

[54] NOZZLE CHECK VALVE SYSTEM

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[58] Field of Search: 261/35, 69 A, DIG. 68

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Primary Examiner—Tim R. Miles

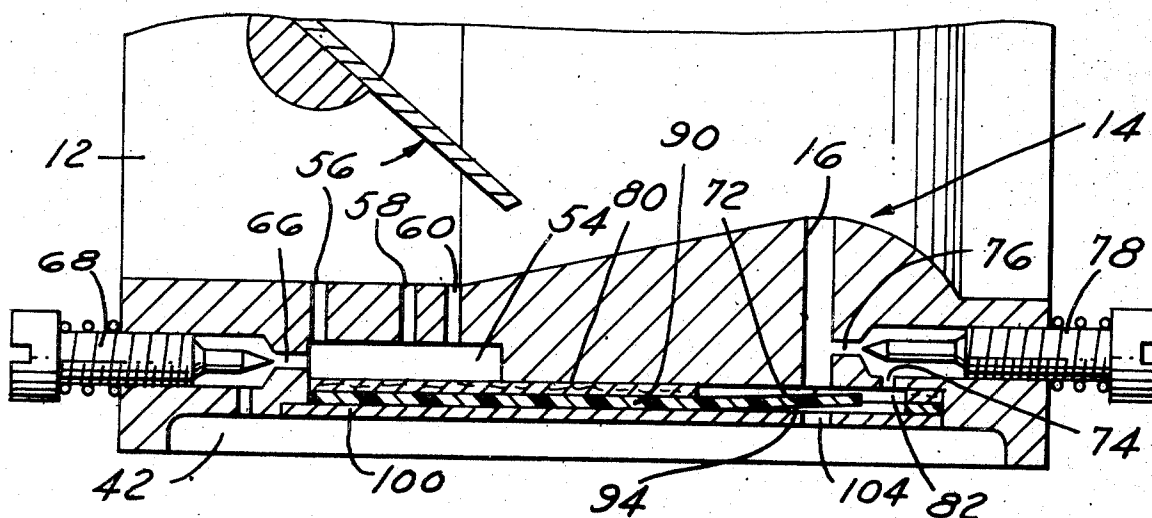
Attorney—Arthur Raisch et al.

[57]

ABSTRACT

A carburetor of the diaphragm type in which a fuel duct from the diaphragm chamber to the venturi mixing passage is formed with branch passages, the first of which flows directly to the mixing passage and the second of which is controlled by a manually operated control valve leading to the mixing passage. A check valve is provided to close, in one position, the fuel duct from the mixing passage, and, in a second position to block the first branch of the fuel duct, leaving the second branch as the fuel supply duct. In an intermediate position of the check valve, fuel can flow through both branch passages to provide an acceleration fuel flow during a change-over condition from idle to full throttle.

4 Claims, 8 Drawing Figures



SHEET 1 OF 2

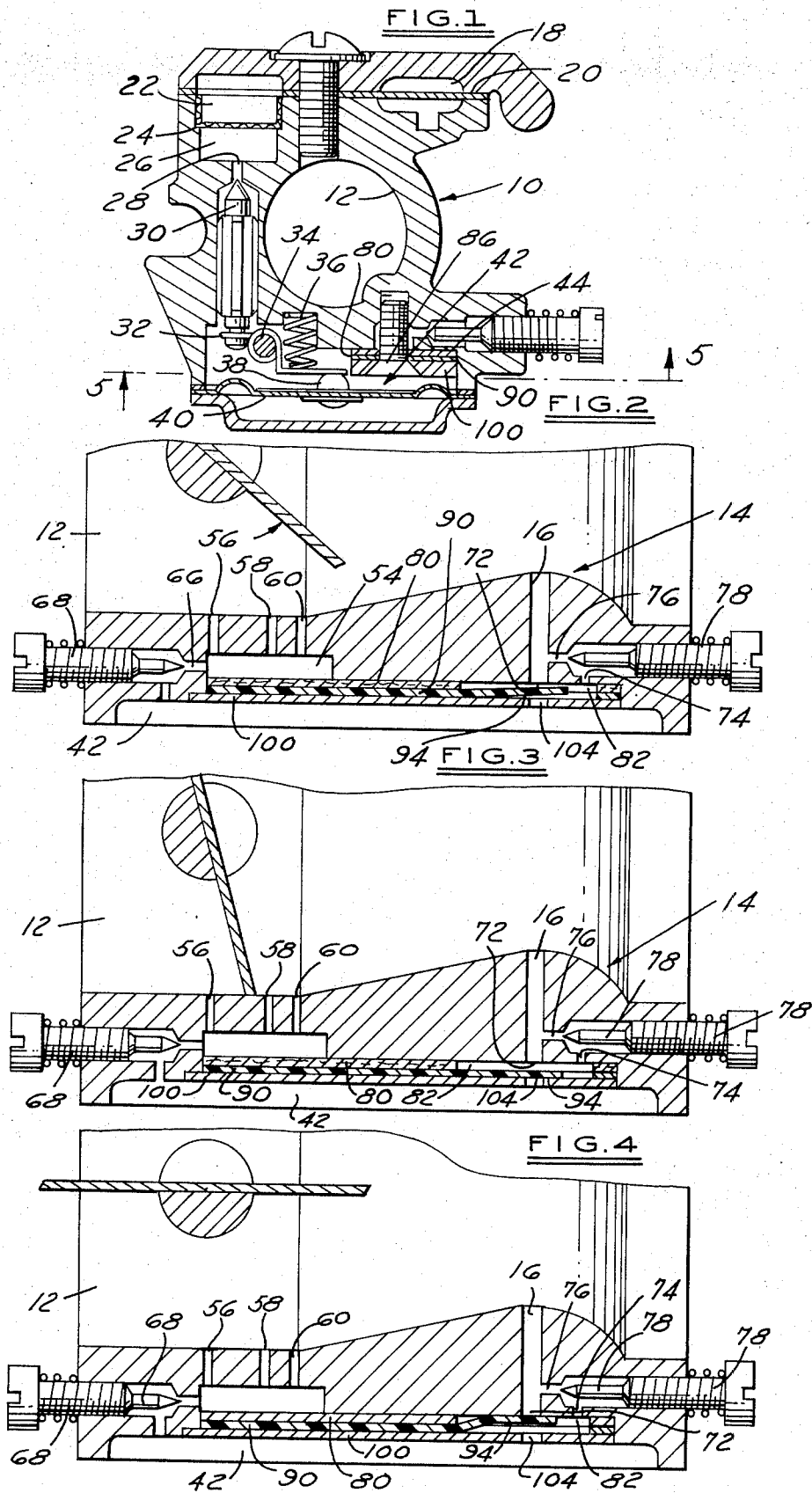


FIG. 5

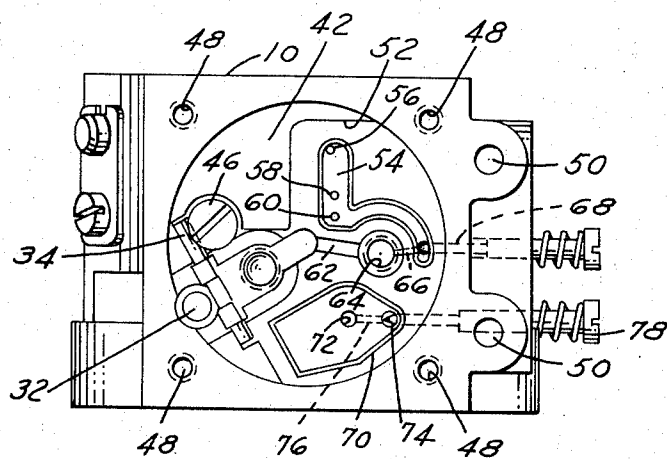


FIG. 6

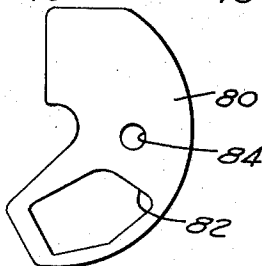


FIG. 7

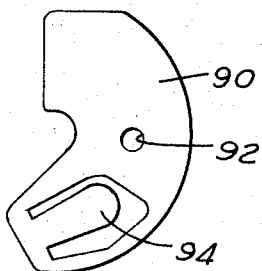
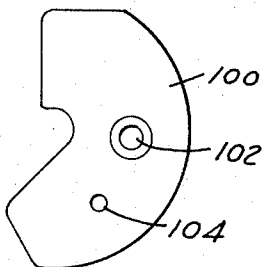


FIG. 8



NOZZLE CHECK VALVE SYSTEM

This invention relates to a Nozzle Check Valve System and more particularly to a check valve control system for the main jet of a carburetor which provides flow from a diaphragm chamber to the venturi area of the carburetor, the construction being such that upon opening of the throttle of the carburetor, an acceleration charge is made available to insure rapid acceleration.

It is an object of the present invention to provide a check valve system for the main fuel supply opening of a carburetor, sometimes referred to as a fuel jet or fuel nozzle, which will serve both as an acceleration system in the changeover from the idle condition to the open throttle condition but also as a suitable check valve upon return of the system to the idle condition. It will be appreciated that it is common practice to provide a check valve in a main jet duct to prevent what is termed "back bleeding" to the idle system under conditions of fuel flow through the idle ports when the main throttle valve is closed.

It is a further object to provide a fuel control system where the check valve is on the lead-in side of the main nozzle needle valve as distinguished from being on the mixing passage side of the needle valve.

It is a further object of the invention to provide a check valve for the main fuel nozzle of a carburetor which can be mounted in a very small space and thus accommodate to a very small carburetor such as required now in the small chain saws that are presently being made. The dimensions of these carburetors are in the nature of a cube which is approximately $1\frac{1}{4}$ inches on a side as distinguished from previous carburetors which were $1\frac{1}{2}$ inches to 2 inches in cubic dimension.

Other objects and features of the invention will be apparent in the following description and claims in which the principles of design and operation are set forth together 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, a sectional view of a carburetor construction showing the general relationship of the diaphragm chamber to the mixing passage.

FIGS. 2, 3 and 4, diagrammatic presentations of the fuel supply system of the present invention showing the check valve in various positions.

FIG. 5, a bottom view of the carburetor shown in FIG. 1 taken on line 5—5 of FIG. 1.

FIG. 6, a view of a gasket sheet used in the valve construction.

FIG. 7, a view of a valve sheet.

FIG. 8, a view of a cover plate.

REFERRING TO THE DRAWINGS

In FIG. 1, a carburetor is shown having a body 10 provided with a mixing passage 12 which includes a venturi section 14 shown diagrammatically in FIG. 2 having a main jet or nozzle duct 16. At the top of the carburetor shown in FIG. 1 is a pump chamber 18 of standard construction having a pump diaphragm 20 which feeds fuel from a suitable intake opening through a discharge chamber 22 and a filter 24 to a fuel chamber 26 having an opening 28 controlled by a needle valve 30.

The position of this valve 30 is controlled by a pivoted lever 32 pivoted at 34 and biased by a spring 36. The lever is controlled by a projection 38 on a diaphragm 40 acting in a diaphragm chamber 42 formed by one wall of the carburetor body and a closure and retaining cap 44.

In FIG. 5, the bottom of the carburetor body 10 is shown as viewed on line 5—5 of FIG. 1. It will be seen that the lever 32 is pivoted on the pin 34 held in place by a screw 46. Screw holes 48 are provided for holding the plate 44 on the body and locator lugs 50 provide proper registry for the diaphragm 40 and the gasket that surrounds it. The wall of the body 10 illustrated in FIG. 5 within the diaphragm chamber 42 is recessed at 52 to provide for a check valve assembly. On the face of the recess 52 is a further recessed passage 54 which contains three openings extending into the mixing passage 12. These openings, designated at 56, 58 and 60, are shown diagrammatically in FIGS. 2 to 4 and form the idle passages for the carburetor. Fuel from the diaphragm chamber passes from the valve 30 through a channel 62 and around a screw opening 64 to a passage 66 (dotted lines) leading to the sinuous passage 54. The idle control valve needle 68 controls fuel flowing through the passage 66 to the idle system.

At another portion of the recess 52 is a roughly rectangular area defined by a ridge 70 on the surface of the recess. Within this area is the opening 72 of the main jet 16. Another hole 74 in the face of the recess extends downwardly and is connected by a cross-passage 76 (dotted lines) controlled by a main throttle needle valve 78. In FIG. 6, a sheet 80 is illustrated of material having a thickness in the neighborhood of one sixty-fourth inch provided with a recess opening 82 which will overlie the area 70 in the chamber 52. The peripheral edges of the opening 82 will seal against the outlining ridge of the area 70. A screw hole 84 is provided for a retaining screw 86 (FIG. 1).

In FIG. 7, a sheet of very thin, resilient material is shown at 90 again having a screw hole 92 and a flap valve 94 formed therein which will overlie the opening 72 within the area 70 of FIG. 5.

In FIG. 8, a retaining plate 100 is illustrated formed of metal having a screw hole 102 which will register with the holes 92 and 84 of the elements 80 and 90. It will be noted that the general profile of the elements 80, 90 and 100 is substantially identical and will fit the recess 52 formed in the wall of the diaphragm chamber. The valve 94, as previously stated, is positioned to overlie the main jet opening 72 leading to the mixing passage and it is also positioned to underlie an opening 104 leading through the plate to the diaphragm chamber. Thus, when the parts are assembled into the diaphragm chamber, the valve 94 will be movable in the recess created by the opening 82 and movable as shown in the diagrammatic views (FIGS. 2 to 4) to close the opening 104 in one position and to close the opening 72 in another position. As shown in these views, the passage then from the diaphragm chamber 42 to the mixing passage is composed of the root portion 104 in the plate 100 which opens into the recess 82, the passage then branching into the first section leading to the jet opening 16 and a second section through the opening 74 and past the main jet valve 78 to the opening 76.

In the operation of the device, it will be appreciated that fuel will flow from a standard fuel inlet under the influence of the pump diaphragm 20 through the filter

24 to the port 28 where it will be controlled by the diaphragm valve 30. The diaphragm valve will be responsive to the engine pulses by reason of the diaphragm 40 in the usual manner. Fuel from the diaphragm chamber will be available to the port 104 in plate 100 and can flow to the main fuel duct opening 16 through the recess 82, the port 74, past the needle valve 78 into the cross passage 76.

When the throttle is wide open as illustrated in FIG. 4, the flow will be through the passages above recited and the check valve flap 94 will be up against the opening 72 to close off the bottom portion of the one branch of the fuel duct. Thus, there will be a controlled flow into the mixing passage. In the other extreme of operation, when the throttle valve is closed, as shown in FIG. 3, the valve 94 will be in the down position closing the root opening 104 to prevent blowback from the mixing passage through the idle chambers. Thus, the fuel may pass from the diaphragm chamber through the idle passages to the opening 56. Passages 58 and 60 in this closed position may serve as air inlets for the idle mixture. In intermediate portions, these passages 58 and 60 may serve as fuel passages. This is again a standard operation in a carburetor of this type.

In FIG. 2, the valve 94 is shown in an intermediate position wherein both the opening 104 and the opening 72 are not closed by the valve. In this state, the throttle valve is moving from the closed position to the open position and the engine being controlled will be moving from an idling cycle to a full throttle condition. Under these conditions, very frequently it is necessary to have an acceleration charge reach the engine to prevent slowdown or even stalling by reason of lack of fuel. With the use of the present invention, it has been discovered that the valve flap 94 will have an intermediate position as shown in FIG. 2 wherein fuel from the diaphragm chamber 42 can pass to the mixing chamber port 16 through both branches of the fuel duct, i.e., through the opening 76 controlled by the manual adjustment needle valve 78 and also from the root passage 104 and the chamber 82 through the duct opening 72. Thus, there is a reserve supply of fuel which can flow from the chamber 82 to the mixing passage through both branches of the fuel system, namely, the opening 72 and the opening 76. This momentary surge of fuel is adequate to prevent stalling and enables the engine to reach a position wherein it is receiving its controlled fuel supply only through the passage 76 after the valve 94 moves by the increased vacuum in the mixing passage to the position shown in FIG. 4.

Thus, by a very simple device, the acceleration charge is made available without the need of pulse chambers or additional pumps and so on. The reason for the unexpected effect in this case is not completely understood. It may be partially due to the fact that the fuel in chamber 82 is pushed upwardly by the flap valve so that it surges into the fuel duct and also that fuel can pass around the sides and the ends of the valve through the chamber 82 to reach the main fuel duct 16 in addition to passing through the ducts controlled by the needle valve. The effect, however, of the construction is

excellent, producing a suitable change-over from idle to full throttle with a very simple construction, this being highly important because of the small size of the carburetor which prevents the addition of more complicated acceleration systems.

I claim:

1. In a diaphragm carburetor having a mixing passage, a diaphragm chamber, a fuel inlet control valve controlled by the position of a diaphragm in that chamber, a main fuel duct to conduct fuel from the chamber to the mixing passage, and an idle fuel passage between the chamber and the mixing passage, that improvement which comprises a main fuel duct with a double branch portion at one portion thereof between a root opening into the chamber and a main fuel nozzle leading to the mixing passage, a fuel metering valve controlling the effective size of one of said branches, and a check valve at said root opening movable to a first position to block reverse flow from said mixing passage to said chamber and to a second position to block flow through the other of said branches, said valve in an intermediate position allowing flow through both said branches.

2. A device as defined in claim 1 in which a plate is mounted on one wall of said chamber having a hole to form the root opening of the main fuel duct and located to provide a flat recess surrounding the diaphragm end of said branch passage, and said check valve comprises a flat valve member in said recess overlying said plate movable to said first position to close said hole and to said second position to close said other branch passage.

3. A device as defined in claim 1 in which a carburetor body has a wall forming one wall of a diaphragm chamber, a plate positioned against said wall having a portion spaced from said wall adjacent said branch passages to provide a thin cavity, said plate having a hole to provide said root passage at said spaced portion, and said check valve comprises a flexible valve member positioned in said cavity to overlie said hole in said first position and movable in said cavity to said second position to close said other branch passage.

4. In a diaphragm carburetor, a carburetor body having a wall forming one wall of a diaphragm chamber, said wall having two branch passages originating at said wall and leading to a common fuel nozzle opening into a mixing passage, a manual control valve positioned to regulate one of said branch passages, a sheet of material on said one wall provided with an opening forming a shallow recess overlying openings to said branch passages, a sheet of flexible material having a flap valve formed therein positioned to overlie said recess, said valve overlying the opening into the other of said branch passages, and plate means overlying said sheets having an opening underlying said flap valve and connecting said chamber to said recess wherein said valve in one position in said recess closes said plate opening and in a second position closes said opening into said other branch passage and in an intermediate position permits flow from said plate opening to both said branch passages.

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