March 25, 1958 G. C. REGISTER 2,828,115

FUEL ATOMIZING AND INJECTING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 22, 1955 2 Sheets-Sheet 1

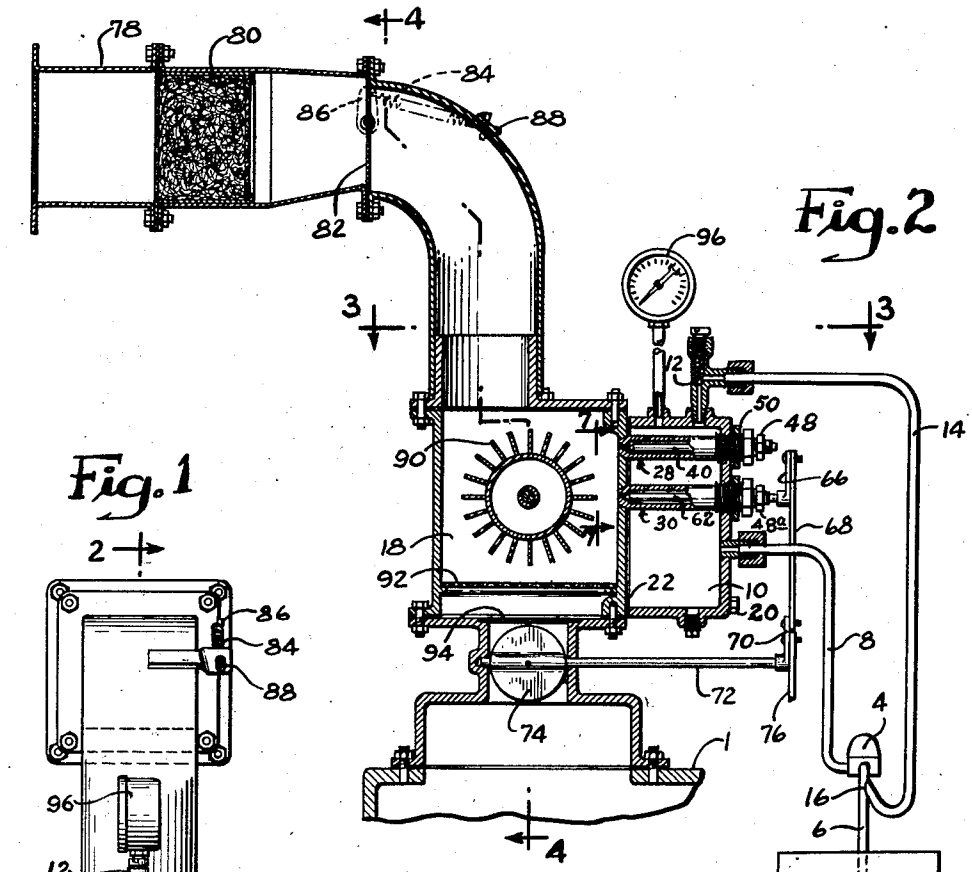


Fig. 2

Fig. 1

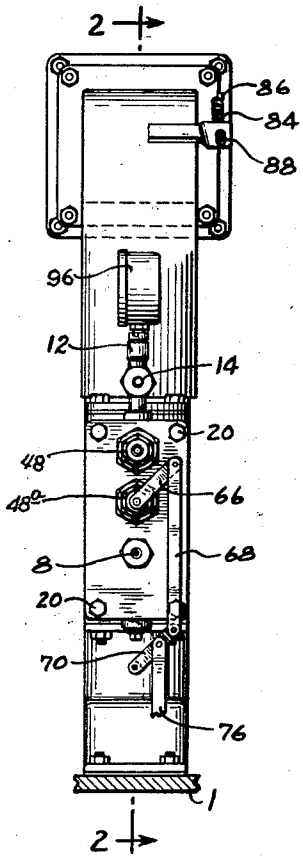
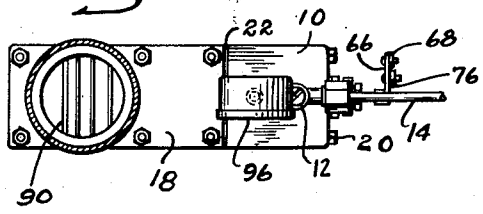


Fig. 3



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Fig. 4

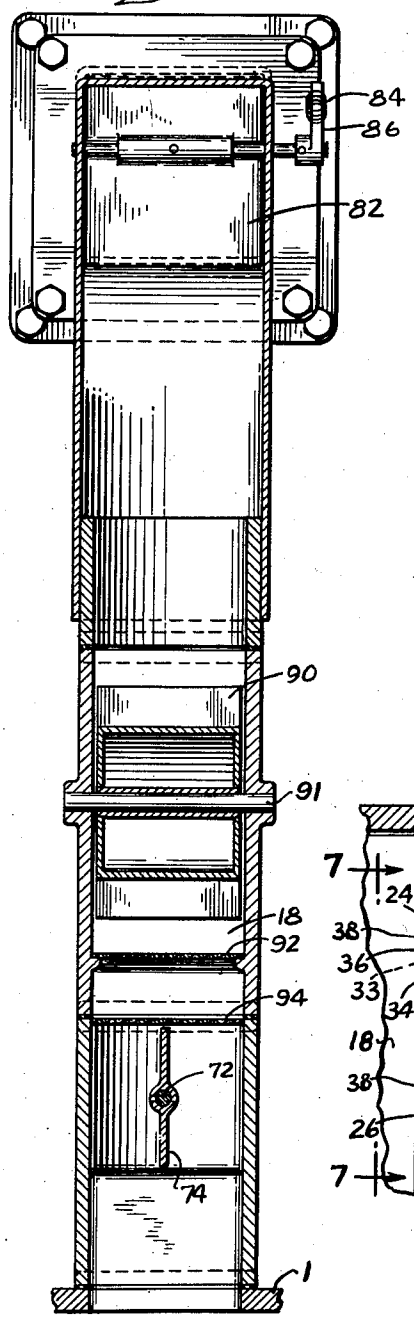


Fig. 5

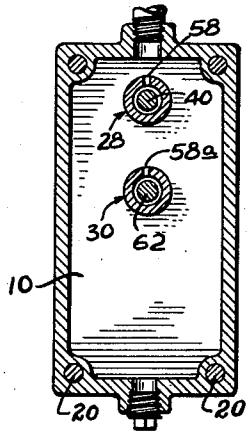


Fig. 7

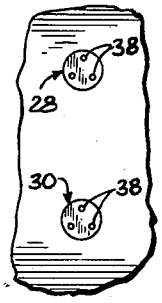
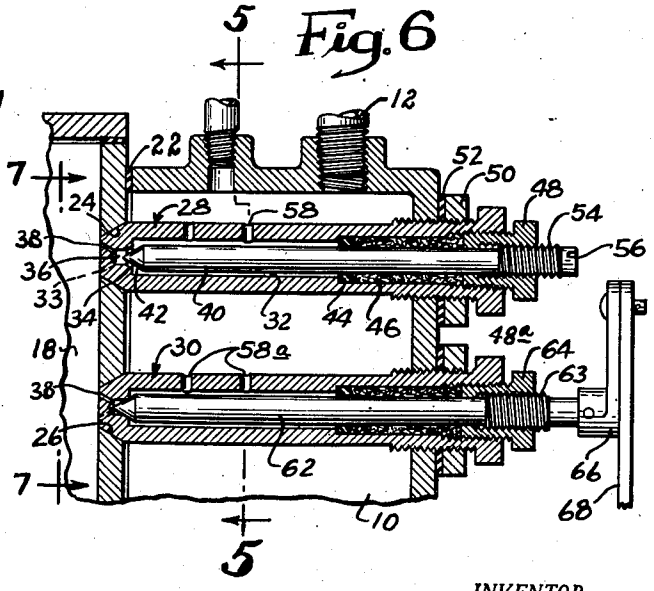


Fig. 6



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FUEL ATOMIZING AND INJECTING DEVICE FOR INTERNAL COMBUSTION ENGINES

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Application November 22, 1955, Serial No. 548,354

3 Claims. (Cl. 261—37)

This invention relates to improvements in a fuel supply and fuel atomizing device for internal combustion engines and more particularly to a fuel atomizing device which will feed fuel into an intake manifold of an engine, with the engine in any position.

Various devices have been proposed heretofore for supplying and atomizing fuel, but these, for the most part, required the use of floats, which necessitated the engine being maintained in a substantially upright position at all times, or required fuel injector devices which injected solid fuel directly into each cylinder of the engine.

The present device is so designed that fuel is maintained under pump pressure in a chamber adjacent the intake manifold of a conventional internal combustion engine of the two or four cycle type, and which fuel is fed into an atomizing chamber under pressure, by a throttle or acceleration valve so as to give the desired speed.

An object of this invention is to provide a fuel atomizer and injector in which fuel is conveyed to a fuel accumulation chamber adjacent the manifold of the engine by a pump, wherein pressure is maintained on the fuel within the fuel accumulation chamber to inject the fuel into the manifold, where the fuel so injected, is further atomized therein, first by a rotating beater element and secondly by means of a screen within the throat of the air passage leading to the engine cylinder.

Another object of the invention is to provide a second injector and atomizer which has a valve system that is readily controlled by means of a throttle valve lever.

Still another object of the invention is to provide a fuel injector and atomizer having an automatic choke device which will automatically open to pass a proportionate amount of fuel, as the suction within the manifold of the engine increases.

Yet another object of the invention is to provide a fuel injector and atomizer which is simple and sturdy in construction, efficient in operation and free of operating defects.

With these objects in mind, and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings, in which like reference characters designate like parts in the several views therein, in which:

Fig. 1 is an elevational, sectional view of an injector and atomizer embodying the invention, with parts broken away, and with parts shown in section, and showing a portion of an engine manifold to which the device is attached;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction indicated by the arrows, with parts broken away and with parts shown in section to bring out the details of construction;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2, looking in the direction indicated by the arrows;

Fig. 4 is an enlarged sectional view taken along the line 4—4 of Fig. 2, looking in the direction indicated by the arrows;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 6, looking in the direction indicated by the arrows;

Fig. 6 is an enlarged, fragmentary, vertical sectional view taken through the fuel accumulating chamber; and

Fig. 7 is a fragmentary view taken on the line 7—7 of Fig. 6, looking in the direction indicated by the arrows.

With more detailed reference to the drawing, the numeral 1 designates generally the manifold of a two or four cycle internal combustion engine, such as an automotive, an airplane, or marine engine or the like. A fuel supply reservoir 2 is provided wherein a suction pump 4 withdraws the fuel from reservoir 2, through suction line 6, and discharges the fuel, such as gasoline or the like, through pipe 8 into the fuel accumulation chamber 10. The fuel accumulation chamber 10 has a pressure relief valve 12 therein, so when the pressure within the chamber 10 reaches a predetermined setting, the relief valve 12 will indicate the pressure within the chamber 10 having reached this predetermined setting, and the fuel will escape through by-pass line 14 to a Y-connection 16 interconnecting with suction line 6. In this manner the surplus fuel, which is discharged out through relief valve 12, re-enters suction line 6, without having to pass into fuel reservoir 2, thereby obviating the necessity of withdrawing the fuel from the reservoir twice.

It is preferable to have the fuel accumulation chamber 10 either made integral with, or secured to the atomizing chamber 18, which leads to the manifold 1 of the engine. In the present instance, the fuel accumulation chamber 10 is shown to be bolted to the atomizing chamber 18 by means of bolts 20. A sealing gasket 22 is provided between the fuel accumulation chamber and the atomizing chamber so as to insure a tight seal therebetween, so as to hold the fuel under pressure in the chamber 10.

The wall of the atomizing chamber adjacent to the fuel accumulation chamber, has two conical apertures 24 and 26 formed therein, which apertures 24 and 26 complementarily receive the respective valve body members 28 and 30, which are conical in shape, as will best be seen from Figs. 2 and 6. The valve body 28 has a bore 32 therein, which has a valve seat 34 on the inner terminal end thereof. The inner end of the valve body 30 has a recess 36 formed therein from which holes 38 radiate, as will best be seen in Figs. 6 and 7, so as to discharge the fuel in finely divided particles, into the atomizing chamber 18. A valve stem 40 has a conical face 42 formed on its inner terminal end to seat on complementary valve seat 34. The stem 40 is smaller than the bore 32, thereby an annular chamber is formed around the stem 40. A sealing ring 44 closes the outer end of the annular space between bore 32 and valve stem 40, which sealing ring may be in the form of an O-ring.

The recess 46, in the valve body may be filled with packing, and may be held in adjusted relation by means of a nut 48. Both the inner and outer diameters of valve body 28 are threaded, the outer diameter thereof being adapted to threadably engage the outer end of the body of the fuel accumulation chamber 10, said outer diameter of the valve body also being adapted to receive a lock nut 50, with a gasket 52 thereunder, so as to insure a tight fit between the valve body 28 and the body of the chamber 10.

The inner diameter of the valve body 28 threadably receives packing gland nut 48, the interior of which packing gland nut 48 is also threaded to threadably receive the threaded portion 54 of the valve stem 40. A screwdriver slot 56 is provided in the outer end of the valve stem 40 to enable the adjustment thereof.

The valve body 28 has one or more apertures 58 formed therein which admit fuel from the fuel accumulation chamber 10 into the annular passage formed by valve stem 40 and bore 32 of the valve body, so as to

pass fuel therethrough, when pressure is exerted on pipe 8 by pump 4. This valve 28 is a valve that is usually termed a slow speed or idling valve, which will admit sufficient fuel to enable the engine to maintain an idling speed. A second valve body 30 is of similar construction, in all respects, to valve 28, except the valve 30 has a stem 62 which extends outward through packing gland 64, and which stem 62 has a lever 66 on the outer terminal end thereof. The lever 66 is connected, by means of a linkage 68 to a second lever 70 on the shaft 72 of a butterfly valve 74, which butterfly valve 74 is positioned within the passage leading to the intake manifold 1.

A second linkage 76 is connected to lever 70 and extends to a remote point, such as the throttle, foot accelerator or the like, so as to enable the butterfly valve 74 to be opened simultaneously with the unscrewing or opening of the valve 62, which valve stem has screw threads 63 thereon, which threads 63 complementarily engage screw threads within packing nut 64. An air inlet pipe 78, which is attached to atomizing chamber 18, has an air filter 80 therein, which conducts the air through an automatic choke valve 82, to atomizing chamber 18. The choke valve 82 is pivotally mounted with a greater area on one side of the pivot than on the other, so as to be automatically responsive to suction within the manifold 1. A spring 84 is attached to choke valve lever 86, and an adjustable nut 88 is attached to spring 84, so as to enable the correct tension to be applied to spring 84 so the choke valve 82 will open to give the correct amount of air into the atomizing chamber 18.

A rotary, wind-responsive turbine element 90 is mounted on trunnion shaft 91 within atomizing chamber 18 and is so positioned that the multiple sprays 38 of valve body 28 and valve body 30 will be directed onto the rotary turbine element 90, which rotary turbine is driven by motion of the incoming air, and the movement of which thoroughly atomizes the fuel particles, to give the proper mixture for the combustion of fuel within the cylinder of the engine.

Screens 92 and 94 are provided within the passage between atomizing chamber 18 and manifold 1, so as to further commingle the air and fuel particles for intimate mixing thereof.

The pressure within fuel accumulation chamber 10 may be varied according to the construction of the particular engine, and may be operated from a few pounds pressure to an excess of one hundred pounds pressure, depending on the result desired to be attained. However, for purposes of illustration, a pressure of four pounds may be maintained within fuel accumulation chamber 10, and if the volume of fuel pumped is in excess of the volume of fuel being used, the excess fuel will be by-passed through relief valve 12 to the by-pass line 14 and thence back through Y-connection 16 to the suction side of pump 4. However, a pressure gauge 96 is provided, which may be connected, through a conduit, to pressure accumulation chamber 10, so as to readily present a means of determining if the fuel within the chamber is being maintained at the proper pressure.

Operation

With the device installed on the intake manifold of an internal combustion engine, the fuel is withdrawn from reservoir 2 through suction line 6 and discharged through pipe 8 to fill and maintain fuel under pressure in fuel accumulation chamber 10. When a predetermined pressure, in chamber 10, has been reached, the relief valve 12 is set to open to by-pass fuel back through pipe 14 through Y-connection 16 in suction line 6, and with the valve stem 40 of valve 28 properly adjusted to give an idling speed, fuel will pass through holes 58 into bore 32 and between conical face 42 and valve seat 34, so as to be forced outward through holes 38 into atomizing chamber 18. The fuel so discharged will strike rotating turbine element 90 so as to break up the fuel particles, which becomes a finely atomized mixture, when mixed with air. The centrifugal force exerted by the turbine will direct the fuel particles against and through the screens 92 and 94 to further atomize the fuel particles so as to produce a highly combustible mixture, when drawn into the manifold 1.

A butterfly valve 74 is positioned in the throat of the intake manifold 1 and is connected by a linkage 68 to valve stem 40, so upon moving linkage 76 connected to a throttle lever, the valve stem 40 will be so rotated as to move the conical face of the valve stem away from the seat so as to give a correctly proportioned amount of gasoline or other fuel into the atomizing chamber for the correct mixture in accordance with the opening of the butterfly valve 74. Furthermore, the choke valve 82 will open the correct amount to provide a combustible mixture which will produce the maximum efficiency from the fuel.

An air cleaner 80 is provided within intake line 78 so as to provide clean air to be admixed with the fuel in the atomizing chamber 18. It is further to be pointed out that the rotary turbine element 90 is off-set with respect to the main line of passage of air from air inlet pipe 78, to manifold 1, thereby making possible the driving of the rotary turbine element 90 by the passage of air into the intake manifold 1.

It is to be pointed out that, with the present invention, the valve 28 and the valve 60 may be readily removed, adjusted and replaced, thereby enabling the device to be serviced in a minimum of time, and since there is a minimum of working or moving parts, there is little likelihood of wear or of the mechanism getting out of adjustment.

While the invention has been described and claimed in one embodiment thereof, it is to be understood that changes may be made in the minor details of construction, and adaptations made to different installations, without departing from the spirit of the invention, or the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. In a floatless fuel injection and atomizing device for an internal combustion engine having a fuel pressure pump and a fuel intake pipe, a housing forming a fuel accumulation chamber, at least two atomizing valves positioned within said fuel accumulation chamber, which fuel accumulation chamber has passages formed therein, which passages interconnect with said fuel intake pipe for directing atomized fuel under pump pressure into said fuel intake pipe leading to at least one cylinder in said internal combustion engine, one of said valves being an idling valve and one of said valves being an operating fuel valve for throttling said engine, said idling valve being positioned in the upper portion of said accumulation chamber and normally being in open communication with said fuel intake pipe, said operating fuel valve being normally closed when said engine is inoperative, and said pump maintaining a substantially constant pressure within said fuel accumulation chamber when said engine is operating.

2. The device as defined in claim 1, wherein said fuel inlet openings in said idling valve are at the upper side thereof immediately adjacent the upper side of said fuel accumulation chamber.

3. In a floatless fuel injection and atomizing device for an internal combustion engine, which engine has at least one cylinder and at least one intake pipe, a fuel system comprising a fuel accumulation chamber, a fuel supply conduit leading to said fuel accumulation chamber, which supply conduit directs fuel thereinto at a constant pressure, at least two atomizing valves positioned within said fuel accumulation chamber, one of said atomizing valves being an idler valve which is set to feed a fixed amount of fuel and positioned in the upper portion of said fuel accumulation chamber immediately adjacent the upper

side thereof, said second atomizing valve being a movable throttle valve for selectively discharging a controlled volume of atomized fuel into said intake pipe leading to said engine cylinder, which valve is normally closed while said engine is not operating and is positioned within said fuel accumulation chamber at a lower level than said idling valve, each of said atomizing valves having a multiplicity of discharge orifices formed therein and which are in communication with said intake pipe leading to said engine cylinder.

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