

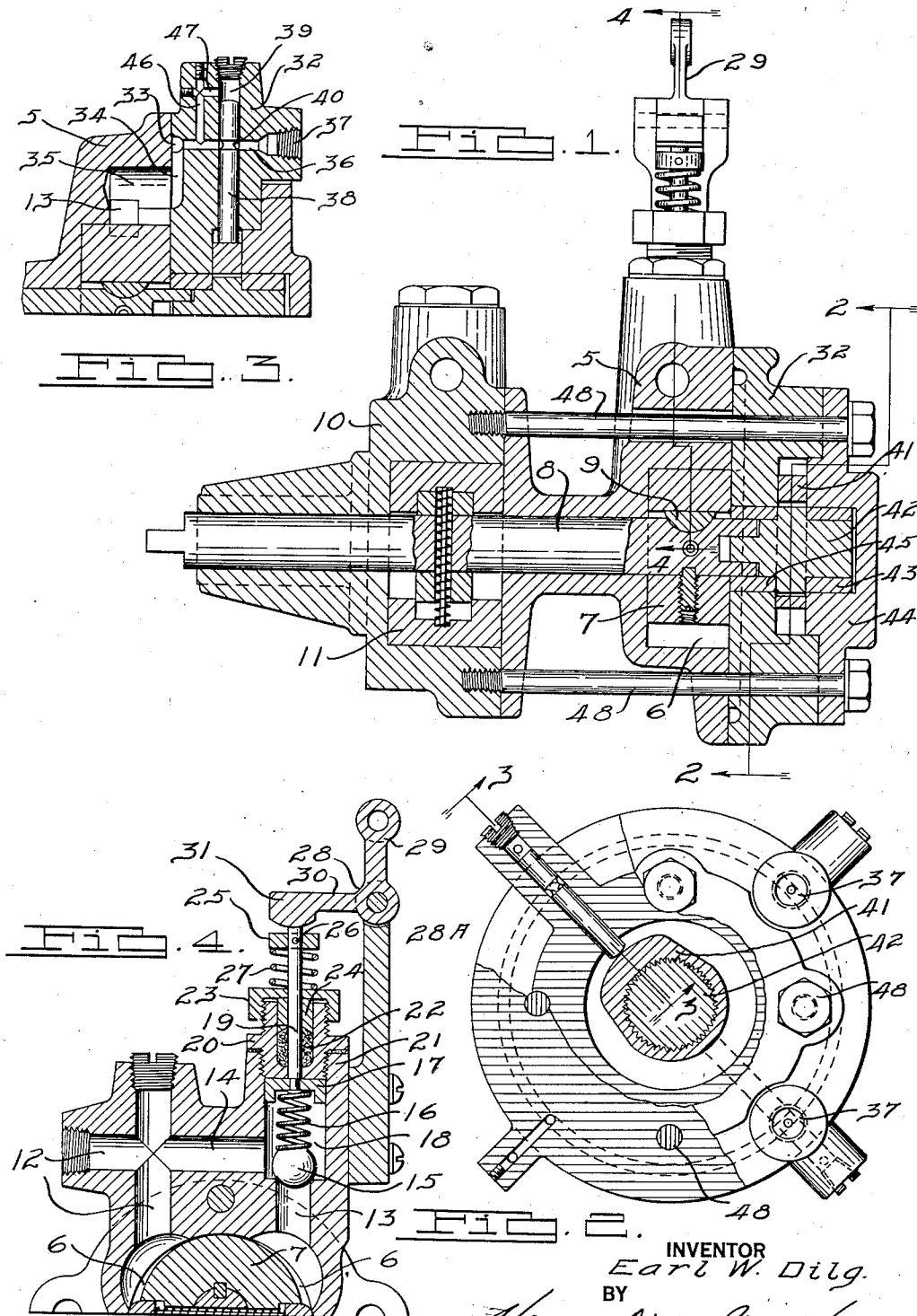
July 19, 1932.

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1,868,161

PUMP MECHANISM

Filed Feb. 20, 1930



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PUMP MECHANISM

Application filed February 20, 1930. Serial No. 429,867.

This invention relates to fuel supply devices for internal combustion engines.

The main objects of this invention are to provide an improved fluid pump and distributing means for the discharge thereof; to provide a unitary structure of pump and distributor having a common drive shaft; to provide improved means for varying the pressure in the pump discharge so as to vary the velocity and consequently the amount of the distributed fluid; and to provide a compact unit of simple construction which will draw the fuel from the supply tank and distribute it to the various cylinders of a motor in variable quantities as desired.

An illustrative embodiment of this invention is shown in the accompanying drawing, in which

Fig. 1 is a vertical, medial, longitudinal, sectional view of my improved unit.

Fig. 2 is a sectional view of the same taken on the line 2—2 of Fig. 1, looking in the direction indicated by the arrows.

Fig. 3 is a sectional view of the same taken on the line 3—3 of Fig. 2, looking in the direction indicated by the arrows.

Fig. 4 is a sectional view of the same taken on the line 4—4 of Fig. 1, looking in the direction indicated by the arrows.

Heretofore in the construction of fuel supply systems utilizing the injection principle, it has been customary to have injection units which have piston plungers therein, which piston plungers are arranged to have a variable stroke, that is, length of travel. This has been necessary for the purpose of increasing or decreasing the amount of fuel supplied to the engine cylinder to meet the varying conditions from idling to that of full power.

These systems have all been more or less unsatisfactory due to the fact that a sufficient range was not obtainable and consequently the majority of the successfully operating injection principle types of fuel systems are confined in their use to engines which run at

substantially constant speed under all conditions, such as airplane and marine motor engines. Such systems are not at all adaptable for use in automobiles where the speed and power output of the motor is constantly changing and has to vary between wide limits.

In the construction shown in the drawing a housing or casing 5 is provided with a pumping cylinder 6, within which is housed a rotor piston 7 rigidly secured to a drive shaft 8 by a key 9. The shaft 8 is journaled in the housing 5, and in the particular unit shown extends into and through another housing 10 which has a rotary lubricating oil pump 11 therein.

The pump housing 5 is provided with intake and discharge passageways 12 and 13, respectively, which communicate with the pumping cylinder 6. A by-pass 14 is formed in the housing 5 for providing communication between the discharge passageway 13 and the intake passageway 12. A ball valve 15 for controlling the flow of fluid through the by-pass 14, is normally, yieldingly urged toward its seat by a helical compression spring 16. One end of the spring 16 fits upon the ball 15 and the other end thereof fits within an inverted cup-shaped plunger 17 slidably mounted within a cylindrical passageway 18, which houses the ball valve and spring assembly.

Means are provided for varying the tension on the spring 16 and comprise a vertically disposed pin or stem 19 axially slidable in a stuffing box 20, which is threaded into an upstanding hollow boss 21 integrally formed on the housing 5. The stuffing box 20 carries a packing gland 22 for preventing the escape of fluid around the stem 19 and a cap nut 23 is threaded on the outer end of the stuffing box for urging a packing gland ring 24 downwardly against the packing 22.

The lower end of the stem 19 is riveted to the inverted cup 17 and the upper end there-

of protrudes above the cap nut 23 and the tip end thereof is provided with a washer 25 secured thereto by a pin 26. A helical compression spring 27 surrounds the outer projecting end of the stem 19 with one end thereof seated on the top side of the cap nut 23 and the other end thereof bearing against the under side of the washer 25.

Means are provided for axially moving the stem 19 downwardly against the action of the compression spring 27 so as to compress the valve spring 16, and comprise a bell crank lever 28, pivoted on the upstanding end of a bracket arm 28A. One arm 29 of the bell crank 28 is adapted to be connected to the carburetor throttle and the other arm 30 thereof terminates in a head 31. The head 31 has a convex face which rests upon and bears against the top end of the stem 19.

Means are provided for distributing the fluid discharged by the pump to a plurality of sources such as the cylinders of an internal combustion engine, and comprise a distributor valve casing 32 which is provided with an annular groove 33 on the inner face thereof. The groove 33 communicates through a passageway 34 with an axially disposed passageway 35 of the pump casing 5, which in turn communicates with the discharge passageway 13. The casing 32 is adapted to fit against the outer side or face of the pump casing 5 in fluid-tight contact therewith so that it closes the groove 33 and forms an annular passageway which is disposed in concentric relation with respect to the axis of the drive shaft 8.

In the particular embodiment shown, the fluid is to be distributed to four different sources, such as a four-cylinder engine, but any number may be provided for in the same manner. The distributor casing 32 as shown, is provided with four axially disposed passageways 36 which are disposed equi-distantly circumferentially of the casing. The inner ends of the passageways 36 communicate with the annular passageway 33, and the outer ends may be threaded as shown at 37 to receive suitable pipe connections which lead to the various cylinders.

Means are provided for controlling the flow of fluid through these passageways 36 and comprise an equal number of valves in the form of pins 38 which are axially slidable in radially extending passageways 39. The passageways 39 intersect and are of larger diameter than the fuel passageways 36. Each of the pins 38 has an annular groove 40 turned in the outer periphery thereof which permits the passage of fluid around the valve pin when said groove is in registry with the fuel passageway 36 by reason of its smaller cross sectional area.

Means are provided for moving the valve pins 38 outwardly radially of the device and comprise a cam 41 mounted on a shaft head

42. The head 42 is journaled in a bushing 43 carried in an outer closure cap 44 and in a bushing 45 carried by the distributor casing or housing 32. The shaft 42 is in axial alignment with the shaft 8 and the adjacent ends thereof have interfitting tongue and groove connections so that the shaft 8 drives the shaft 42. The cam 41 is preferably mounted on the shaft head 42 by a plurality of V-shaped teeth or serrations so that its position relative to the shaft may be readily adjusted by slipping the cam axially off of its serrated mounting and replacing in a different angular position.

Means are provided for normally holding the valve pins 38 inwardly in contact with the cam 41 and comprise passageways 46 and 47 which provide communication between the fluid discharge passageway 36 and the outer end of the valve pin passageway 39 so that fluid pressure in the discharge of the pump will be exerted against the outer end of the valve pin at all times.

The fuel pump housing 5, lubricating oil pump housing 10, distributor housing 32 and outer closure cap 44 are all tied together and held in assembled relationship by a plurality of axially extending cap screws 48 which are threaded into the housing 10, and the heads of which bear against the outer side of the closure cap 44.

In the operation of this unit the intake 12 of the fuel pump is connected to a suitable source of supply and the shaft 8 connected to a suitable source of power so that it may be rotated. Usually this connection is to the cam shaft of the internal combustion engine through suitable gears. When this connection has been made the cam 41 is adjusted on its mounting so as to be in proper timed relationship with respect to the cylinders of the engine whereby fuel will be discharged to said cylinders at the appropriate times with relation to the opening and closing of the engine cylinder valves.

The normal output of the fuel pump is considerably in excess of the fluid permitted to pass by the valve pins 38, such excess escaping around the by-pass ball valve 15 and returning through the passageway 14 to the intake side of the pump. The arrangement is preferably such that with the by-pass valve spring 16 in the position shown in Fig. 4 of the drawing, only sufficient fluid will be discharged through the passageways 36 to cause the internal combustion motor to idle, the remainder of the fuel by-passing within the fuel pump.

When it is desired to speed up the motor the throttle is actuated to rotate the bell crank lever 38 in a left-hand direction as viewed in Fig. 4 of the drawing, whereby the arm 30 which carries the head 31 is rotated downwardly to axially move the stem 19 downwardly and thus compress the by-pass valve

spring 16. This increased pressure on the spring 16 will in turn increase the pressure of the fluid in the discharge passageways of the pump, thereby causing a proportionately greater amount of fuel to pass by the valve pins 38 during the same period of opening. As the pressure within the pump is increased the amount of fluid fuel discharged through the passageways 36 will be proportionately increased. The strength of the by-pass valve spring and the contour of the cam 41 may be varied to meet the requirements of different engines.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims:—

I claim:—

1. In a fluid pump and distributing apparatus, the combination of a housing having a pumping cylinder therein, intake and discharge passageways in said housing communicating with said pumping cylinder, a shaft journaled in said housing, a rotor piston on said shaft for said pumping cylinder, a valve pin passageway intersecting said discharge passageway, a valve pin slidable in said valve pin passageway, said pin normally closing said discharge passageway, a portion of said pin being of less cross sectional area than the remainder for permitting the passage of fluid thereby when in registry with said fluid discharge passageway, a passageway providing communication between said fluid discharge passageway and the passageway at one end of said valve pin for moving said pin in one direction by fluid pressure, and a cam driven by said pump shaft for moving said pin in the opposite direction.

2. In a fluid pump and distributing apparatus, the combination of a housing having a pumping cylinder therein, a shaft journaled in said housing, a rotor piston on said shaft for said pumping cylinder, intake and discharge passageways in said housing communicating with said pumping cylinder, said housing having a plurality of branch fluid passageways concentrically arranged with respect to the axis of said shaft and circumferentially spaced therearound, a plurality of radially extending valve pin passageways in said housing intersecting said fluid passageways, cylindrical valve pins axially slidable in said pin passageways, said pins normally closing said branch fluid passageways, a portion of each of said pins being of less cross sectional area than the remainder for permitting the passage of fluid thereby when in registry with its fluid passageway, passageways in said housing providing communication between said pump discharge and

the outer ends of said valve pin passageways for moving said pins inwardly by fluid pressure, and a cam on said shaft for moving said pins outwardly to open said valves.

3. In a fluid pump and distributing apparatus, the combination of a housing having a pumping cylinder therein, a shaft journaled in said housing, a rotor piston on said shaft for said pumping cylinder, intake and discharge passageways in said housing communicating with said cylinder, a by-pass providing communication between said intake and discharge passageways, a valve for controlling the passage of fluid through said by-pass, yielding means normally urging said valve toward a closed position, a valve normally closing said pump discharge passageway, means operated by said pump shaft for opening said valve a constant interval in relation to the rotation of said pump rotor, and means for varying the pressure of said by-pass valve yielding means to vary the pressure in said pump discharge and thereby vary the amount of fluid flowing past said discharge valve.

4. In a fluid pump and distributing apparatus, the combination of a housing having a pumping cylinder therein, a shaft journaled in said housing, a rotor piston on said shaft for said pumping cylinder, intake and discharge passageways in said housing communicating with said cylinder, a by-pass providing communication between said intake and discharge passageways, a valve for controlling the passage of fluid through said by-pass, a spring normally urging said valve toward a closed position, a valve normally closing said pump discharge passageway, a cam driven by said pump shaft for opening said discharge valve a constant interval in relation to the rotation of said pump rotor, and throttle means for varying the tension on said by-pass valve spring to vary the pressure in said pump discharge and thereby vary the quantity of fluid flowing past said discharge valve.

5. In a fluid pump and distributing apparatus, the combination of a housing having a pumping cylinder therein, a shaft journaled in said housing, a rotor piston on said shaft for said pumping cylinder, intake and discharge passageways in said housing communicating with said pumping cylinder, said housing having a plurality of branch fluid passageways, concentrically arranged with respect to the axis of said shaft and circumferentially spaced therearound, said passageways operatively associated with an annular passageway disposed adjacent the ends thereof, a plurality of radially extending valves in the passageways in said housing intersecting said concentrically arranged passageways, cylindrical valve pins axially slidable in said passageways, said pins normally closing said branch fluid passageways, a portion

of each pin being of less cross sectional area than the remainder for permitting the passage of fuel thereby when in registry with the fluid passageway, passageways in said housing providing communication between said pump discharge and the outer ends of said valve passageways for moving said pins inwardly by fluid pressure and a cam on said shaft adjacent said rotor for moving said pins outwardly for moving said valve.

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