

[54] **POWER FUEL SUPPLY SYSTEM**

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[51] Int. Cl. **F02m 7/06**

[58] Field of Search **261/23 A, 69 R, 69 A, 67**

[56] **References Cited**
UNITED STATES PATENTS

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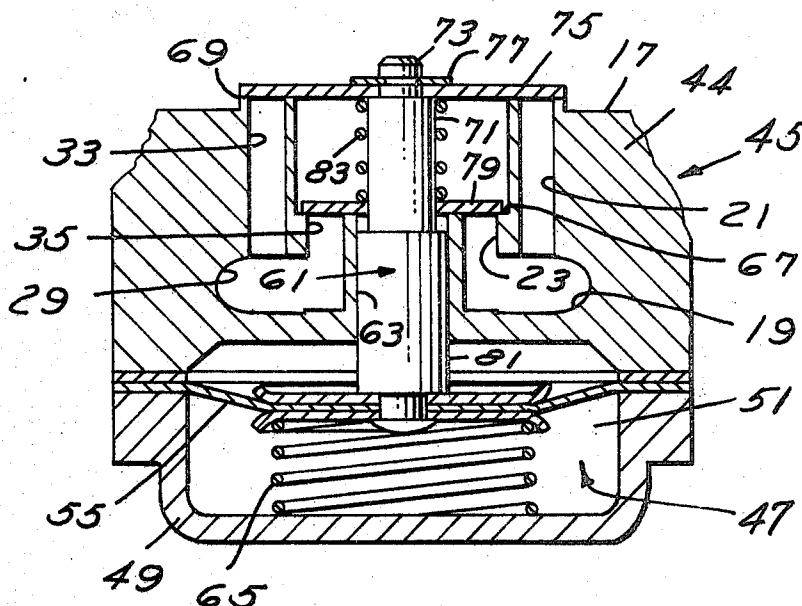
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[57] **ABSTRACT**

A power fuel supply system for an internal combustion engine carburetor. The system includes a single-stage or multi-stage power valve assembly having closure elements which are movable in response to intake manifold vacuum to open and close the inlets to the power fuel supply system. The valve is especially suitable for a multi-barrel carburetor to prevent fuel transfer or interaction between the right-hand fuel supply passages and the left-hand fuel supply passages.

9 Claims, 5 Drawing Figures



SHEET 1 OF 2

FIG. 1

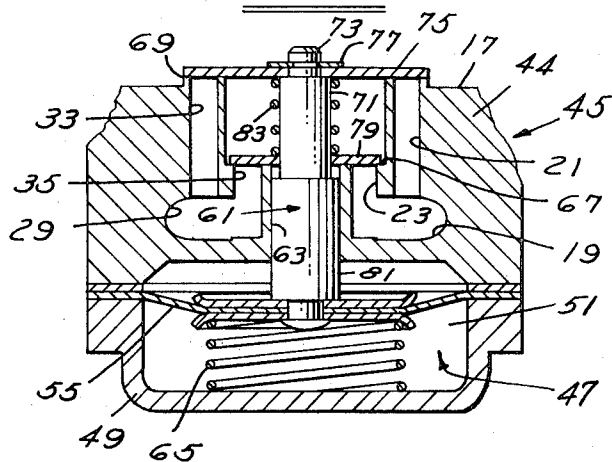


FIG. 2

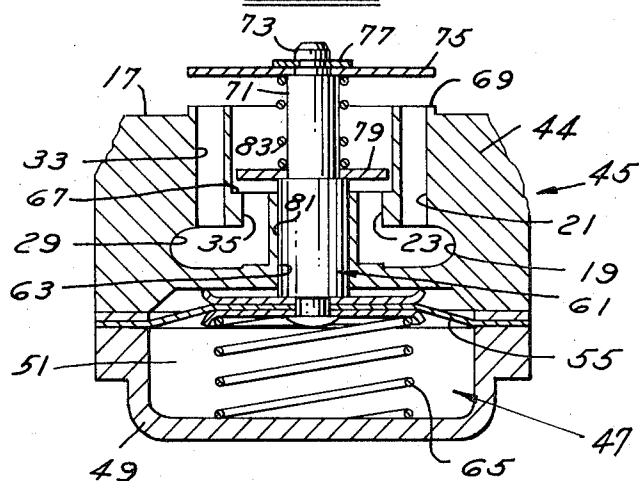
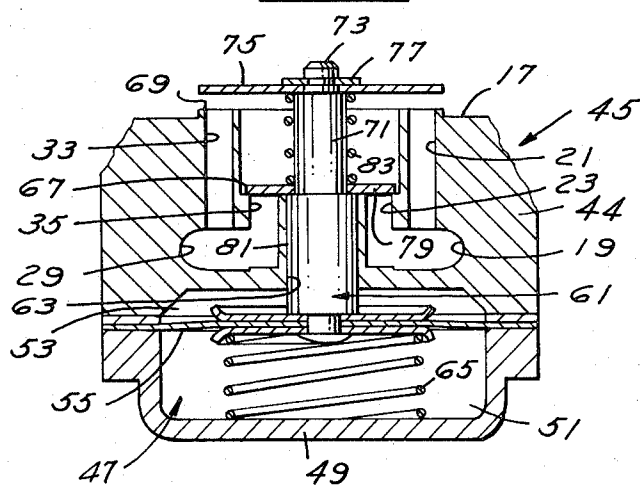


FIG. 3



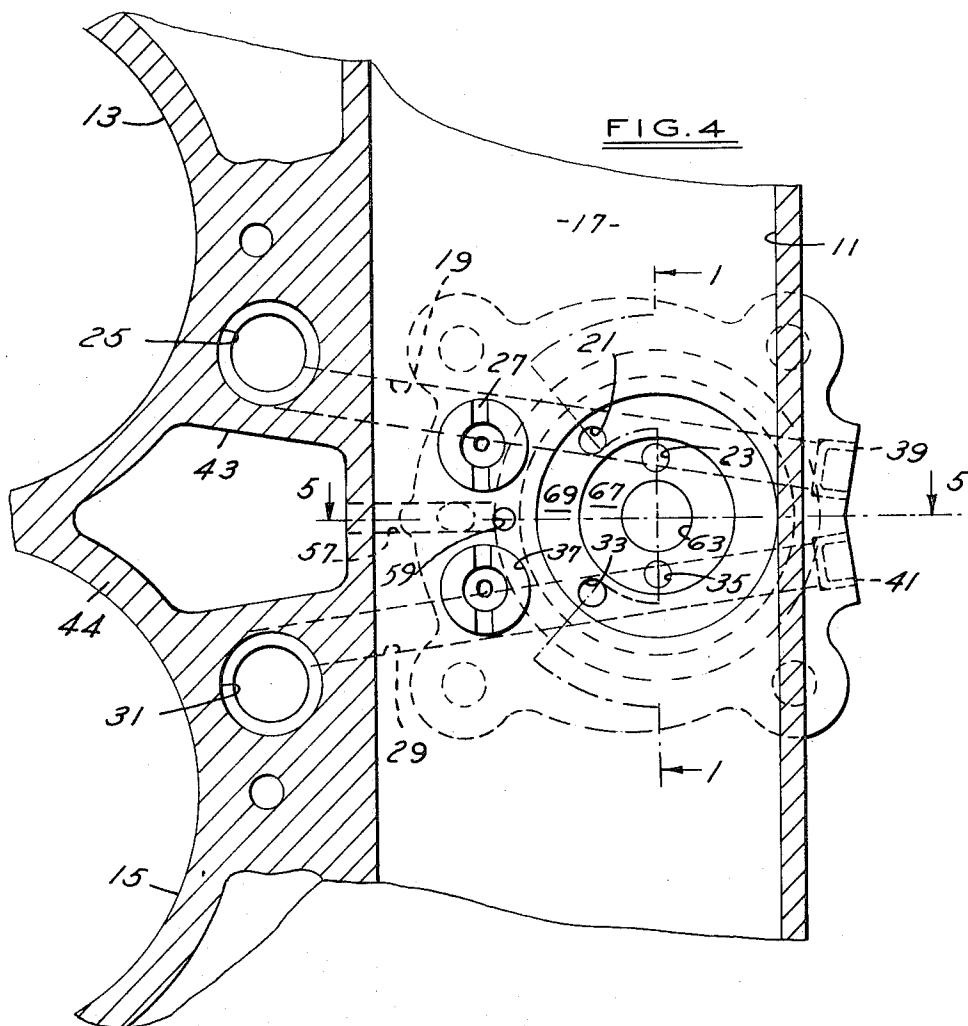
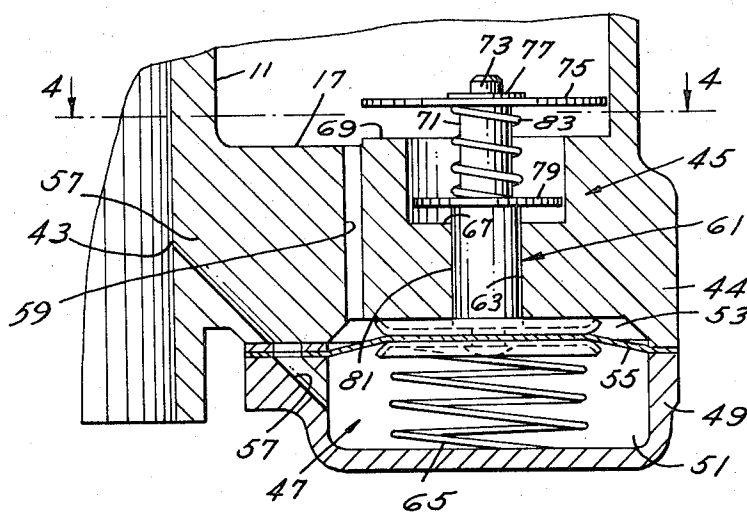


FIG. 5



POWER FUEL SUPPLY SYSTEM

BACKGROUND AND SUMMARY OF THE INVENTION

Most carburetors used in automobile engines today employ a power fuel supply system to supplement the main fuel supply system during acceleration or at any time there is a heavy load on the engine. Such a power fuel supply system generally includes a valve responsive to a drop in intake manifold vacuum to provide a richer mixture to the engine combustion chambers in accordance with the demand for more power.

One type of power fuel supply system utilizes a simple on-off valve which opens when the intake manifold vacuum drops below a certain magnitude to provide additional fuel to the engine. Another type of power fuel supply system employs a comparatively expensive metering rod cooperating with a metering orifice or jet to provide a variable fuel flow through the fuel supply system more tailored to the magnitude of vacuum drop within the intake manifold.

Particular problems especially during vehicle cornering occur with carburetors having two or more barrels in which one of the barrels feeds one group of engine cylinders and the other of the barrels feeds another group of engine cylinders. For reasons of economy and packaging, it is common for each of the inlets of the power fuel supply system for the two or more barrels to be regulated by a single vacuum responsive valve. The valve when open permits fuel to enter a chamber where the inlets to the fuel delivery passages are located. U.S. Pat. No. 3,172,923 granted to Romeo et al on Mar. 9, 1965 illustrates such a power fuel supply system. When the valve is closed, it prevents fuel in the fuel bowl from entering the chamber but it does not seal one inlet from the other. Consequently, interaction or fuel flow through the chamber from one fuel delivery passage to the other occurs and is considered a potential source of certain performance limitations. Because the power fuel supply system of many present day carburetors feed directly into or are combined with the main fuel metering system, fuel transfer or interaction between delivery passages of the power fuel supply system also provides interaction between the separate sides of the main fuel system. When an automotive vehicle is cornering, centrifugal force causes the barrel or barrels on one side of the carburetor to receive an rich fuel and air mixture and the barrel or barrels on the other side of the carburetor to receive a lean mixture. When the delivery passages of the fuel supply systems are interconnected, as is described previously, the problem of fuel mixture imbalance during cornering is magnified.

It is an object of this invention to improve the cornering operation of engines employing carburetors such as described above. It is also an object of this invention to provide a power fuel supply system in which the fuel delivery passages are unconnected and independent and in which interaction or fuel transfer between the fuel delivery passages of one side of the carburetor and those of the other side of the carburetor is precluded. The invention further provides a construction in which single or multi-stage power valve may be readily and economically incorporated without the use of metering rods. Still further, the invention provides the construction in which expensive duplica-

tion of valve elements is unnecessary, and in which substantial economies in packaging and the manufacturing cost may be realized.

A fuel enrichment or power fuel supply system for a carburetor having two or more barrels constructed in accordance with this invention includes a first fuel delivery passage and a second fuel delivery passage interconnecting the fuel bowl of the carburetor and first and second carburetor barrels, respectively. The first and second fuel delivery passages have first and second inlets, respectively, which receive fuel from the fuel bowl. A vacuum motor is formed in the carburetor having a variable volume chamber in communication with a source of intake manifold vacuum. The vacuum motor includes a movable plunger member which is displaceable in response to changes in the intake manifold vacuum pressure. The plunger member includes one or more closure elements which open and close the fuel delivery passage inlets. When the closure element or elements are in closed positions, there is no communication from the first fuel delivery passage to the second fuel delivery passage.

A two-stage power fuel supply system may be provided by utilizing two closure elements in which one element is resiliently connected to the second element. As the valve is closing, the resiliently connected closure element first blocks a first pair of inlet ports while further closing displacement of the plunger member causes the second closure element to close a second pair of inlet ports. While this latter displacement is occurring, the resilient means connecting the first and second closure elements is being compressed to permit movement of the first closure relative to the second. This construction permits a two-stage closing of the inlets: the closing of the first pair of inlets stops a first portion of the fuel flow while the closing of the second pair of inlets stops the remaining fuel flow into the power fuel delivery passages.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross sectional view taken along line 1—1 of FIG. 4 of a portion of a carburetor showing a power fuel supply system including a two-stage power valve constructed in accordance with this invention. The valve is in a closed position.

FIG. 2 is a cross sectional view similar to FIG. 1, showing the power valve in an open position.

FIG. 3 is a cross sectional view similar to FIGS. 1 and 2 showing the power valve elements in an intermediate position in which one pair of inlets are blocked and a second pair of inlets are open.

FIG. 4 is a cross sectional view taken along line 4—4 of FIG. 5 of a portion of a carburetor with certain elements removed.

FIG. 5 is a cross sectional view taken along line 5—5 of FIG. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 4 and 5 of the drawings show portions of a two-barrel carburetor having a fuel enrichment system or power fuel supply system constructed in accordance with the invention. The power fuel system interconnects the carburetor fuel bowl 11 and the carburetor barrels 13 and 15. The bottom interior surface of the fuel bowl is designated by reference numeral 17. Drilled passage 19 interconnects a pair of inlet risers

21 and 23 with the right-hand main fuel well 25. Fuel well 25 is communicated with the barrel 13 in a conventional manner through a venturi assembly (not shown). The main fuel metering jet 27 opens from the fuel bowl into the same drilled passage 19. A second drilled passage 29 interconnects the left-hand main fuel well 31 and a second pair of inlet risers 33 and 35. The left-hand fuel well 31 feeds into a conventional venturi assembly (not shown) positioned in barrel 15. A main fuel metering jet 37 opens from the fuel bowl into the drilled passage 29. The ends of the drilled passages 19 and 29 are closed by means of plugs 39 and 41. A compartment 43 is formed in the main carburetor body 44 which is vented to the intake manifold and constitutes a source of intake manifold vacuum.

FIGS. 1, 2 and 3 illustrate a power valve assembly which is the heart of the power fuel supply system. A vacuum motor 47 includes an enclosure defined by a portion of the main carburetor body 44 and a cover 49. The enclosure is divided into two compartments 51 and 53 by a flexible diaphragm 55. The lower compartment 51 is communicated with the source of intake manifold vacuum 43 by passage 57 shown in FIG. 5 of the drawings. The upper compartment 53 is connected with the fuel bowl 17 by passage 59. The fuel bowl is at atmospheric pressure. Connected to the flexible diaphragm is a plunger assembly 61 which is slidably and sealingly received within a bore 63 formed in the carburetor main body 44. A compression spring 65 is positioned between the plunger 61 and the cover 49 to urge the plunger in an upwardly direction.

Concentrically disposed about bore 63 are annular valve seats 67 and 69. Inlet 21 connecting passage 19 and inlet 33 connecting passage 29 open to the fuel bowl from valve seat 69. Similarly, inlet 23 from passage 19 and inlet 35 from passage 29 open to the fuel bowl from valve seat 67. It may be seen from the drawings that valve seat 67 is both radially and axially spaced from valve seat 69.

Plunger member 61 includes a reduced diameter intermediate segment 71 and a further reduced diameter end segment 73. A first disc-shaped closure element 75 is secured to the end member 73 by a snap ring 77. The closure element 75 abuts a shoulder formed by the end of intermediate segment 71 of the plunger so that it is fixed axially relative to the plunger member. A second disc-shaped closure member 79 is slidably received about the intermediate segment of the plunger member and is biased toward engagement with a shoulder formed by the end of full diameter segment 81 of the plunger member by a compression spring 83. The axial length of intermediate segment 71 of plunger member 61 is greater than the axial distance between valve seat 67 and valve seat 69 to permit closure member 79 to engage valve seat 67 and close inlets 23 and 35 prior to the engagement of closure member 75 with valve seat 69 and the closing of inlets 21 and 33.

OPERATION

The power fuel supply system described in previous paragraphs provides additional fuel to the engine during acceleration or any time there is a heavy load on the engine. During normal operation of the engine, the main fuel supply system provides fuel from the fuel bowl 11 through main metering jets 27 and 37, drilled passages 19 and 29, respectively, main fuel wells 25 and 35, respectively, and finally into the respective

barrels 13 and 15 by conventional venturi assemblies (not shown). During such normal conditions as, for example, under moderate cruising speeds, the elements of power valve assembly 45 are in closed position as shown in FIG. 1 permitting no fuel flow through any of the inlets 21, 23, 33 and 35. When increased power is desired the vehicle operator depresses the accelerator pedal causing the carburetor throttle valve (not shown) to open. Intake manifold vacuum is then substantially decreased. This decreased intake manifold vacuum is communicated to the lower compartment 51 of the vacuum motor 47 through passage 57 and compartment 43. Reduced vacuum pressure within compartment 51 provides a diminished force opposing compression springs 83 and 65 and the plunger member 61 is displaced in an upwardly direction.

If the throttle opening is partial and the vacuum drop is moderate, the plunger member 61 will be displaced only a portion of its full range of travel to the position as shown in FIG. 3. In that position closure element 75 is spaced from valve seat 69 and closure element 79 is seated on valve seat 67. Fuel flow through inlets 21 and 33 is permitted, but flow through inlets 23 and 35 is blocked.

If the throttle valve (not shown) is fully open or very nearly fully open, the vacuum drop is at or near maximum and the plunger member 61 is displaced upwardly to the full extent of its range of travel by spring 65 as shown in FIGS. 2 and 5 of the drawings. Closure member 79 is biased by spring 83 against the shoulder formed by the upper end of full diameter segment 81 of plunger 61 and is lifted from valve seat 67 to open inlets 23 and 35. Fuel flow is permitted through inlets 21 and 33, as well as through inlets 23 and 35, to provide a maximum amount of enrichment fuel.

Inlets 21, 23, 33 and 35 may be fitted with restrictors (not shown) for precise metering of power fuel relative to the main fuel supply of the carburetor.

It can be seen from the foregoing description that right-hand drilled passage 19 and main fuel well 25 are entirely separated and independent from left-hand drilled passage 29 and main fuel well 31.

Modifications and alterations will occur to those skilled in the art which are included within the scope of the following claims.

I claim:

1. A power fuel supply system for an internal combustion engine carburetor having at least two barrels,

said carburetor including a fuel bowl, a first fuel passage interconnecting said fuel bowl and a first of said barrels, a second fuel passage interconnecting said fuel bowl and a second of said barrels, said first fuel passage having first and second inlets leading from said fuel bowl, said second fuel passage having third and fourth inlets leading from said fuel bowl, a vacuum motor having a variable volume chamber in communication with a source of engine intake manifold vacuum, said vacuum motor including a movable member displaceable in response to changes in intake manifold vacuum pressure, said movable member including closure means which in one extreme position close all of said inlets, in the other extreme position open all of said inlets, and in an intermediate position close said

first and third inlets and open said second and fourth inlets.

2. A power fuel supply system for an internal combustion engine carburetor having at least two barrels,

said carburetor including a fuel bowl, a first fuel passage interconnecting said fuel bowl and a first of said barrels, a second fuel passage interconnecting said fuel bowl and a second of said barrels, said first fuel passage having first and second inlets leading from said fuel bowl, said second fuel passage having third and fourth inlets leading from said fuel bowl,

a vacuum motor having a variable volume chamber in communication with a source of engine intake manifold vacuum, said vacuum motor including a movable member displaceable in response to changes in intake manifold vacuum pressure, said movable member including a first closure member that in one position of said movable member overlies and closes said first and third inlets, and

a second closure means resiliently mounted to the remainder of said movable member that in intermediate positions of said movable member overlies and closes said second and fourth inlets, said movable member being displaceable to one extreme position in which each of said inlets are closed by said first and second closure means, said movable element being displaceable to the opposite extreme position in which each of said inlets are unobstructed and spaced from said closure means, said movable element being positionable in intermediate positions in which said second closure means overlies and closes said second and fourth inlets and said first closure means is spaced from and is unobstructive of said first and third inlets.

3. A power fuel supply system according to claim 2,

said movable member having a portion protruding into said fuel bowl,

valve seat means formed in a surface of said fuel bowl about said protruding end portion,

said first and third inlets opening at said valve seat means so as to be closable by said first closure means upon displacement of said movable member,

said second and fourth inlets opening at said valve seat means so as to be closable by said second closure means,

compression spring means connecting said first closure means to said second closure means,

said first closure means being fixed relative to said protruding portion in the direction of displacement of said movable member,

said second closure member being movable relative to said protruding portion in the direction of displacement of said movable member.

4. A power fuel supply system according to claim 2,

said movable member having a portion protruding into said fuel bowl,

first and second valve seats formed in an interior surface of said fuel bowl about said protruding portion,

said first and third inlets located in said first valve seat, said second and fourth inlets located in said second valve seat,

said first closure means being engagable with said first valve seat to close said first and third inlets, said second closure means being engagable with said second valve seat to close said second and fourth inlets,

compression spring means connecting said first closure means to said second closure means,

said first closure means being fixed relative to said protruding portion in the direction of displacement of said movable member,

said second closure means being movable relative to said protruding portion in the direction of displacement of said movable member.

5. A power fuel supply system according to claim 4,

said carburetor including a bore opening into said fuel bowl,

said movable member slidingly and sealingly received in said bore,

said movable member including an abutment, said second closure means biased toward said abutment and away from said first closure means by said compression spring means.

6. A power fuel supply system according to claim 5,

said first valve seat being axially spaced from said second valve seat,

said first closure means being axially spaced from said second closure means,

the axial distance between said first and second valve seats being less than the axial distance between said first and second closure means when said second closure means engages said abutment.

7. A power fuel enrichment system according to claim 6,

said first and second valve seats each being annular in shape and concentric with said bore,

said first closure means comprising a circular element of a diameter substantially equal to the major diameter of said first valve seat,

said second closure means comprising a circular element of a diameter substantially equal to the major diameter of said second valve seat.

8. A power fuel supply system for an internal combustion engine carburetor having at least two barrels,

said carburetor including a fuel bowl, a first fuel passage interconnecting said fuel bowl and a first of said barrels, a second fuel passage interconnecting said fuel bowl and a second of said barrels,

said first fuel passage having a first inlet leading from said fuel bowl,

said second fuel passage having a second inlet leading from said fuel bowl,

a vacuum motor having a variable volume chamber in communication with a source of engine intake manifold vacuum, said vacuum motor including a movable member displaceable in response to changes in intake manifold vacuum pressure,

said movable member including closure means which in one extreme position overlies each of said inlets and seals one inlet from the other and in the other extreme position is removed from each of said inlets.

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9. A power fuel supply system for an internal combustion engine carburetor having at least two barrels,

said carburetor including a fuel bowl, a first fuel passage interconnecting said fuel bowl and a first of said barrels, a second fuel passage interconnecting said fuel bowl and a second of said barrels, said first fuel passage having a first inlet leading from said fuel bowl,
 said second fuel passage having a second inlet leading from said fuel bowl,
 a vacuum motor having a variable volume chamber in communication with a source of engine intake manifold vacuum, said vacuum motor including a

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movable member displaceable in response to changes in intake manifold vacuum pressure.
 said movable member including closure means which in one extreme position individually close each of said inlets and in the other extreme position open each of said inlet ports,
 said movable member having an end portion protruding into said fuel bowl,
 a valve seat formed in a surface of said fuel bowl about said protruding end portion,
 said first and second inlets opening from said valve seat.

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