Aug. 26, 1941. H. C. EDWARDS 2,254,174

FUEL PUMP

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Fig. 1.

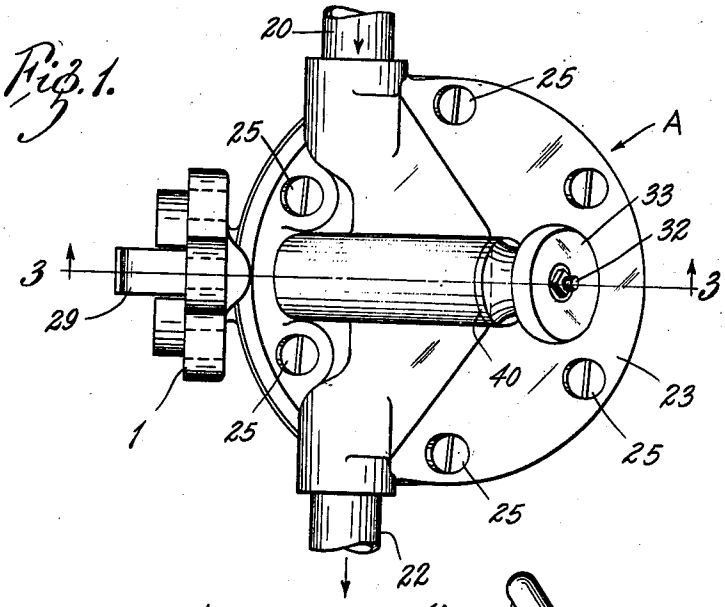
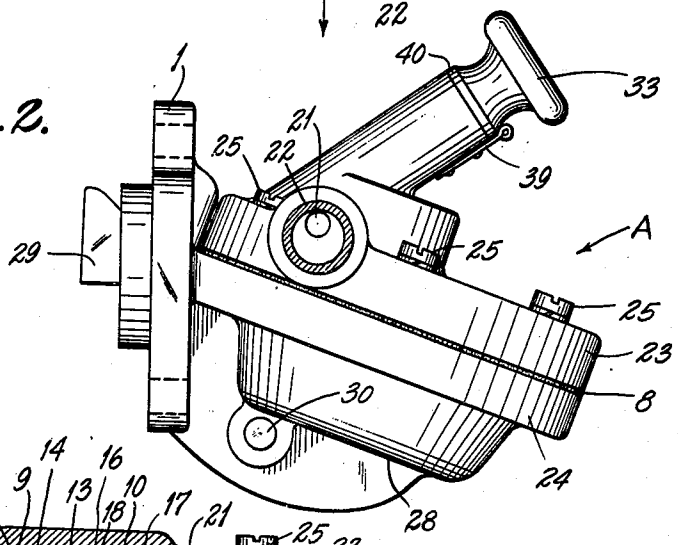


Fig. 2.



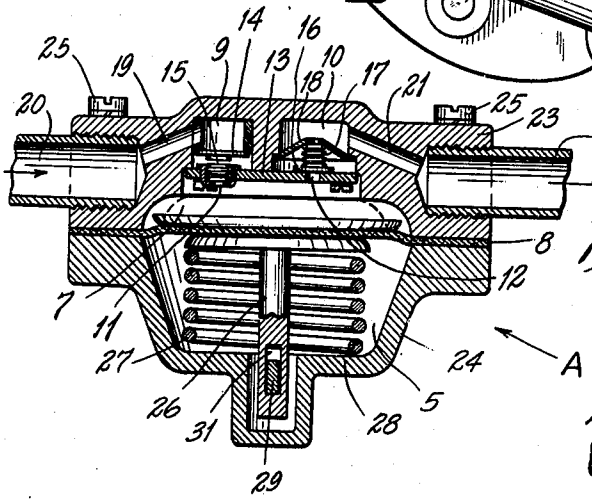


Fig. 4.

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Fig. 3.

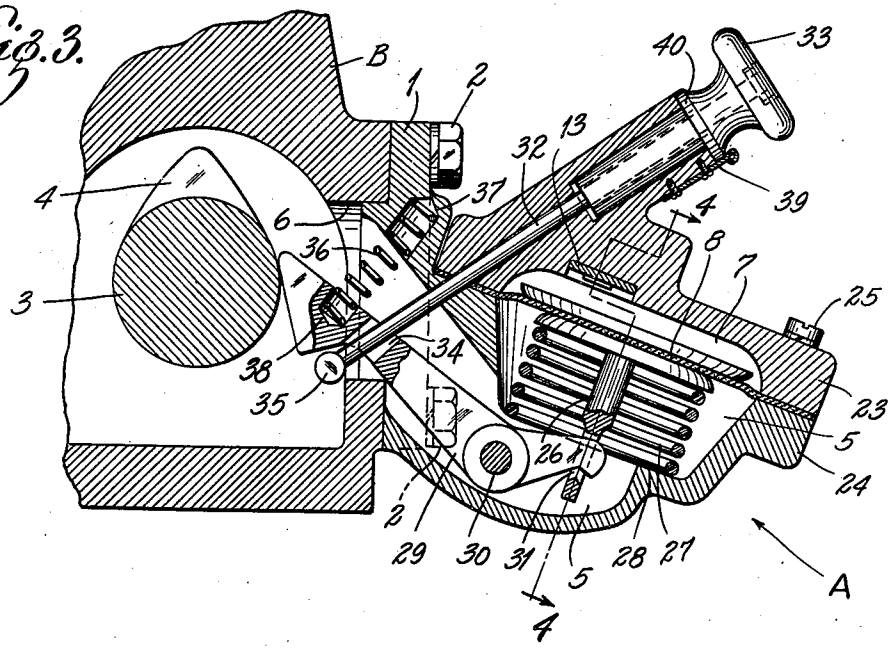
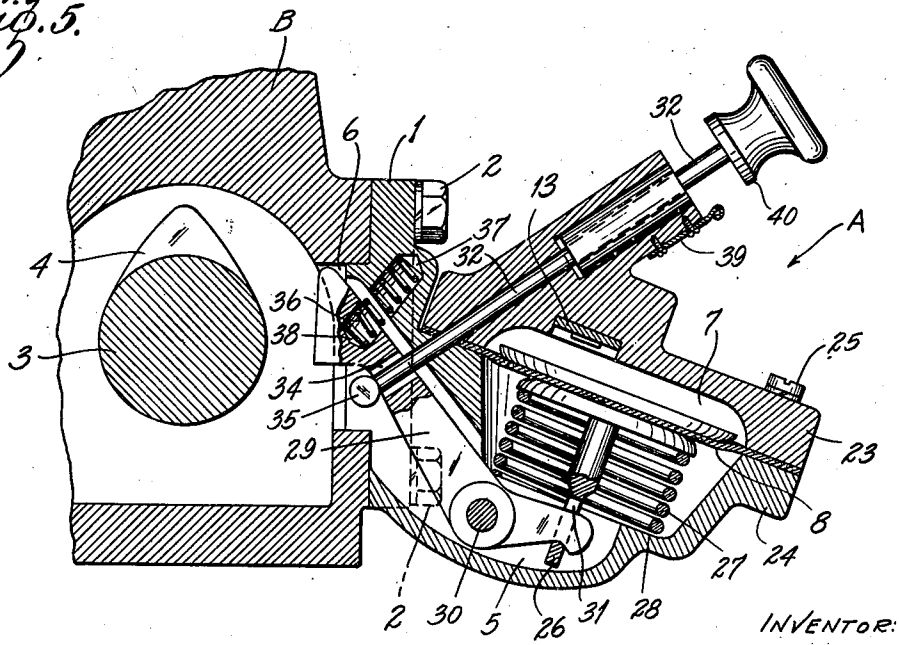


Fig. 5.



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2,254,174

FUEL PUMP

Herbert C. Edwards, Massillon, Ohio, assignor to The Timken Roller Bearing Company, Canton, Ohio, a corporation of Ohio

Application June 13, 1938, Serial No. 213,323

5 Claims. (Cl. 103—207)

This invention relates to pumps, particularly to diaphragm pumps of the kind operated by or in unison with the internal combustion engine for supplying fluid fuel to a charge forming device thereof. The principal object of the invention is to provide manually operable means for priming and flushing the pump that is simple and easy to operate, readily accessible and of simple and economical construction. The invention consists in the pump and in the construction, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a plan view of a pump embodying my invention,

Fig. 2 is a side view of said pump,

Fig. 3 is a central section on the line 3—3 of Fig. 1, showing the pump mounted on a housing containing a cam for actuating said pump and the manually operable priming means in inoperative position,

Fig. 4 is a section on the line 4—4 of Fig. 3; and

Fig. 5 is a section similar to Fig. 3, showing the manually operable priming means in operable position.

The pump shown in the accompanying drawings comprises a sectional casing A having a vertically disposed attaching plate or flange 1 that is removably secured by cap screws 2 to the vertical face of the housing B of the fuel injection pump for a Diesel engine, said housing containing a power driven shaft 3 having a cam 4 thereon for operating a pump mechanism enclosed within said casing. Said casing has two chambers formed therein, a lower chamber 5, which contains the pump actuating mechanism and opens into the housing B through an opening 6 formed therein opposite the cam shaft 3, and an expansible upper chamber 7 with a contained impeller in the form of a deformable wall 8 of flexible material, whereby the volumetric content of said expansible chamber may be successively increased and diminished by movement of said deformable wall or diaphragm.

Located in the pump casing A, above the pump chamber 7 are inlet and outlet valve chambers 9 and 10 that communicate with said pump housing through ports 11 and 12 extending through a partition 13 which separates said valve chambers from said pump chamber. The inlet valve chamber 9 is provided with an inwardly opening valve 14 which is yieldably held against its seat by means of a spring 15 interposed between said valve and the partition 13; and the outlet valve chamber 10 is provided with a valve 16 which covers the outlet port 12 in said partition and is yieldably held in closed position by means of a spring 17 interposed between the outlet valve and a suitable cage 18 having an opening therein for the passage of fuel. A suction or inlet passageway 19 leads inwardly from one side of the casing A to the inlet valve chamber 9 and is connected at its outer end to a suitable supply pipe 20. Leading outwardly from the outlet valve chamber 10 through the other side of the casing A is an outlet passageway 21 that is connected at its outer end with a suitable outlet or discharge pipe 22.

For convenience in manufacture, the casing A is made in upper and lower sections 23 and 24, respectively, that are secured together with the marginal portion of the diaphragm 8 clamped therebetween by means of cap screws 25, the upper section containing the inlet and outlet passageways and valve chambers and the lower section containing the mechanism for operating the diaphragm. Said mechanism comprises a stem 26 projecting downwardly from the diaphragm 8 axially thereof, a coil compression spring 27 surrounding said stem between the underside of said diaphragm and an annular seat 28 provided therefor in the lower chamber 5, and a rock lever 29 pivoted, as at 30, in said chamber with its inner arm loosely engaging an elongated slot 31 provided therefor in the lower portion of said stem and with its outer arm extending into the housing B through the opening 6 thereof and bearing against the cam 4 therein. By this arrangement, when the rise of the cam cooperates with the outer arm of the oscillatory lever 29, the inner arm thereof pulls the diaphragm 8 downwardly, thereby causing fluid to be drawn into the pump chamber 7 through the inlet valve 14, and when the rise of said cam moves out of contact with said lever, the inner arm thereof swings upwardly, thus permitting the compressed spring 27 to expand and force said diaphragm upwardly and force the fluid out of said pump chamber through the discharge valve 16. The elongated slot 31 in the stem 26 of the diaphragm 8 permits continued operation of the lever 29 by the cam 4 when the pressure in the pump chamber 7 is sufficient to prevent expansion of the diaphragm actuating spring 27.

Manually operable means is provided for actuating the lever 29 when it is desired to prime or flush the pump. Said means comprises a rod 32

mounted for reciprocating movement in the upper or cover section 23 of the pump casing A. This rod has one end located exteriorly of the casing and provided with an operating knob 33 and has its other end disposed in the chamber 5 in the lower section 24 of the casing A and extending through an elongated slot 34 in the long arm of the lever 29 and terminating beneath said arm in a head 35 adapted to abut thereagainst. A coil spring 36 has one end seated in a recess 37 in said casing and its other end seated in a recess 38 provided therefor in the long arm of said lever, said spring tending to urge said arm in the direction of the cam 4 and the headed end 35 of the manually operable rod 32. The reciprocable rod 32 is releasably held in its innermost position by means of a leaf spring 39 which is secured to the casing A and has a free end adapted to snap over a peripheral rib 40 on the operating knob 33.

By the arrangement described, the pump may be manually operated by reciprocating the rod 32, the outward movement of the rod causing the headed inner end 35 thereof to bear against the long arm lever 29 and thus cause the short arm thereof to pull the diaphragm 8 downwardly, while the spring 27 serves to force the diaphragm upwardly and operate the lever to draw the rod inwardly. In the event that the pressure in the pump chamber 7 is sufficient to prevent expansion of the diaphragm operating spring 27, the lever 29 is actuated by the smaller spring 36 to draw the rod inwardly, the elongated lever receiving slot 31 in the stem 26 of the diaphragm permitting such movement of the lever. The manually operable rod 32 is preferably disposed at a diverging angle to the vertical face of the housing B, thereby making the rod readily accessible for easy operation. In the inoperative position of said rod, the headed inner end 35 thereof is located in the housing B where it is entirely clear of the lever 29 during the mechanical operation thereof. In such position of the rod any oil that accumulates thereon during the mechanical operation of the pump will drain off the headed inner end of said rod into the cam chamber of the housing B.

While I have shown and described my pump in connection with a fuel injection pump, it is obviously applicable to other devices.

What I claim is:

1. In a pump, a casing having a chamber, a diaphragm forming a deformable wall of said chamber, and having a stem with a transverse opening, a coil compression spring surrounding said stem between said diaphragm and a seat provided therefor in said casing for moving said diaphragm in one direction, mechanically operated means for moving said diaphragm in the other direction comprising a lever mounted in said casing for oscillatory movement on an axis disposed transversely of said stem with one arm loosely engaging the opening therein, a rotary cam engaging the other arm of said lever for swinging the same in a direction that will move said diaphragm against the pressure of said spring, a member reciprocable in said casing transversely of said lever axis with its outer end located exteriorly thereof for manual operation, the inner end portion of said member extending loosely through an opening provided therefor in said other arm of said lever and terminating in a head larger than said opening, and a spring mounted in said casing for urging said other arm in the direction of the head at the inner end of said member.

2. In a pump, a casing having a pump chamber, a diaphragm forming a deformable wall of said chamber and having a stem with a transverse opening, a coil compression spring surrounding said stem between said diaphragm and a seat provided therefor in said casing for moving said diaphragm in one direction, a lever mounted in said casing for oscillatory movement on an axis disposed transversely of said stem with one arm disposed in the transverse opening therein, a rotary operated cam engaging the other arm of said lever for swinging the same in a direction that will move said diaphragm in the other direction, and a member reciprocable in said casing transversely of said lever axis with the outer end located exteriorly thereof for manual operation, the inner end portion of said member extending loosely through an opening provided therefor in said other arm of said lever and terminating in a head larger than said opening, said openings in said stem and said other arm of said lever being elongated to permit said lever to oscillate when said spring is compressed and said member is in its innermost position, and a spring mounted in said casing and bearing against said other arm of said lever for urging the same in the direction of the head at the inner end of said member.

3. In a pump, a casing having a chamber and a contained impeller, a spring for moving said impeller in one direction, a lever pivoted in said casing with one arm operatively connected to said impeller for moving the latter in the other direction, a cam in operative relation to the other arm of said lever for swinging the same in a direction that will move said impeller in said other direction and independently manually operable means engageable with said other arm of said lever for swinging the same in the same direction as said cam swings it.

4. In a pump, a casing having a chamber and a contained impeller, a spring for moving said impeller in one direction, a lever pivoted in said casing with one arm operatively connected to said impeller for moving the same in the other direction, and independently operable mechanically and manually operable means both engageable with the other arm of said lever for swinging the same in a direction that will move said impeller in said other direction, said mechanically operable means comprising a rotary cam engaging said other arm of said lever, and said manually operable means comprising a member reciprocable in said casing transversely of the axis of said lever with its outer end portion located exteriorly of said casing and with its inner end portion extending loosely through an opening provided therefor in said other arm of said lever and terminating in an enlargement adapted to bear against the cam opposing face of said other arm of said lever.

5. In a pump, a casing having a chamber and a contained impeller, a spring for moving said impeller in one direction, a lever pivoted in said casing with one arm operatively connected to said impeller for moving the same in the other direction, independently operable mechanically and manually operable means engageable with the other arm of said lever for swinging the same in a direction that will move said impeller in said other direction, said mechanically operable means comprising a rotary cam engaging said other arm of said lever, and said manually operable means comprising a member reciprocable in said casing

transversely of the axis of said lever with its outer end portion located exteriorly of said casing and with its inner end portion extending loosely through an opening provided therefor in said other arm of said lever and terminating in a head larger than said opening adapted to swing said lever in said direction when said member is pulled outwardly in said opening, and a spring mounted in said casing for urging said other arm in the direction of said head of said member and in the direction of said cam.

HERBERT C. EDWARDS.