United States Patent

Bickhaus et al.

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[45] **Aug. 1, 1972**

[54] **STAGED CARBURETOR**

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[21] Appl. No.: **105,083**

Related U.S. Application Data

[63] Continuation of Ser. No. 751,397, Aug. 9, 1968, abandoned.

[52] **U.S. Cl.** ....**261/51,** 261/52, 261/56, 261/62, 261/69 R, 261/DIG. 56

[51] **Int. Cl.** **F02m 9/10**

[58] **Field of Search**...261/62, 51, 52, 69 R, 56, DIG. 56–64

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[57] **ABSTRACT**

A carburetor having the usual throttle valve is also equipped with a butterfly valve surrounding the main fuel boost venturi (venturi valve). The venturi valve is linked to the throttle valve in such a manner as to begin opening movement shortly after the throttle valve begins to open. Air velocity over the main fuel nozzle approaches a maximum as the venturi valve begins to open and remains substantially constant thereafter to promote most efficient mixing of fuel and air.

6 Claims, 10 Drawing Figures

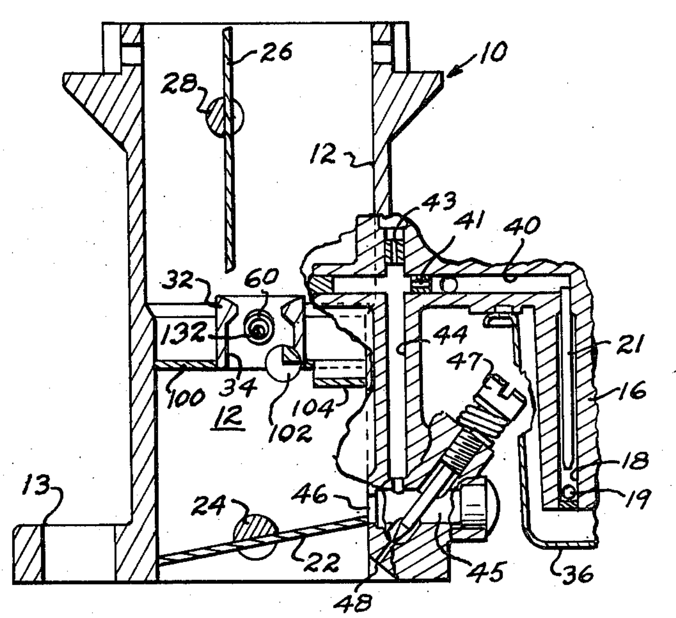


FIG. 1.

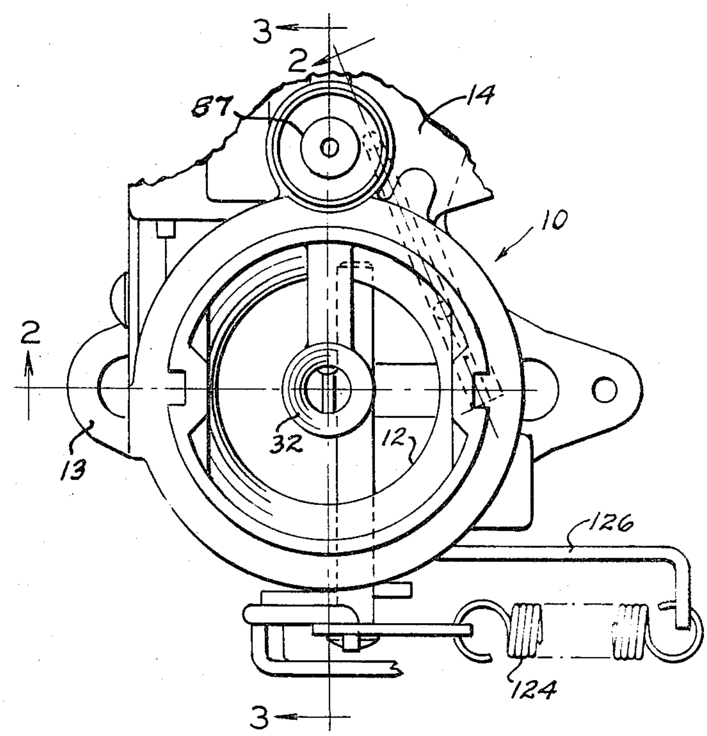
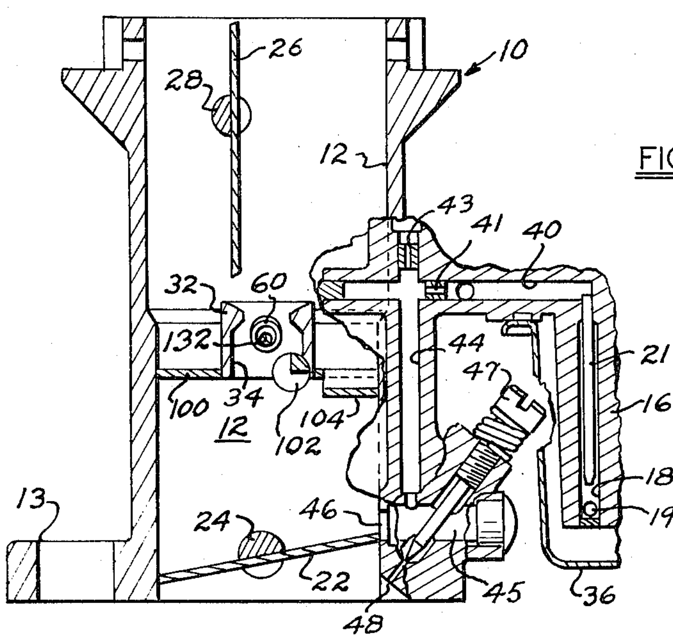


FIG. 2.



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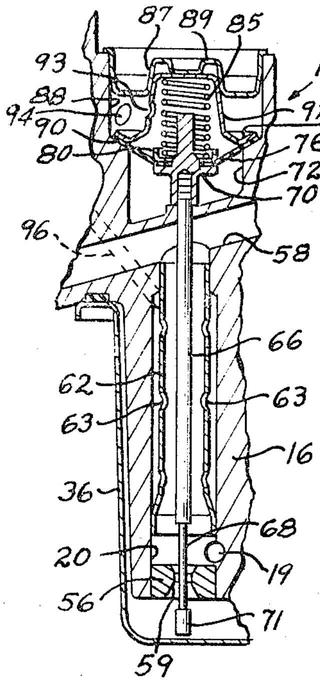

FIG. 4.

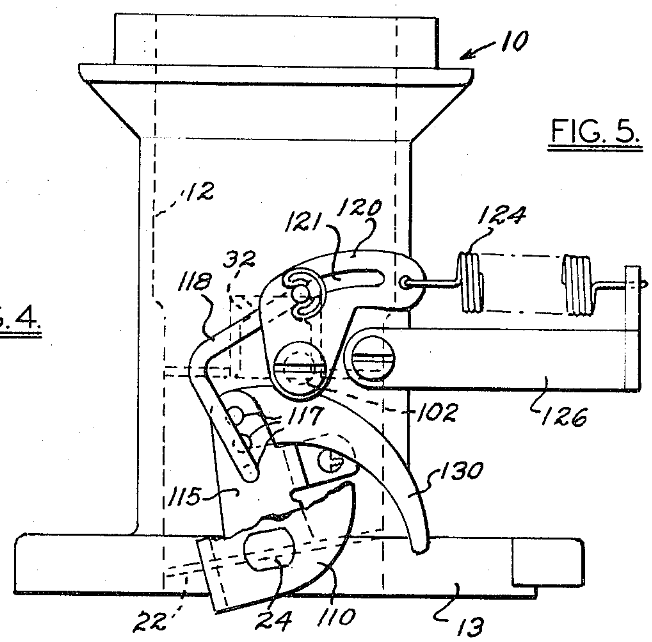

FIG. 5.

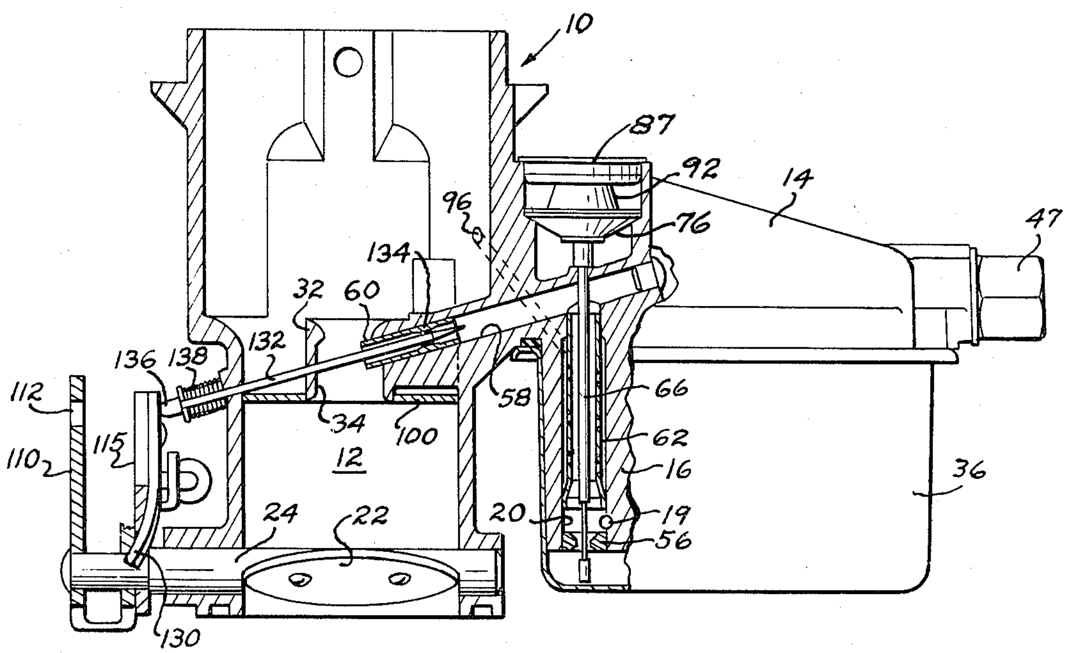

FIG. 3.

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FIG. 6.

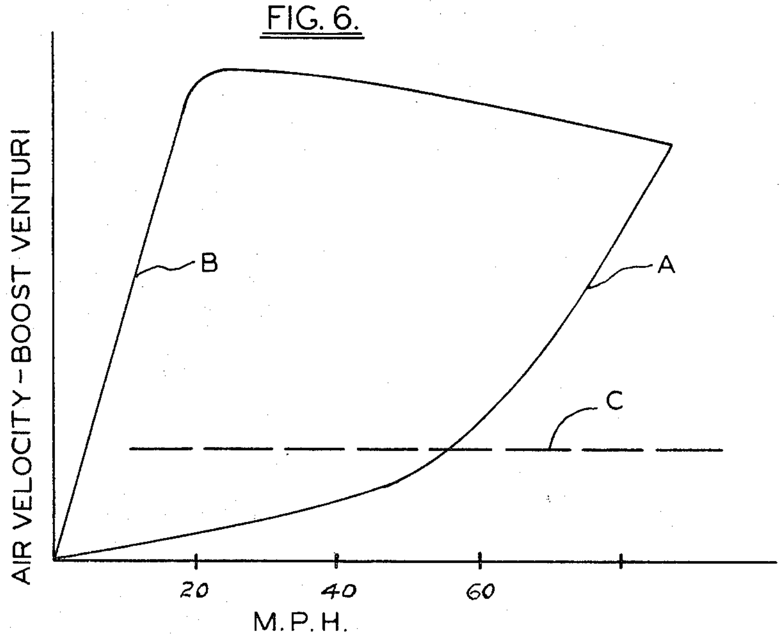
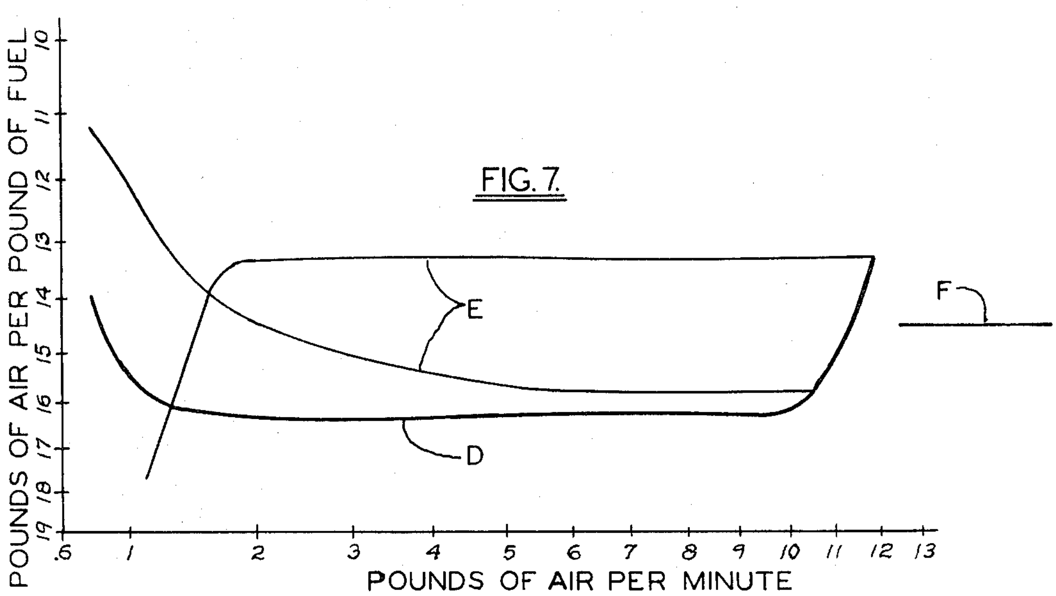


FIG. 7.



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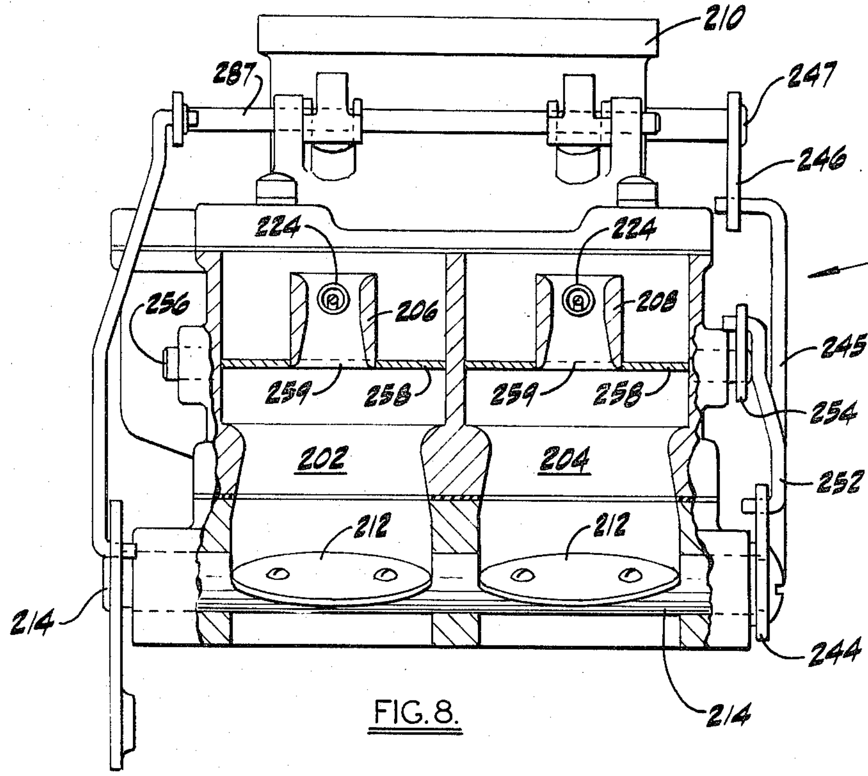

FIG. 8.

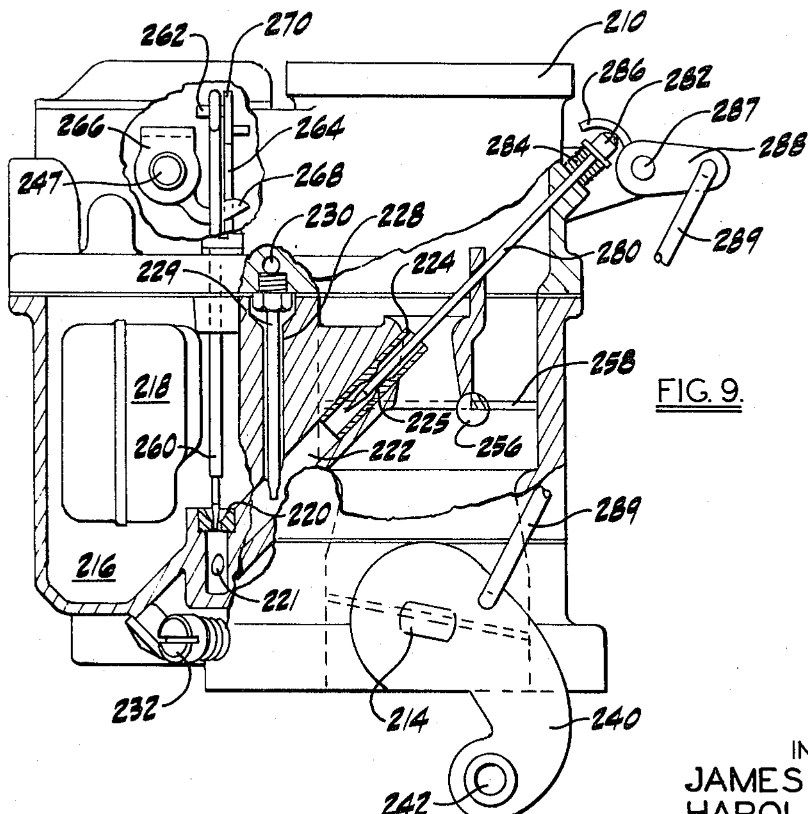

FIG. 9.

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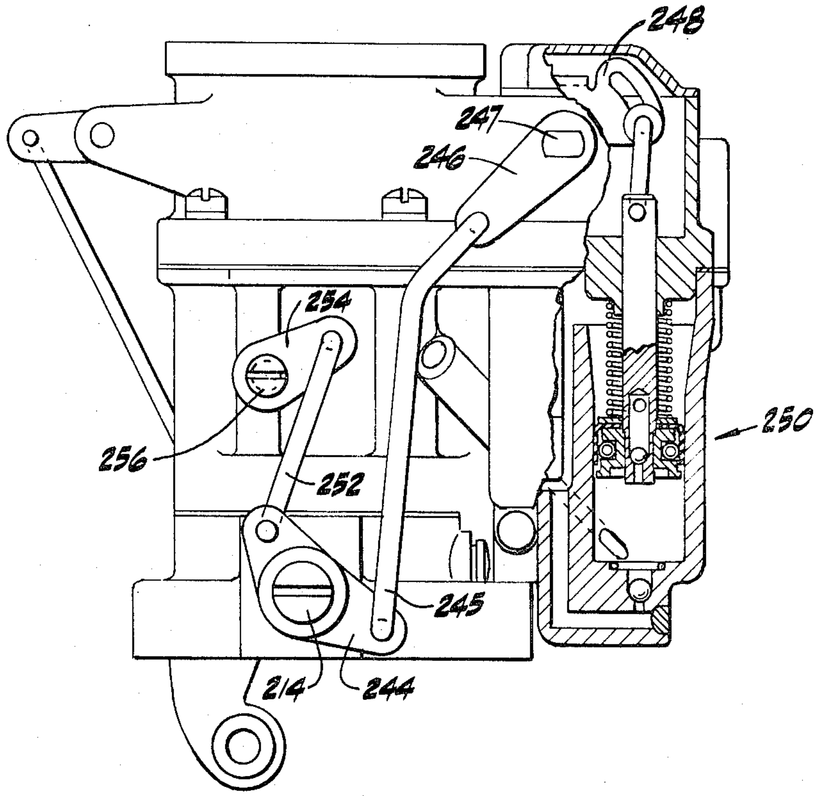

FIG. 10.

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STAGED CARBURETOR

This application is a continuation of application Ser. No. 751,397, filed Aug. 9, 1968, now abandoned.

BACKGROUND OF THE INVENTION

Most conventional carburetors use a butterfly type throttle valve and two separate although frequently interconnected fuel systems. The type construction employed in the past has been such that throughout substantial portions of the operating range of the carburetor something less than ideal mixing of air and fuel resulted.

The two fuel systems normally present in a carburetor are the idle or low speed fuel system and the main or high speed fuel system. The idle fuel system includes a pair of ports through which fuel is discharged into the mixing conduit. One of these ports is swept by the throttle valve and is of a fixed size. The other port normally includes a needle valve to adjust the fuel flow at curb idle. It is customary that both of the idle fuel ports be placed in the wall of the mixing conduit and because of this location only a part of the air passing the throttle valve sweeps over the fuel discharged from the two ports. The remainder of the air passes an opposite edge of the throttle plate and can only mix with fuel at some point posterior to the throttle. In other words, during the portion of the time when the idle fuel system is discharging fuel, all of the fuel is discharged on one side of the mixing conduit adjacent a first edge of the throttle plate and only approximately one-half of the air is present at that same location. The remaining one-half of the air passes the opposite edge of the throttle plate and mixes with the fuel at a much later time. Moreover, at curb idle and very low part throttle ranges fuel is discharged from the idle system ports in such a manner that it is not completely projected outwardly into the mixing conduit but instead frequently portions of the fuel trickle down the wall of the conduit to fall off into the intake manifold in rather large drops. This condition results in a less than ideal air/fuel mixture because a high degree of atomization and vaporization is necessary for good mixing of air and fuel. Unless there is a very good mixing of air and fuel the total composition will not be of a homogenous nature. When the air and fuel are less than perfectly mixed it is possible and even probable that the mixture will be routed to the individual cylinders in such a manner that some cylinders will receive a lean mixture. When this condition exists it is frequently referred to as imperfect or poor distribution.

Imperfect distribution has a very definite relationship to the quantity of unburned hydrocarbons and carbon monoxide discharged into the atmosphere through the exhaust system of the automobile. If the mixture reaching an individual cylinder is too lean there will be either imperfect combustion or no combustion at all. In the past this condition has been corrected in part by making the overall mixture richer and this had the adverse affect of causing an increase in unburned hydrocarbons and carbon monoxide as well as a decrease in fuel economy.

The conventional main fuel system also creates some difficulty in the part throttle ranges. The main nozzle begins to discharge fuel at fairly low part throttle operating conditions. In the early stages of fuel discharge from the main nozzle the air velocity sweeping by the nozzle is necessarily low and the fuel is broken up only into relatively large droplets. In contrast at maximum air flow the velocity of the air passing the main nozzle reaches several hundred feet per second and this velocity is sufficient to vaporize or atomize the fuel to such an extent that excellent mixing with the air is possible.

In many conventional carburetors the main fuel nozzle is located in the vicinity of a large venturi. The actual discharge of fuel may take place in a smaller venturi referred to as a boost venturi. Maximum air velocity is found in the boost venturi. It therefore appears that a carburetor designed to minimize the function of the idle fuel system and to provide for maximum air velocity in the boost venturi over substantially all of the normal range of operations will promote more efficient mixing of air and fuel. With more efficient mixing the mixture ratios can be leaner while at the same time a more uniform mixture will be discharged from the carburetor itself. All of this will enable a reduction in unburned hydrocarbons and in carbon monoxide.

BRIEF DESCRIPTION OF THE INVENTION

According to the invention a downdraft carburetor is provided with conventional choke and throttle valves. There is also provided an idle fuel system similar in most respects to conventional idle fuel systems excepting that dimensions and relationships are such that the idle fuel system contributes a smaller quantity of fuel over the normal range of operation of idle fuel systems. The carburetor is also supplied with a main fuel system which discharges into a boost venturi by way of a main fuel nozzle. The main fuel nozzle may be provided with a metering rod which is responsive to throttle position to regulate and meter fuel discharged by the main fuel nozzle. A butterfly type throttle valve is arranged in the mixing conduit above the usual throttle valve. This auxiliary butterfly valve has been termed a "venturi valve." The venturi valve surrounds a boost venturi into which the main fuel nozzle discharges. The throttle valve and the venturi valve are connected by suitable linkages in such a manner that the throttle valve opens only a few degrees before the linkage picks up the venturi valve. Alternatively the venturi valve may begin its opening movement at the same time as the throttle valve begins its movement. During the time that the venturi valve is closed, most of the air passing through the carburetor necessarily passes through the boost venturi with the result that air velocity in the boost venturi increases rapidly with only slight opening of the throttle valve. Thereafter concurrent movement of the throttle valve and the venturi valve is regulated to maintain the high air velocity in the boost venturi throughout the remaining portion of the opening of the throttle valve.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the barrel of a single barrel carburetor and a portion of the fuel bowl cover.

FIG. 2 is a sectional view taken along the lines 2—2 of FIG. 1.

FIG. 3 is a cross sectional view taken along the lines 3—3 of FIG. 1.

FIG. 4 is an enlarged view of a portion of FIG. 3.

FIG. 5 is an elevation showing the linkages between the throttle valve and the venturi valve.

FIG. 6 is a plot of air velocity in the boost venturi versus road speed of a vehicle for a conventional carburetor and for the carburetor of the invention.

FIG. 7 is a plot of air/fuel ratios for a conventional carburetor and for the carburetor of the invention.

FIG. 8 is a sectional view of a two-barrel carburetor.

FIG. 9 is an elevation partly in section illustrating the fuel metering of the carburetor of FIG. 8 and,

FIG. 10 is a side elevation showing the linkage between the throttle valve and the venturi valve.

DETAILED DESCRIPTION

The carburetor shown consists essentially of a casting 10 which is formed with a fuel and air mixture conduit 12 and a fuel bowl cover portion 14 from which is inwardly formed a depending boss 16 containing a main fuel well structure 20 and an idle fuel well structure 18. Fuel wells 18 and 20 are connected by a cross passage 19. As shown the mixture conduit 12 is arranged and aligned vertically during operation and is connected by a flange 13 to the intake manifold of an internal combustion engine. In the lower part of conduit 12 there is rotatably mounted a throttle valve 22 fixed to a throttle shaft 24 to move the throttle 22 between open and closed positions. In the upper portion of the fuel/air mixture conduit 12 there is similarly mounted for rotational movement an unbalanced choke valve 26 fixed to a choke valve shaft 28 which is also jounralled in aligned apertures through the body casting 10. Between the upper and lower portions of the mixture conduit 12 is located a small boost venturi 32 which has an inner venturi surface 34 coaxially aligned with the mixture conduit 12.

A fuel bowl 36 is fixed beneath the fuel bowl cover 14 and is held with its rim tightly against a gasket fitted between the rim of the fuel bowl 36 and matching portions of the fuel bowl cover 14. In customary manner a float is mounted within bowl cover 36 to coact with an intake needle valve. The needle valve regulates inflow of fuel from the fitting 47.

The lower end of the fuel wall 20 is closed by a fitting 56 having a central orifice 59, which is carefully formed to provide a metering jet for the flow of fuel from the fuel bowl 36 to the mixture conduit 12. The upper end of fuel well 20 intercepts a cross fuel passage 58 directed downwardly into the boost venturi 32. A nozzle fitting 60 is press fitted into the end of passage 58 and has one end thereof extending into the center of the boost venturi. Press fitted within the well 20 is a fuel emulsion tube 62 having apertures 63 therethrough along its length.

A metering rod 66 (see FIG. 4) is suspended within the fuel well 20. Rod 66 has at its lower end 71 an intermediate reduced portion 68 positioned within the main fuel jet orifice 59 for operation in response to engine requirements. Metering rod 66 is supported from a retainer 70 in which the upper end of rod 66 is fixedly engaged. Metering rod 66 extends upwardly across the main fuel passage 58 and into a recess 72 formed in the upper portion of the carburetor body casting 10. A diaphragm 76 is held on the retainer 70 by a cup washer 80 pressed tightly down over the upper end of retainer 70. A cylindrical bore 88 is formed in the upper surface of the carburetor casting 10 and forms a continuation of the cavity 72. There is formed between bore 88 and cavity 72 and annular shoulder 90 having a conical surface. One end of a coil spring 85 is fitted into the cup washer 80. A sheet metal thimble shaped retainer 92 is placed within the bore 88 in a position shown with the upper end of spring 85 against the top of the retainer 92. The sheet metal eyelet cup 89 is press fitted into the top of the bore 88 and has a central reentrant portion 87 which telescopes over the end of retainer 92 to tightly press the retainer 92 downwardly into the bore 88 so that a flange rim 91 of the retainer 92 will force the periphery of diaphragm 76 onto the surface of shoulder 90 with sufficient pressure to form a fuel tight fit. Spring 85 is slightly compressed to press the diaphragm and metering rod retainer assembly downwardly.

An aperture 93 through the wall of thimble retainer 92 provides access from bore 88 to the inside of retainer 92. A passage 94 is formed through the body casting 10 to the flange portion 13 of the carburetor and opens at 25 into the mixing conduit downstream of the throttle 22. In this manner passage 94 connects the space above the diaphragm 76 to manifold pressure of the engine.

A passage 96 is formed between the mixing conduit 12 from a region below the choke valve 26 to extend downwardly into the upper portion of well 20. Air flows through the passage 96 into the well 20 and thence into the apertures 63 to form a fuel emulsion within the tube 62 for delivery to the main fuel nozzle 60.

Suspended in idle fuel well 18 is an idle fuel tube 21. Tube 21 discharges fuel into a cross passage 40 which is provided with an economizer restriction 41 and an air bleed 43. A mixture of air and fuel from passage 40 and air bleed 43 is let downwardly by passage 44 to an idle fuel cavity 45. A port 46 is located adjacent the edge of throttle plate 22 for discharging fuel under idle conditions. Needle valve 47 regulates the flow of idle fuel through the adjustable idle port 48 for trimming the quantity of fuel to the precise amount required for good curb idle operation.

The carburetor as described above is substantially a standard carburetor as presently used. Arranged within mixing conduit 12 midway between the throttle valve and the choke valve is an annular disk type valve or venturi valve 100. The venturi valve is rotatably mounted on a shaft 102 and may have an offset portion 104 arranged in such a manner that when the venturi valve is opened the offset 104 will clear the edge of boost venturi 32. Venturi valve 100 substantially blocks off the space surrounding venturi 32 when the valve is in its closed position. As a result, during the time valve 100 is closed substantially all of the air passing through the carburetor must pass through the boost venturi 32. Because venturi 32 is relatively small in diameter, even low flow rates will result in high air velocity through the boost venturi.

While venturi valve 100 is shown as a single annular disc mounted on a single shaft, it will be appreciated that other construction could be used. For example disc 100 could be cut in half and each portion separately mounted on its own shaft. Alternatively, an iris type valve could be used. In any construction, the important feature to be retained is that of directing air at high velocity through the boost venturi, even at low flow rates.

Throttle shaft **24** is provided with a throttle lever **110** which by way of eye **112** is connected to a throttle rod and the usual foot pedal. Also mounted on throttle shaft **24** is a lever **115** having a plurality of apertures **117**. An end of a link **118** passes through one of the apertures **117** and is suitably secured therein. Venturi valve shaft **102** is provided with a slotted lever **120** and the other end of link **118** passes through the slot in the arm **120**. A spring **124** biases the venturi valve **100** toward a closed position. The spring engages lever **120** and an end of a mounting bracket **126**.

When the throttle lever **115** is rotated, counterclockwise as shown in FIG. **5**, it causes the link **118** to move. The first movement of link **118** is to the end of the slot **121** in lever **120** after which the end of the link picks up the lever arm and starts the opening movement of venturi valve **100**. Thus, the throttle valve can open through any desired number of degrees before the venturi valve begins its opening movement.

Attached to lever arm **115** is a cam **130** which is so contoured as to cause a metering rod **132** to move with respect to an orifice **134** in the nozzle **60**. Rod **132** is provided with a head **136** for engagement with the cam surface. The head **136** may be of low friction material. The spring **138** biases metering rod **132** in a direction to withdraw it from the orifice **134**. The cam surface controls the movement of metering rod **132** so that at wide open throttle the metering rod presents a small diameter in the orifice **134** and at low part throttle or at curb idle conditions the metering rod presents a larger diameter surface within the orifice.

The operation of the carburetor just described can be best described with respect to FIG. **6**. In FIG. **6**, there are portrayed somewhat idealized curves of the air velocity in a boost venturi with respect to road speed in miles per hour. The curve labeled A represents air velocity as it might be measured in a standard carburetor without a venturi valve. The curve labeled B is representative of the air velocity in the boost venturi of the present carburetor. It will be noted that the air velocity rises very rapidly to a peak and thereafter falls somewhat. The falling off of the air velocity can be attributed to the opening of the venturi valve. The venturi valve can be adjusted to begin its opening movement somewhere near the time the air velocity in the boost venturi reaches a peak. In the particular construction shown this adjustment is readily and easily achieved by shortening or lengthening the link **118**.

As shown in FIG. **6**, is a horizontal line C. The line C represents air velocity in the boost venturi above which reasonably efficient and effective atomization of the fuel occurs. From curve A it will be seen that efficient atomization does not occur until after the car has reached a speed of perhaps 50 MPH. In contrast the atomization is above the minimum efficient level with the present invention almost immediately after the car moves away from the curb. In other words, for most normal driving situations efficient atomization can be achieved with the present invention throughout the entire range of normal driving. It is seldom that a car moves at speeds below **15** or 20 MPH for any length of time. In contrast in normal city driving situations the car moves most of the time at speeds above 20 MPH and in those cities having freeways a great deal of the driving will be done at speeds between 20 and 50 MPH.

Since air velocity in the boost venturi of the present invention rises so rapidly, it is possible to start fuel flowing from the main nozzle much earlier than is the case with conventional carburetors. This in turn results in the ability to operate the engine at much leaner mixtures than has been true in the past. This is dramatically illustrated in FIG. **7**, where fuel/air ratio curves are plotted against air flow for the carburetor of the present invention. The curve marked D represents the fuel/air ratio in pounds of air per pound of fuel for the carburetor of the invention. The entire part throttle range only is shown. Curve E represents an idealized flow curve for a standard carburetor such as has been used for comparison purposes in the past. Up until a few years ago most carburetors flowed at ratios near the idealized curve with departures being made for particular engines and for particular driving conditions. Curve E shows the wide open throttle portion of the curve and this portion is not shown for curve D for the reason that it is unimportant insofar as measurement of exhaust emissions is concerned. The line F shown on FIG. **7** represents the approximately stoichiometric ratio that is theoretically required for complete combustion. The line is only approximate because it may shift upwardly or downwardly slightly depending upon the BTU content of the particular fuel being used at any given time.

It will be seen that the curve D is much leaner than the theoretical curve and a curve such as D would not have been possible a few years ago because engine operation would have been unsatisfactory. The ability to drive a car with an engine equipped with a carburetor flowing as lean as the curve D is attributed largely to the much better mixing of the air and fuel through better atomization. This insures that more nearly equal mixture ratios are delivered to each of the various cylinders. Combustion can be initiated and maintained in the combustion chamber of any cylinder when the ratio is lean but there are limits beyond which combustion will be erratic or it will not occur at all. Prior practice has dictated that the overall mixture ratio be rich enough so that the leanest cylinder will receive a mixture such as to maintain good burning conditions in that cylinder. The carburetor of the invention assists materially in distributing the uniform lean mixtures to all of the cylinders. This results in marked decrease in the hydrocarbon and carbon monoxide emissions from the engine by way of its exhaust system.

From the foregoing it will be seen that is normal operation fuel flows from the idle system principally at the curb idle condition. Once the throttle has moved away from the curb idle position fuel will begin to flow from the main fuel nozzle and with only a small degree of additional opening of the throttle air velocity within the boost venturi will rise high enough to insure good atomization of the fuel. The point at which venturi valve **100** will begin to open can be controlled to some degree by the amount of leakage around the boost venturi. If the space between the boost venturi and the venturi valve is relatively large air velocity will not increase as rapidly and the venturi valve should open at a somewhat later point. If this space is small the air velocity will increase rapidly and the venturi valve should open more quickly.

The foregoing discussion has assumed normal operating temperatures. It is believed obvious that for cold starting the choke valve **26** can be closed and the operation will be much like that of a standard carburetor. The choke can be manually or automatically controlled as desired.

Since the venturi valve directs idle air through the boost venturi, it is entirely feasible to cause a portion of the fuel for idling to come from the main nozzle, and some carburetors have been so calibrated. Such a calibration is beneficial because the idle fuel system contributes a lesser amount of fuel thereby decreasing the undesireable condition of allowing fuel to trickle down the wall of the bore.

The carburetor just described employs a main fuel system which discharges an emulsion of air and fuel through the main nozzle. Such carburetors are sometimes called "air bled." Distinguishing characteristics of such an air bled carburetor is the emulsion tube in the main fuel well and a downwardly inclined nozzle. Basic principles of the invention can also be applied to another type of carburetor which does not use an emulsion system, but instead provides a liquid or "solid" fuel to the main nozzle. In such a carburetor the nozzle usually is upwardly inclined. In FIGS. **8** through **10** there is shown a 2-barrel carburetor having upwardly inclined main nozzles.

The two-barrel carburetor **200** is provided with a pair of mixing chambers **202,204** having mounted within them boost venturis **206** and **208**. Surmounting the mixing chambers is an air horn **210** which may be provided with a choke valve as is customary. The pair of throttle plates **212** are mounted on the throttle shaft **214** which is journalled in the body of the carburetor for rotational movement. The carburetor is also provided with a fuel bowl **216** and a float **218** for controlling the flow of fuel into the carburetor.

Fuel from fuel bowl **216** passes through a metering orifice **220** into passage **221** which communicates with main fuel passage **222** and with the main nozzle **224**. Nozzle **224** is provided with a restriction **225** which constitutes a second metering point in the main fuel system. In some instances a restriction **225** may not be necessary. Suspended in well **228** is an idle fuel tube **229** which obtains fuel from the passage **221**. Fuel from tube **229** is discharged into a passage **230** which communicates at its other end with an idle fuel port or ports arranged in the side wall of the carburetor in a conventional manner. Idle fuel adjusting screw **232** can be used to regulate the flow of idle fuel to one of the idle ports. The idle port arrangement, while not shown in FIGS. **8** through **10**, is similar to that shown in FIG. **2**.

Throttle shaft **214** at one end is provided with a lever arm **240** having an eye **242** for connection to the usual throttle actuating rod. At its other end throttle shaft **214** is provided with a lever arm **244**. A link **245** is fitted into a receiving aperture in the lever **244** and also into a receiving aperture of a lever **246**. Lever **246** is mounted on a counter shaft **247**. Also mounted on shaft **247** is a slotted lever **248** which actuates the accelerating pump **250** in the customary manner. The other end of lever **244** is connected by a link **252** to a lever **254** which is mounted on a venturi valve shaft **256**. In each mixing conduit there is mounted on shaft **256** a venturi valve **258**. As in the case of the single-barrel version, each valve **258** is cut away at its center to provide openings **259** which closely surround the skirt of the boost venturis **206, 208**. When the venturi valve is closed as shown in FIGS. **8** and **9** virtually all air passing through the carburetor must pass through the boost venturis.

A main fuel metering system is provided for each main nozzle **224**. Fuel for the main fuel system enters from bowl **16** into the main fuel passageway by way of metering jet **220**. The quantity of fuel flowing through jet **220** is regulated by a tapered end portion of metering rod **260**. Rod **260** is suspended from a pin **262** on push rod **264**. Rod **164** moves up and down in response to engine vacuum as is more fully explained in U. S. Pat. No. 2,715,523 to Moseley et al. When there is high engine manifold vacuum the rod **264** will be pulled downwardly by the vacuum and when the vacuum is vary small the rod will rise to the position shown in FIG. **9**. A means is provided for also regulating the position of rod **260** in accordance with throttle position. Shaft **247** rotates responsive to throttle rotation by way of the connecting link **245** (FIG. **10**). A crank **266** on rod **247** has a finger **268** which coacts with a horizontal surface **270** on push rod **264**. Thus when the throttle is rotated in the finger **268** moves upwardly lifting push rod **264** and by way of pin **262** the metering rod **260** to allow more fuel to pass through the jets. The tapered end of rod **260** can be so contoured as to provide precisely the exact amount of fuel required for any throttle position.

If it is found desireable or necessary additional control over the flow of fuel from the main nozzle **224** can be effected by way of metering rods **280**. The rods **280** are provided with tapered end portions which move in restriction **225** to regulate the flow of fuel. Rod **280** is provided with an end cap **282** which is biased outwardly by a spring **284**. Cap **282** and rod **280** are prevented from moving outwardly by a cam **286** mounted on shaft **287**. Shaft **287** is rotated by a lever **288** which is connected by way of a link **289** to the throttle lever **240**. It is evident that as the throttle lever **240** is rotated in a direction to open the throttles that the cam **286** will move in response thereto thereby allowing the spring **284** to move the nozzle metering rod **280** in response to throttle movement.

While the carburetor of FIGS. **8** through **10** has been shown as a two-barrel carburetor, it will be appreciated that all of the principles involved are equally applicable to a single-barrel carburetor or to the primaries and/or secondaries of a four-barrel carburetor. In both embodiments of the carburetor shown and described, there are two metering rods for controlling the quantity of fuel flowing through the main nozzles. It is of course possible to use only one of the metering rods. Thus in FIGS. **8–10**, either one of the rods **260, 280** can be used alone and the other omitted.

Through use of the venturi valve of the invention, it is possible to create a condition of substantial vacuum in the zone between the throttle valve and the venturi valve. For example, the intake manifold vacuum at steady state cruising conditions, at speeds below about 70 MPH, is usually about 16–18 inches Hg. By adjusting the linkage between the venturi valve and the throttle valve to a desired point, the vacuum between the two valves can be regulated for best performance. A vacuum as high as 8-10 inches Hg. can be achieved but a lesser amount may prove best for particular conditions. Notwithstanding the ability to achieve the high vacuum in the aforementioned zone, the carburetor of the invention does not restrict air flow for wide open throttle conditions. This is so because both valves can be fully opened at the same time to permit maximum flow.

It is the high vacuum in the zone between the venturi valve and the throttle valve that induces the high air velocities in the boost venturi as described earlier in connection with FIG. 6. Such high vacuums are not required at higher speeds and higher engine RPM because the normal breathing of the engine induces high velocities even in a normal carburetor. (see curve A of FIG. 6)

We claim:

1. A carburetor for an internal combustion engine comprising:

A. a body structure having at least one air/fuel mixture conduit therethrough,

B. a throttle valve mounted across said conduit for movement from an open position to a position closing said conduit,

C. means for operating said throttle valve,

D. means for supplying fuel to said mixture conduit,

E. a boost venturi having an air passage therethrough and centrally located in said mixture conduit above said throttle valve and having a main nozzle therein in communication with said means for supplying fuel,

F. an unbalanced venturi valve means mounted in said mixture conduit for obstructing the flow of air around said boost venturi when said venturi valve means is in a closed position,

G. means for biasing said venturi valve means toward a closed position whereby said venturi valve means is closed at least during a portion of the part throttle range of operation of said carburetor,

H. an idle fuel system in communication with said means for supplying fuel and having a discharge port adjacent an edge of said throttle valve for supplying fuel during idle and low part throttle operation of said carburetor,

I. restricting orifice means including an adjustable metering element in the said means for supplying fuel to said main nozzle, and

J. positive opening control means for said venturi valve means comprising linkage means including lost-motion connecting means connecting said venturi valve means to said throttle valve operating means for controlling the opening thereof to thereby maintain high air velocity in said boost venturi throughout the part throttle operation of said carburetor.

2. The carburetor of claim 1 in which the said restricting orifice is located at the point fuel enters the main fuel system.

3. The carburetor of claim 1 in which the said restricting orifice is located in the said nozzle adjacent the discharge end thereof.

4. The carburetor of claim 1 in which the said adjustable metering element is provided with throttle actuated positioning means adapted to position said metering element for minimum fuel flow when said throttle is at curb idle position and for maximum fuel flow when said throttle is open.

5. The carburetor of claim 1 including a plurality of air/fuel mixture conduits.

6. The carburetor of claim 1 including vacuum means for positioning the said metering element in response to engine manifold vacuum.

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