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FUEL SUPPLY SYSTEM

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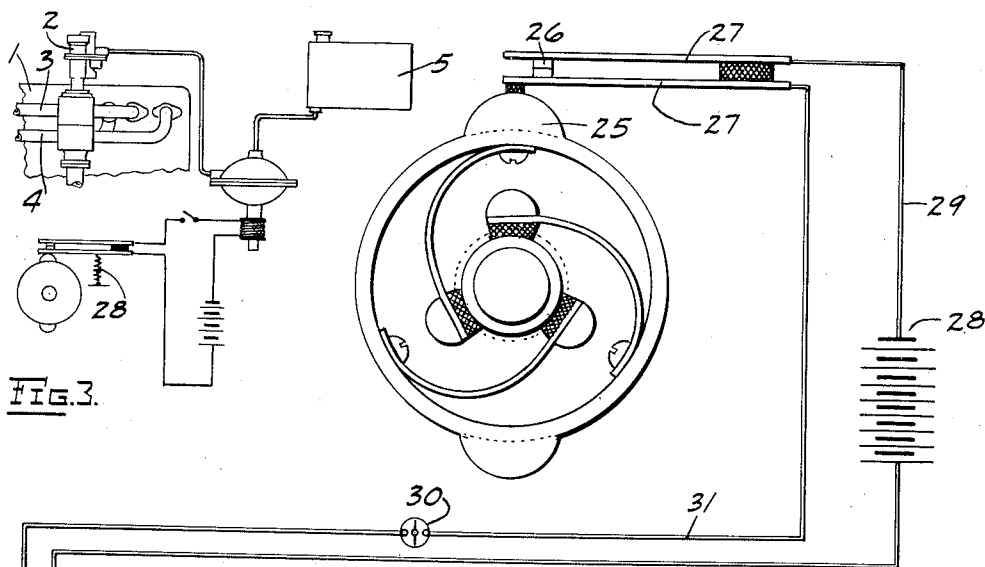


FIG. 1.

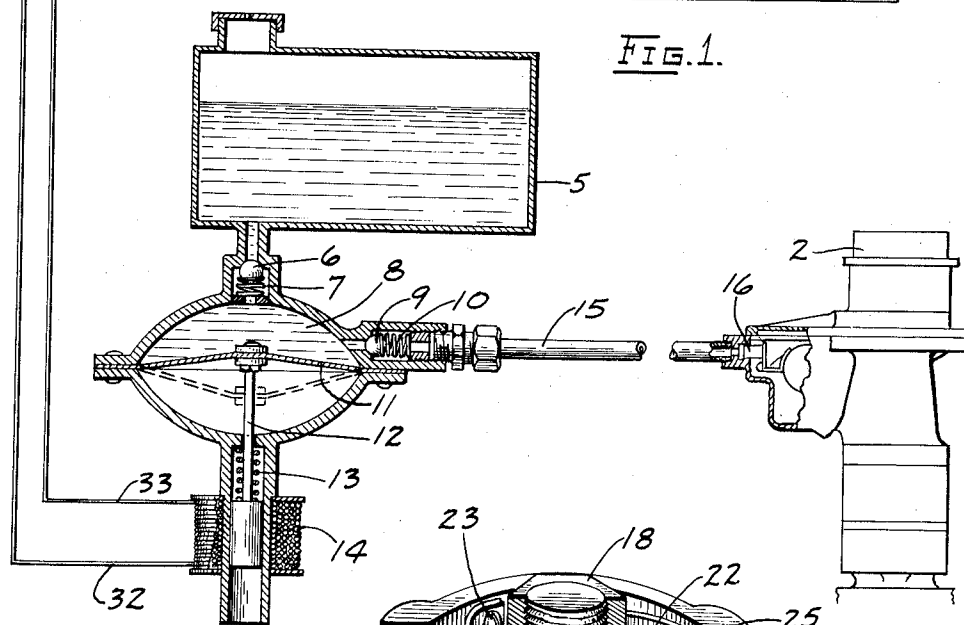


FIG. 2.

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FUEL SUPPLY SYSTEM

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10 Claims. (Cl. 123—140)

This invention relates to fuel supply systems and more particularly to electrically operated pumping devices for supplying fuel from the main tank of an internal combustion engine to the carburetor.

It has been considered highly desirable to locate the pump at the bottom of the main fuel tank, because it can be supplied with fuel by gravity and no suction is required to draw the fuel into the pumping chamber. Another advantage of this type of mounting is that the boiling of the fuel between the pump and the carburetor will not stop the fuel supply. It is very difficult to locate a mechanically operated pump at the main tank because of the desirability of operating it from the engine which is usually eight or ten feet away. For this reason, electric pumps have been suggested, but they are subject to several difficulties. One of these difficulties is the unreliability of the action of the breaker points or brushes, and the other is the danger of continuous operation of the pump if the operator forgets to turn off the current when the motor is not running, as a defective float valve in the carburetor may permit the pump to discharge continuously.

It is an object of this invention to provide a thoroughly reliable electric pump, mounted at the main tank of the engine.

It is a further object of the invention to provide an electric pump which will be incapable of continuously discharging fuel even though the current is left turned on and there is some defect in the operation of the carburetor float valve.

It is a further object of the invention to provide a pump of the above described character in which there will be no electrical contacts to be made or broken at or near the pump or fuel tank.

It is a further object of the invention to provide an arrangement for controlling the supply of current to the fuel pump by means of the engine.

It is a further object of the invention to provide a means controlled by the engine for supplying current to the fuel pump, in impulses which at low speeds correspond to the rate of operation of the engine but which at high speeds are supplied at a frequency corresponding to a lower rate of speed than that at which the engine is operating.

It is a further object of the invention to provide a means for supplying power impulses to the fuel pump at a rate which does not increase as the rate of operation of the engine increases.

It is further object of the invention to provide a means controlled by the engine for supplying current impulses to the solenoid operated fuel

pump without reducing the length of each individual impulse in accordance with the increase of speed at which the engine is operated.

The invention will be better understood upon reference to the following specification and accompanying drawing, in which

Figure 1 is a diagrammatic showing of the invention.

Figure 2 is a perspective of the breaker cam, parts being shown in section and others broken away.

Figure 3 is a diagrammatic view showing the application of the invention.

The reference numeral 1 indicates an internal combustion engine, having a carburetor 2, intake manifold 3, and exhaust manifold 4. The fuel supply is carried by a main tank 5, the outlet of which is provided with a lightly seated check valve 6. This valve may be closed in any suitable manner, but I have indicated a light spring 7 for the purpose. An expansible chamber 8 receives fuel through the inlet check valve 6 and has an outlet port which is controlled by the outlet check valve 9, normally held in closed position by the spring 10 or by any other suitable means. The expansible chamber is provided with a diaphragm 11, normally held in the position shown by the dotted lines in Figure 1 by the rod 12 and spring 13. The diaphragm may be moved to the position shown in solid lines in Figure 1 by the electric solenoid 14. The outlet of the expansible chamber 8 is connected to the carburetor 2 by means of the conduit 15 and float chamber of the carburetor is provided with a conventional float operated valve 16 for stopping the admission of fuel when a predetermined fuel level has been reached. This fuel line may be provided with further pressure control accessories of the type shown in Figures 3 and 16 of the Ericson and Boyce Patent No. 2,059,355, issued November 3, 1936, if desired, but these form no part of the present invention and are, therefore, not shown.

The engine is provided with a rotatable shaft 17 which is driven by the engine and which may be the well-known distributor shaft which carries the cam 18 which operates the breaker points for the ignition system. Any shaft driven by the engine, however, will serve the purpose. This shaft carries a cam housing 19 which is provided with a bearing 20 so that it will be freely rotated on the shaft except as resisted by the brake members 21. These brake members are carried at the inner end of spring arms 22 attached to the housing 19 by screws 23. The spring arms may be provided with weights 24 which are thrown out-

wardly by centrifugal force as the speed increases. The cam housing is provided with one or more cams 25 adapted to operate a pair of breaker points 26 which are normally held in separated position by the spring arm 27, but brought into contact by the cams 25. The breaker points are connected to the battery 28 by means of lead 29 and to the ignition switch 30 by means of lead 31. The solenoid 14 is connected to the ignition switch 30 by means of the lead 32 and to the battery by means of lead 33.

In operation, when the engine speed is low, the brake action of the members 21 causes the cam housing to rotate in accordance with the speed of the engine, but at high speeds the members 21 slip on the shaft 17 so that the increase in speed of operation of the breaker points 26 is less than the increase in speed of the operation of the engine. Furthermore, the slipping action of the members 21 causes a slight slowing down or stoppage of the cam housing 25 at each contact of the breaker points on account of the resistance interposed by the spring arm 27. This results in energizing the solenoid and pumping of fuel at a rate which is much more constant than the rate of engine operation, it being understood that the pump can supply no more fuel than is required by the engine on account of the action of the float valve 16. Other limiting factors are, of course, the strength of the solenoid and any other pressure controls which may be provided.

An important feature in the invention is the fact that the action of the members 21 is such as to give a slight dwell of the breaker points even at high speeds, so that there will be time enough to saturate the solenoid coil sufficiently to give a substantial operation to the diaphragm 11.

The invention is not limited to the structure shown, but may be modified in various respects as will occur to those skilled in the art, and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a device of the class described, a driving shaft, a pulsating fluid pump having an operating solenoid, and means for operating said pump from said shaft comprising a circuit make and break device electrically connected to said solenoid, a member rotatable relative to said shaft and arranged to actuate said device during its rotation, said member having brake elements, and means urging said elements into frictional engagement with said shaft for transmitting motion from said shaft to said member, said last mentioned means being adapted to yield as the speed of said member increases to reduce the frictional resistance between said brake elements and said shaft whereby slippage may occur therebetween.

2. In a fuel feed mechanism for an internal combustion engine, an engine driven rotating member, a pulsating fuel pump, a second rotating member having an operating connection with said pump for transmitting pulsations thereto, a transmission device operatively connecting said rotating members, said transmission device including a frictional device, and means urging said frictional device into frictional engagement with one of said rotating members, said means being yieldable by centrifugal force as the speed of said members increases to reduce the effectiveness of said frictional device and eventually produce slippage between said device and said last mentioned member.

3. In fuel feed mechanism for an internal combustion engine, an engine driven rotating member, a pulsating fuel pump, and a second rotating member concentric with said first member and having structure frictionally engaging said first member, said second member having an operating connection with said pump for transmitting pulsations thereto and said structure being radially yieldable by centrifugal force for producing slippage between said members as the speed thereof increases.

4. Mechanism as specified in claim 3 including spring means urging said frictional structure against said engine driven member with sufficient force to prevent slippage until a predetermined effective maximum speed of said pump has been reached.

5. In fuel feeding mechanism for an internal combustion engine, a pulsating fuel pump, a pair of concentric rotating members, one being engine driven and the other being operatively connected to said pump for transmitting pulsations thereto, and a centrifugally yieldable, frictional clutch connection between said members arranged to yield when the engine speed exceeds a predetermined rate.

6. In fuel feeding mechanism for an internal combustion engine, a pulsating fuel pump, and a pair of concentric rotating members, one being engine driven and the other being operatively connected to said pump for transmitting pulsations thereto and having radially yieldable structure frictionally engaging the first-mentioned member for transmitting rotation between said members, said structure incorporating a centrifugal governor for varying the frictional resistance between the rotating member connected to the pump and said engine driven member inversely in accordance with the engine speed.

7. In an internal combustion engine, a fuel pump, engine operated means for operating the fuel pump, and means including a speed responsive device for limiting the speed of the pump as the engine speed increases.

8. In an internal combustion engine, a fuel pump, an operating device for said pump, means driven from the engine for actuating the operating device, said means including a speed responsive device, said speed responsive device being constructed and arranged to form a positive driving connection between the operating device and the engine driven means when the engine speed is low and to form a slipping connection when the engine is operated at a higher speed.

9. In an internal combustion engine, a pump, a solenoid for operating said pump, means driven by the engine for making and breaking a current supply to said solenoid and for controlling the rate of current impulses to said solenoid, said control means including means capable of operation at high engine speeds for increasing the length of the current impulses relative to the speed of the engine.

10. In an internal combustion engine, a solenoid operated pump, an engine operated shaft, a make and break device for controlling the supply of current to said solenoid, driving means operated by said shaft to operate said make and break device, said driving means including speed responsive means for increasing the proportion of time during which current flows to the solenoid relative to the speed of the engine operated shaft as the engine speed increases.