

[54] **VAPOR-FREE CARBURETOR**
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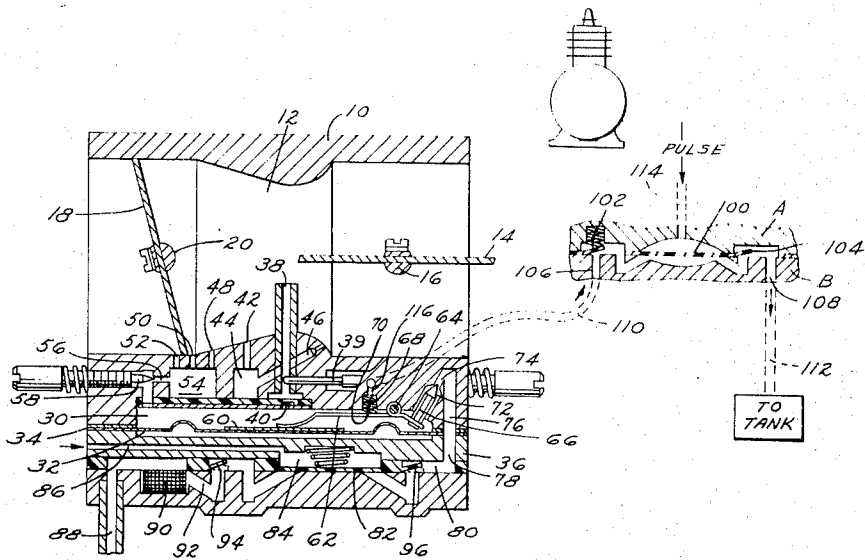
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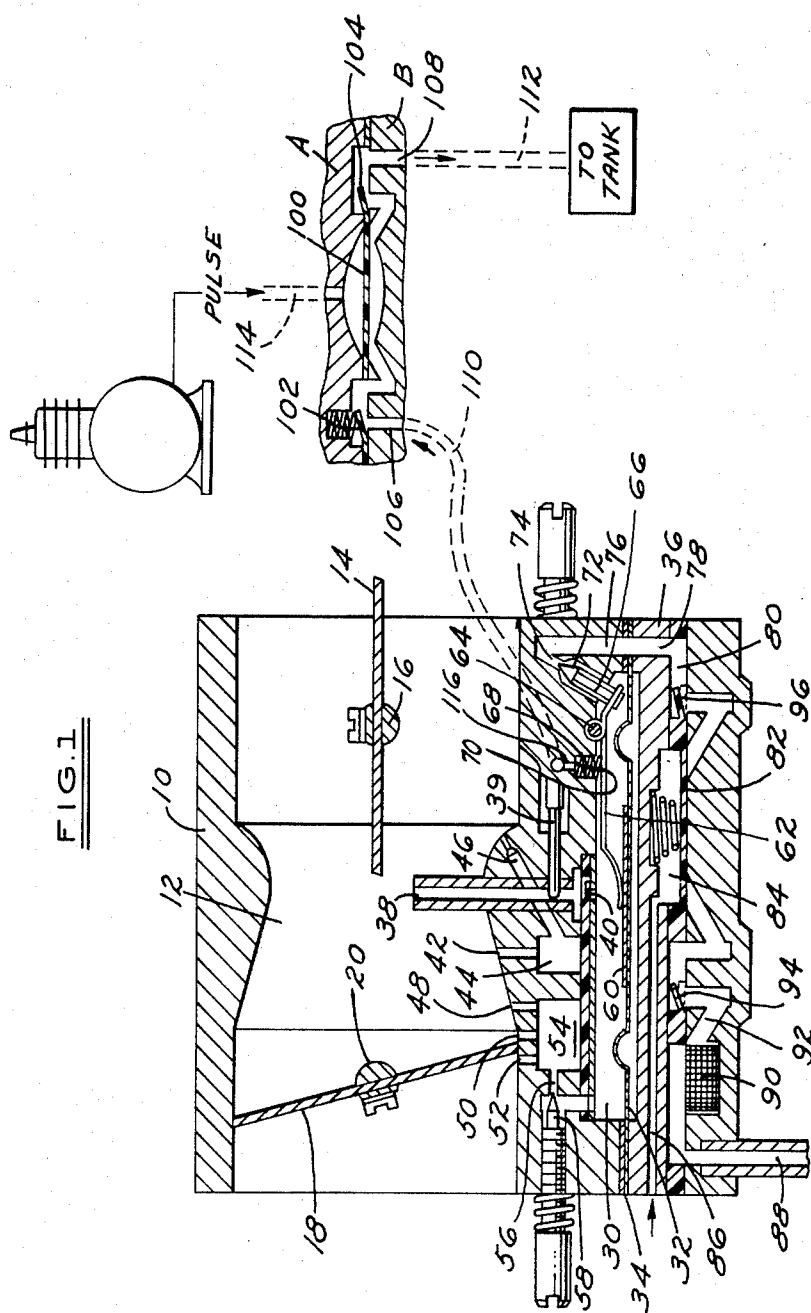
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[57] **ABSTRACT**

A diaphragm-controlled carburetor having a fuel inlet valve and a diaphragm chamber particularly for location on small engines where the carburetor is subject to high vibration and close confinement so that there is a possibility of heat build-up and the provision of a vapor pump in the carburetor for removal of vapor from a high point in the metering diaphragm chamber where vapor can collect to prevent vapor lock and other malfunctioning of the carburetor.

1 Claim, 3 Drawing Figures





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VAPOR-FREE CARBURETOR

This invention relates to a Vapor-Free Carburetor and relates more particularly to a carburetor utilizing a diaphragm chamber and a diaphragm control of a fuel inlet valve. One of the problems in connection with the operation of internal combustion engines such as, for example, used on snow vehicles is the accumulation of vapor in the carburetor to the extent that the flow of fuel is inhibited and the function of the carburetor and the engine is adversely affected. This condition is aggravated by the fact that on certain vehicles, the engine and carburetor are closely confined under a protective hood which is not well ventilated so that heat from the engine can build up in the confined area and transfer conductively to the carburetor. This tends to cause advance vaporization of the fuel in portions to the carburetor where the control is dependent on the liquid state.

Another condition is operation at high altitudes in mountains where the atmospheric pressure is lower than usual, a condition which contributes to the formation of vapor in the carburetor.

In a U. S. Pat. to Martin et al., No. 3,235,238, dated Feb. 15, 1966, there is provision made for the removal of vapor from a domed fuel chamber by induction into the mixing chamber and the disclosure in this patent recognizes the problem of proper liquid control in the presence of vapor. However, the solution in the Martin patent is inadequate since the aperture for vapor removal destroys the calibration of the carburetor and the low throttle conditions are not adequately handled.

It is an object of the present invention to provide a system which eliminates the passing of vapor through the metering system which is founded on the control of liquid rather than vapor by a positive removal system which is more responsive throughout the entire speed range.

It is a further object of the invention to provide a supplemental vapor removal pump which can be incorporated in a carburetor housing for actuation by pulsations from an internal combustion engine.

Other objects and features of the invention relating to details of construction and operation will be apparent in the following description and claims in which the principles of operation of the invention are set forth together with the best mode presently contemplated.

Drawings accompany the disclosure and the various views thereof may be briefly described as:

FIG. 1, a view of a relatively simple diaphragm carburetor showing the manner in which a separate pump can be utilized to remove vapor.

FIG. 2, a sectional view of a diaphragm carburetor having a fuel pump and a vapor pump incorporated therein.

FIG. 3, a plan view of a diaphragm control plate.

REFERRING TO THE DRAWINGS

In FIG. 1, a carburetor housing 10 has a mixing passage 12 with a choke valve 14 on a control shaft 16 and a throttle valve 18 on a control shaft 20. A diaphragm chamber 30 is provided in the carburetor housing closed at the bottom by a diaphragm 32 overlying a gasket 34 and held in place by an intermediate housing plate 36.

Extending upwardly from the chamber 30 is a main fuel jet 38 controlled by a needle valve 39 and connected to the diaphragm chamber through a suitable

one-way valve 40. An intermediate fuel supply port 42 connects to a small fuel well 44 which is fed through the main jet opening and which is also connected to a bleed port 46. Multiple idle ports 48, 50 and 52 connect to a fuel well 54 by a short port 56 from chamber 30 controlled by idle needle valve 58. The central portion 60 of diaphragm 32 bears against a lever 62 pivoted at 64 carrying at one end a fuel inlet valve 66.

A spring 68 urges the lever to a position closing the valve 66. The spring 68 is located in a recess 70 at the top of the diaphragm chamber 30. The valve 66 is positioned in a bore 72 having at its top end a passage 74 which provides a suitable seat and which has a juncture with a vertical fuel passage 76. Passage 76 continues from the housing 10 into the intermediate plate 36 in a passage 78 which is connected to the outlet 80 of a small fuel pump having a pulsating diaphragm 82 in a chamber 84, the upper side of the diaphragm being connected to a pulse passage 86. A fuel inlet 88 feeds fuel from a suitable tank through a filter 90 to a pump inlet passage 92. Pump valves 94 and 96 are provided as a part of the pump diaphragm.

Also in the carburetor housing, but shown in a separate fragmented view, is a vapor pump diaphragm 100 held between two portions A and B of suitable housing members with inlet and outlet valves 102 and 104, respectively, and an inlet passage 106 and an outlet passage 108. The inlet passage 106 is connected by a passage 110 to the top of the recess 70. The outlet of the pump 100 is connected to the tank through a passage 112.

A pulse opening 114 in the pump housing A will cause fluctuation of the pump diaphragm 100 and create a low pressure for the chamber 70 where vapor will collect as the high point in the diaphragm chamber 30. Thus, constant operation of the pump 100 will keep this vapor exhausted from the diaphragm chamber, there being suitable calibration of the restricted passage 116 such that an undesirable low pressure will not occur in the chamber 30.

Thus, when the passage 86 and the passage 114 are connected to the crankcase of an engine, for example, on which the carburetor is mounted, there will be a pulsing of the fuel pump 82 furnishing liquid fuel to passages 78 and 76 and there will be a pulsing of the vapor pump 100 which will draw off vapor from the chamber 70 and the top of the passage 76. Accordingly, excessive vibration of the engine due to high speed operation or rough terrain, which tends to cause foaming of the fuel, will not adversely affect the liquid fuel flow system controlled by the diaphragm 32 and the fuel inlet valve 66.

Referring to FIG. 2, a main carburetor housing 120 has a mixing passage 122 with a choke valve 124 and a throttle valve 126. A main fuel passage 130 controlled by a needle valve 132 leads to a fuel well 134 which is connected to a tube 136a leading upwardly through the venturi portion of the mixing passage. The tube has multiple outlets 138a for fuel. The well 134 also has an air inlet 136 and a feed port 138 leading to an intermediate fuel supply chamber 140 with suitable fuel passages 142. An idle recess 144 has some intermediate passages 146 connecting to the mixing passage and also a main idle port 148 controlled by a needle valve 150.

In the bottom of the housing 120 is formed a diaphragm chamber 160 closed by a diaphragm 162 which

acts on one end of a lever 164 pivoted in the housing and carrying at its other end a fuel inlet valve 166 operating in a suitable seat thimble 168 which has a top port opening to a recess 170. A small flexible member 172 provides an anti-back bleed check valve 174 for the entrance of fuel into the main fuel passage 130 and this member also has a small port 176 which furnishes fuel from the diaphragm chamber to the idle recess 144. The diaphragm 162 is held in place by a first intermediate plate 178 which has a top recess 180 below diaphragm 162 and a bottom recess 182 which serves as a part of a pumping chamber above a diaphragm 184 which is controlled in its motion by a leaf spring member having a pan support portion 186 with a side extension anchoring portion 188 provided with locating tabs 190 clamped against the bottom of the intermediate plate 178 by a second intermediate housing plate 192. The pumping chamber 189 is defined by the diaphragm 184 and the shallow opening below it in plate 192.

The spring or plate 186 and the side extension 188 have sufficient resiliency to allow the pan portion 186 overlying diaphragm 184, FIG. 3, to fluctuate up and down in conjunction with the diaphragm 184. The diaphragm member 184 also has a valve flap 196 backed by a suitable coil spring to control a passage which will be described below.

At the left-hand portion of the assembly, as shown in FIG. 2, a pump diaphragm 200 is provided between recesses in plate 178 and a second intermediate plate 192, this being a secondary vapor pump which has a disc-like inlet valve 202 and a flap-type outlet valve 204. The diaphragms 184 and 200 are pulsed by engine pulses through a connection conduit 206 leading from a crankcase connection of an internal combustion engine to the chamber 182 and thence to a connecting passage 208 to the diaphragm 200.

The bottom side of the intermediate plate 192 has two flat surface recesses 210 and 212 which serve as portions of booster chambers in conjunction with opposed recesses 214 and 216 in a third intermediate plate 220 which holds a diaphragm member 222 in position between these respective chambers. This diaphragm member 222 also provides a flap valve 224 for the pump diaphragm 186. In the bottom of the third intermediate plate 220 is a chamber 226 which provides an inlet chamber together with an annular chamber 228 which surrounds a fuel inlet 230 leading from a tank T.

A filter screen 232 serves to filter fuel entering the chamber 226 before it passes through the valve 224. The normal flow of fuel for the carburetor system will originate at the tank T and flow through the passage 230 and the filter screen 232 to the valve 224 in response to fluctuation of the fuel pump diaphragm 184. Fuel will then flow through passages leading to the valve 196 to an upwardly extending passage 240 terminating at the recess 170 at the top of the fuel inlet valve. Fuel will then move through the fuel inlet valve 166 in response to control of the lever 164 and the diaphragm 162 so that it is available to the main jet through the one-way valve 174 and also to the intermediate flow chamber 140 and the idle chamber 144. Fuel will thus be available to the mixing chamber as it is called for by reason of the adjustment of the choke and throttle.

The pulse chambers formed by the respectively shallow pockets 210-214 and 212-216 serve to enhance the flow of fuel. It will be noted that chambers 214 and 212 are connected to atmosphere. Chamber 210 is connected to the fuel passage 240 and the chamber 216 is connected to the fuel recess 226.

The vapor removal system of the carburetor is under the control of the pump diaphragm 200 and its respective valves 202 and 204. The inlet valve 202 is connected through a passage 242 which leads to the diaphragm chamber 160 directly adjacent the valve 166 which is a high point in the fuel reservoir above the diaphragm. Thus, any vapor and foam which is created in the diaphragm chamber by reason of the flow of the fuel and the vibration of the carburetor will be pulled through the inlet valve 202 and pushed to the outlet valve 204 which leads to a down passage 244 through the plates 192, 220, and the bottom plate 250 which has formed therein an outlet 252 which will be connected to a fuel tank T. Thus, the out-flow of the vapor pump to passage 244 will carry vapor from the top of diaphragm chamber 160 to the tank. This permits the diaphragm 162 and the related inlet valve 166 to control liquid fuel only and prevents a vapor build-up which interferes with the control system built for handling liquid fuel.

It will be noted that since the pump 200 is actuated by pressure pulsations from the engine it pumps most vigorously at part or idle throttle conditions when the crankcase pulses are longer and stronger. Since this is the time that the least fuel is being pulled through the carburetor and also the least cooling is being accomplished in the engine cavity, the heat build-up at the carburetor location is apt to be greatest. This contributes to the vaporization conditions. Thus, the pump 200 is most effective when most needed.

What is claimed as new is as follows:

1. In a carburetor having a diaphragm control fuel inlet valve leading to a diaphragm chamber in which there is a fuel chamber above the diaphragm from which fuel is fed to a mixing passage through a main jet passage and through supplemental jet passages for idling, that improvement which comprises:

- a. a carburetor housing having a diaphragm chamber and a diaphragm across said chamber, means forming a mixing passage adjacent said chamber, and a valve controlled fuel inlet passage between said chamber and a fuel supply passage leading to said chamber,
- b. a fluid vapor pump associated with said carburetor housing including a housing means for supporting a pump diaphragm having chambers on each side of said pump diaphragm, said housing having an inlet and outlet means leading to one of said chambers and having a pulse passage to receive engine pulses leading to the chamber on the other side of said pump diaphragm, and one-way valves at said inlet and outlet means,
- c. means connecting an inlet of said fluid vapor pump chamber with said diaphragm chamber at a point spaced above said diaphragm and above the normal fuel level of fuel in said diaphragm, and
- d. means connecting said outlet of said pump chamber to a fuel tank.

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