Sept. 9, 1958 R. V. KLIKUNAS ET AL 2,851,065

AUTOMATIC TANK FILLING NOZZLE

Filed Oct. 5, 1956 3 Sheets-Sheet 1

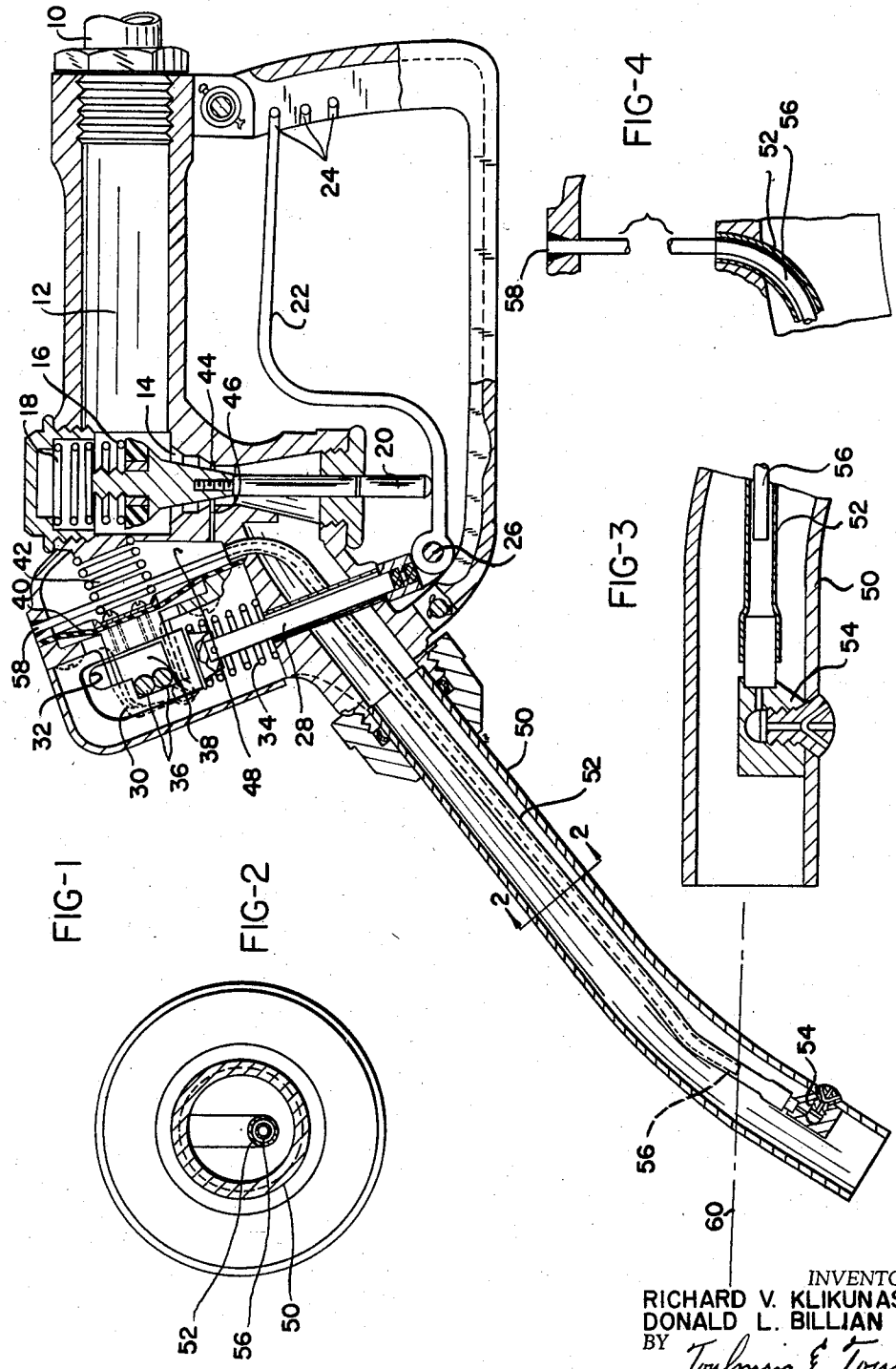


FIG-1

FIG-2

FIG-3

FIG-4

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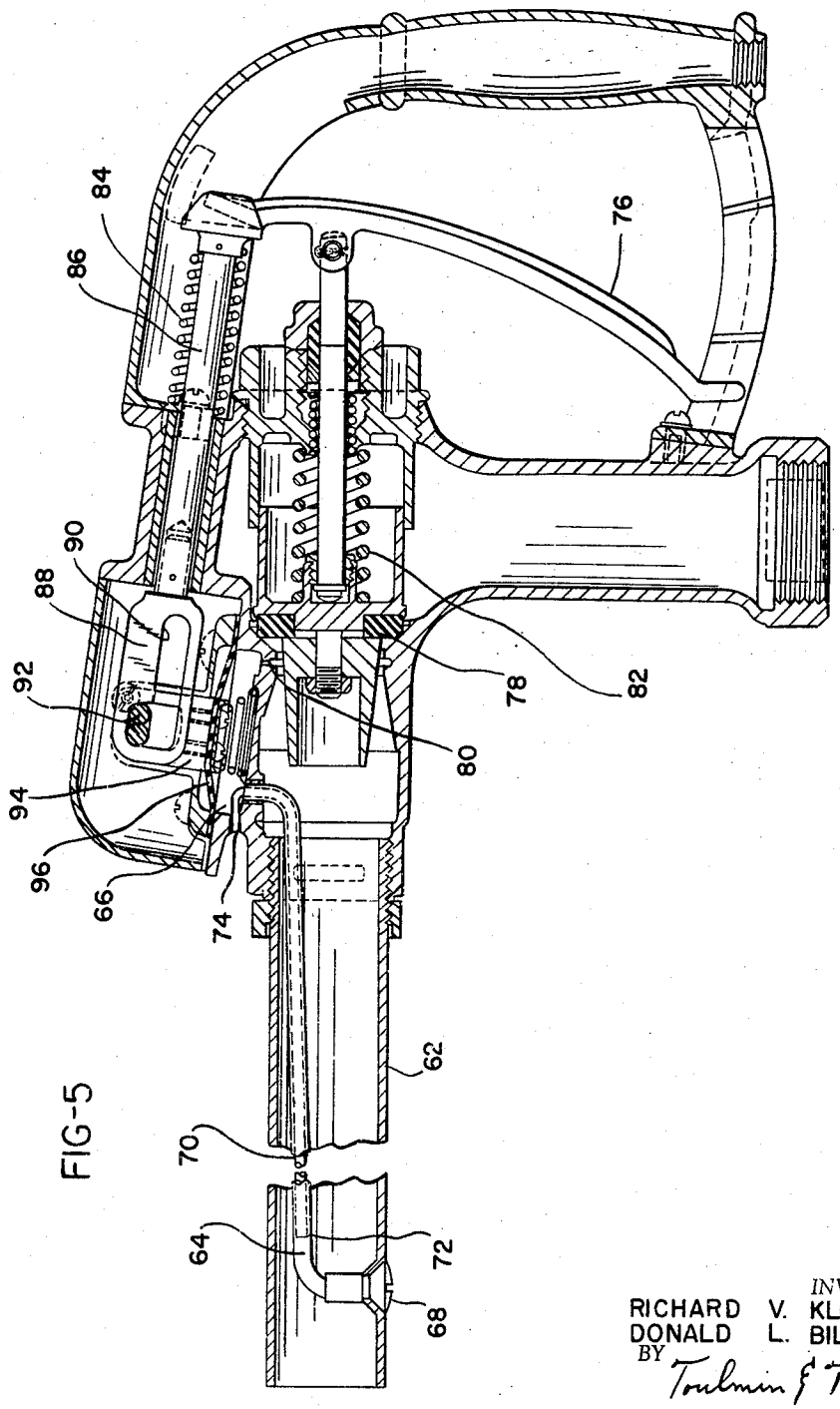


FIG-5

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AUTOMATIC TANK FILLING NOZZLE

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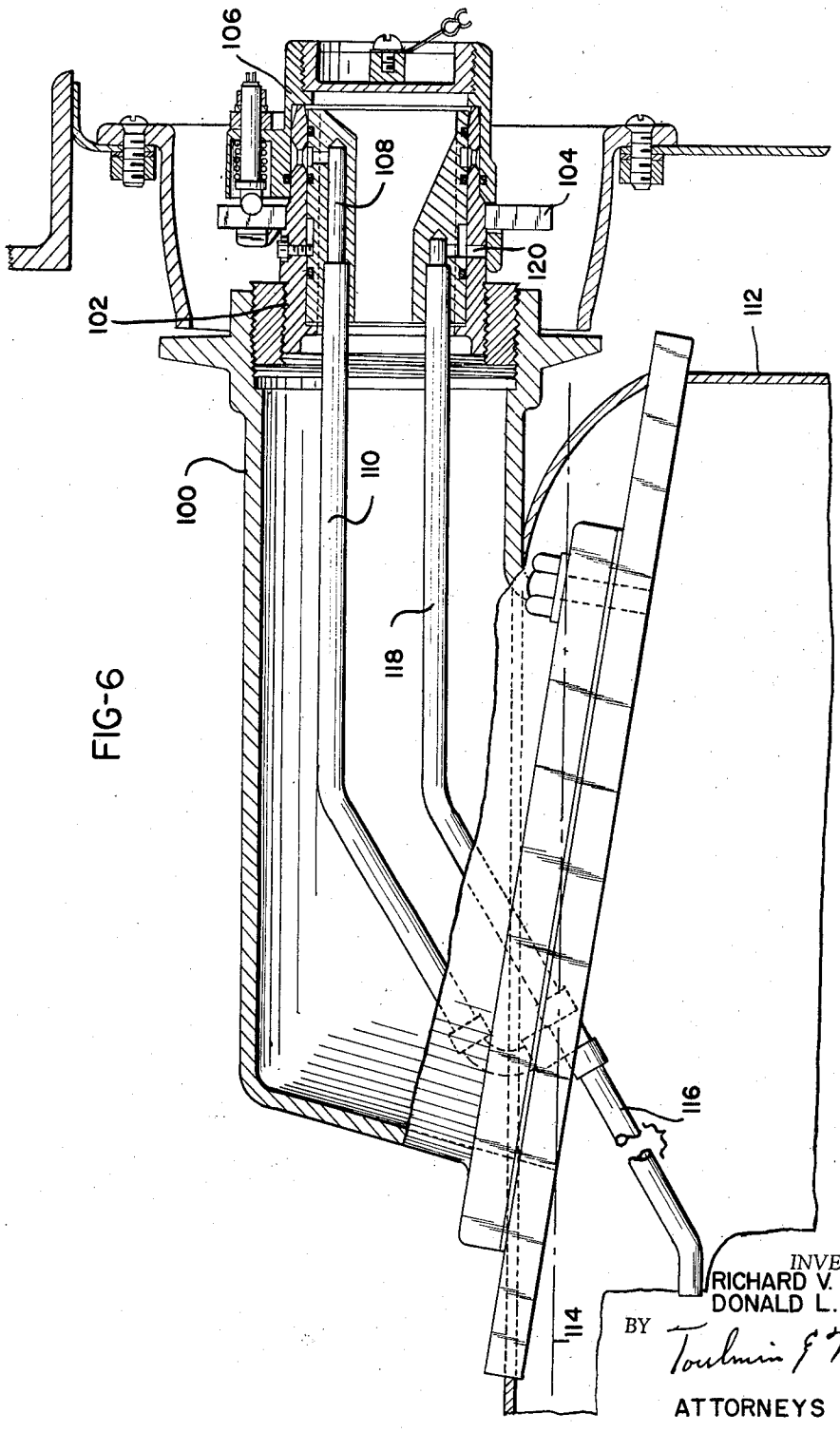


FIG-6

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AUTOMATIC TANK FILLING NOZZLE

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Application October 5, 1956, Serial No. 614,310

7 Claims. (Cl. 141—209)

This invention relates to a method and apparatus for dispensing fluid, and in particular to an improved automatic trip-type fluid dispensing nozzle and the method of operation thereof.

In the art of dispensing liquids, such as delivering fuel to automobile fuel tanks and other containers and dispensing other liquids wherein the containers are to be filled to a predetermined level, one of the preferred forms of dispensing devices includes a nozzle which can be latched open and which is adapted for automatically tripping closed when the liquid level in the container reaches a predetermined level.

The most successful and widely used nozzle arrangement is the type in which the flow of fluid through the nozzle is utilized to create a subatmospheric pressure that is transmitted to a diaphragm connected with the tripping mechanism of the nozzle. The subatmospheric pressure exerted on the diaphragm is relieved via a vacuum relief tube until the liquid level desired is reached. When the liquid level reaches the end of the vacuum relief tube and closes it off this permits the subatmospheric pressure to develop on the diaphragm and causes it to flex, thereby to actuate the tripping mechanism.

Usually the vacuum relief tube referred to is carried directly by the nozzle and the nozzle inserted directly into the tank or container to be filled, as is the case with the usual gasoline dispensing nozzle employed in a filling station.

In other cases, as in connection with a locomotive fuel tank, the filling fitting in the tank extends angularly therefrom and the nozzle is never inserted down into the tank. In this case a part of the vacuum relief tube is carried by the nozzle and another part carried by the fitting and the tubes are connected together when the nozzle is attached to the fitting.

While the devices referred to above are generally satisfactory for accomplishing the automatic tripping of the nozzle by the closing off of the end of the tube, serious defects which arise in connection with this type of automatic control are those where the liquid being dispensed is of the type that will foam. A great many liquids are of this type and they include whiskey, fuel oil, gasoline, milk, chemical fluids, and the like.

The dispensing of fluids of this nature into a tank or container is usually accompanied by a substantial amount of foaming, and when this foam rises to the point that it covers the end of the vacuum relief tube a tripping of the nozzle may occur which, of course, is a false tripping since the true liquid level has not yet reached the end of the vacuum relief tube.

This brings about erratic control of the liquid level and prevents an accurate measurement, and this, of course, has other obvious undesirable defects, such as reducing the quantity of fuel that is placed in a locomotive fuel tank which might result in a serious reduction in the distance that the locomotive may travel. In other cases, where the quantity of liquid in a container is important

for legal reasons; such false tripping of the automatic nozzle occasions considerable inconvenience.

Having the foregoing in mind, it is a particular object of the present invention to provide an arrangement wherein false tripping of the automatic nozzle is prevented.

Another object of the present invention is the provision of a vacuum-type automatic trip nozzle in which the tripping of the nozzle is independent of the foaming of the liquid being dispensed.

A further object of the present invention is the provision of an automatic trip nozzle of the nature referred to which is inexpensive and simple to construct, but which has the new characteristic of being arranged to trip the nozzle closed at precisely the proper liquid level.

A still further object of the present invention is the provision of an arrangement for preventing false tripping of a vacuum-type automatic trip nozzle which is adaptable for use in any situation wherein such nozzles can be used.

These and other objects and advantages of this invention will become more apparent upon reference to the following specification taken in connection with the accompanying drawings, wherein:

Figure 1 is a longitudinal section through a conventional type vacuum trip nozzle such as is employed in filling stations and embodying the improvement of the present invention;

Figure 2 is a cross sectional view indicated by line 2—2 on Figure 1 showing the construction of the novel vacuum relief tube of the present invention;

Figure 3 is a view showing the outer end of the vacuum relief tube drawn in enlarged scale;

Figure 4 is a view drawn on about the same scale but showing the opposite end of the vacuum relief tube;

Figure 5 is a view similar to Figure 1 but showing a somewhat different type nozzle structure; and

Figure 6 is a view showing the adaptation of the present invention to a tank such as a locomotive fuel tank.

Referring to the drawings somewhat more in detail, the nozzle of Figure 1 comprises means for receiving a supply conduit 10 which delivers fluid to flow passage 12 extending through the nozzle. Conduit 10 and passage 12 has a valve seat 14 adapted for engagement by a valve 16 which is spring-urged toward the seat by a spring 18.

Rod 20 attached to the valve member extends out from the body of the valve into engagement with a lever 22, and at one end adapted to be latched in open position as by notch means 24 and having its other end pivoted at 26 to a rod 28 extending upwardly through a tube to the opposite side of the valve body. The upper end of rod 28 is connected with a block 30 having an L-shaped slot 32 therein. A spring 34 normally urges block 30 and rod 28 upwardly, and in its upper position the short leg of slot 32 is adapted for receiving rollers 36 mounted on a block 38 movable at right angles to the length of rod 28 and connected to a diaphragm 40 spring-urged by spring 42 in a direction to hold rollers 36 in the short leg of slot 32, thereby to hold block 30 and rod 28 in their Figure 1 position.

The flow passage through the valve member has a region therein at 44 in which subatmospheric conditions exist when fluid is flowing through the valve due to the venturi effect created by the shape of the passageway, and this subatmospheric pressure is conducted through a passage 46 to chamber 48 on the side of the diaphragm opposite its connection with block 38.

It will be evident that whenever a predetermined suction is created within chamber 48, the diaphragm 40 will flex and withdraw rollers 36 from the short leg of the L-shaped slot, whereupon spring 18, which is stronger than spring 34, will snap the valve member closed regardless of the position in which lever 22 is latched.

The flow passage through the valve extends from the

downstream side of the valve seat through a discharge spout **50**, and the liquid passes from the discharge spout **50** into the container or tank to be filled.

For the purpose of relieving the vacuum created in chamber **48**, so long as the liquid level in the tank or container is below a predetermined amount, there is a tube **52** connected at its one end with chamber **48** and at its other end being connected via a bored screw and block at a point on the side of the spout **50**, which is at about the liquid level that it is desired for the nozzle to trip closed.

According to the present invention, in order to prevent a false tripping of the nozzle by the closing off of the end of the vacuum relief tube by foam, there is an auxiliary tube **56** located inside the vacuum relief tube and extending therethrough and up through chamber **48** and out to the atmosphere at **58**. It will be evident that auxiliary tube **56** will supply atmosphere to the level indicated at **60** within the vacuum relief tube **52** regardless of whether or not there is foam building up about the end of the spout **50**.

The passages and the screw and block **54** are too small for the foam to pass into vacuum relief tube **52**, but these passages will, of course, permit the liquid to pass therein so that the lower end of the inner tube **56** will only be closed off when the true liquid level rises to the level at **60**. At this time communication between chamber **48** and any source of air or gas will be interrupted and the subatmospheric pressure created therein by the passage of liquid through the nozzle will cause the diaphragm to snap closed.

The described device accordingly provides a ready means for making the nozzle completely insensitive to foaming conditions of the liquid being dispensed thereby, and provides for a precise and accurate shut-off of the nozzle when the liquid in the tank reaches a precisely predetermined level.

The nozzle arrangement of Figure 5 is substantially identical with that of Figure 1, except that the spout portion **62** in Figure 5 is straight so that the nozzle can be inserted straight down into the top of the container, such as a barrel or drum. In Figure 5 the vacuum relief tube **64** extending from the diaphragm chamber **66** to a bored screw **68** has therein the inner tube **70** that extends from the shut-off point **72** along tube **64** into the diaphragm chamber and then out through the side wall thereof as at **74** to the atmosphere.

The nozzle arrangement of Figure 5 operates in exactly the same way as the structure in Figure 1. The lever **76** is adapted for being latched in a predetermined open position, and this withdraws valve member **78** from its valve seat so that fluid will flow through the valve, thus creating a subatmospheric pressure in the valve directly below the seat that is communicated with chamber **66** via passage **80**.

When the valve trips off by the lower end of tube **70** being closed, the valve spring **82** snaps the valve member closed against the bias of the lighter spring **84** associated with rod **86** that carries the block **88** in which is located the L-shaped slot **90** that receives the rollers **92** carried on block **94** as attached to diaphragm **96**.

The arrangement of Figure 6 illustrates the manner in which the present invention can be practiced in connection with a tank or container so arranged that the nozzle cannot be inserted therein far enough to position the end of a vacuum relief tube carried thereby at the proper liquid level. Rather, the arrangement of Figure 6 is such that a nozzle is attached to the fitting in the fitting opening of the tank and a vacuum relief tube carried by the fitting connects with the vacuum relief tube of the nozzle.

In Figure 6 the fitting **100** is attached to the filling opening of the tank or container at the top and extends horizontally toward the side so as to be accessible for attachment thereto of a nozzle. Mounted within the fitting is an adapter member **102**, and this member, by virtue of the leg means **104**, is adapted for detachably receiving a nozzle having a mating fitting when the cap **106** is detached from the adapter member. A nozzle of the type adapted for being attached to such an adapter is illustrated and described in our co-pending application, Ser. No. 614,309, filed October 5, 1956.

When a nozzle of the type referred to is mounted on the adapter fitting **102** the vacuum relief tube in the nozzle is automatically connected via passage **108** within the adapter member with a tube **110** attached to the adapter member and extending inwardly along fitting **100** and then downwardly into the tank **112** to the level it is desired to fill the tank, this level being indicated by the line at **114**.

According to the present invention filling to this precise level, regardless of foaming of the liquid being introduced into the tank, is insured by connecting to the end of tube **110** a branch tube **116** that extends down to a distance below level **114**, and another tube **118** that extends backwardly to the adapter fitting and is connected therethrough with port **120** that opens to the atmosphere. Port **120** is closed by cap **106** when the cap is mounted on the adapter fitting, but is left open to the atmosphere when the cap is removed and a nozzle is attached to the adapter fitting.

It will be apparent that the structure of Figure 6 operates in the same manner as the previously described modifications to insure that the end of the vacuum relief tube, in this case tube **110**, is only closed when the true liquid level rises to the end of the tube. Foaming of the liquid being dispensed does not operate to seal off the end of the vacuum relief tube because such foam will not build up within the small conduit **116**, but instead only the true liquid level will rise within this conduit so that a supply of atmosphere is available to the inner end of tube **110** until it is closed off by the actual liquid within the tank.

From the foregoing it will be perceived that the present invention provides a simple but highly effective and novel arrangement for entirely eliminating the troublesome effects of foaming of liquids being dispensed by automatic nozzles and insures maximum and accurate filling of tanks and containers at all times.

It will also be evident that the present invention can be practiced not only with new manufacture, but can also be adapted to existing equipment since most of the time all that would be required would be the drilling of a hole in a nozzle, the insertion of a length of tube through the hole into the vacuum relief tube until the end of the inserted tube reaches a predetermined point, and then the sealing of the inserted tube at the end thereof in the said drilled hole.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions, and accordingly it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

We claim:

1. An automatic nozzle of the nature described having a valve and a discharge spout, a latch to hold the valve open, a vacuum tripping device operable to trip the latch to permit the valve to close, means responsive to flow of fluid through the nozzle to draw a suction on said tripping device, a vacuum relief tube leading from said tripping device to a point in the discharge spout that will be at the level to which a container is to be filled when the spout is inserted in the filler opening of the container, whereby the suction in the tripping device will be relieved until the liquid level in the container rises to a point where it will close off the end of said tube, and means for preventing foam on top of the liquid from causing a false tripping of the nozzle comprising a first conduit means leading from the end of the vacuum relief tube to a point on the discharge spout that will be below the said liquid level, and a second conduit means leading from the end of the vacuum relief tube to the atmosphere.

2. In an automatic nozzle having a body portion, a valve, and a discharge spout; a spring normally urging the

valve closed, a latch for latching the valve open, a vacuum tripping device operable to trip the latch to permit the valve to close upon a predetermined vacuum being built up therein, means for creating a subatmospheric condition in the tripping device in response to liquid flow through the nozzle, a vacuum relief tube leading from said device to a point on the discharge spout corresponding to the desired maximum liquid level in a container to be filled when the nozzle is mounted in the filling opening thereof, and means for making the tripping device insensitive to any foaming condition of the liquid in the container comprising a first conduit extending from the end of the vacuum relief tube downwardly to a point on the discharge spout that will be a substantial distance below the said liquid level when the nozzle is in use whereby only liquid rises to the end of the vacuum relief tube, and a second conduit leading from the end of the vacuum relief tube to the atmosphere so that when the said first conduit is closed by the liquid atmosphere will relieve the vacuum tripping device until the liquid level in the first conduit reaches the end of the vacuum relief tube.

3. In a vacuum trip nozzle having a valve; a latch to hold the valve open, a vacuum tripping device to trip the latch so the valve will close, means responsive to liquid flowing through the nozzle for creating a subatmospheric pressure in the tripping device, a vacuum relief tube leading from the tripping device to a point which will be at the level of the liquid at which the valve is to trip closed when the nozzle is being used so that the vacuum in the device will be relieved until the end of the tube is closed off by the liquid, and means for preventing false tripping of the valve due to foam being created on the liquid comprising a first conduit extending from the end of the vacuum relief tube to below the said liquid level, and a second conduit extending from the end of the vacuum relief tube to the atmosphere remote from the liquid.

4. In an automatic vacuum trip nozzle having a normally closed valve and having a latch to hold the valve open and a vacuum-operated tripping mechanism for releasing the latch to permit the valve to close, means responsive to liquid flowing through the nozzle for creating a subatmospheric pressure in the tripping mechanism, a vacuum relief tube extending along the nozzle to a point therein which will be substantially below the liquid level at which the valve is to trip closed when the nozzle is placed in a container for filling the same, and means for making the tripping arrangement insensitive to foam created by the liquid being dispensed comprising a conduit leading from the atmosphere to a point on said vacuum relief tube which is at the level at which the nozzle is to trip closed whereby the vacuum relief tube will relieve pressure in the tripping mechanism until solid liquid rises therein to a point where it will close off the end of said conduit.

5. In a vacuum trip nozzle of the nature described having a valve and a latch to hold the valve open and vacuum relief tripping means to release the latch to permit the valve to close; means in the nozzle for creating a subatmospheric pressure in said tripping means in response to fluid flow through the nozzle, a vacuum relief tube normally leading to said tripping means to prevent the subatmospheric pressure from reaching the point where the tripping means will operate and said tube extending along the nozzle to a point thereon that will be substantially below the liquid level in the container being filled by the nozzle at which the valve is to trip closed, and a smaller tube extending along inside the first-mentioned tube from a point therein corresponding to said liquid level to and through the nozzle and opening to the atmopshere.

6. In a normally closed automatic vacuum trip nozzle having a valve and having a latch operable to hold the valve open and a vacuum operated trip mechanism for releasing the latch to permit the valve to close, means in the nozzle responsive to flow of liquid therethrough for creating a subatmospheric pressure in the trip mechanism, a vacuum relief tube extending from the trip mechanism to a point relative to the nozzle which will be substantially below the liquid level at which the valve is to trip closed when the nozzle is supplying fluid to a fluid receiver, and means for making the trip mechanism insensitive to foam created in the receiver by the liquid being dispensed comprising a conduit leading from the atmosphere to a point on the said vacuum relief tube which is at the said liquid level at which the valve is to trip closed whereby the vacuum relief tube will relieve pressure in the tripping mechanism until foam-free liquid rises therein to a point where it will close off the end of said conduit.

7. In a vacuum trip nozzle having a valve, a latch to hold the valve in the open position, a vacuum tripping device to trip the latch so the valve will close, means responsive to liquid flowing through the nozzle for creating a subatmospheric pressure in the tripping device, tube means comprising a first portion leading from said vacuum tripping device to a point which will be at the level of the liquid at which the valve is to trip closed when the nozzle is being used, a second portion leading to the atmosphere, and a third portion extending downwardly to below said level and being open at the bottom, all said portions being in communication at said point, whereby the arrangement is such that the vacuum in the tripping device will be relieved via the tube means until liquid in the said third portion rises therein to the said point thus causing the said first portion of the tube means leading to the tripping device to be sealed off from gas flow thereto from the said second or third portions of the tube means, the said third portion of the tube means extending downwardly being operable for causing foam that might be generated in the liquid by the flow thereof from the nozzle to collapse within the said third portion of the tube means thereby preventing false tripping of the tripping device.

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