Pump Description

1 — SHAFT, DRIVE
2 — SEAL, DRIVE SHAFT
3 — SEAL "O" RING (HOUSING)
4 — HOUSING ASSY., PUMP
5 — SEAL "O" RING (HOUSING)
6 — SPRING, FLOW CONTROL
7 — VALVE ASSY., CONTROL
8 — SEAL "O" RING (PRESSURE & END PLATE)
9 — PIN, DOWEL
10 — PLATE, THRUST
11 — ROTOR, PUMP
12 — RING, SHAFT RETAINING
13 — VANE, PUMP
14 — RING, PUMP
15 — PLATE, PRESSURE
16 — SPRING, PRESSURE PLATE
17 — PLATE, END
18 — RING, END PLATE RETAINING
19 — SEAL "O" RING (HOUSING TO STUD)
20 — RESERVOIR ASSY., PUMP
21 — CAP ASSY., RESERVOIR
22 — STUD OR BOLT
23 — SEAL "O" RING (FITTING ASSY.)
24 — FITTING ASSY., CONNECTOR &
25 — BRACKET, STEERING PUMP MOUNTING
26 — MAGNET

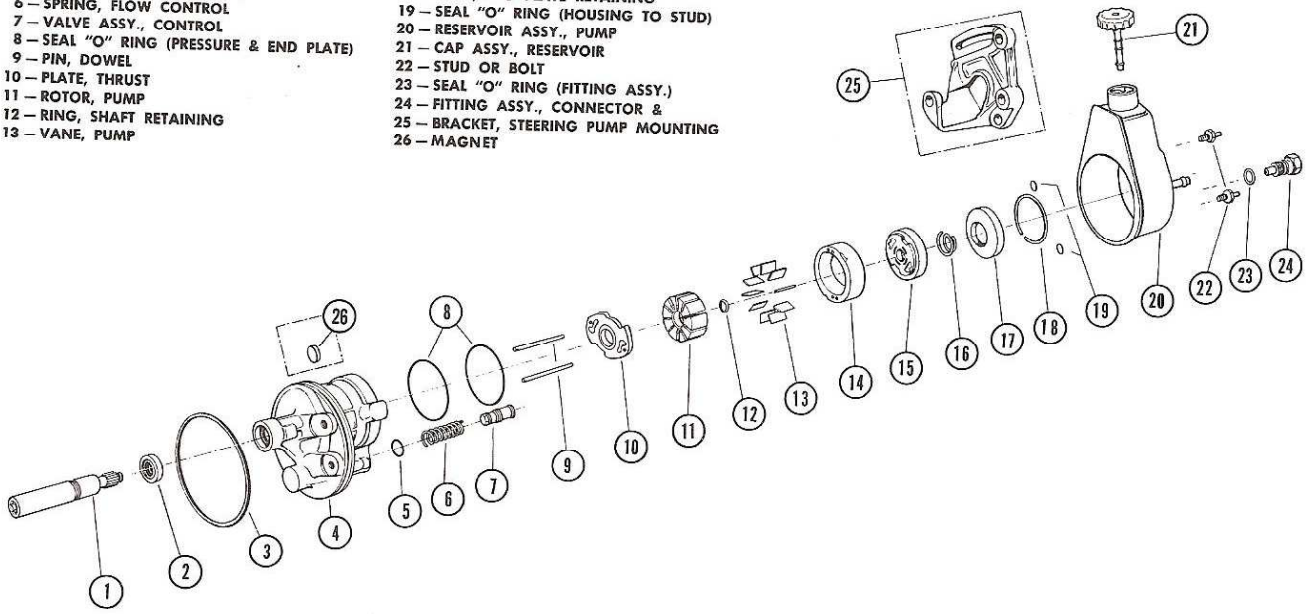

Fig. 62 — Hydraulic Pump Assembly

The housing and internal parts of the pump are inside the reservoir so that the pump parts operate submerged in oil. The reservoir is sealed against the pump housing, leaving the housing face and the shaft hub exposed. The reservoir has a filler neck fitted with a cap. A shaft bushing and seal are pressed into the housing from the front. The drive shaft is inserted through this seal and bushing. A large hole in the rear of the housing contains the functional parts; namely ring, rotor, vanes and plates. A smaller hole contains the control valve assembly and spring.

The thrust plate (Fig. 62, item 10) is located on the inner face of the housing by two dowel pins. This plate has four central blind cavities for undervane oil pressure. The two outer blind cavities direct discharge oil through the two cross-over holes in the pump ring (Fig. 63), through the pressure plate, and into cavity 1 (Fig. 64). The two outside indentations in the thrust plate are for intake of the oil from the suction part of the pump.

The pump ring (Fig. 63) is a plate having the mating surfaces ground flat and parallel. The center hole is a two lobed cam in which the rotor and vanes operate. The ring is placed next to the thrust plate, and located with the same dowel pins.

The pressure plate is fitted against the ring and located with the same two dowel pins. This plate has six through ports. The four central through ports connect from cavity 1 (Fig. 64) to supply undervane oil perssure. The two outer ports pass oil under discharge pressure to cavity 1.

The reservoir is for oil storage. It receives and directs the return oil back to the make-up passage of the pump.

The drive shaft is fitted with a pulley and is belt driven from the crankshaft. The rotor is loosely splined to the drive shaft and secured with a retaining ring. It is located centrally within the ring and between the thrust and pressure plates. The ten vanes are mounted in radial slots in the rotor (Fig. 63)

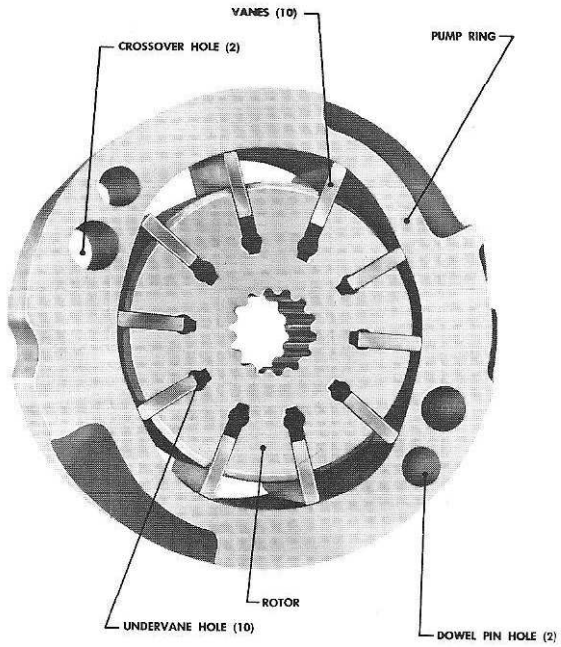

Fig. 63 — Pump Ring and Rotor

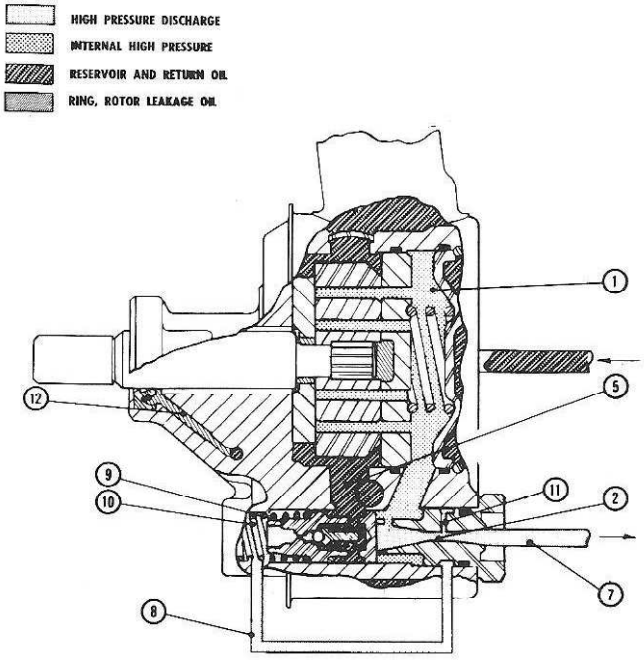

Fig. 64 — Slow Cornering

Pump Operation

The mode of operation of the power steering pump is based upon the demand of the power steering gear. The various major modes of operation are: slow cornering, moderate to high speed straight ahead driving, and cornering against the wheel stop. The pump is designed to recognize these conditions as required by the steering gear valve and compensate for them internally.

As the drive shaft turns the rotor, the vane tips follow the inner cam surface of the pump ring, moving outward and inward twice during each revolution. This results in a complete pumping cycle every 180 degrees of rotation (Fig. 63). Oil is moved in the spaces between the vanes. As the vane tips move outward, oil is sucked into the inter-vane spaces through four suction ports in the pressure and thrust plates. The pressure of the oil is raised, and the oil is discharged from the pump ring, as the vane tips move inward. High pressure oil discharges into cavity 1, (Fig. 64), through two open ports in the pressure plate, and through two blind ports in the thrust plate, which are connected to cavity 1 by the cross-over holes in the ring. A portion of this oil is circulated through the central port system in the pressure plate, forcing the vanes to follow the cam surface of the ring. The ring-rotor leakage oil (12) is used for bushing lubrication and then bled to the reservoir.

SLOW CORNERING (FIG. 64)

During slow cornering maneuvers, the oil pressure required will usually not exceed 400 p.s.i. The RPM of the pump is not high enough to require internal bypassing of oil, therefore, the pump bypass port to (5) remains closed. The high pressure discharge oil (7) is slightly lower in pressure than the internal high pressure oil (1). The drop in pressure occurs as oil flows through the flow control orifice (2). This reduces the pressure at the bottom end of the pump control valve (9) because the orifice (11) is connected by passage (8) to (9) resulting in a pressure unbalance on the valve. The flow control valve moves away from the discharge fitting, but due to the force of the flow control spring (10) the valve remains closed to the bypass hole (5). The oil pressure does not build up high enough to cause the pressure relief valve to actuate, because the oil pumped through the steering gear is allowed to recirculate through the entire system.

MODERATE TO HIGH SPEED OPERATION (FIG. 65)

When operating at moderate to high speed, it is desirable to limit the temperature rise of the oil. This is done by flow controlling. The control valve

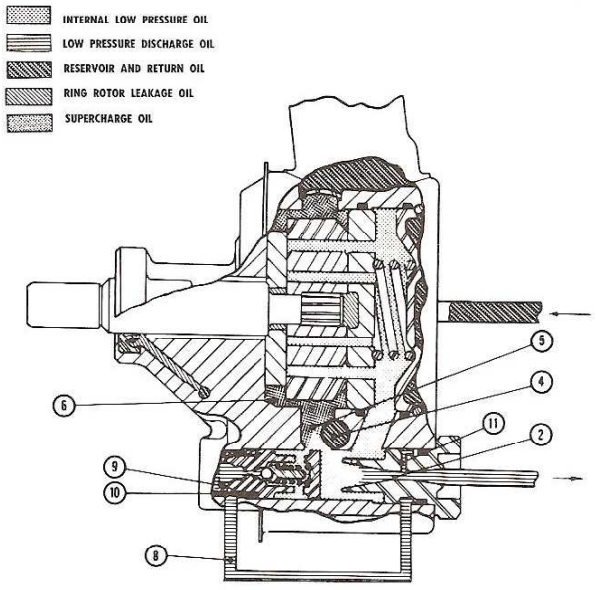

Fig. 65 — Flow Controlling

in the steering gear is an open center rotary valve. When this valve is in the straight ahead position, oil flows from the pump through the open center valve and back to the pump reservoir without traveling through the power steering gear. When this flow exceeds the predetermined system requirements, oil is by-passed within the pump. This is accomplished by the pressure drop which occurs across the flow control orifice (2). The pressure is reduced at the bottom of the flow control valve (9) because the orifice (11) is connected by (8) to the bottom of valve (9).

The pressure unbalance of the valve is sufficient to overcome the force of the spring (10), allowing the valve to open the bypass hole (5), and diverting oil into the intake chamber (6). Supercharging of the intake chamber occurs under these conditions. Oil at high velocity discharging past the valve into the intake chamber picks up make-up oil at hole (4) from the reservoir on the jet pump principle. By reduction of velocity, velocity energy is converted into supercharge pressure in cavity (6). During this straight ahead driving condition, the discharge pressure should not exceed 100 p.s.i.

CORNERING AGAINST WHEEL STOPS (FIG. 66)

When the steering gear control valve is actuated in either direction to the point of cut-off, the flow of oil from the pump is blocked. This condition occurs when the front wheels meet the wheel stop, or when the wheel movement is otherwise blocked by a curb or deep sand or mud. The pump is equipped with a pressure relief valve. The relief valve is contained inside the flow control plunger (13). When the pressure exceeds a predetermined pressure, (greater than maximum system requirements) the pressure relief ball (14) opens, allowing a small amount of oil to flow into the bypass hole (5). This flow of oil passing through the pressure relief orifice (11) causes a pressure drop and resulting lower pressure on the bottom end of the control valve (9).

The pressure unbalance then causes the valve to compress the spring (10) allowing the major portion of the oil to bypass into the intake chamber (from 3 to 6) in the same manner as is accomplished by flow controlling. Relief pressures are usually between 750 and 1450 p.s.i. depending on the vehicle requirements.

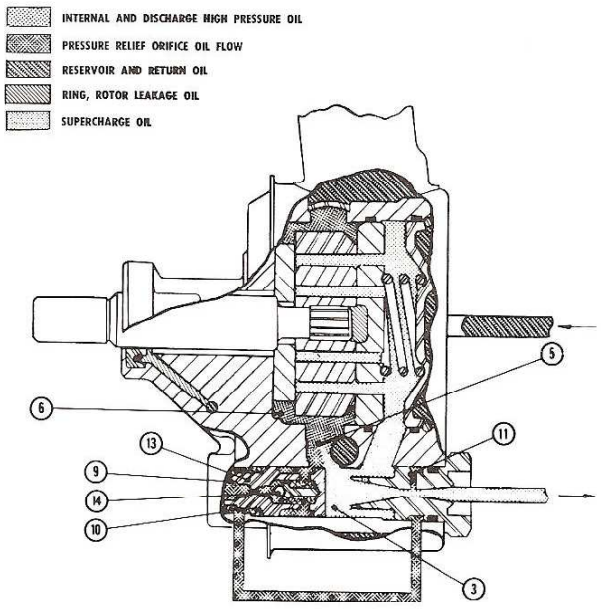

Fig. 66 — Pressure Relief

REMOVAL OF PUMP FROM VEHICLE

1. Disconnect both hoses at pump, taking care not to bend hoses any more than absolutely necessary. (With time and temperature exposure, hoses may take a "set" and will not have the flexibility of a new hose). When both hoses are disconnected, secure ends in raised position to prevent drainage of oil. (Fig. 1)