

[54] **AUTOMATIC FUEL DISPENSING NOZZLE** 3,018,136 1/1962 Williams ..... 251/14 X  
 [75] **Inventor: Edward A. Mayer, Newburgh, N.Y.** 3,253,611 5/1966 Cummins ..... 251/14 X  
 3,586,073 6/1971 Vest ..... 141/128  
 [73] **Assignee: Texaco, Inc., New York, N.Y.**  
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[52] **U.S. Cl.** ..... 141/128, 251/14  
 [51] **Int. Cl.**... B67d 5/04, B67d 5/377, F16k 31/145  
 [58] **Field of Search** ..... 141/128, 5; 251/14

[57] **ABSTRACT**

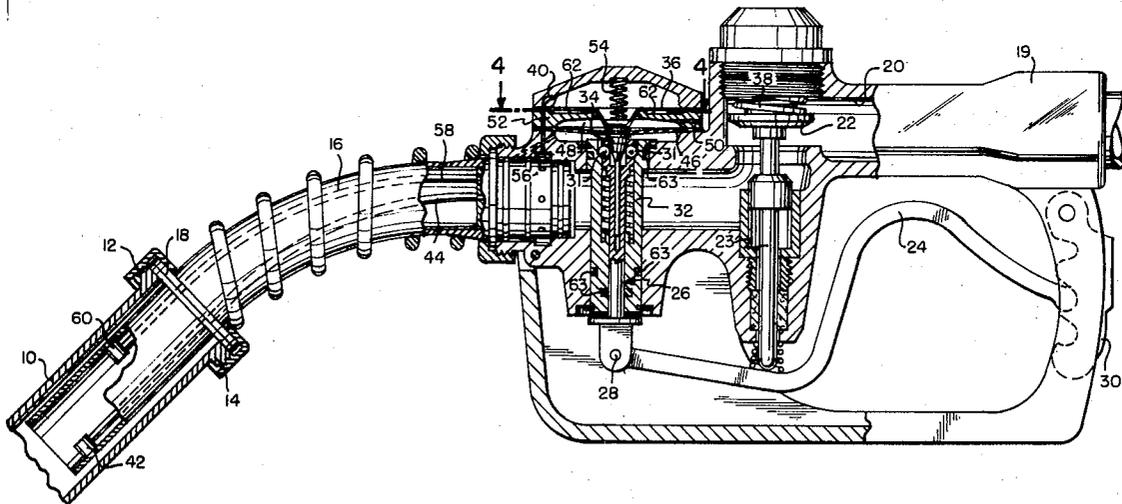
A valved fuel dispensing nozzle with a lockout plunger which is unlocked to release the valve in response to the action of a vacuum signal on a diaphragm, resulting from the rise of fluid about the spout wherein a second diaphragm is also connected to unlock the lockout plunger in response to a predetermined rise of pressure within the fuel tank.

[56] **References Cited**

**UNITED STATES PATENTS**

3,586,069 6/1971 Vest ..... 141/128 X  
 3,586,070 6/1971 Daniels ..... 141/128

**4 Claims, 4 Drawing Figures**



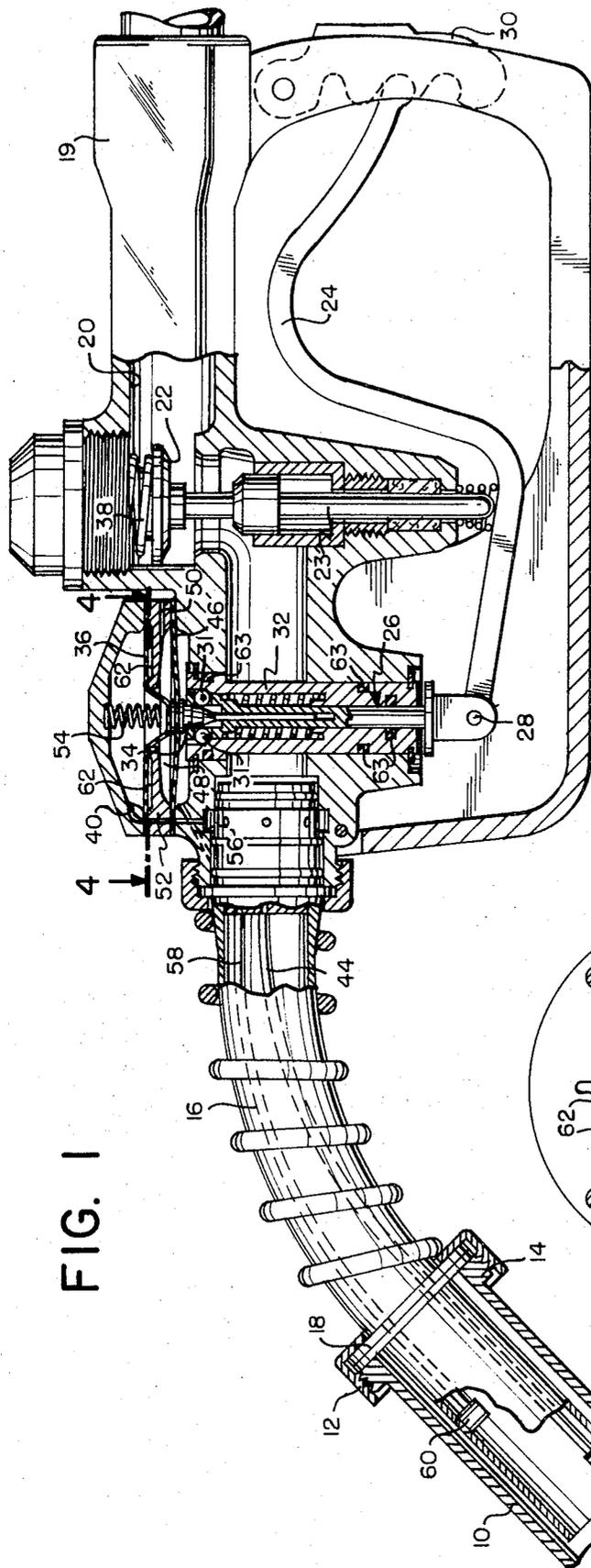


FIG. 1

FIG. 4

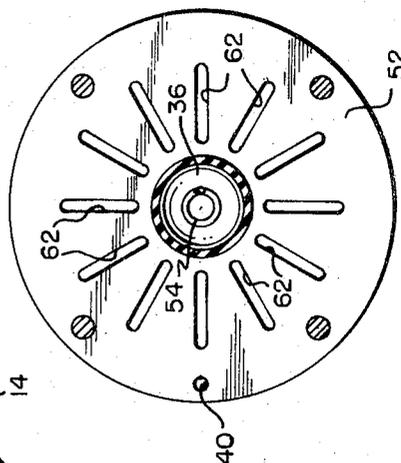


FIG. 3

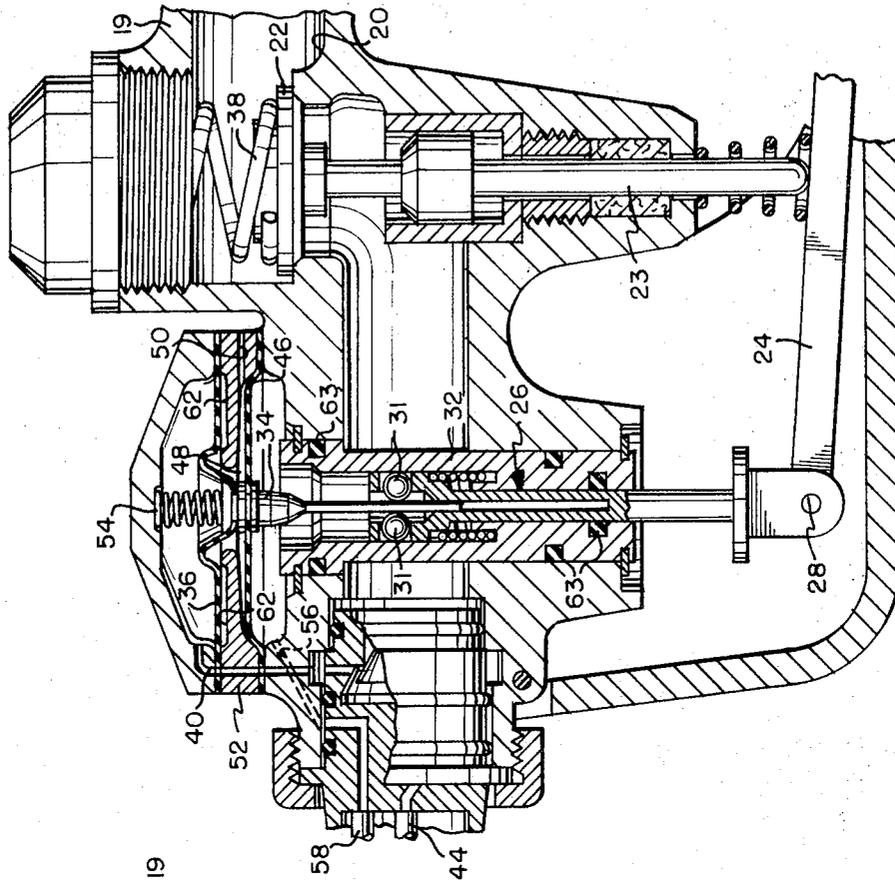
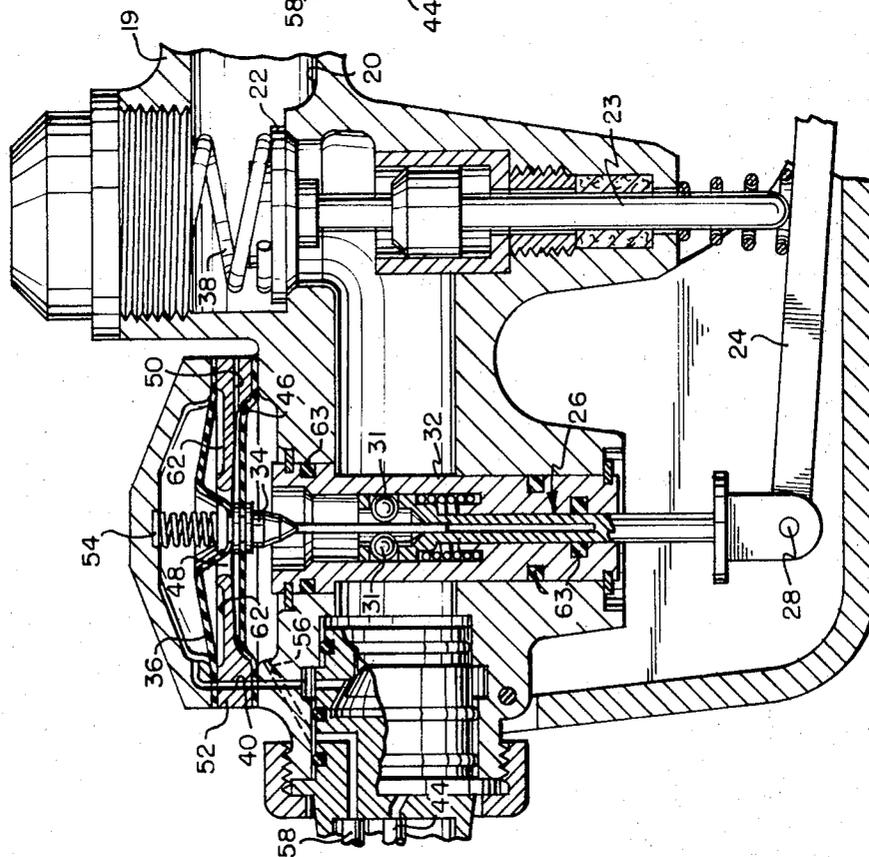


FIG. 2



**AUTOMATIC FUEL DISPENSING NOZZLE**

The present invention relates to a fuel dispensing nozzle and more particularly to an automatic flow control nozzle.

It is the primary objective of the present invention to provide a nozzle as above, which is responsive to overpressure in the fuel tank to cut off automatically, thereby to prevent damage to a vehicle fuel tank, for example.

Heretofore it has become a matter of almost universal convention to provide each fuel dispensing nozzle with a vacuum signal, responsive, lockout plunger associated with the lever controlling the main flow valve of the nozzle. A venturi source associated with the interior of the nozzle normally tends to set up a vacuum which is continuously relieved or vented by a pressure tap downstream near the tip of the nozzle spout.

When, however, a sudden back-surge of liquid fuel immerses this tap or vent, the internal vacuum signal rises, releasing the lockout plunger and terminating the operation of the nozzle. The present invention, on the other hand, contemplates operation in connection with a vehicle fueling system which is presumably forthcoming, in which the nozzle makes tight or sealing engagement with the inlet pipe of the fuel tank.

While the present invention does not undertake to predict what form the prospective sealed vehicle fueling system will take and what means will be employed to vent or relieve the tank pressures due to the influx of fuel delivered by the nozzle, it is obvious that venting will have to be realized, and that, in the event of some interruption of venting, as for example, by closure or blocking of the venting instrumentality, the pressure will arise.

It is therefore an object of the present invention to prevent excessive pressure increase in the vehicle fuel tank by terminating the inflow of fuel into the tank, automatically, as and when the pressure arises a predetermined amount above normal ambient.

This is accomplished preferably by means of the same lockout plunger which terminates the fuel supply in response to conclusion of the filling operation, as, for example, by the creation of a vacuum signal which is set up in response to the surge of liquid about the vent or so-called pressure tap.

This vastly simplifies the system by providing the additional function without any apparent or material alteration in the size of the device.

It is accomplished in accordance with the present invention by causing a control pin, which dominates the action of the lockout plunger and which previously responded only to the vacuum signal, to respond also to pressures in excess of some predetermined value in the fuel tank to effect a like termination of the operation.

In order to illustrate more or less diagrammatically one preferred form of the present invention, reference is made to the figures of the drawing wherein

FIG. 1 illustrates a dispensing nozzle embodying the present invention, coupled in sealing relationship with the inlet pipe of a fuel tank, parts of the assembly being broken away to show the internal structure.

FIGS. 2 and 3 are a detailed elevation and views in sections of the central structure shown in FIG. 1 to illustrate positioning of the parts in response to (in FIG. 2) a vacuum signal, (FIG. 3) an excess pressure in the vehicle fuel tank.

FIG. 4 is a detailed sectional view taken on the line 4-4 of FIG. 1.

As will be apparent from the present figures, the present invention is intended for use during so-called tight seal fill operations, namely wherein the connection between the dispensing nozzle and the fuel tank is tightly or partially sealed.

To this end, therefore, FIG. 1 shows the inlet pipe 10 of a fuel tank, not shown, provided with a coupling at its free end, comprising an annular cap 12 threaded on to the upper threaded extremity 14 of the pipe 10 as indicated. Spout 16 of the dispensing nozzle is provided with an annular collar 18 which, as shown, may be provided with sealing means to enable a tightly or partially sealed connection. Insofar as the present invention is concerned, the exact structure of the seal is of no significance and may take any suitable form.

In general, the basic structure of the nozzle is shown by way of example in U.S. Pat. No. 3,085,600, being formed of a casting 19 having a central channel 20 and a main control valve 22, which is opened via valve stem 23 by means of a lever 24, pivoted to a lockout plunger 26 by fulcrum 28. A manually actuated latch 30 is normally adjusted to hold the lever in open position. The lockout plunger 26 is locked in the position shown by a plurality of steel balls 30, which are held against shoulders formed on fixed housing 32 by a central control pin 34.

Control pin 34, in the conventional structure, is actuated by diaphragm 36, in response to a vacuum signal as aforementioned, in an upward direction. This draws out the pin 34 from between the balls 30, permitting them to drop inwardly and releasing the lockout mechanism so that a relatively heavy spring 38, which normally closes main poppet valve 22, will drive down lever 24 and lockout plunger 26, together with fulcrum 28, closing the valve 22 and releasing the latch 30.

The vacuum signal is created in a continuously acting venturi system 38, not shown, which communicates by passage 40, shown in dotted lines, with the space above diaphragm 36. The vacuum signal, as is known, does not arise to operative value until a vent or tap 42 which, thru conduit 44, communicates with the aforementioned venturi system, is closed by a splash or regurgitation of fuel around the vent 42.

In addition to the aforementioned conventional control system, the present invention provides a lower diaphragm 46, fixed to the same central pin 34 but normally separated from the upper diaphragm 36 by a space 48 which is vented to atmosphere as at 50. Also, the space between the two diaphragms 36 and 46 is largely occupied by an annular support or shelf 52, which forms a rest for the greater part of the area of the upper diaphragm 36. Relatively light coil spring 54 tends to urge both diaphragm down into operative position. It is to be noted that while, as aforementioned, the space between the two diaphragms 36 and 46 is kept open to atmosphere by a conduit 50, the space below diaphragm 46 is closed by seals 63 and connects via duct or conduit 56 with tube 58 which, like tube 58, passes down thru the interior of spout 16 and is vented (within the vehicle fuel tank) as at 60, preferably on the upper side of the spout and ordinarily above any back surge of fluid.

Accordingly, therefore, diaphragm 46 responds to predetermined, positive pressures in the vehicle tank (namely the fill pipe 10) which act upon the lower sur-

face thereof and against the atmospheric pressure prevailing on the upper side of the diaphragm in chamber 48.

Therefore, in normal operation, as filling proceeds to completion, with venting and with no untoward pressure increase in filler pipe 10, a final rise of fluid around vent 42 will raise a vacuum signal in the space above upper diaphragm 36, lifting the diaphragm to the position shown in FIG. 2, thus retracting pin 34 upwardly and permitting balls 30 to drop inwardly. This unlocks the plunger 26 which is driven downwardly by the effect of spring 38, thru valve stem 23 and lever 24.

Diaphragm 46, being fixedly associated with diaphragm 36 by virtue of a mutual connection to pin 34, is likewise drawn upwardly but not thru any action of its own.

However, reference to FIG. 3 of the drawing shows the position of the parts upon incidence of excessive pressure in the fuel tank. This pressure, transmitted thru vent 60 and duct or conduit 58, raises the pressure below the lower or pressure-responsive diaphragm 46, forcing the diaphragm upwardly against atmospheric pressure normally existing in the space 48 thereabove.

Again, by virtue of the mutual connection of the two diaphragms 36 and 46 to the same central pin, the central portion of diaphragm 36 is also raised as shown. Due however to the shelf or support 52 only the central portion of the upper diaphragm 36 is raised. This is of particular significance in view of the fact that an increase in pressure transmitted via duct 58 will also be reflected in some measure by the pressure in duct 44. It, therefore, follows that as the pressure below diaphragm 46 is increased, there will be a similar increase of pressure (in spite of any differential attributable to the venturi action) above diaphragm 36 so that without the support ledge 52 the force exerted against diaphragm 36 will tend to counteract the effect of the lower diaphragm 46.

Since, however, in accordance with the present invention, only the central portion of diaphragm 36 need be flexed upwardly (as against the greater area of the diaphragm 46 exposed to the increase in pressure) the net result will likewise be an upward movement or retraction of the pin 34, which, in substance, produces the net or resulting effect as before in respect to the lockout plunger on the remaining elements of the dispensing nozzle.

In brief, therefore, the present invention provides a mutually pressure-responsive and vacuum-responsive lockout plunger mechanism for control of the dispensing nozzle in response to both a vacuum signal as is conventional and a pressure signal, such as might result from malfunction of a pressure filling system.

FIG. 4 indicates in general the provision of radial channels 62 on the upper surface of the annular shelf or plate 52 to limit any tendency of the upper diaphragm 36 to adhere thereto. On the other hand, the normal roughness of ordinary machining may be sufficient to accomplish this effect.

It is also important to observe that the annular ledge or support 52, previously mentioned, performs the very important function of counteracting the relative practical discrepancy which tends to occur between the two

pressure phenomena involved. Stated in another way, inasmuch as the typical vehicle tank has very little pressure capacity, the pressure rise at which the present invention must necessarily operate is rather small, say in the order of not more than 2 to 4 inches of mercury.

The typical vacuum signal, on the other hand, that is to say, the negative pressure set up by closure of the vent 42, for example, may normally amount to several times this, as for example 8 inches of mercury. Accordingly, therefore, it is advantageous to have a greater effective area in the diaphragm 46 relative to the effective area of the diaphragm 36 at times when the device is being caused to operate in response to a pressure signal rather than a vacuum signal. Likewise, it is to be noted at this time that the upward force created by the superatmospheric pressure on the lower face of the diaphragm 46 need lift only the central portion of diaphragm 36 within the inner margins of ledge 52.

I claim:

1. In a fuel dispensing nozzle comprising a spout (16) adapted to sealably engage a fuel tank inlet, a flow control valve (22) being normally spring biased into a closed position to preclude fuel flow therethrough, an end pivoted lever (24) actuatable to adjust said flow control valve (22) to a fully open position, and a lock-out plunger (26) having opposed ends, one end operably engaging the pivot end (28) of said lever (24), means forming a closure at said lock-out plunger (26) other end,

at least two diaphragms (36, 46) sealably positioned in said means forming said closure, and connected with said lock-out plunger (26) to form adjacent pressure and vacuum chambers within said closure, first sensing means communicating said vacuum chamber with said nozzle spout whereby to urge said diaphragm (36) into said vacuum chamber and thereby displace said lock-out plunger (26) to adjust said flow control valve (22) to a partially open position at such time as said first sensing means is immersed in fuel,

second sensing means communicated with said pressure chamber whereby to transmit pressure thereto from said nozzle spout, and thereby urge said pressure sensitive diaphragm (46) into said pressure chamber to further adjust said lock-out plunger (26) and to permit said flow control valve (22) to move to the fully closed position.

2. In a fuel dispensing nozzle as defined in claim 1, wherein said respective pressure and vacuum sensing means includes; conduits communicated with the respective pressure and vacuum chambers, each of said conduits having openings therein longitudinally spaced along said nozzle spout.

3. In a fuel dispensing nozzle as defined in claim 2, wherein said vacuum sensing conduit opening is disposed at a position downstream of the opening in said pressure sensing conduit.

4. In a fuel dispensing nozzle as defined in claim 2, including vent means in said closure means forming a vented space intermediate the respective diaphragms (36, 46).

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