

July 28, 1970

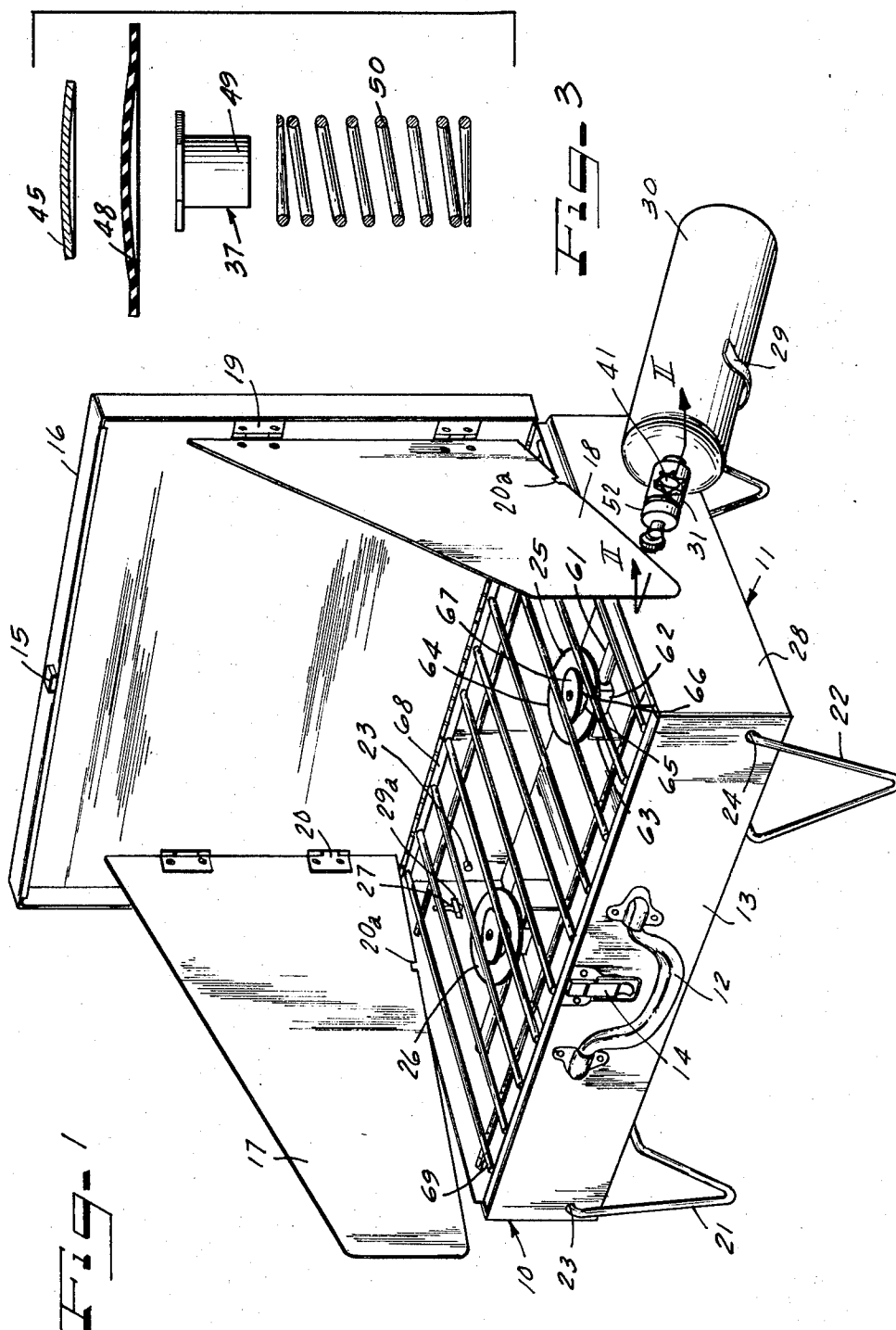
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3,521,669

FUEL REGULATOR FOR A PROPANE APPLIANCE

Filed March 8, 1968

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

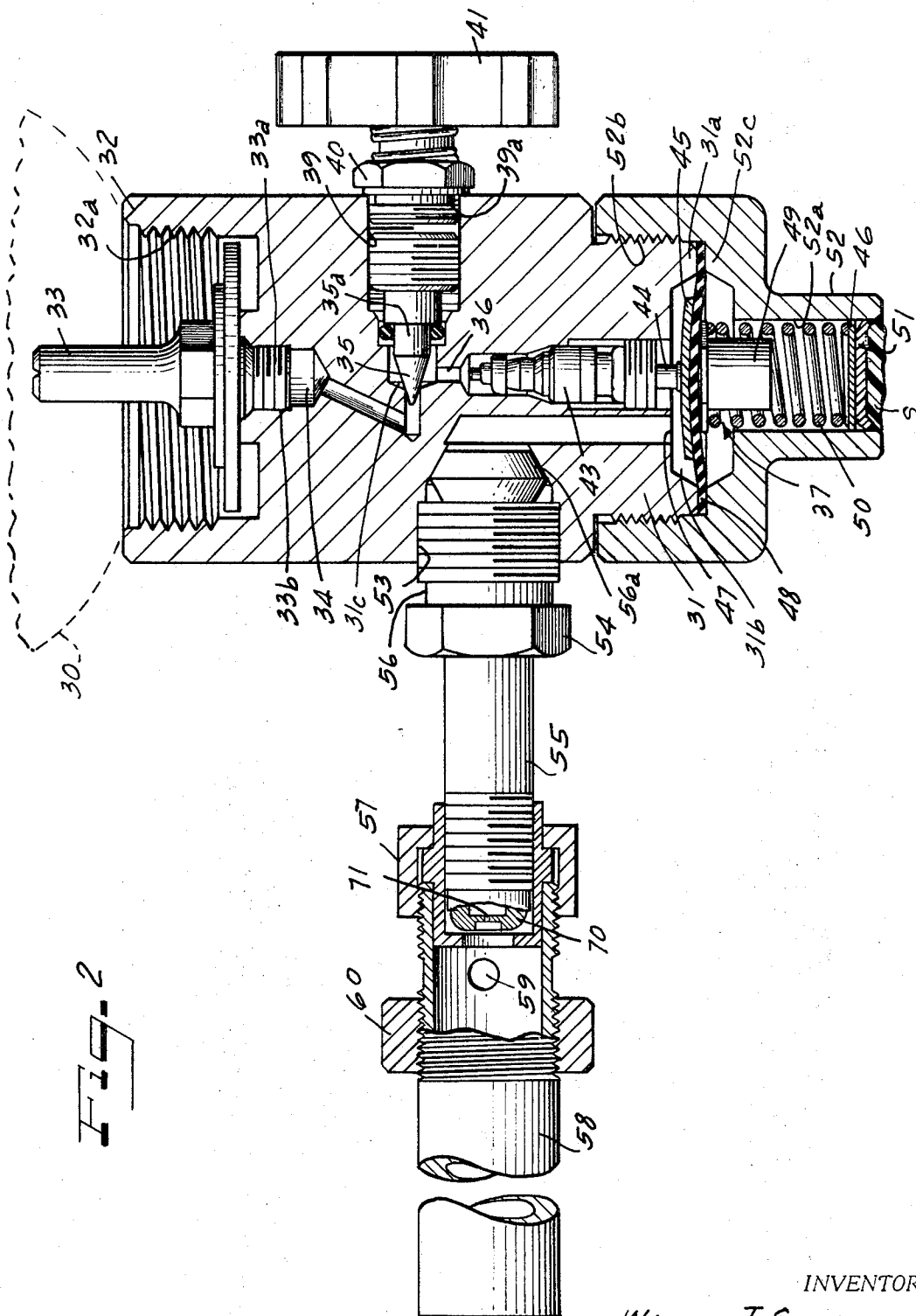


Fig. 2

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Fig. 4

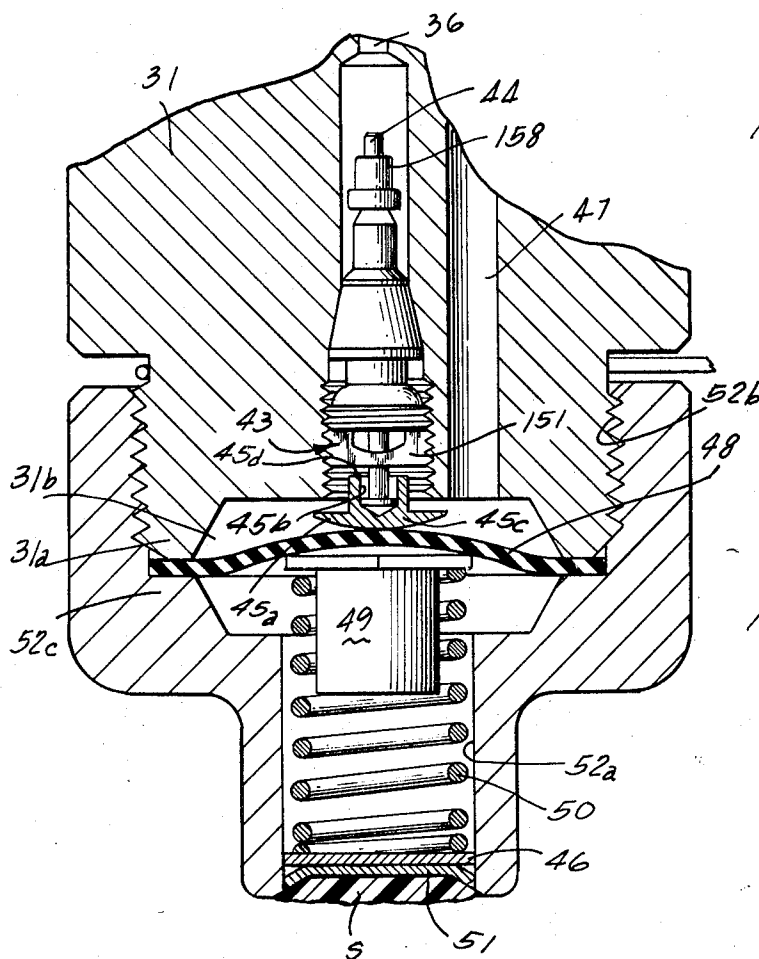
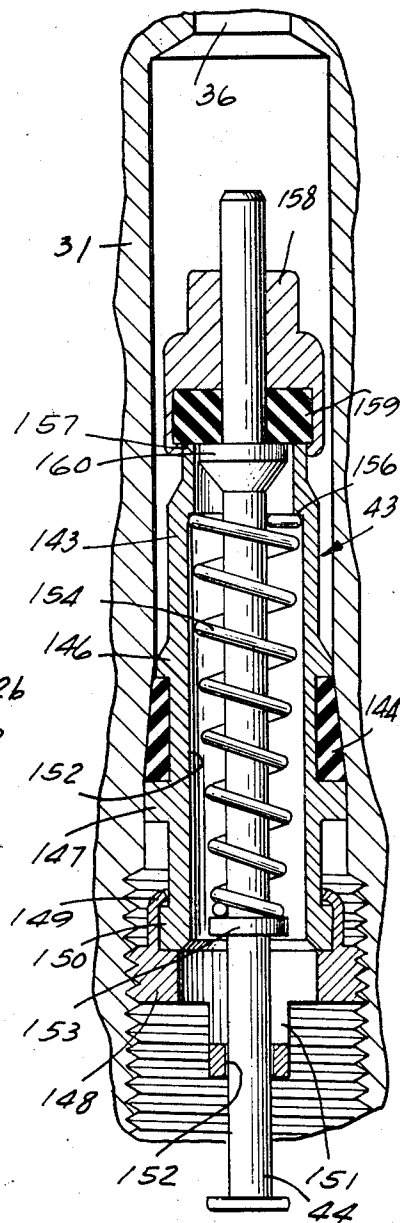


Fig. 5

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3,521,669
FUEL REGULATOR FOR A PROPANE APPLIANCE
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3 Claims

ABSTRACT OF THE DISCLOSURE

A fuel regulator for a propane appliance wherein a preset spring biased valve member such as a conventional "tire valve" is disposed in series with a manual on-off valve and is controlled by a diaphragm regulator so that gaseous fuel will be supplied to the appliance at constant pressure.

BACKGROUND OF THE INVENTION

Field of the invention

This invention pertains to a pressure regulated valve for a gas burner assembly.

Prior art

The burner assembly of the present invention is an improvement over conventional burner assemblies especially those designed for use out of doors. In prior constructions, variations in temperatures made use of a propane or gas appliance extremely difficult due to the resultant changes in pressure of the gas both in the cylinder and in the burner. Such difficulty was greatest at extremes of outside temperature, either very cold, such as 0° F. where the great decrease in pressure brought about by such cold surroundings made the burners almost inoperable, or very hot, such as in excess of 100° F. where increased volatility might be expected. Further, the conventional burners by necessity had small inlet orifices which has a tendency to clog, thereby causing faulty operation and hazardous conditions. The prior art devices also require the use of conduit means in addition to that integral with the device itself to carry the fuel from the container to the burners which further add to the possibility of faulty operation.

SUMMARY OF THE INVENTION

The present invention overcomes the shortcomings of the prior art by providing in combination with a portable compact gas fuel stove an easily attachable pressure regulated valve which can supply fuel at constant pressure regardless of the temperature of the surrounding environment, thus allowing the stove to be used effectively even at extremes such as 0° F. or at 100° F.

Further, since the pressure regulated valve permits only fuel at a constant pressure to pass through the valve, the size of the inlet orifice can be made larger which reduces the problems of orifice clogging.

Also, since the pressure regulated valve of the present invention is integral with the housing containing the actuator for the pressurized fuel container and is also easily attachable to the stove, it can serve as a means for supporting the container as well as for controlling the supply of fuel and as such eliminates the need for additional conduit and supporting means.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the complete stove assembly showing the attached container of pressurized gaseous fuel.

FIG. 2 is a sectional view of the control valve housing showing the pressure regulated valve.

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FIG. 3 is an exploded view of the pressure regulated valve assembly.

FIG. 4 is a fragmentary view similar to FIG. 2 but showing an embodiment of a diaphragm assembly utilizing a rivet-shaped member provided for the purposes of the present invention.

FIG. 5 is a sectional view to illustrate additional details of construction of the valve core assembly or so-called "tire valve."

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although the pressure regulated valve of the present invention is of general utility, a particularly useful application is found in applying the same to the controls of a camp stove fueled by a gas such as propane or the like of the type illustrated in FIG. 1 and shown generally at 10. In the embodiment illustrated the walls of the stove casing are formed from sheet metal to have a rectangular shape similar to a small high portable carrying case. However, various other geometric shapes could also easily be provided.

A handle 12 is located in a mid-portion of the front wall 13 to facilitate the transportation of the stove 10 when it is in its compact fold-up position.

The female portion of a clamp lock 14 is provided on the front wall 13 to allow mating with the complementary male portion 15 on the lid 16 thereby permitting the locking of the case 11 when the stove is not in use.

Two trapezoidally shaped windshields 17 and 18 are attached to the underside of the lid 16 by way of fastened hinges 19 and 20 so as to allow the angular displacement of said shields 17 and 18 from a folded position parallel to the lid 16 when not in use, to a position perpendicular to the lid 16 when cooking, so as to keep the wind off the burners. A notched portion as at 20a engages the adjoining side wall of the casing 11.

The lid 16 is also hinged to allow it to fold down and provide for a compact fold-up position and facilitate portability. Two rods 21 and 22 with portions adjacent their ends bent in a V-shape are provided as legs for supporting the stove. A transverse support portion between said legs is positioned so as to be engagingly disposed across the underside of the stove body for added support. The rods are attached to said stove body 11 by means of extending the bars through holes 23 and 24 formed in the front and rear walls of the case. The rods 21 and 22 can be pivotally displaced to the side of the case thus permitting retraction of the legs and facilitating the portability of the stove.

In the exemplary embodiment illustrated, two burners 25 and 26 are provided. Since the operation would be identical for each burner, the structure and operation of only one need be described in detail. The burner assembly has a chamber 62 formed of sheet metal and fixedly attached to the stove by an elbow bracket 63. A deflector 64 having a central bore with at least one aperture adjacent to said bore to facilitate mixture of air and gaseous fuel is placed atop the chamber 62. A bowl 65 also with a center bore is placed atop the deflector 64 with the smaller diameter engaging the deflector. An annular member 66 with corrugated edges and a central bore is placed atop the bowl 65. Such annular member 66 has at least one additional aperture to facilitate the flow of fuel. A plate 67 with a central bore is placed atop the annular corrugated member 66 such plate 67 being made of a shiny material to allow reflection of heat and facilitate the use of the burners. A screw is passed through the central bores of each of the aforementioned members 64, 65, 66 and 67 fixedly engaging such member to the inlet chamber 62 thereby forming the burner assembly.

Inwardly extending flanges 68 from the stove walls are used to support a detachable grill 69. The grill 69 is thus positioned over the burners 26 to facilitate cooking during the operation of the stove 10.

A slot 27 is formed in the side wall 28 of the casing 11 having axes of different lengths so as to allow the insertion and rotating into position of the holder 29 for the fuel cylinder or container 30. The holder 29 is formed from a single band of sheet metal in the form of a semi-circle at one end so as to be complementary with the shape of the container 30 for receiving said container. The other end of the band is notched to form a neck portion 29a. The width of said neck portion 29a is less than the smaller of said axes while the width of the band itself is greater than the smaller of said axes, thus allowing the bracket to be inserted into the slot and held thereby.

The neck portion 29a besides keeping the holder from falling out of the slot unintentionally allows the holder to be positioned in such a way as to support the cylinder 30 so the axis of the cylinder 30 lies parallel to the side wall 28. In addition, the holder supports the cylinder so that it is tilted upward as shown in FIG. 1 to allow the gaseous fuel to rise towards the control valve body 31.

The control valve body 31 has a coupling collar formed thereon at 32 which is internally threaded as at 32a for threaded engagement with a correspondingly threaded fitting in a top wall of a propane fuel tank 30 to facilitate engagement with said fuel tank 30 and in combination with the bracket 29 forms a compact and simplified supporting means as well as actuating means for the cylinder or fuel tank 30.

In the form of the invention illustrated, a small throw-away fuel tank 30 is illustrated. However, it should be appreciated that the present invention has excellent utility when combined with any source of fuel wherein a gaseous fuel such as propane is supplied. In this connection, propane is oftentimes furnished in large size tanks and the actual point of utilization, whether it be a camp stove, a lantern or a torch, is connected to the large supply tank by means of flexible conduit. In such an instance, the regulator assembly of the present invention would be connected to the flexible conduit rather than to the top of the tank. The valve body 31 has a pusher pin 33 for engaging an adjoining valve in either a fitting or in a fuel tank. The valve body is also provided with a suitable screw threaded bore shown at 33a and to which the pusher pin 33 is connected, thereby to direct gaseous fuel passing therethrough into a passage 33b formed in the valve body 31. Thus, when the coupling collar 32 is threaded into assembly with a tank or with a fitting, the pusher pin will automatically engage and open the valve associated with the fuel supply and will release a flow of gaseous propane fuel through an opening formed in the pusher pin 33 into a central tubular inlet passage 34, thereby placing the further flow of gas under the control of the opening and closing of a tapered valve head 35 formed on the end of a stem 35a carried in an internally threaded bore 39 formed in the valve body 31. The valve body 31 has a seat 31c engageable with the valve head 35. The stem 35a may be selectively actuated by means of an enlarged hand wheel 41 connected to the end of the stem 35a and positioned exteriorly of a stop nut 40 which has an abutment portion 39a engageable with the threaded portion of the stem 35a when the valve head 35 is in an open position. Thus, the valve may be set and fuel passing the valve head 35 will be directed into an intermediate passage 36 for further control by a regulating apparatus shown generally at 37.

In accordance with the principles of the present invention, there is provided in the valve body 31 a valve 43 which takes the form of a so-called "tire valve" having an external actuating pin 44. The valve 43 is of a type which is commercially available and the details thereof are illustrated in FIG. 5. Thus, there is a hollow tubular body 143 having a recess in which is received an annular

sealing ring 144 which seats against the adjoining bore wall of the passage extending through the valve body 31 in which the valve 43 is located. A recess is formed for the sealing ring 144 by a pair of annular shoulders 146 and 147 respectively.

A bridge member 148 is provided with a flange 149 turned over an annular shoulder 150 at the end of the body 143, thereby to place the bridge member 148 in firm assembly with the body 143. The bridge member 148 is circumferentially discontinuous and has a lateral opening 151 extending therethrough, thereby freely passing gaseous fuel through the center bore 152 of the body 143 so that the opening 151, in effect, forms an outlet for the valve 43. The bridge is also provided with an opening 152 in which is slidably supported the external actuating pin 44. The pin 44 internally of the body 143 has an annular shoulder 153 against which is bottomed the coils of a coil spring 154. The other end of the coil spring 154 is bottomed against an internal shoulder 156 formed in the body 143 adjacent an inlet end of the valve shown at 157.

There is attached to the inlet end of the stem or pin 44 a valve head 158 having an enlarged recess in which an annular sealing ring 159 is located. A conical backing member 160 is connected to the pin 44 and is disposed centrally inwardly of the body portion 143 so that the inlet end of the body portion at 157 engages against the sealing ring 159, thereby to close the valve 43. The continuous bias exerted by the coils of the spring 154 tends to keep the valve 43 closed, however, when the pin 44 is depressed against the bias of the coil spring 154, the entire valve head 158 will be moved away from the inlet end of the body 143 so that gaseous fuel may pass through the valve 43 through the inlet 157, and out through the outlet 151.

Actuation of the external pin 44 by depression opens the valve 43 and permits the passage of fluid. In the form of the invention shown in FIG. 2, the external pin 44 of the valve 43 is in engagement with a metal plate 45. The plate 45 is in engagement with a flexible diaphragm 48 made of rubber or similar flexible material.

In the form of the invention shown in FIG. 4, the plate 45 is eliminated and a rivet-shaped member 45a has a hollow stem 45b to provide a socket for receiving the external pin 44 of the valve 43. The member 45a also has an enlarged head 45c which forms an abutment area for engaging against the flexible diaphragm 48. The end of the stem 45b forms a stop 45d engageable with the bridge 148 on the valve 43, thereby limiting the total movement of the diaphragm 48 within a prescribed range.

The diaphragm 48 is in engagement with the enlarged head of a guide 49. A spring 50 has its coils piloted on the guide 49 at one end and the other end of the spring 50 is bottomed against a washer 46 which is adjustably positioned and locked in place by a retainer 51 cooperating with the adjoining side walls of a bore 52a formed in the cap member 52.

As shown in the drawings, the retainer 51 may take the form of a snap ring made of spring metal and has peripheral lock portions provided by a circumferential row of radially outwardly extending fingers which engage the adjoining walls of a bore 52a. Thus, the washer 46 and the retainer 51 are adjustably positioned against the bias of the spring 50 to a preselected calibration. To insure that the preset calibration is not disturbed, the recess in the end of the bore 52a outwardly of the retainer 51 may be filled with a suitable sealant such as silicon rubber shown at S.

The cap 52 is threaded onto the valve body 31 as at 52b and the outer edges of the diaphragm 48 are clamped between opposed confronting shoulders 31a and 52c.

The pin 44 is preloaded by the spring 154. Thus, the forces tending to close the valve 43 include the internal spring 154 of the valve 43 as well as the pressure forces acting on the face of the diaphragm 48 as it forms one wall of an internal cavity between the cap member 52 and the valve body 31, as shown at 31b.

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The principal opening force tending to open the valve 43 is the continuous biasing force exerted by the spring 50 and whatever ambient pressures are acting on the opposite side of the diaphragm 48.

When the valve 35 is opened and gaseous fluid fuel is admitted into the intermediate passage 36, the fluid passes to the cavity 31b under the control of the valve 43. The gaseous fluid then passes through the passageway 47 and through a tube 55 connected to the valve body 31 as at 53 by a compression fitting 56.

In accordance with the present invention, an orifice block is shown at 70 and has a restricted orifice opening 71 through which the fluid is discharged into a mixer tube 58 connected to the tube 55 as at 57. Air for mixture with the fluid fuel is drawn into the mixing tube 58 through one or more air holes shown at 59 and the resulting mixture is then directed to a point of utilization for combustion. An air adjustment collar 60 is threaded on the mixing tube 58 and can be adjusted relative to the air holes 59, thereby to control the mixing action in the mixing tube.

The restriction of the gaseous fuel passing through the orifice opening 71 effects a back pressure which acts on the diaphragm 48, thereby insuring that the valve 43 is regulated as a function of pressure.

With a typical fuel such as propane, volatilization is dependent upon temperature. Hence, in a low temperature environment, a lower fuel pressure is available than when the same fuel supply is in a high temperature environment.

The regulator arrangement of the present invention will allow a greater valve opening in a cold ambient and will provide a correspondingly reduced valve opening in a hot ambient, thereby insuring that a supply of gaseous fuel at constant pressure will always be available.

It will be appreciated that variation in the size of the orifice opening 71 may change the flow volume of any pre-set calibration of the diaphragm 48. Accordingly, it is contemplated that the orifice block 70 should be selected in matched relation to the calibration of the diaphragm 48, depending on the volume flow and flow velocity desired at the point of utilization.

The mixer tube 58 passes through the side of the stove 28 and slidably engages a fixed conduit member 61 therein in a close fitting relation. The fixed conduit member 61 opens into the chamber 62 which is a part of the previously described burner assembly, thus allowing the valve body 31 to form the flow passage from the fuel supply and specifically as shown in FIG. 1 the fuel cylinder 30 to the burners without the need for any additional conduit as well as forming a support for the fuel cylinder itself.

Although minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim as our invention:

1. A pressure regulator for an LP appliance comprising, a generally cylindrical housing having an axial coupling portion at one end for connection to an LP fuel cylinder, a pusher pin in said coupling portion forming a fuel inlet and also forming an actuator to open a closure valve on an LP cylinder, a fuel outlet disposed on the peripheral wall of said housing and having a communicating passage opening out of the other end of said housing,

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a fuel passage formed in said housing and extending generally axially therethrough from said fuel inlet to the other end of said housing,

a cover member connected to said other end of said housing and forming together therewith a diaphragm chamber communicating with said fuel outlet,

a flexible diaphragm clamped between said housing and said cover,

a tire valve in said fuel passage for controlling the flow of fuel therethrough,

said tire valve having a stem extending out of said passage into said diaphragm chamber, and

a rivet-shaped member interposed between said stem and said diaphragm and having a hollow stem to provide a socket for receiving and seating the tire valve stem,

said rivet-shaped member also having an enlarged head forming an abutment area for engaging said flexible diaphragm,

the end of said hollow stem forming a stop engageable with the bridge on said tire valve,

thereby limiting total movement of the diaphragm within a prescribed range so that fuel directed through said fuel inlet will be metered out of said fuel outlet at a predetermined pressure.

2. A pressure regulator as defined in claim 1 and further characterized by

biasing means in said cover member to pre-load said flexible diaphragm,

said cover member having a bore formed therein opening out of the end of said cover member in axial alignment with said fuel passage and disposed to receive said biasing means therein, a washer in said bore bottoming said biasing means, and

a retainer in said bore for adjustably positioning and locking said washer in said bore comprising a snap-ring made of spring metal and having peripheral lock portions provided by a circumferential row of radially outwardly extending fingers engageable with the adjoining walls of said bore,

whereby said washer and said retainer may be selectively positioned against the biasing means to a pre-selected calibration.

3. A pressure regulator as defined in claim 2 and further characterized by

a sealant filling the recess in the end of the bore outwardly of the retainer to insure that the preset calibration is not disturbed.

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U.S. Cl. X.R.

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