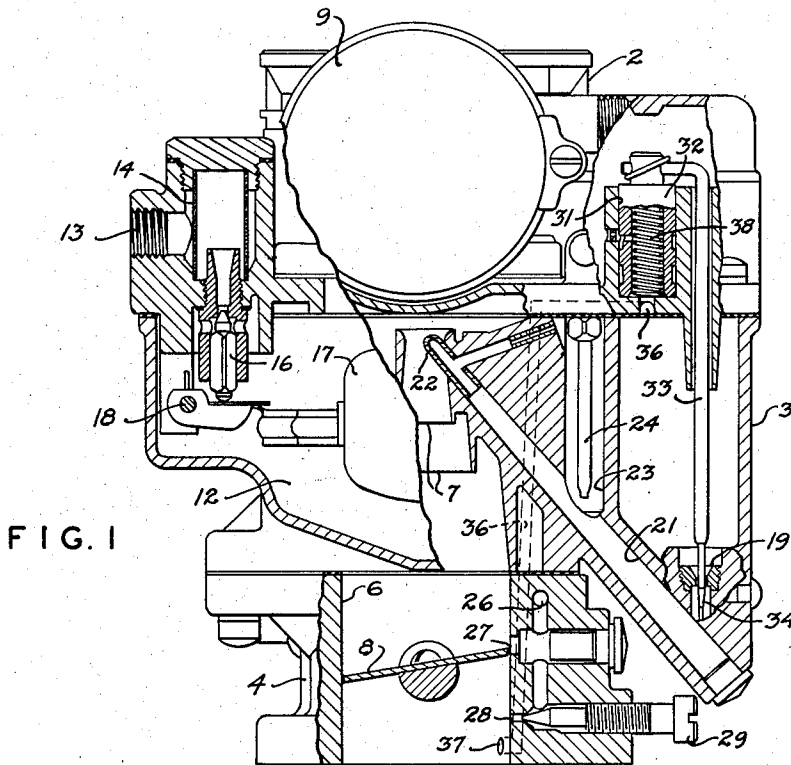
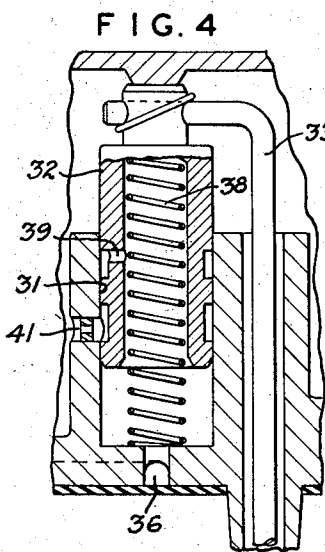
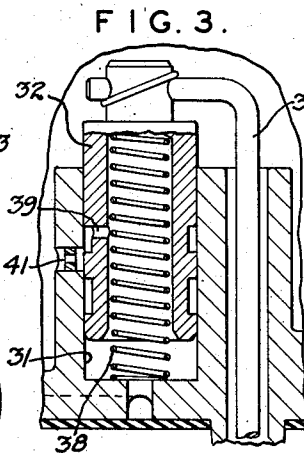
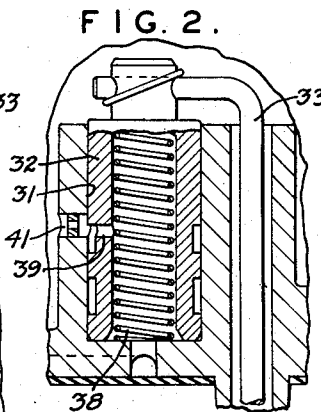


April 14, 1959

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CARBURETOR STEP-UP DEVICE

2,882,027

Filed Aug. 5, 1957



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CARBURETOR STEP-UP DEVICE

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Application August 5, 1957, Serial No. 676,180

11 Claims. (Cl. 261—69)

This invention relates to carburetors for internal combustion engines and, more particularly, to means for supplying additional fuel to the engine intake when the engine is subjected to relatively heavy loads.

Heretofore, carburetors have been provided with step-up devices operable responsive to intake manifold suction and/or throttle movement to enrich the mixture to an engine during acceleration and other relatively heavy load conditions when it is desirable to develop maximum horsepower. Such step-up devices may, for example, comprise a metering rod having a tapered end movable within a fuel metering jet to vary the flow of fuel there-through responsive to engine requirements.

In some types of step-up devices, the metering rod is actuated by a piston or diaphragm operable responsive to intake manifold suction, whereby the metering rod is moved back and forth between its minimum and maximum fuel discharge positions. For example, during idling, the metering rod is urged to its minimum discharge or idling position, and during acceleration, the metering rod is moved to its maximum or full open position in a one-stage operation. The present invention contemplates the provision of a step-up device in which the metering rod is moved from its idling position to an intermediate position responsive to light acceleration, and then moved from its intermediate position to full open position to provide full power enrichment.

Another object of the invention resides in the provision of a carburetor step-up device comprising means responsive to intake manifold suction for progressively varying the position of a metering rod within a fuel metering orifice to more accurately control the richness of the mixture supplied to the engine.

Another object of the invention resides in the provision of a carburetor step-up device having two stages of operation during acceleration of an engine to thereby provide a more economical mixture.

A further object of the invention is to provide a carburetor step-up device including a piston operable responsive to manifold suction for varying the position of a fuel metering rod, the piston serving as a valve for an air bleed opening to vary the force acting to move the piston.

The invention embodies other novel features, details of construction, and arrangement of parts which are hereinafter set forth in the specification and claims, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view illustrating a carburetor provided with a step-up device embodying features of the invention.

Figs. 2, 3, and 4 are fragmentary detail sectional views illustrating different positions of the piston during operation of the step-up device.

Referring now to the drawings for a better understanding of the invention, a downdraft carburetor is shown as comprising an air horn section 2, a main body section 3, and an outlet section 4, said sections being secured

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together and forming a mixture conduit 6 having a stack of venturis 7 in the main body section.

A choke valve (not shown) is provided in the inlet end of the mixture conduit 6, and a throttle valve 8 is disposed in the outlet end of the conduit. A conventional choke control mechanism 9, responsive to intake suction and temperature, is provided to control the operation of the choke valve. The throttle valve 8 is connected by means of any suitable linkage to an accelerator pedal controlled by the operator.

The main body section 3 is provided with a fuel bowl 12 having a fuel inlet 13 provided with a screen filter 14 and needle valve 16. A float 17 is pivotally mounted at 18 within the bowl to actuate the needle valve to maintain a substantially constant fuel level within the bowl.

A fuel metering orifice 19 leads from the fuel bowl to an upwardly inclined main fuel passage 21 having a main fuel nozzle 22 discharging into the primary venturi. The idling fuel system comprises a fuel well 23 leading upwardly from the main passage 21 and having a metering tube 24 communicating with an idle passage 26 provided with idle ports 27 and 28. An idle adjustment screw 29 is provided for the idle port 28.

A cylinder 31 is provided on the air horn section 2 to receive a step-up piston 32 which is connected at its upper end to a metering rod 33 having a tapered end 34 extending through the metering orifice 19. A suction passage 36 leads from the cylinder 31 below the piston 32 to a suction port 37 in the mixing conduit 6 posterior to the throttle 8. A helical compression spring 38 is provided in the cylinder 31 to yieldably resist movement of the piston into the cylinder responsive to intake manifold suction when the throttle is in idling position.

To modulate the movement of the piston during acceleration and deceleration, the wall of the piston 32 is formed with an air bleed aperture 39 movable into and out of registry with a restricted aperture 41 provided in the wall of the cylinder 31.

In the operation of the step-up device thus shown and described, the piston 32 is moved to the inner end of the cylinder 31 by intake manifold suction when the throttle 8 is in its idling position, as illustrated in Figs. 1 and 2 in the drawing, to dispose the metering rod 33 in position to provide minimum fuel flow through the orifice 19.

When the throttle is moved to partially open position to provide light acceleration, the suction posterior of the throttle decreases to, for example, approximately 12" Hg, and causes the spring 38 to move the piston 32 to an intermediate position, as shown in Fig. 3. The piston 32 is maintained in its intermediate position, due to the air bleed therethrough, when the intake manifold suction is between, for example, 12" Hg and 8" Hg.

When the intake manifold suction decreases from 12" Hg to between, for example, 6" Hg—8" Hg, due to opening of the throttle from light acceleration position to full power enrichment position, the spring 38 acts to move the piston 32 to its retracted position, as illustrated in Fig. 4, to provide maximum fuel flow through the orifice 19.

Movement of the throttle from full open position to partially open position causes the piston to move from its retracted position shown in Fig. 4 to its intermediate position shown in Fig. 3; and further movement of the throttle to its idling position causes the piston to move from its intermediate position to its economy position, shown in Fig. 2.

It will be noted that the step-up device thus shown and described provides two stages of operation when the throttle is moved from its idling position to a partially

open position and thence to full open position, whereby the metering rod 33 is moved from its minimum flow position to a medium flow position and thence to a maximum flow position. It will be further noted that the piston and metering rod will be maintained in their intermediate positions when the intake manifold suction is between a predetermined range of, for example, 8" Hg and 12" Hg to provide a medium fuel flow through the orifice 19.

Certain structures have been described herein which will fulfill all the objects of the present invention, but it is contemplated that other modifications will be obvious to those skilled in the art which come within the scope of the invention as defined by the appended claims.

We claim:

1. In a carburetor for an internal combustion engine having an intake manifold, a mixture conduit having a throttle therein, a fuel passage discharging into said conduit, a fuel bowl having a metering orifice leading into said passage, a movable metering device for variably restricting the flow of fuel through said orifice, movable means responsive to intake manifold suction for moving said device to maximum and minimum fuel flow positions including a suction connection extending from a source of engine suction, and air bleed means coacting with said suction responsive means and forming an inlet for said suction connection for maintaining said rod in an intermediate fuel flow position when said throttle is intermediate its idling and full power enrichment positions.

2. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means including a movable part for actuating said valve between maximum and minimum flow positions, and a variable air bleed means in said suction responsive means operated by said movable part for maintaining said valve in an intermediate flow position throughout an intermediate range of throttle positions.

3. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means including a movable part for actuating said valve between maximum and minimum flow positions, and a variable air bleed means in said suction responsive means for maintaining said valve in an intermediate flow position throughout a predetermined intermediate range of throttle positions, said air bleed means including an air bleed port controlled by the movable part of said suction responsive means.

4. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means including a movable part for actuating said valve between maximum and minimum flow positions, and a variable air bleed means in said suction responsive means for maintaining said valve in an intermediate flow position throughout a predetermined intermediate range of throttle positions, said air bleed means including an air bleed port controlled by the movable part of said suction responsive means, said bleed port being open when the valve is in minimum flow position and closed when the valve is in maximum flow position.

5. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means for actuating said valve between maximum and minimum flow positions, variable air bleed means in said suction responsive means for maintaining said valve in an intermediate flow position throughout a predetermined intermediate range of throttle positions, said suction responsive means including a cylinder having a piston therein, and said air bleed means com-

prising a port in the wall of said cylinder, and a port in the piston for movement into and out of registry with the port in the cylinder wall.

6. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means for actuating said valve between maximum and minimum flow positions, variable air bleed means for maintaining said valve in an intermediate flow position throughout a predetermined intermediate range of throttle positions, said suction responsive means including a cylinder having a piston therein, said air bleed means comprising a port in the wall of said cylinder, and a port in the piston for movement into and out of registry with the port in the cylinder wall, and means yieldably resisting movement of said piston responsive to suction.

7. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means for actuating said valve between maximum and minimum flow positions, variable air bleed means for maintaining said valve in an intermediate flow position throughout a predetermined intermediate range of throttle positions, said suction responsive means including a cylinder having a piston therein, and said air bleed means comprising a port in the wall of said cylinder, and a port in the piston for movement into and out of registry with the port in the cylinder wall, said ports being in registry during idling throttle positions and out of registry during full throttle position.

8. In a step-up device for a carburetor having a fuel bowl for supplying fuel to a main fuel passage and thence into a mixture conduit having a throttle therein, a valve controlling the flow of fuel to said passage, suction responsive means including a suction passage and a movable part for actuating said valve between maximum and minimum flow positions, and air bleed means in said suction responsive means variable by said movable part for maintaining said valve in an intermediate flow position throughout a predetermined intermediate range of throttle positions when said movable part moves to decrease the air bleed said valve including a metering rod movable within a fuel metering orifice, and a restricted passage for limiting the maximum flow from the suction responsive means to the mixture conduit.

9. In a fuel metering step-up device for a carburetor having a fuel bowl supplying fuel to a main fuel passage for discharge into a mixture conduit having a throttle therein, a fuel valve controlling the flow of fuel to said main fuel passage, suction responsive means comprising a cylinder having a piston therein for actuating said fuel valve between minimum and maximum flow positions, a suction passage connecting said cylinder with said conduit posterior of said throttle, and a suction control valve means comprising said piston in said passage for maintaining said fuel valve intermediate its minimum and maximum flow positions throughout a predetermined range of throttle movements.

10. In a carburetor, a mixture conduit, a fuel reservoir, a fuel passage connecting said fuel reservoir and said mixture conduit, a valve for controlling the flow of fuel through said passage, a throttle in said mixture conduit, and means for operating said valve for varying the flow through said passage comprising suction actuated means including a cylinder in said carburetor for operating said valve, a suction passage between said suction actuated means and said mixture conduit, a piston in the cylinder of said suction actuated means exposed to substantially atmospheric pressure on one side, and to the pressures in said suction passage on the opposite side, means for variably resisting the force of suction on said movable part, a variable air bleed means in the cylinder

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wall of said suction actuated means controlled by movement of said piston in said cylinder independent of variations in suction in said suction passage caused by operation of said throttle for modulating the force on said suction actuated means so as to unbalance the forces acting on said movable part and move said valve to positions intermediate its extreme positions, and means for limiting the maximum flow in said suction passage cooperating with variation in said air bleed means by said movable part.

11. In a carburetor, a fuel bowl for supplying fuel, a mixture conduit, a throttle valve in said mixture conduit, a fuel passage connecting said fuel bowl and said mixture conduit, a valve controlling the flow of fuel through said passage, suction responsive means for actuating said valve between maximum and minimum flow positions, said suction responsive means including a cylinder and a piston movable in said cylinder, means for ap-

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plying a fluid pressure to one side of said piston tending to close said valve, a first means for applying a variable force to the opposite side of said piston tending to open said valve, additional means for applying variable forces on the opposite side of said piston, said means including a passage connecting said cylinder with suction posterior of said throttle in said mixture conduit, and a port in the wall of said cylinder opening to atmosphere, means for limiting the total maximum flow through said passage connecting posterior of the throttle, and means operated as said piston moves over said port for varying the flow through said suction passage and thereby the differential in the forces operating on said piston to move said valve to positions intermediate full open and closed positions.

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