Nov. 25, 1952 J. S. CARREY 2,619,333

CARBURETOR

Filed Sept. 26, 1949 2 SHEETS—SHEET 1

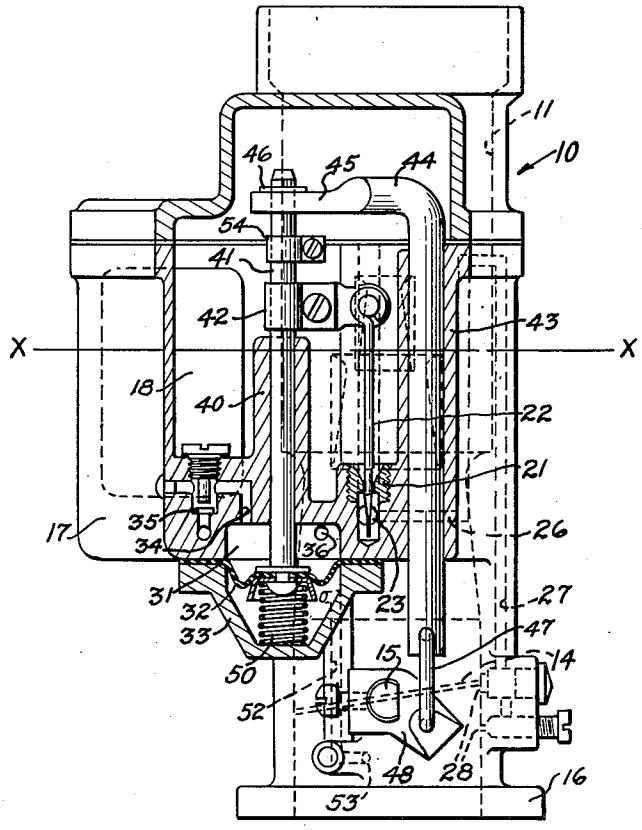


FIG. 1.

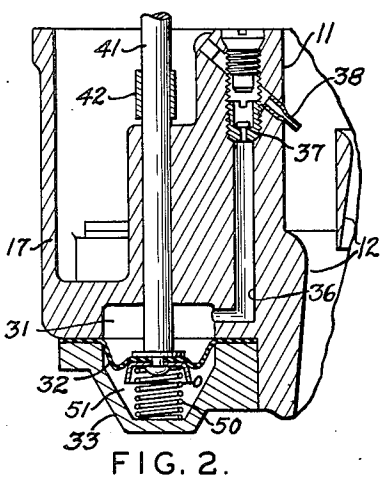


FIG. 2.

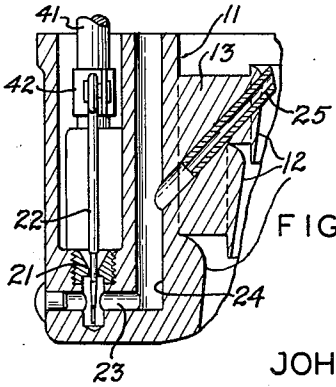


FIG. 3.

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CARBURETOR

Filed Sept. 26, 1949 2 SHEETS—SHEET 2

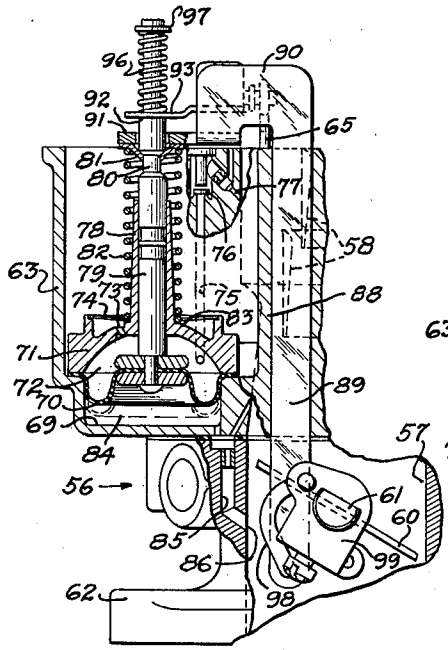


FIG. 5.

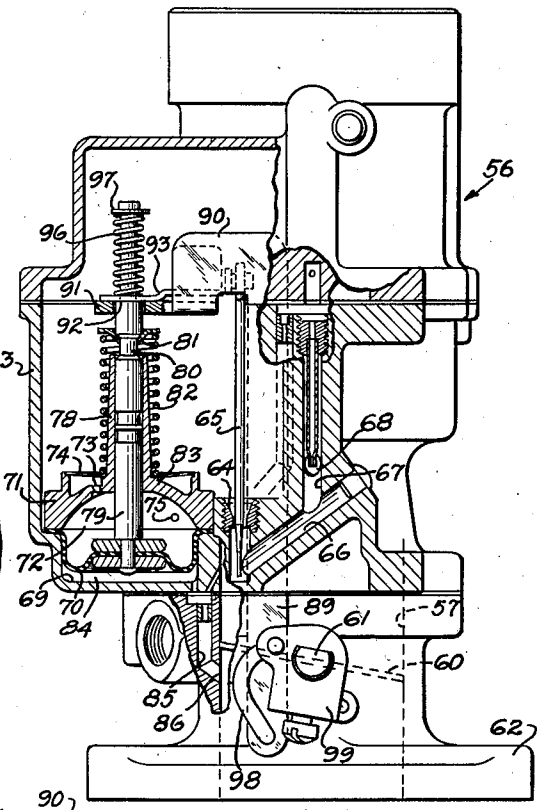


FIG. 4.

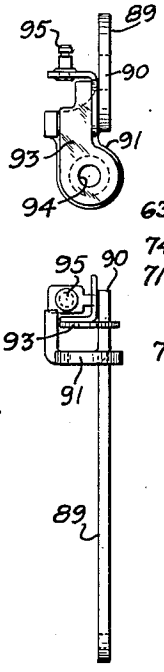


FIG. 7.

FIG. 8.

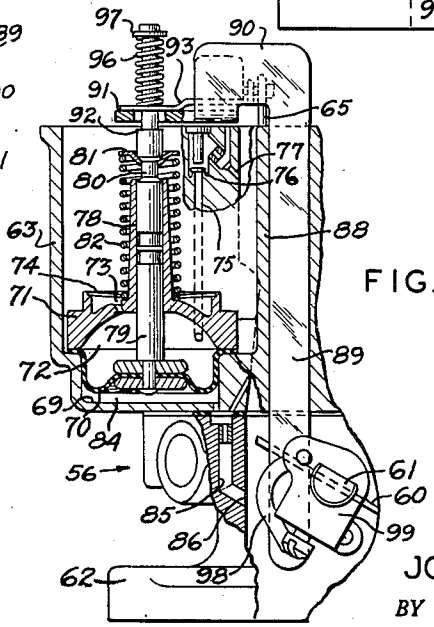


FIG. 6.

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UNITED STATES PATENT OFFICE

2,619,333

CARBURETOR

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Application September 26, 1949, Serial No. 117,772

7 Claims. (Cl. 261—34)

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This invention relates to carburetors for internal combustion engines, and consists particularly in a novel accelerating pump and fuel metering means. This application is a continuation in part of my co-pending application, Serial No. 674,876, filed June 6, 1946, now abandoned. Certain features disclosed, but not claimed herein, are claimed in a copending application, Serial No. 194,289, filed November 6, 1950 in the name of Henry Boller.

Automotive carburetors are usually provided with accelerating pumps, the purpose of which is to supply an extra charge of fuel when needed, as for acceleration. Such pumps are usually operated by the throttle or by manifold suction. Each type has advantages and disadvantages, the throttle actuated pump having desirable positive action not attained by the suction type, whereas the suction actuated pump is capable of supplying a pick-up or accelerating charge whenever needed, even though the throttle valve is not moved. It has been found that a diaphragm type pump is more satisfactory than the piston type, since an imperfect piston packing may result in loss of pressure or sticking of the piston but the diaphragm pump arrangements with which I am familiar other than the one disclosed in my copending application, Serial No. 674,876, have not provided for joint suction and manual operation of the same diaphragm by means of simple compact mechanism wholly concealed within and protected by the normal wall structure of the carburetor.

An object of this invention is to provide an improved arrangement whereby the operation of the accelerating pump and metering pin are controlled either by the throttle valve or by changes in suction, yet providing for a greater degree of flexibility in the interrelation of movement between these elements, thereby to make their operation more nearly responsive to engine fuel requirements.

More specifically, the object of this invention is to provide, in a pump of the character mentioned, means whereby the throttle may be opened and the metering pin elevated without necessarily causing a discharge movement of the pump diaphragm until the manifold vacuum has been sufficiently reduced to justify a discharge movement.

Other objects and advantages of the present invention will appear readily from the disclosure which follows, where read in connection with the accompanying drawings, in which:

Fig. 1 is a side view and vertical section through an automotive carburetor, embodying one form of the invention, the parts being shown in idling positions.

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Figs. 2 and 3 are detailed vertical sections taken at different angles to the plane of Fig. 1 so as to illustrate, respectively, the accelerating pump discharge passage and the main fuel nozzle.

Fig. 4 is a side view of a vertical section through an automotive carburetor, embodying a modification of the invention.

Figs. 5 and 6 are fragmentary side views and vertical sections showing the pump structure of Fig. 4 in different operative positions.

Figs. 7 and 8 are, respectively, a plan view and an elevation of the operating link detail.

Referring first to Figs. 1 to 3, the carburetor 10 includes a mixture conduit 11 formed with a series of Venturi tubes 12, centrally supported in the conduit by a rib 13. Discharge of fuel mixture from conduit 11 is controlled by a throttle valve 14 mounted on a shaft 15. A suitable choke valve (not shown) may be provided in the upper portion of the mixture conduit. Mixture conduit 11 is flanged at its lower end, as at 16 for attachment to the engine intake manifold (not shown). A constant level fuel bowl 17 encloses a float 18 controlling a needle valve (not shown) for maintaining fuel at a constant level X—X.

A metering orifice element 21 controlled by a stepped metering pin 22 is provided in the lower portion of bowl 17. Passages 23 and 24 connect element 21 to main fuel nozzle 25 which discharges into the smallest Venturi tube 12. Fuel for idling is supplied through passages 26 and 27 to ports 28 adjacent and posterior to the edge of throttle 14 when closed.

A cavity 31 is formed in the lower wall of constant level chamber 17 and is closed on its outer side by a flexible diaphragm member 32, secured in place by a cap 33. Cavity 31 and diaphragm member 32 form a pumping chamber which is connected to the fuel bowl 17 by inlet passage 34 controlled by inlet check valve 35. A passage 36, controlled by outlet check valve 37, and restricted outlet nozzle 38 connect the pumping chamber to mixture conduit 11.

A tubular guide 40 extends upwardly into constant level chamber 17 from the central portion of pump chamber cavity 31 and slidably receives the diaphragm actuating stem 41. A bracket 42 is secured to stem 41 and carries metering pin 22 so that movements of the metering pin correspond to movements of the diaphragm. A second

tubular guide 43 extends vertically into constant level bowl 17 and slidably receives a link 44 having an offset portion 45 at its upper extremity with an aperture which slidably receives the upper extremity of stem 41. A collar or washer 46 keyed or otherwise lodged on stem 41 limits upward movement of link 44 relative thereto. Link 44, at its lower extremity is connected by a small link 47 to an arm 48 rigid with throttle shaft 15, so that upon opening movement of the throttle the diaphragm is forced upwardly to inject a charge of accelerating fuel into the mixture conduit, and the metering orifice 21 is simultaneously opened.

A coil spring 50 is compressed between the underside of diaphragm 32 and cap 33 and urges diaphragm 32 upwardly. Chamber 51 formed between diaphragm 32 and cap 33 is connected by a suction passage 52 to a port 53 opening into the mixture conduit 11 posterior to throttle 14, so that when engine suction increases, diaphragm 32 is moved downwardly, compressing spring 50, and drawing a charge of liquid fuel from constant level chamber 17 into pumping chamber 31. Upon sufficient decrease of suction, spring 50 causes discharge movement of the diaphragm.

An adjustable limitation on the upward or discharge movement of diaphragm 32 relative to operating link 45 is provided by a stop collar 54 which is secured to stem 41 above bracket 42. Such a limitation may be necessary to obtain the desired mixture proportions under certain conditions. The stop also permits priming action of the pump in starting the engine by operation of the throttle pedal.

It should be noted that the entire pumping and metering arrangement, with the exception of the lower extremity of link 44 and its operating connection to the throttle, is located wholly within the confines of the constant level bowl. The mechanism is thus protected from dust and other foreign material and does not interfere with the symmetrical, compact appearance of the carburetor.

Operation of the device is as follows: Fuel is drawn into pumping chamber 31 by downward movement of the diaphragm to the position of Fig. 1 upon increase in manifold suction. Thereafter, the diaphragm may move upwardly to discharge fuel into the mixture conduit either upon opening movement of the throttle through linkage 44 or upon expansion of spring 50 when a drop in suction occurs and metering pin 65 moves accordingly. The liquid fuel in the pumping chamber acting against the diaphragm provides a cushioning or dashpot action against too abrupt opening movement of the metering pin and throttle. The manual and suction operations complement but do not interfere in any way with each other.

Referring now to Figs. 4 through 8, in which a modified form of the invention is illustrated, the carburetor 56 includes a mixture conduit 57 formed with Venturi tubes 58, centrally supported in the conduit. A throttle valve 60 mounted on a shaft 61 controls the discharge of fuel mixture from mixture conduit 57. A flange 62 is formed at the lower end of mixture conduit 57 for attachment to the engine intake manifold. The constant level fuel chamber 63 includes a float controlled needle valve (not shown) for maintaining fuel at a constant level.

A metering orifice element 64, controlled by a stepped metering pin 65 is positioned in the lower portion of constant level chamber 63. Passages 66 and 67 connect the metering orifice element with the main nozzle passage 68.

A depression 69 is formed in the bottom wall of constant level chamber 63 and is closed on its inner side by a diaphragm member 70, secured in place by an inverted cup 71, the cup and diaphragm cooperating to form a pumping chamber 72 which communicates with constant level chamber 63 by means of an opening 73 in the upper portion of cup 71. An annular screen 74 is mounted on cup 71 to filter impurities from fuel entering the pumping chamber. A passage 75 controlled by an outlet check valve 76 and having a restricted outlet nozzle 77 connects pumping chamber 72 with fuel mixture conduit 57. A tubular guide 78 extends upwardly into constant level chamber 63 from the central portion of cup 71 and slidably receives the diaphragm actuating stem 79. Stem 79 is formed with a groove 80 which receives and prevents upward movement of a cupped, horseshoe washer 81 relative to the stem. A coiled compression spring 82 is received about guide 78, its lower end abutting a boss 83 on the upper surface of cup 71 and its upper end abutting washer 81 so as to tend to urge stem 79 and diaphragm 70 upwardly.

A chamber 84, formed between bowl depression 69 and diaphragm 70 is connected by a suction passageway 85 with a suction port 86 in the mixture conduit wall posterior to the throttle, so that diaphragm 70 moves responsive to variations in manifold suction.

A second vertical guide 88 of rectangular cross section extends into constant level chamber 63 adjacent guide 78 and slidably receives a gooseneck link 89 having at its upper end an offset portion 90 formed with a horizontal ledge 91. Ledge 91 has an aperture in its outer end portion which slidably receives diaphragm stem 79. The upper end portion of stem 79 is of slightly less diameter than the remainder of the stem to form a shoulder 92, the function of which is described below. An angular bracket 93 has an aperture 94 at one end for slidably receiving this narrow portion of stem 79, and has a pin 95 at its other end for attachment of metering pin 65. The bracket normally seats on the upper portion 91 of link 89 or stem shoulder 92, whichever is uppermost and itself seats a coiled compression spring 96, retained on stem 79 by a keyed or otherwise retained washer 97. Link 89 at its lower end is connected by a small link 98 to an arm 99 rigid with throttle shaft 61, so that upon opening movement of the throttle, link 89 moves upwardly, carrying with it bracket 93 and resiliently, by means of spring 96, urging stem 79 and diaphragm 70 upwardly, as in Fig. 6. When the decrease in suction occurs at a greater rate than opening of the throttle valve, shoulder 92 of stem 79 engages bracket 93 to further elevate metering pin 65 as in Fig. 5. When suction remains high, even though the throttle is being opened, diaphragm 70 prevents upward movement of stem 79; upward movement of link 89 by the throttle elevates bracket 93 and the metering pin while compressing spring 96, as in Fig. 6. During closing movement of the throttle, spring 96 again urges bracket 93 downwardly against either shoulder 92 or ledge 91, whichever is uppermost, so that lowering of the metering pin is limited by one of these elements.

Operation of the device is as follows: Fuel is drawn into the pumping chamber by downward movement of the diaphragm resulting from in-

crease in manifold suction. Thereafter, the diaphragm may move upwardly either upon a drop in suction or upon opening movement of the throttle through linkage 89, upward movement of ledge 91 being transmitted to stem 79 via bracket 93, spring 96, and washer 97. The position of bracket 93, and consequently of metering pin 65, is governed by whichever of the elements, ledge 91 or shoulder 92, is uppermost, downward or closing movement of the metering pin being thereby limited by the amount of suction or the degree of opening of the throttle.

It should also be noted in this connection that by shortening the length of travel of link 98 this device may be constructed so that the throttle connection cannot fully elevate the metering pin, the last portion of metering pin elevation and final movement of the diaphragm in the pumping direction being produced by a further decrease in suction.

The invention may be modified in various respects as will occur to those skilled in the art and the exclusive use of all modifications as comes within the scope of the appended claims is contemplated.

I claim:

1. In a carburetor, a downdraft mixture conduit having a throttle therein, a constant level fuel bowl adjacent the same, a recess in the bottom wall of said bowl, a horizontal diaphragm extending across said recess and dividing the same into an accelerating pump chamber above said diaphragm and a suction chamber below said diaphragm, said diaphragm being sealingly secured over said recess, inlet and outlet passages connecting said pump chamber, respectively, to said bowl and said conduit, a suction passage connecting said suction chamber to said mixture chamber below said outlet passage, a spring urging said diaphragm upwardly in opposition to suction thereon, a tubular guide extending vertically from such recess into said fuel bowl above the normal fuel level therein, an operating stem centrally secured to said diaphragm and extending upward through said guide and terminating within said bowl, a second tubular guide extending vertically into said bowl, a second stem having an offset portion slidably carried by said operating stem, a link connecting said second stem to said throttle, and spaced abutments on said diaphragm operating stem forming a lost motion operative connection between said second stem and said throttle and said first stem and said diaphragm.

2. In a carburetor, a downdraft mixture conduit having a throttle therein, a constant level fuel bowl, an enclosed depression in the bottom of said bowl, a diaphragm dividing said depression into a pump chamber and a suction chamber, inlet and outlet passages, respectively, connecting said pump chamber to said bowl and said conduit, a suction passageway connecting said suction chamber to said conduit posterior to said throttle, an operating stem attached to said diaphragm and having a resilient, one-way operating connection with said throttle, a metering orifice element within said bowl, a metering pin slidably and resiliently secured to said stem for elevation therewith upon reductions in suction and for elevation with said one-way connection upon opening movements of said throttle.

3. In a carburetor, a downdraft mixture conduit having a throttle therein, a constant level fuel bowl adjacent the same, a depression in the bottom wall of said bowl, a diaphragm sealingly

closing said depression to form a suction chamber therewithin, an inverted cup sealingly secured to said diaphragm to form an accelerating pump chamber, inlet and outlet passages connecting said pump chamber, respectively, to said bowl and said conduit, a suction passage connecting said suction chamber to said mixture chamber below said outlet passage, a fuel passage connecting said bowl with said conduit, a metering orifice element for controlling the flow of fuel through said passage, a metering pin in said orifice, a tubular guide extending verticaly from said cup, an operating stem centrally secured to said diaphragm and extending upward through said guide and terminating within said bowl, a spring on said guide for urging said stem upwardly in opposition to suction on said diaphragm, an upwardly facing shoulder on said stem, a second guide extending vertically into said bowl, a link slidable in said second guide, said link at its lower extremity being operatively connected to the throttle and having at its upper extremity a horizontal ledge slidable on said operating stem, a bracket slidably carried by said stem above said shoulder and also above said ledge, and a second spring on said stem for urging said bracket downward, said metering pin being attached to said bracket for movement therewith.

4. In a carburetor, a mixture conduit having a throttle therein, a fuel bowl, an accelerating pump pressure chamber formed in a wall of said bowl, a diaphragm sealingly closing said chamber, inlet and outlet fuel passages, respectively, connecting said chamber to said bowl and said conduit, a suction chamber formed on the outer side of said diaphragm and a suction passage connecting the same to said conduit, a pair of tubular guides extending upwardly into said bowl, an operating stem extending from said diaphragm through one of said guides, a link connected to said throttle and extending through the other guide and having a lost-motion, operative connection to said stem, and a spring constantly urging said diaphragm in opposition to the suction effect thereon for causing pump discharge upon a drop in suction, said stem being located wholly within the confines of said bowl and said link being wholly within said bowl except for the extremity thereof connected to said throttle.

5. A carburetor as specified in claim 4 further including a metering orifice element within said bowl and a metering pin carried by said stem above the guide receiving the same and wholly within the confines of said bowl.

6. In a carburetor, a downdraft mixture conduit having a throttle therein, a constant level fuel bowl adjacent the same, a recess in the bottom wall of said bowl, a flexible diaphragm sealingly secured over and forming the outer wall of said recess, inlet and outlet passages, respectively, connecting said recess to said bowl and said conduit, a tubular guide extending vertically into said bowl to a point above the normal fuel level therein, an operating stem centrally secured to said diaphragm and extending upwardly through said guide and terminating within said bowl, a second tubular guide extending vertically into said bowl, and a link connected at its lower extremity to said throttle and slidably received in said second guide, said link having an off-set portion and said stem having an abutment near its upper extremity forming a one-way connection between the two whereby opening movement of said throttle moves said diaphragm

upwardly to inject an accelerating charge into said conduit.

7. In a carburetor, a mixture conduit having a throttle therein, a constant level fuel bowl, a wall of said bowl having restricted, oppositely cupped parts forming a chamber, a diaphragm mounted between said cupped wall parts and forming a pump chamber and a suction chamber, restricted inlet and outlet passages, respectively, connecting said pumping chamber to said bowl and said conduit, a suction passage connecting said suction chamber to said conduit posterior to said throttle, an actuating stem projecting from said diaphragm into said bowl, a guiding and sealing sleeve projecting from the inner of said cupped wall parts inwardly along said stem, an operating connection between said throttle and said stem inwardly of said sleeve, a metering orifice element within said bowl, a metering pin cooperating with said orifice element, and

an operating connection for said pin also attached to said stem inwardly of said sleeve.

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