Aug. 16, 1938. D. J. DESCHAMPS ET AL 2,126,874

VALVE FOR PUMPS

Filed May 7, 1936

Fig. 1

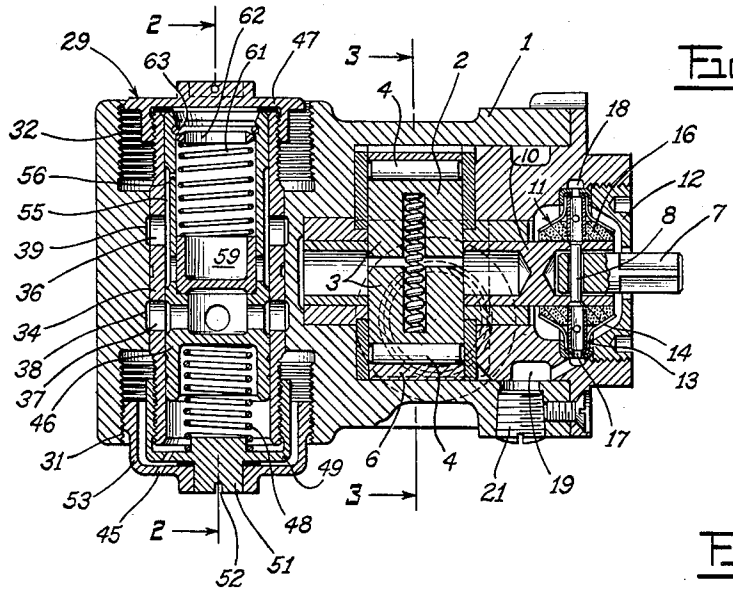


Fig. 4

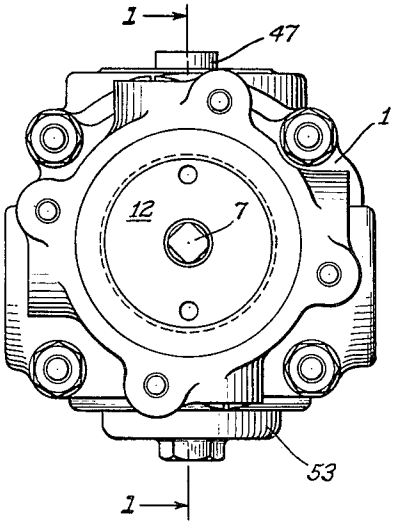


Fig. 2

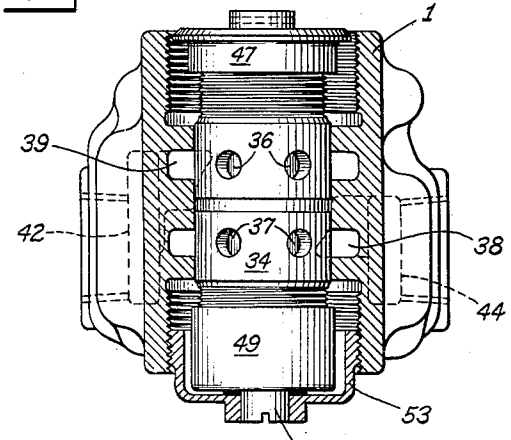
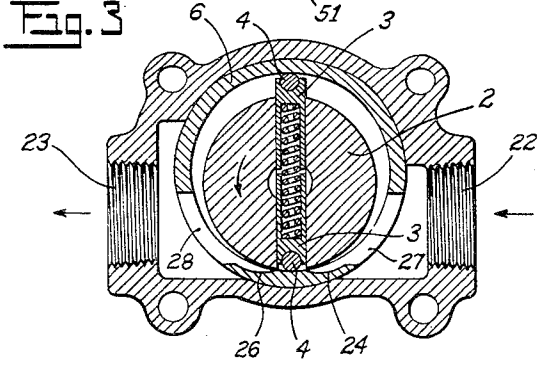


Fig. 3



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VALVE FOR PUMPS

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9 Claims. (Cl. 277—45)

This invention relates to fluid pumps and more particularly to fuel delivery pumps for internal combustion engines.

In internal combustion engines, it is customary and in many cases absolutely necessary that the fuel be supplied to the carburetor or other fuel metering device under a slight pressure, the fuel being pumped from some remote source of supply. The transfer pump is used to maintain a substantially constant pressure at the inlet to the carburetor or other fuel metering device, and to eliminate variations in the head of fuel from the main supply tank.

The transfer pump forming the subject matter of the present invention has been designed to meet a requirement that, within the capacity of the pump, the outlet pressure shall be no less than 6½ pounds per square inch and no greater than 7½ pounds per square inch throughout all variations in inlet pressure between one pound per square inch positive pressure and 6 pounds per square inch negative pressure.

The principal object of the invention is to provide a fluid pump in which the outlet pressure is maintained substantially constant irrespective of wide variations in inlet pressure.

Another object of the invention is to provide a fluid pump in which the delivery side of the pump is connected with the inlet side of the pump whenever the pressure exceeds a predetermined value.

Another object of the invention is to provide a fluid pump in which the delivery pressure is controlled in accordance with the differential between the delivery pressure and the atmospheric pressure, and is not affected by the differential between delivery pressure and inlet pressure.

Another object of the invention is to provide a fluid pump of the vane type in which friction between the vane and the housing is materially reduced by the inclusion of rolling contact members.

Another object of the invention is to provide a fluid pump in which it is possible to force fluids through the pump when the same is stationary.

Other objects and features of the invention will be apparent from the following description when taken in connection with the attached drawing, in which:

Fig. 1 is a sectional view of a fluid pump embodying the invention;

Fig. 2 is a view, partly in section, taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1; and

Fig. 4 is a view of the driving end of the pump.

Referring to the drawing:

The housing is shown at 1, in which is eccentrically mounted rotor 2 having a pair of sliding vanes 3 mounted therein, in the ends of which are mounted rollers 4 adapted to contact with the cylindrical liner 6 of the housing. The rotor is driven in any suitable manner by driving shaft 7 secured to the shaft 10 of the rotor by pin 8. In order to prevent leakage of fuel along the rotor shaft, it is rotatably mounted in a sealing member generally designated at 11 which is removably inserted in the housing and locked therein by plug 12. The sealing member comprises a stamping 13 to which is secured a spring washer 14 having oppositely flared inner portions which engage suitable sealing washers 16 preferably formed of cork or other compressible material. The sealing members 16 are resiliently urged against the stamping 13 and the rotor shaft by means of the spring washer 14 and prevent any leakage of fuel along the shaft. Stamping 13 is preferably formed with a series of apertures 17 which communicate with an annular recess 18 in which fuel may collect and drain into annular passage 19 from which the collected material may be withdrawn by removal of plug 21.

Rotor 2 is adapted to rotate in a counter-clockwise direction, as viewed in Fig. 3, and will transfer fluids from inlet opening 22 to the outlet opening 23. It may be noted from inspection of Fig. 3 that the cylindrical liner 6 is relieved at 24 and 26 immediately adjacent the openings 27 and 28. The relief at 26 is provided to prevent hammering of the pump when it is rotated in the counter-clockwise direction shown in the drawing and the relief provided at 24 is adapted to prevent hammering when the rotational direction of the rotor is reversed, in which event it is obvious the direction of flow through the pump will also be reversed.

In order to insure a substantially constant outlet pressure of the pump, a regulating device generally designated at 29 is provided which has its operative elements in communication with both the inlet and outlet passages of the pump. It will be noted the regulating device may be inserted in either of the threaded openings 31 and 32 of the housing and may be reversed in position when the direction of pump rotation is reversed. In the position shown in Fig. 1, the regulating device is shown as adapted to regulate the outlet pressure for a counter-clockwise direction of rotation, as viewed in Fig. 3. The regulating device comprises a sleeve 34 which is preferably pressed

into the housing, although if desired, it may be secured therein by any other desired means. The sleeve is provided with openings 36 and 37, openings 36 being in communication with the outlet side of the pump by means of groove 39 and cored passage 42. Openings 37 are in communication with the inlet side of the pump by groove 38 and cored passage 44. Within sleeve 34 is slidably mounted a sleeve valve 46 which is urged toward cap 47 by a spring 48, the compressive force of which may be adjusted by screw cap 49 having a stem 51 provided with a screw driver slot 52. A closure member 53 is threaded into the housing 1 for locking the adjusting cap in position and both cap 49 and member 51 are provided with atmospheric openings 45 whereby the lower end of sleeve valve 46 is subjected to atmospheric pressure. The upper end of sleeve valve 46 is in communication with the outlet pressure of the pump by means of recess 55 and opening 56.

Attention is called to the fact that the inlet pressure is applied to the exterior of the valve 46 intermediate the ends thereof and therefore there is no tendency for variations in inlet pressure to move the valve in either direction, whereas the outlet pressure of the pump is applied to the exterior and to the interior of the valve and movement of the valve therefore occurs whenever the outlet pressure overcomes the force of spring 48. Means are provided for forcing fuel from the inlet side of the pump to the outlet side of the pump through the relief valve in the event it should be desired to do so while the rotor is in a stationary position blocking the passageway, as shown in Fig. 3. This is desirable in some cases, and in order to provide for such an operation, a relief valve 59 is slidably mounted within the sleeve valve and is seated therein by means of the spring 61 which is held in place by washer 62 and lock ring 63. During the ordinary operation of the pump, relief valve 59 is subjected to outlet pressure on its upper side and inlet pressure on its under side, which serves to keep the valve on its seat. In the event of pump stoppage, if positive pressure should be applied to the inlet side of the pump by any desired means, the relief valve will be lifted from its seat and allow fluids to by-pass the rotor and be delivered to the outlet side of the pump.

In the operation of the pump, the rotor 2 will transfer fluids from the inlet side to the outlet side in a manner well understood in the art and both the inlet and outlet pressure will be applied to the regulator valve 46 by means of grooves 38 and 39. If the outlet pressure of the pump should increase beyond a predetermined value, the valve 46 will be forced downwardly, as shown in Fig. 1, against the force of spring 48 and bring the lower end of the passage 55 in communication with groove 38 and in which position fluids may pass directly from groove 39 into groove 38 which is in communication with the inlet side of the pump whereby the outlet pressure will be reduced to the predetermined value. It will be noted that as the inlet pressure has no tendency to move the valve in either direction, the inlet pressure may vary within very wide limits without causing any substantial variation in the predetermined outlet pressure of the pump.

While a preferred embodiment of the invention has been illustrated and described, it is understood this showing and description are illustrative only, and that the invention is not regarded as limited to the form shown and described or otherwise, except by the terms of the following claims.

What is claimed is:

1. In a relief valve for a fluid pump, a housing having inlet and outlet conduits, a main piston valve controlling communication between said conduits, means for impressing inlet conduit pressure on the periphery of said piston valve intermediate the ends of said valve whereby said inlet pressure is ineffective to influence the operation of the valve, means for impressing outlet pressure on one end of said valve, said valve having its opposite end exposed to atmospheric pressure, and a check valve in said piston valve exposed to both inlet and outlet conduit pressures adapted to pass fluid through said piston valve toward the outlet pressure side thereof and arranged to open when the inlet pressure exceeds the outlet pressure by a predetermined amount.

2. In a relief valve for a fluid pump, a housing having inlet and outlet conduits, a piston valve interposed between said conduits for controlling flow between the same, said valve having spaced grooves thereon communicating with the inlet and outlet conduits respectively, said piston valve having its opposite ends exposed to outlet pressure and atmospheric pressures respectively and being movable to cause one of said grooves to connect the outlet conduit with the inlet conduit upon an increase of outlet pressure, resilient means opposing movement of said piston by an increase in outlet pressure, a passageway in said piston connecting said inlet pressure groove with the pump outlet pressure end of said piston, and a check valve controlling said passageway arranged to open when the pressure in the inlet conduit exceeds the pressure in the outlet conduit.

3. In a relief valve for a fluid pump, a housing having a discharge conduit and an intake conduit, a piston valve for controlling flow between said conduits, said valve having annular recesses on its outer surface adapted to permit flow between said conduits in one position of the valve and to obstruct the flow in another position thereof, means for subjecting one side of the piston head to discharge conduit pressure, and means for subjecting the opposite side of the piston head to atmospheric pressure.

4. In a relief valve for a fluid pump, a housing having a discharge conduit and an intake conduit, a piston valve for controlling flow between said conduits, said valve having annular recesses on its outer surface adapted to permit flow between said conduits in one position of the valve and to obstruct the flow in another position thereof, means including a restricted orifice for subjecting one side of the piston head to discharge conduit pressure, and means for subjecting the opposite side of the piston head to atmospheric pressure.

5. In a relief valve for a fluid pump, a housing having a discharge conduit and an intake conduit, a piston valve for controlling flow between said conduits, said valve having annular recesses on its outer surface adapted to permit flow between said conduits in one position of the valve and to obstruct the flow in another position thereof, means for subjecting one side of the piston head to discharge conduit pressure, and means for subjecting the opposite side of the piston head to atmospheric pressure, said piston head having a passageway therethrough connecting the discharge pressure side of the head with the inlet conduit, and a check valve in the passageway arranged to open when the pressure in the inlet

conduit exceeds the pressure in the discharge conduit.

6. In a relief valve for a fluid pump, a housing having a discharge conduit and an inlet conduit, a valve piston controlling flow between said conduits, said housing having two spaced annular recessed portions normally closed by a peripheral portion of said piston, one of said portions being connected with the discharge conduit and the other being connected with the inlet conduit, said piston having an annular groove on its periphery normally overlying one of said recesses and being of sufficient width to overlie both of said recesses upon movement of the piston, a second groove on said piston overlying the recess that is connected with the inlet conduit, means for impressing the pressure in the discharge conduit of the pump upon an end portion of the piston, and means for subjecting the other end portion of the piston to atmospheric pressure.

7. In a relief valve for a fluid pump, a housing having a discharge conduit and an inlet conduit, a valve piston controlling flow between said conduits, said housing having two spaced recessed portions normally closed by a peripheral portion of said piston, one of said portions being connected with the discharge conduit and the other being connected with the inlet conduit, said piston having a groove on its periphery normally overlying one of said recesses and being of sufficient width to overlie both of said recesses upon movement of the piston, a second groove on said piston overlying the recess that is connected with the inlet conduit, means for impressing the pressure in the discharge conduit of the pump upon an end portion of the piston, means for subjecting the other end portion of the piston to atmospheric pressure, a passageway through said piston connecting the second mentioned piston groove with the discharge pressure side of said piston, and a check valve in said passageway arranged to open toward the discharge pressure side of said piston.

8. In a relief valve for a fluid pump, a housing having a discharge conduit and an inlet conduit, means for controlling the flow of fluid between said conduits including a valve exposed to inlet fluid in a manner to neutralize the entire effect of inlet pressure to move the valve, said valve being exposed to discharge outlet pressure and atmospheric pressure in a manner to be operable to increase the amount of fluid by-passed when the differential between discharge outlet pressure and atmospheric pressure is increased, and a check valve in said piston exposed to both outlet and inlet conduit pressures permitting flow only from said inlet to said outlet conduit in all operative positions of said controlling valve.

9. In a relief valve for a fluid pump, a housing having inlet and outlet conduits, a hollow cylindrical piston valve controlling communication between said conduits, means for impressing inlet conduit pressure on the periphery of said piston valve intermediate the ends of said valve whereby said inlet pressure is ineffective to influence the operation of the valve, means for impressing outlet pressure over the entire area of one end of the piston valve, said piston valve having the entire area of its opposite end exposed to atmospheric pressure, and a check valve intermediate the ends of said piston valve and exposed to both inlet and outlet conduit pressures, said check valve being adapted to pass fluid through said piston valve toward the outlet pressure side thereof when the inlet pressure exceeds the outlet pressure by a predetermined amount.

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