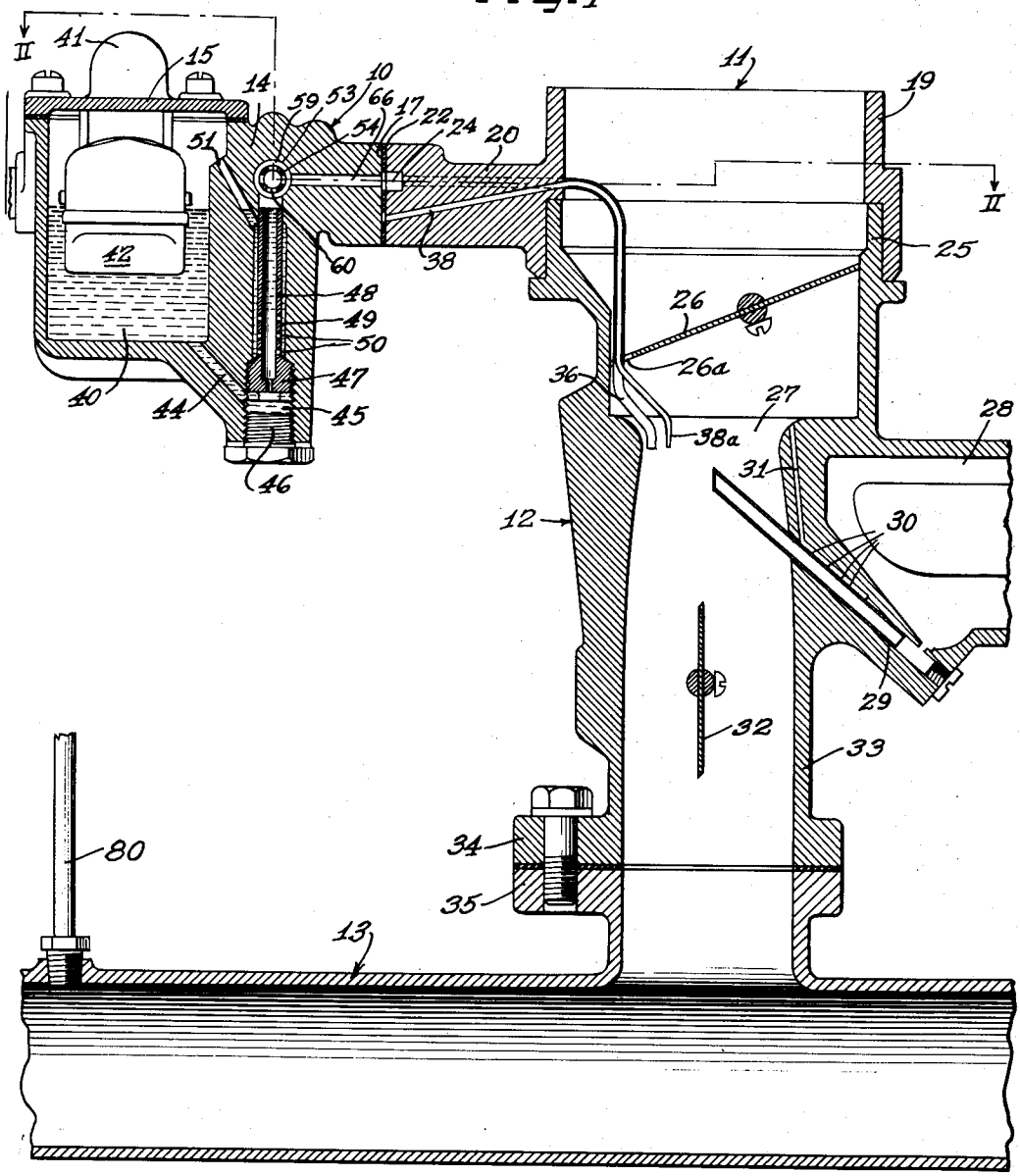
Sept. 6, 1955 D. E. ANDERSON 2,717,149

FLUID FEED DEVICE

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Fig. 1



Inventor
DAVID E. ANDERSON

by Hill, Sherman, Meroni, Gross & Simpson Attys.

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Fig. 2

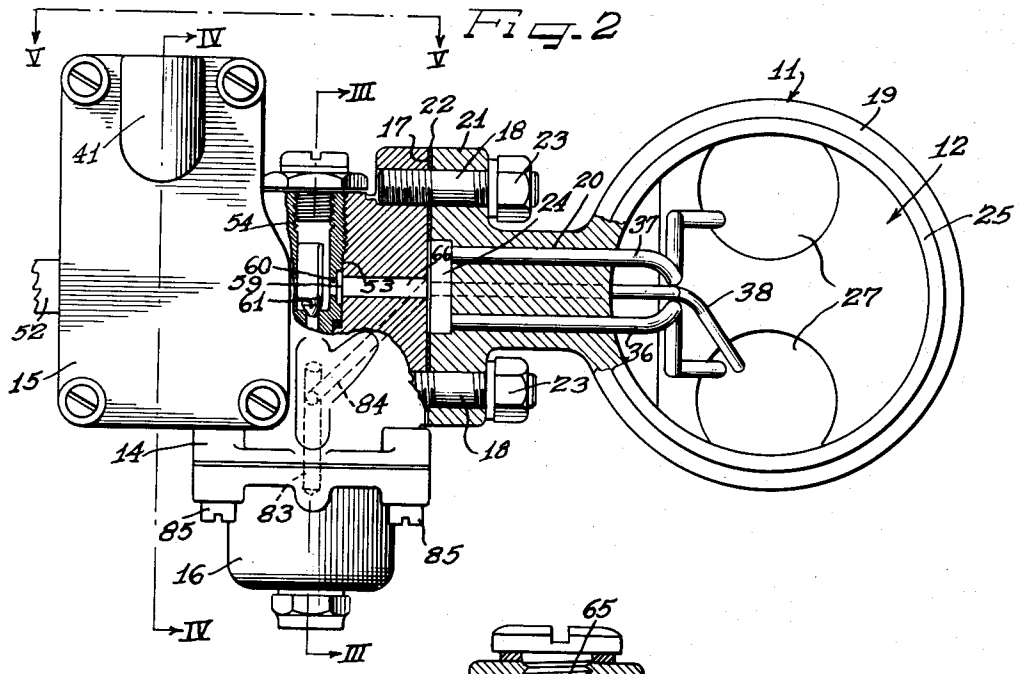
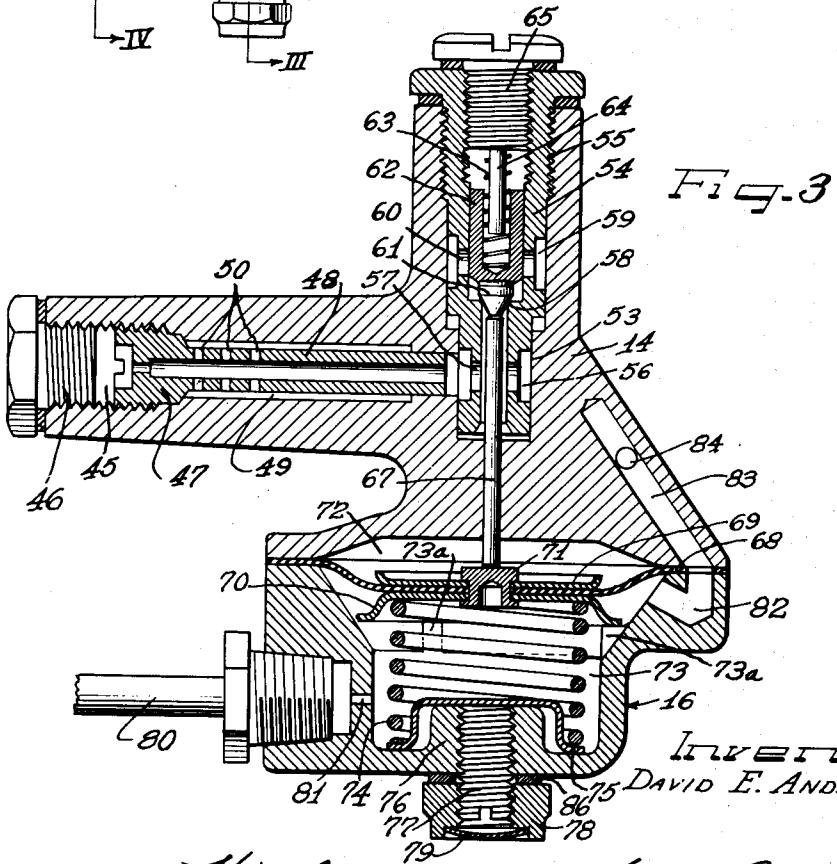


Fig. 3



Inventor
DAVID E. ANDERSON

by Hill, Sherman, Meroni, Gross & Simpson Attys.

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Fig. 4

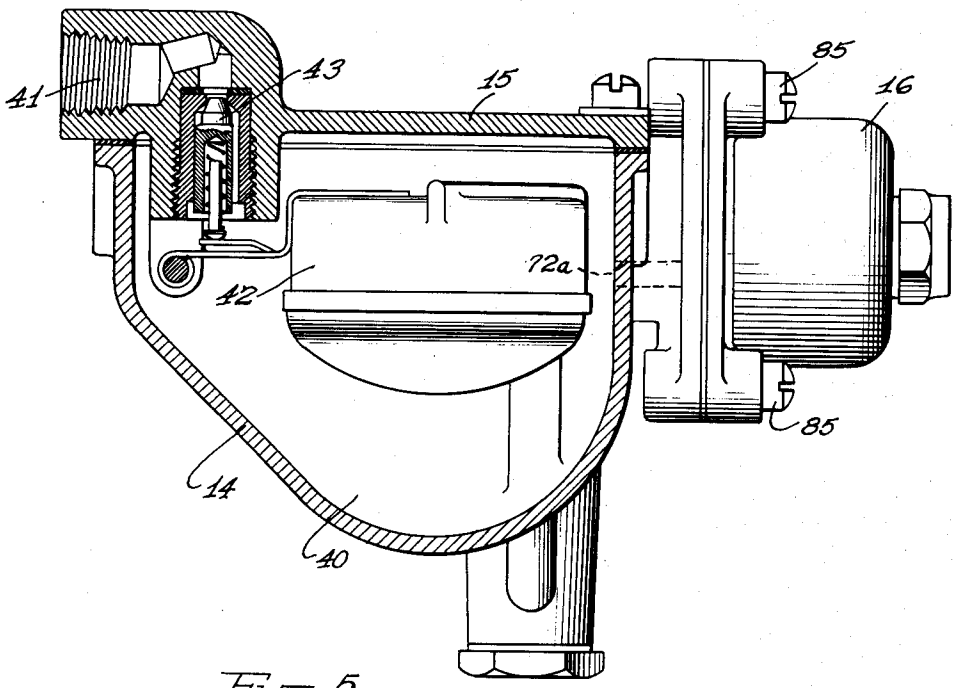
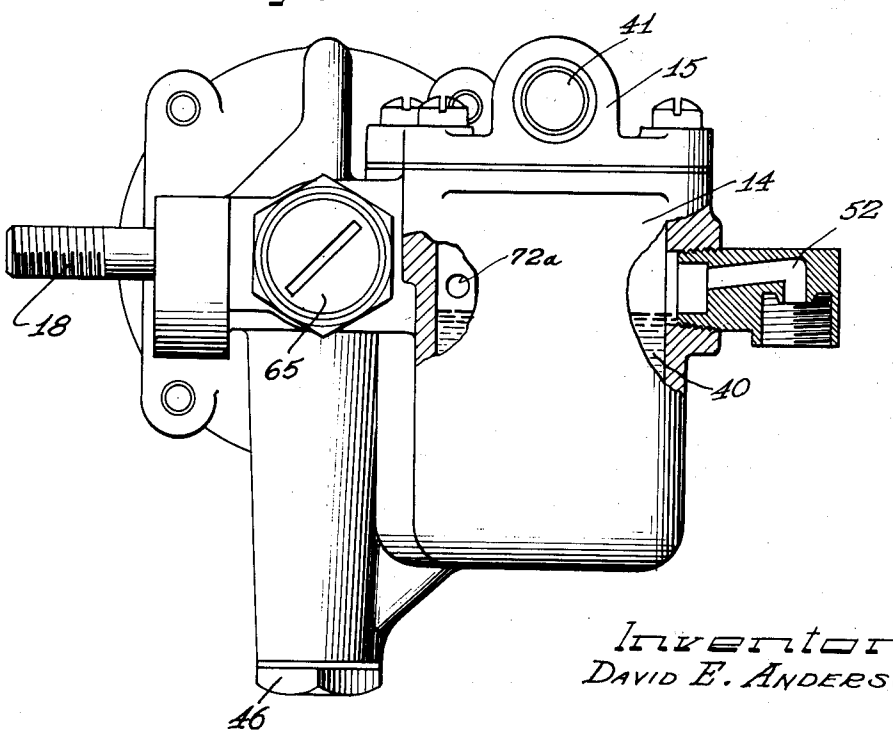


Fig. 5



Inventor
DAVID E. ANDERSON

by Hill, Sherman, Meroni, Gross & Simpson Attys.

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2,717,149

FLUID FEED DEVICE

David E. Anderson, Cleveland Heights, Ohio, assignor to Thompson Products, Inc., Cleveland, Ohio, a corporation of Ohio

Application October 9, 1951, Serial No. 250,481

7 Claims. (Cl. 261—18)

This invention relates to a device for accurately metering fluids into the fuel intake of an internal combustion engine under a vacuum regulator which is sealed against leakage and which maintains a supply of fluid substantially at delivery level to minimize suction requirements for inducing delivery.

Specifically, this invention relates to a device for feeding air and anti-detonant mixtures to the carburetor of an internal combustion engine under the joint influence of vacuum existig at the carburetor venturi and vacuum existing beyond the throttle valve of the carburetor, while utilizing carburetor venturi vacuum as a delivery force but controlling the liquid level of the anti-detonant so that only a small vacuum lift is necessary to insure delivery.

This invention will be hereinafter described as specifically embodied in a supplemental unit for attachment to a carburetor, but it should be understood that the principles of this invention are adapted to be built directly into a carburetor. The invention will also be hereinafter specifically described as embodied in a unit for feeding a mixture of air and anti-detonant solution to the carburetor, but it should be further understood that the unit is useful for feeding a second fuel, or any other solution or mixture, to the carburetor.

In accordance with this invention, a float bowl supplies an anti-detonant solution such as a mixture containing 85% methanol, 15% water, 3 cc. per gallon tetraethyl lead, and a small amount of a corrosion-inhibiting dispersant such as a sulphonated oil of the green acid type, to an upstanding perforated tube. The tube is surrounded by a chamber and is equipped with a metering orifice. Fluid will rise in the chamber and tube to the level maintained in the float bowl. The chamber is vented to the atmosphere below this level, so that as the anti-detonant solution is drawn upwardly through the tube orifice, air is drawn through the air bleed vent into the liquid in the chamber and through the apertures of the tube to form a finely divided air-liquid mixture. This below liquid venting arrangement simplifies calibration of the unit. A metering valve is provided at the upper end of the air tube for controlling flow of the mixture to the discharge tube which opens downstream in the carburetor venturi. The metering valve is actuated by a spring loaded diaphragm.

A feature of the invention resides in the provision of a sealed diaphragm chamber vented to the carburetor venturi and to the fuel intake of the engine downstream from the throttle valve of the carburetor. This chamber also contains the spring and, as the vacuum increases, the spring load on the valve is relieved, so that the valve will close under the influence of a light spring. No sliding bearing or similar leakage path defining arrangement is used in the vacuum chamber.

When vacuum is created in the carburetor venturi and when the vacuum load on the diaphragm is smaller than the spring load on the diaphragm, the anti-detonant-air

mixture will be drawn past the metering valve through the delivery tube for admixture with the main fuel in the carburetor venturi. When the vacuum load on the diaphragm exceeds the spring load, the metering valve will close to stop the flow of anti-detonant and air to the delivery tube. Of course, the metering valve is effective to control the rate of flow between fully opened and fully closed positions.

Another feature of the invention resides in the maintenance of the anti-detonant liquid level in the float bowl substantially at the metering valve level, to minimize the vacuum forces necessary to feed the anti-detonant into the carburetor.

Another feature of the invention resides in the provision of a restriction in the tube which vents the diaphragm to venturi vacuum, thereby proportioning the effective venturi vacuum operating force on the diaphragm relative to the effective manifold vacuum operating force. A metering valve operating differential vacuum based upon a desired ratio of venturi vacuum to intake manifold vacuum is thus easily obtained.

It is, then, an object of this invention to provide a fluid feed device with a supply chamber maintaining a liquid level only slightly below the delivery level for the device, thereby necessitating only a small vacuum pull to feed the liquid.

Another object of this invention is to provide a fluid feed device having a valve controlled from a leak-proof vacuum chamber free from possible leakage paths between movable members.

A further object of the invention is to provide an efficient air bleed for a fluid feed device which will insure an adequate supply of liquid and air under all requirements of the engine.

A further object of the invention is to provide a more sensitive vacuum controlled fluid feed device for the fuel intake system of an engine by eliminating any possible chance for leakage out of the vacuum control system.

Another object of the invention is to provide an easily adjustable device for setting the spring tension on the spring loaded diaphragm making possible the use of commercial limit springs.

A still further object of this invention is to provide a supplemental fluid feed device for an engine carburetor composed of three simple die castings.

A still further object of the invention is to provide a supplemental fluid feed unit for an automotive carburetor which can have any of its components serviced without disturbing any other components and without removing the unit from the automobile.

A further object of the invention is to provide a supplemental fluid feed device for attachment to a carburetor between the carburetor air inlet and the air filter without interfering with the air filter.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of a preferred example only, illustrate one embodiment of the invention.

On the drawings:

Figure 1 is a vertical cross-sectional view, with parts in elevation, illustrating a supplemental fluid feed device according to this invention mounted on the air horn of a carburetor carried by the intake manifold of an internal combustion engine.

Figure 2 is a plan view, with parts in horizontal section, taken along the line II—II of Figure 1.

Figure 3 is a vertical cross-sectional view, with parts in elevation, taken along the line III—III of Figure 2.

Figure 4 is a vertical cross-sectional view, with parts in elevation, taken along the line IV—IV of Figure 2.

Figure 5 is an end elevational view, with parts in vertical cross section, taken along line V—V of Figure 2.

As shown on the drawings:

As shown in Figure 1, the supplemental fluid feed unit 10 of this invention is supported on an adapter 11 which is carried by a carburetor 12 on the intake manifold 13 of an internal combustion engine. The unit 10 is composed of three die cast housing pieces including a main body 14, a top cover 15, and a side cap 16. The main body has a flat mounting face 17 with studs 18 projecting therefrom. The adapter 11 has an upstanding tubular portion 19 with a laterally extending boss 20 terminating in an apertured outturned end flange 21 receiving the studs 18 therethrough. A gasket 22 is interposed between the face of the end flange 21 and the end face 17 of the housing 14. Nuts 23 on the stud 18 are tightened against the end flange 21 to draw the flange against the gasket and to draw the gasket against the end face 17, thereby sealingly connecting the two parts. The central portion of the end flange 21 is recessed at 24 for a purpose to be more fully hereinafter described.

The tubular portion 19 of the member 11 is disposed over the air horn 25 of the carburetor 12. An air cleaner (not shown) is adapted to be mounted on the upper portion of the tubular member 19.

The carburetor 12 has the conventional butterfly choke valve 26 in the air horn 25 for regulating air flow to the conventional venturi throat 27 of the carburetor. A float bowl 28 on the carburetor supplies fuel to the venturi throat 27 through an air tube 29 having perforations 30 registering with an air bleed 31 vented to the upstream side of the venturi throat. The venturi throat discharges to a main throttle valve 32 mounted in the throttle body 33 of the carburetor. The end of the throttle body 33 has a flange 34 which is mounted on the intake flange 35 of the intake manifold 13.

As best shown in Figure 2, the carburetor 12 is of the dual or multiple type having two identical venturi throats 27 both fed from the single air horn 25. Each throat 27 receives main fuel in the same manner described in connection with Figure 1 and each throat discharges into a separate throttle body 33 to supply a separate intake manifold.

Feed tubes 36 and 37 extend through the boss 20 of the adapter 11 and connect the recess 24 with the venturi throats 27. As shown in Figures 1 and 2, each tube 36 and 37 extends into the tubular portion 19 of the adapter 11, thence downwardly through the air horn 25, and thence through a notch 26*a* in the choke valve 26 to terminate in an open end facing downstream in a venturi throat 27. Vacuum in the venturi throats will pull fluid through the tubes.

A vacuum control tube 38 also extends through the boss 20 to register with an opening in the end face 17 of the body 14 remote from the recess 24 in the boss. This control tube 38 extends into one of the venturi throats 27 and has a pinched end 38*a* shown in Figure 1 for controlling the venturi vacuum bleed as will be hereinafter described.

The main body 14 has an open topped chamber 40 closed by the cover 15. Anti-detonant liquid is fed to this chamber 40 from an inlet 41 in the cover 15. A float 42 in the chamber operates an inlet valve 43 in the inlet 41 to control the gravity feed of fluid into the chamber 40. A supply tank (not shown) feeds the fluid by gravity to the inlet 41. When the liquid level reaches the height in the chamber 40 shown in Figure 1, the float 42 will close the valve 43. The chamber 40 drains through an outlet passage 44 to a sump 45 closed by a plug 46 as shown in Figure 1. An orificed plug 47 in the sump 45 in spaced relation above the plug 46 and above the passage 44 discharges upwardly into an upstanding perforated tube 48 surrounded by a chamber 49 and having perforations 50 joining the interior of the tube with the chamber. The chamber 49 is vented through a passage 51 with the top of the float bowl chamber 40. The passage 51 communicates with the chamber 49 at a level below the level of liquid in the chambers 40 and 49 so that air entering the chamber 49 must pass through a column of liquid before reaching the perforations 50 to enter the tube 48. As shown in Figure 5, the float bowl chamber 40 is vented to the atmosphere through an apertured plug 52 above the liquid level in the chamber 40. The chamber 49 is thereby vented to the atmosphere through the float bowl.

The upper end of the tube 48 discharges into a horizontal bore 53 in the body unit 14. This bore 53, as best shown in Figure 3, contains a tubular insert 54 which is threaded into the outer end of the bore at 55. The inner end of the tubular insert is exteriorly grooved at 56 above the air tube 48 and ports 57 join the groove 56 with the interior of the tube. A valve seat 58 is formed on an internal shoulder in the tubular insert 54 in laterally spaced relation from the groove 56. A second external groove 59 is formed around the tube 54 in the bore 53 on the opposite side of the seat 58 from the groove 56. This second groove 59 is connected with the interior of the tube through ports 60.

A metering valve 61 is slidably mounted in the tube 54 to coact with the seat 58. The valve has a recessed guide head 62 slidable in the tube 54 and receiving a light coil spring 63. The spring 63 is guided around a pin 64 depending from a closure plug 65 that is threaded into the outer end of the tube 54. The spring 63 is bottomed on the plug 65 and urges the metering valve 61 against its seat to separate the grooves 56 and 59.

As shown in Figures 1 and 2, the ports 60 and groove 59 of the tube 54 discharge into a passage 66 extending to the mounting face 17 and registering with the recess 24.

Therefore, when the metering valve 61 is opened, anti-detonant fluid will flow from the float chamber 40 through the orifice plug 47 into the air tube 48, where it will be admixed with air drawn through the perforations 50 and the fluid-air mixture will flow into the groove 56 of the tube 54 and thence through the ports 57 and past the metering valve 61, the ports 60, groove 59, and passage 66 into the recess 24. The feed tubes 36 and 37 thereupon deliver the mixture to the carburetor venturi throats 27.

The valve 61 is moved to its open position by a pin 67 which is slidably mounted in the body 14 and extends into the tube 54 to act against the valve 61 in opposition to the spring 63. A flexible pin actuating diaphragm 68 is clamped between the side face of the body and the side cap 16. The central portion of the diaphragm has a metal washer 69 on the side thereof facing the body 14. A cup-shaped washer 70 is bottomed on the opposite face of the diaphragm and both washers are clamped against the opposite faces of the diaphragm by a head 71. The head 71 abuts the pin 67. The pin thus floats between the valve head 61 and diaphragm head 71, to transmit the movements of these heads.

The side face of the body 14 is recessed at 72 and the cap 16 has a central chamber 73 opposing the recess 72 so that the diaghrapm is free to flex in opposite directions. Three circumferentially spaced projections 73*a* form stops for engaging the periphery of the cup-shaped washer 70 to limit movement of the diaphragm into the chamber 73.

A spring 74 is bottomed in the cup-shaped washer 70 at one end and on an adjustable retainer 75 at the other end. The cap 16 has threaded boss 76 receiving a set screw 77 in threaded relation therethrough for acting on the retainer 75 to adjustably position the retainer relative to the end wall of the cap for controlling the compression of the spring 74. A lock nut 78 is threaded on the projecting portion of the set screw 77 and a sealing disk 79 snapped into the lock nut can be provided to prevent inadvertent access to the set screw for varying the adjustment of the spring.

As shown in Figure 1, the intake manifold **13** receives one end of a tube **80**, the other end of which, as shown in Figure 3, communicates with the chamber **73** in the cap **16**. An orifice **81** provides a restriction to meter the vacuum effect of the intake manifold vacuum in the chamber **73**.

The chamber **73** is also vented through a passage **82** in the cap with a passage **83** in the side wall of the body **14**. This passage **83** connects with a passage **84** extending to the mounting face **17** of the body **14** as shown in Figure 2. The chamber **72** is vented to the upper portion of the float bowl chamber **40** by a passage **72***a* shown in Figures 4 and 5 above the liquid level in the bowl. Since this upper portion of the float bowl chamber is, in turn, vented to the atmosphere through plug **52**, the chamber **72** is thus vented to the atmosphere.

The end of the passage **84** registers with the end of the venturi suction tube **38**, so that the chamber **73** in the cap **16** is under the joint influence of carburetor venturi vacuum and intake manifold vacuum. The pinched end **38***a* of the tube will serve as an orifice coacting with the orifice **81** for the tube **80** to regulate the relative effectiveness of the carburetor venturi vacuum and intake manifold vacuum. Since the carburetor vacuum is dependent upon air flow through the carburetor, which is a function of speed of engine operation, and since the manifold vacuum is controlled by the setting of the throttle **32**, which, in turn, is indicative of the load on the engine, the chamber **73** is subjected to a net differential vacuum effect based on the speed and load of the engine.

The cap **16** is tightly clamped against the periphery of the diaphragm **68** by means of cap screws **85** threaded into the body as best shown in Figures 2 and 4. In addition, the lock nut **78** is bottomed against the sealing washer **86**. Therefore, any possible avenues of leakage out of the chamber **73** are effectively sealed, and, since the chamber contains no movable parts communicating with another chamber through a bearing or the like, the vacuum chamber **73** is not subjected to heretofore necessary leakage paths.

Operation

The operation of the device **10** involves gravity feeding of liquid anti-detonant to the chamber **40** and maintenance of the liquid level just slightly below the metering valve **61** by the float **42**. When the vacuum in the chamber **73**, controlled by the joint influence of the carburetor venturi vacuum in the throat **27**, and the vacuum in the intake manifold **13**, is insufficient to collapse the spring **74**, this spring will move the diaphragm toward the recess **72** in the end face of the body **14** for causing the pin **67** to unseat the valve **61** off its seat **58**. The carburetor venturi vacuum in the throats **27** of the dual carburetor will thereupon exert a pull on the feed tubes **36** and **37** to cause a flow of the liquid anti-detonant upwardly through the air tube **48** into the horizontal tube **54** and thence through the passage **66** into the recess **24** for feeding into the tubes. As the liquid flows upwardly through the air tube **48**, air from the atmosphere is fed through the nipple **52** into the float chamber **40** and thence through the passage **51** into the liquid in the passage **49** surrounding the tube. The air and liquid will form a mixture which is pulled through the apertures **50** to further admix with the liquid for forming an air-liquid feed. The orifice **47** at the bottom end of the tube **48** will proportion the amount of liquid relative to the amount of air flowing through the tube.

Since the liquid level in the chamber **40** is only slightly below the metering valve **61**, and since the fluid from the metering valve is not raised to a higher level en route to the carburetor, only a very slight lifting vacuum is necessary to effect free feeding of the anti-detonant liquid and the air. This low lift requirement makes possible a feeding of anti-detonant liquid under conditions when only a slight vacuum occurs in the carburetor venturi.

When the vacuum in the chamber **73** builds up to overcome the spring force **74**, the diaphragm **68** will be pulled into the chamber **73** to collapse the spring and thereupon relieving the spring load on the pin **67** so that the light spring **63** acting on the valve will cause the valve to push the pin and approach its seat **58** for metering the anti-detonant-air mixture until the pin is moved sufficiently so that the metering valve **62** is completely closed. The flow of anti-detonant liquid and supplemental air will thereupon cease, since the engine no longer needs this supplementary mixture.

The provision of a horizontally acting metering valve and a depending vertical air tube makes possible a compact unit which can fit under the air cleaner conventionally mounted on the air horn of a carburetor, so that the units of this invention can be connected to the carburetor through the media of a mounting collar interposed between the carburetor air horn and the air cleaner.

From the above descriptions, it will be understood that this invention provides a fluid feed device having many engineering, manufacturing, servicing, and installation advantages.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In combination with a dual carburetor having a plurality of venturi throats supplied by a single air horn, a tubular mounting on said air horn having a laterally projecting boss with an end mounting face, a pair of feed tubes in said mounting each joining said end face with a separate carburetor venturi throat, a third tube in said mounting joining said end face with one of said carburetor venturi throats, a supplemental feed device mounted on the end face of said boss having a discharge passage communicating with said feed tubes and a second passage communicating with said third tube, said device having a float controlled chamber and an upstanding passage connecting the bottom of said chamber with said discharge passage, means venting said upstanding passage with the atmosphere, said venting means communicating with the passage at a level below the liquid level therein, a perforated tube in said upstanding passage receiving fluid from said chamber at a level below said venting means, a metering valve between the upper end of said tube and said discharge passage for controlling flow from the tube into the discharge passage, a light spring urging said metering valve into closed position, a pin for urging said metering valve into open position, a diaphragm for actuating said pin, a spring loading said diaphragm to move the pin for opening the valve, means defining a closed chamber receiving said last mentioned spring and one face of the diaphragm, a passage venting said third tube with said closed chamber, and an additional tube venting said closed chamber with said carburetor downstream from the venturi throats thereof, whereby said metering valve will be jointly controlled by carburetor venturi vacuum and by vacuum downstream from said carburetor venturi throats.

2. In combination with the fuel intake system of an internal combustion engine including an intake manifold, a carburetor on said manifold having a throttle valve, a venturi upstream from said throttle valve, an air horn upstream from said venturi, and a choke valve in said air horn, a mounting collar on said air horn having a laterally projecting boss, a feed tube extending through said boss into said collar and downwardly through said air horn into the carburetor venturi, a vacuum tube extending through said boss into said collar and downwardly therefrom through the air horn into said venturi, a supplemental feed device mounted on said boss having a discharge passageway communicating with said feed tube and a vacuum chamber communicating with said

vacuum tube, a second tube joining the intake manifold with said vacuum chamber, a liquid supply chamber in said device vented to the atmosphere, an upstanding air tube communicating with the bottom of said supply chamber, a metering valve between said discharge passageway and the top of said air tube, a light spring urging said metering valve into closed position, a spring loaded diaphragm actuated pin urging said valve into open position, said diaphragm being vented to said vacuum chamber for retracting the pin away from the metering valve to permit the light spring to close the valve when the vacuum in the chamber exceeds the spring load on the diaphragm, and a float in said supply chamber for maintaining the liquid level therein slightly below the level of the metering valve to minimize the vacuum lift requirements on the feed tube for supplying the supplemental fluid to the carburetor venturi.

3. In a device for metering fuel to the fuel intake of an internal combustion engine, a body having a horizontal bore extending inwardly from one side thereof, a fuel supply chamber in communication with an inner portion of said bore and a fuel outlet passage in communication with a portion of said bore spaced from said inner portion, means defining a valve seat intermediate said spaced portions in said bore, a valve member movable against said seat, removable means for closing said bore on said one side of said body, a cap on the opposite side of said body, a diaphragm between said cap and said body, means for subjecting said diaphragm to engine intake vacuum, and means between said diaphragm and said valve member for actuating said valve member and thereby controlling fuel flow in response to engine intake vacuum.

4. In a device for metering fuel to the fuel intake of an internal combustion engine, a body having a horizontal bore extending inwardly from one side thereof, a fuel supply chamber in communication with an inner portion of said bore and a fuel outlet passage in communication with a portion of said bore spaced from said inner portion thereof, means defining a valve seat intermediate said spaced portions inside the bore, a valve member movable against said seat, removable means for closing said bore at said one side of said body, spring means between said removable means and said valve member for urging said valve member against said seat, said removable means bein adjustable to adjust the applied pressure of said spring means, a cap on the opposite side of said body, a diaphragm between said cap and said body, means for subjecting said diaphragm to engine intake vacuum, and means between said diaphragm and said valve member for actuating said valve member against the action of said spring means and thereby controlling the fuel flow in response to engine intake vacuum.

5. A device for metering an air and liquid mixture to the fuel intake of an internal combustion engine having an intake venturi throat and a throttle valve downstream from said throat which comprises a body having a float chamber, an upstanding passageway communicating with the top and bottom of said chamber, a horizontal passageway communicating with the upper end of said upstanding passageway and a discharge passageway communicating with said venturi throat, a perforated tube in said upstanding passageway adapted to feed air from the top of said chamber into liquid flowing through the tube from the bottom of the chamber, a metering valve in said horizontal passageway controlling flow from the tube to the discharge passageway, a cap on the side of the body, a diaphragm between the cap and body, a spring in said cap urging said diaphragm toward the body, a pin slidable into the body against said metering valve and contacting the central portion of said diaphragm, means venting the cap to the venturi and to the intake downstream from the throttle valve for subjecting the diaphragm to the joint influence of two different vacuums in the fuel intake of the engine, and a light spring urging said metering valve against said pin, whereby movement of said diaphragm will control the position of the metering valve for metering air and liquid from the float chamber to the venturi throat.

6. In an internal combustion engine fuel intake system including a carburetor arranged to be mounted on the engine intake manifold and having a throttle valve, a venturi upstream from the throttle valve, an air horn upstream from the venturi and a choke valve in the air horn, a mounting collar on said air horn having a laterally projecting boss, a fuel feed unit on said boss, said boss having a passage extending inwardly from said unit to the interior surface of said collar, and a feed tube extending from said passage downwardly through the air horn to the carburetor venturi.

7. In an internal combustion engine fuel intake system including a carburetor arranged to be mounted on the engine intake manifold and having a throttle valve, a venturi upstream from the throttle valve, an air horn upstream from the venturi and a choke valve in the air horn, a mounting collar on said air horn adapted to receive and support an air cleaner and having a laterally projecting boss with a horizontally extending fuel supply passage therethrough, a fuel feed unit on said boss including a fuel supply chamber and a horizontal passage in communication with said fuel supply chamber and with said fuel supply passage in said boss, horizontally movable valve means in said horizontal passage, a cap mounted on one side of said unit in alignment with said horizontal passage, a diaphragm between said cap and said unit for controlling said valve means, and means for subjecting said diaphragm to engine intake vacuum.

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