

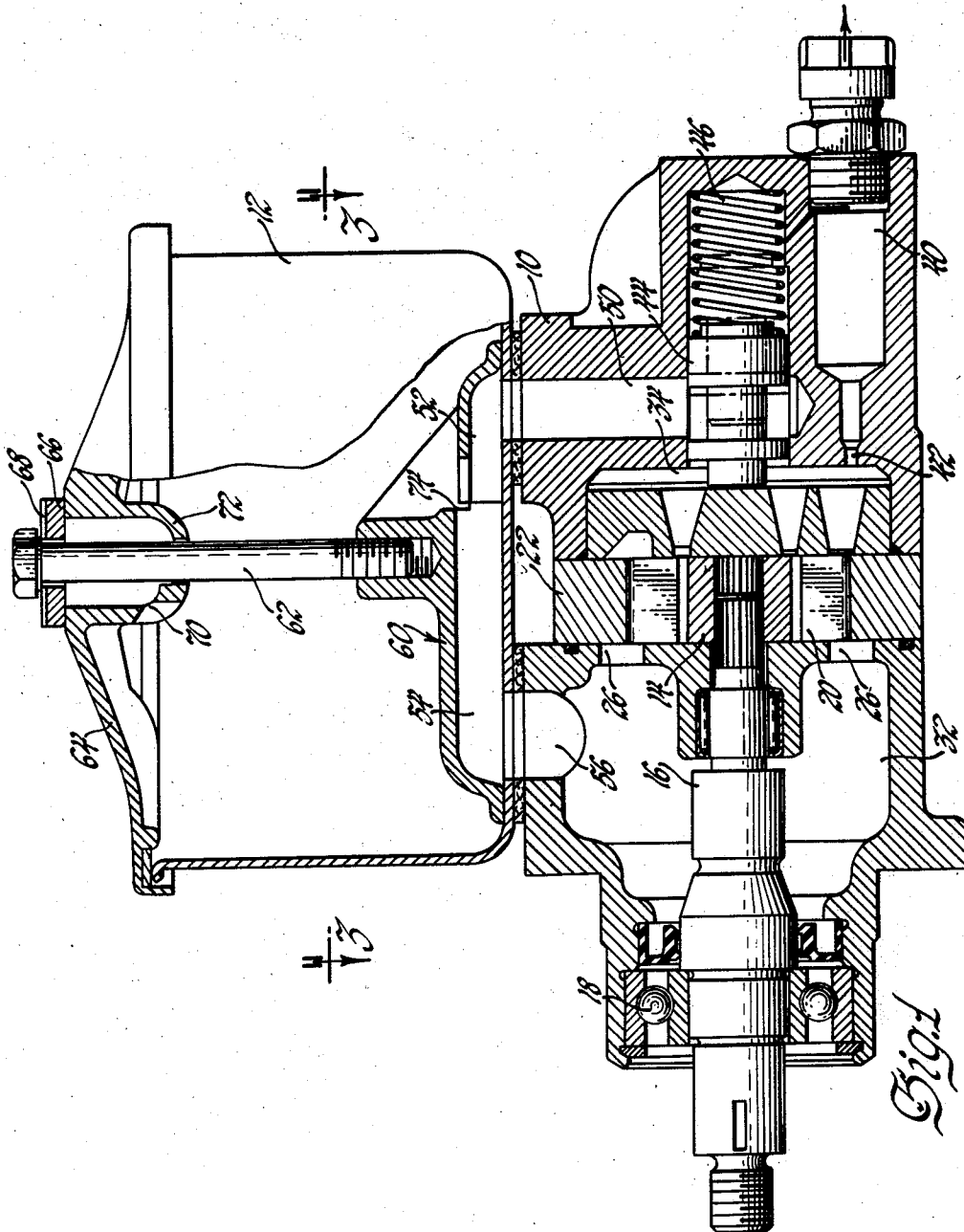
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D. TOSCHKOFF
SUPERCHARGING PUMP

2,858,766

Filed Sept. 19, 1955

3 Sheets-Sheet 1



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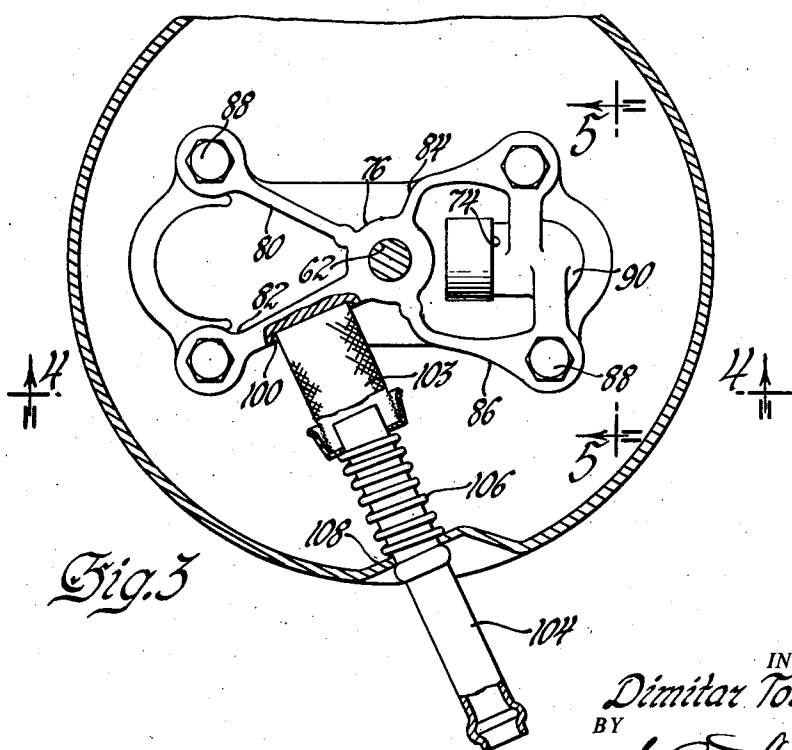
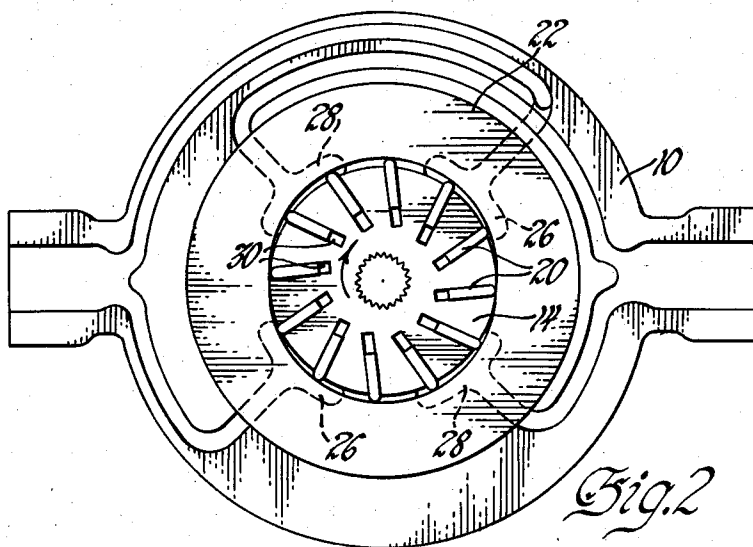
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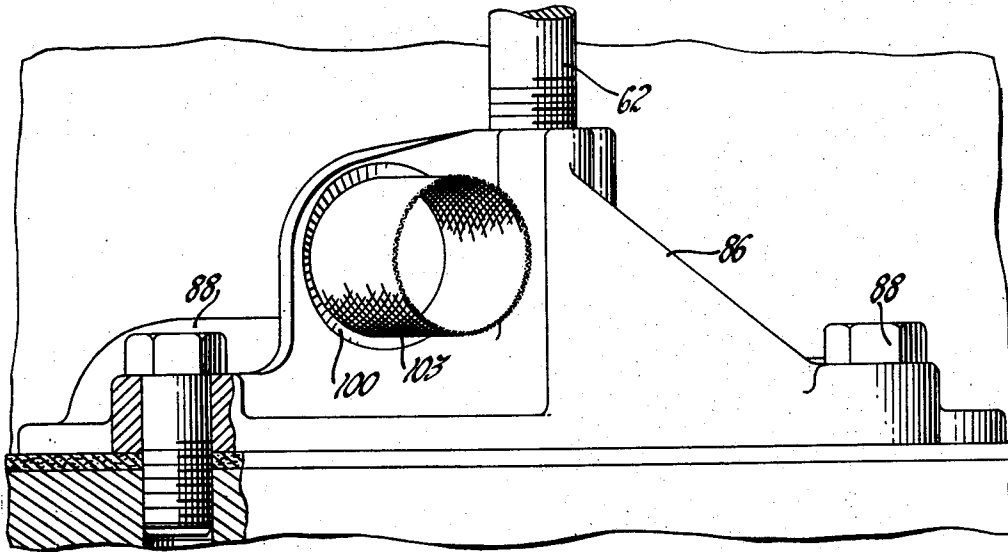


Fig. 4

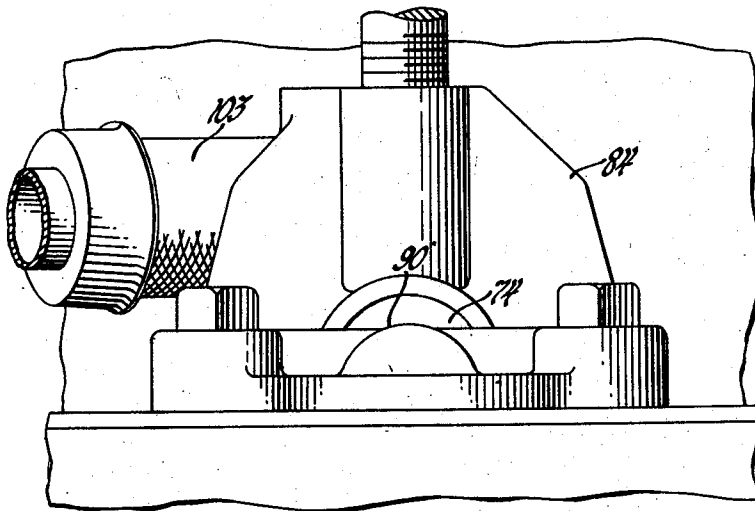


Fig. 5

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SUPERCHARGING PUMP

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1 Claim. (Cl. 103—42)

This invention has relation to fluid circuits and more especially concerns such a circuit including a pump whereby the circulated fluid is moved. In a more particular aspect, the invention relates to hydraulic circuits wherein the pump component is of the constant displacement type and runs continuously while the apparatus with respect to which the circuit is functional is in operation.

The invention is an outgrowth of problems encountered in the operation of a constant displacement vane pump used in the hydraulic power steering of automotive vehicles. This pump is normally powered from the crank shaft of the vehicle engine and comprises a flow control valve serving to provide a constant quantity of fluid to the power steering system (e. g. 1.8–2 gals. per min.), the excess fluid, representing the bulk of the output of the pump at cruising speeds, being bypassed from the discharge side of the pump to the suction side thereof.

The principal object of the present invention is to prevent cavitation in such a pump, thereby to render the pump less noisy in operation and to work a general improvement in the operation of the circuit comprising the pump.

A corollary object is to accomplish the foregoing without making substantial changes in the design of the pump and circuit.

The invention will be particularly described with the aid of the accompanying drawings illustrating a preferred embodiment thereof and in which:

Figure 1 is a section through an assembly including a power steering pump of the type above mentioned and a reservoir supplying make-up fluid to the pump;

Figure 2 is a schematic representation of the pump;

Figure 3 is a section on the line 3—3 in Figure 1; and

Figures 4 and 5 are details of the means interconnecting the pump and reservoir.

Referring first to Figure 1 wherein the pump and reservoir are respectively generally designated by the numerals 10 and 12, it will be seen that the rotor 14 of the pump is splined to the drive shaft 16 and that the drive shaft turns in ball bearings 18. For pumping action, vanes 20 carried by the rotor are caused to move radially in and out as the rotor turns in a cam ring 22 surrounding the vanes.

The operation of the pump will be readily understood from Figure 2 in which like numerals refer to like parts in Figure 1. As indicated by the arrow, the rotor turns clockwise, fluid being drawn in at suction ports 26 and discharged through ports 28. Vanes 20 are maintained in contact with the cam ring 22 by centrifugal force plus discharge pressure behind the vanes at 30. As shown in Figure 1, there is a common suction chamber 32 for the ports 26 and a common discharge chamber 34 for ports 28.

Discharge fluid leaving the pump via passageway 40 first passes through an orifice 42 operating to limit the

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output of the pump to say 2 gals. per minute. The bypassing of the excess fluid is a function of a valve 44 which is loaded by a spring 46, calculated to yield whenever the pressure drop across orifice 42 is greater than than that required to pass fluid at the rate of 2 g. p. m. through the orifice, the valve 44 is displaced to the right against the resistance of the spring 46 to open the discharge chamber to a passageway 50. This passageway extends to a relatively restricted passageway 52, in turn opening to a third passageway 54 communicating with the suction chamber 32 via a short vertical passageway 56.

Passageways 52 and 54 are provided by a manifold member 60 serving to secure reservoir 12 to the pump housing. Additionally, the manifold member accommodates the end of a bolt 62 through which the lid 64 of the reservoir is secured to the body thereof. A washer 66 mediate the head of the bolt and the top of the reservoir lid has a slot 68 therein providing an air vent. This slot is complementary to the hole 70 in the boss portion 72 of the reservoir lid.

Manifold 60 may with advantage be formed by casting and preferably is shaped as shown by Figures 3 and 4 wherein the numeral 76 denotes a central boss portion which is internally threaded to receive the previously-mentioned bolt 62. Extending from this boss are four downwardly sloping ridges 80, 82, 84, and 86, each terminating in a hole receiving one of the bolts 88 which extend into threaded holes in the pump casing.

Mediate ridges 84 and 86, as the manifold is viewed in plan, the body portion of the manifold is rounded at 90. A slot 74 (Figure 5) is formed in this rounded portion to provide for communication between the reservoir and the conduit 52. From Figure 1 it will be seen that the slot is located just beyond the restriction 52.

Ridge 82 of the manifold has a bevelled hole 100 therein to seat a filter element 103 (Figure 3) connected at its other end to the return tube 104 from the system served by the illustrated equipment. Spring 106 encircling the tube 104 bears against the filter and against a flattened portion 108 of the wall of the reservoir, thereby to assure firm seating of the filter.

Returning to Figure 1, it should be readily understood that with valve 44 in its dotted line position, the velocity of the fluid passing from the discharge chamber 34 to the suction chamber 32 is markedly increased in restricted passageway 52. As the fluid passes from the latter passageway to passageway 54, which is of much larger area, a substantial portion of the velocity head of the fluid is transformed into pressure, with resultant supercharging of chamber 32. In this way, the cavitation previously experienced, especially at high pump speeds, is substantially completely eliminated.

I claim:

55 A pump and reservoir assembly in which the reservoir is carried by the pump in superposed relation and has a pair of openings in the bottom thereof and which comprises a member superposed over said openings within the reservoir to provide in conjunction with the bottom of the reservoir a conduit between said openings, one of said openings being larger than the other and communicating with the suction side of said pump, the other of said openings having communication with the discharge side of said pump through a valve-controlled by-pass passage, said conduit including a relatively unrestricted portion overlying said one opening and a relatively restricted portion overlying said other of said openings, said member being apertured so as to open said conduit to said reservoir at a point just beyond said relatively restricted portion and adjacent said unrestricted portion.

(References on following page)

2,858,766

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References Cited in the file of this patent

UNITED STATES PATENTS

94,582	Dunham	Sept. 7, 1869
2,138,369	Briant	Nov. 29, 1938
2,251,664	Davis	Aug. 5, 1941
2,640,429	McLeod	June 2, 1953

2,696,787

2,698,579

2,724,335

2,768,582

507,266

4

Jaworowski Dec. 14, 1954

Hammond Jan. 4, 1955

Eames Nov. 22, 1955

Klessig et al. Oct. 30, 1956

FOREIGN PATENTS

Great Britain June 13, 1939