

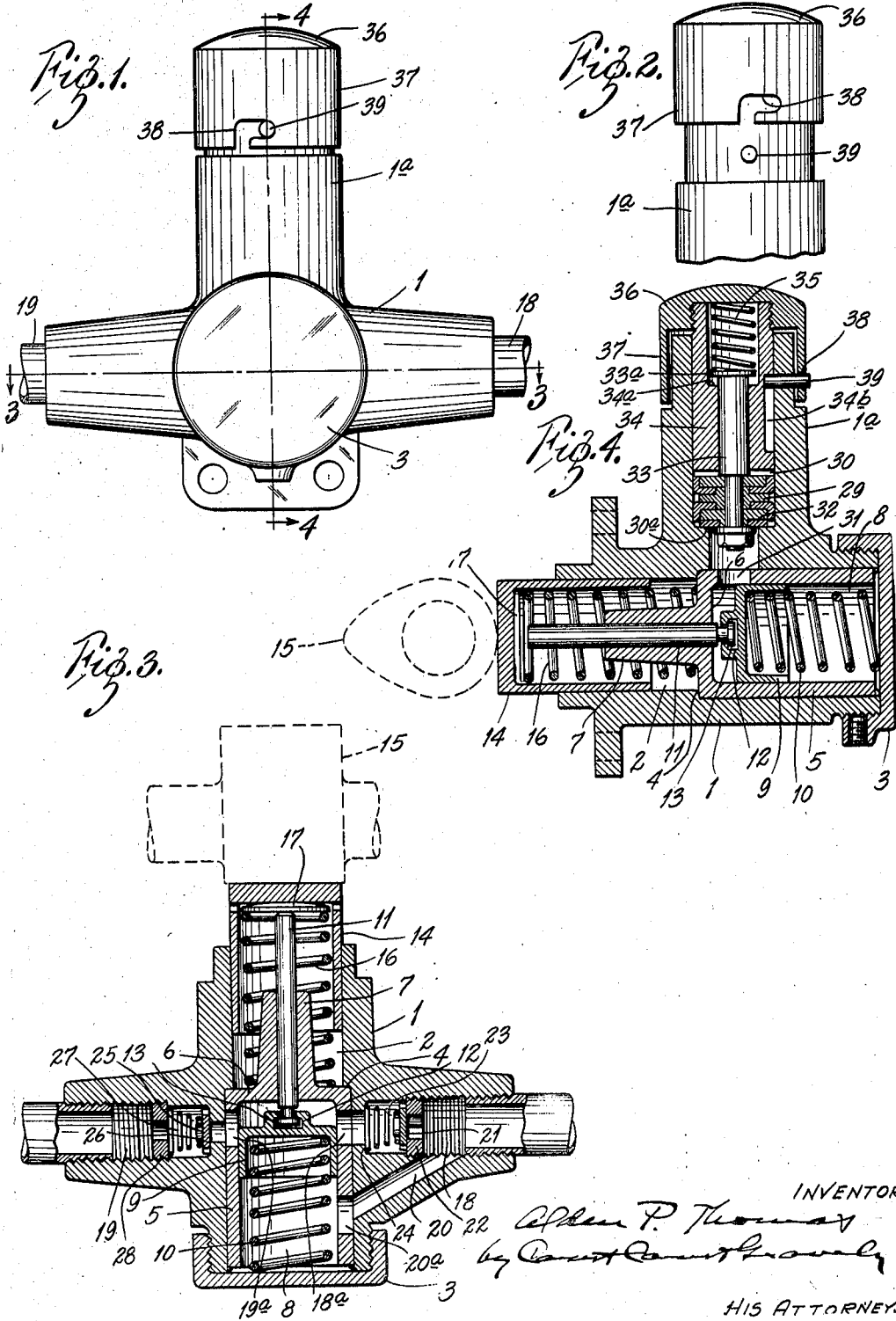
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FUEL PUMP

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FUEL PUMP

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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 provide a strong, compact and durable oil and air 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 the pump and clearing the fuel system of air. The invention consists in the pump and in the construction, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawing, which forms 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 operating knob of the auxiliary pump piston being shown in locked position.

Fig. 2 is a similar view of the upper portion of the pump, showing said knob in unlocked position.

Fig. 3 is a central horizontal longitudinal section on the line 3—3 of Fig. 1; and

Fig. 4 is a vertical central longitudinal section on the line 4—4 in Fig. 1.

The pump shown in the accompanying drawing comprises a housing 1 having a central horizontal bore 2 extending therethrough from front to back thereof, whose front end is closed preferably by means of a threaded cap 3. Mounted in the front end portion of the housing bore between an annular shoulder 4 therein and the cap or closure 3 for the front end thereof is a hollow cylindrical liner 5 having a wall 6 at the inner end thereof and a hollow stem 7 that projects axially from the rear face of said wall. This cup-shaped liner cooperates with the closed outer end of the housing bore 2 to form a pump chamber or cylinder 8 for a piston 9, preferably in the form of a cup whose open end faces the outer end of said cylinder.

Interposed between the outer end of the pump cylinder 8 and the bottom of the cup-shaped piston 9 is a coil compression spring 10, the expansive effect of which operates to force said piston towards the inner end of said cylinder. The piston is moved in the opposite direction by a push rod or plunger 11 mounted for axial sliding movement in the rearwardly projecting hollow stem 7 of the liner 5 with one end extending into the rear end of the pump chamber 8 and loosely connected to the adjacent rear end of the piston 9. This loose connection prefer-

ably comprises an undercut groove 12 in the inner end wall of the piston and a head 13 on the adjacent end of said plunger fitting in said groove.

Mounted for reciprocating movement in the rear end portion of the pump housing bore 2 is a tappet cup 14 whose open end faces the front end of said bore. The forward stroke of the tappet cup is produced by a power operated tappet or edge cam 15; and the return stroke of said cup is produced by the expansive effect of a coil spring 16 interposed between the end wall 6 of the liner 5 and a disk 17 having a convex surface disposed in abutting relation to the bottom or closed end of said cup.

The pump housing 1 has horizontally disposed, axially aligned inlet and outlet passageways 18 and 19 therein disposed one on each side of the pump cylinder 8 and communicating with the inner end thereof through diametrically opposed ports 18a and 19a in the liner 5. Said housing is also provided with a branch passageway 20 that leads at an oblique angle from the inlet passageway 18 and communicates with the outer end of the pump cylinder through a radial port 20a in the liner 5. The inlet passageway 18 is provided between its points of communication with its branch passageway 20 and said cylinder with an inwardly opening suction or check valve in the form of a disk 21 that seats against the inner face of an annular member or washer 22 that is threaded into said passageway. This inlet valve 21 is yieldably held against its replaceable seating 22 by means of a compression coil spring 23 interposed between said valve and an annular shoulder 24 in said passageway. The outlet passageway 19 is provided with an outwardly opening check valve in the form of a disk 25 that is yieldably held against an annular seating 26 in said passageway by a coil compression spring 27 interposed between said valve and an annular member or washer 28 threaded into said outlet passageway outwardly of said valve.

The hereinbefore described pump is also provided with a manually operable auxiliary pumping device comprising a piston 29 reciprocable in the axial bore 30 of an upright cylindrical extension 1a of the pump housing 1. The inner end of the bore or cylinder 30 communicates with the inner end of the main pump cylinder 8 through a radial port 31 in the liner 5. The inner end of the auxiliary piston 29 is provided with a gasket 32 adapted, in the innermost position of said piston, to seat against an annular shoulder 30a in the bore 30 and thus cut off com-

munication between said bore and the main pump cylinder 8. The piston 29 is provided with an axially extending rod 33 that extends outwardly into the axial bore of a sleeve 34 that is mounted for reciprocating movement in the bore 30 outwardly of the piston 29 therein. The outer end of the piston rod 33 terminates short of the corresponding end of the bore in the axially slidable sleeve 34 in a head 33a that cooperates with an annular shoulder 34a provided therefor in said bore; and a coil compression spring 35 is interposed between said head and a knob 36 that is threaded on the outer end of said sleeve. The knob 36 is provided with a peripheral skirt or flange 37 that encloses the outer end portion of the radial extension 1a of the pump housing and has a bayonet notch 38 in the lower edge thereof adapted to engage a pin 39 that extends radially through the wall of said extension with its outer end in position to enter said notch when said knob is depressed and rotated slightly and thus releasably hold the same in the innermost position with the piston 29 firmly held down on its seat 30a by the pressure of the spring 35. The inner end of the pin 39 of the bayonet joint extends into the bore 30 and enters a longitudinal recess 34b in the side of the sleeve 34 and thus limits the reciprocating movement thereof.

The operation of the above pump is as follows: When the tappet cup 14 is forced inwardly by the rise of the cam 15, the plunger 11 forces the piston 9 outwardly in the cylinder 8. This outward movement of the piston draws fuel into the cylinder through the inwardly opening suction or inlet valve 21 while the outwardly opening outlet or discharge valve 25 remains closed. When the drop of the cam 15 is in engagement with the tappet cup, the spring 16 forces said cup rearwardly, thereby releasing the pressure of the plunger on the inner end of the piston 9 and thus permitting said piston to be forced inwardly in its cylinder by the spring 10. This rearward or inward movement of the piston 9 forces the fuel in the inner end of the cylinder 8 through the outlet valve 25 and thence through the outlet passageway 19 to the injection pump or other charge forming device of the engine. The forward or front end of the cylinder is always supplied by the branch 20 of the inlet passageway with fuel which surges back and forth between the piston 9 and said inlet passageway during the reciprocating movement of the piston, thereby preventing the piston from sucking air on its suction stroke and returning to said inlet passageway any fuel that may leak past the piston during the delivery stroke thereof.

When it is desired to prime or flush the pump, the operating knob 36 is released from the hold down pin 39 therefor and the auxiliary piston 29 is reciprocated to draw fuel through the inlet valve 21 into the main pump chamber 8 and then discharge said fuel through the outlet valve 25 thereof. The inward motion of the knob 36 is transmitted to the piston rod 33 through the spring 35, while the outward movement of said knob is transmitted to said rod by the engagement of the shoulder 34a in the rod receiving bore of said sleeve with the underside of the head 33a at the outer end of said rod. The pin 39, which cooperates with the slot 34b in the sleeve 34, serves to limit the sliding movement of said sleeve in both directions. In the innermost or locked position of the knob, the spring 35 exerts considerable downward pressure on the piston rod 33 and thus serves to hold the piston 29 in

tight sealing engagement with the shoulder 30a in the bore 30 so as to prevent leakage of air to the fuel system.

The hereinbefore described pump has several advantages. The inlet and outlet valves are close to the pump cylinder and the inlet and outlet passageways are short and straight and open directly into the cylinder at diametrically opposite points. The suction stroke is imparted to the piston entirely by the cam and the discharge stroke is imparted to said piston by the spring only, thereby securing a more positive pumping action. The filling of the cylinder through the inlet valve on the suction stroke is facilitated by the displacement by said piston of fuel in the spring chamber of the cylinder back into the inlet passageway. This forcing of such fuel into the inlet passageway assists the inlet valve in opening and also assists the piston in obtaining an adequate supply of fuel from said inlet passageway. Any leakage past the piston from the high to the low pressure side of the cylinder is returned directly into the intake passageway, and this low pressure side of the cylinder is constantly filled with fuel which prevents the piston from sucking air on its suction stroke.

While I have described my pump for use as a supply pump for a fuel feed system of an internal combustion engine, it is obviously adapted for other uses.

What I claim is:

1. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating directly with the same end of said cylinder and a valveless branch passageway in continuous communication with said inlet passageway and the other end of said cylinder, a piston reciprocable in said cylinder, and an inwardly opening check valve in said inlet passageway between said cylinder and the point of communication of said inlet passageway with said branch passageway.

2. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating directly with the same end of said cylinder and a valveless branch passageway communicating with said inlet passageway and the other end of said cylinder, a piston reciprocable in said cylinder, a check valve in said outlet passageway, and an inwardly opening check valve in said inlet passageway between said cylinder and said branch passageway.

3. A pump comprising a housing having a cylinder, diametrically opposed inlet and outlet passageways communicating directly with said cylinder adjacent to the same end thereof and a valveless branch passageway communicating with said inlet passageway and with said cylinder adjacent to the other end thereof, a piston reciprocable in said cylinder, a check valve in said outlet passageway, and an inwardly opening check valve in said inlet passageway between said cylinder and said branch passageway.

4. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating directly with the same end of said cylinder at diametrically opposite points and a valveless branch passageway leading from said inlet passageway to the other end of said cylinder, a piston reciprocable in said cylinder, a check valve in said inlet passageway between said cylinder and said branch passageway, power operated means for moving said piston in a direction that will draw fluid from said inlet passageway into said first mentioned end of said cylinder, and

spring means for moving said piston in the opposite direction to discharge fluid through said outlet passageway.

5. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating directly with the same end of said cylinder at diametrically opposite points and a valveless branch passageway leading from said inlet passageway to the other end of said cylinder, a piston reciprocable in said cylinder, an inwardly opening check valve in said inlet passageway between said cylinder and said branch passageway, a check valve in said outlet passageway, power operated means for moving said piston in a direction that will draw fluid from said inlet passageway into said first mentioned end of said cylinder, and force fluid in said other end of said cylinder and said branch passageway into said inlet passageway, and spring means for moving said piston in the opposite direction to discharge fluid through said outlet passageway and to draw fluid into said other end of said cylinder through said inlet branch passageway.

6. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating with one end of said cylinder at diametrically opposite points and a valveless branch passageway leading from said inlet passageway to the other end of said cylinder, a piston reciprocable in said cylinder, an inwardly opening check valve in said inlet passageway between said cylinder and said branch passageway, a check valve in said outlet passageway, power operated means for moving said piston only in a direction that will draw fluid through the check valve in said inlet passageway into said first mentioned end of said cylinder, a spring in said other end of said cylinder for moving said piston in the opposite direction to discharge said fluid through the check valve in said outlet passageway, said power operated means including a plunger reciprocable in said housing and having a connection with said piston adapted to accommodate misalignment of said piston and said push rod.

7. A pump comprising a body having a cylindrical bore therein, a removable closure for said bore, a hollow cylindrical liner in said bore having at the end remote from said closure an end wall which has a hollow stem projecting axially therefrom on the side thereof remote from said closure, a piston reciprocable in said liner between the end wall thereof and said closure, inlet and outlet passageways communicating with the interior of said liner, a spring interposed between said closure and said piston, and a plunger reciprocable in said hollow stem and operatively engaging the adjacent end of said piston.

8. A pump comprising a body having a cylindrical bore therein, a removable closure for said bore, a hollow cylindrical liner in said bore having at the end remote from said closure an end wall which has a hollow stem projecting axially therefrom on the side thereof remote from said closure, a piston reciprocable in said liner between the end wall thereof and said closure, inlet and outlet passageways both communicating directly with the interior of said liner adjacent to the end wall thereof, a spring interposed between said closure and said piston, a plunger reciprocable in said hollow stem and operatively engaging the adjacent end of said piston, said inlet passageway having a branch in continuous communication with the interior of said liner adjacent to the closure opposing end thereof, and an inwardly opening check valve in said inlet

passageway between its points of communication with said liner and said branch passageway.

9. A pump comprising a body having a cylindrical bore therethrough, a removable closure for said bore, a hollow cylindrical liner removably mounted in said bore and having at the end remote from said closure an end wall which has a hollow stem projecting axially therefrom on the side thereof remote from said closure, a piston reciprocable in said liner between the end wall thereof and said closure, inlet and outlet passageways communicating with the interior of said liner, a spring interposed between said closure and said piston, and a plunger reciprocable in said hollow stem and operatively engaging the adjacent end of said piston, said plunger having a connection with said piston adapted to accommodate misalignment of said piston and said plunger.

10. A pump comprising a body having a cylindrical bore therein, a removable closure for said bore, a hollow cylindrical liner in said bore and having at the end remote from said closure an end wall which has a hollow stem projecting axially therefrom on the side thereof remote from said closure, a piston reciprocable in said liner between the end wall thereof and said closure, inlet and outlet passageways communicating with the interior of said liner, a check valve in said outlet port, a spring located in said liner between said closure and said piston, a plunger reciprocable in said hollow stem and connected to the adjacent end of said piston, said inlet and outlet passageways each communicating with the interior of said liner at points located adjacent to said end wall thereof, and said inlet passageway having a valveless branch communicating with the interior of said liner adjacent to the closure opposing end thereof, and a check valve in said inlet passageway between said liner and said branch passageway.

11. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating with one end of said cylinder, a piston reciprocable in said cylinder, and a check valve in said inlet passageway, said housing having a second cylinder therein opening into said end of said first mentioned cylinder, and a manually operable piston reciprocable in said second cylinder.

12. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating with one end of said cylinder and a branch passageway communicating with said inlet passageway and the other end of said cylinder, a piston reciprocable in said cylinder, and a check valve in said inlet passageway between said cylinder and said branch passageway, said housing having a second cylinder therein opening into said first mentioned end of said first mentioned cylinder, and a manually operable piston reciprocable in said second cylinder.

13. A pump comprising a body having a cylindrical bore therein, a removable closure for said bore, a hollow cylindrical liner in said bore having at the end remote from said closure an end wall with a hollow stem projecting from the side thereof remote from said closure, a piston reciprocable in said liner between the end wall thereof and said closure, inlet and outlet passageways communicating with the interior of said liner adjacent to the end wall thereof, a check valve in said outlet port, a spring interposed between said closure and said piston, a plunger reciprocating in said hollow stem and operatively connected to the adjacent end of said piston, a branch pas-

- sageway communicating with said inlet passageway and the interior of said liner adjacent to the closure opposing end thereof, a check valve in said inlet passageway between said liner and said branch passageway, said body having a second cylinder therein opening into said liner adjacent to the end wall thereof, and a manually operable piston reciprocable in said second cylinder.
- 10 14. A pump comprising a housing having a cylinder, inlet and outlet passageways communicating with one end of said cylinder, a piston reciprocable in said cylinder, said housing having a second cylinder therein opening into said end of said first mentioned cylinder, and a manually operable piston reciprocable in said second cylinder, said second cylinder having a seat therein for the inner end of the piston therein, and releasable means for holding said end of said piston against said seat.
- 15 15. A pump comprising a housing having a cylinder and inlet and outlet passageways com-

municating with one end of said cylinder, a piston reciprocable in said cylinder, a second cylinder opening into said end of said first mentioned cylinder and having an annular shoulder formed therein adjacent to the inner end thereof, a piston in said second cylinder adapted in its innermost position to seat against said annular shoulder and cut off communication between said cylinders, a sleeve reciprocable in the outer end portion of said second cylinder, a rod fixed to the piston in said second cylinder and extending outwardly therefrom into said sleeve, a knob fixed to the outer end of said sleeve, a spring mounted in said sleeve between said knob and the outer end of said rod, and means for locking said knob to the pump housing in the innermost position of said sleeve, whereby said spring is placed under compression and operates to hold the piston in said second cylinder against the annular shoulder therein.

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