

Jan. 25, 1966

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CARBURETOR

3,231,249

Filed July 30, 1962

3 Sheets-Sheet 1

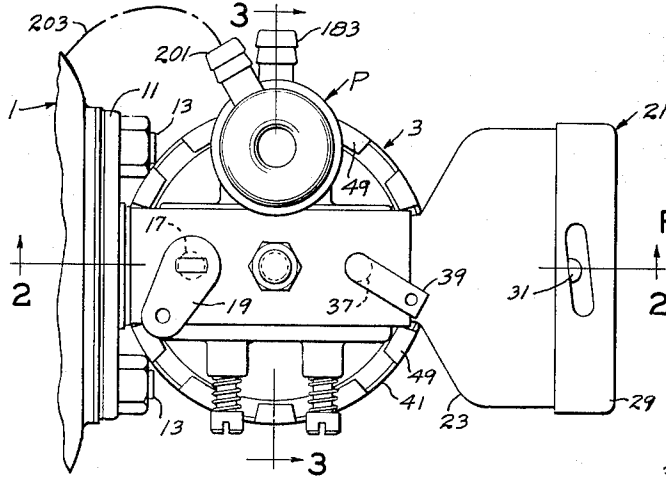


FIG. 1.

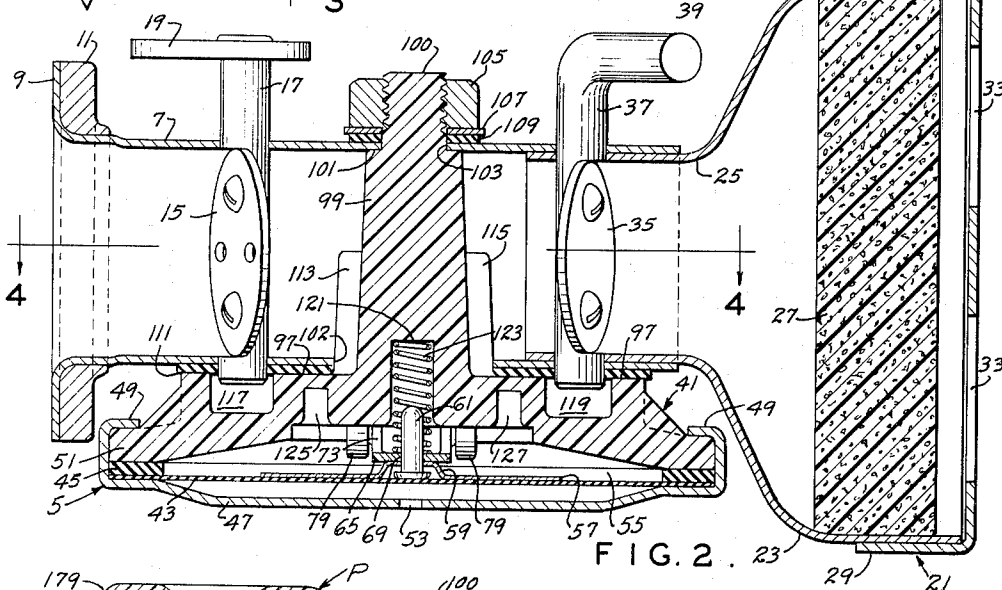


FIG. 2.

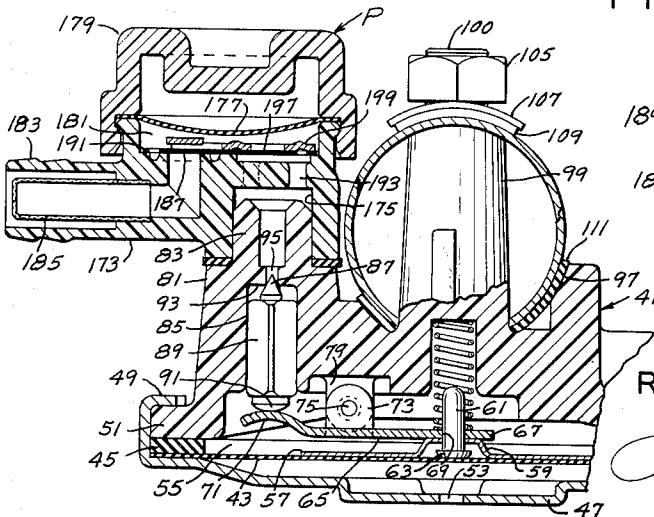


FIG. 3.

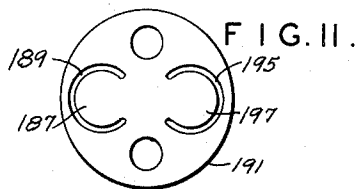


FIG. II.

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3 Sheets-Sheet 2

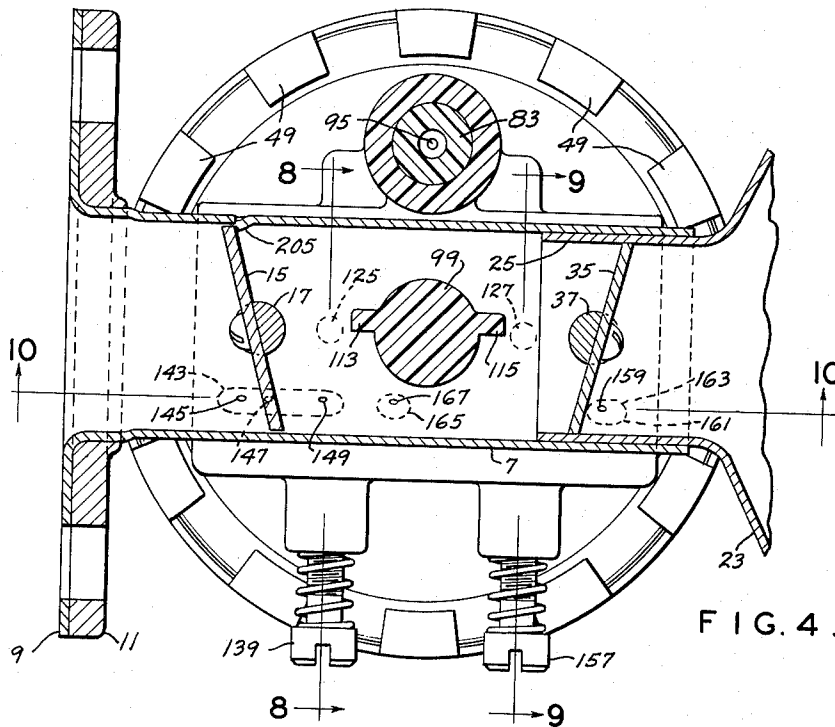


FIG. 4.

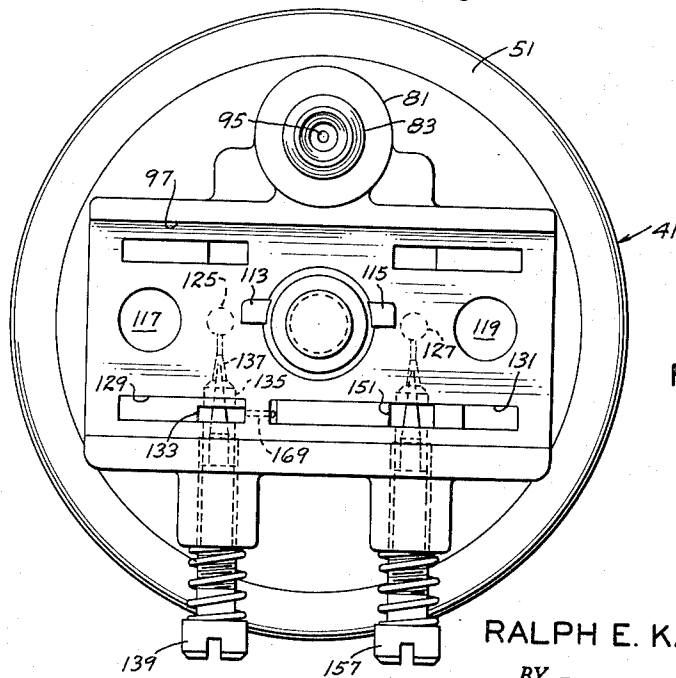


FIG. 5.

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3 Sheets-Sheet 3

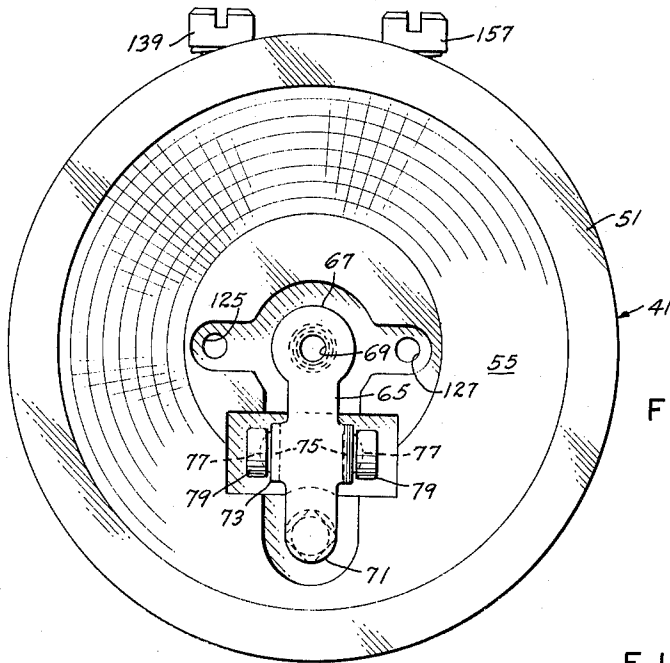


FIG. 6.

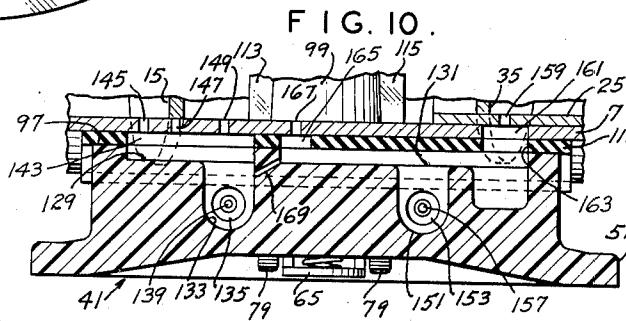


FIG. 10.

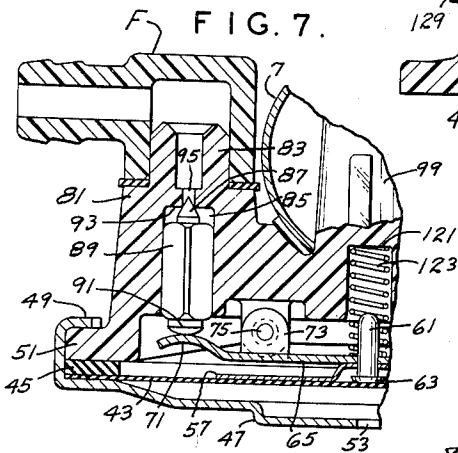


FIG. 7.

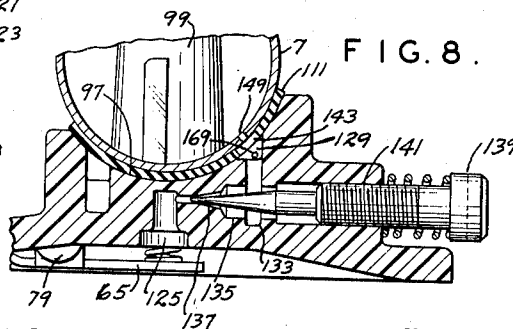


FIG. 8.

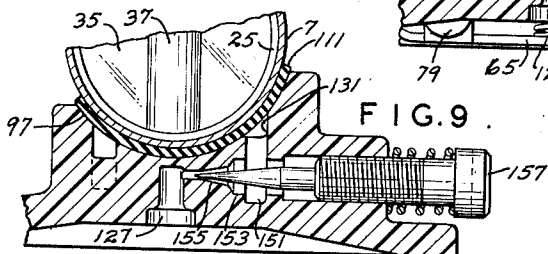


FIG. 9.

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6 Claims. (Cl. 261-41)

This invention relates to carburetors, and particularly to carburetors of the class having a diaphragm for control of fuel admission thereto.

Among the several objects of the invention may be noted the provision of a carburetor for small internal combustion engines which can be used on devices such as power lawn mowers, outboard motors and the like. It is desirable that the carburetor be manufactured at low cost primarily from molded plastic and from sheet metal parts which are adapted to be readily and quickly but accurately assembled. Another object is to provide a carburetor of this class which, though of simplified construction, has an idle system in addition to a high speed fuel metering system.

The novel carburetor design has a mixture conduit constituted by a sheet metal tube and a plastic molded part comprising the fuel circuits, the venturi and fuel reservoir. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated, FIG. 1 is a plan view of a carburetor according to the invention, with a fuel pump attached thereto;

FIG. 2 is an enlarged longitudinal section of the carburetor taken generally on line 2-2 of FIG. 1;

FIG. 3 is an enlarged transverse section taken generally on line 3-3 of FIG. 1, parts being removed;

FIG. 4 is a section taken generally on line 4-4 of FIG. 2;

FIG. 5 is a plan view of a subassembly of certain parts;

FIG. 6 is a bottom view of FIG. 5 rotated 180° with respect to FIG. 5;

FIG. 7 is a fragmentary section generally similar to FIG. 3 showing the carburetor without a pump attached thereto;

FIGS. 8 and 9 are fragmentary sections taken generally on line 8-8 and 9-9, respectively, of FIG. 4;

FIG. 10 is a fragmentary section taken generally on line 10-10 of FIG. 4, parts being omitted; and

FIG. 11 is a plan of a valve disk shown in FIG. 3.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, there is indicated at 1 in FIG. 1 the intake manifold of an engine to be served by the carburetor, the entire assembly of which is designated 3. A carburetor subassembly generally indicated at 5 is constructed for easy application to a simple sheet metal mixture conduit or tube 7 as will be made clear. Tube 7 is flanged at 9 (FIGS. 2 and 4). It is adapted for telescopic insertion into a bolting ring 11. Connecting bolts 13 (FIG. 1) attach ring 11 and flange 9 to the intake manifold 1 passing through suitable openings for the purpose.

In the tube 7 is located a throttle valve 15 which is supported upon a rotatable cross shaft 17 in the tube 7 and which carries an outer control lever 19. At numeral 21 there is shown in general an air filter assembly. This comprises a flared sheet metal cup 23 having a tubular extension 25 adapted to be telescoped into the outer open

2

end of the tube 7. In the cup 23 is contained a disk of suitable air-filtering material 27. On the open end of the cup 23 is a cap 29 having a quick detachable bayonet connection 31. This cap 29 has openings 33 in its face. In the outer end of the tube 7 and within the extension 25 is located a choke valve 35 which is supported upon a rotatable cross shaft 37 journaled in the extension 25 and tube 7. Shaft 37 is bent at its upper end to form a choke control lever 39.

Subassembly 5 comprises a molded body 41 formed of a plastic of an acetal resin type such as, for example, "Delrin" made by the Du Pont Company. The body is formed generally of inverted circular cup shape. A flexible diaphragm 43 and a flat ring-shaped gasket 45 are clamped against the peripheral margin of the bottom of body 41 by a cup-shaped sheet metal cover 47 having ears 49 crimped around a peripheral flange 51 on body 41. The diaphragm 43 is composed of any suitable flexible material such as, for example, a nylon base synthetic fuel resistant rubber. Cover 47 has a central air inlet opening 53. Diaphragm 43 closes off a fuel chamber 55 within the bottom of body 41. Resting loosely on the diaphragm is a circular sheet metal transfer plate 57. Stamped centrally into the plate 57 is a bulge 59 in which is a central opening for loosely receiving a centering pin 61 having a head 63 (FIG. 3) which is located in the space under the bulge.

At 65 is indicated a stamped sheet metal rocker lever at one end 67 of which is an opening 69 (FIGS. 2 and 6) accepting the pin 61. The lever 65 at its other end is formed with a bulge 71. Struck up from the sides of the lever 65 are ears 73 having outwardly projecting bulges or bosses 75 adapted to be snapped into mating recesses 77 (FIG. 6) in downwardly extending lugs 79 integrally formed with body 41.

Body 41, at one side, is formed with an upwardly extending boss 81 having a reduced-diameter upward tubular extension 83. Extending up into boss 81 from chamber 55 is a passage 85 slidably receiving a needle valve 87. This valve has a stem 89 of cruciform shape in transverse cross section slidably fitting in passage 85. At the lower end of the valve is a contact head 91 which engages the convex surface of bulge 71 of lever 65. At the upper end of passage 85 is a seat 93 for the valve 87 around a port 95 for flow from extension 83 into passage 85 and chamber 55 when the valve is open.

Body 41, at the top, has an elongate transverse surface 97 of arcuate shape in cross section for seating the tube 7, the latter extending transversely across the top of the body, with boss 81 and its extension 83 at one side of the tube. Extending upwardly from the bottom of this recess at the center of the body 41 is a stem or post 99 molded with body 41 as an integral part thereof. Post 99, as shown in FIG. 2, is generally of circular cross section and somewhat tapered from its root in body 41 toward its upper end, and has a reduced-diameter threaded upper end extension 100 providing an upwardly facing annular shoulder 101. The post extends through a relatively large hole 102 in the bottom of tube 7 and its threaded extension 100 extends through a hole 103 in the top of tube 7. The tube 7 is held in assembly with body 41 by a nut 105 threaded on extension 100 with an arcuate metal washer 107 and an annular sealing washer 109 interposed between the nut and the top of the tube. A gasket 111 is interposed between tube 7 and body 41 in recess 97, and has a hole registering with hole 102 receiving the post. The latter is located between the throttle valve 15 and the choke valve 35, and is formed with two integral ribs 113 and 115 (FIGS. 2, 4 and 5), rib 113 extending downstream in the direction toward the throttle valve 15 and constituting a stop engageable

by the throttle valve for determining the full-open position of the throttle valve, rib 115 extending upstream in the direction toward the choke valve 35 and constituting a stop engageable by the choke valve for determining the full-open position of the choke valve. These ribs are offset toward one side of the central vertical longitudinal plane of post 99 and tube 7. Post 99 provides portions of restricted cross sectional area in tube 7 to provide a venturi effect.

The lower ends of shafts 17 and 37 extend through holes in the bottom of tube 7 (and a hole in part 25 in the case of shaft 37) and through registering holes in gasket 111 into cavities 117 and 119 in body 41. Post 99 has a recess 121 at its lower end in which is located a compression spring 123 reacting from the upper end of recess 121 against the end 67 of the lever 65, and surrounding centering pin 61.

Body 41 is molded with a recess 125 (FIGS. 2 and 6) extending up from chamber 55 on the downstream (throttle) side of post 99 and a recess 127 extending up from chamber 55 on the upstream (choke) side of post 99. Recess 125 constitutes a fuel intake for the idle system of the carburetor and recess 127 constitutes a fuel intake for the high speed fuel system of the carburetor, as will appear. Body 41 is molded with two relatively shallow elongate grooves 129 and 131 (FIGS. 5, 8, 9 and 10) extending parallel to the axis of metal tube 7 and lengthwise in the tube-seating surface 97. These grooves are arranged in line in a vertical plane offset toward one side of the surface 97. Groove 131 extends from a point upstream of choke valve 35 to a point downstream of post 99. Groove 129 has its upstream end adjacent the downstream end of groove 131 and separated therefrom, and extends nearly to the downstream end of surface 97. At its upstream end, groove 129 has a deep pocket 133 located laterally and outwardly from intake recess 125 (FIGS. 5, 8 and 10). The intake 125 communicates with this pocket through an idle fuel passage 135 having a tapered portion 137 with which is co-operable the pointed end of an idle adjustment screw 139 threaded in a lateral hole 141 in body 41 for adjusting flow of idle fuel from intake 125 to pocket 133 and groove 129.

Gasket 111 has an elongate slot 143 registering with groove 129, and tube 7 is provided with three ports 145, 147 and 149 for communication between groove 129 and the interior of the tube 7. Port 145 is located downstream from throttle valve 15 when the latter is in closed position, and may be referred to as a constant feed idle port. Port 147 is so located as to be blocked by the rim of the throttle valve when the latter is in closed position, and may be referred to as an acceleration port. Port 149 is located upstream from the throttle valve when the latter is in closed position and may be referred to as an idle air bleed port.

Groove 131 has a deep pocket or well 151 located intermediate its ends and laterally outward of high speed fuel intake 127. The latter communicates with this pocket via a high speed fuel passage 153 having a tapered portion 155 with which is co-operable the pointed end of a high speed system adjusting screw 157 for adjusting flow of fuel from intake 127 to pocket 151 and groove 131. Gasket 111 covers groove 131. Air is adapted to bleed into groove 131 at its upstream end via hole 159 in extension 25, a slot 161 in tube 7 and a hole 163 in the gasket 111, hole 159 being located upstream from choke valve 35 when the latter is closed. Gasket 111 is provided with a hole 165 adjacent the downstream end of groove 131 in register with a high speed port 167 in tube 7 for delivery of air/fuel mixture from groove 131 into the tube. An air and fuel bleed 169 extends between and connects grooves 129 and 131.

Fuel is supplied to fuel chamber 55 under control of needle valve 87 from a fuel tank (not shown). Flow of fuel may be direct from the tank to the carburetor via

an inlet fitting such as indicated at F in FIG. 7 on extension 83 of boss 81 or with assist from a diaphragm type of fuel pump such as indicated at P in FIGS. 1 and 3. As shown in FIG. 3, pump P comprises a molded plastic cup-shaped body 173 having a downwardly opening socket 175 receiving extension 83 of boss 81. Body 173 is closed by a diaphragm 177 clamped in place by a snap-on molded plastic cap 179 to define a fuel chamber 181. Body 173 is formed with an inlet 183 for connection of a fuel line from the tank, with a screen 185 in the inlet. This leads to the bottom of chamber 181. Flow of fuel from chamber 181 back through the inlet is prevented by a flapper check valve 187 formed by a C-shaped cut 189 in a fuel-resistant rubber valve disk 191 (see FIG. 7). Body 173 is formed with outlet ports such as indicated at 193 for flow from chamber 181 to socket 175, and thence through extension 83. Disk 191 has a second C-shaped cut 195 forming a flapper check valve 197 for the outlet ports. The disk is held in place by a sheet metal retainer 199 secured to body 173 by screws (not shown). Cap 179 has a nipple 201 for connection as indicated at 203 in FIG. 1 to the intake manifold. Fluctuation in vacuum in the intake manifold causes diaphragm 177 to flex for pumping fuel, flapper valve 187 opening and flapper valve 197 closing against retainer 199 on upward flexing of the diaphragm for intake of fuel to the pump chamber 181, valve 187 closing and valve 197 opening on downward flexing of the diaphragm for pumping fuel from chamber 181 to extension 83.

The throttle 15 comprises an elliptical sheet metal disk attached as by screws to a flat on the throttle shaft 17. Similarly, the choke 35 comprises an elliptical sheet metal disk attached as by screws to a flat on the choke shaft 37. The mixture conduit tube 7 has a throttle stop constituted by struck-in ear 205 (FIG. 4) engageable by the throttle 15 for determining the proper idle position of the throttle for proper idle r.p.m. of the engine and for preventing the throttle from sticking in the tube 7 (particularly if the tube may be somewhat out-of-round, as may occur). This ear or stop 205 limits movement of the throttle in closing direction (clockwise as viewed in FIG. 4) to keep the periphery of the throttle from contacting the bore, leaving a small space around the throttle for flow of air at idle. For example, it may stop the throttle about 2° before a full closure position of the throttle. Stop 205 is also particularly useful as a stop for accurate positioning of a tool for forming the ports 145, 147 and 149. It is particularly important that port 147 be accurately located to be closed by the throttle 15 when the latter is in idle position. Stop 205 enables this to be economically accomplished prior to assembly of shaft 17 and throttle 15 with the tube 7. Stop 205 is readily accurately positioned relative to the holes formed in tube 7 for throttle shaft 17, the angular relationship between a transverse plane through the axis of the throttle shaft holes and the tip of the stop establishing the angle of the throttle at idle, and it is possible accurately to locate port 147 by utilizing this relationship, the procedure simply involving insertion of a gauge on the tool into the end of the tube 7 until it engages stop 205.

Operation is as follows:

On starting the engine (choke 35 set in starting position for limited supply of air to tube 7, and throttle 15 opened), fuel for starting is delivered from fuel chamber 55 to tube 7 via high-speed fuel intake 127, passage 153, pocket 151, groove or passage 13 and port 167 and via idle fuel intake 125, passage 135, pocket 133, groove or passage 129 and ports 145, 147 and 149. This fuel mixes with air flowing through tube 7 to provide a relatively rich air/fuel mixture for starting.

After the engine has started and warmed up, choke 35 may be fully opened, and throttle 15 controlled as desired for high-speed operation. As previously noted, post 99 provides portions of restricted cross sectional area in tube 7 to provide a venturi effect such as to generate a

partial vacuum in tube 7 in the region of high-speed port 167. This induces flow of fuel from fuel chamber 55 to tube 7 via high-speed fuel intake 127, passage 153 (metered by screw 157), pocket 151, groove or passage 131 and high-speed fuel port 167. Air bleeds into groove or passage 131 for mixture with fuel flowing therethrough to port 167 via the high-speed air bleed hole 159.

For engine idling, throttle 15 is returned to its FIG. 4 idle position against ear or stop 205, being then almost but not quite fully closed to allow for some flow of air past the throttle. A partial vacuum is drawn downstream from the almost closed throttle, and this induces a flow of fuel for idling from fuel chamber 55 to tube 7 downstream from the throttle via idle fuel intake 125, passage 135 (metered by idle adjusting screw 139), pocket 133, groove or passage 129 and the constant feed idle port 145. Air bleeds into the passage 129 for mixture with fuel flowing therethrough to the port 145 via idle air bleed port 149, also via bleed 169. The latter also serves to keep the high speed system active so that air/fuel mixture is immediately available for acceleration on opening the throttle. As the latter is opened, acceleration port 147 is opened to supply additional fuel to tube 7 for mixture enrichment on acceleration.

Diaphragm 43 is subject on its outer side to atmospheric pressure (via vent hole 53), and is adapted to move inward against the bias of spring 123 in response to decrease in pressure in fuel chamber 55 as results upon delivery of fuel from chamber 55 to tube 7. Upon inward movement of the diaphragm, lever 65 is rocked counterclockwise as viewed in FIG. 3, permitting needle valve 87 to open for flow of fuel to chamber 55 to replace fuel delivered from chamber 55 to tube 7.

Part of the advantages of the invention accrue from the fact that the parts are mostly composed of plastic moldings, sheet metal stampings and simple screw machine parts or the like. This fact lends itself to low cost production of the parts themselves. Moreover, the parts as a whole are arranged for rapid final assembly from basic subassemblies. Thus, with the molded plastic body 41 inverted, needle valve 87 is dropped into its hole 85, and spring 123 is dropped into its recess 121. Then the lever 65 may be easily and quickly assembled with body 41 simply by snapping the bosses 75 on ears 73 into the recesses 77 in body lugs 79. Then pin 61, after having been inserted through the center hole in transfer plate 57, is itself inserted into the hole 69 of lever 65. This assures central location of the transfer plate 55. Pin 61 also keeps spring 123 concentric with lever 65 and prevents friction of the spring against the side of the recess 121. Next, the gasket 45 is placed on body 41, the diaphragm 43 is placed on the gasket and over the head 63 of pin 61, and the cover 47 is applied and ears 49 on the cover crimped around flange 51 of body 41. Next, the gasket 111 is positioned in recess and the post 99 is entered in holes 102 and 103 to extend across the tube 7. Then washers 109 and 107 are placed on post end extension 100 and the nut 105 is screwed on extension 100. The pump P, if utilized, or the fitting F (FIG. 7) may then be pressed onto the extension 83 of boss 81.

The tubular extension 25 of the cup 23 is telescoped into the inlet end of tube 7 until the choke shaft holes therein are aligned with choke shaft holes in tube 7. Extension 25 has a friction fit in tube 7. Throttle 15 and choke 35 may be provided in tube 7 either before or after application of the body 41, this being accomplished by entering the shafts 17 and 37 in their respective holes, and then fastening the throttle and choke to their respective shafts, as by means of screws. The shafts 17 and 37 have flat sides for engagement with the throttle and choke, and the throttle may have idle-speed holes as appears in FIG. 2.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A carburetor comprising a substantially flat integral body formed of plastic material having on one side a dished surface, a diaphragm sealed to said dished surface to form a closed fuel chamber therewith, a separate tube mounted on a surface portion of said body for air flow therethrough, a post extending from said body surface portion and integral therewith, said post extending through said tube to form a restricted air passage with the inner surface of said tube, a throttle valve movably mounted within said tube on one side of said post to control air flow from said restricted air passage, a choke valve movably mounted within said tube on the other side of said post to control air flow entering said tube, a groove having first and second aligned sections formed in said body surface portion extending parallel to the axis of said tube and closed by said tube, said body formed with a fuel well recess extending from said groove into said body and a fuel passage connecting said fuel chamber to said fuel recess, manually adjustable means in said passage to vary fuel flow therethrough, said tube formed with a nozzle passage through the wall thereof connecting said first aligned groove section with a portion of said restricted air passage adjacent to said post to form a high speed nozzle for said carburetor.

2. The invention of claim 1, wherein said integral carburetor body is formed with a second fuel passage connecting said fuel chamber with said second aligned groove section said tube formed with a port through the wall thereof downstream of said throttle and opening into said second passage to provide fuel for low engine speeds during closed throttle operation.

3. A carburetor comprising an integral body formed of plastic material having on one side a dished surface, a diaphragm sealed to said dished surface to form a closed fuel chamber therewith, said body including an arcuate surface on an opposite side thereof, a sheet metal tube of substantially uniform diameter mounted coaxially in said arcuate surface for air flow therethrough, a post extending from said arcuate body surface and integral therewith, said post extending through said sheet metal tube to form a restricted air passage with the inner surface of said said metal tube, a throttle valve movably mounted within said sheet metal tube on one side of said post to control air flow from said restricted air passage downstream of said post, a choke valve movably mounted within said sheet metal tube on the other side of said post to control air flow entering said metal tube upstream of said post, a pair of axially aligned grooves formed in said arcuate body surface and parallel to the axis of said arcuate surface, said body formed with a different fuel well recess extending from each groove into said body a first fuel passage connecting said fuel chamber to one fuel recess and a second fuel passage connecting said fuel chamber to said other fuel recess, manually adjustable means in each of said first and second fuel passages to vary fuel flow therethrough, said metal tube formed with a nozzle opening through the wall thereof connecting one of said grooves with a portion of said restricted passage, a port connecting the other one of said grooves downstream of said throttle in closed position, to provide fuel and air to said engine during closed throttle operation, said metal tube formed with an air bleed opening through the wall thereof connecting said one groove to the interior of said metal tube upstream of said choke valve to provide an air bleed into said one groove, said integral body formed with an air bleed passage connecting said aligned grooves for bleeding air from said air bleed opening into said other groove during closed throttle operation.

7

4. A carburetor comprising an integral body formed of plastic material having on one side a dished surface, a diaphragm sealed to said dished surface to form a closed fuel chamber therewith, said body including an arcuate surface on an opposite side thereof, a sheet metal tube of substantially uniform diameter mounted coaxially in said arcuate surface for air flow therethrough, a post extending from said arcuate body surface and integral therewith, said post extending through said sheet metal tube to form a restricted air passage with the inner surface of said metal tube, a throttle valve movably mounted within said sheet metal tube on one side of said post to control air flow from said restricted air passage downstream of said post, a choke valve movably mounted within said sheet metal tube on the other side of said post to control air flow entering said metal tube upstream of said post, a pair of aligned grooves formed in said arcuate body surface parallel to the axis of said arcuate surface, said metal tube having a portion exposed to and closing said grooves, said body formed with a different fuel well recess extending from each groove into said body and a first fuel passage connecting said fuel chamber to one fuel recess and a second fuel passage connecting said fuel chamber to said other fuel recess, manually adjustable means in each of said first and second fuel passages to vary fuel flow therethrough, said metal tube portion formed with a nozzle passage through the wall thereof connecting one of said grooves with a portion of said restricted air passage and an air bleed passage connecting said one groove to the interior of said metal tube upstream of said choke valve to provide air flow into said one groove during open throttle operation of said carburetor, said metal tube portion having a first port connecting the other one of said

8

grooves downstream of said throttle in closed position and a second port connecting said other groove upstream of said throttle in closed position to provide air flow into said other groove during operation of said throttle in closed position.

5. A carburetor as set forth in claim 4 having an acceleration port in said metal tube connecting said second groove to the interior of said metal tube, said acceleration port being positioned to be closed by the throttle when in closed position and to be opened as said throttle moves from closed position whereby said acceleration port supplies fuel from said second groove into said metal tube for engine acceleration.

6. A carburetor as set forth in claim 5 wherein said tube is formed with a stop engageable by the throttle to determine the idle position of the throttle closing said acceleration port.

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