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CARBURETOR

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FIG. 1

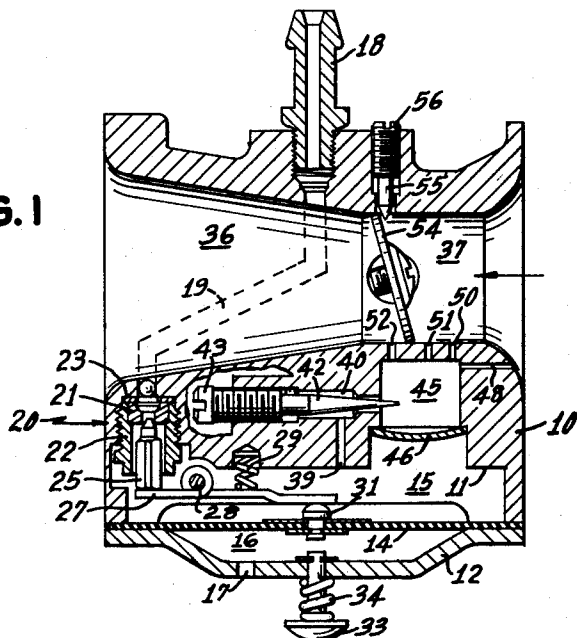
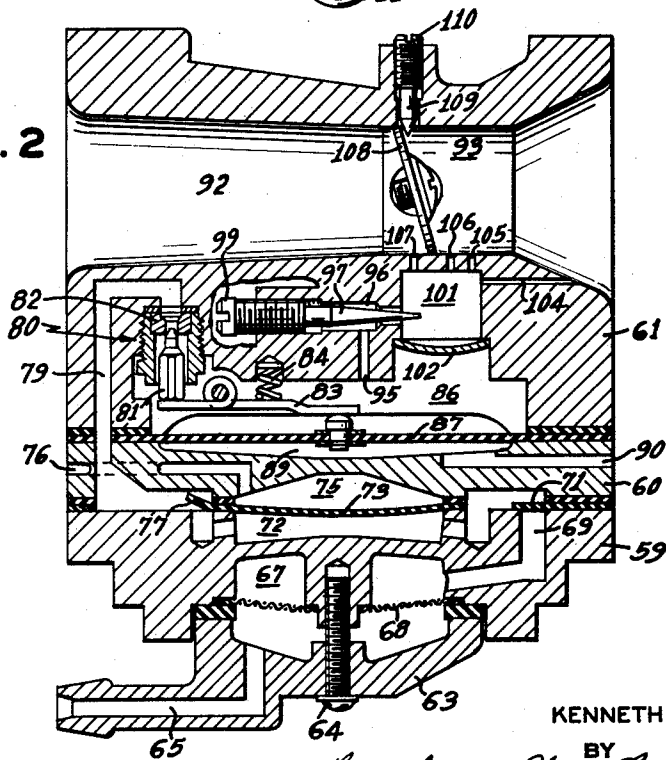


FIG. 2



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CARBURETOR

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1 Claim. (Cl. 261-41)

This invention relates in general to relatively low-cost carburetors and, more particularly, to a simplified carburetor which has only one air-flow controlling shutter in the throat only of its venturi mixing chamber and which is provided with a single fuel system for both idling and open-throttle conditions. The new carburetor design is especially adaptable to diaphragm-type and float-type carburetors.

It is typical of conventional carburetors that they include a fuel reservoir kept at substantially constant capacity by diaphragm or float control means and a venturi air-fuel mixing chamber having the usual constricted throat portion. A main fuel-delivery passage, controlled by its own needle valve or the like, leads from the reservoir to the throat portion of the mixing chamber and a separate idling system, also controlled by its own needle valve, extends from the reservoir to a point in the mixing passage downstream from the throat portion. Two separate air-flow controlling shutters or butterfly valves are usually located in the mixing chamber, the choke shutter being upstream from the venturi throat and the main shutter being at the point where the idling system opens into the mixing chamber.

It is the primary purpose of the present invention to make basic departures from these design features in order to radically simplify carburetors and make them much lower in cost, and yet to do so without impairing their performance. The number of fuel passages, valves and shutters present in known carburetors is to be minimized as much as possible and, at the same time, satisfactory control is to be maintained over the air-fuel mixture under both idling and open throttle conditions. A further object of the invention is that the new carburetor is to be of particularly compact size and is to be provided with fewer moving parts.

Stated broadly, the carburetor of the invention comprises a body member formed with a fuel reservoir. Means are included for introducing fuel into the fuel reservoir. The body member is also formed with an air-fuel mixing chamber having a constricted throat portion and with fuel-delivery conduit means connecting the fuel reservoir with the throat portion only of the mixing chamber. A single valve shutter is positioned in the mixing chamber. It is located in the throat portion and serves to control the flow of air therethrough.

This use of only one valve shutter in the mixing chamber, and that being located at the throat portion thereof, is of great importance in the new carburetor. In combination with the other features described fully hereinbelow, it provides adequate control over the richness or leanness of the air-fuel charge under both idling and throttling conditions and thereby replaces the combination of both a main and choke shutter previously believed to be necessary.

The invention also includes another basic feature which contributes considerably to the achievement of the above-mentioned objects. This is the novel design of the fuel-delivery conduit means communicating the throat portion of the mixing chamber with the fuel reservoir. According to the invention, separate main and idling orifices open into the mixing chamber. The fuel-delivery conduit means comprises a single passage communicating with the reservoir and connected with each of said orifices.

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A single adjustable valve is located in this single passage for controlling all delivery of fuel from the reservoir to the mixing chamber.

By means of this unique fuel-delivery system, it is no longer necessary that separate idling and main fuel systems be incorporated in a carburetor in the conventional manner. Moreover, it makes possible the use of only one needle valve for maintaining control of fuel flow from the reservoir to both the main and idling orifices. This single needle valve replaces the combination of two such valves operating in the respective fuel systems of known carburetors.

Each of these various features of the new carburetor contributes toward the achievement of a highly simplified low-cost charge-forming device. It is evident that together they cooperate to provide a carburetor which is especially advantageous from the standpoint of economy, simplicity and, at the same time, precision of operation. The improvements embodied in the invention are of value in many different types of carburetors but they are particularly advantageous in diaphragm-type carburetors used in relatively small-size internal combustion engines. There are also many diaphragm-type carburetors which are modified to include integral diaphragm pumps and these charge-forming devices may also be designed to advantage in accordance with the present invention.

A preferred embodiment of the new carburetor is described hereinbelow with reference to the accompanying drawing, wherein

FIG. 1 is a diagrammatic longitudinal section of a diaphragm carburetor of the type provided by the invention; and

FIG. 2 is a diagrammatic longitudinal section of a diaphragm carburetor equipped with an integral diaphragm pump and including the features of the invention.

Referring first to the carburetor of FIG. 1, it comprises a body member 10 formed with a cavity 11 which is subtended by a coverplate 12. Between the body member 10 and the coverplate 12, a flexible control diaphragm 14 is disposed. The cavity 11 and the control diaphragm 14 together define a fuel reservoir 15 which is unvented, i.e., not open directly to the atmosphere at any point. The coverplate 12 and the control diaphragm 14 together define an air chamber 16 which is vented to the atmosphere through an aperture 17 extending through the coverplate 12.

Fuel-supplying means are provided which include a detachable fitting 18 threaded into the body member 10 and adapted to receive a hose leading from a source of liquid fuel. A fuel-supplying passage 19 is formed in the body member 10 and communicates the bore of the fitting 18 with the reservoir 15. To control the flow of fuel from the passage 19 into the reservoir 15, an inlet valve assembly 20 is provided which comprises a valve seat 21 mounted in a valve casing 22 which, in turn, is threaded into a recess in the cavity 11. Both the valve seat 21 and casing 22 fit against a gasket 23 encircling the opening of the fuel-supplying passage 19. Loosely positioned within the valve casing 22 is a valve needle 25 having a conical end portion adapted to fit within and seal the aperture defined by the valve seat 21. The opposite end of the valve needle 25 rests on one end of a lever arm 27 which is fulcrumed at 28 and urged by a spring 29 in a direction normally closing the valve needle 25 against its seat 21.

At the opposite end of the lever arm 27, contact is made with a button 31 centrally mounted on the control diaphragm 14. By this construction, a drop in pressure below atmospheric within the reservoir 15 causes the diaphragm 14 to flex upwardly, pivot the lever arm 27 and admit fuel from the fuel-supplying passage 19 through the inlet valve assembly 20. Conversely, when atmos-

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pheric pressure or greater exists in the reservoir 15, the diaphragm 14 flexes downwardly and the inlet valve assembly 20 is automatically closed. To aid in starting the engine with which this carburetor is associated, a primer button 33 is mounted in the coverplate 12 and can be depressed against a spring 34 to force the diaphragm 14 upwardly into the reservoir 15 and manually open the inlet valve assembly 20.

The new carburetor also includes a venturi air-fuel mixing chamber 36 formed in the body member 10. The mixing chamber 36 includes a longitudinally extended constricted throat portion 37. Air is adapted to flow in the direction of the arrow through the mixing chamber 36 and into the engine crank case or cylinders.

A single fuel-delivery system is incorporated in the carburetor to direct fuel from one point in the reservoir 15 to the throat portion 37, and only the throat portion, of the mixing chamber 36. This novel fuel-delivery system includes a single passage 39 extending from the reservoir 15 to a valve chamber 40. Flow from the valve chamber 40 is controlled by a single needle valve 42 which is threaded into the body member 10 and is exposed on the exterior of the carburetor at its slotted head 43. After passing the needle valve 42, fuel proceeds into a single auxiliary fuel chamber 45. In the construction of the carburetor body member, the chamber 45 is part of the cavity 11 but it is completely sealed off therefrom during assembly by a plug 46. An air-bleed 48 extends through the body member 10 to communicate the auxiliary chamber 45 with atmosphere.

There are three passages extending from the auxiliary chamber 45 into communication with the throat portion 37 of the mixing chamber 36. These three passages open into the throat portion of the mixing chamber respectively at a main fuel orifice 50, a secondary idling orifice 51, and a primary orifice 52. The orifices 50, 51 and 52 are positioned in closely spaced longitudinal arrangement relative to the axis of the venturi mixing chamber 36. In practice, the main fuel orifice 50 is considerably larger in diameter than the idling orifices 51 and 52 and is located upstream relative to the idling orifices.

To control the flow of air through the mixing chamber 36, a single butterfly-type valve shutter 54 is provided. The valve shutter 54 is pivotally mounted about an axis extending diametrically through the throat portion 37 of the mixing chamber. Hence, the valve shutter 54 is operable immediately within the throat portion 37. Furthermore, it is located therein such that in its fully closed position (shown in FIG. 1) it extends across the throat portion 37 of the mixing chamber between the secondary idling orifice 51 and the primary idling orifice 52.

It is also provided by the invention that an adjustable stop 55 is threadably mounted in the body member 10 and is provided with an end portion which extends into the throat portion 37 of the mixing chamber 36. The other end of the stop 55 is exposed on the exterior of the carburetor and includes a slotted head 56. By turning the stop 55 into its threaded mounting, the inner end portion thereof engages the edge of the valve shutter 54 when the shutter is in its closed position. It is thereby possible to limit the extent to which the valve shutter 54 can be closed within the throat portion 37 of the mixing chamber.

The operation of the new carburetor shown in FIG. 1 is as follows: Fuel is pumped or fed by gravity to the fitting 18 and thence through the fuel-supply passage 19 into the reservoir 15. It may be necessary initially to depress the primer button 33 in order to open the inlet valve 20 and admit a certain amount of fuel into the mixing chamber 36. The engine is started with the valve shutter 54 in at least partly open position and air is drawn through the mixing chamber 36 in the direction shown by the arrow. The venturi effect within the throat portion 37 creates suction which draws additional fuel from the various orifices 50, 51 and 52. The fuel passing through these orifices from the auxiliary chamber 45 is aerated by means of the air bleed 48.

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Control over the richness of the air-fuel mixture under either idling or open throttle conditions depends primarily on three factors. The first is a constant factor, i.e., the diameter of the orifices 50, 51 and 52. The second two factors are variable and they are respectively the setting of the needle valve 42 and of the adjustable stop means 55. The two variable factors can be so correlated with the constant factor of orifice size such that the carburetor delivers an air-fuel charge dependably under idling and open-throttle conditions and can smoothly change from one condition to the other.

For example, the needle valve 42 may be set in a position which gives a good throttling mixture. If this setting of the needle valve 42 for open-throttle conditions is not the most desirable for idling conditions, adjustment can be made for idling simply by limiting the extent to which the valve shutter 54 can close in the mixing chamber. Suitable positioning of the stop means 55 in this regard can increase the amount of air drawn through the mixing chamber 36 under idling conditions and can vary the richness of the idling mixture otherwise established by the setting of the needle valve 42. During idling, of course, fuel exits through the primary idling orifice 52 on the engine side of the valve shutter while air bleeds into the chamber 45 through the secondary idling orifice 51, the main orifice 50 and the air bleed 48. If desired, the two orifices 50 and 51 can be combined into a single larger orifice upstream of the shutter 54 to serve as both a main and secondary idling orifice.

It is the location of the shutter 54 adjacent each of the fuel-delivery orifices which permits the one shutter to serve as efficiently as do the usual two under both idling and open throttle conditions. This in turn, makes possible the use of a single fuel system leading from the fuel reservoir 15 and also permits the incorporation of only a single needle valve 42 in the fuel system. The stop means 55 works in conjunction with each of these features in that it provides the necessary refinement of control heretofore possible only where multiple needle valves, shutters and fuel systems were provided.

Turning now to FIG. 2, this embodiment of the new carburetor includes a body member made up of body elements 59, 60 and 61. A coverplate 63 is secured by a screw 64 to the body element 59 and includes a hollow fitting 65 adapted to receive a hose leading from a source of fuel. Fuel proceeds through the fitting 65 into a chamber 67 defined between the body element 59 and the coverplate 63. Within the chamber 67, the fuel passes through a filter element 68. A passage 69 in the body element 59 leads from the chamber 67 through a check valve flap 71 into a pumping cavity 72. The cavity 72 is partly defined by a flexible pump diaphragm 73 gripped between the body elements 59 and 60. The pump diaphragm 73 also partly defines a second cavity 75 formed in the body element 60 which is connected through a passage 76 to a source of fluctuating fluid pressure, such as the crank case of the engine. From the pumping cavity 72, fuel proceeds through a second flap-type check valve 77 to a fuel-delivery passage 79 extending into the body element 61. Both of the flap-type check valves 71 and 77 may be integral flaps formed as part of the pump diaphragm 73.

From the fuel-supplying passage 79, fuel proceeds through an inlet valve assembly 80 which includes a valve needle 81 adapted to fit within and seal the aperture in a valve seat 82. The valve needle 81 rests on one end of a fulcrumed lever 83 which is urged by a spring 84 normally into a position closing the inlet valve 80.

A fuel reservoir 86 is formed within the body element 61 and is partly defined by a flexible control diaphragm 87 which engages the lever arm 83. On the other side of the control diaphragm 86 is an air chamber 89 vented to the atmosphere by a passage 90 formed in the body element 60.

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The body element 61 has an air-fuel mixing chamber 92 extending therethrough which includes a longitudinally extended constricted throat portion 93. Fuel is delivered from the reservoir 86 to the mixing chamber 92 by fuel-delivery means which include first a single passage 95 leading from the reservoir 86. The passage 95 communicates with a valve chamber 96 within which a single needle valve 97 operates. The needle valve 97 is threadably mounted in the body element 61 and its head portion 99 is exposed on the exterior of the carburetor. After passing the needle valve 97, fuel enters an auxiliary chamber 101 which is separated from the reservoir 86 by a plug 102. Air is introduced into the auxiliary chamber 101 by means of an air bleed 104.

From the auxiliary chamber 101, fuel may proceed through either a main orifice 105, a secondary idling orifice 106 or a primary idling orifice 107, each of which opens into the throat portion 93 of the mixing chamber 92. A single butterfly-type valve shutter 108 is pivotally mounted in the throat portion 93 of the mixing chamber 92 such that in closed position it extends across the throat portion 93 between the secondary idling orifice 106 and the primary idling orifice 107. An adjustable stop 109 is threadably mounted in the body element 61 and it has an end portion which extends into the throat portion 93 of the mixing chamber to limit the extent to which the shutter 108 may be closed therewithin. The stop 109 has a head portion 110 exposed on the exterior of the carburetor.

In the operation of the carburetor shown in FIG. 2, the cyclic fluctuation of fluid pressure within the cavity 75 causes cyclic flexure of the pump diaphragm 73. By the action of the check valves 71 and 77, fuel is thereby drawn from its source through the filter element 68 and into the pump cavity 72. Thence it is forced through the fuel-supplying passage 79, past the inlet valve assembly 80, and into the reservoir 86. When the reservoir 86 is at the desired capacity, the diaphragm 87 flexes downwardly and closes the inlet valve 80. However, when fuel is drawn through the various orifices 105, 106 and 107 by the flow of air through the venturi mixing chamber 92, the control diaphragm 87 flexes upwardly to open the inlet valve 80 and maintain the reservoir 86 at constant capacity.

As in the previous embodiment, the single valve shutter 108 positioned in the throat portion 93 of the venturi can operate to control the air-fuel mixture delivered by this carburetor under both idling and open throttle conditions. A suitable correlation can be established between the diameter of the orifices 105, 106 and 107 and the settings of the single needle valve 97 and stop means 109 such that fuel is delivered smoothly at full throttle conditions when the shutter 108 is fully open and at idling conditions when the shutter 108 is either fully closed or is held opened a certain degree by the stop means 109.

It is characteristic of both of these embodiments that only one butterfly-type valve shutter is provided in the air fuel-mixing chamber, that a single fuel system is provided between the respective fuel reservoirs and mixing chambers, that only one needle valve need be incorporated to control the delivery of all fuel through this fuel delivery system, and that stop means are provided to vary

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the extent to which the single shutter closes within the mixing chamber. While each of these features alone contributes to the achievement of a simplified low-cost carburetor, it is evident that together they cooperate to provide particularly efficient performance in the new highly simplified device.

I claim:

A carburetor comprising in combination a body member formed with an unvented fuel reservoir, a flexible diaphragm defining one wall of said fuel reservoir, valve means responsive to flexure of said diaphragm for admitting fuel into said reservoir, an air-fuel mixing chamber formed in said body member and having a longitudinally extending constricted throat portion, a separate main orifice opening into said constricted throat portion and primary and secondary idling orifices opening into said constricted throat portion of said mixing chamber, said orifices being closely spaced in said constricted throat portion in substantially longitudinal alignment relative to the axis of said constricted throat portion, fuel-delivery conduit means formed in said body member and connecting said fuel reservoir with said constricted throat portion only, said fuel-delivery conduit means comprising an auxiliary fuel chamber, a single passage communicating with said reservoir and said auxiliary chamber, a single adjustable valve located in said single passage for controlling delivery of all fuel from said reservoir to said mixing chamber, and multiple passages communicating with said auxiliary chamber and with the respective orifices, a single valve shutter pivotally mounted in the constricted throat portion of said mixing chamber to control the flow of air therethrough, said valve shutter in its closed position extending across said throat portion upstream relative to said primary idling orifice and downstream relative to said secondary idling orifice and said main orifice, and an adjustable stop screw threadably mounted in said body member and having an end portion extending into said mixing chamber, said end portion being engageable with said shutter for selectively limiting the extent to which said valve shutter may be closed in said mixing chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,310,432	Pembroke	July 22, 1919
1,547,296	Bullard	July 28, 1925
1,742,429	Walker	Jan. 7, 1930
1,839,102	Kessel	Dec. 29, 1931
2,407,534	Carlson	Sept. 10, 1946
2,626,790	Betcher	Jan. 27, 1953
2,670,189	Phillips	Feb. 23, 1954
2,711,884	Zarnack	June 28, 1955
2,728,564	Bracke	Dec. 27, 1955
2,774,582	Bracke	Dec. 18, 1956
2,776,821	Davis	Jan. 8, 1957
2,827,272	Phillips	Mar. 18, 1958
2,841,372	Phillips	July 1, 1958
2,841,373	Broge	July 1, 1958
2,877,003	Goodridge et al.	Mar. 10, 1959
2,979,312	Phillips	Apr. 11, 1961
3,030,084	Phillips	Apr. 17, 1962
3,037,751	Phillips	June 5, 1962