July 10, 1934. W. H. MUZZY 1,965,666

ENGINE OPERATED FUEL PUMP

Filed Jan. 16, 1930

Fig. 1.

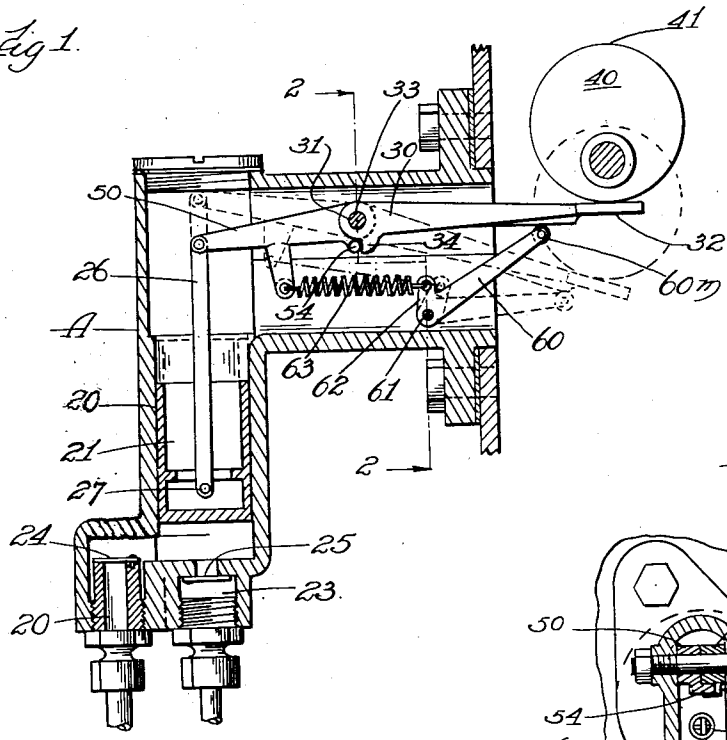


Fig. 2.

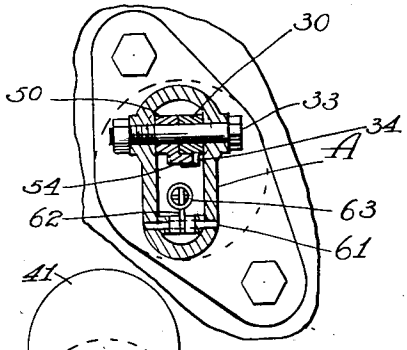


Fig. 3.

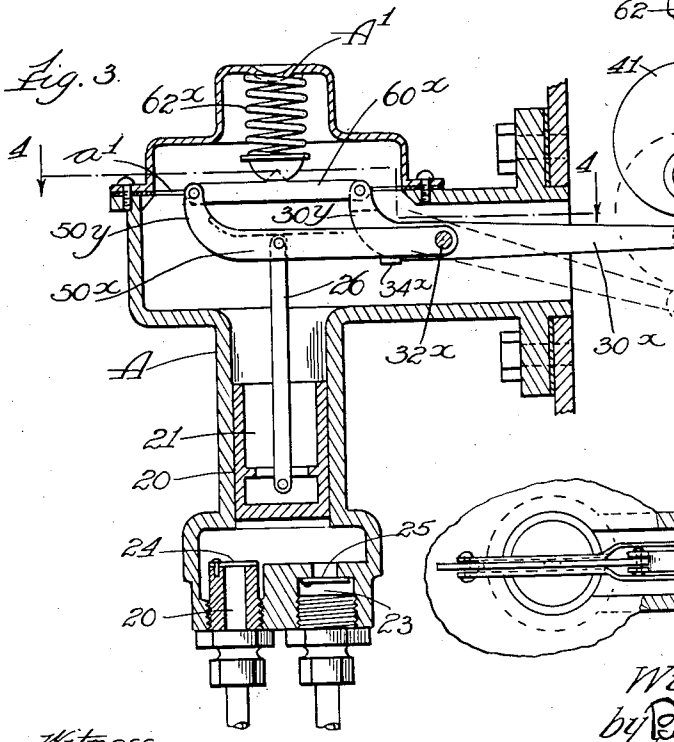
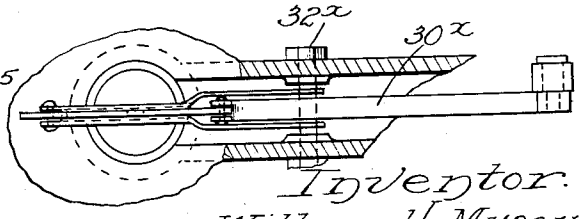


Fig. 4.



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Patented July 10, 1934

1,965,666

UNITED STATES PATENT OFFICE

1,965,666

ENGINE OPERATED FUEL PUMP

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Application January 16, 1930, Serial No. 421,266

6 Claims. (Cl. 103—215)

The purpose of this invention is to provide an improved construction of an apparatus for supplying fuel to an internal combustion engine, said apparatus being of the nature of an engine-operated pump for lifting the fuel from a lower source and advancing it to the engine. It consists in the elements and features of construction shown and described as indicated in the claims.

In the drawing:

Figure 1 is a vertical section of the pumping apparatus embodying this invention.

Figure 2 is a detail section at the line 2—2 on Figure 1.

Figure 3 is a view similar to Figure 1 showing a modified form of the invention.

Figure 4 is a section at the line 4—4 on Figure 3.

The problem to whose solution this invention is particularly directed is,—in a fuel pump for supplying an internal combustion engine varyingly according to engine requirement, and for such variable supply having the pumping member spring-pressed for its feeding movement and actuated for its fuel intake movement by operating connection which is positively actuated in one direction in the active phase of an engine cam having an active and an idle phase in its cycle,—to avoid a second spring to cause the cam-actuated part to follow the cam in the idle phase of the latter, and at the same time to ensure the complete following through the full range of the positive actuation by the cam in every instance, notwithstanding the variation from zero to maximum stroke in the feeding movement which the spring in different instances gives the pumping member.

The solution of this problem, it may be seen upon consideration, involves an arrangement of parts by which the single spring, which for giving the feeding stroke must react ultimately on a fixed part of the structure,—which may be referred to as the pump body,—and on the pumping member, shall react also on the cam-actuated part in the direction for causing that part to follow the cam independently of its reaction on the pumping member; so that the limitation of the feeding movement which the pumping member will take from the spring, varying according to the engine requirement, shall not operate to limit the reaction on the cam-actuated part, which must under all variations of engine requirement make the same movement to follow the cam in its idle phase.

The preferred solution of this problem is presented in the construction shown in Figure 1, which will now be described in detail.

The pump is shown as of the cylinder-and-piston type comprising a body, A, having as the pumping chamber the piston cylinder 20, the pumping member being the piston 21, the pump body containing fuel inflow and delivery passages 22 and 23, suitably controlled for one-way flow through the pump chamber from the fuel source to the engine by intake and discharge valves 24 and 25, seating against reverse flow.

A lever, 30, fulcrumed in the pump body at 31, extends from the pump body for reaching an engine cam 40 whose operating abutment 41 acts on the terminal 32 of the lever 30 for one-way actuation of the lever in the rotation of the cam. A second lever 50 has its fulcrum co-axial with that of the lever 30 and as shown, both levers are fulcrumed side by side on the same fulcrum bolt 33, mounted fixedly in the pump body. This second lever, 50, is operatively connected with the pumping member,—the piston 21,—by pivotal connection to the piston stem 26, which is preferably,—but in view of the short stroke of the piston, not necessarily,—also pivotally attached to the piston, as seen at 27. The two levers, 30 and 50, are furnished with co-operating abutments 34 and 54, respectively, relatively located on the levers for co-operating encounter and engagement to cause the two levers upon their encounter to move as a unit in the movement of the first lever 30 about the fulcrum in the direction of the positive actuation of said first lever by the cam 40 in the active phase of the cam cycle; so that so much of the movement of the first lever under the actuation of the cam as continues after the encounter of the lever abutments, is communicated positively to the pumping member.

At a convenient position in the pump body lateral with respect to the levers 30 and 50, there is fulcrumed, as seen at 61, a third lever 60—62, which for convenience of obtaining the movement of the lever arms in proper directions, as hereinafter described, is in the form of a bell-crank lever having its longer arm, 60, extending obliquely toward the lever 30 and bearing thereagainst at a substantial distance from the fulcrum of said lever, 30, as seen at 60^m. This bell crank lever has a shorter arm 62; and a spring 63 is stretched between said lever arm 62, and an arm 52 of the lever 50, said spring thus reacting for stressing the lever arm 60 against the lever 30 in the direction for holding said lever 30 against the cam 40, and thus caus-

ing said lever to follow the cam in the idle phase of the latter. And the same reaction of the spring 63 at the end attached to the arm 52 operates concurrently with said reaction on the lever 30 for stressing the lever 50 against the piston stem and thereby stressing the piston in the direction of its feeding stroke.

Another form of the invention is shown in Figure 3. In this form, the lever 30^x, corresponding to the lever 30 of the previous form, is fulcrumed on the bolt 32^x, on which there is also fulcrumed a lever 50^x, which is connected, as seen at 53, to the piston stem 26. The levers 30^x and 50^x have lugs 30^y and 50^y respectively, projecting laterally from said respective levers at the opposite sides thereof from the piston; and a lever link 60^x is pivotally connected at its opposite ends to said lugs 30^y and 50^y; and the lever 30^x has a lug 34^x, corresponding to the lug 34 of the previous form, for engaging the lever 50^x.

A spring 62^x is arranged to react at one end on the pump body,—in the cup A^1, which closes an aperture a^1, through which the parts may be introduced and handled for connecting them as described,—and at the other end on the lever link 60^x, midway between the pivotal connections of that link to the levers 30^x and 50^x respectively.

Upon consideration it will be understood that this construction operates in the same manner as that shown in Figure 1 for the purpose of accomplishing by one spring, 62^x, the two functions, viz, (*a*) causing the piston-operated lever to follow the cam in the idle phase of the cam, and (*b*) giving the piston varying feeding stroke according to the variation of engine requirement.

I claim:

1. In an apparatus for supplying fuel to an internal combustion engine, in combination with a pumping chamber having fuel supply and delivery connections, a pumping member reciprocably co-operating with said chamber for fuel intake and delivery; two levers both fulcrumed on the pump body, the first operatively connected with the pumping member for giving it positively its intake movement, the second arranged for positive actuation in one direction only about its fulcrum in the active phase of a cam having an idle phase, said levers having respectively abutments arranged to come into encounter with each other and cause the two levers to operate as a unit in said positive movement of the second lever; one and the same spring means reacting at a fixed point on the pump body and also on each of said levers tending to rock the levers relatively to each other in the direction for separating their co-operating abutments and causing the first lever to give the pumping member its fuel delivery movement and causing the second lever to follow the cam in its idle phase.

2. In the construction defined in claim 1, a third lever fulcrumed on the pump body, the spring means serving as a connection from one of the first two levers to an arm of said third lever, and the other arm of said third lever being operatively connected with the other of said first two levers; whereby the fulcrum of the third lever becomes a point of reaction of the spring on the pump body.

3. In the construction defined in claim 1, a bell crank lever in addition to the two levers mentioned, fulcrumed on the pump body, the spring means being arranged reacting between one of the two first mentioned levers and one arm of the bell crank lever, the other arm of the bell crank lever being extended in engagement with the other of said first mentioned levers for communicating to the latter the stress of the spring in the direction opposite to that in which it is actuated positively by the engine cam.

4. In the construction defined in claim 1, the two levers having their fulcrums co-axial.

5. An apparatus for supplying fuel to an internal combustion engine comprising in combination with a pump structure containing a pumping chamber and having fuel supply and delivery connections, a pumping member co-operating with said chamber for fuel intake and delivery, operating connections to the pumping member arranged to be actuated positively in one direction by an engine cam for giving the pumping member its fuel intake stroke, said connections comprising two parts mounted movably with respect to each other and with respect to the pump structure, the first of said parts positively connected with the pumping member and the second exposed to the engine cam for actuation thereby in one direction only; means by which said two movable parts act as a unit when giving the pumping member its intake stroke, a spring connected at one end for reaction of said first part in the direction for causing said part to give the pumping member its feeding stroke, and means to which the spring is connected at the other end for transmitting the reaction of the spring to the fixed pump structure, said means being operatively associated with the second part for causing the latter to follow the cam in its idle phase.

6. In the construction defined in claim 5, a lever fulcrumed on the pump structure having an arm operatively associated with the cam-actuated movable part, said lever being connected by the spring to the pumping member actuating part; whereby the spring reacts on the fixed pump structure at the fulcrum of said lever.

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