United States Patent

[11] 3,633,557

[72] Inventors **Charles H. Tuckey; Kenneth C. Schneider, both of Cass City, Mich.**

[21] Appl. No. **7,190**
[22] Filed **Jan. 30, 1970**
[45] Patented **Jan. 11, 1972**
[73] Assignee **Walbro Corporation Cass City, Mich.**

[54] **DIAPHRAGM CARBURETOR**
5 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **123/119 B,** 123/73 A, 123/74 R, 261/41 D, 261/72, 261/DIG. 68
[51] **Int. Cl.** **F02f 9/00,** F02b 33/04
[50] **Field of Search** ..... 123/73 A, 119 B, 74 R, 74 A; 261/DIG. 68, 41.4, 72

[56] **References Cited**

UNITED STATES PATENTS

2,737,935	3/1956	Olson	123/119 B
3,265,050	8/1966	Tuckey	261/41.4 X

Primary Examiner—Wendell E. Burns
Assistant Examiner—R. B. Rothman
Attorney—Barnes, Kisselle, Raisch & Choate

ABSTRACT: A diaphragm carburetor system and construction in which the fuel supply for the main jet and the idle jet is brought from a diaphragm chamber through a main jet control valve and the idle jet control valve in series. A passage is provided in the carburetor to receive crankcase pulses from the two-cycle engine being controlled, and to expose these pulses to the idle system so that under full throttle conditions the pulses will be open to the idle system to blow collected fuel in that system back to the main jet as an acceleration charge and also to dry out the idle system so that upon the closing of the throttle there will be a delayed fuel flow through the idle system to prevent overrich comedown. This is accomplished by surface passages and a circuit gasket in the top wall of the diaphragm chamber to simplify the construction of the system.

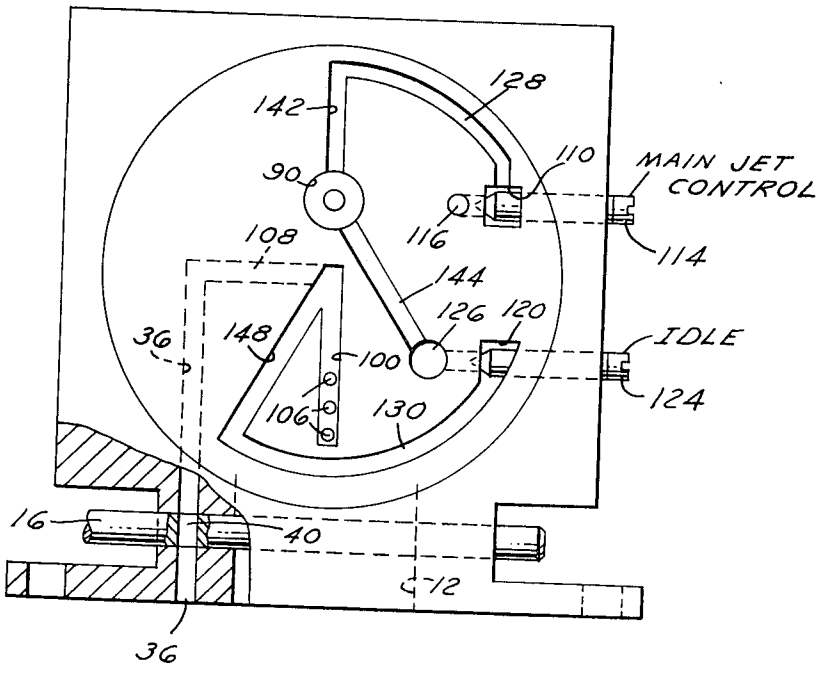


FIG. 1

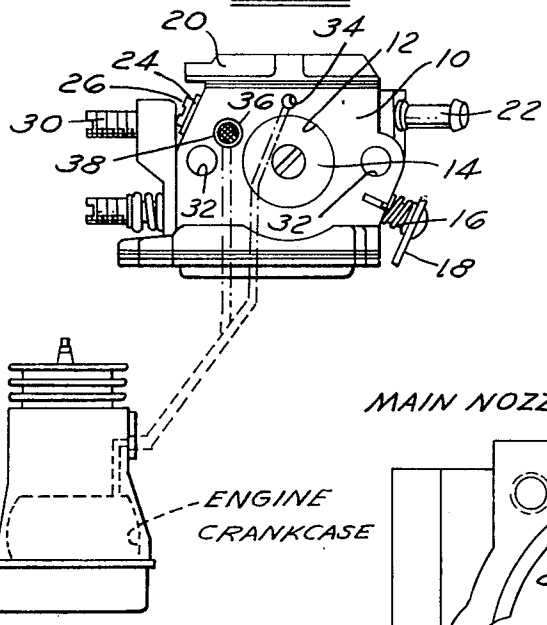


FIG. 5

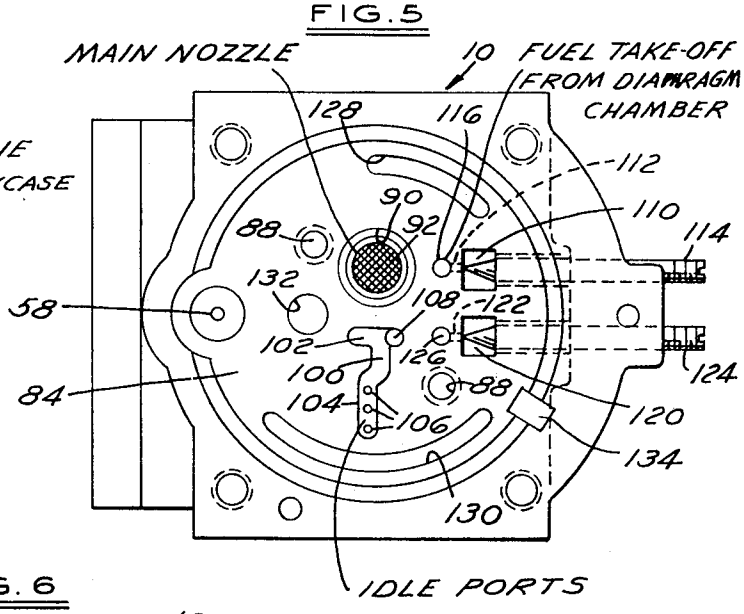
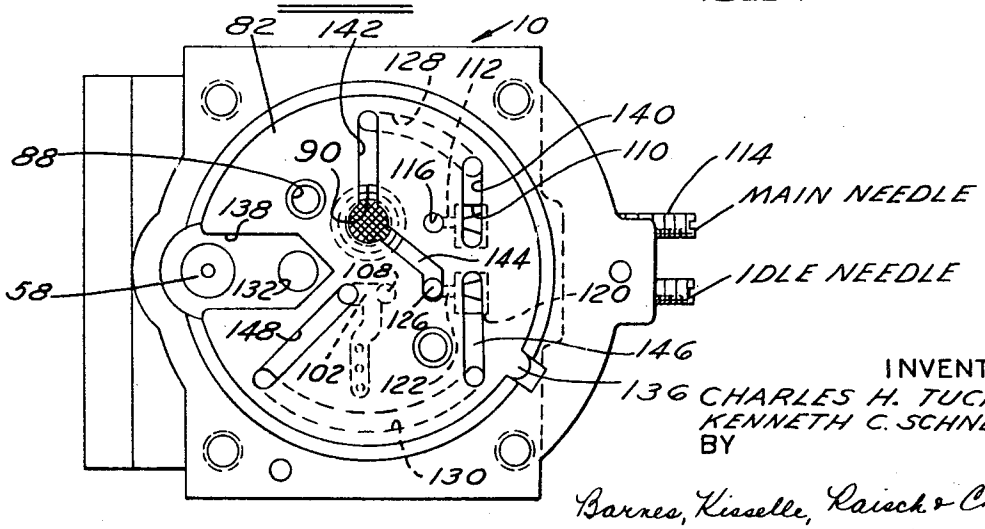


FIG. 6



INVENTOR
CHARLES H. TUCKEY
KENNETH C. SCHNEIDER
BY
Barnes, Kisselle, Raisch & Choate
ATTORNEYS

FIG. 4

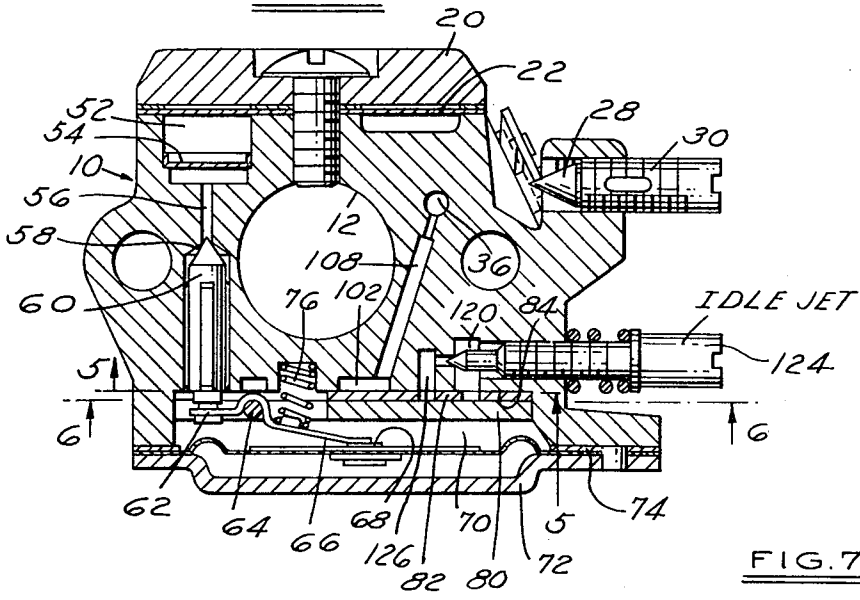


FIG. 7

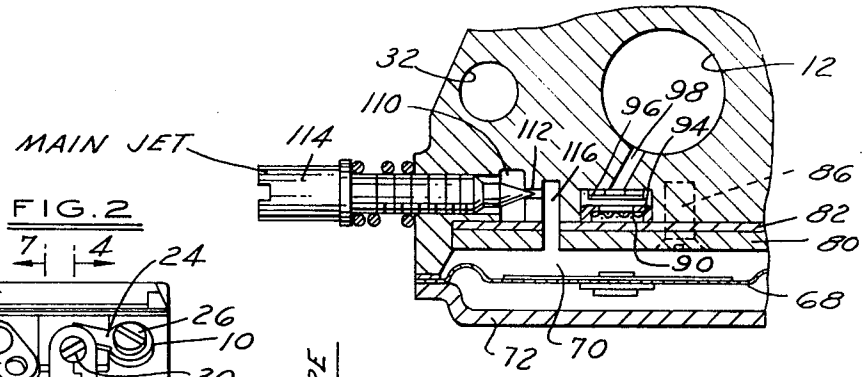


FIG. 2

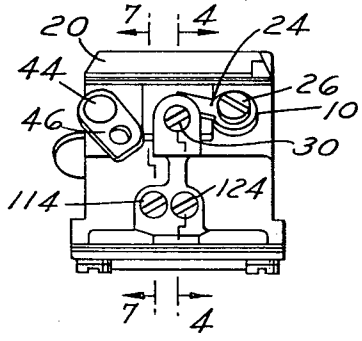


FIG. 8

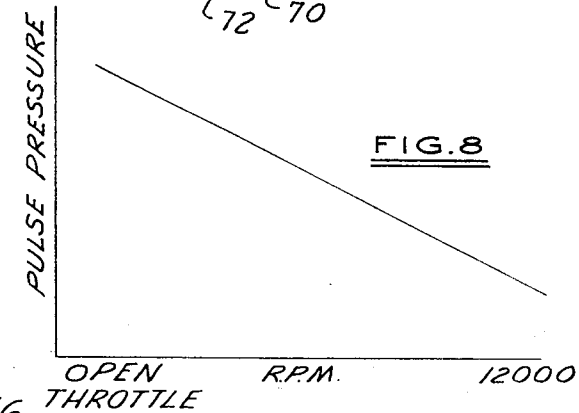
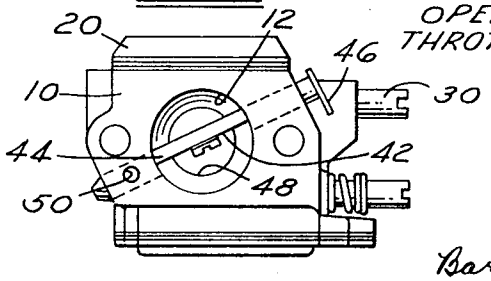


FIG. 3



INVENTORS
CHARLES H. TUCKEY
KENNETH C. SCHNEIDER
BY
Barnes, Kisselle, Raisch & Choate
ATTORNEYS

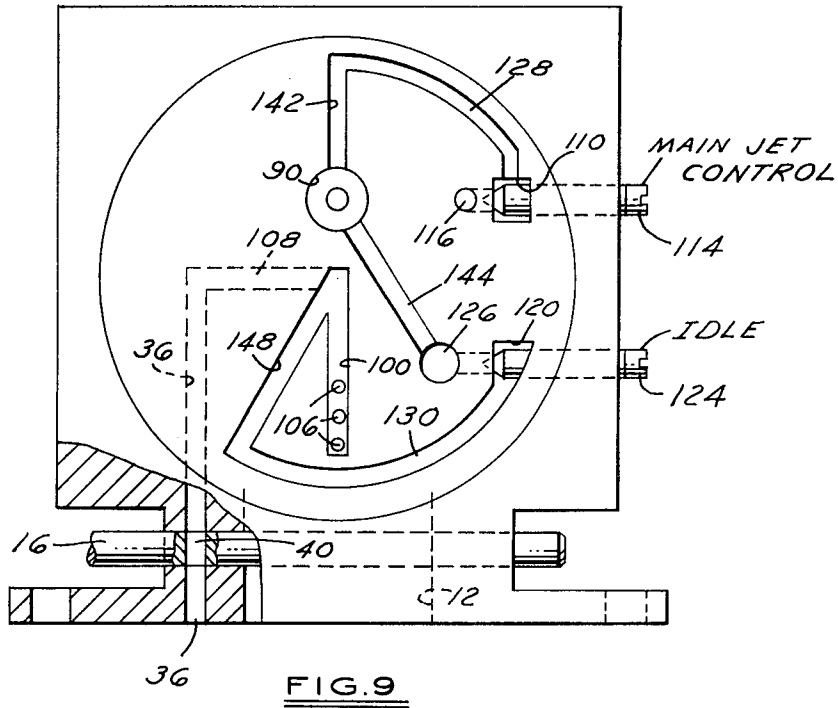


FIG.9

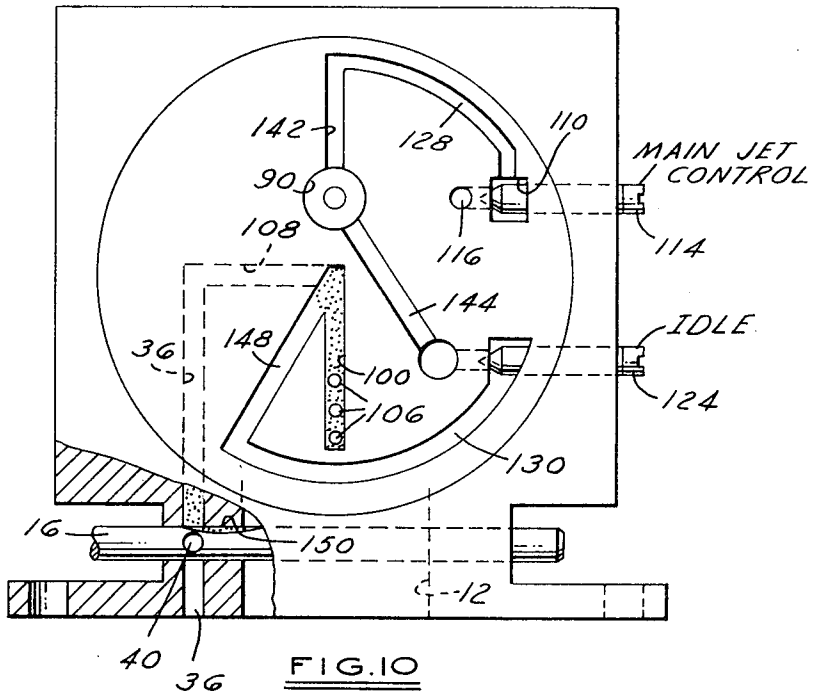


FIG.10

INVENTORS
CHARLES H. TUCKEY
BY KENNETH C. SCHNEIDER

Barnes, Kisselle, Raisch & Choate
ATTORNEYS

DIAPHRAGM CARBURETOR

This invention relates to a carburetor design and more particularly to a carburetor utilizing a system wherein crankcase pressure is open to the idle fuel passage under open throttle conditions to dry out the idle system while at the same time moving fuel into the carburetor as an acceleration charge.

It is an object of the present invention to simplify the carburetor construction to provide means to furnish an acceleration charge upon opening the throttle and at the same time accomplish an idle system which delays in filling upon closing of the throttle to prevent what is called overrich comedown or excessive fuel upon throttle closing which may cause the engine to kill.

It is another object of the invention to provide a unique carburetor design wherein necessary passages to accomplish the purpose are partially open face passages in one wall of a chamber in the carburetor and partially perforated passages in a plate insert to simplify the coring and drilling of the carburetor and to permit easy access to critical passages in case of cleaning or repair.

Other objects and features of the invention will be apparent in the following description and claims in which the principle of operation is described together with details of construction in connection with the best mode presently contemplated for the practice of the invention.

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

FIG. 1, an end elevation of a carburetor assembly.

FIG. 2, a side elevation.

FIG. 3, an elevation of the other end of the carburetor assembly.

FIG. 4, a sectional view on line 4—4 of FIG. 2.

FIG. 5, a bottom view of the carburetor taken from the diaphragm chamber.

FIG. 6, a bottom view with a channeled circuit gasket in position.

FIG. 7, a partial sectional view on line 7—7 of FIG. 2.

FIG. 8, a pressure speed curve.

FIGS. 9 and 10, diagrammatic presentations of the main jet and idle jet fuel passages illustrating the throttle control shaft.

Referring to the drawings:

As illustrated in FIG. 1, the carburetor has a main body 10 with a mixing passage 12 in which is a throttle valve 14 mounted on a shaft 16 controlled by a lever 18. A top plate 20 forms a standard fuel pump on the carburetor body taking fuel from the fuel inlet 22 and delivering it to the carburetor diaphragm chamber through a diaphragm-controlled valve in a conventional circuit including the fuel pump, the inlet valve, and the metering diaphragm.

At the other end of the throttle control valve shaft 16 is a small arm 24 held on the end of a throttle shaft by a cap screw 26. The position of this arm 24, and the throttle valve, as shown in FIG. 2, is controlled by the conical end 28 of an adjustable set screw 30, as seen best in FIG. 4. Holes 32 are for mounting the carburetor and a small hole 34 in the forward face of the carburetor and shown in FIG. 1 is utilized for receiving crankcase pressure pulses for actuating the pump in the top of the carburetor body under the housing cap 20.

Another opening 36 in the mounting face of the carburetor protected by a screen 38 is positioned to be exposed to crankcase pressure pulses of an engine on which the carburetor is mounted. This crankcase pulse is valved by a portion of the throttle valve 16 as illustrated more in detail in FIGS. 9 and 10 by a hole in the shaft which allows pressure to pass to the idle system, in a manner to be described later, when the throttle shaft is in full open position.

Referring to FIG. 3, the other end of the carburetor is shown with the mixing passage at 12 in which is positioned a choke valve 42 mounted on a shaft 44 extending through the housing, this shaft being controlled by a small arm 46. The choke valve is shown in the open position to expose the venturi restriction 48 of the mixing passage. In the hole 50 behind the shaft 44 can be positioned a detent (not shown) which acts on flats of the choke shaft to locate it in open or closed position.

Referring to FIG. 4, the housing 10 is shown with the cap 20 over the pump diaphragm 22 which delivers fuel into chamber 52 leading through a filter 54 to a passage 56 terminating at a valve seat 58. This valve seat is controlled by a needle valve 60, the lower end of which is actuated by a lever end 62 fulcrummed at 64 having a control lever end 66 actuated by a diaphragm 68 in a diaphragm chamber 70, the diaphragm being held in place by the bottom plate 72 of the carburetor with a suitable gasket 74. A coil spring 76 urges lever end 66 downwardly to close the valve 60 except when actuated to an open position by the diaphragm 68.

An intermediate plate 80 carries the fulcrum pin 64 for the lever ends or lever arms and this plate holds in position a circuit gasket 82 which lies against a bottom face 84 of the carburetor body. Two flathead screws 86 (see FIG. 7) are mounted in holes 88 to mount the plate 80 and also hold the circuit gasket 82 in place firmly against the bottom face 84.

Referring basically to FIG. 5 and also supplementary to FIGS. 4 and 7, it will be seen that the face 84 at the bottom of the carburetor has a check valve cavity 90 in which is mounted a filter screen 92 carried by a cage 94 which also serves as a seat for a unidirectional valve 96. Check valve cavity 90 opens to the mixing passage 12 through a main orifice port 98. Also in the face 84 shown in FIG. 5, is an idle passage 100 having a leg 102 near the center of face 84 and a leg 104 extending radially having idle ports 106 connected to the mixing passage.

A passageway 108 extends upwardly from legs 102 into the body (see FIG. 4) where it connects to the passage 36 (FIG. 1) which leads past the throttle shaft as previously described to be valved by the position of the shaft. It will be noted that the connection of passage 108 to 102 is approximately at the center of the diaphragm chamber which gives a balance of fuel head at this point regardless of the position of the tilt carburetor. Beyond this point, the fuel to the idle system is a mixture of air and fuel not materially affected by gravity. This concept is fully described in a copending application of Charles H. Tuckey, Ser. No. 853,597, filed Aug. 19, 1969.

A rectangular port 110 extending upwardly into the body connects at one wall with a short passage 112 which serves as a control seat for a needle valve 114. The passage 112 leads to a port 116 which connects through the circuit gasket 82 and the plate 80 to the diaphragm chamber 70 (FIG. 7). A similar rectangular port 120 shown in FIG. 5 connected at one wall to a short passage 122 is controlled by a needle valve 124 for idle adjustment, the passage 122 terminating in a passage 126 which forms part of an idle system in a manner to be described in connection with the circuit gasket.

Other recesses in the carburetor face 82 include an arcuate passage 128 at the top of the drawing in FIG. 5 and an arcuate passage 130 at the bottom of the drawing, the function of which will be later described. A circular recess 132 serves as a spring seat for spring 76 previously described. A small recess 134 at the circumference of the chamber 70 serves as a locator for a locator tab 136 on the circuit gasket shown in FIG. 6. This circuit gasket 82 has a radial segment removed to provide an opening 138 for the operation of the needle valve 60 and the lever end 62.

It will be seen that the circuit gasket has a passage 140 which leads from the chamber 110 to the arcuate passage 128 and a second passage 142 which leads from the passage 128 to the check valve cavity 90.

Thus, fuel from the takeoff passage 116, from the diaphragm chamber 70, will be controlled by the main needle valve 114 and pass into the chamber 110 where it can flow through the passages 140, 128 and 142 to the check valve cavity 90 leading to the mixing passage. With respect to the idle fuel supply, this originates from the check valve cavity 90 and passes through a passage 144 in gasket 82 to the port 126 and the short passage 122 to the chamber 120 and thence through the passage 146 in gasket 82 to the arcuate passage

130 and a radial passage 148 in the circuit gasket 82 to the passage 102 leading to the idle passage 100 and ultimately the idle ports 106 shown in FIG. 5. Thus, it will be seen that the surface passages in the surface 84 together with the cut perforate passages in the circuit gasket 82 form, for the most part, the main jet passages and the idle fuel passages for the carburetor.

It will be appreciated from the above that the two needle valve controls in the chambers 110 and 120 are in series in the sense that all of the fuel supply to the check valve cavity 90 passes the needle valve 114 and all of the idle fuel also passes this cavity 90 and then on to the additional passages leading to the idle needle control at chamber 120. The passage 108, previously described and shown in FIG. 4, terminates at 102 leading to the idle jets and this passage receives crankcase pressure from the passage 36 originating at the face of the carburetor (see FIG. 1). Passage 36 is controlled by a hole formed in the throttle shaft 16, this hole being aligned with the passage 36 when the throttle valve is in the open position.

To facilitate the explanation, a diagrammatic presentation of the circuits has been shown in FIGS. 9 and 10. In these FIGURES the flow of fuel will be evident from the main jet recess 110 to the check valve cavity 90 leading to the mixing passage and then the idle fuel takeoff 144 leads to the idle fuel recess 120 and then to the passages 130 and 148 to the idle passage 100.

The juncture of the passages 148 and 100 is connected to the passage 36 which passes through the opening for the throttle valve shaft 16. The throttle shaft has a cross passage 40 which, in the position shown in FIG. 9, with the throttle valve in open position, connects crankcase pulse pressure from the face of the carburetor to the idle system, thus blowing out all of the idle fuel either to the idle ports 106 or back into the check valve cavity 90. Since the path to the main nozzle 98 offers least resistance, the bulk of the fuel will move through it. When the throttle is moved to a closed position, as shown in FIG. 10, the cross port 40 is closed and a small portion of the shaft 16 if cut away at 150 into the main mixing passage 12 so that passage 36 leading to passage 100 is vented.

It will be appreciated that at full throttle, there is crankcase pressure all the time and thus once the system is cleared of fuel, air continues to pump back through the idle system toward the main nozzle. The pressure of this air varies with the r.p.m. (see FIG. 8). At low speed with a wide open throttle condition under what is sometimes referred to as a lug down or load condition, the pressure is higher and at the same time the venturi signal or pressure drop is less so more air is forced in which causes the mixture to be lean. Accordingly, the carburetor engine combination is adjusted so as not to lean out too much at this lug down condition. Then when the system moves out of the heavy load to a no load condition, the situation reverses, that is, the venturi signal increases and the crankcase pressure pulses decrease so that a much richer mixture is obtained which will limit the top speed of the engine and prevent runaway. Thus, the need for a supplemental fuel system is eliminated.

On the other hand, during the idle cycle, the crankcase pulse is blocked off by the closing of the throttle permitting the idle system to work independently of the crankcase pressure. However, as soon as the throttle is opened, all of the fuel in the idle system will blow back through the passages 148, 130, 126 and 144 to the check valve cavity 90, thus creating an accelerating charge as the throttle is moved to open position. This dries out the idle system so that when the throttle is cut back from full throttle to idle, there is a certain amount of time delay for the refilling of the idle system and this prevents what is called a rich comedown or underrun.

What is claimed as new is as follows:

1. In a carburetor system for an internal combustion engine including a carburetor body with a main nozzle and an idle port leading to a mixing passage and a throttle valve in said passage movable from a closed to an open position, that improvement which comprises:

a. means forming a fuel inlet in said body,

b. passageways in said body placing said main fuel nozzle in series between said fuel inlet and said idle port,

c. a manual main control valve in said passageways ahead of said main fuel nozzle and an idle control valve in said passageways ahead of said idle port, said valves having openings respectively decreasing in effective size,

d. a crankcase pulse passageway adapted to be connected at one end to the crankcase of an engine to which fuel is being delivered and connected directly at the other end to said passageway between said idle control valve and said idle port, and

e. valve means in said crankcase pulse passageway associated with said throttle valve to open said crankcase pulse passageway when said throttle is moved to open position to move all the fuel out of the idle fuel passageway under open throttle conditions.

2. A carburetor system as defined in claim 1 in which the carburetor body includes a diaphragm chamber having one wall formed by said body, a diaphragm in said chamber, and a valve controlled by said diaphragm to admit fuel to said chamber and thence to the fuel inlet, said passageways in said body being formed in part in said one wall of said body and in part by openings in a circuit gasket lying adjacent said wall.

3. A carburetor system as defined in claim 1 in which the carburetor body includes a diaphragm chamber having one wall formed by said body, a diaphragm in said chamber and a valve controlled by said diaphragm to admit fuel to said chamber and thence to the fuel inlet, said passageways in said body being formed in part as a plurality of unconnected surface openings in said one wall of said body and in part as a plurality of unconnected perforate openings in a circuit gasket, said respective openings being disposed to interconnect, and means to close said openings on one side of said gasket and hold said gasket tightly against said one wall of said body.

4. A carburetor and two-cycle engine combination in which the carburetor is mounted on the engine, the carburetor having a main nozzle and one or more idle ports leading to a mixing passage and a throttle valve in said passage movable from a closed to open position, that improvement which comprises:

a. means forming a fuel flow passage from a fuel inlet to a main nozzle opening, thence to an idle passage leading to an idle port opening,

b. means forming a passage from the crankcase of an engine through said carburetor to said fuel flow passage between said main nozzle opening and said idle port opening to convey crankcase pulse pressure to said fuel flow passage, and

c. means associated with said throttle valve responsive to movement of said throttle valve to open position to open said pulse pressure passage to force fuel out of said idle passage during open throttle conditions of said carburetor.

5. A carburetor as defined in claim 4 in which the means forming said fuel flow passage comprises a wall of said carburetor having passages cut into its surface, a circuit gasket having perforate passages formed therein and positioned to form continuous passages formed therein and positioned to form continuous passages in conjunction with the surface passages of said wall, and a closing plate overlying said circuit gasket closing one side of said perforate passages and pressing said gasket tightly on said surface to confirm and isolate said passages in said surface and said gasket.

* * * * *