# United States Patent [19]

**Miller, Jr.**

[11] **3,796,240**

[45] **Mar. 12, 1974**


[54] **CLOSED FUELING DEVICE WITH AUTOMATIC CUTOFF**


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[22] Filed: **Nov. 30, 1971**

[21] Appl. No.: **203,323**

[52] **U.S. Cl.** ..... **141/198**, 141/386

[51] **Int. Cl.** ..... **B65b 57/14**

[58] **Field of Search** ..... 137/414; 141/23, 24, 128, 141/192–229, 346, 347, 382, 383, 384, 386; 222/67, 68, 213, 214



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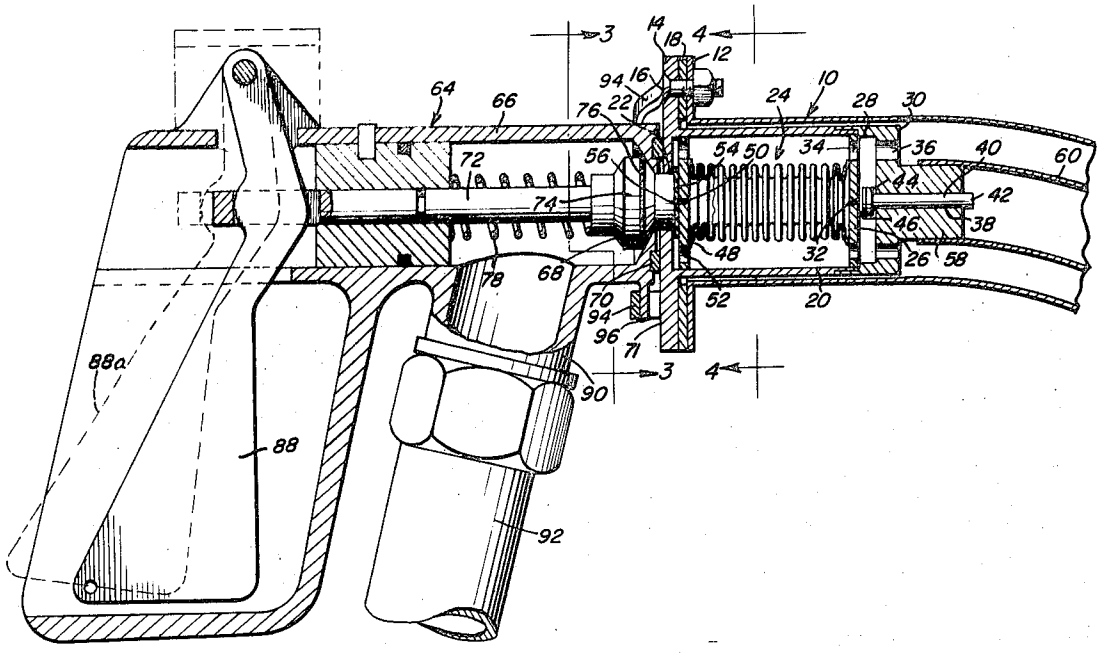
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[57] **ABSTRACT**

A fuel tank inlet pipe including an inlet end and an outlet end opening downwardly into an associated tank. The inlet end of the pipe includes structure by which the outlet nozzle of a fuel discharge line may be coupled to the inlet pipe in fluid-tight sealed engagement therewith and also a fuel flow control valve for controlling the flow of fuel into the inlet pipe and operable, upon actuation of the valve, to move a valve member into closed position with a force generated by the pressure of the fuel delivered to the discharge nozzle. The valve includes a bleed port rendering the pressure of fuel delivered to the nozzle inoperative to move the valve member to the closed position and the bleed port itself has a valve member operatively associated therewith for closing the bleed port and rendering the line pressure of fuel delivered to the nozzle capable of moving the valve member of the control valve to its closed position in response to the tank and/or the inlet pipe being filled.


**7 Claims, 9 Drawing Figures**



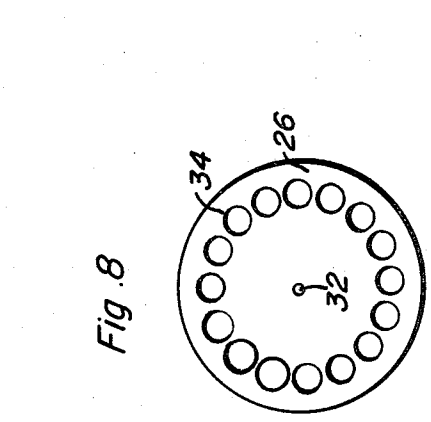



Fig. 8

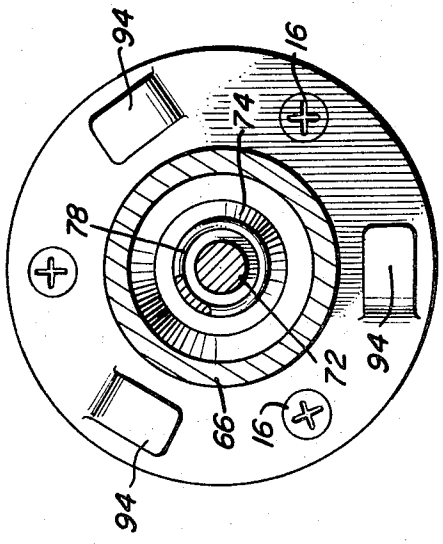



Fig. 3

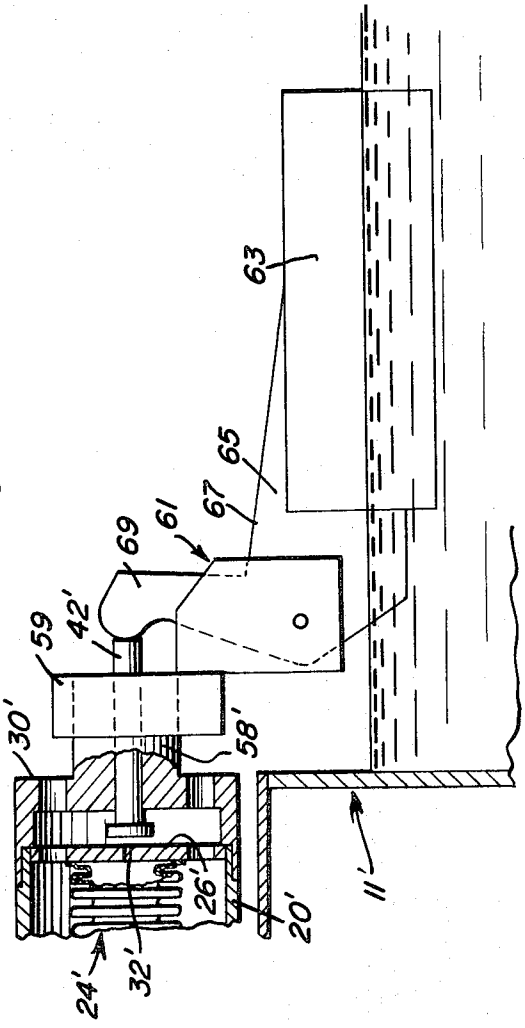



Fig. 9

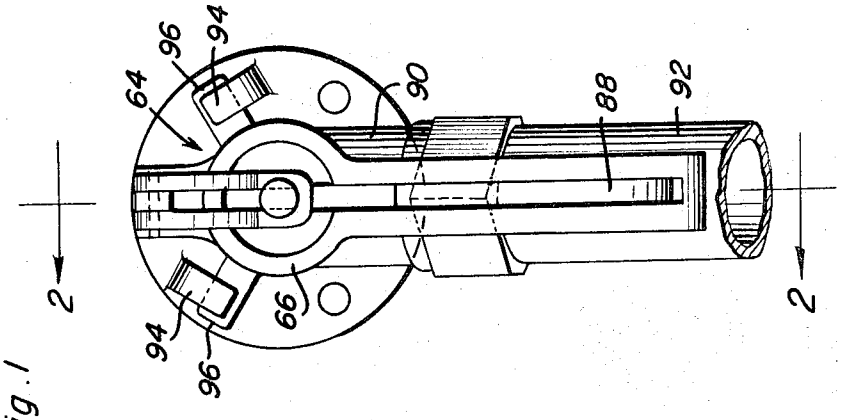



Fig. 1

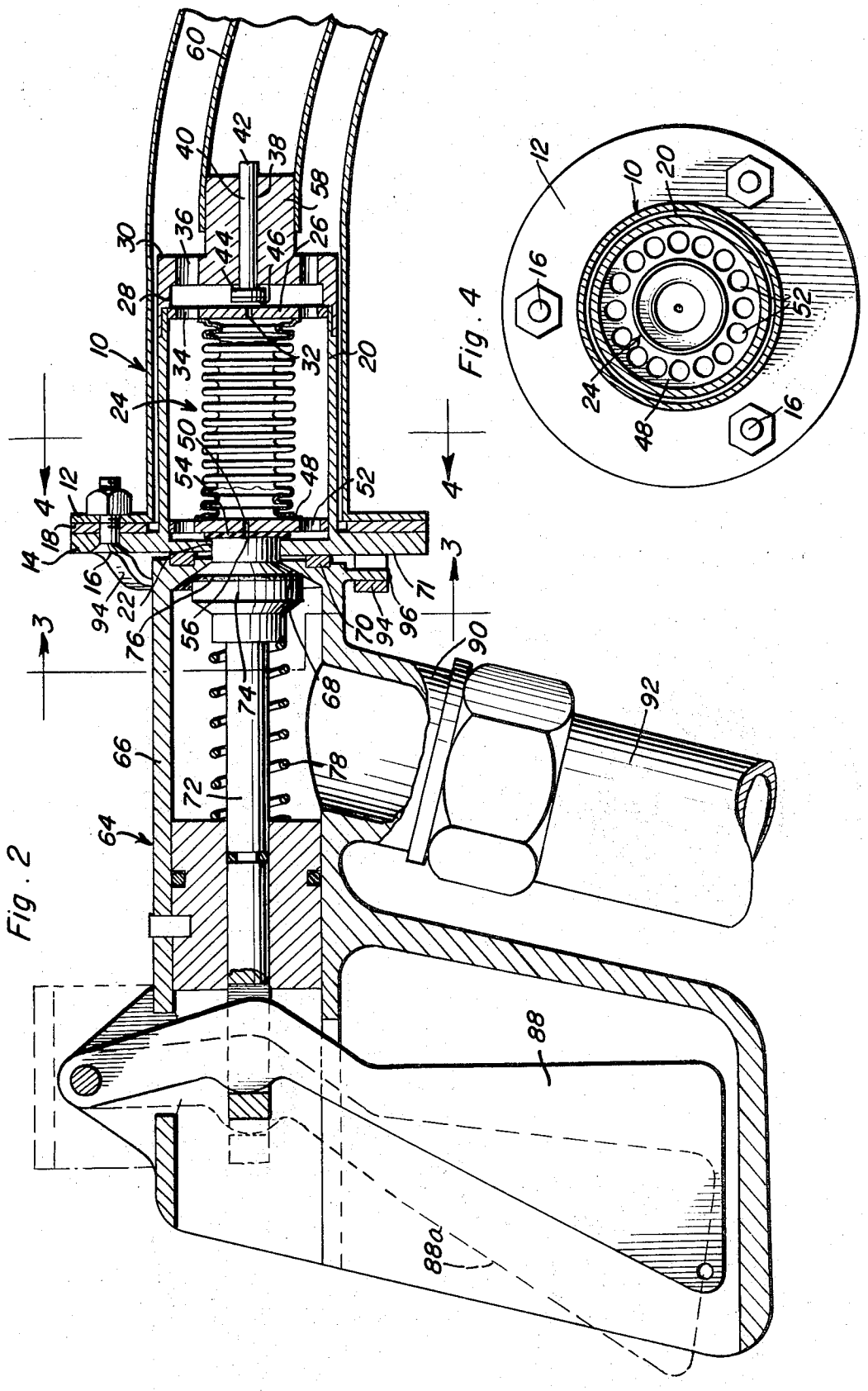
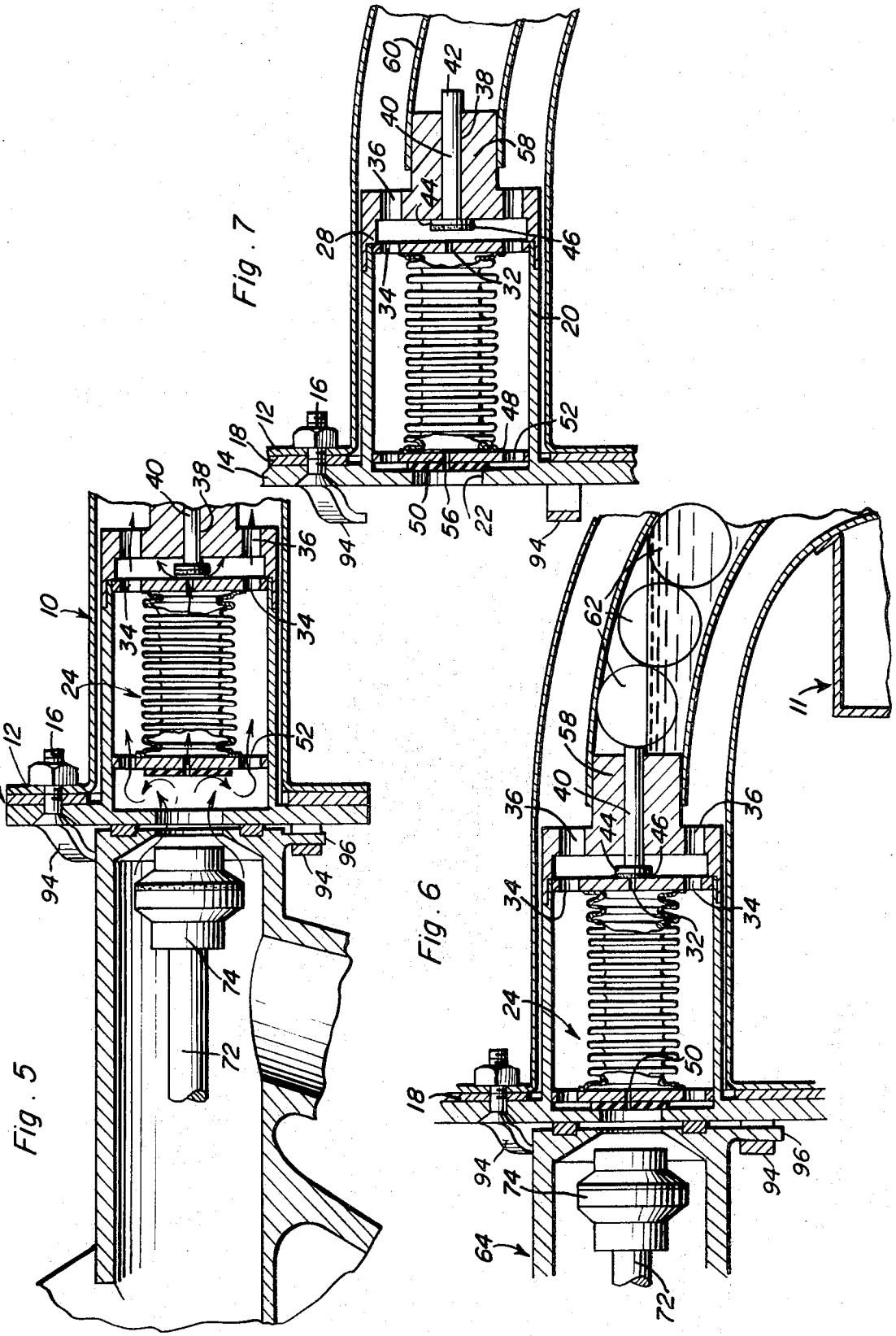

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Fig. 2


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Fig. 4


Fig. 7
Fig. 6
Fig. 5

# CLOSED FUELING DEVICE WITH AUTOMATIC CUTOFF

The closed fueling system of the instant invention has been primarily designed for use in conjunction with various types of fuel tanks provided with a tank vent capable of extracting fuel vapors from the atmosphere within the tank displaced by the fuel being supplied thereto. However, the closed fueling system incorporates a tank inlet pipe and an associated fuel line nozzle which are sealingly engaged with each other during the tank filling operation so as to prevent any of the atmosphere within the tank being expelled therefrom through the inlet pipe during the tank filling operation. Also, this type of construction prevents fuel spillage from the nozzle or the filler pipe for the tank as the tank and filler pipe are filled.

The main object of this invention is to provide a closed fueling system constructed in a manner whereby no vapors from within the tank will be vented to the ambient atmosphere during a tank filling operation.

Another object of this invention is to provide a fueling system whereby spillage from the inlet end of the inlet pipe as well as spillage from the nozzle of the associated fuel line will be prevented.

A final object of this invention to be specifically enumerated herein is to provide a closed fueling system in accordance with the preceding objects which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a device that will be economically feasible, long lasting and relatively trouble-free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout.

FIG. 1 is a fragmentary rear elevational view of the fuel line nozzle of the instant invention illustrated as mounted in sealed engagement with the inlet end of the inlet pipe of an associated fuel tank;

FIG. 2 is an enlarged fragmentary vertical sectional view taken substantially upon the plane indicated by the section line 2—2 of FIG. 1;

FIG. 3 is a vertical sectional view taken substantially upon the plane indicated by the section line 3—3 of FIG. 2;

FIG. 4 is a vertical sectional view taken substantially upon the plane indicated by the section line 4—4 of FIG. 2;

FIG. 5 is a fragmentary vertical sectional view similar to FIG. 2 but with the inlet valve of the inlet pipe in the open position;

FIG. 6 is a fragmentary vertical sectional view also similar to FIG. 2 but with the nozzle valve in the open position and the control valve for the inlet pipe in the closed position;

FIG. 7 is a further fragmentary vertical sectional view of the inlet end of the inlet pipe with the nozzle removed and the control valve for the inlet pipe in its normal closed position;

FIG. 8 is an elevational view of the end plate on the downstream end of the control valve for the inlet pipe; and

FIG. 9 is a fragmentary side elevational view of a modified form of valve actuator for the control valve of the inlet pipe.



Referring now more specifically to the drawings, the numeral 10 generally designates the inlet pipe of a fuel tank 11. It is to be understood that the fuel tank includes a vent line (not shown) suitably equipped whereby the atmosphere displaced by the fuel being fed to the tank through the inlet pipe may be vented therefrom without fuel fumes being discharged into the ambient atmosphere.

The inlet pipe 10 includes a mounting flange 12 at its inlet end to which a mounting plate 14 is secured by means of fasteners 16, there being an annular sealing washer 18 disposed between the mounting flange 12 and the mounting plate 14 establishing a fluid-tight seal between the pipe 10 and the mounting plate 14.

The mounting plate 14 includes a cylindrical lateral extension 20 which is loosely telescoped into the inlet end of the pipe 10. Further, the mounting plate 14 has a central fuel opening 22 formed therein.

A bellows assembly referred to in general by the reference numeral 24 is provided and includes a first end plate 26 seated in the inner end of the extension 20 against a shoulder 28 defined by an end wall assembly 30 carried by the inner end of the extension 20. The end plate 26 has a small central aperture 32 defining a bleed port formed therethrough and a plurality of circumferentially spaced apertures 34 formed about its outer periphery. Also, the end wall assembly includes a plurality of outer circumferentially extending apertures 36 corresponding to the apertures 34 formed therethrough and a central bore 38 also formed therethrough. The bore 38 slidingly and rotatably receives the shank portion 40 of a valve member 42 including a diametrically enlarged head 44 disposed between the central portion of the end wall assembly 30 and the central portion of the end plate 26, the head 44 including a resilient sealing surface 46 for engagement with the inner side of the end plate 26 about the central aperture 32 formed therein.

The outer end of the bellows assembly 24 includes an end plate 48 provided with a central small diameter aperture or bleed port 50 and circumferentially spaced outer peripheral apertures 52. In addition, the outer surface of the end plate 48 includes a sealing disk 54 having a central bypass slot 56 formed therein that is normally closed.

As may be seen from FIGS. 2, 6 and 7 of the drawings, the end wall assembly 30 includes a downstream projecting neck 58 centrally through which the bore 38 extends and the neck 58 has one end of the tube 60 centrally disposed in the pipe 10 telescoped thereover, the tube 60 having a plurality of spherical buoyant members 62 loosely received therein with the uppermost spherical member 62 engageable with the innermost end of the shank portion 40.

A nozzle assembly referred to in general by the reference numeral 64 is provided for coaction with the inlet pipe 10 and includes a hollow body 66 defining an outlet port 68 about which an annular sealing washer 70 is supported for fluid-tight sealed engagement with the outer surface 71 of the mounting plate 14. The body 66 includes a reciprocal valve member 72 including a head 74 provided with an annular seal 76 for sealed engagement with the inner end of the outlet port 68. The spring 78 yieldingly biases the valve member 72 to the closed position thereof illustrated in FIG. 2 of the drawings and the nozzle assembly 64 is provided with a pivoted trigger 88 for manually urging the valve member

72 to the open position thereof illustrated in FIGS. 5 and 6 of the drawings. Also, the nozzle assembly body 66 includes an inlet fitting 90 for fuel to which the outlet end of a fuel supply line 92 is connected.

From FIG. 3 of the drawings it may be seen that the outer periphery of the mounting plate 14 includes three equally circumferentially spaced cam lugs 94 and from FIGS. 1 and 2 of the drawings it may be seen that the body 66 includes an equal number of circumferentially spaced radially outwardly extending flanges 96 for coaction with the lugs 94 to cam the outlet end of the body 66 and the sealing washer 70 into tight sealed engagement with the outer surface of the mounting plate 14 as the nozzle assembly 64 is coupled to the mounting plate 14 by means of the lugs 94 and flanges 96 in a manner which is believed to be obvious.

In operation, prior to the tank with which the inlet pipe 10 is operatively associated being filled the spherical members 62 are resting in the lower end of the tube 60 by means of any suitable apertured end wall (not shown) mounted thereon. If desired, the inlet pipe 10 may be provided with a closure cap similar to the outlet end of the hollow body 66 of the nozzle assembly 64 although a closure cap is not needed inasmuch as the slit 56 is normally closed in the sealing disk 54. However, when it is desired to fill the tank associated with the inlet pipe, the nozzle assembly 64 is supported from the mounting plate 14 in the manner illustrated in FIGS. 1, 2 and 5 of the drawings. The trigger 88 may then be moved to the dotted line position 88*a* illustrated in FIG. 2 of the drawings so as to shift the valve member 72 to the open position and any suitable means (not shown) may be utilized to retain the trigger 88 in the phantom line position.

Upon opening of the valve member 72, fuel flows from the hollow body 66 through the outlet port 68 and acts upon the outer face of the sealing disk 54 of the normally closed bellows assembly 24 so as to shift the end plate 48 to the right from the position thereof illustrated in FIG. 2 of the drawings to the position thereof illustrated in FIG. 5 of the drawings whereupon the fuel from the nozzle assembly 64 may enter the inlet pipe 10 through the apertures 52, 34 and 36. Although the fuel entering the inlet pipe 10 may also enter the bellows assembly 24 through the bleed port 50, the bleed port 32 is open and accordingly, all fuel entering the bellows assembly 24 may be bled therefrom at substantially the same rate, the bleed port 32 may be larger than the bleed port 50 if desired.

As the tank with which the inlet port 10 becomes filled, the spherical members 62 are buoyed up in the tube 60 whereupon the uppermost spherical member 62 engages the shank portion 40 of the valve member 42 so as to urge the latter to the left from the position thereof illustrated in FIG. 2 of the drawings to the position thereof illustrated in FIG. 6 of the drawings whereupon the bleed port 32 is closed and the pressure of fuel being supplied to the nozzle assembly 64 is allowed to build-up within the bellows assembly 24 thereby expanding the latter and urging the end wall or plate 48 to the closed position thereof illustrated in FIG. 6 of the drawings terminating any flow of fuel from the hollow body 66 of the nozzle assembly 64 into the inlet pipe 10. After the valve member 42 has thus terminated flow from the nozzle assembly 64 into the inlet pipe 10, the trigger 88 may be released so as to close the valve member 72 and the nozzle assembly 64 may be disengaged from the mounting plate 14 after which the closure cap, if provided, may be secured to the mounting plate 14.

Inasmuch as the slit 56 is normally closed, even should the fuel level within the tube 60 drop allowing the spherical members 62 to fall back downwardly in the tube 60, the inlet pipe 10 will be substantially closed against the discharge of fuel vapors therefrom. Of course, as hereinbefore set forth, provision is made, other than the inlet pipe 10, for the associated tank whereby the atmosphere within the tank being displaced by the fuel discharged into the tank will be prevented from discharge into the ambient atmosphere.

With attention now invited more specifically to FIG. 9 of the drawings, there will be seen a modified form of extension 20' which is substantially identical to the extension 20 and is provided with an end wall assembly 30' corresponding to the end wall assembly 30. However, the neck 58' of the end wall assembly 30' has a mounting body 59 of a float assembly referred to in general by the reference numeral 61 secured thereto. The float assembly 61 is of course disposed within the associated tank 11' and includes a float member 63 carried by a pivoted float arm 65 comprising a part of a bell crank 67 having a second arm 69 operatively associated with the valve member 42' carried by the end wall assembly 30' and corresponding to the valve member 42. Of course, it will be evident that upon the float 63 being elevated the second arms 69 will urge the valve member 42 to the left as viewed in FIG. 9 of the drawings so as to close the bleed port 32' corresponding to the bleed port 32 in the end plate 26' of the bellows assembly 24' corresponding to the bellows assembly 24. Therefore, it may be seen that the assemblage illustrated in FIG. 9, when utilized in conjunction with a nozzle assembly such as the nozzle assembly 64, is operative in substantially the same manner as the inlet pipe valve assembly illustrated in FIGS. 2, 5, 6 and 7.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. In combination, a liquid conduit including an inlet end and an outlet end portion, said inlet end including inlet end structure defining a downstream facing annular valve seat, a bellows member disposed in said conduit downstream from said seat and extending longitudinally thereof, the first end of said bellows member remote from said seat being stationarily mounted in said conduit and including a first bleed opening therein, the second end of said bellows member adjacent said seat including annular upstream facing end surface means sealingly engageable with said seat and a second bleed opening within the confines of said annular end surface means, said bellows member being normally biased toward an expanded position with said end surface means sealingly engaged with said seat and also being lengthwise compressible upon the impingement of fluid under pressure on said second end to force said second end from said seat, and means responsive to backflow of fluid in said conduit to close said first bleed opening,

whereby the pressure of incoming fluid may be allowed to build-up in said bellows member through said second bleed opening to expand the bellows member and thereby cause said end surface means to seal against said seat.

2. The combination of claim 1 wherein said inlet end structure also defining an upstream facing annular seal surface, a discharge nozzle including an inlet and an outlet, said nozzle outlet including annular seal structure sealingly engageable with said annular seal surface, said nozzle and said inlet end structure including coacting support means operative to removably support said nozzle from said inlet end of said conduit with said seal structure sealingly engaged with said annular seal surface.

3. The combination of claim 2 wherein said nozzle includes a control valve for controlling the flow of fluid therethrough, said control valve including means for terminating the flow of fluid through said nozzle.

4. The combination of claim 1 wherein said means responsive to a backflow of fluid in said conduit includes a valve member supported in said conduit for guided limited movement in upstream and downstream directions, said valve member, when in its upstream limit position, closing said first bleed opening, and valve actuating means in the form of buoyant abutment means mounted in said conduit for guided movement in upstream and downstream directions, said buoyant abutment means being engageable with said valve member to urge the latter in said upstream direction in response to a backflow of fluid in said conduit.

5. The combination of claim 1 including a fluid delivery line having an outlet nozzle, said nozzle and said inlet end structure including coacting means operative to releasably secure said nozzle to said inlet end structure in fluid-tight communication therewith, said means responsive to backflow of fluid in said conduit including float means operatively associated with said outlet end portion of said conduit and actuator means operable by said float means for closing said first bleed opening in response to a tank with which said outlet end portion is associated being filled a predetermined amount, said outlet end portion opening into a tank, said float means being mounted in said tank.

6. The combination of claim 5 wherein said outlet end portion extends downwardly and said float means is guidingly supported therein for movement therealong and may be buoyed upwardly in said outlet end portion in response to fluid rising in said outlet end portion.

7. The combination of claim 6 wherein said outlet end portion includes guide means for said float means defining a shield against at least all but a small percentage of fluid flowing downwardly through said outlet end portion from said inlet end acting upon said float means.

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