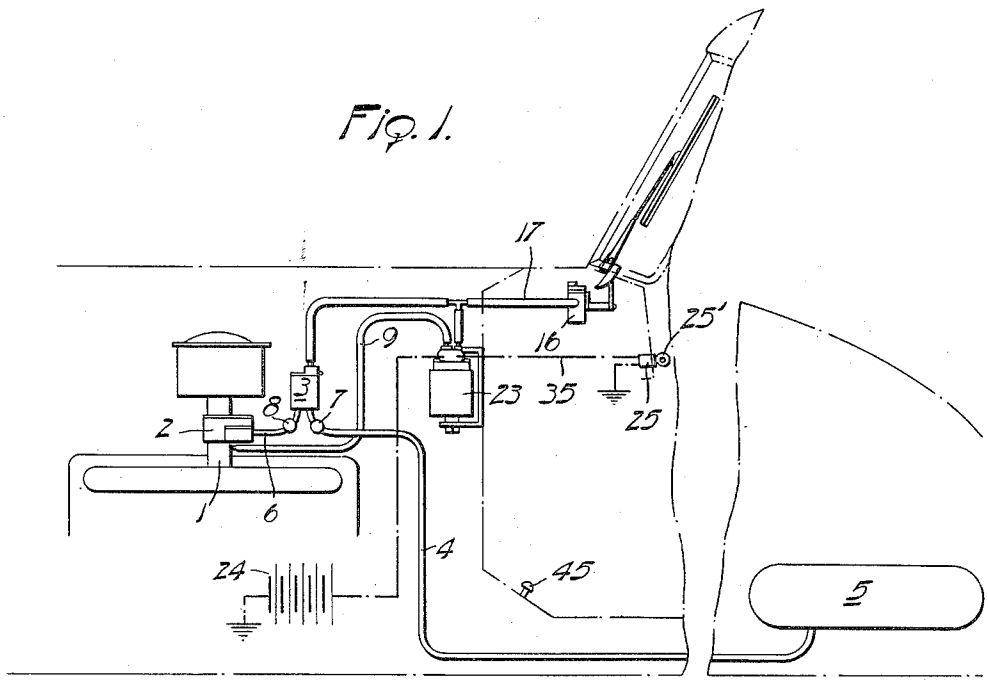
Aug. 12, 1952 A. RAPPL 2,606,543

FUEL SYSTEM

Filed April 20, 1948 2 SHEETS—SHEET 1

Fig. 1.



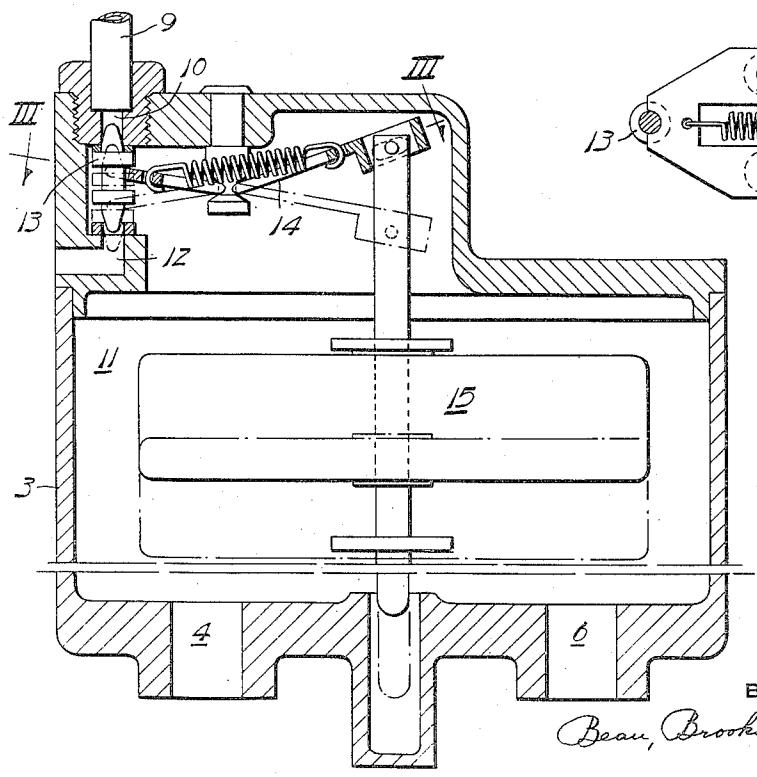


Fig. 2.

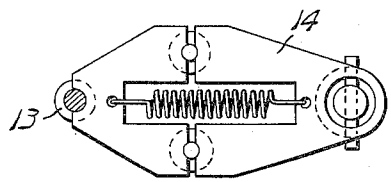


Fig. 3.

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Fig. 4.

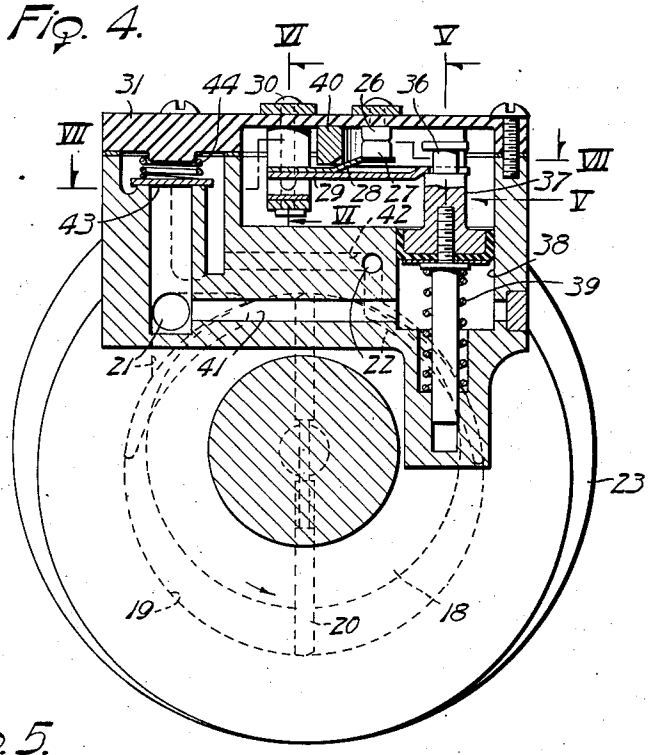


Fig. 5.

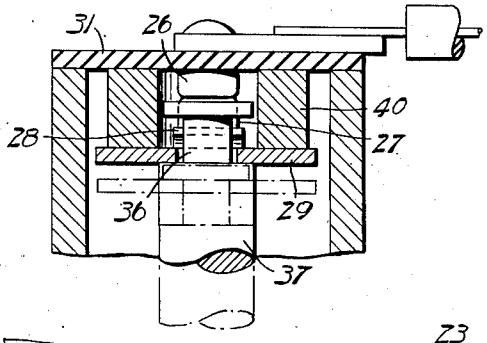
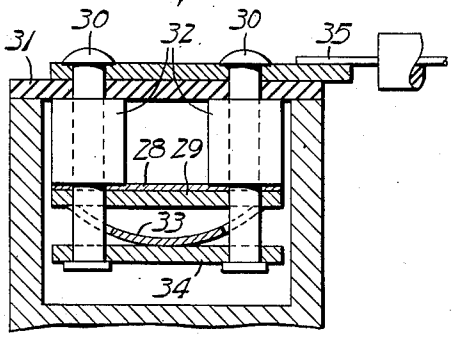


Fig. 6.



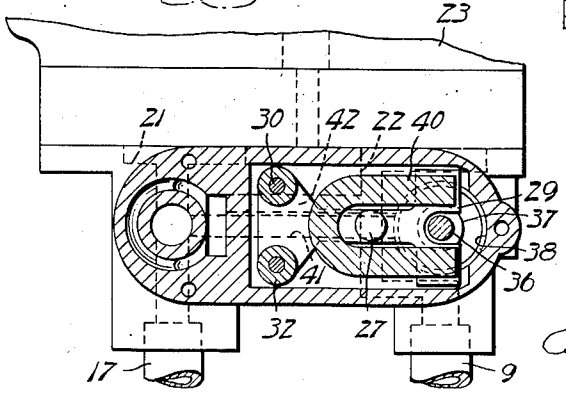


Fig. 7.

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FUEL SYSTEM

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Application April 20, 1948, Serial No. 22,143

12 Claims. (Cl. 123—136)

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This invention relates to an accessory system for a motor vehicle and especially to a system which utilizes the suction influence of the intake manifold as its source of operating pressure. This source fluctuates according to the position of the engine throttle, and many attempts have been made to supplement or to wholly supplant the source, during intervals of operating deficiency, in an effort to maintain the operation of the system.

The primary object of this invention is to provide a practical source of operating pressure which is normally disposed inoperative but will quickly function upon demand during intervals when the manifold source of fluctuating pressure is insufficient for practical accessory operation. Again, the invention resides in a novel pressure generating unit which is simple in design, efficient in use, and automatic in operation.

Furthermore, the invention resides in a fuel system which will insure ample fuel supply for starting the engine as well as for the continued reliable and efficient operation. After a motor vehicle has stood idle for a prolonged period the fuel in the carburetor may dissipate, through leakage or otherwise, and retard the starting of the engine. The fuel system of the present invention is designed to provide an adequate supply of fuel for facilitating and effecting a quick start of the engine when the starter control is initially actuated.

The foregoing and other objects will manifest themselves as the following description progresses, reference being had to the accompanying drawings, wherein

Fig. 1 is a schematic view of the general layout of the improved accessory system incorporating, by way of example, a windshield cleaner and a vacuum fuel tank;

Fig. 2 is a vertical sectional view through the vacuum fuel tank;

Fig. 3 is an irregular section taken about on line 3—3 of Fig. 2 and depicting the valve action;

Fig. 4 is a transverse sectional view through the pump unit showing the bypass or shunt passage and the automatic control feature; and

Figs. 5, 6, and 7 are sectional views taken respectively about on lines 5—5, 6—6 and 7—7 of Fig. 4.

Referring more particularly to the drawings, the numeral 1 designates the intake manifold of the motor vehicle power plant, 2 the carburetor thereof, and 3 the vacuum or gravity flow tank which latter is connected by a conduit 4 to the supply tank 5 and by a conduit 6 to the usual float chamber of the carburetor, suitable check valves 7 and 8, respectively, being interposed in

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the connecting passages for directing the flow of fluid properly through the system. The suction influence of the intake manifold is transmitted through a passage 9 to a port 10 opening into the fuel chamber 11 of the fuel tank 3. An atmospheric port 12 opens in opposition to the suction port 10 and is opened and closed in alternation therewith by an interposed valve 13. A snap action 14 effects a quick shift of the valve 13 as the float 15 rises and falls with corresponding changes in the level of the fuel in the chamber 11, thereby opening the chamber to the suction influence of the manifold 1 when the fuel supply is at a predetermined minimum and closing the suction communication when replenishment of the fuel supply has been completed. For compactness, the gravity flow tank 3 may be an integral part of the carburetor, and the chamber 11 may constitute the usual float chamber of the carburetor. When the suction port 10 is closed the atmospheric pressure will act through the port 12 upon the liquid and enable the latter to gravitate through the passage 6 to the carburetor. If desired, a secondary accessory, such as the windshield cleaner 16, may be connected into the suction line by a branch passage 17.

Interposed in the suction line, or placed in suitable communication with it, is a secondary source of negative pressure which is herein illustrated in the form of a rotary pump, the same having a rotor 18 eccentrically mounted within a chamber 19 of the pump housing and carrying impeller blades 20 for effecting air movement from the inlet passage 21 to and out through the outlet passage 22.

An electric motor 23 is provided to operate the pump, the motor being arranged coaxially of the pump and connected to a source of energy, such as the battery 24. In accordance with this invention means are provided to effectively operate the pump prior to starting the engine, such means comprising herein the usual ignition switch 25 which is also connected in circuit with the motor 23. Consequently, when the engine ignition system is closed by turning the switch key 25', the pump will become energized and start the flow of fuel by the time the starter control is actuated. Cooperating with the ignition switch, and forming a part of the pump operating means, is a pressure responsive switch having a fixed contact 26 and a movable contact 27, the latter being carried by a spring finger 28 on a pivoted arm 29. A pair of posts 30 loosely but pivotally mount the arm 29, such posts depending from a cover plate 31 of suitable insulating material and serving to hold the arm plate assembly 28, 29 in spaced relation there-

to with the aid of spacers 32. A bowed spring 33 has its opposite ends slotted to straddle the depending posts and rests upon a shelf 34 in a manner to exert an upward pressure on the arm 29 for normally holding the latter up against the spacers 32. The posts 30 electrically connect the circuit wire 35 to the contact bearing finger 28 which is borne by the arm 29.

The pressure responsive switch is mounted on the pump housing for completing the readily mountable pump-motor unit. The outer end of the arm 29 is bifurcated to receive the reduced neck 36 of a plunger 37, which latter operates within a chamber 38 and is lifted by an underlying coiled spring 39 to a position for maintaining the contacts 26, 27 in circuit closing relation. Means are provided to insure a quick make and break engagement between the contacts. To this end the bifurcated portions of the arm 29 are extended laterally to underlie and form an armature for a permanent magnet, such as the horseshoe magnet 40. This magnet will serve to hold the switch contacts together until the plunger 37 responds to a dominating pressure whereupon the arm 29 will quickly move. Likewise, when the plunger carries the arm sufficiently far into the magnetic field the armature forming arm will yield to close the contacts. The plunger chamber 38 communicates through a passage 41 with the inlet passage 21 of the pump, and, since this inlet passage is connected to the accessory, it will be apparent that the pressure condition in the suction line between the pump and the accessory will determine the opening and closing of the switch contact points 26 and 27. Therefore, the system will serve to maintain a constant head or level of fuel in the vacuum pump 11 whenever the valve 13 opens the suction line to the vacuum tank.

When first starting the vehicle the ignition switch 25 is closed. At this moment the electric motor will become energized and likewise the pump, providing the contact 27 is engaged with contact 26, which will be the case when the negative pressure has dissipated from the accessory supply line. The response of the motor will be instantaneous and may be of brief duration sufficient to evacuate the supply line and to depress the plunger for reopening the motor circuit. However, should the vacuum tank require replenishment and the valve 13 be opened, the fuel will flow from valve 7 into chamber 11. An ample supply of fuel will therefore be assured for a quick start of the vehicle engine. All of this will transpire by the time that the usual starter button 45 is actuated. The spring 39 is calibrated and designed to maintain the switch 26, 27 closed when the pump is required for either accessory and a resultant air-stream is flowing through the pump passages.

When the manifold suction influence is sufficient, the air-flow from the accessory will bypass the arrested pump through a shunt passage 42 which joins the inlet and outlet passages 21 and 22. A check valve 43 is held seated by a spring 44 for normally closing the shunt passage when the pump is in operation.

The pressure responsive member 37, being subject to slight pressure changes in the manifold influence, is precluded from opening the switch 26, 27 except in the presence of a predetermined suction urge sufficient to overcome the magnetic pull imposed upon the arm 29 by the magnet. When this takes place the contact point 27 will be pulled away from the companion contact 26 with a snap action and thereby avoid destructive arcing between the points. Furthermore, the reduced neck 36 is elongated to afford a limited play or lost motion in the connection between the plunger and the arm 29. This will permit a certain freedom of movement for the plunger independent of the switch arm 29. Likewise, it will enable a freedom of movement of the contact bearing arm 29 to its circuit closing position when it has been advanced by the plunger sufficiently far into the magnetic field.

While the foregoing description has been given in detail, it is not intended thereby to limit the invention since the inventive principles involved are capable of assuming other physical changes without departing from the spirit of the present invention and the scope of the appended claims.

What is claimed is:

1. A fluid pressure generating unit comprising a rotary pump having a chamber with an inlet and an outlet, the latter being circumferentially spaced from the inlet, a shunt passage connecting the inlet and outlet in a manner to bypass the chamber, a check valve in the shunt passage confining fluid flow therethrough uni-directionally from the inlet to the outlet, an electric motor supporting the pump and connected thereto for operating the same, and pressure responsive switch means in circuit with the motor and responsive to the pressure in the shunt passage.

2. A fluid pressure generating unit comprising a rotary pump having a housing, an inlet and an outlet communicating with the pump chamber at circumferentially spaced points, a shunt passage connecting the inlet and outlet in a manner to bypass the chamber, a check valve in the shunt passage compelling fluid flow therethrough uni-directionally from the inlet to the outlet, a rotary electric motor arranged on the pump for operating the same and mountable therewith as a unit, a switch connected in circuit with the motor, and means in the pump housing responsive to the fluid pressure in the shunt passage for operating the switch, said means being connected to the switch by a play connection affording limited independent movement of the fluid responsive means.

3. A pressure generator comprising a rotary pump having an inlet and an outlet communicating with the pump chamber at circumferentially spaced points, an electric motor for operating the pump, a chamber shunting passage connecting the inlet to the outlet and embodying a one-way check valve, a switch connected in circuit with the motor and having a magnet acting to attract the switch to its circuit closing position, and means responsive to the fluid pressure in the passage and connected to the switch for opening it against the magnetic force.

4. A pressure generating device for motor vehicle accessory systems, comprising a combined motor pump unit mountable and demountable as a unit, a switch connected in circuit with the motor and having a contact arm movable to a circuit closing position for controlling its operation, a shunt passage connecting the inlet to the outlet in a manner to bypass the pump chamber, a check valve arranged in the shunt passage for directing fluid flow therethrough from the inlet to the outlet, a permanent magnet acting to hold the contact arm in a closed position, and means responsive to the fluid pressure for controlling the switch, said responsive means being joined to the contact arm by a lost motion coupling to enable the arm

responding to the magnetic force independently of the responsive means.

5. A pressure generating system comprising a pump, a motor for actuating the pump, a switch connected in circuit with the motor for controlling its operation and having a contact arm movable to a circuit closing position, a magnet acting on the arm as an armature for attracting the same to its circuit closing position, and means responsive to the pump pressure for controlling the switch and connected to the switch by play connection for enabling independent preliminary operation of said means in opening the switch and for enabling independent closing movement of the contact arm following a predetermined movement of the pressure responsive means therewith.

6. A pressure generating unit for motor vehicle accessory systems, comprising a pump having a housing, a motor for actuating the pump carried by the housing, a switch on the housing connected in circuit with the motor for controlling its operation, a shunt passage connecting the inlet to the outlet in a manner to bypass the pump chamber, a check valve arranged in the shunt passage for directing fluid flow therethrough from the inlet to the outlet, means responsive to the fluid pressure for controlling the switch, and means for securing a quick opening and closing of the switch by said pressure responsive means.

7. A fuel system for a motor vehicle, comprising a gravity flow tank communicating with a carburetor, a suction line from the engine manifold to the tank, a suction pump interposed in the suction line, a fuel supply line to the tank, float controlled means operable to close the communication from the pump to the tank, a motor for actuating the pump, a switch connected in circuit with the motor for controlling its operation, a shunt passage connecting the inlet to the outlet in a manner to bypass the pump chamber, a check valve arranged in the shunt passage for directing fluid flow therethrough from the inlet to the outlet, means responsive to the pressure in the suction line at the inlet side of the pump for controlling the switch, and a permanent magnet attractively holding the switch in one position while permitting actuation of the switch to its other position in the presence of a dominating suction urge imposed thereon by the pressure responsive means.

8. A fuel system for a motor vehicle, comprising a gravity flow tank communicating with a carburetor, a suction line from the engine manifold to the tank, a suction pump interposed in the suction line, a fuel supply line to the tank, float controlled means operable to close the communication from the pump to the tank, a motor for actuating the pump, a switch connected in circuit with the motor for controlling its operation, a shunt passage connecting the inlet to the outlet in a manner to bypass the pump chamber, a check valve arranged in the shunt passage for directing fluid flow therethrough from the inlet to the outlet, means responsive to the pressure in the pump inlet for controlling the switch, a play connection between the pressure responsive means and the switch enabling limited freedom of movement of one part, and a magnet holding the switch in its closed position while permitting a dominating suction urge from either the pressure responsive means or the manifold to move the switch from such position.

9. A fuel system for a motor vehicle, comprising a gravity flow tank communicating with a carburetor, a suction line from the engine manifold to the tank, a suction pump interposed in the suction line, a fuel supply line to the tank, float controlled means operable to close the communication from the pump to the tank, a motor for actuating the pump, a switch connected in circuit with the motor for controlling its operation, a shunt passage connecting the inlet to the outlet in a manner to bypass the pump chamber, a check valve arranged in the shunt passage for directing fluid flow therethrough from the inlet to the outlet, and means responsive to the pressure in the pump inlet for controlling the switch and including a magnet holding the switch in one position for release by and upon a dominating urge imposed upon the switch by said pressure responsive means, the latter being resiliently connected to the switch.

10. A fuel feeding system for a motor vehicle power plant having an intake manifold as a source of suction, a gravity flow fuel tank supplying fuel to a carburetor, and an ignition circuit with a switch therein; in combination, a suction pump having its inlet connected to the tank and its outlet connected to the intake manifold, a shunt passage connecting the inlet to the outlet and including a check valve for insuring fluid flow therethrough from the inlet to the outlet, an electric motor for actuating the pump, a normally closed switch in series with the ignition switch and acting jointly therewith to control the operation of the pump motor, and pressure responsive means affected by the pressure in the inlet and at the inlet side of the check valve for opening the normally closed switch.

11. A motor vehicle having a gravity flow tank with a float controlled venting means, a pressure line between the vehicle power plant and the tank normally closed by the float controlled venting means when the tank is full of fuel, an ignition circuit having a control switch, a pressure pump interposed in the line, an electric motor connected to drive the pump when the power plant line pressure is ineffective, a switch for the motor arranged in circuit with the control switch, and means controlling the second switch to energize the motor and pump when the control switch is closed in the presence of a deficient supply of fuel.

12. A motor vehicle power plant having a fuel system with a fuel line leading from a supply tank through a float controlled valve into a chamber at the point of fuel consumption, a suction line connected to the chamber for lifting fuel from the tank to the chamber, a starter system having an ignition switch and a starter switch, a suction pump unit connected into the suction line, and an electric motor for driving the pump, said motor being connected in circuit with the ignition switch independently of the starter switch for being energized by the closing of the former to start the pump prior to operation of the starter switch.

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