Oct. 11, 1932. F. W. HECKERT 1,881,554

FLUID PUMP

Filed Jan. 2, 1930 2 Sheets-Sheet 1

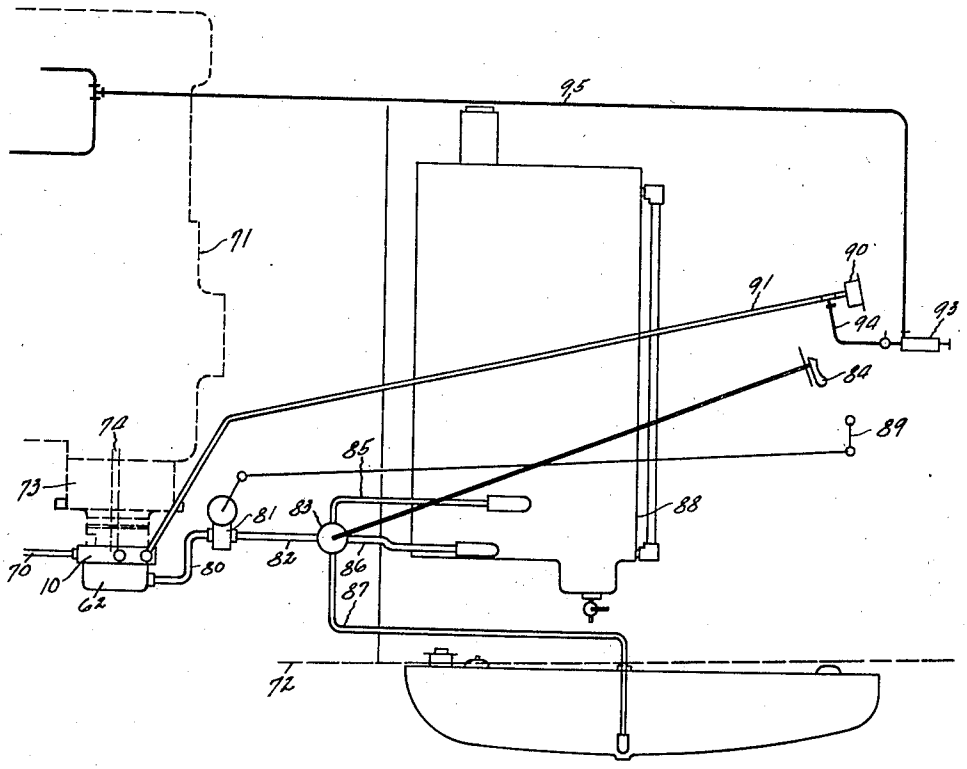
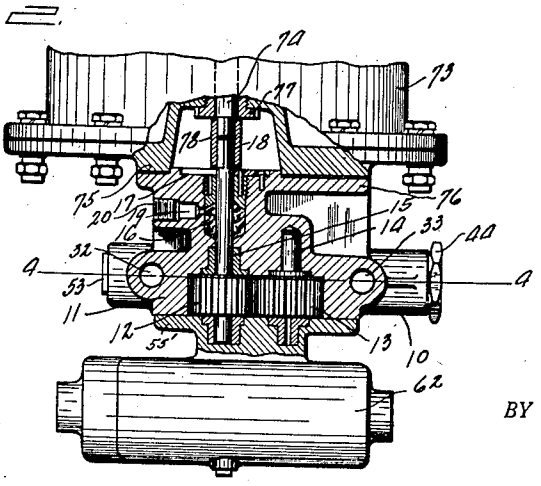


Fig. 1.

Fig. 2.



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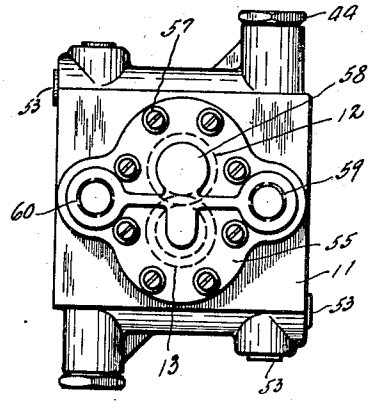


Fig. 3.

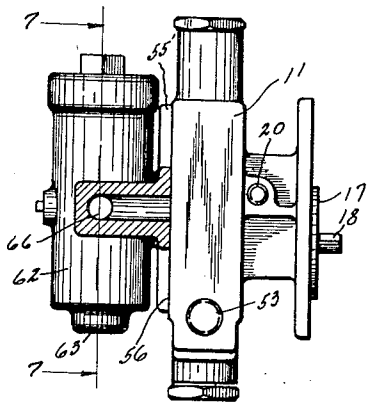


Fig. 5.

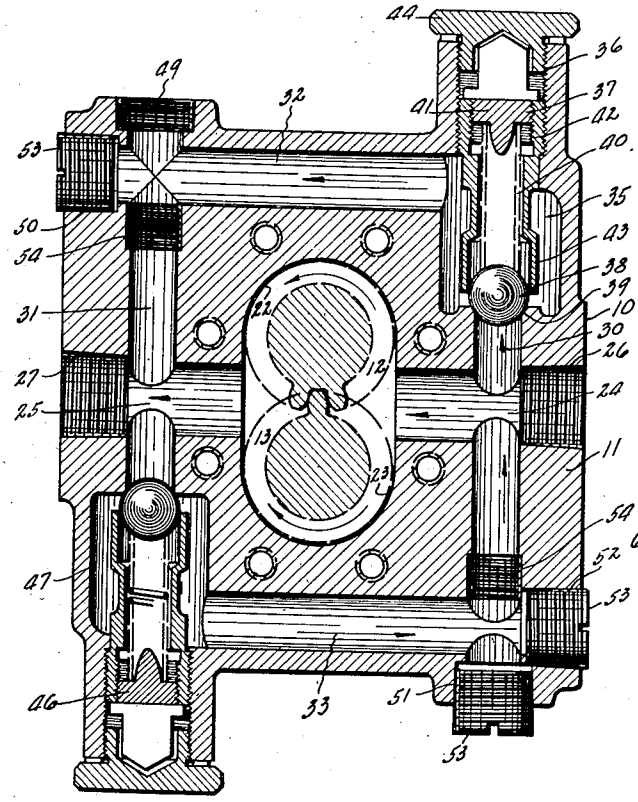


Fig. 4.

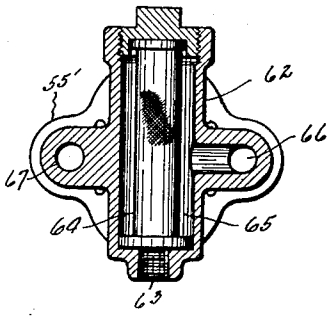


Fig. 7.

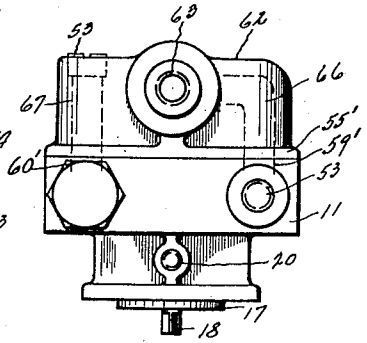


Fig. 6.

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FLUID PUMP

Application filed January 2, 1930. Serial No. 417,982.

This invention relates to fluid pumps and to fuel systems of an internal combustion engine embodying a fuel pump.

One object of the invention is the provision of a fluid-pump incorporating a by-pass and a relief passage in the body of the pump, the pump having an impelling means adapted to be driven in either direction, the two passages being adapted to function one as a relief and the other as a by-pass regardless of the direction in which the impelling means is driven.

Another object of the invention is the provision of a fluid pump which is simple in its construction and which is provided with a number of fluid outlets or openings some of which are closed by removable plugs, so that the fluid system in which the pump is used may be simplified, and connections easily and conveniently made.

A further object of the invention is the provision of a fluid pump of the character mentioned to which a fluid strainer is directly attached in a reversible manner.

A still further object of the invention is the provision of a fuel pump which may be driven from and attached to an oil pump which in turn is driven from the internal combustion engine with which the fluid system is incorporated.

Other objects and advantages of the invention will be apparent from the following description and from the accompanying drawings in which—

Fig. 1 is a schematic view of the fluid system, embodying the present invention;

Fig. 2 is a vertical central section through the oil and fuel pumps showing the latter directly connected to and driven from the former;

Fig. 3 is a plan view of the fluid or fuel pump of the present invention;

Fig. 4 is a central transverse section through the fuel pump on the line 4—4 of Fig. 2;

Fig. 5 is a front elevation of the fuel pump showing the strainer partly in section and attached directly to the fuel pump;

Fig. 6 is a side elevation of the fuel pump; and

Fig. 7 is a sectional view through the strainer on the line 7—7 of Fig. 5.

Referring more particularly to the drawings the pump designated generally 10 is herein shown as adapted to pump fuel or gasoline to an internal combustion engine. The pump comprises an integral body member 11, preferably in the form of a comparatively flat and generally rectangular metal casting. Within the body member is the fluid impelling means, which, as shown, are the two intermeshing pump gears 12 and 13. The gear 13 is mounted on a short shaft 14 journaled in the body member, and gear 12 is rigidly provided on a driving shaft 15 also journaled in the body member and provided with suitable cork or other packing 16. This shaft 15 projects somewhat beyond the cap plate 17, where it is provided with a squared end as indicated at 18, adapted to be connected to and driven from a suitable driving device. The body member of the pump is preferably provided with drain passages 19, normally closed by the plugs 20, the passages extending to the packing 16 so that any fuel which accumulates therein may be drained off from time to time.

The gears 12 and 13 fit snugly in the partly cylindrical recesses 22 and 23 in the body member, and from the construction shown, it will be apparent that the shaft 15 is adapted to rotate in either direction to effectively cause the pumping of the fuel along the passages 24 and 25 which lead to the inlet and outlet sides of the impelling gears. Assuming the gear 13 is driven in the rotation of the arrow shown in Fig. 4, the fluid or fuel will be drawn through the passage 24, which thus serves as an inlet passage, and discharged through the outlet passage 25. The two pas-

sages 24 and 25 are aligned and extend entirely through the body member, the ends of these passages being provided with internal screw threads, or other suitable attaching means 26 and 27 to which fluid conduits may be readily connected. The passages 24 and 25 may be readily drilled directly through the body member of the pump before the gears are in place, and there is no chance of leakage through leaky gaskets due to the fact that the body member of the pump in which the passages are provided is of integral construction.

Extending transversely to the passages 24 and 25 are passages 30 and 31, which communicate with passages 32 and 33 extending at right angles to the two passages 30 and 31 as shown; all of the passages 30, 31, 32 and 33 lying in the same common plane with the passages 24 and 25, this plane extending normal to the axis of rotation of the gears. The body member of the pump is provided with an enlarged chamber 35 between the passage 30 and the passage 32. Adjacent this chamber 35 the body member is internally threaded as indicated at 36 to receive a removable and adjustable ball-check valve 37. This valve is provided with a ball 38 which seats on a surface 39 in the body member of the pump to close the adjacent portion of the passage 30. A spring 40 normally holds the ball on its seat, this spring pressing at its outer end against the plate 41 which is removably threaded in a sleeve 42 which extends down into the chamber 35 and provides a guide 43 for the ball 38. A cap plug 44 is screwed into the end of the threaded portion 36 to prevent leakage, and this cap plug may be readily removed so that the plate 41 and the sleeve 42 can be rotatably adjusted to vary the tension of the spring. It will thus be apparent that the passages 30, 31 and 32 together with the check valve provide a by-pass between the inlet and the outlet sides of the pump so that when the gears are stationary or inoperative, fluid may be forced by an external hand-pump for example, past the ball of the check valve which is lifted from its seat against the tension of the spring by the pressure thus exerted on the fluid, and the fuel can thus be forced through the pump by passing the impelling means for the starting of the engine with which the fuel pump is associated.

The pump is preferably constructed in a symmetrical manner as indicated in Fig. 4, and the passages 30, 31 and 33 are adapted to form a relief passage so that fuel may be returned from the outlet side of the pump to the inlet side, when the pressure exerted by the impelling means on the fluid exceeds some predetermined limit. A spring-pressed check valve 46 similar in its construction and arrangement to the valve 37 is provided in an enlargement 47 of the passage 31, it being understood that the construction and arrangement of the valves 46 and 37 are similar. Due to the similarity of the by-pass and the relief passage of the pump the impelling means may be driven in either direction and one of the passages will be effective as a relief while the other acts as a by-pass. If the gear 13 is rotated clockwise or reversely to the arrow shown in Fig. 4, the passage 25 will be the inlet passage, passage 24 the outlet passage, check valve 46 the by-pass valve, and valve 37 the relief passage valve. If it is desired that the pressure at which fluid should be by-passed around the impelling gear be less than the pressure at which the pump relief is effective, the adjustment of the spring pressure of one or both of the check valves is readily accomplished.

As shown, the passages 30, 31, 32 and 33 extend to the outer surface of the pump body member, and the openings 49, 50, 51 and 52 thus provided are internally threaded in a similar and uniform manner so that they may interchangeably receive removable plugs 53, or may be attached to the threaded ends of fluid conduits or connections which may lead to a pressure gage or to other apparatus. The threaded openings 26 and 27 are similar to the various threaded openings just mentioned and these may if desired be closed by the removable plugs 53 so that one or more of the openings 49, 50, 51 or 52 may serve as the inlet or outlet passages of the pump. Preferably the passages 30 and 31 are threaded as indicated at 54 to receive a small removable closure plug or plugs in case it is undesirable to have direct communication between the inlet and outlet sides of the pump-impelling gears.

The integral pump body member may be provided with a detachable plate 55 which is mounted in place on the flat surface 56 of the pump body by means of the screws 57, and as shown in Fig. 3 the plate 55 forms a cover plate, having suitable portions 58 in which bearing bushings for the gears are provided. This cover plate may have inlet and outlet openings 59 and 60 threaded to receive the removable plugs 53, these openings being at the ends of passages which extend parallel to the axis of rotation of the gears and which intersect the passages 24 and 30 and also the passages 25 and 31; it being understood that the body member itself is provided with passages 59 and 60 which register with the passages 59 and 60 in the plate 55. Preferably however, as shown in Figs. 2, 5 and 6 the cover plate 55′ forms the end plate of a strainer unit 62, which is adapted to strain the fuel or other fluid before or after it passes by the impelling means. The strainer unit 62 is provided with a suitable inlet opening 63 through which the fuel is supplied to the interior of the strainer or screen 64. After passing through the strainer or screen

into the chamber 65 the fuel travels through the passage 66 which is aligned with the passage 59 in the pump body. When the gear 13 is rotated in the direction of the arrow shown in Fig. 4, and the passage 24 is the inlet passage of the pump the fuel will be supplied after it is strained through the passage 66 to the intake side of the gears. The opening 26 will be stopped at this time by one of the plugs 53. Opposite the passage 66 the pump unit is provided with a passage 67 aligned with the passage 60′ in the pump body, but this passage 67 does not directly communicate with the chamber 65 in which the strained fuel is held. The end of passage 67 may be closed by one of the plugs 53 when the opening 27 in the pump body forms the outlet opening of the pump, or the opening 27 may be closed by a plug 53 and the fluid supplied from the pump gears may be taken away through the passage 67, to which a suitable pipe may be connected.

When the direction of rotation of the pump is contrary to the arrow of Fig. 4 and the passage 25 forms the inlet passage to the impelling means, the strainer unit may be reversed in its attachment to the pump body member, as the various attaching holes are symmetrically arranged on opposite sides of the plate 55′, and as the openings 66 and 67 are symmetrically arranged upon opposite sides of the pump unit. With the passage 66 of the pump unit registering with the passage 60′ instead the passage 59′ (passage 60′ now being the pump), the fuel may be strained before it is passed through the pump. It is apparent that the arrangement and construction of the pump and the strainer unit permit the fuel to be strained either before or after it passes through the impelling gears, regardless of the direction in which the gears are driven; and furthermore that the by-pass and relief passages and valves will be effective one as a by-pass through which fluid may be forced without passing through the gears and the other as a relief for the return of fluid from the outlet to the inlet sides of the gears, regardless of the direction of rotation of the pump gears. The pump is therefore adapted to a great many installations, and the various connecting passages and outlets of the pump permit the installation of the fuel system in the most convenient manner and permits the use of short and direct fuel pipes. While the embodiment of the invention shown embraces two intermeshing gear members it is to be understood that the unique valve and passage arrangement is not to be limited to this precise fluid impelling means.

Fig. 1 shows an arrangement of a fuel system of an internal combustion engine of an airplane, embodying the pump 10 which is adapted to supply fuel through a conduit 70 to the carburetors of the engine 71 of the airplane 72. The fuel pump is preferably mounted directly below the oil pump 73 which is provided with the engine driven pump shaft 74 as shown in Fig. 2. The oil pump 73 through which oil is supplied to the circulating system of the engine, has a lower end wall 75 against which the flanged attaching surface 76 of the fuel pump fits, the central portions of the end wall being depressed upwardly so that the end of the shaft 74 of the oil pump projects past the packing nut 77, and may be connected as by means of the attachment coupling 78 to the squared end 18 of the shaft 15 of the fuel pump. The fuel pump is thus located at a very low point in the fuel system, being below the bottom of the engine, and the drive of the fuel pump being taken directly from the oil pump impeller shaft permits a very simple installation.

Fuel is supplied to the strainer unit 62 through a conduit 80 coming from the hand-pump 81. This hand-pump is connected through a conduit 82 to a three-way valve 83 controllable at 84 from the cockpit or the instrument board of the airplane. The control device 84 is adapted to bring the conduit 82 into communication with any one of the three pipes 85, 86 or 87 which lead respectively to the normal main tank connection, the reserve fuel connection and the auxiliary tank connection. Fuel is thus drawn through either of the pipes 85 or 86 from the fuel tank 88 to the conduit 82, and when the hand-pump is operated manually by a suitable device 89 available to the operator, fuel is forced through the pipe 80 past the by-pass check of the pump and through the conduit 70 to the carburetors, the pump 10 being inoperative at this time. After the engine starts the fuel will of course be drawn through the conduit 80 or through an auxiliary fuel-pump connection to the pipe 82 and delivered to the carburetors under pressure, the relief passage and valve of the fuel pump being operative to return excess fuel back to the intake side of the pump. A fuel-pressure gage 90 is connected by the conduit 91 direct to one of the openings 49, 50, 51 or 52 which is in communication with the outlet side of the pump, so that the fuel pressure supplied to the carburetors will be indicated on the gage. The hand-priming pump 93 may be connected by the conduit 94 to the conduit 91 of the pressure gage, and the outlet side of this priming pump leads to a conduit 95 which goes to the engine and which supplies a small quantity of fuel directly to the engine cylinders to aid in the starting of the engine. It will be apparent that the fuel system described is very simple and utilizes a minimum amount of fuel pipes and thus the danger of breaking or failure of the supply lines is greatly minimized. The number of couplings needed is exceed-

ingly small and as the weight of several couplings is considerable it will be understood that the fuel system of the present invention is of exceedingly light weight and of great simplicity.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A fluid pump comprising a body member having inlet and outlet openings, rotatable impelling means therein adapted to be driven in either direction and in direct and substantially unobstructed communication with said inlet opening, said body member having valved passages therein between the inlet and outlet sides of the impelling means functioning as by-pass and relief passages around the impelling means regardless of the direction of rotation of the impelling means.

2. A fluid pump comprising a body member having inlet and outlet openings, rotatable impelling means therein adapted to be rotated in either direction and in direct and substantially unobstructed communication with said inlet opening, said body member having a plurality of passages between the inlet and outlet sides of the impelling means, a check valve in one of said passages providing for passage of fluid only from the inlet to the outlet side of the impelling means, and a check valve in the other of said passages providing for passage of fluid only from the outlet to the inlet side of the impelling means, the check valves being similar in construction so that one passage operates as a by-pass and the other as a relief passage regardless of the direction of rotation of the impelling means.

3. In a fluid pump, a body member having inlet and outlet passages, impelling means in the body member between the inlet and outlet passages, a strainer unit adapted to be removably fastened to the body member and having inlet and outlet passages, the strainer unit having provisions for its attachment to the said body member in a plurality of different positions so that the outlet passage of the strainer unit registers with either the inlet or the outlet passage of the said body member.

4. In a fluid pump, a body member having inlet and outlet passages, impelling means in the body member between the inlet and outlet passages, a strainer unit adapted to be removably fastened to the body member and having inlet and outlet passages, the strainer unit having provisions for its attachment to the said body member in a plurality of different positions so that the outlet passage of the strainer unit registers with either the inlet or the outlet passage of the said body member, and means for driving the impelling means in either direction.

5. In a fluid pump, an integral body member having inlet and outlet passages, impelling means in the body member between the inlet and outlet passages, a strainer unit adapted to be removably fastened to the body member and having inlet and outlet passages, the strainer unit having provisions for its attachment to the said body member in a plurality of different positions so that the outlet passage of the strainer unit registers with either the inlet or outlet passage of said body member, said body member having a plurality of passages between the inlet and the outlet sides of the impelling means, one adapted to operate as a by-pass and one as a relief passage regardless of the direction in which the impelling means is driven, some of said passages extending to the outside of this body member, and removable plugs closing ends of said extended passages.

6. A fluid pump comprising a body member having inlet and outlet openings therein, rotatable impelling means in said body member in free and unobstructed communication with said inlet and outlet openings, said body member having valve passages between the inlet and outlet sides of the impelling means functioning as by-pass and relief passages around the impelling means, the body member and the passages being symmetrically constructed on opposite sides of the impelling means.

7. A fluid pump comprising a body member having inlet and outlet openings, rotatable impelling means in said body member adapted to be driven in opposite directions and in free communication with said inlet and outlet openings, said body member having valved passages between the inlet and outlet sides of the impelling means functioning as by-pass and relief passages around the impelling means, the body member and the passages being symmetrically constructed on opposite sides of the impelling means, a valve in each of said valved passages, springs controlling the operation of said valves, and means for adjusting the tension of said springs.

8. A fluid pump comprising a body member having inlet and outlet passages, reversible impelling means therein for causing a fluid flow in either direction, said body member having a plurality of passages between the inlet and outlet sides of the impelling means, a ball check valve in one of said passages providing for passage of fluid only from the inlet to the outlet side of the impelling means, a compression spring engaging said ball to control its operation, means for adjusting the compression of said spring, a ball check valve in the other of said passages providing

for passage of fluid only from the outlet to the inlet side of the impelling means, a compression spring engaging the last named ball to control its operation, and means for adjusting the compression of said last named spring, said check valves and passages providing a by-pass and a relief passage around the impelling means regardless of the direction of flow through the pump.

In testimony whereof I hereto affix my signature.

FREDERICK W. HECKERT.