Jan. 15, 1935. C. L. CUMMINS 1,988,164

PUMP MECHANISM

Filed May 23, 1931 2 Sheets-Sheet 1

Fig. 1.

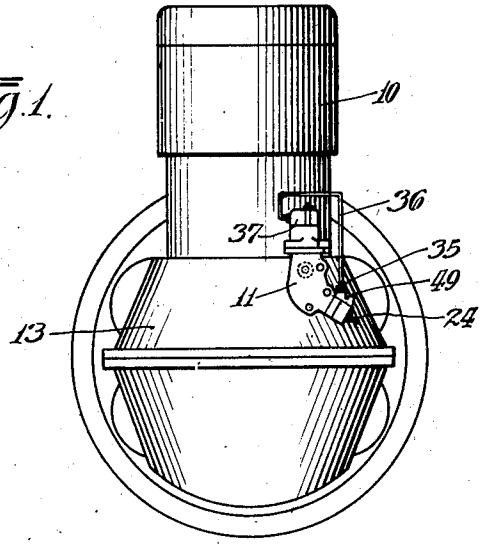
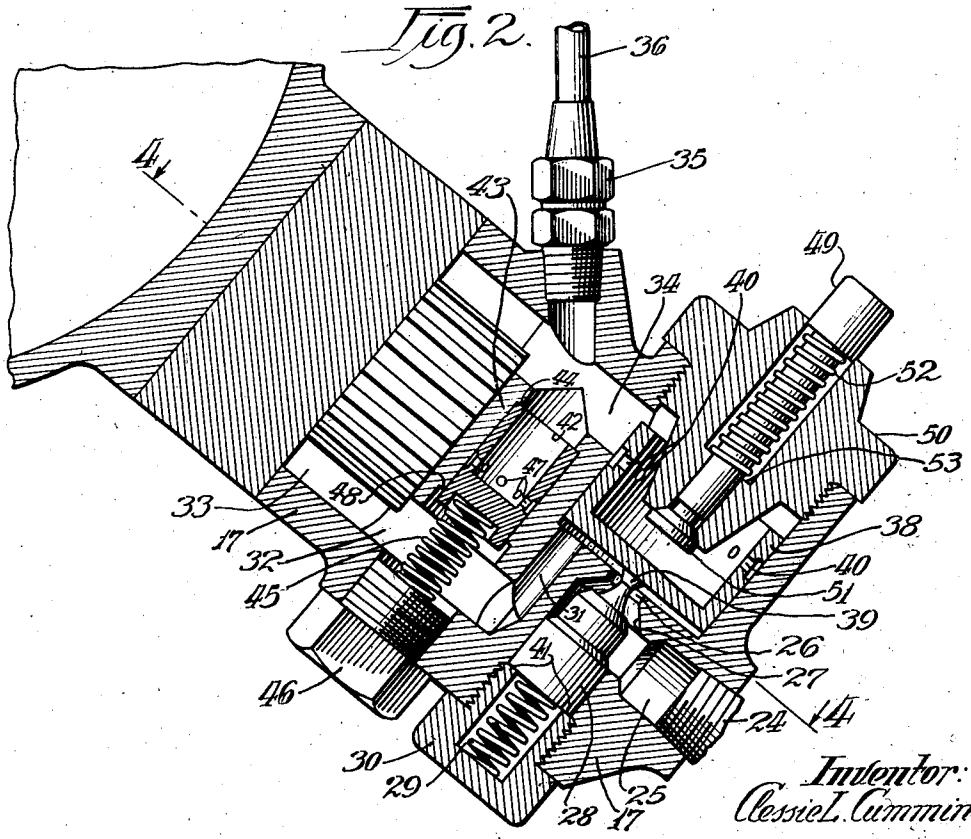


Fig. 2.



Inventor:
Clessie L. Cummins,
By, Reeter, Hibben, Davis & Macaulay
Attorneys

Jan. 15, 1935. C. L. CUMMINS 1,988,164

PUMP MECHANISM

Filed May 23, 1931 2 Sheets-Sheet 2

Fig. 3.

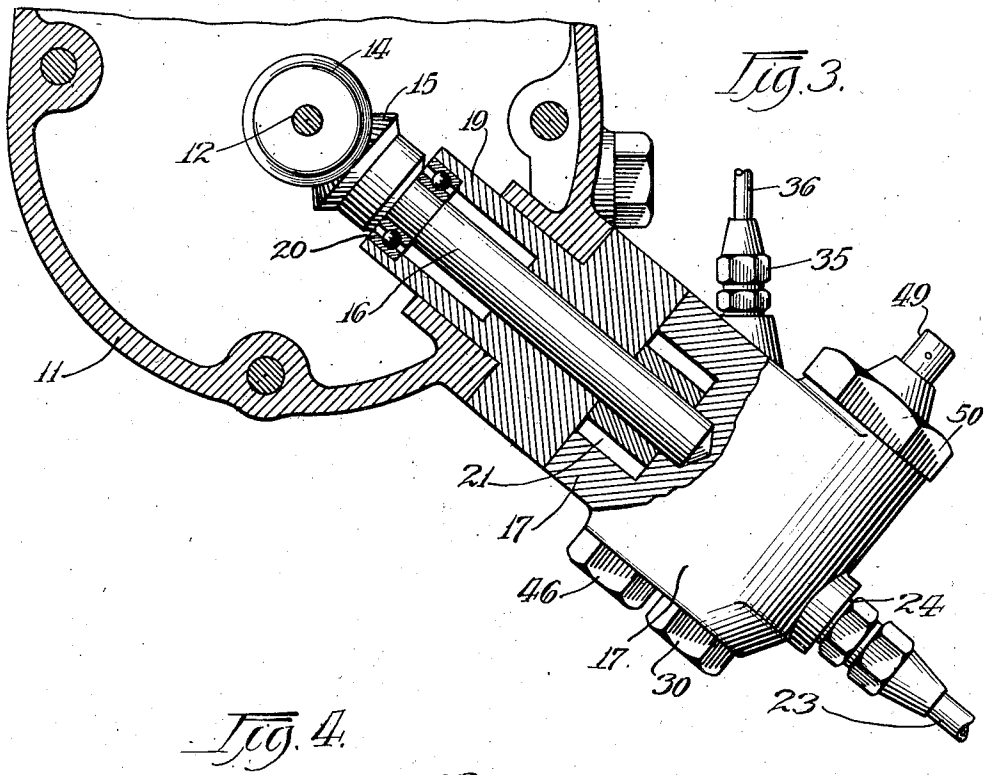
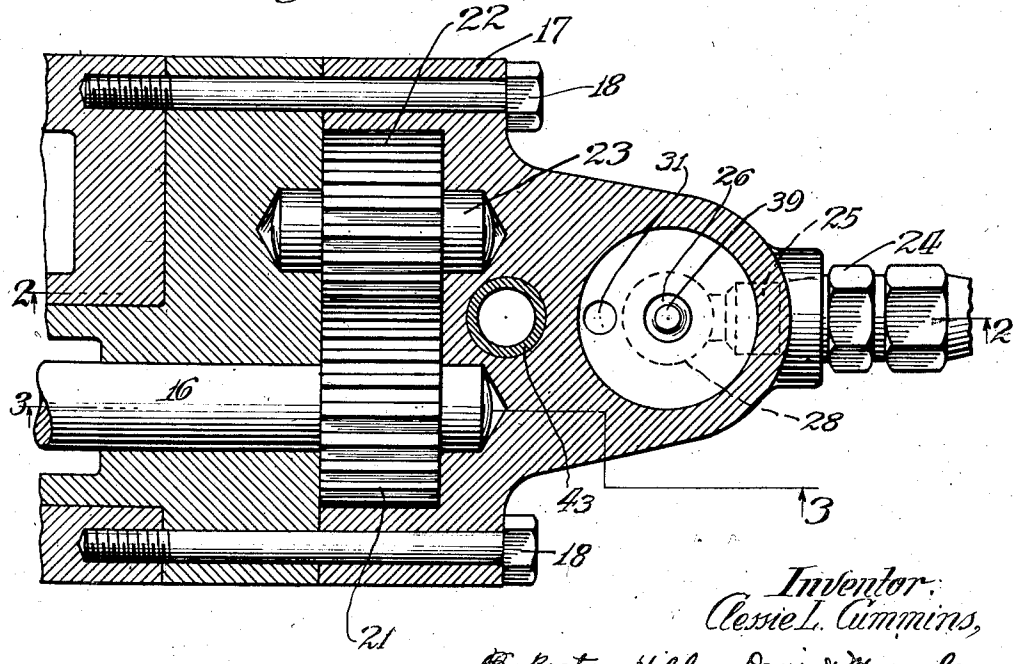


Fig. 4.



Inventor:
Clesse L. Cummins,
By Rector, Hibben, Davis & Macauley
Attorneys.

Patented Jan. 15, 1935 1,988,164

UNITED STATES PATENT OFFICE

1,988,164

PUMP MECHANISM

Clessie L. Cummins, Columbus, Ind., assignor to Oil Engine Development Company, Columbus, Ind., a corporation of Indiana

Application May 23, 1931, Serial No. 539,478

3 Claims. (Cl. 103—40)

My invention relates to pump mechanisms and is concerned primarily with providing a device which incorporates pumping and flow control functions when placed in a fluid supply line.

One object of my invention is to provide a mechanism comprising pump and valve units in which the valve unit is operable to automatically open and close the supply line upon a starting and stopping, respectively, of the pumping unit of the mechanism.

A further object is to devise an arrangement of the character indicated in which provision is made for automatically relieving the pressure established in the casing of the mechanism by the pump unit when said pressure attains a predetermined value, thereby avoiding unnecessary strain on the parts without affecting the capacity of the mechanism to function according to its primary purpose.

A further object is to provide for an independent and manually controlled actuation of the valve unit as may be required under certain circumstances, particularly where it becomes necessary to initially prime the pump unit before automatic control of the valve unit can be established.

A further object is to devise a mechanism as above set forth which may be conveniently arranged as a single and self-contained unit and which is therefore susceptible of incorporation in fluid supply lines under a variety of operating conditions.

These and further objects of my invention will be set forth in the following specification, reference being had to the accompanying drawings, and the novel means by which said objects are effectuated will be definitely pointed out in the claims.

Figure 1 is an end view of a conventional type of internal combustion engine, showing my improved pumping mechanism applied thereto, this particular application having been selected for purpose of illustration only.

Fig. 2 is a vertical sectional elevation of the mechanism as viewed in Fig. 1, or as taken along the line 2—2 in Fig. 4, looking in the direction of the arrows.

Fig. 3 is a further sectional elevation of the entire unit as taken along the line 3—3 in Fig. 4, looking in the direction of the arrows.

Fig. 4 is a sectional view taken along the line 4—4 in Fig. 2, looking in the direction of the arrows.

The present application is a division of my copending application for a fuel pump and distributing apparatus for internal combustion engines, Serial No. 438,048, filed March 22, 1930.

Referring to the drawings, the numeral 10 (Fig. 1) designates a conventional type of internal combustion engine, more particularly one intended for the consumption of fuel oil, which has been selected as illustrating one operative application of my improved mechanism. It will be understood, however, that I do not desire the structure hereinafter described and claimed to be restricted in its application in any respect by reason of its being disclosed for use in connection with an internal combustion engine, as I contemplate that it may be employed under a variety of conditions and is generically adaptable for use in any fluid supply line where the advantages of a mechanism of this type are required.

A housing 11 is carried by the engine 10 and encloses the fuel pump and distributor mechanisms which are more particularly described in the aforesaid application and which are driven from a shaft 12 journaled in said housing and in the crank case 13 of the motor. The shaft 12 has secured thereto a bevel gear 14 which meshes with a bevel gear 15 attached to one end of a gear pump shaft 16 which extends downwardly in an inclined direction through a lower wall of the housing 11 (see Fig. 3).

The lower end of the shaft 16 is journaled in a gear pump housing 17 which is secured to the housing 11 by bolts 18 and which is further provided with a sleeve extension 19 projecting through a suitable opening provided in the wall of the housing 11 and at its inner end is counterbored to receive a bearing 20 which is located adjacent the gear 15 and in which the shaft 16 rotates.

The foregoing description refers only to a conventional method of driving the pump mechanism hereinafter described and in and of itself forms no part of the present invention, as it is contemplated that my improved mechanism may be driven from other sources and by other means than those indicated.

Adjacent the lower end of the shaft 16, the latter has attached thereto a gear 21 (see Fig. 4) which meshes with a gear 22 secured to a stub shaft 23, the ends of said stub shaft being journaled in the housing 17 and the indicated pair of gears constituting the pumping unit of the mechanism.

When placed in a fluid supply line, and referring more particularly to Fig. 2, the mechanism will be so located that the fluid will be delivered through a pipe line 23 which is connected by a

nipple 24 to the lower end of the gear pump housing 17, the opposite end of the pipe line 23 being connected to a suitable fluid source, such as a tank (not shown). The nipple 24 delivers the fuel into a passage 25 which communicates with a port 26 having a valve seat 27. The port 26 is closed, when the pump unit is at rest, by the seating of a plug valve 28 against the valve seat 27, said valve being shown in the open position in Fig. 2 against the compression of a spring 29 which is carried in a hollow cap 30 mounted in one wall of the housing 17. The manner in which the plug valve 28 is displaced from the closed to the open position shown in Fig. 2 will be presently described, but assuming that said valve is open, the fuel from the line 23 passes through the port 26 for delivery into the interior of the housing 17. After flowing through the port 26, the fluid passes through the ducts 31 and 32 to the suction side of the gear pump, as indicated by the numeral 33. The discharge from the gear pump is collected in a cavity 34 which is in communication by means of a nipple 35 with a pipe line 36. In the particular environment illustrated in Fig. 1, the fluid passing through the pipe line 36 is eventually delivered to the distributor head 37, as more particularly described in the aforesaid application.

Reverting to the plug valve 28 and the manner in which it is opened, it will first be understood that this valve is provided for the purpose of automatically closing the supply line from the main tank through the pipe line 23 when the pumping unit ceases operation and means are further provided for automatically opening this valve when the pumping unit resumes operation. A hollow piston 38 is slidably mounted within the housing 17 in axial alignment with the valve 28 and with the head of said piston extending toward said valve. An extension 39 is formed on the end of the valve 28 and projects through the port 26 for contact with the outer face of the head of the piston 38, as shown clearly in Fig. 2. Accordingly, movement of the piston 38 toward the valve 28 moves the latter to an open position against the spring 29 and when the actuating force operating against said piston has been removed, the spring 29 returns the valve 28 to a closed position.

The apron portion of the piston 38 is provided with a plurality of circumferentially disposed apertures 40, some of which are always in communication with the cavity 34 which receives the fluid discharge directly from the gear pump. Therefore, assuming this particular portion of the piston to be filled with a fluid and the valve 28 to be occupying a closed position, it will be apparent that when the gear pump is placed in operation, a suction will be created across the outer face of the piston head and a pressure throughout the interior of said piston operating through the several ports 40. Hence, the piston 38 will be moved to actuate the plug valve 28 to the open position shown in Fig. 2, whereupon communication will be established between the fluid supply and delivery lines 23 and 36, respectively.

A positive stoppage of the valve 28 in an opening direction is provided by engagement of said valve with the cap 30, as indicated by the numeral 41, but as a further safety measure and in order to prevent unnecessary strain on the several parts which might otherwise occur from the creation of an excessive pressure against the interior of the piston 38, special means are provided to automatically relieve the pressure within the gear pump housing when it reaches a predetermined point. Between the gear pump and the piston 38, an auxiliary, hollow piston 42 is slidably mounted within a suitable wall portion 43 and is normally maintained against a shoulder 44 provided in said portion by means of a spring 45 which engages the opposite and outer end of said piston, said spring being retained in position by engagement of one end thereof with a threaded plug 46 carried by the housing 17. The piston 42 has formed in the apron portion thereof adjacent the head a plurality of circumferentially disposed apertures 47 which are normally covered by the enclosing wall portion 43, but which are arranged to be uncovered when the piston has moved a sufficient distance against the compression of the spring 45, or when said apertures have moved beyond the shoulder 48, when communication will be established between the interior of the piston 42, which is in communication at all times with the cavity 34, and the duct 32. The uncovering of the ports 47 occurs when a predetermined fluid pressure has been established on the discharge side of the gear pump, as is regulated by adjusting the several ports, whereupon the piston 42 will be actuated against the spring 45 to effect a local cycle flow through the auxiliary piston 42 to the suction side of the gear pump.

As stated above, the capacity of the pumping unit of the mechanism to automatically control the position of the valve 28 is dependent upon the presence of fluid in the housing 17. However, under certain conditions of operation, as when the mechanism is first placed in service, or after it has been subjected to a process of overhauling involving a disassembly of the several parts, or it has been necessary to blow the supply and delivery lines free of all fluid, it becomes important to provide some arrangement for independently opening the valve 28 in order to prime the mechanism with fluid. For this purpose, a plunger 49 is slidably mounted in a cap 50 substantially in axial alignment with the piston 38, the cap 50 being threaded or otherwise mounted in the pump housing 17. The inner end of the plunger 49 carries a head 51 which engages the inner face of the piston to thereby actuate said piston in a direction to open the valve 28. The plunger 49, during the priming operation, is held in the position indicated until the mechanism has been entirely filled with the fluid employed, a result which may be readily obtained by the use of a hand pump or other devices, whereupon the plunger is then released for retraction to the position shown in Fig. 2 under the actuation of a spring 52 which encircles said plunger within the cap 50, abutting at the lower end against a shoulder 53 formed in said cap and at the opposite end against the outer head of the plunger.

As long as the mechanism is completely filled with fluid, therefore, starting of the gear pump serves to almost immediately build up a pressure sufficient to actuate the valve 28 in an opening direction and thereby enables the pump to draw fluid from the supply line 23 and deliver the same to the pipe line 36. This condition will obtain as long as the pump unit remains in operation, any excessive pressures above those required to maintain the valve 28 in an open position being automatically relieved by the movement of the piston 42, and upon a stoppage of the pump unit, the pressure in the housing 17 falls to zero and the spring 29 returns the valve 28 to a closed position, automatically interrupting communica-

tion of the supply and delivery pipe lines 23 and 36.

While I have shown one set of elements and combinations thereof for effectuating my improved pump mechanism, it will be understood that the same is intended for purpose of illustration only and in nowise to restrict my device to the exact forms and structures shown, for many changes may be made therein without departing from the spirit of my invention.

I claim:

1. Pump mechanism comprising in combination, pump means connectible to a fluid supply, a normally closed valve in the line between said means and supply, means for opening said valve comprising a hollow piston having a head engageable with said valve and whose interior is in communication with the discharge side of said pump means, the pressure established by said means operating against the inner face of said head to actuate the same for opening said valve, a regulating piston subjected to the discharge pressure of said pump means and having apertures in the wall thereof, and a common casing enclosing said pump means and pistons and having partition walls serving as guides for said pistons, said apertures being normally covered by the adjacent partition walls and uncovered by the movement of the regulating piston when the discharge pressure of said pump means rises above a predetermined value to thereby by-pass a portion of the fluid to the suction side of said pump means.

2. Pump mechanism comprising in combination, pump means connectible to a fluid supply, a normally closed valve in the line between said means and supply, means for opening said valve comprising a piston having a head engageable on one side thereof with said valve and whose opposite side is exposed to the discharge pressure of said pump means to thereby actuate said piston to open said valve, a regulating piston subjected to the discharge pressure of said pump means and shiftable to provide a relieving by-pass around said pump means, and a common casing enclosing said pump means and pistons and having partition walls serving as guides for said pistons, said walls including openings communicating the opposite sides of said pistons with the inlet and discharge sides of said pump means, respectively.

3. Pump mechanism comprising in combination, pump means connectible to a fluid supply, a normally closed valve in the line between said means and supply, means for opening said valve comprising a piston having a head engageable on one side thereof with said valve and whose opposite side is exposed to the discharge pressure of said pump means to thereby actuate said piston for opening said valve, a regulating piston subjected to the discharge pressure of said pump means and shiftable to provide a relieving by-pass around said pump means, and a common casing enclosing said pump means, valve and pistons and having partition walls serving as guides for said valve and pistons, said walls including passages communicating the discharge side of said pump means with one side of said pistons, respectively, and the inlet side with the discharging end of said regulating piston and with that side of the first piston opposite the side on which discharge pressure acts.

CLESSIE L. CUMMINS.