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[54] **CARBURETOR PRIMING SYSTEM**
 4 Claims, 5 Drawing Figs.

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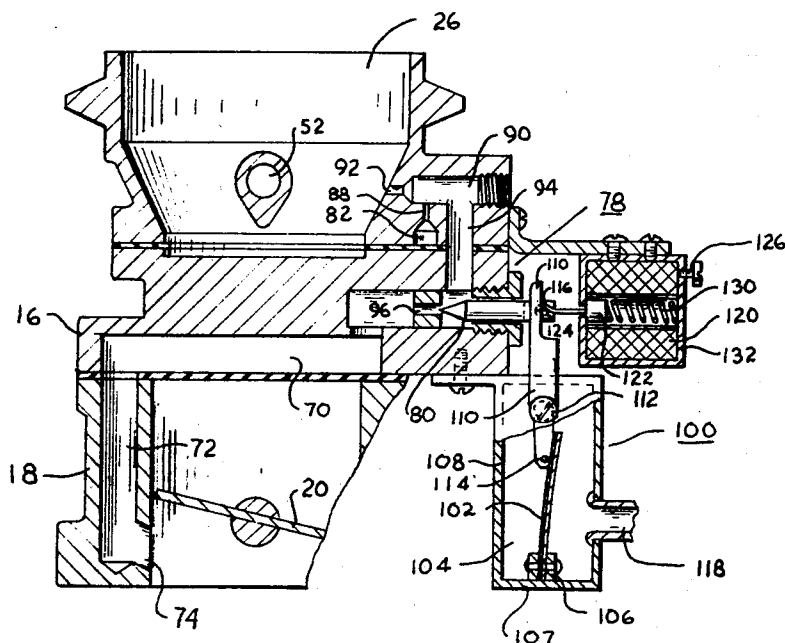
[51] Int. Cl..... **F02m 1/06,**
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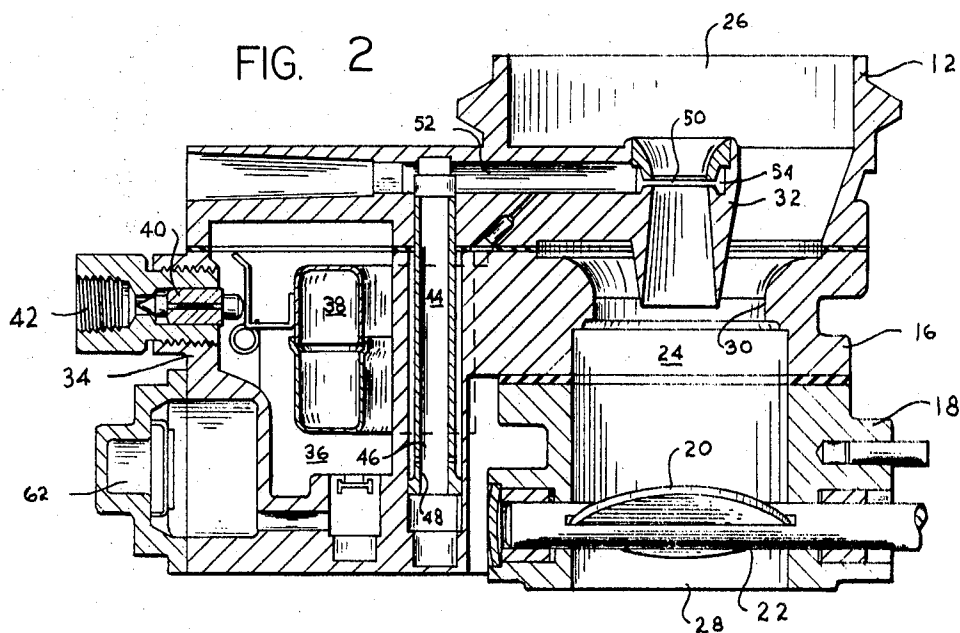
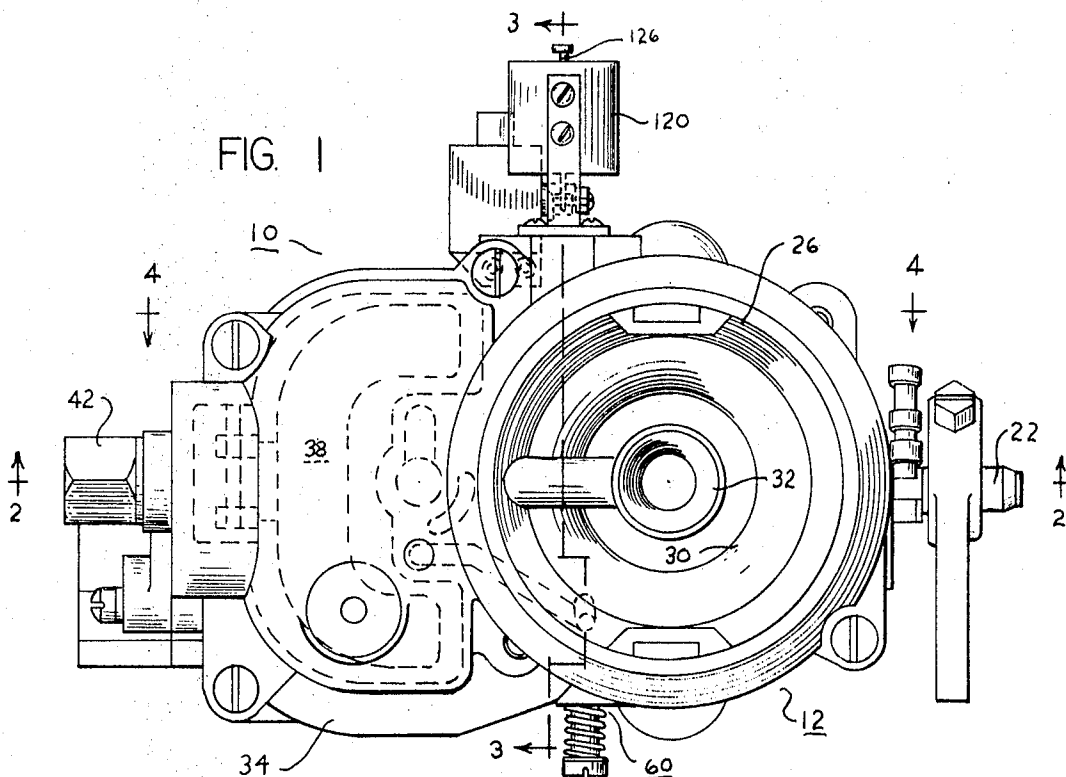
[50] Field of Search..... **261/39.4;**
123/187.5, 180 (E), 179 (G,L)

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ABSTRACT: A priming system for float-type carburetors, in which a fuel enrichment passage connects the float chamber with the induction passage on the engine side of the throttle valve and an air passage connects the fuel enrichment passage with the induction passage near the air intake thereof. A valve disposed in the fuel enrichment passage posterior to the air passage is automatically controlled by a bimetallic element and a solenoid for controlling the fuel-air mixture supplied to the induction passage in accordance with the engine temperature.





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FIG. 3

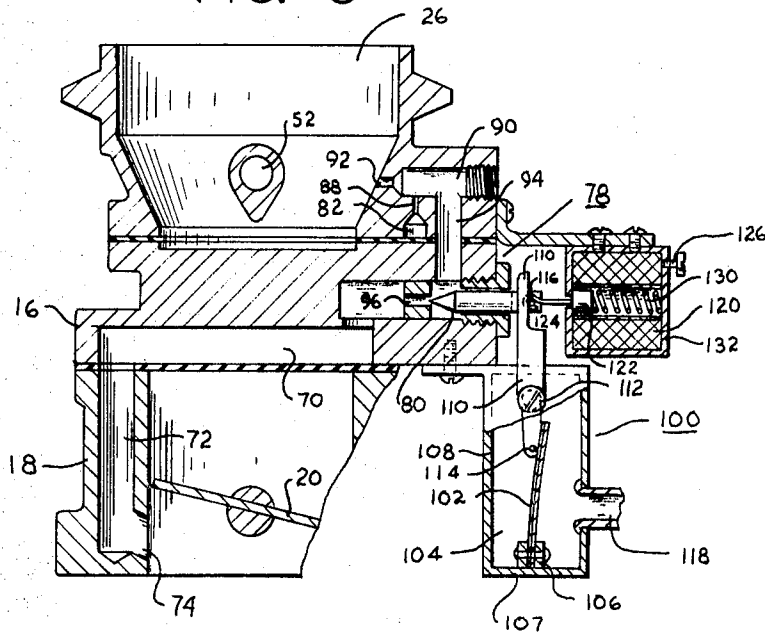


FIG. 4

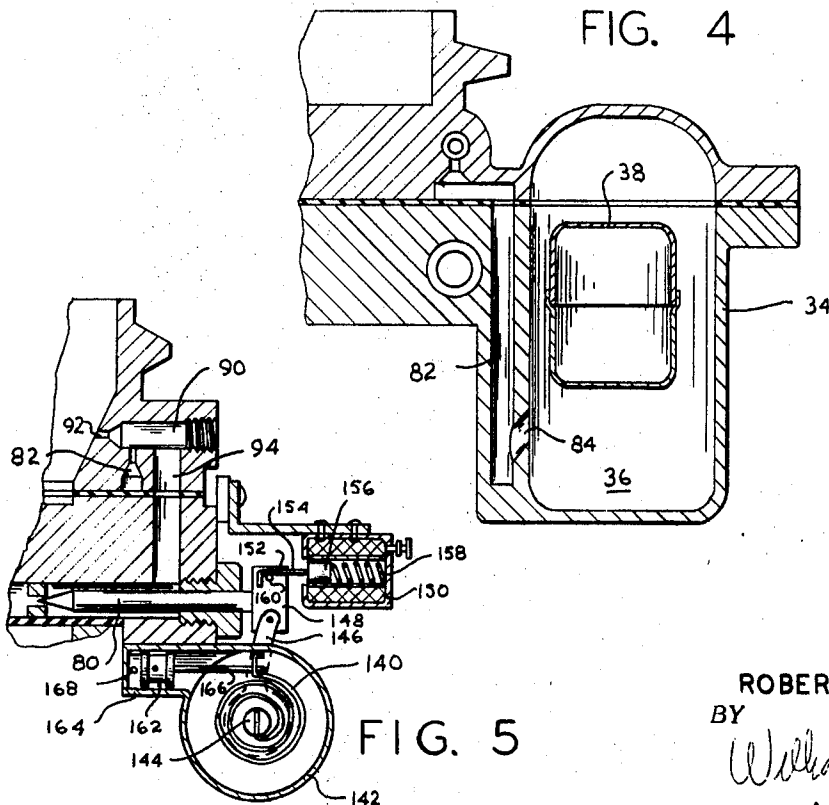
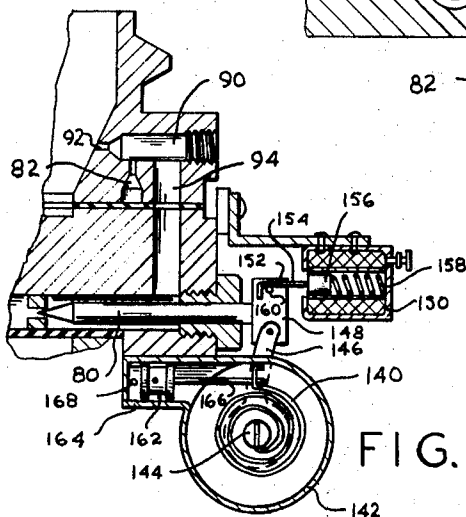


FIG. 5



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CARBURETOR PRIMING SYSTEM

Most vehicle internal combustion engines use downdraft carburetors which normally are mounted on the top or near the top of the engine and project substantially above the engine. These carburetors are also provided with air cleaners which extend further above the engine. Further, the conventional carburetors have a choke valve in the air inlet and, in many installations, have an automatic mechanism for controlling the valve. These various components require appreciable space under the engine hood for proper operation. However, in order to provide a vehicle with a low silhouette in body design, the hood is often placed in close proximity to the engine, thus leaving only a limited amount of vertical space for the carburetor and air cleaner above the engine. Low and compact carburetors with relatively small air horns and throttle bodies have been designed; however, those carburetors contain a choke valve in the air horn or air intake, normally positioned above the main body and adding to the overall height of the carburetor, thus interfering with the desired compactness of the engine compartment and low carburetor silhouette and with the satisfactory installation of the air filter. Further, because of the close proximity of the choke valve to the main jet in the prior low silhouette carburetors, the valve frequency interfered with the proper operation of the main jet. This difficulty was frequently increased by the use of the automatic control mechanism. It is therefore one of the principal objects of the present invention to provide a downdraft, float-type carburetor which is of compact and low construction and design for satisfactory installation in a limited space and of low hood silhouette appearance, and which contains an automatic priming system not requiring additional usable space for satisfactory operation, for cold-starting and warming-up of the engine.

Another object of the invention is to provide a float-type carburetor for an internal combustion engine in which the conventional choke valve is eliminated, and the section of the carburetor normally containing the choke valve is reduced in height without sacrificing performance, and in which an automatic priming system utilizing a rich mixture of fuel and air disposed principally in the body of the carburetor is employed in place of the conventional choke valve.

A further object is to provide an automatic cold-start enrichment system for carburetors of the aforesaid type, which will operate dependably in response to low operating forces, and which can be made readily responsive to starting under various engine temperature conditions to provide quick starting and continuous optimum operation of the engine during the warm-up period.

Still another object of the invention is to provide in a carburetor a relatively simple automatic enrichment system for cold-starting which can effectively and readily be adjusted to give optimum performance and avoid flooding under varying starting temperature conditions, and which can be incorporated in the body of the carburetor without rearranging the conventional main and idle systems, and without requiring appreciable enlargement of the main carburetor body.

Additional objects and advantages of the invention will become apparent from the following description and accompanying drawings, wherein:

FIG. 1 is a top plan view of a carburetor embodying the present invention;

FIG. 2 is a vertical cross-sectional view of the carburetor shown in FIG. 1, the section being taken on line 2-2 of the latter FIG.;

FIG. 3 is a vertical cross-sectional view of the carburetor shown in the preceding FIGS., the section being taken on lines 3-3 of FIG. 1;

FIG. 4 is a fragmentary cross-sectional view of the carburetor taken on line 4-4 of FIG. 1; and

FIG. 5 is a fragmentary, cross-sectional view similar to the view of FIG. 3, illustrating a modified form of the invention.

Referring more specifically to the drawings, numeral 10 designates a /downdraft, float-type carburetor for an internal

combustion engine, which may be considered as essentially conventional, except for the improvements constituting the present invention. The carburetor shown includes an air horn 12 to which is normally secured an air filter (not shown), the main body 16, the throttle body 18 with a throttle 20 mounted therein on a shaft 22 journaled in the sidewalls of the throttle body, and the induction passage 24 extending from the air inlet 26 to the air outlet 28 on the engine side of the throttle. The carburetor is mounted on an intake manifold by bolts extending through flanges at the lower edge of the throttle body, and the outlet 28 of the induction passage communicates directly with the manifold. The throttle 20 is controlled by the operator through a linkage (not shown) connected to shaft 22.

The main body 16 includes a large venturi 30, small venturi 32, and a fuel bowl 34 having a float chamber 36 therein with a float 38 for regulating the level of the fuel in the chamber by controlling a fuel inlet valve 40 at the end of the fuel supply line 42. The float chamber is connected to the throat of the small venturi by a main discharge system indicated generally by numeral 44 and having a well 46 with a perforated tube 48 therein for receiving fuel from the float chamber and delivering the fuel to outlet 50 in the small venturi, by a passage 52 connected to the upper end of perforated tube 48 and to an annular groove 54 in the small venturi communicating with outlet 50. In the operation of the main metering system, fuel flows from the float chamber through a metering orifice into tube 48, where it mixes with air to form a fuel-air emulsion which is delivered through passage 52 to outlet 50 in the small venturi. The carburetor shown contains the conventional idle system and accelerating pump indicated generally by numerals 60 and 62, respectively, and a power enrichment device. The details of these three components will not be described herein since they do not have any direct bearing on the present invention.

The present priming system shown in FIG. 3 is designed to deliver a fuel-air mixture to the induction passage on the engine side of the throttle in an amount varying in accordance with engine temperature. Passages 70 and 72 in the carburetor and throttle bodies, through which the mixture is supplied to the induction passage, are connected to discharge opening 74 below the throttle, and to a mixture forming and control mechanism indicated generally by numeral 78, which includes fuel and air supply passage and a control valve 80. The valve is connected to the float chamber 36 by a passage 82 and port 84, the upper end of passage 82 being connected to a valve mechanism through a restriction 88. The air for the fuel-air mixture is supplied through conduit 90 connected at its upper end to the induction passage near the air inlet by an orifice or port 92, and to the valve mechanism by a passage 94. The restrictions or orifices 88 and 92 can be varied in size to give the proper starting mixture and prevent flooding. Valve mechanism 80 is of the reciprocating type, which varies the effective size of orifice 96 connecting both the fuel passage 82 and air passage 90 with fuel-air mixture passage 70. When the valve is moved to its closed position, the flow of fuel-air mixture to the engine is completely cut off and the engine operates with the normal fuel-air mixture supplied principally by the main and idle fuel systems. During engine starting and warm-up, the operation of the valve permits a varying amount of fuel-air mixture to enter passage 70, thereby adjusting the richness of the fuel-air supply to the engine to satisfy engine requirements as engine operating conditions vary.

Valve 80 is controlled primarily by a thermostatic device, indicated generally by numeral 100, consisting of a bimetallic element 102 disposed in a chamber 104, the bimetallic element being secured by a fixture 106 to the bottom 107 of casing 108. The action of the thermostatic element is transmitted to valve 80 by a lever 110 pivoted on a pin 112 mounted in the opposed sidewalls of the casing. The lower end of lever 110 is provided with a pin 114 against which the thermostatic element presses in order to move the valve toward its open position as the element moves to the left, as viewed in FIG. 3, on a decrease in temperature. The upper end of lever 110 passes

through a slot in the end of valve 80, engages a pin 116 in the valve, and urges the valve open as the thermostatic element reacts against pin 114. Chamber 104 in casing 108 is connected by a conduit 118 to a suitable source of heat representative of engine temperatures. This conduit would normally be connected to a heat transfer means on the exhaust manifold from which air is drawn through conduit 118 to the chamber, and hence into the induction passage on the engine side of the throttle valve through a passage (not shown) connected to chamber 104. Since the thermostatic element is subjected to the heated air from the exhaust manifold, it moves valve 80 to various positions relative to port 96 to provide the required fuel enrichment for the cold-starting and warming-up operation. As the engine is warming up, the upper end of the thermostat moves from left to right, thus permitting the valve to move toward closed position, ultimately seating on the inlet end of port 96.

In order to provide maximum enrichment during starting, solenoid 120, having a plunger 122 connected to the valve by a stem 124, fully retracts valve 80 from port 96 while the engine is being cranked. The solenoid is connected to the starting circuit by a wire connected to contact screw 126. The valve is constantly urged toward closed position by a spring 130 in the center of solenoid 120, the spring reacting between the outer end wall 132 of the solenoid and the end of the plunger to urge the valve toward closed position. Thus, as the upper end of bimetallic element 102 gradually moves from right to left, the spring gradually moves the valve toward closed position.

In the operation of the carburetor with the present automatic priming system incorporated therein, starting with the engine cold, valve 80 is moved by the thermostatic element 102, to a partially open position illustrated in FIG. 3, thus connecting passage 70 with the fuel bowl through passages 94 and 90, orifice 88, passage 82, and port 84, and simultaneously connecting passage 70 with the air inlet of the carburetor through passages 94 and 90 and port 92. When the operator closes the starter switch, the solenoid 120 is energized, thus causing plunger 122 and stem 124 to move the right, thereby withdrawing valve 80 from port 96 to its fully opened position to give maximum enrichment to the starting mixture. While the engine is being cranked under this condition with the throttle valve in its substantially closed position, the vacuum created by the engine is transmitted through passages 72, 70, 94 and 90 simultaneously to fuel passage 82 and air port 92, thereby drawing the fuel and air into passage 90 where the fuel and air are mixed to form an emulsion which flows through passage 94, orifice 96, passages 70 and 72 to port 74, where it is discharged into the induction passage on the engine side of the throttle valve, thus enriching the mixture over and above the enrichment supplied by the main fuel and/or idle jets. As soon as the engine commences to run, the operator opens the starting switch, thus deenergizing solenoid 120, and permitting spring 130 to urge valve 80 toward closed position. However, since the engine is still cold, the thermostatic element 102 reacting against the pin 114 at the lower end of lever 110 maintains the valve in a partially open position and provides additional fuel-air enrichment for the engine. As the engine continues to run, warm air is transmitted through conduit 118 to chamber 104 and heats element 102, thereby causing the upper end thereof to move to the right, permitting lever 110 to move in the counter clockwise direction. As lever 110 moves in the foregoing manner, spring 130 continually urges the valve toward closed position. When the engine becomes fully warm, the valve 80 seats on the inlet of orifice 96, thus closing the valve, which remains closed as long as the engine is running under normal operating conditions.

The modified form of the present invention illustrated in FIG. 5, involves the same basic priming system, and hence like numerals will be given to like parts. In this embodiment, a coiled bimetallic element 140 is used in place of the leaf-type bimetallic element illustrated in the previous embodiment. The coiled element is disposed in a casing 142 and is rigidly

anchored at its inner end on a pin 144. The outer end of the thermostatic element is connected to a lever 146 which in turn is connected to the valve 80 by a member 148. A solenoid 150 is connected by a one-way connection 152 to member 148, and fully withdraws valve 80 from orifice 96 when the engine starter is operating. The connection 152 consists of a stem 154 connected to a plunger 156 which is urged to the left, as illustrated in FIG. 5, by coiled spring 158. When the starter switch is closed, the left-hand end of stem 154 engages a pin 160 and pulls member 148 and valve 80 to the right, thus fully opening orifice 96. In this embodiment, in place of using the solenoid spring to close the valve, a vacuum piston 162 operating in cylinder 164 urges the valve closed when the engine starts to run. The piston is connected by a stem 166 to lever 146, and cylinder 164 is connected by port 168 and a passage (not shown) to the induction passage on the engine side of the throttle valve. When the engine starts, the vacuum in the induction passage is transmitted to cylinder 164 and reacts on the end of piston 162, urging the piston and lever 146 to the left, which in turn urge valve 80 towards its closed position in opposition to the cold thermostatic element 140. The element, which is disposed in casing 142, is heated by air from the exhaust manifold in a manner similar to that previously described herein, and the outer end of the element tends to move toward the left, i.e. in the counterclockwise direction, as it is heated by the warm air entering casing 142, thus permitting the vacuum in cylinder 164 to move piston 162, and hence lever 146 further in the direction to close valve 80. When the engine is fully warm, the thermostatic element is no longer effective to resist the closing movement of the piston 162, and valve 80 becomes fully closed and remains closed as long as the engine is running under normal operating conditions.

In the present priming system, the enriched fuel mixture, which provides the additional richness to the normal mixture supplied to the engine, mixes readily with the air passing through the induction passage and gives quick and effective response to engine requirements and eliminates the injection of much of the raw fuel into the cylinders which frequently occurs with the conventional type of choke valve. Since valve 80 can be easily operated without any substantial interference from the airflow in the induction passage, the automatic control, including the bimetallic element and solenoid, can be relatively small and weak, thereby conveniently permitting a low and compact carburetor design.

While only two embodiments of the present priming system have been described in detail herein, various changes and modifications may be made without departing from the scope of the invention.

I claim:

1. In an internal combustion engine having an electric starter system with a switch and a carburetor with a fuel bowl and an induction passage with a throttle therein: said carburetor including a priming system comprising a fluid passage connecting the fuel bowl with the induction passage on the engine side of the throttle, a passage connecting said fluid passage with a source of air to form a fuel-air emulsion in said fluid passage for delivery to the induction passage on the engine side of the throttle, valve means including a movable member in said fluid passage posterior to the connection with said air passage by its movement, a thermostatic element movable in response to engine temperature, lever means including a lever pivotally mounted and interconnecting said movable member and said thermostatic element, and solenoid means including a plunger member reciprocally movable and controlled by the starter switch and means drivingly connecting said movable member and said plunger for movement therewith when said starter switch is closed.

2. A priming system for a carburetor as defined in Claim 1, in which said thermostatic element is of the coiled-type mounted in a casing connected at one end to said lever member and means responsive to manifold vacuum disposed in said casing urges said valve toward closed position.

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3. A priming system for a carburetor as defined in Claim 1, in which said thermostatic element is of the leaf-type engaging said lever at one end thereof and is disposed in a casing subjected to air at a temperature representing engine temperature, and in which a spring urges said movable member toward a closed position in opposition to said element.

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4. A priming system for a carburetor as defined in Claim 3, in which said solenoid plunger member is directly connected to said movable member and in which said spring acts on said plunger member in the direction to close said valve.

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