Sept. 10, 1940. F. MAYNE ET AL 2,214,708

NOZZLE VALVE ATTACHMENT

Filed July 5, 1938

Fig.-1

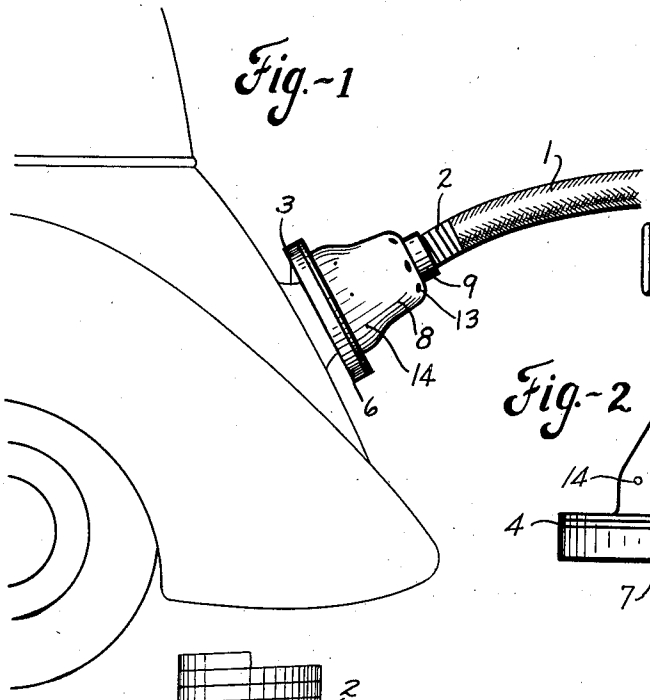
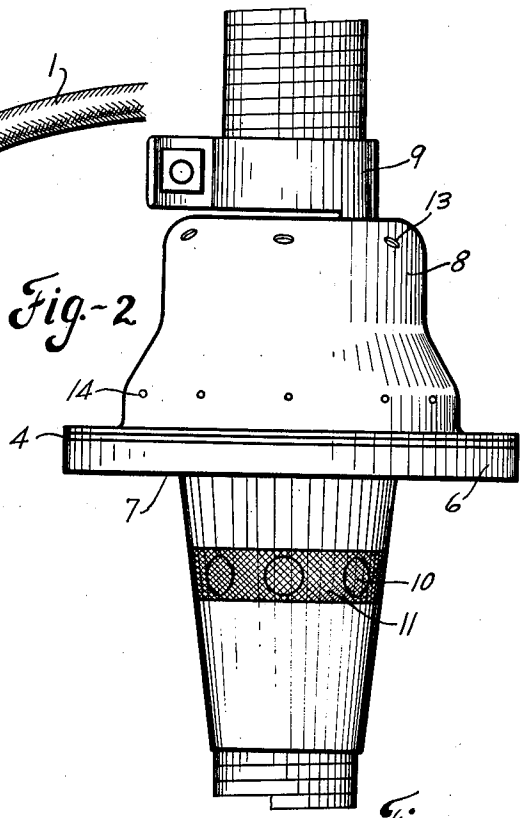


Fig.-2



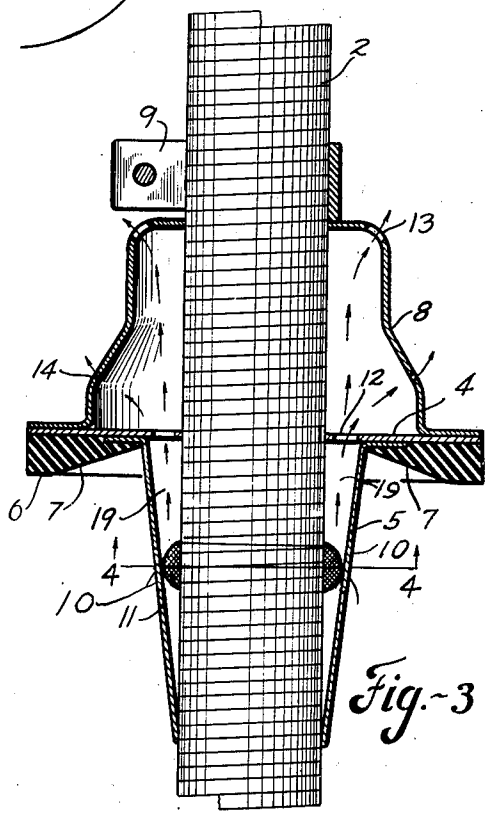
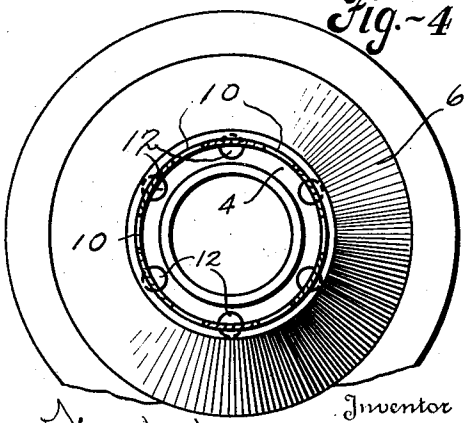


Fig.-3

Fig.-4



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NOZZLE VALVE ATTACHMENT

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20 Claims. (Cl. 226—109)

This invention pertains to liquid dispensing apparatus, and more particularly to a tank closure and vent unit for attachment to a hose nozzle to be introduced into a tank opening for controlling the escape of displaced air from the tank and preventing ejection of liquid thereby. While the present invention is herein shown and described in its application to hose nozzles for dispensing gasoline, it is to be understood that the invention is not limited to such purpose alone, but is applicable to nozzles for supplying liquids of other character.

In dispensing gasoline into fuel tanks of automobiles it is not unusual that the gasoline is forced from the tank opening by the reaction of an entrapped body of air before the tank is completely filled. In any event, the outflow of air past the entering stream of gasoline causes a considerable portion of the volatile content of the fuel and minute globules or particles thereof to be carried away by the escaping air as gas or spray. More or less violent eruptions of fuel and air frequently occur while the tank is being filled wherein the liquid fuel is caused to overflow the tank.

The present nozzle attachment not only serves to close and seal the tank opening about the inserted nozzle when dispensing gasoline to prevent eruptive return flow of the liquid fuel, but it also automatically controls the escape of displaced air from the tank and maintains sufficient super-atmospheric pressure therein to restrain excessive evaporation of the volatile portion of gasoline from the supply stream.

The object of the invention is to provide a tank closure unit, having an air control vent passage for application to a hose nozzle, which may not only be economically manufactured but will be efficient in use, automatic in action, uniform in its operation, having minimum parts, and unlikely to get out of repair.

A further object of the invention is to provide closure means for the filling opening of a tank about the dispensing nozzle to prevent eruptive discharge or overflow of liquid from the tank.

A further object of the invention is to control and restrain the escape of displaced air from the tank to minimize loss of liquid and gaseous content entrained therewith.

A further object of the invention is to maintain sufficient pressure within the tank being filled to minimize vaporization of volatile liquid.

A further object of the invention is to provide a nozzle attachment which will be readily and quickly applicable to existing nozzles and readily interchangeable upon nozzles of corresponding size.

A further object of the invention is to provide a tank closure and vent unit having the advantageous structural features and inherent meritorious characteristics herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described or illustrated in the accompanying drawing.

In the drawing, wherein is shown the preferred but obviously not necessarily the only forms of embodiment of the invention,

Fig. 1 is a side elevation showing in somewhat exaggerated size the present closure and vent unit applied to the tank opening of an automobile fuel tank.

Fig. 2 is a side elevation of the unit and a portion of the nozzle to which it is applied.

Fig. 3 is a vertical sectional view through the assembled unit.

Fig. 4 is a transverse sectional view on line 4—4 of Fig. 3.

Like parts are indicated by similar characters of reference throughout the several views.

While for illustrative purposes, but with no intent to unduly limit the application or scope of the invention, it is herein shown and described as applied to a hose nozzle for supplying gasoline to the fuel tank of an automobile, it is to be understood that such is for the purpose of explanation and that the invention is not limited or restricted to such use only, but may be applied to dispensing nozzles for any purpose.

In the drawing, 1 is the fuel supply hose, and 2 the hose nozzle, which is introduced into the fuel tank opening 3 of a motor vehicle, indicated in Fig. 1. The tank opening is ordinarily of materially larger diameter than that of the hose nozzle introduced thereinto, leaving a surrounding space through which the displaced air escapes and through which in its escape it forces more or less liquid fuel into the open where it is lost. The outrush of air under slight compression, due to the filling of the tank, in counterdirection to the inflowing stream of fuel and thereabout causes considerable distortion of the fuel stream whereby it is broken and divided and droplets and minute globules are separated therefrom and entrained with the outrushing air

from the tank. Many times the outrush of a relatively large body of entrapped air will divert substantially the entire inflowing stream of fuel out through the opening of the tank about the nozzle with a geyser effect and resultant loss of considerable fuel.

The present nozzle attachment is designed to overcome these difficulties and effect a considerable saving of fuel. The closure and vent unit comprises a disc or diaphragm 4 having therein a central opening through which the hose nozzle 2 extends and provided on its lower side with a tapered tubular extension 5, which at its lower and smaller end substantially fits or conforms to the periphery of the hose nozzle 2. The tapered tubular extension 5 is fixedly secured to the diaphragm 4 and contiguous to the latter is surrounded by a sealing collar or gasket 6, preferably of rubber or other semi-flexible composition. The sealing gasket or collar 6 has a tapered or flaring face 7 for contact with the mount of the tank opening. This flaring or tapered contour serves to more easily center the dispensing nozzle in the tank opening and facilitates a leak-tight joint between the closure and vent unit and the mouth of the tank under slight pressure applied to the nozzle or the unit by the operator.

Surmounting the diaphragm or disc 4 and surrounding the nozzle 2 is a dome 8 fixedly attached to the upper side of the disc 4. A clamp collar 9 attached to the top of the dome 8 serves to fixedly secure the unit in its adjusted position upon the dispensing nozzle 2.

The tubular tapered extension 5 is provided at mid-height with a series of vent holes 10 covered by a fine mesh screen 11. The holes 10 permit the escape of entrapped air from the tank through such screened holes 10 into the concentric jacketed space 19 intermediate the tubular extension 5 and the nozzle. From this space the escaping air passes upwardly through a series of ports or holes 12 in the diaphragm or disc 4, through which the space 19 communicates with the interior of the dome 8. The holes or ports 12 in the diaphragm 4 are preferably of somewhat smaller size than the openings 10 in the tubular extension and, as shown in Fig. 4, are in staggered or offset relation thereto. This affords a baffle effect, causing the escaping air to follow a tortuous path. The dome 8 is provided about its top with a series of vent holes 13, preferably of somewhat smaller size than the holes 12 in the diaphragm and again offset or staggered in relation thereto. In addition to the holes 13 at the top of the dome a further series of holes 14 are preferably, although not necessarily, provided about the base of the dome. The relative sizes and disposition of the several series of vent holes through which the escaping air passes prevents a rapid outrush of entrapped air, retarding the air flow sufficiently that it will not distort and break up the fuel supply stream, and due to the baffling effect it will not carry out any appreciable quantity of entrained fuel globules or droplets. At the same time, by restraining the outrush of air from the tank, there is temporarily induced therein a slight back pressure which, while not sufficient to interfere with the inflow of fuel, will nevertheless be sufficient to retard or prevent excessive evaporation of the volatile content of the fuel.

The addition of the dependent tapered tubular extension 5 below the closure head or diaphragm and the addition of the perforate dome 8 thereabove, by providing a tortuous baffled passage for the escaping air, materially increases the effectiveness of the unit.

The closure head held in contact with the tank opening by the operator's grasp of the inserted nozzle prevents any geyser-like eruption of the fuel and, while permitting orderly and controlled escape of the air, will effectively prevent distortion of the supply stream of fuel and the entrainment of particles thereof in the air current.

While the closure head or collar has been herein shown and described as having a concave face covered with synthetic rubber, or other sealing composition, it is to be understood that the contact face may be formed with its taper or flare in the opposite direction affording a convex seating surface, or made flat, and further, if the head or collar is sufficiently accurately finished, the gasket or yielding sealing material may be omitted.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. A tank closure and vent unit applicable to a dispensing nozzle including a closure head engageable with the tank opening through which the nozzle extends, a dependent tubular jacket surrounding the nozzle beneath the closure head forming intermediate the jacket and nozzle an annular air passage closed at its lower end having communication with the interior of the tank through lateral openings in the wall of said tubular jacket, a perforate dome surmounting the closure head, a diaphragm disposed in a plane substantially perpendicular to the axis of the nozzle having therein a plurality of vent holes affording communication between the annular air passage and the dome, the respective vent openings in the jacket wall, the diaphragm and in the dome being unaligned and of such relative size as to baffle the escape of entrapped air, the construction and arrangement being such that the displacement of air by inflow of liquid to the tank is restrained and controlled to prevent eruptive discharge of liquid and minimize entrainment of liquid in the escaping air.

2. A dispensing nozzle attachment including a closure head concentrically affixed thereto, a dependent tubular extension thereon surrounding the nozzle in spaced relation thereto, a dome surmounting the closure head in concentric relation with the nozzle, and a series of unaligned air vent openings in the dependent tubular extension, the closure head and the dome providing a permanently open tortuous passage through which entrapped air may escape to atmosphere from a tank to the opening of which the closure head is applied.

3. A tank closure and vent unit including a closure head applicable in sealing relation with a tank opening, a dependent tubular extension projecting therefrom and a dome surmounting the closure head, said head, tubular extension, and dome having therein an unaligned series of vent holes defining a permanently open tortuous path for the escape of entrapped air from the tank.

4. A tank closure and vent unit including a closure head engageable in sealing relation with a tank opening, a dome surmounting the head and a dependent tubular extension projecting from the side of the head opposite the dome, and forming an annular chamber about an associated dispensing nozzle inserted therethrough closed at its lower end and having lateral openings therein for communication with the tank the dome, head, and tubular extension being fixedly connected in axial alignment, concentric aligned openings through said members through which a dispensing nozzle may be inserted, a division wall between the tubular extension and dome having vertical openings therein, the dome having therein openings to atmosphere staggered in relation with the holes in the division wall, and a permanently open tortuous air escape passage formed thereby from the tank to which the device is applied, through the tubular extension and head into the dome and thence to atmosphere.

5. A tank closure and vent unit including a closure head having a tapered seat on its under surface for engagement with a tank opening and having a concentric opening therein through which a dispensing nozzle may be projected, said closure head having therein a plurality of permanently open restricted air escape orifices baffle means associated therewith and a tortuous passage formed thereby including alternating constricted and enlarged portions wherein fluid pressure is decreased through successive multiple stages, through which entrapped air may escape from the tank to atmosphere, the construction and arrangement being such that eruptive discharge of liquid from the tank under influence of entrapped air is prevented and the escape of air from the tank is restrained and regulated to noneruptive flow thereof.

6. The combination with a dispensing nozzle for insertion into the filling opening of a tank, of a closure head for the tank opening carried by the nozzle and engageable with the margin of the tank opening while the nozzle is inserted therein for closing the opening against the escape of liquid about the nozzle, and a permanently open air escape passage from the tank to atmosphere, including a succession of air pressure chambers communicating through restricted openings with each other and with the tank and with atmosphere through which air pressure within the tank is relieved by plural successive decreasing pressure stages.

7. The combination with a dispensing nozzle for insertion into the filling opening of a tank, of a disc-like closure collar surrounding the nozzle and attached thereto, the face of said collar being tapered and of sufficiently yielding character to make substantially leak-tight contact with the margin of the tank opening when applied thereto, a dependent tubular jacket surrounding the nozzle in spaced relation therewith beneath said closure collar, closed at its lower end and having lateral inlet ports providing communication between a tank in which the nozzle is inserted and the space interiorly of said tubular jacket, a dome surmounting the closure collar and having communication with the space within the jacket and air vent openings to atmosphere in the wall of said dome in unaligned relation with said jacket space.

8. A tank closure and vent unit comprising a closure collar engageable upon a dispensing nozzle insertable into a tank opening, the collar being a size sufficient to overhang the margin of the filling opening of the tank and of a character to make leak-tight contact therewith, means for fixedly securing the collar in axially adjusted position upon the nozzle, a perforate dome surmounting the collar, and a passageway leading past said collar from a point below the collar and in communication with a tank in which the nozzle may be inserted and discharging into the dome, the passage and dome having air vent ports communicating with the tank and with atmosphere respectively in unaligned relation and of different capacities, the construction and arrangement being such that the escape of air displaced from the tank by admission of fluid thereto is baffled and relieved through progressively decreasing pressure zones from tank pressure to atmosphere.

9. A tank closure and vent unit including a closure collar engageable upon a dispensing nozzle insertable into the filling opening of a tank, the collar being of sufficient size to overhang the margin of the filling opening and of such character as to make substantially leak-tight contact therewith, means for fixedly securing the collar in adjusted relation upon the nozzle, said collar having therein a restricted vent opening for escape of trapped air from the tank, and baffle means located above and below the closure collar in the path of escape of air from the tank through said vent opening directing the escaping air through a tortuous path of travel.

10. A tank closure and vent unit including a closure collar engageable upon a dispensing nozzle insertable into the filling opening of a tank, the collar being of sufficient size to overhang the margin of the filling opening and of such character as to make substantially leak-tight contact therewith, means for fixedly securing the collar in adjusted relation upon the nozzle, said collar having therein a restricted vent opening for escape of trapped air from the tank, a dependent tubular extension carried by the closure collar and surrounding the nozzle in spaced relation thereto, and an air escape passage formed thereby with which the said restricted vent opening communicates, said tubular extension having communication with the interior of the tank.

11. A tank closure and vent unit including a closure collar engageable upon a dispensing nozzle insertable into the filling opening of a tank, the collar being of sufficient size to overhang the margin of the filling opening and of such character as to make substantially leak-tight contact therewith, means for fixedly securing the collar in adjusted relation upon the nozzle, said collar having therein a restricted vent opening for escape of trapped air from the tank, a dependent tapered tubular extension carried by the closure collar and surrounding the nozzle in spaced relation therewith, throughout the major portion of its length but contacting the nozzle at its extremity and an intermediate air passage formed thereby with which the said restricted vent opening terminally communicates, the tubular extension having at least one

lateral opening therein through which said air passage communicates with the interior of the tank.

12. A tank closure and vent unit including a closure collar engageable upon a dispensing nozzle insertable into the filling opening of a tank, the collar being of sufficient size to overhang the margin of the filling opening and of such character as to make substantially leak-tight contact therewith, means for fixedly securing the collar in adjusted relation upon the nozzle, said collar having therein a restricted vent opening for escape of trapped air from the tank, a dependent tubular extension carried by the closure collar and surrounding the nozzle in spaced relation therewith, said extension making contact at its lower end with the periphery of the nozzle, said extension having therein at least one lateral vent port through which air may escape from the tank to the space intermediate the tubular extension and the nozzle and with which the air vent opening in the closure collar communicates to permit escape of air therethrough to atmosphere.

13. A tank closure and vent unit including a closure collar engageable upon a dispensing nozzle insertable into the filling opening of a tank, the collar being of sufficient size to overhang the margin of the filling opening and of such character as to make substantially leak-tight contact therewith, means for fixedly securing the collar in adjusted relation upon the nozzle, said collar having therein a restricted vent opening for escape of trapped air from the tank, a housing surmounting the collar and surrounding the nozzle with the interior of which the air vent opening communicates, said housing having therein at least one air escape opening to atmosphere.

14. A tank closure and vent unit including a closure collar engageable upon a dispensing nozzle insertable into the filling opening of a tank, the collar being of sufficient size to overhang the margin of the filling opening and of such character as to make substantially leak-tight contact therewith, means for fixedly securing the collar in adjusted relation upon the nozzle, said collar having therein a restricted vent opening for escape of trapped air from the tank, and a recessed housing surmounting the collar and having therein an opening through which the nozzle may extend, and air escape openings in the housing in laterally offset relation with the air vent opening in the collar.

15. The herein described method of minimizing waste of liquid while filling a tank, including the steps of inserting a dispensing nozzle into a filling opening of a tank, closing the filling opening exteriorly of the inserted nozzle sufficiently leak-tight to prevent discharge of liquid therethrough, maintaining a permanently open passage through a plurality of succeeding chambers of progressively increasing capacity for escape of entrapped air, while sufficiently retarding the escape of air from the tank to maintain temporarily therein a pressure slightly in excess of atmospheric pressure by which excessive evaporation of a volatile liquid is restrained.

16. The herein described method of preventing eruptive discharge of liquid from a tank while being filled under influence of high pressure air entrapped within the tank, including maintaining a permanently open path of escape for entrapped air, restraining the rapid escape of displaced air by successive abrupt steps of decompression and restricting the escape of air to a gradual outflow at substantially atmospheric pressure thereby preventing distortion of the inflowing stream of liquid, and temporarily maintaining a super-atmospheric pressure within the tank to prevent excessive evaporation during the filling operation.

17. The herein described method of preventing eruptive discharge of liquid from a tank while being filled, including maintaining a permanently open path of escape for entrapped air of progressively increasing capacity, preventing rapid outrush of entrapped air under pressure, by conducting the escaping air through successions of interconnected chambers of progressively increasing size wherein its pressure is intermittently reduced by successive stages restricting the escape of entrapped air to a gradual outflow at substantially atmospheric pressure of less than the volume of inflowing liquid and thereby temporarily maintaining a back pressure within the tank greater than atmospheric pressure and gradually dissipating such pressure.

18. The herein described method of preventing eruptive discharge of liquid from a tank while being filled, including maintaining a permanently open path of escape for entrapped air of progressively increasing capacity, preventing rapid outrush of entrapped air under pressure, restricting the escape of entrapped air, and conducting the escaping air through a plurality of succeeding abrupt decompression stages wherein the turbulence of the escaping air is permitted to subside before release to atmosphere.

19. The combination with a liquid supply nozzle for insertion into a tank opening of a head surrounding the nozzle in spaced relation with the discharge end thereof for contact with the margin of the tank opening and serving to limit the extent to which the nozzle may be inserted within the tank opening, and a permanently open relief passage for entrapped air consisting of a succession of pressure reducing chambers of progressively increasing capacity leading past the head from the tank to atmosphere, including alternating constricted and expanded portions through which the displaced air is relieved through successive stages of abrupt decompression and finally discharged at substantially atmospheric pressure.

20. The combination with a liquid supply nozzle for insertion into a tank opening of a chambered head surrounding the nozzle in spaced relation with the discharge end thereof, and adjustable thereon toward and from the discharge end of the nozzle, said chambered head having a restricted orifice communicating with the interior of the tank and a second restricted orifice communicating with atmosphere and an enlarged chamber therebetween through which air entrapped in the tank is relieved to atmosphere, and means for fixedly securing the head in its adjusted position on the nozzle, the construction and arrangement being such that the head makes contact with the margin of the tank opening and serves to limit the extent to which the nozzle may be inserted within the tank opening.

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