Feb. 21, 1939. W. B. GOODMAN ET AL 2,148,265

CARBURETOR AND PRIMING DEVICE

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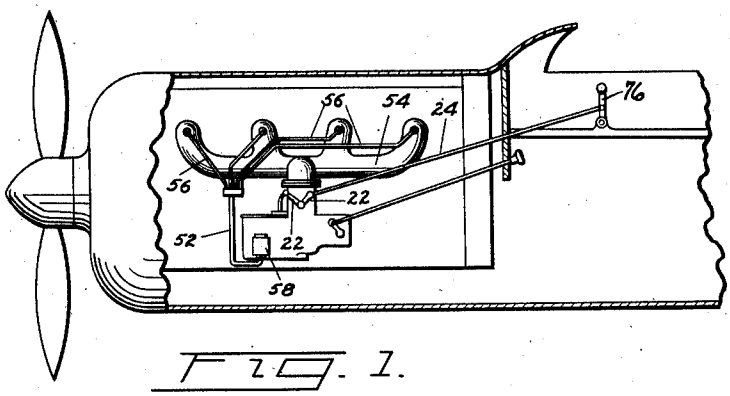


FIG. 1.

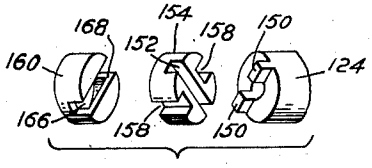


FIG. 11

FIG. 2.

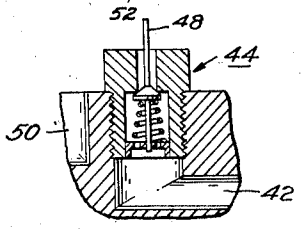


FIG. 10

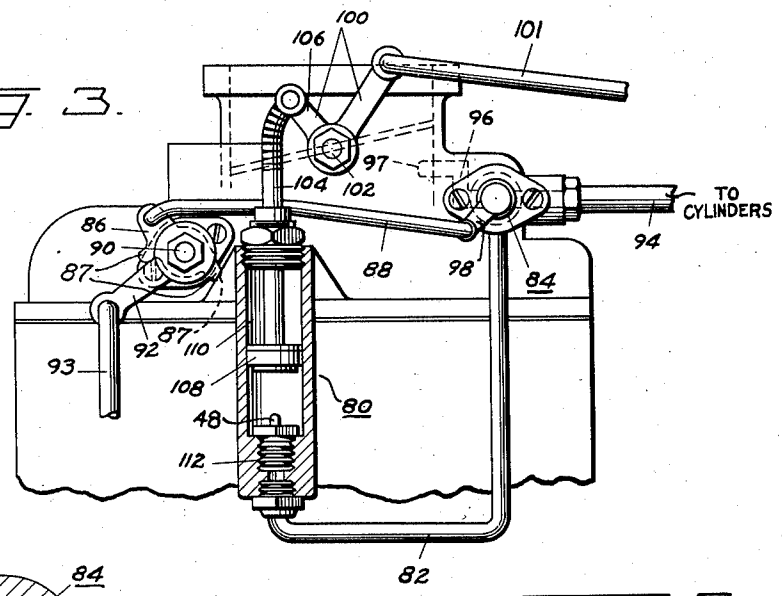
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FIG. 3.



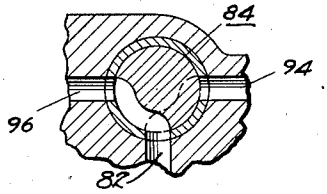


FIG. 4.

FIG. 5.

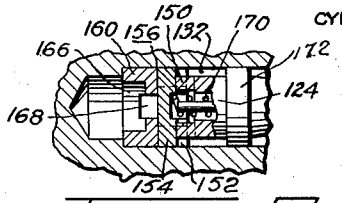
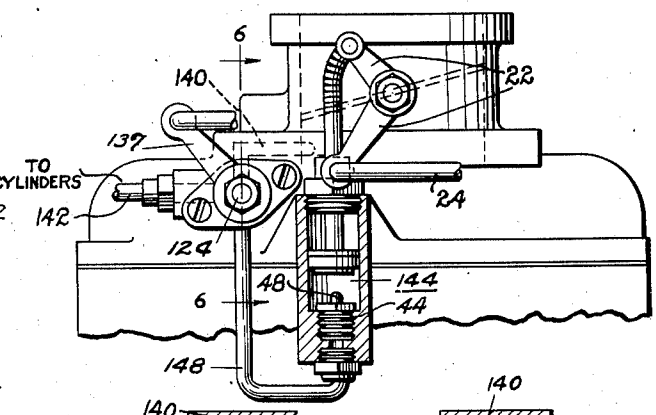


FIG. 9.



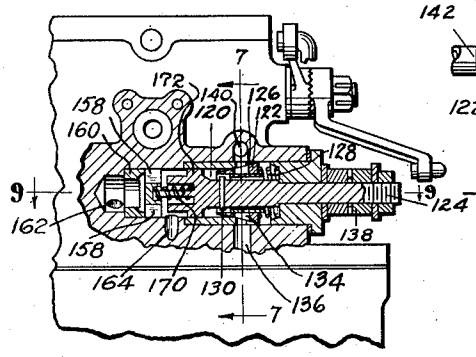


FIG. 6.

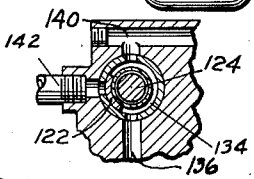


FIG. 7.

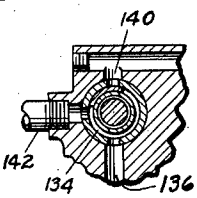


FIG. 8.

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Patented Feb. 21, 1939 2,148,265

UNITED STATES PATENT OFFICE

2,148,265

CARBURETOR AND PRIMING DEVICE

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Application December 23, 1933, Serial No. 703,778

4 Claims. (Cl. 123—187.5)

This invention relates to carburetors and more particularly to priming devices to be used in conjunction with carburetors equipped with acceleration pumps.

In many of the larger high-compression internal-combustion engines it is very difficult to secure a mixture in the cylinders that is sufficiently rich to support combustion when the engine is cold.

An object of this invention is to provide an apparatus whereby liquid fuel may be injected into the cylinders to facilitate starting of the engine.

A further object is to utilize the conventional acceleration pump of the carburetor to supply a priming charge directly to the inlet ports of the engine under certain conditions of operation.

A still further object is to provide a priming device of simplified construction, which may be formed integrally with the body portion of the carburetor.

The above and other useful and novel features of this invention will appear more fully from the following detailed description when taken in connection with the accompanying drawings, in which:

Figure 1 is an elevation showing the invention applied to an airplane engine;

Figure 2 is a section showing the construction of the priming device;

Figure 3 illustrates a modified form of the invention;

Figure 4 is an enlarged sectional view showing the valve used in connection with the modification shown in Figure 3;

Figure 5 is a modification similar to Figure 3 embodying a different arrangement;

Figure 6 is a section on line 6—6 of Figure 5;

Figure 7 is a section on line 7—7 of Figure 6 showing the position of the valve when discharging to the fuel nozzle of the carburetor;

Figure 8 is a section similar to Figure 7 showing the valve in the priming position;

Figure 9 is a fragmentary section taken substantially on line 9—9 of Figure 6;

Figure 10 is an enlarged sectional view along the pressure responsive valve in the base of the acceleration pump; and

Figure 11 is an exploded view of the several parts constituting the altitude mixture control valve.

Referring more particularly to Figure 1, there is shown, for the purpose of illustrating this invention, a carbureting device embodying the invention as used on an airplane engine. A priming device 58 is associated with the acceleration pump unit 80 of the carburetor and discharges directly to the cylinders of the engine through fuel ducts 52 and 56 which are fixed in the intake manifold 54.

Figure 2 shows a carburetor having a body portion 10 forming a main carbureting passage 12 in which are positioned the usual venturi 14 and fuel discharge nozzle 16. A throttle valve 18 of the butterfly type is mounted on shaft 20, which is journaled in the walls of the main carbureting passage 12. Fixed to shaft 20 is a double-armed crank 22, one arm of which connects with rod 24, by means of which the throttle valve 18 is actuated. The other arm of crank 22 connects through link 26 to an acceleration pump which may be of any desired construction, but which in the illustrated embodiment comprises a piston rod 28 and a piston 30 which is slidable in a cylinder 32. Fuel is admitted to cylinder 32 through a check valve 34 which communicates with fuel reservoir 36. Piston 30 is slidably mounted on rod 28 and is yieldingly urged downwardly by a compression spring 38, the upper end of which abuts against a washer 40. The pump discharges through passage 42 to the fuel nozzle 16, the discharge passage being controlled by a pressure-responsive outlet valve 44 designed to be opened either by fuel pressure or by flange 46 on the rod 28 contacting with the projecting stem 48 of the valve 44 (see Figure 10).

In order to adapt the acceleration pump just described to be used as a priming pump, a second discharge passage 50 leads from the cylinder 32 and connects by a duct 52 and manifold 54 to a plurality of ducts 56 leading to the intake manifold of the engine adjacent the respective inlet ports of the cylinders.

The passage 52 is controlled by a pressure-responsive valve mechanism which comprises a shell 58 forming a chamber 60 in which piston 62, having a valve point 64, is yieldingly urged to the lower extremity of chamber 60 by spring 66, which is held in chamber 60 by a cap screw 68. A vent 70 is located in the upper portion of shell 58 to prevent air lock in chamber 60 when piston 62 slides therein.

To prime and start the engine the operator will actuate the throttle lever 76, thus operating the acceleration pump by means of the above-described mechanism. A portion of the acceleration fuel will thereupon be ejected through fuel nozzle 16, but due to the fact that passage 42 is restricted by valve 44, a larger portion of the fuel will pass through duct 50 to chamber 72

where the resulting pressure will force piston 62 upwardly in cylinder 60, compressing spring 66 and opening passage 52 so that fuel will be forced to the inlet ports of the cylinders.

When the priming operation has been completed, the operator sets the throttle in the proper position and starts the engine. When the engine starts, suction will be transmitted through duct 52 which, together with the force of spring 66, will hold valve point 64 in contact with valve seat 74 and prevent the further flow of fuel through said valve. If the acceleration pump is then actuated, it will discharge to the fuel discharge nozzle 16 of the carburetor through check valve 44 and fuel duct 42.

Figure 3 illustrates a modification of an acceleration pump which is actuated by the throttle mechanism through a linkage consisting of rod 101, double-armed crank 100 and rod 104, the upper portion of which is made of flexible material such as a flexible cable wound circumferentially by a tight coiled spring, giving an appearance similar to a conventional Bowden conduit.

The acceleration pump 80 discharges to a fuel duct 82 leading to valve member 84, which is of the type shown in Figure 4. An arm 98, fixed to valve member 84 in such a manner as to actuate it, is pivotally connected with arm 86 by link 88. Arm 86 is fixed to the shaft 90 of a conventional mixture control mechanism and is actuated by arm 92 and rod 93, which is manually operated through suitable control mechanism at the operator's position. Two offset stops 87, formed on the lever 86 are engaged by arm 92 to move valve 84 when rod 93 is actuated.

The operation of this device is as follows. When it is desired to prime the engine, the operator moves the mixture control rod 93 to "lean" position, thereby rotating arm 86 in the clockwise direction, and through the link 88, rotating arm 98 in a counterclockwise direction to move the valve 84 to the position shown in dotted lines on Figure 4, thereby opening the fuel duct 94 and closing off the fuel duct 96. Duct 94 leads, through connections similar to those shown in Figure 2, to a plurality of jets in the intake manifold adjacent the inlet ports of the engine. The operator will then open the throttle valve, thereby operating the acceleration pump by means of the connecting mechanism and pumping fuel through check valve 112 and fuel duct 82 to valve 84 where it is directed through the passage shown in dotted lines on Figure 4 to fuel line 94 leading to the inlet ports of the engine.

When the priming operation has been completed, the operator moves the mixture control lever on the instrument board (not shown) to "full rich" position, thereby rotating arm 86 in the counter-clockwise direction and rotating crank 98 in the clockwise direction through link 88, to move the valve 84 to the position shown in full lines on Figure 4, closing fuel duct 94 and opening fuel duct 96. The acceleration pump 80 will then discharge to the fuel discharge nozzle 97 through fuel duct 96.

Figures 5–9 illustrate a valve mechanism operable in conjunction with the altitude mixture control mechanism of an aircraft carburetor for selectively opening and closing a plurality of ports in a fuel line leading from the acceleration pump.

The valve mechanism comprises a cylinder 120 in which a shaft 124 is rotatably journaled. A tapered barrel valve member 122 is keyed to the shaft 124 by means of pin 130 projecting through the shaft 124 and slidable longitudinally in a slot in valve member 122, which is yieldingly urged against its seat 126 by means of a spring 128. An annular groove 134 is cut in the valve member 122 for approximately three-quarters of the circumference, to permit fuel to enter said passage from the acceleration pump discharge duct 136, and discharge through either of two ports 140 and 142 leading to the main carbureting passage or the cylinders of the engine.

The altitude mixture control is also operated by the lever 137 through the shaft 124 as best shown in Figures 6, 9, and 11. The shaft 124 is provided with extensions 150 at its inner end arranged to be inserted into a slot 152 formed in a rotatable portion 154 of a valve, indicated generally by the reference numeral 156, positioned in the inner end of cylindrical bore 120. The member 154 is also provided with passages 158. Cooperating with the rotatable portion 154 of the valve 156 is an annular member 160 fixedly secured in the bore 120 and which by means of a bore 166 and a slot 168 permits air to freely flow from a duct 162 connected to atmosphere to a duct 164 leading to the fuel or float chamber of the carburetor when the slot 168 of member 160 is in alignment with the passages 158 of member 154.

When the rotatable portion 154 of the valve member 156 is moved to a position to close the communication with atmosphere, the fuel reservoir is subjected to the variations of fluid pressure existent in the induction passage of the carburetor. The pressure to which the fuel in the float chamber is subjected is therefore decreased, whereupon less fuel will be supplied to the induction passage. The pressure in the induction passage is dependent, in part, on the barometric pressure of the atmosphere in which the device is operating, and since the quantity of fuel supplied is dependent in part on the pressure in the induction passage, the fuel to air ratio of the mixture supplied by the carburetor is controlled in accordance with variations in barometric pressure. An altitude mixture control is thus effected.

A spring 170 retained in the inner end of shaft 124 maintains the member 154 seated upon the fixed member 160 of valve 156. The shaft 124 is also formed with an enlarged portion 172 which closely fits the bore 120 to prevent communication between the valve 156 and the valve mechanism controlling the priming of the engine.

The operation of this device is as follows. To prime the engine the operator rotates the shaft 124 by means of arm 137 and other mechanism (not shown), to move the altitude mixture control mechanism to "lean" position, thereby moving the valve member 122 to the position shown in Figure 8, to close the duct 140 and open the duct 142. It is thus apparent that when the acceleration pump is actuated by movement of the throttle lever it will discharge fuel directly to the inlet ports of the engine, thereby producing a rich mixture for starting purposes.

When the priming operation has been completed, the operator moves the altitude mixture control to the "rich" position, thereby rotating the shaft 124 in the counter-clockwise direction and rotating the valve member 122 to the position shown in Figure 7, to close the duct 142 and to open the duct 140. The acceleration pump will then discharge to the fuel nozzle of the carburetor. The appropriate throttle valve setting is then made and the engine started.

With the devices illustrated and described it is possible to pump liquid fuel direct to the engine

to obtain a mixture that is sufficiently rich to start the engine.

It is expressly understood that the scope of this invention is to be restricted by nothing appearing herein except the appended claims.

We claim:

1. In an internal combustion engine, a plurality of cylinders and a carburetor having a manually actuated acceleration pump, a chamber communicating with the acceleration pump, connecting means between said chamber and cylinders, and pressure responsive means in said chamber adapted to normally close said connecting means and to interconnect said acceleration pump and cylinders when a predetermined pressure is established in the acceleration pump.

2. In an aircraft engine, an intake manifold, a carburetor having a main carbureting passage, means including a fuel nozzle for supplying fuel to the carbureting passage, acceleration means for supplying an increased quantity of fuel to the carbureting passage under certain conditions of operation, connecting means between the acceleration means and the intake manifold, and pressure responsive means controlling the connecting means to supply fuel directly to the intake manifold from the acceleration means under certain conditions of operation.

3. In combination with a carburetor including a fuel reservoir, means forming a main induction passage and a discharge nozzle for a multi-cylinder internal combustion engine, an altitude mixture control mechanism including a shaft and means to subject the fuel reservoir to fluid pressures existent in the main induction passage, an acceleration pump, a priming device mounted on said shaft and comprising means to selectively supply fuel from the acceleration pump to the cylinders of the engine and to the discharge nozzle, and manually operable means to actuate said shaft to control the priming device and the altitude mixture control mechanism.

4. In combination with an aircraft carburetor, including a fuel reservoir, a throttle, and means forming an induction passage for a multi-cylinder engine, an altitude mixture control mechanism comprising manual means to selectively subject the fuel reservoir to variations in fluid pressure in the induction passage or to atmospheric pressure, a manually operable acceleration pump operated in accordance with throttle position, and a priming device associated with and dependent on the position of the altitude mixture control mechanism to deliver fuel from the acceleration pump to the cylinders of the engine or to the induction passage of the carburetor.

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