Dec. 7, 1965 V. D. NEWMAN ETAL 3,222,039

CARBURETOR

Filed Feb. 15, 1963 2 Sheets-Sheet 1

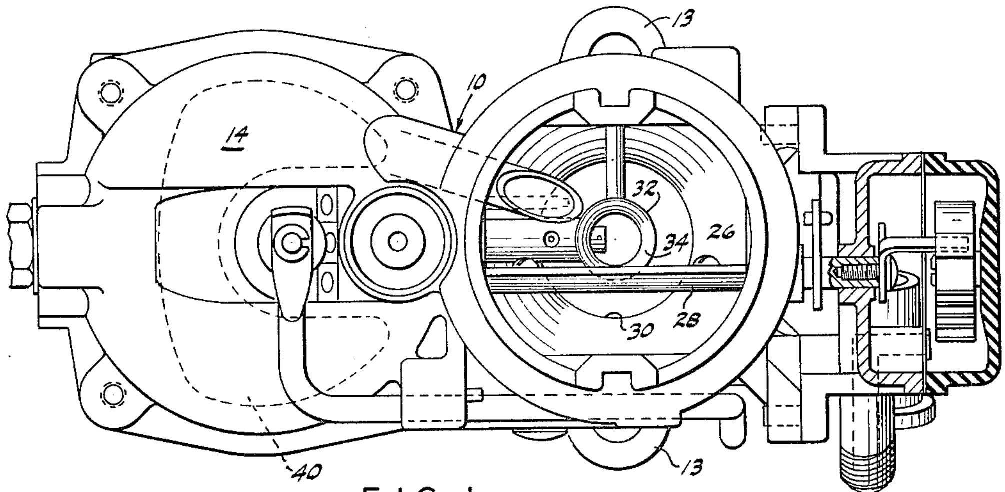

FIG. 1.

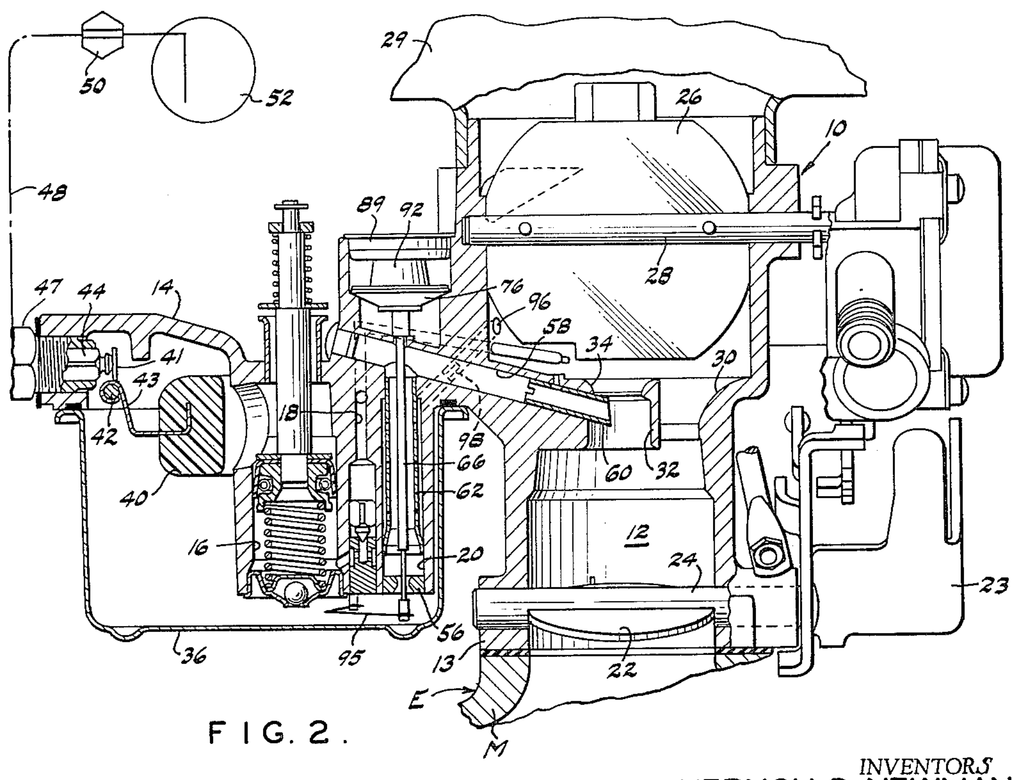

FIG. 2.

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CARBURETOR

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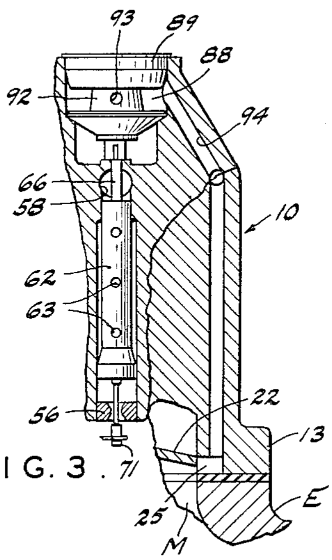

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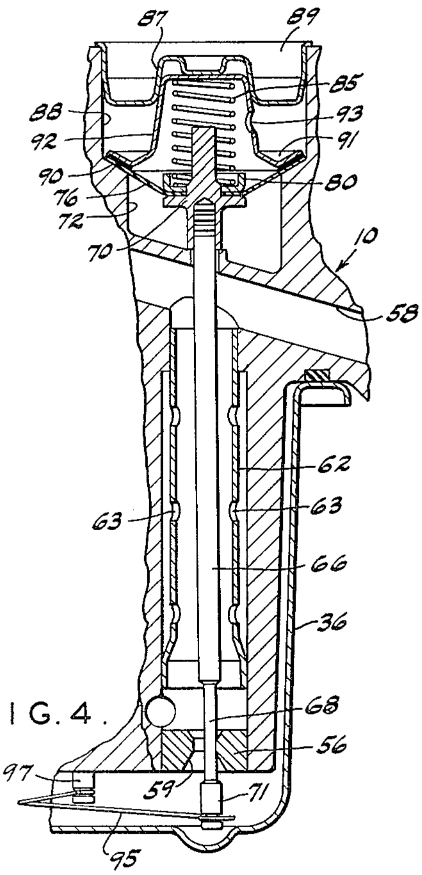

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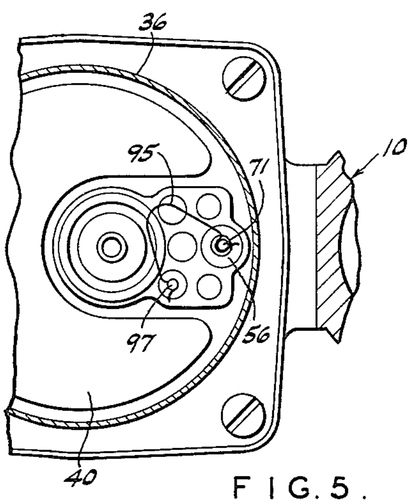

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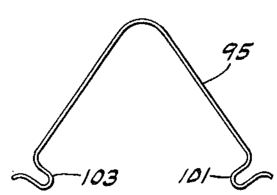

F I G. 6.

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3,222,039
Patented Dec. 7, 1965

3,222,039
CARBURETOR

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Filed Feb. 15, 1963, Ser. No. 258,870
2 Claims. (Cl. 261—69)

This invention is directed to the fuel system for automotive vehicles and specifically is directed to an improvement in a carburetor for such a fuel system.

A type of carburetor for supplying an air and fuel mixture to an automotive vehicle engine is one in which fuel is delivered to a mixture conduit from a fuel reservoir in the carburetor. The fuel is forced by atmospheric pressure on the surface of fuel within the fuel reservoir through a main fuel passage to the mixture conduit where it flows into an air stream and mixes with the air in passing to the engine. To provide the optimum fuel air mixture ratio over the range of engine operation, one type of carburetor utilizes in the main fuel system a fuel jet or restriction of a predetermined size. A metering rod has a free graduated end positioned within this fuel jet. The graduations on the metering rod vary from a large diameter to one of small diameter. These graduated portions of the metering rod are moved into the jet in response to engine requirements. Generally, when the engine is operating at low speeds or at times where a minimum amount of fuel is required, the large diameter portion of the metering rod extends within the jet to minimize the flow of fuel to the main fuel passage. At other times when the maximum amount of fuel is required for proper engine operation, the smallest portion of the metering rod extends through the jet to maximize fuel flow into the engine. In the type of carburetor, with which the invention is associated, a vacuum motor consisting of a diaphragm is attached to the metering rod to move the several graduated portions of the rod through the jet as required for engine operation. It has been recognized that it is necessary to maintain the free graduated end of the metering rod at a constant position within the jet. If this is not done and during high speed operation of the engine when the flow of fuel through the jet is at a maximum, the free metering portion of the rod will tend to whip around the jet from side to side and cause considerable turbulence and disruption of the fuel flow through the jet. This has resulted in an inconsistent flow of fuel during engine operation so that the metering rod does not properly proportion the fuel to the engine. It has been found in the past that, if the metering rod is retained against one side of the jet in a fixed position, the flow of fuel will remain more consistent at all speeds of engine operation. It is known that the metering rod can be biased by a spring to one side of the jet to provide the optimum results. However, in the type of carburetor to be described the metering rod is suspended from a vacuum motor diaphragm through the main nozzle and through a fuel tube in such a manner that it has been difficult to position and support a spring in the known way to bias the rod end against the side of the jet. For these reasons a well known type of spring, mounted at the upper end of the metering rod, has been ineffective for biasing the lower end of the metering rod against the jet wall.

Therefore, it is an object of this invention to provide a simplified yet effective spring bias for a metering rod.

Another object of the invention is to provide a simple spring biasing means which is easily accessible for servicing to bias the metering rod against the edge of the metering jet.

The particular invention is one in which the graduated end of the metering rod extends through a jet into a fuel bowl of the carburetor in such a manner that when the

fuel bowl is removed, the metering rod end is easily accessible for servicing. A hairpin spring is mounted with one end on the metering rod and another end on a fixed stud extending from the carburetor body for biasing the metering rod end against the jet wall and to provide consistent flow of fuel through the jet.

FIGURE 1 is a plan view of a carburetor embodying the novel features of this invention.

FIGURE 2 is substantially a longitudinal sectional view of the carburetor of FIGURE 1, which is shown mounted on an engine manifold and with an air filter partially in section.

FIGURE 3 is a partial sectional view of the carburetor of FIGURE 1 and showing a portion of the main fuel passage.

FIGURE 4 is an enlarged sectional view of a portion of FIGURE 3 illustrating features of the invention.

FIGURE 5 is an enlarged plan view from below of the metering rod assembly of FIGURE 2, with the fuel bowl removed.

FIGURE 6 is a plan view of a metering rod spring, in accordance with the invention.

The carburetor shown in FIGURES 1 and 2 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 integrally formed a depending accelerating pump cylinder **16**, an accelerating fuel passage **18** and a fuel well structure **20**. As shown, the mixture conduit **12** is arranged and aligned vertically during operation and is connected by a flange **13** to the intake manifold M of an internal combustion engine E. In the lower part of the conduit **12** there is rotatably mounted a throttle valve **22** fixed to a throttle shaft **24** journaled in appropriately aligned apertures of the body casting **10**. A manually operable throttle lever **23** is fixed to 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 journaled in aligned apertures through the body casting **10**. To the top of the mixture conduit **12** is connected an air filter **29**, partially shown in section in FIGURE 2. Between the upper and lower portions of the mixture conduit **12** is formed a venturi or air flow restricting surface portion **30**. A small booster venturi **32** is formed integrally with the body casting **10** and has an inner venturi surface **34** coaxially aligned with the mixture conduit **12** and the primary venturi surface **30**.

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**. A float **40** fixed to a float lever **43** is pivotally mounted from pin **42** journaled in a depending portion of fuel bowl cover **14**. A lever arm **41** of the float lever **43** abuts the lower end of a needle valve **44** having a tapered end extending into a valve seat of the inlet fitting **47** leading to the fuel bowl **36**. The fitting **47** connects the carburetor to a fuel line **48**. Fuel is forced under pressure by a pump **50** from a fuel tank **52**, both schematically shown, through the fuel line **48** and into the carburetor inlet fitting **47**. With the fuel level in bowl **36** low, the float **40** is lower and lever arm **43** allows valve **44** to be pressed by fuel pressure in line **48** to an open position. Fuel flows into the bowl **36** and when it reaches a predetermined level, the float lever arm **41** presses upwardly against the needle valve **4** to close the inlet to the fuel bowl.

The lower end of the fuel well **20** is closed by a fitting **56** having a central orifice **59** (FIGURE 4), 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 the fuel well **20** intercepts a cross fuel passage **58** directed downwardly into the secondary venturi structure **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 secondary venturi surface **34**. Press-fitted within the well **20** is a fuel emulsion tube **62** having apertures **63** therethrough along its length, as shown in FIGURE 4.

A metering pin **66** is suspended within the fuel well **20**. Pin **66** has, at its lower end **71**, an intermediate reduced portion **68** positioned within the main fuel jet orifice **69** for operation in response to engine requirements. Flow of fuel through the main jet **56** is controlled by the metering rod **66** and in accordance with the rod portion **68** or **71** within the jet **56**, as described below. The metering rod **66** is supported from a retainer **70** in which the upper end of rod **66** is frictionally engaged.

As shown in FIGURES 2 and 4, the 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** an 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 in FIGURE 4 with the upper end of spring **85** against the top of the retainer **92**. A sheet metal eyelet-cup **89** is press-fitted into the top of bore **88** and has a central re-entrant portion **87** which telescopes over the end of retainer **92** to tightly press the retainer **92** downwardly into the bore **88** so that a flanged 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 and will press the diaphragm and metering rod retainer assembly downwardly into its lowest position, as shown in FIGURE 4.

An aperture **93** through the wall of thimble retainer **92** provides access form bore **88** to the inside of retainer **92**. As shown in FIGURE 3, 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 and manifold M below or downstream of the throttle **22**. In this manner, passage **94** connects the space above the diaphram **76** to the manifold pressure of the engine.

A passage **96** (FIGURE 2) is formed between the mixing conduit **12** from a region between the choke valve **26** and the throttle valve **22** to extend downwardly into the upper portion of well **20**. Within the passage **96** is press-fitted a restriction element **98** for controlling air flow through passage **96** into the well **20**.

The operation of the main fuel circuits of the carburetor is as follows: Fuel from the fuel bowl **36** flows into the well structure **20**, to fill it to the level of the fuel in the bowl. Upon the turning over of the engine, air is sucked through the air filter **29** into the mixture conduit **12** and the intake manifold M. The flow of air through the booster venturi **32** provides a sub-atmospheric pressure within the venturi surface **34** which extends back through the fuel passage **58** to the upper end of fuel well **20**. The atmospheric pressure on the surface of the fuel within bowl **36** raises the fuel within the well **20** and simultaneously air is sucked through the restriction **98** and the bleed passage **96** into the upper portion of the fuel well. This air passes around and through the apertures **63** in the emulsion tube **62** to mix with the fuel and its vapor and to form an air-fuel emulsion. The emulsion is carried upwardly from the fuel well into the main fuel passage **58** and out the nozzle **60** to form a fuel and air mixture with the air passing through the mixture conduit **12**.

When the engine is operating at low or idling speed such that the manifold vacuum is high, in the order of 18 inches of mercury, the diaphragm is forced by atmospheric pressure to its uppermost position. This places the larger portion **71** of the rod **66** in the central metering portion of jet **56**. A drop in manifold vacuum reduces the force of atmospheric pressure on diaphragm **76** and spring **85** presses rod **66** downwardly a corresponding amount until the reduced rod portion **68** is positoned within the jet to permit an increase of fuel flow. As the shoulder between the rod portions **68** and **71** falls below the central metering portion of the jet passage **59**, a maximum amount of fuel can flow through the jet. Manifold vacuum tends to drop as the throttle is opened from a closed position and thus the movement of the reduced portion **68** of rod **66** into the jet coincides with greater need for fuel as the throttle opens. The particular metering rod **66** substantially operates as an off and on construction. That is, the fuel flow is either restricted by the large portion **71** of the rod or is less restricted by the reduced portion **68** of the rod and with little or no effect produced by the shoulder between rod portion **68** and rod portion **71**. However, other types of metering rods may be used with a graduated thickness between rod portions **68** and **71**.

It has been found that during engine operation the fuel flow through the metering jet **56** will tend to move the metering rod end around and from side to side within the jet opening. This effect is particularly extreme at high engine speeds when fuel flow is at a maximum. Then the free end of rod **66** whips around the jet opening **59**. Any change in position of the metering rod during fuel flow through the jet provides an uneven flow of fuel so that the engine performance is not uniform. It has been found in the past that it is advantageous to bias the metering rod **66** to one side of the jet so that it is retained always in one position during engine operation. In prior art structures, the biasing spring has been mounted at the upper portion of the metering rod to force the lower end against the side of the jet. However, with the construction of the particular carburetor structure shown in FIGURE 4, it is difficult to arrange a spring along the length of the metering rod **66** to appropriately bias the end of the rod against the side of the jet **56**.

Accordingly, then, in accordance with this invention, a light spring **95** is used for biasing the lower end of metering rod **66** against the metering jet **56**. Spring **95** consists of a light, thin, single strand hairpin spring fixed between the end of rod portion **71** and a fixed stud **97** extending from the portion of casting **10**. Spring **95** is formed with a separate loop at each end. One loop **101** is fitted within a groove in the rod end **71** and the other end loop **103** is fixed into a groove in the end of the stud **97**. The bias of spring **95** is such as to move the end **71** of the rod **66** away from the stud **97** and against one side of the metering jet **56**, as shown in FIGURE 4. This spring bias eliminates any movement of the metering rod **66** freely from side to side in the passage **59**. Thus, the flow of fuel through the jet **56** is maintained consistent.

The shape of the spring **95** is substantially that shown in FIGURE 6. The spring itself may be made of 0.012″ gauge music wire having a precoating of zinc or cadmium to prevent corrosion. This particular material is not limiting and any appropriate material may be used for this spring.

Spring **95** has the advantage of maintaining the friction of the rod **66** against the jet **56** to a minimum so as not to interfere with the action of the diaphragm **76**. The support of spring **95** is such that as the rod **66** moves vertically, spring **95** will pivot around the stud **97**. This arrangement minimizes friction between the spring **95** and rod **66** which would be greater if rod **66** had to slide through the loop **101**. Thus spring **95**, being attached as described to the end **71** of the metering rod, moves directly with the metering rod and is not forced to slide over a surface of the rod with a greater friction of movement.

The friction due to rotational movement of spring loop **103** in the grove of stud **97** is small in comparison to prior art arrangements.

We claim:

1. A carburetor comprising a body having an air and fuel mixture conduit therethrough, a main fuel passage within said carburetor body, means forming a restricted jet portion of said fuel passage, a metering rod movably mounted within said fuel passage and having a free end of varying thickness extending through said restricted jet passage portion, means attached to the other end of said rod for supporting said rod and for providing reciprocable motion of said rod along its longitudinal axis, and a spring biasing said free rod end against the wall of said jet passage portion, said spring consisting of a single strand of wire forming a single loop and having spaced outwardly biased ends each being formed with an arcuate portion, a stud projecting from said carburetor body in a direction substantially parallel to the longitudinal axis of said metering rod and closed spaced therefrom on the downstream side of said restricted jet portion, one arcuate end portion of said spring loop being fixed to said free rod end and the other arcuate end portion thereof being fixed to said stud, the movement of said rod along its longitudinal axis moving the end portion of said spring fixed to the rod relative to said end portion fixed to said stud whereby friction from said spring upon movement of said metering rod is minimized.

2. A carburetor comprising a body having an air and fuel mixture conduit therethrough, a main fuel passage within said carburetor body, means forming a restricted jet portion of said fuel passage, a metering rod movably mounted within said fuel passage and having a free end of varying thickness extending through said restricted jet passage portion, diaphragm actuated means attached to the other end of said rod for supporting said rod and for providing reciprocable motion of said rod along its longitudinal axis, and a spring biasing said free rod end against the wall of said jet passage portion, said spring consisting of a single strand of wire forming a single loop and having spaced outwardly biased ends each being formed with an arcuate portion, a stud projecting from said carburetor body in a direction substantially parallel to the longitudinal axis of said metering rod and closely spaced therefrom on the downstream side of said restricted jet passage portion, a first groove formed in said free metering rod end, a second groove formed in said stud, one arcuate end portion of said spring loop being fitted within said first groove of said free rod end and said other arcuate end portion thereof being fitted within said second groove of said stud, the movement of said rod along its longitudinal axis moving said spring end portion on the rod relative to the spring end portion on the stud whereby friction from said spring upon movement of said metering rod is minimized.

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