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CARBURETOR CONSTRUCTION

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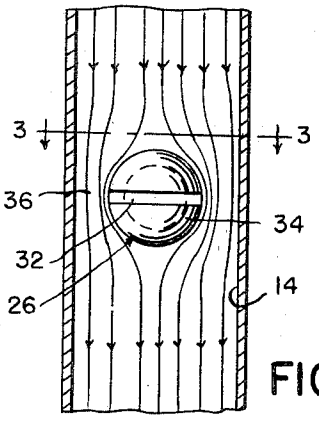


FIG. 2.

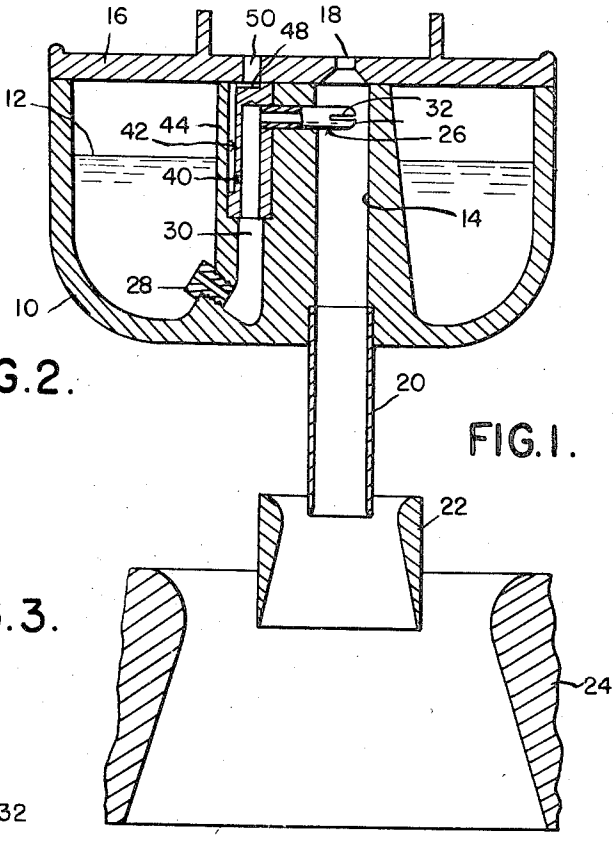


FIG. 1.

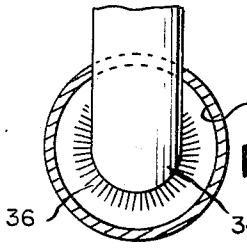


FIG. 3.

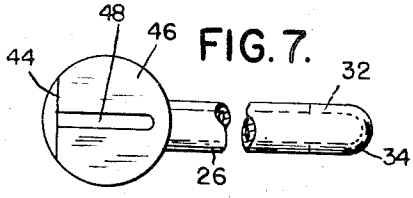


FIG. 7.

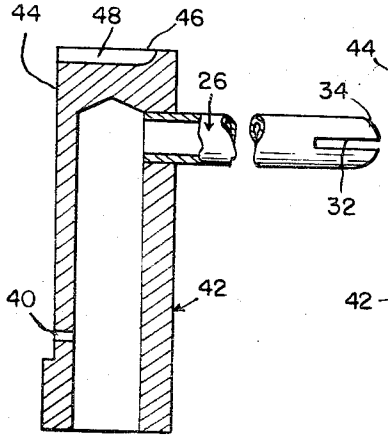


FIG. 5.

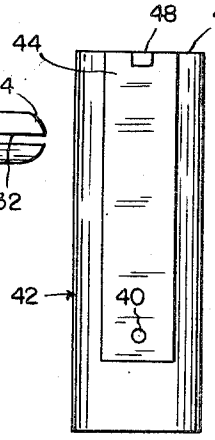


FIG. 6.

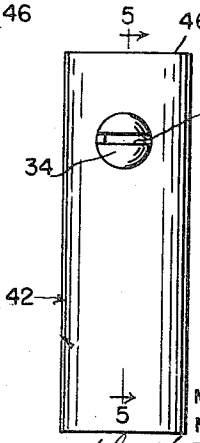


FIG. 4.

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CARBURETOR CONSTRUCTION

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Application June 13, 1955, Serial No. 514,908

3 Claims. (Cl. 261—78)

The present invention relates to a carburetor construction, and more particularly to an improvement in the main well and discharge tube.

It is an object of the present invention to provide a carburetor characterized by its ability to deliver completely atomized fuel and to avoid irregularity in flow which would result from entrance into the air stream of relatively large drops of liquid fuel.

It is a further object of the present invention to provide a carburetor characterized in its sensitivity in response to extremely small variations in partial vacuum at the main fuel nozzle.

More specifically, it is an object of the present invention to provide a carburetor characterized in that the main fuel nozzle is designed in association with the main fuel discharge tube so as to provide a venturi, the nozzle having relatively narrow elongated fuel discharge ports located substantially in the throat of the venturi.

It is a further object of the present invention to provide a carburetor having a main well connected at one end to a fuel supply jet and connected at the other end to a discharge nozzle characterized in the provision of an air bleed restriction in the well intermediate the jet and nozzle constructed and arranged to introduce air into the liquid fuel between the restriction and the nozzle in a manner to produce an air-fuel emulsion.

It is a feature of the present invention to provide a carburetor having a discharge nozzle extending laterally into a discharge passage, the nozzle having a rounded end and shaped to define in cooperation with the adjacent wall surfaces of the discharge passage a venturi having a generally U-shaped throat, said discharge nozzle having a narrow elongated fuel discharge slot extending along both sides and around the end of the nozzle and located substantially in the throat of the U-shaped venturi.

Other objects and features of the invention will become more apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a more or less diagrammatic sectional view of the features of a carburetor entering into the present invention.

Figure 2 is a diagrammatic sectional view illustrating the operation of the nozzle illustrated in Figure 1.

Figure 3 is a diagrammatic sectional view taken substantially on the line 3—3, Figure 2.

Figure 4 is a side elevation of the main well tube and nozzle assembly illustrated in Figure 1.

Figure 5 is a sectional view on the line 5—5, Figure 4.

Figure 6 is an elevational view looking to the right in Figure 5.

Figure 7 is a plan view of the structure shown in Figure 5.

It is a requirement of present day carburetors that fuel be kept under very accurate control and that there be no fuel which is not at all times under control. Modern carburetors are required to operate with relatively small

forces and to produce variations in fuel supply in accordance with extremely small changes in the operating forces. In fact, the amount of gasoline moved under extremely accurate control presents a rather monumental task to the relatively small force available from the air flow.

In the present construction the size of the fuel passages is limited to the minimum that will handle the fuel required for satisfactory operation of the engine. The present invention is characterized in that it provides a nozzle operating in conjunction with the fuel discharge passage adapted to spray fuel in a mist and in a thin sheet generally perpendicular to the direction of air flow so that the fuel is substantially completely atomized. In addition, the nozzle is designed to cooperate with the discharge passage to produce a venturi the throat of which surrounds the generally elongated narrow discharge port in the nozzle. Finally, means are associated with the discharge nozzle to provide a supply of air-fuel emulsion characterized in its relatively low mass so that it may respond substantially instantaneously to extremely small variations in the partial vacuum acting at the discharge ports of the nozzle.

The foregoing provides an improvement which substantially eliminates a surge problem heretofore encountered as a result of large globs of fuel being introduced into the air stream. The present carburetor substantially avoids the surge problem by a three-fold action. In the first place, the supply of fuel available to the discharge nozzle is in the form of an air-fuel emulsion so that in no case could relatively large drops or globs of liquid fuel be introduced into the air stream. In the second place, the air-fuel emulsion is introduced into the air stream through a relatively elongated narrow slit-like port which thereby introduces a fine mist of the emulsion of air and fuel in a sheet generally perpendicular to the direction of flow of air so that the fuel, which is already in the form of a fuel-air emulsion, is further atomized in a most efficient manner. Finally, the operation of the carburetor in producing a smooth even flow of finely atomized fuel is enhanced by the design of discharge nozzle in association with the discharge passage so that the two cooperate to define a venturi the throat of which surrounds the discharge nozzle, and more particularly, receives the ports of the discharge nozzle.

The drawings are more or less diagrammatic and are intended to show only the elements of the carburetor which enter into the present invention. The carburetor is shown as comprising a bowl **10** adapted to receive liquid fuel indicated at **12**, the level of which will be maintained by suitable float controlled valve mechanism not shown. The bowl **10** is provided with a central portion having a main discharge passage **14** extending therethrough. Associated with the bowl **10** is a cover **16** having an aspirating opening **18** communicating with the main discharge passage. The main discharge passage **14** is provided at its lower end with a tubular extension **20** the lower end of which is located in the throat of a booster venturi indicated at **22**. The lower edge of the booster venturi **22** is in turn located in the throat of the main venturi **24**. It will of course be appreciated that the carburetor is provided in association with an internal combustion engine having an intake manifold maintained during operation of the engine at a variable partial vacuum designed to induce a flow of air through the venturi **24**. Flow of air through the main venturi **24** provides a zone of reduced pressure at its throat which in turn induces a secondary flow of air through the booster venturi, thus establishing a zone of further reduced pressure or increased vacuum at the lower end of the tube **20**. Atmospheric air is thus drawn through the aspirating opening **18**.

Located in the main discharge passage **14** is a discharge nozzle **26** adapted to deliver fuel into the discharge passage. Fuel is drawn through the nozzle **26** as a result of the partial vacuum existing thereat in the main discharge passage. Fuel in the bowl **10** flows through the main jet **28** into the main well **30** and thence through a passage in the nozzle **26** to a discharge port **32** located in the main discharge passage **14**. More specifically, the flow of fuel through the jet **28**, well **30** and nozzle **26** is the result of pressure differential between the substantially atmospheric pressure existing within the bowl **10** and the partial vacuum existing in the main discharge passage **14**.

In accordance with the present construction the nozzle **26** is of a particular design to produce an improved action on the fuel as it is sprayed or discharged into the main discharge passage. In the first place, the end of the discharge nozzle **32** is rounded preferably to a generally spherical construction as indicated at **34**. The discharge nozzle includes a tubular portion which extends into the main discharge passage **14** through a side wall thereof as best illustrated in Figure 3. The parts are so proportioned that the discharge nozzle and the adjacent wall portions of the main discharge passage **14** cooperate to define a venturi the throat of which is of generally U-shaped configuration as indicated by the reference numeral **36** in Figure 3.

As a result of this construction the flow of air induced through the main discharge passage from the partial vacuum existing within the intake manifold and enhanced by the cooperating actions of the venturi **24** and **22**, produces a further diminution of pressure or increase in partial vacuum available at the discharge port **32** provided in the discharge nozzle.

In order that the fuel passing through the discharge port **32** shall be most completely and finely atomized the discharge port is provided in the form of an elongated relatively narrow slot. The slot **32** is disposed to extend along both sides and across the end of the nozzle **26** and occupies the throat of the venturi produced by the nozzle and discharge passage. As a result of this, the elongated relatively narrow slot which forms the discharge port causes the fuel to spray out into a sheet generally perpendicular to the direction of flow of air past the nozzle. Accordingly, the fuel is presented to the air stream in a manner best calculated to produce complete and fine atomization.

However, complete reliance is not placed upon the provision of the fuel supply port in the form of an elongated relatively narrow slot. Instead, means are provided which serves to form an air-fuel emulsion to be supplied to the nozzle to further insure complete atomization of the fuel and to prevent introduction of drops or globs of liquid fuel into the air stream. This is accomplished by the provision of an air bleed restriction **40** which introduces air into the main well **30** at a point between the jet **28** and nozzle **26** so as to form an emulsion of air and fuel in that portion of the main well located above the bleed restriction **40**. More specifically, and as best illustrated in Figures 4–7, the construction involves a main well tube assembly comprising a main well tube **42** to which the discharge nozzle **26** is attached. The main well tube **42** at the side opposite the discharge nozzle **26** is provided with a flat surface as indicated at **44**, and the air bleed restriction **40** is provided by a very small opening extending from the flat surface **44** to the interior of the tube. At its upper end the flat end wall **46** of the main well tube is provided with a channel **48** extending to the flat surface **44**. When the upper end of the main well tube **42** is in contact with the underside of the cover **16** of the bowl **10**, the channel **48** is in registration with an air inlet port **50** provided in the cover. Thus, air at atmospheric pressure is available to the air bleed restriction **40** and is drawn into the liquid fuel as it rises through the well **30**. Since the air is introduced through an extremely small bleed restriction

it operates to produce an emulsion of fuel and air which moves upwardly in the well and through the passage in the laterally extending discharge nozzle. It is found that the air-fuel emulsion is sufficiently permanent so that in operation a supply of the emulsion is at all times available to the discharge nozzle.

The particular advantage of providing the fuel to the discharge nozzle in the form of an air-fuel emulsion is to increase sensitivity of the carburetor to relatively small changes in manifold vacuum. This is due primarily to the fact that the mass of air-fuel emulsion is greatly reduced from the corresponding mass of solid liquid fuel. Accordingly, movement of the emulsion in response to variations in partial vacuum are quick and reflect more accurately the quantitative changes in partial vacuum.

In addition to the increase in sensitivity produced by the supply of the air-fuel emulsion, it is of course apparent that the air-fuel emulsion is much more readily susceptible to complete atomization by the air stream in the main discharge passage **14** and particularly, in view of the fact that the emulsion is introduced in the form of a thin sheet into the throat of a venturi, the sheet being disposed substantially perpendicular to the direction of air flow for most efficient atomization.

From the foregoing it will be observed that the structural modifications involving (1) the production of the venturi throat **36** surrounding the end of the discharge nozzle **26**, (2) the provision of the elongated relatively narrow discharge slot at both sides and extending around the end of the discharge nozzle **26**, and (3) the provision of the air bleed restriction **40** to provide a supply of air-fuel emulsion for the discharge nozzle, all cooperate to produce a continuous smooth finely atomized flow completely devoid of irregularities due to introduction into the air stream of relatively large globs or drops and further, enhance sensitivity of fuel supply in accordance with extremely small variations in manifold vacuum.

The drawings and the foregoing specification constitute a description of the improved carburetor construction in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What we claim as our invention is:

1. In a carburetor having a venturi, and a nozzle opening into said venturi and characterized by the delivery of a uniformly and finely divided fuel-air mixture by the nozzle to the throat of the carburetor venturi comprising a tubular main fuel supply nozzle having a port communicating with atmosphere, and an open end adapted to discharge into the venturi of the carburetor, a tubular fuel supply member extending into said nozzle from a side thereof, said member having a generally spherically rounded end provided with an elongated slot occupying the axis of said member and perpendicular to the axis of said nozzle, said fuel supply member having a bleed connection to atmosphere to bleed air into the fuel supply member to form a fuel-air emulsion whose rate of flow is responsive to small variations in pressure within the throat of the carburetor venturi.

2. In a carburetor, a main nozzle for supplying a primary fuel-air mixture comprising a cylindrical primary air passage, an atomizing nozzle in said passage comprising a tubular member having a spherically rounded end having its center on the axis of said passage to define an arcuate restriction in said passage, said end having a transverse slot occupying a plane containing the center of said rounded end and perpendicular to the axis of said passage, a fuel passage connecting said tubular member to a supply of liquid fuel, and an air bleed in said fuel passage to bleed air into the fuel passage to provide a low gravity fuel-air mixture to the atomizing nozzle.

3. In a carburetor having a venturi, means for supplying a mixture of fuel and air to the venturi comprising a fuel bowl having a central block provided with a vertically extending cylindrical primary air supply passage,

a main well extending downwardly from the top of said block and a jet connecting the bottom of the well to the interior of the bowl, an air bleed tube in the upper portion of said well having ports therein communicating with atmosphere, a tubular member extending from the top of the air bleed tube laterally into the cylindrical primary air supply passage, said tubular member having a spherically rounded end the center of which lies on the axis of said primary air supply passage and which defines therewith a restricted U-shaped passage, the end of said tubular member being provided with a slot passing through the center of the spherical end portion thereof and occupying a plane perpendicular to the axis of the primary air supply passage, a cover for said bowl having a restricted

aspirating port communicating with the primary air supply passage and a second port communicating with said air bleed tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,261,756	Britton	Apr. 9, 1918
1,477,280	Pordes	Dec. 11, 1923
1,816,756	Whatmough et al.	July 28, 1931
1,895,470	Mathieu	Jan. 31, 1933
2,589,559	Lebeda	Mar. 18, 1952
2,676,004	Bimberg	Apr. 20, 1954
2,681,216	Knecht	June 15, 1954