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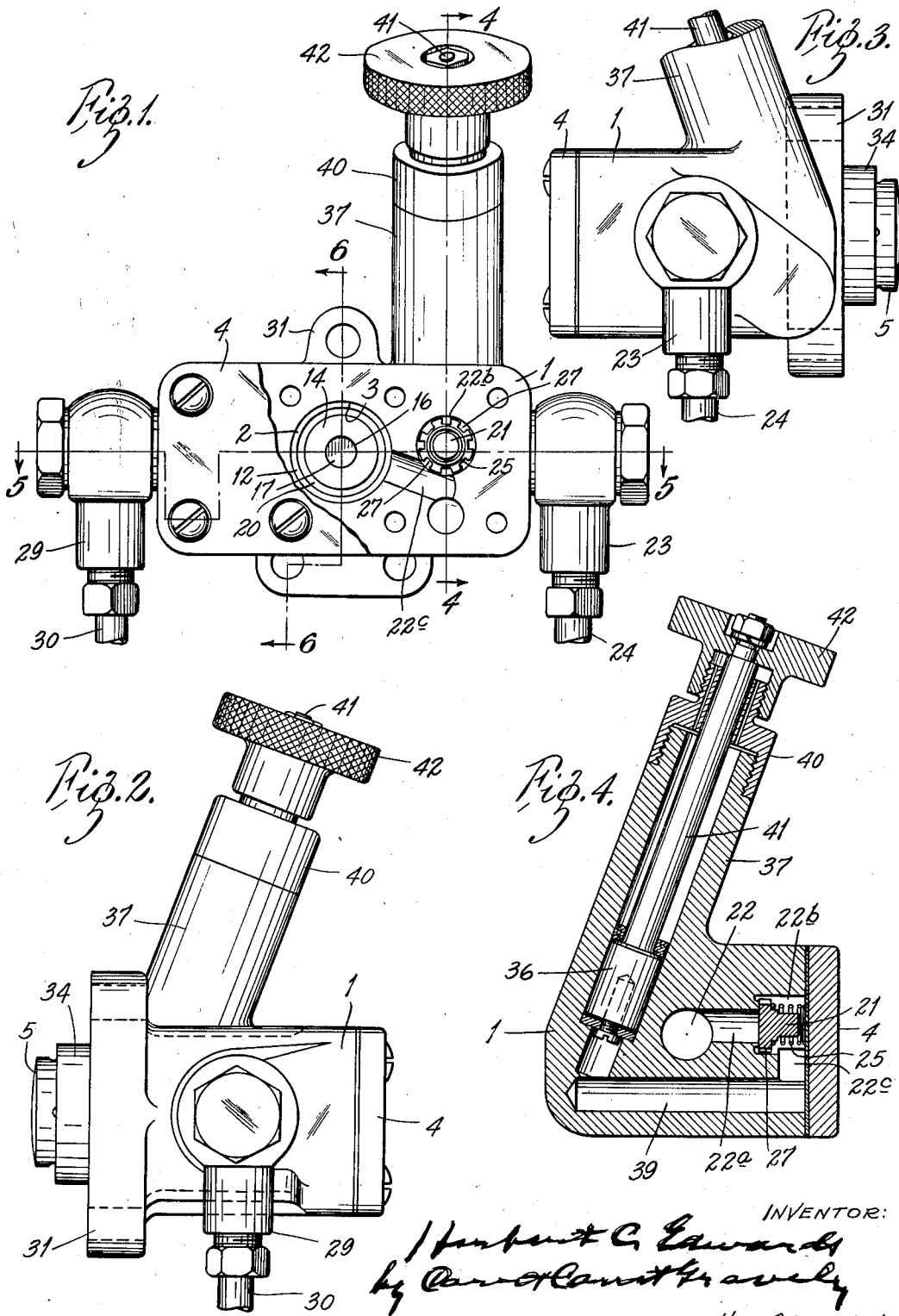
H. C. EDWARDS

2,185,145

FUEL PUMP

Filed June 3, 1937

2 Sheets-Sheet 1



INVENTOR:  
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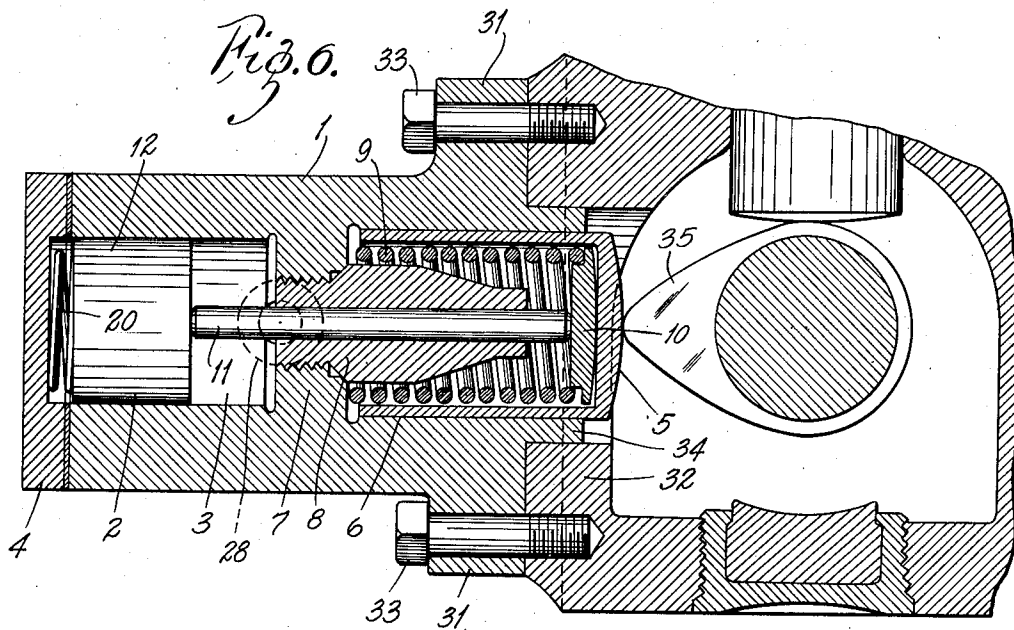
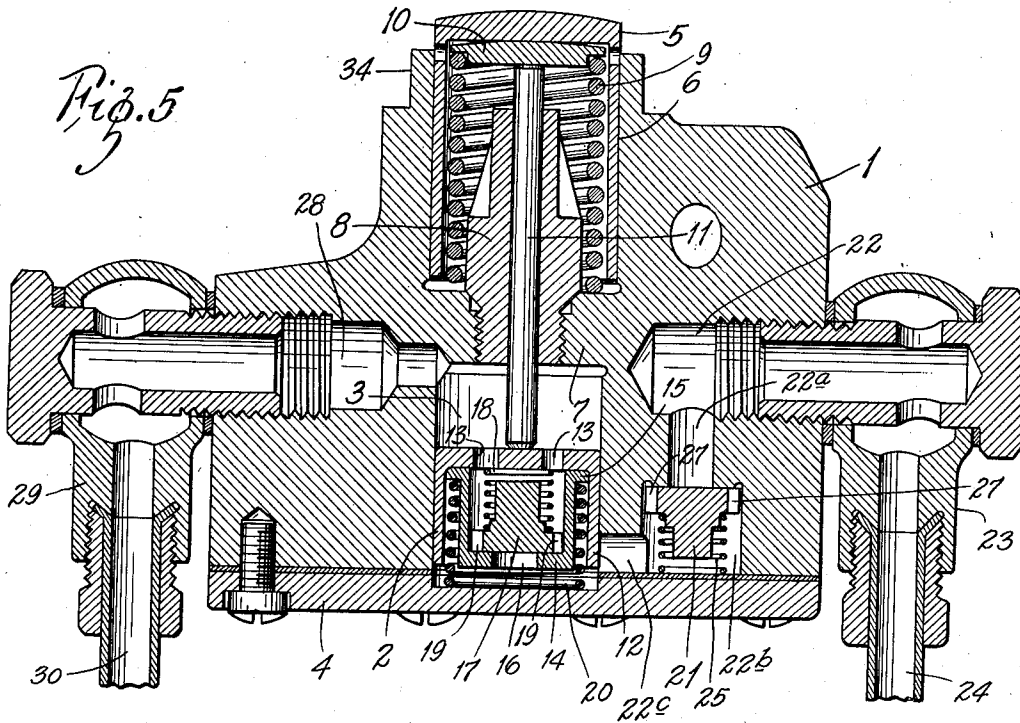
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# UNITED STATES PATENT OFFICE

2,185,145

## FUEL PUMP

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Application June 3, 1937, Serial No. 146,170

3 Claims. (Cl. 103—178)

This invention relates to pumps, particularly fuel pumps of the kind operated by or in unison with an internal combustion engine for supplying fluid fuel to the charge forming device thereof.

It has for its principal objects to produce a strong, compact and durable oil tight pump of simple and economical construction, to facilitate assembly and disassembly of the parts, and to provide separate, readily accessible manually operable means for priming and flushing the pump. 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 front elevation of a pump embodying my invention, the front cover plate being shown partly broken away,

Fig. 2 is a view looking at one end of said pump,

Fig. 3 is a view looking at the opposite end thereof,

Fig. 4 is a vertical cross-section on the line 4—4 in Fig. 1,

Fig. 5 is a horizontal section on the line 5—5 in Fig. 1; and

Fig. 6 is a vertical section on the line 6—6 in Fig. 1.

The pump shown in the accompanying drawings, comprises a housing 1, a valved piston 2 reciprocable in a central horizontal cylindrical chamber 3, which opens through the front face of said housing and is closed by a removable cover plate 4, and a tappet cup 5 reciprocable in a chamber 6, which opens through the rear face of said housing and is disposed in axial alinement with but is separated from the piston supporting chamber by a partition 7 having a threaded bore adapted to receive and support the threaded inner end of a bushing 8 that is disposed centrally of the tappet cup chamber and extends substantially the full length thereof. The forward stroke of the tappet cup 5 is produced by a suitable actuator hereinafter described; and the return stroke of said tappet cup is produced by the expansive effect of a coil spring 9 which bears at one end against the partition 7 and at the other end against a disk 10 having a convex surface disposed in abutting relation to the bottom or closed outer end of said cup. Reciprocable in the axial bore of the bushing 8 is a push rod 11 with one end disposed in abutting relation to the spring seat disk 10 and with the other end disposed in abutting relation to the inner end of the valved piston 2, whereby the inward or down stroke only

of the tappet cup 5 is transmitted to said piston to produce the outward or discharge stroke thereof.

The valved piston 2 comprises an exterior outwardly opening cup 12 having a series of circumferentially spaced openings or ports 13 in the bottom thereof, and an interior inwardly opening cup 14 having an outstanding flange 15 at its inner end adapted to space the side wall thereof from the side wall of said exterior cup, and a central inlet opening 16 in the bottom of said interior cup through which pumped or impelled fuel flows. The opening 16 is closed by a reciprocating check valve 17 that seats against the inner face of the bottom of the inner cup 14. The closure of said valve is effected during the discharge stroke of the piston by a coil spring 18 and by the pressure of the fuel on the discharge side of said piston. The spring 18 surrounds the stem of the valve 17 between the head thereof and the bottom of the interior cup 14. The head of the valve has a series of circumferentially spaced notches 19 in its peripheral edge adapted to permit flow of the fluid between the valve and the inner cup 14 when the former is forced off its seat. The inward or suction stroke of the piston 2 is produced by the expansive effort of a coil spring 20 interposed between the inner and outer cups of the piston with one end bearing against the flanged inner end 15 of the inner cup and with the other end seated in a circular recess provided therefor in the inner face of the front closure plate 4.

Leading inwardly from one end of the housing 1 is a suction or inlet passageway 22 that is connected at its outer end by a suitable fitting 23 to a suitable fuel supply pipe 24. This suction passageway has a forwardly extending branch 22a that opens into an enlarged valve chamber 22b that opens through the front face of the housing 2 and is closed by the cover plate 4. The chamber 22b contains a reciprocating suction or check valve 21 having a head that seats against the outer end of the branch 22a of the inlet passageway and a stem portion surrounded by a compression coil spring 25 interposed between the valve head and the cover plate 4. The valve head is provided with a series of circumferentially spaced peripheral notches 27 that permit fuel to pass around said head when it lifts off its seat. The valve chamber communicates through a passageway 22c with the forward end of the piston chamber 3. This passageway is formed by a groove or channel in the front face of the

pump housing which is closed by the cover plate therefor.

Located in the end of the housing remote from the inlet passageway is an outlet or discharge passageway 28 which leads from the inner end of the piston chamber 3 to the end of said housing where it communicates through a suitable fitting 29 with an outlet or discharge pipe 30.

When the above fuel pump is used for supplying fuel to the injection pump of a Diesel engine (see Fig. 6), the rear side of the supply pump housing 1 is provided with an attaching plate or flange 31 that is removably secured to the side wall of the injection pump housing 32 by cap screws 33. The side wall of the injection pump housing 32 is provided with an opening adapted to snugly receive a boss 34 formed on the rear face of the supply pump housing 1 around the tappet cup chamber 6. The tappet cup 5 extends into the injection pump housing 32 and is adapted to be forced inwardly against the pressure of the tappet cup spring 9 by means of the rotary tappet or edge cam 35 of the injection pump.

The fuel supply pump is also provided with separate or auxiliary manually operable priming and flushing means. Said means comprises a piston 36 reciprocable in an upward cylindrical extension 37 of the pump housing 1. The inner or lower end of the cylinder 37 communicates through a passageway 39 with the inlet passageway 22c leading to the suction valve chamber 22b. The outer end of the passageway 39 is closed by the front cover plate 4. The outer end of the cylinder 37 is closed by means of a threaded cap 40; and the piston 36 is provided with a stem 41 that extends through a supporting bore provided therefor in said cap and is provided beyond said cap with a suitable operating handle 42.

The operation of the above pump is as follows: When the tappet cup 5 is forced inwardly in its chamber 6 by rise of the cam 35, the push rod 11 forces the valved piston 2 outwardly in its chamber 3. This outward movement of the valved piston exerts sufficient pressure on the fuel between the outer ends of said piston and its chamber to force the valve 17 in said piston off its seat and thus permit the fluid to pass through the port 16 in the piston into the rear portion of the pump chamber 3 and the outlet passageway 28, fitting 29 and pipe 30. During this forward stroke of the valved piston, the suction valve 21 prevents return flow of the fuel in the suction passageway 22.

When the drop of the cam 35 is in engagement with the tappet cup 5, the spring 9 forces said cup rearwardly, thereby releasing the pressure of the push rod 11 on the inner end of the valved piston 2 and thus permitting said piston to be forced inwardly in its chamber by the spring 20. This rearward or inward movement of the valved piston forces the fuel previously transferred to the rear portion of the pump chamber through the discharge pipe to the injection pump or other charge forming device; and creates a suction in the forward end of the suction valve chamber 22b sufficient to lift the suction valve therein off its seat and permit a fresh supply of fuel to be drawn into the forward end of said pump chamber.

When it is desired to prime or flush the pump, the piston 36 of the auxiliary pump is manually reciprocated by means of the handle 42 to draw the fuel into the horizontal bore or passage 39 and then force said fuel through the passageway 22c into the forward end of the pump chamber

3 and thence through the valved piston 2 to the inner end of said pump chamber where it is discharged through the outlet passageway 28.

The strength of the spring 20, which operates the valved piston during its working stroke, depends on the fuel pressure required by the injection pump. The length of the working stroke of the piston varies, depending on the pressure of the fuel on the discharge side thereof, this difference in the length of the stroke of the piston and tappet cup being permitted by the mere abutting engagement of the push rod and piston.

The priming pump is located above the main mechanically operated pump where it is readily accessible and is clear of the front cover plate; and said plate may be quickly and easily removed so that access may be had to the valved piston and the suction valve. The bushing serves to support the push rod for the greater portion of its length; it may be made of a material particularly adapted for guide bushings; and it may be readily replaced in case of undue wear.

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. A pump comprising a housing having spaced parallel pump and valve bores therein both open at the front face of said housing, an inlet passageway opening into the inner end of said valve bore through one end of said housing, a channel in said face of said housing and extending from the outer end of said valve bore to the outer end of said pump bore, a second pump bore leading downwardly from the top of said housing, a second passageway disposed parallel with said pump and valve bore also open at the front face of said housing and communicating at its inner end with said second pump bore and at its outer end with said channel, and a discharge passageway leading from the inner end of said first mentioned pump bore, a suction valve in said valve bore, a valved piston reciprocable in said first mentioned pump bore, a plate removably secured to the front face of said housing for closing the open ends of said pump and valve bores and said second passageway and for covering the channel extending therebetween, and a manually operable piston reciprocable in said second pump bore.

2. A pump comprising a housing having a pump bore and a valve bore therein both open at the front face of said housing, an inlet passageway opening into the inner end of said valve bore, a channel in said face of said housing and extending from the outer end of said valve bore to the outer end of said pump bore, and a discharge passageway leading from the inner end of said pump bore, a suction valve in said valve bore, a valved piston reciprocable in said pump bore, a plate removably secured to the front face of said housing for closing the open ends of said pump and valve bores and for covering the channel extending therebetween, a spring interposed between said closure plate and said piston for moving the latter towards the inner end of said pump bore, said housing having a tappet cup bore therein open at the rear face thereof and disposed in axial alignment with said pump bore, an inwardly opening tappet cup reciprocable in said tappet cup bore, a plate in said tappet cup and having a convex surface facing the bottom of said cup, a coil compression spring disposed in said cup with one end seated against the bottom of said tappet cup bore and with the other

end bearing against said plate to hold the convex surface thereof in contact with the bottom of said cup, a bushing in said tappet cup bore, and a rod reciprocable in said bushing with one end disposed in abutting relation to said plate and with its other end extending into said pump bore and cooperating with said piston.

3. A pump comprising a housing having spaced parallel pump and valve bores therein, an inlet passageway opening into one end of said valve bore, a connecting passageway extending from the opposite end of said valve bore to the corre-

sponding end of said pump bore, a discharge passageway leading from the opposite end of said pump bore, a second pump bore, a passageway disposed parallel with said spaced parallel pump and valve bores and communicating at one end with said second pump bore and at its outer end with said connecting passageway, a suction valve in said valve bore, a valved piston reciprocable in said first mentioned pump bore, and a manually operable piston reciprocable in said second pump bore.

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