeding 1000 psi. Operation at pressures over 1000 psi will overload and shorten the life of the pump bearings. Excessive shock loads on the pump will also overload the bearing.

Very often that which appears to be pump failure is merely a minor difficulty caused by improper operation of the hydraulic system. The following charts list the difficulties most commonly encountered and indicate their causes and remedies. Do not dismantle your Racine Hydraulic Pump. Check the accompanying trouble charts carefully. If these suggestions do not eliminate your difficulty, consult your nearest Failing representative.

NOTE: When ordering replacement parts, give model and serial number of pump from name plate on pump.

3.40 MAIN HYDRAULIC PUMP TROUBLE CHART

TROUBLE	CAUSE	REMEDY
	1. Air leak in suction line Air leak in case drain line Air leak around shaft packing	Pour oil on joints and around shaft while listening for change in sound of operation. Tighten as required.
	2. Low oil level in reservoir	Fill reservoir so that surface of oil is well above end of suction line during all parts of cycle.
	3. Air bubbles in intake line	All return oil lines must be below oil surface and away from intake line.
EXCESSIVE PUMP NOISE	4. Restricted flow through suction piping	Check suction piping and fittings to make sure full size is used throughout without excessive impedance. Make sure suction line is not plugged with rags or foreign material.
	5. Reservoir not vented	Check vent in filler cap to be sure it is open.
	6. Coupling misalignment	Re-align pump and motor shafts.
	7. Pump running too fast	Reduce speed. (Speeds above 1450 RPM are harmful, especially to No. 6 pump)
	8. Pump running too fast	Reduce speed. (Speeds above 1450 RPM are harmful, especially to No. 6 pump)
	9. Wrong type of oil	Use a good, clean hydraulic oil having a viscosity of approximately 200 S.S.U. at 100° F.
	10. Sticking vane	Remove cover assembly (220523) and check rotor (302004) and vanes(301129) for presence of chips or sticky oil. (see pump cross-section).

TROUBLE	CAUSE	REMEDY
SYSTEM EXCESSIVELY HOT	1. Pump operated at higher pressures than required	Reduce pump pressure to minimum required.
	2. Pump not unloaded during idle periods of machine operation cycle	Use open-center valve or two pressure governors when suitable.
	3. Insufficient cooling facilities.	Install oil cooler. Increase reservoir capacity.
	4. Pump discharging through relief valve	Remove relief valve. (Not required with Racine spring governor variable volume pumps. Relief valves create additional heat.)
	5. Excessive slippage in pump	Tighten bolts on cover and plate (290102). See pump cross-section.
LEAKAGE AT OIL SEAL	1. Pressure in pump case	Inspect case drain line for restriction. Should be full 3/8" pipeline to reservoir.
	2. Coupling misalignment	Re-align pump and motor shafts.
	3. Oil too hot	See trouble section headed "System Excessively Hot."
	4. Abrasives on pump shaft	Protect shaft from abrasive dust and foreign material.
	5. Packing damaged at installation	Replace oil seal. Packing should be eased on shaft carefully.
BEARING FAILURE	1. Excessive or shock loads	Reduce operating pressures. Observe maximum operating pressure of 1000 psi.
	2. Coupling misalignment	Re-align pump and motor shafts.
	3. Chips or other foreign matter in bearings	Make sure clean oil is used. Essential for efficient operation and long life of bearings.

TROUBLE	CAUSE	REMEDY
PUMP NOT DELIVERING OIL	1. Adjusting screw on pump too loose.	Tighten adjusting screw (301149) five turns after spring tension is felt.
	2. Wrong direction of pump	Observe arrow on pump case directly above shaft. Direction of rotation should correspond
	3. Oil level low in reservoir	Maintain oil level in reservoir well above end of suction line at all times.
	4. Air leak in suction line	Tighten joints and apply good pipe compound, non-soluble in oil.
	5. Pump cover too loose	Tighten eight hexagon bolts on pump cover (220523).
	6. Pump running too slowly	Increase speed. (Minimum recommended speed - 600 RPM)
PUMP NOT DELIVERING PRESSURE	1. Pump not delivering oil	See trouble section headed "Pump Not Delivering Oil."
	2. Pressure adjusting screw not set high enough	Set adjusting screw (301149) to desired pressure.
	3. Pressure being relieved through relief valve	Remove relief valve. (Not required with variable volume pumps)
	4. Oil by-passing to reservoir	Test circuit pressure progressively. Watch for open-center valves or other valves open to reservoir.
	5. Pressure ring sticking	Loosen eight hexagon bolts on cover (220523). Reduce number of shims between cover (220523) and plate (290102).
	6. Governor piston sticking	Inspect governor for dirt or excessive scoring.

TROUBLE	CAUSE	REMEDY
OVERLOADING MOTOR	1. Motor not properly sized for pressure and volume requirements	Review pump characteristic curves.
	2. Pump delivering full volume through relief valve	Remove relief valve. (Not required with variable volume pumps)
	3. Excessive internal leakage in pump	Tighten eight hexagon bolts on pump cover (220523). Add shims between cover (220523) and port plate(29010

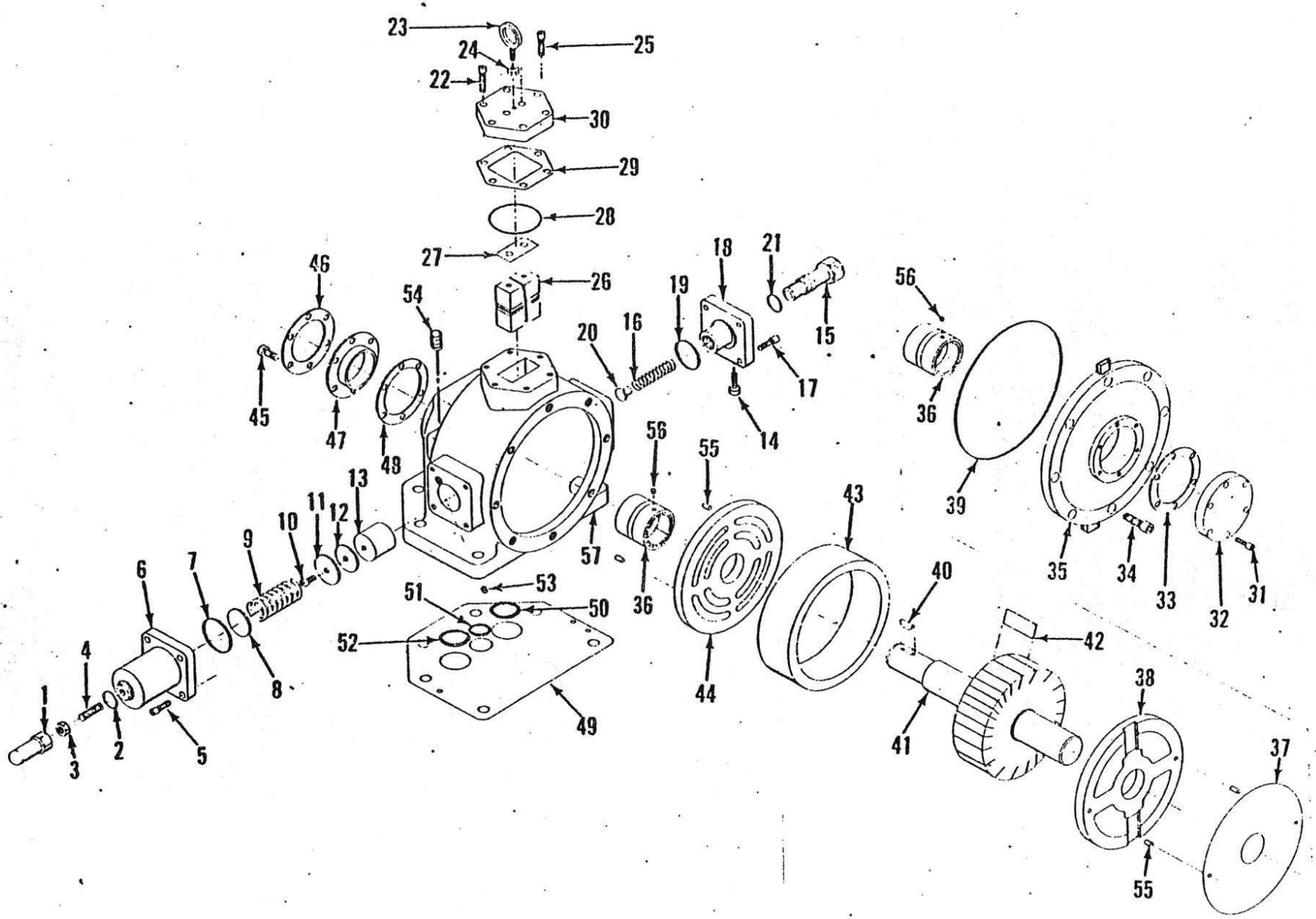

Figure 3-81. Main Hydraulic Pump

1. CAP
2. GASKET
3. JAM NUT
4. PRESSURE ADJUSTING SCREW
5. SCREW
6. HOUSING
7. O-RING
8. WASHER
9. SPRING
10. SCREW
11. STOP WASHER
12. SHIM
13. PISTON
14. SCREW
15. VOLUME ADJUSTING SCREW
16. SPRING
17. SCREW
18. CAP
19. O-RING
20. BUTTON
21. O-RING
22. SCREW
23. EYEBOLT
24. JAM NUT
25. SCREW
26. THRUST BLOCK ASSEMBLY
27. SHIM
28. O-RING
29. SEAL
30. THRUST BLOCK CAP
31. SCREW
32. COVER CAP
33. GASKET
34. SCREW
35. COVER
36. BEARING
37. SHIM
38. COVER PLATE
39. O-RING
40. KEY
41. ROTOR SHAFT
42. VANE
43. RING
44. PORT PLATE
45. SCREW
46. WASHER
47. SEAL
48. GASKET
49. SEAL
50. O-RING
51. O-RING
52. O-RING
53. PLUG
54. PLUG
55. LOCATING PIN
56. SCREW
57. BODY

Legend for Figure 3-81. Main Hydraulic Pump

a. Disassembly

NOTE

Thoroughly clean the outside of the pump body and check for defects, such as cracks at the suction port.

(1) Remove the pressure adjusting screw cover (1) and gasket (2).

(2) Loosen the jam nut (3) and turn the adjusting screw (4) counterclockwise to relieve all pressure on the governor spring (9).

(3) Remove the screws (5), governor housing (6), o-ring (7), washer (8), and spring (9).

(4) Remove the screw (10), washer (11), and shim (12) from the piston (13).

(5) Loosen the screw (14) and the volume adjusting screw (15) out to relieve pressure on the spring (16).

(6) Remove the screws (17), cap (18), o-ring (19), spring (16), and button (20). Remove the screw (14), volume adjusting screw (15), and o-ring (21).

(7) Remove the screws (22) and remove the entire unit by lifting on the eyebolt (23).

(8) Loosen the jam nut (24) and remove the eyebolt (23).

(9) Remove the screws (25), thrust block assembly (26), shim (27), o-ring (28), and seal plate (29) from the thrust block cap (30).

(10) Remove the screws (31), cover cap (32), and gasket (33).

(11) Remove screws (34) and tap lightly on the cover (35) with a plastic hammer or mallet while prying

on the dogs on each side of the cover to remove the cover from the pump body (57).

NOTE

When the cover (35) is freed from the pump body (57) the cover (35), bearing (36), shim (37), and cover plate (38) will separate from the pump as an assembly.

(12). Remove the key (40 from the rotor shaft (41). Check to be sure the keyway is free of burrs that could damage the seal or bearing.

(13) Carefully slide the rotor shaft (41), vanes (42), ring (43), and port plate (44) out of the pump body (57).

(14) Remove the ring (43) and port plate (44).

(15) Remove the screws (45), washer (46), seal (47), and gasket (48).

(16) Remove the cover plate (38), shim (37), and o-ring (39).

(17) Remove the seal plate (49) and o-rings (50, 51, and 52).

(18) If bearings (36) require replacement, use a bearing puller and remove the bearings from the cover (35) and body (57).

(19) Do not remove plugs (53 and 54) or locating pins (55) unless replacement is necessary.

b. Cleaning, Inspection, and Repair

(1) Clean all metal parts in an approved solvent and dry thoroughly.

(2) Check the bearings for pitting and wear. If the bearings show any signs of pitting or wear, they must be replaced.

(3) Check the wearing surfaces of the plates (38 and 44), ring (43), rotor shaft and vanes (41 and 42). Replace any parts that show excessive wear.

(4) Check plates (38 and 44) for warping. Place the plates on a surface plate with the side of the plate that is assembled toward the ring (43) facing downward. Depress the plate at opposite points around the circumference. If a rocking motion can be detected, the plate is warped. Do not reinstall a warped plate.

NOTE

Make sure there are no burrs on the face of the plate. Burrs could make a true plate appear to be warped.

(5) Inspect all seals, o-rings, and gaskets, and replace if necessary.

c. Reassembly

NOTE

If the ring (43) or plates (38 and 44) are being replaced, both new and old parts should be measured with a micrometer, and any differences noted. The difference is important for final assembly shimming.

(1) Make sure that all parts are clean, and lubricate the parts with hydraulic fluid as reassembly progresses.

(2) Insert the port plate (44). Make sure the plate is properly aligned with the locating pins.

NOTE

The locating pins are purposely positioned at different distances from the center line of the pump to prevent the plate from being installed upside down.

(3) Insert the ring (43).

(4) Carefully insert the rotor shaft (41). Care must be exercised to avoid force which could displace the bearing needles.

(5) Install the volume control assembly, making sure the shank of the button (20) remains inside the spring (16).

(6) Install the thrust block unit.

(7) Perform the following procedures to check or correctly position the ring (43).

(a) Insert the governor piston (13) in position, making certain there is no foreign material under the stop washer (11).

NOTE

A bar bolted across the piston stop washer (11) will ensure that the stop washer is providing a positive stop.

(b) Move the ring (43) to make positive contact with the piston (11).

(c) With the ring (43) in positive contact with both the piston (11) and thrust block (26), check the clearance between the rotor (41) and ring (43). The clearance should be 0.004 to 0.006 inch.

(d) If the clearance is not correct, remove the piston stop washer (11) from the piston (13) and add or subtract shims (12) as necessary to achieve the correct clearance.

(8) Insert the vanes (42). Insert each vane so that the slant of the beveled edge of the vane is toward the direction of rotor rotation.

NOTE

If the ring (43) or plates (38 and 44) are being replaced, check the difference that was noted when the old and new parts were measured with a micrometer to determine the number or thickness of shims (37) to be used.

(9) Assemble the cover (35), bearing (36), shim (37) and cover plate (38). Make sure the locating pins (55) are fully inserted, to allow the plate (38) to lie flat on the cover (35).

(10) Install the o-ring (39) and insert the complete cover (35) and plate (38) assembly into the pump.

(11) Insert four of the eight screws (34) in alternate holes around the cover (35). Rotate the shaft (41) while tightening the four screws (34) by hand. Continue to rotate the shaft (41) and tighten the four bolts (34) with a wrench.

CAUTION

The rotor shaft must be rotated while tightening the cover and plate assembly to prevent the vanes from cocking and seizing.

(12) Check the movement of the ring (43). Push in on the piston stop washer (11). When the proper amount of shims (37) is installed, a very noticeable amount of drag will be felt when the governor piston (13) is pushed in. If the clearance is correct, the spring (16) will begin to return the ring (43) and piston (13) when pressure on the stop washer (11) is released.

NOTE

If the piston (13) does not return when pressure is released, the number of shims (37) must be reduced. Conversely, if little or no drag was felt when the piston was pushed in, and the piston (13) returns quickly when pressure on the stop washer (11) is released, more shims (37) must be added.

(13) When proper shimming is achieved, install the remaining four screws (34). Tighten all screws (34), alternately until all screws are torqued to 90-95 inch pounds.

(14) Reinstall the gasket (33), cover cap (32), and screws (31).

(15) Reinstall the spring (9), washer (8), o-ring (7), governor housing (6), and screws (5).

d. Adjustment

(1) Pressure Adjustment. The pressure adjusting screw (4) provides a means of regulating system pressure within a range of 0 to 1000 psi. Clockwise rotation of the screw increases the pressure. Counterclockwise rotation of the screw decreases the pressure. When pressure adjustments are being made, the pump must be operating against a closed circuit.

CAUTION

Make small adjustments when adjusting pressure, as fast adjustments do not always respond immediately on the gauge.

Hydraulic pressure should be adjusted to a minimum for proper operation of the system. Excessive high pressure results in more power required to operate the pump, and reduces the serviceable life of the pump.

NOTE

When pressure adjustment is completed, tighten the jam nut (3) and install the o-ring (2) and cap (1).

(2) Volume Adjustment. The pump output volume can be adjusted with the adjusting screw (15). Loosen the screw (14) and turn the adjusting screw in to decrease the output volume or out to increase the output volume. When the volume adjustment is completed, tighten the screw (14).

NOTE

The output volume must be adjusted to supply a sufficient quantity of fluid to operate the maximum number of hydraulic components that will be operating at the same time.

3.41 MAST RAISING CYLINDER (Figure 3-82).

a. Removal

(1) Disconnect both hydraulic hoses from the mast raising cylinder.

(2) Remove the cotter pin (1), nut (2), lockwasher (3), and bolt (4).

(3) Remove the cap on the end of the piston rod (19) to disconnect the mast raising cylinder from the mast.

(4) Remove the cotter pin (5), hinge pin (6), and remove the mast raising cylinder.