ABSTRACT: A safety automatic trip fluid dispensing nozzle for cooperatively sealing a tank fill pipe to prevent fluid splashage and vapor emission in which a valve mechanism with an operating linkage is preconditioned for valve mechanism operation upon fill pipe sealing and for valve mechanism deactuation upon unseating intentionally or inadvertently or upon increased fill pipe pressure transmitted to the dispensing nozzle beyond a predetermined pressure level.
Gasoline dispensing self-service stations have increased appreciably recently in various locations. Additionally, gasoline dispensing is now a commodity sold in retail outlets other than gasoline service stations including neighborhood grocery stores and supermarkets with the customer actually operating the gasoline pump. With the introduction of "preset" devices permitting a customer to pay a cashier at a location removed from the dispensing pump enabling the customer to fill his own tank for the predetermined volume and the increased use of bill, coin or credit card accepting gasoline dispensing pumps which dispense the selected and paid-for volume, it is increasingly important to provide increased safety measures to eliminate the hazards attendant in the dispensing of gasoline by untrained personnel. Continuous handling of the dispensing equipment by untrained, non-technical persons demands maximum protection against mishaps and malfunctioning particularly at busy or unattended service stations.

A further embodiment of the seal is shown in FIG. 2 which is threadably connected bushing 13 for cooperatively receiving a flexible hose (not shown) from a gasoline dispenser pump. The discharge end 14 of the nozzle is provided with a nozzle dispensing tube 15 secured to the discharge end 14 by suitable bushings 16 and 17 with the discharge end 18 of tube 15 being shown inserted into a gasoline tank fill pipe 19 at the top end of which there is an inverted flange 20 for cooperatively receiving a releasable latching lug 21 secured to nozzle tube 15. A fluid detector opening 22 at the lower end of the nozzle tube 15 communicates with the air line 23 which extends through nozzle tube 15 into the nozzle body 11 with the upper end 24 of line 23 terminating in chamber 25 formed in the nozzle body 11. A vent opening 26 positioned adjacent with the latching lug 21 communicates with the air and vapor evacuation line 27 which extends through the tube 15 to discharge vapor and air through the opening 28 in tube 15 to the fitting 29 secured to the tube 15 to which fitting air and vapor evacuation line 30 is connected at one end and the other end is connected at a remote location to a venting reservoir or chamber for receiving vapor and air without venting to the atmosphere for air pollution or contamination in the vicinity of the gasoline service station.

A fill pipe sealing assembly 31 is secured to the nozzle tube 15 through the collar 31 that is fixed in position 32 to retain the coil spring 33 in encircling position about tube 15. A fill pipe sealing member 34 made of any suitable resistant material which will not deteriorate readily when subjected to gasoline and gasoline vapors is yieldably biased by spring 33 into engagement with the inverted flange 20 of a fill pipe 19 when the discharge tube 15 is inserted properly and releasably latched as shown in FIG. 1. The face 35 of the seal member 34 is preferably resilient or spongy to obtain maximum seating of the seal member and the inverted flange 20. A valve mechanism pre-conditioning link 36 is pivotally connected at 37 to the sealing member 34 at one end thereof and to a pivotal bell crank 38 at the other end thereof. Upon positioning the sealing member 34 from the unseated to the seated position, as shown in FIG. 2, bell crank 38 will rotate or pivot in a counterclockwise direction.

The inlet passage 12 is provided with a handle 39 which may be suitably insulated, preferably on the exterior, to make the handle more comfortable to use during cold weather. An inlet valve assembly 40, shown in the seated position in FIG. 2, has a valve member 41 secured to valve assembly plunger 42 which extends through a packing gland 43 in the body boss 44 with a coil spring 45 exerting pressure against the packing 43 through the threaded packing nut 46. The upper end of the valve assembly 40 in the inlet passage 12 has a coil spring 47.
exerting pressure downwardly on the valve 41 with the spring being retained in the valve assembly chamber 48 formed in the spring cover 49 that is threadably retained in the nozzle body 50. The valve seat 50 is restricted and forms with the circumferential opening 51 a Venturi effect upon fluid flowing through the restricted opening 50 to create a suction through the passage 52 communicating with the circumferential opening 51. Passage 52 leads to the suction chamber 53 in the body adjacent to the valve assembly. Fluid will flow in the valve assembly open condition through inlet passage 12 through the orifice 58 into the chamber 54 before passing to the discharging passage 14 and tube 15.

At the upper end of the valve mechanism actuating section 54 is an inlet pressure chamber 55 partially formed in the closure cap 56 secured by bolts 57 to the nozzle body with a pressure-responsive diaphragm 58 extending through the chamber 55. Fluid entering inlet passage 12 will flow through the passage 55 into the fluid pressure chamber 55. A diaphragm connected plunger 59 extends downwardly from the diaphragm housing 60 through the opening 61 into the vacuum chamber 53. Coil spring 62 will normally urge the diaphragm 58 upwardly except the force of spring 62 is overcome by the inlet pressure of the fluid to be dispensed. Upon proper pressure being exerted in the inlet passage 55 by the fluid tending to exert pressure upon the diaphragm 58, plunger 59 will be depressed urging plunger 59 downwardly into vacuum chamber 53 to engage the upper end 63 of plunger 64 that is connected to vacuum diaphragm 65 supported in the vacuum chamber 53.

The ball cage 66 includes the cage ring 66 for engaging the balls 67 in the seated position about the depending suction diaphragm plunger 64. The plunger 64 is slidable guided in its movement within the outer trip rod or plunger 68 that is movable within the bore 69 formed in the body depending boss 70 forming an annular chamber for receiving the coil spring 71 which normally urges plunger 68 upwardly in the ball cage 66. The plunger 68 is recessed to form a bell crank opening 72 permitting the free inner plunger engaging tip 73 of the bell crank to engage the terminal end 74 of plunger 64. A manual valve assembly opening lever 75 is pivotally connected at the pivot pin 76 to the plunger 68 at the lower end thereof with the pin 76 floating with the movement of the plunger 68. Accidental movement of the lever 75 may be prevented by the guard or housing 78 which shields the lever 75. A conventional type releasable lever-locking mechanism with spaced flow control openings 80 is pivotally mounted on the housing 78 to engage the free end of the lever 75 in the open valve position. An operating lever return spring 81 supported on lever 75 encircles the lower end of plunger 42.

In advance of the vacuum chamber 53, there is positioned in the body a cylindrical piston-receiving chamber 82 for slidably receiving piston 83 for movement therein against the action of spring 84. Venting port 85 is provided to prevent back pressure against the displacement of piston 83. Any pressure transmitted to chamber 25 from the discharge tube will be transmitted to the passage 86 in piston 83 which in turn will transmit such pressure to the circumferential groove 87 in piston 83 through the transverse openings 88. Any pressure transmitted from the circumferential groove 87 will pass through the vacuum chamber connecting passage 90 into vacuum chamber 53. During normal operation when fluid is flowing through the nozzle at normal pressures, air will flow from the fill pipe 23 into vacuum chamber 53 which in turn will have a vacuum created through the flow of fluid through the orifice 50 in the valve assembly creating a suction in chamber 53 through passage 52. However, in those instances when pressure in the gasoline tank, fill pipe, or dispensing nozzle may be increased above a predetermined level, this pressure is transmitted directly to the piston 83 against the action of spring 84 closing off the flow of air to the port 90 thereby increasing the vacuum created in the vacuum chamber 53 flexing the diaphragm 65 upwardly. The plunger 64 will be disengaged from the seated position upon plunger 68, the seated position being shown in FIG. 2, causing loss of the pivot and automatically tripping the valve mechanism to the inoperative position by closing the valve assembly 40 to terminate fluid flow through the nozzle dispenser.

In order to precondition operation of the safety fuel dispensing nozzle, the sealing means 31 must be in sealing engagement with the fill line opening in order to pivot the bell crank 38 out of engagement with the terminal end 74 of the plunger 64. Fluid pressure in the inlet passage 12 must be transmitted through passage 55 to the pressure chamber 55 to urge the plunger 59 downwardly in engagement with the plunger 64 in order to establish a firm connecting line with the pivot 76 maintained in position in order to have the lever 75 unseat the valve assembly 40 to permit fluid flow through the nozzle. In the event of reduction of inlet pressure below a predetermined amount, the diaphragm 58 will move upwardly disengaging the plunger 59 from plunger 64 thereby tripping the valve mechanism to the off position. Upon fluid detection in the opening 22 and line 23, increases suction in the vacuum chamber 53 will occur causing the valve assembly 40 to be lowered into the seated position as the increased suction will raise the plunger 64 upwardly causing a loss of the pivot 76. Upward vertical movement of the plunger 64 will also urge plunger 59 upwardly. Unseating of the sealing member 34 will cause the bellcrank 38 to pivot in a clockwise direction as shown in FIG. 2 to raise the end of plunger 64 also causing a loss of the pivot and terminate flow as the spring action of spring 47 in the valve assembly 40 will force the valve into the closed position.

Although a single preferred embodiment has been disclosed, many modifications to the pressure chamber may be incorporated as well as the elimination of the pressure chamber may be incorporated as well as the elimination of the inlet pressure chamber by incorporating a flow check valve.

1. A fluid-dispensing nozzle comprising a valve mechanism body having inlet and discharge passages, tank fill line sealing means displaceable on said body discharge passage preventing fluid splashage and vapor emission in a seated position on a tank fill line, a valve mechanism having a lever actuated linkage, means operatively connected with said seating means and said linkage for valve mechanism deactivation upon unseating of said seating means from said fill line and for preconditioning said linkage and said valve mechanism for actuation upon seating said sealing means upon said tank fill line, and means for deactivating valve mechanism operation upon pressure increase beyond a predetermined amount in the discharge passages.

2. A fluid-dispensing nozzle as claimed in claim 1, and means in said discharge passage communicating with said valve mechanism for deactivation of said valve mechanism upon fluid fill or contact.

3. A fluid-dispensing nozzle as claimed in claim 1, said seating means being yieldably retained on said discharge passage for seating engagement with the open end of a tank fill line.

4. A fluid-dispensing nozzle as claimed in claim 1, said seating means being yieldably biased on said discharge passage for seating and sealing the open end of a tank fill line, and means on said discharge passage for releasably locking the discharge passage on a tank fill line.

5. A fluid-dispensing nozzle as claimed in claim 1, said valve mechanism including a spring-loaded plunger valve assembly at said inlet passage, a valve-actuating section having a vacuum chamber and a positive pressure chamber in said body, said pressure chamber communicating with said inlet passage, said vacuum chamber having a pressure-responsive means therein, said vacuum chamber communicating with said valve assembly to transmit a pressure differential therethrough, means in said discharge passage for transmitting a pressure differential to said vacuum chamber, means movable with said pressure responsive means connected to said valve mechanism preconditioning means whereupon seating engagement of said sealing means with a fill line said safety.
mechanism may be actuated for operation and upon disengagement of said sealing means with a fill line or failure to maintain a predetermined pressure differential in said vacuum chamber, said valve mechanism will be urged into a close position.

6. A fluid-dispensing nozzle as claimed in claim 5, said fluid pressure chamber in said body having pressure responsive means therein, said spring loaded plunger valve assembly having a restricted opening and a lever-engaging plunger extending from said valve, said pressure responsive means in said vacuum chamber having a diaphragm and a linkage-actuating plunger extending therefrom, said pressure-responsive means in said fluid positive pressure chamber having a diaphragm and a linkage-actuating plunger extending therefrom for cooperation with said linkage-actuating plunger of said vacuum chamber pressure-responsive means whereby reduction or lack of fluid pressure in said fluid pressure chamber or unseating of said sealing means or improper pressure differential in said vacuum chamber will terminate fluid flow or prevent full preconditioning for actuation of said linkage for said valve mechanism.

7. A fluid-dispensing nozzle as claimed in claim 1, said valve mechanism body discharge passage having an elongated tube for insertion into a tank fill pipe and a return line therein for transmitting a pressure differential communicating with the interior of said fill pipe to detect fluid level therein, said tank fill line sealing means having a resiliently biased collar for cooperatively seating engagement with the open end of a fill pipe guidably supported on said tube, fill pipe latching means on said tube for releasably engaging a fill pipe in the seated position of said sealing means on a fill pipe, said valve mechanism having a valve assembly in said inlet passage, said valve assembly having a spring-actuated plunger and valve forming the valve a restricted inlet orifice to restrict fluid flow in the valve open position, an inlet pressure chamber communicating with said inlet passage having a pressure responsive diaphragm and connected plunger, a vacuum chamber communicating with said return line and said tube and said restricted opening having a pressure responsive diaphragm and connected plunger, said plungers being adapted for cooperation with each other for transmitting a force when suitably preconditioned with fluid pressure and said inlet passage and the absence of a fluid in said tube, said lever actuated linkage connected to said sealing means and at least one of said plungers and having a manual actuating link adapted to cooperate with said linkage and one of said plungers and said valve assemblies spring actuating plunger whereby sealing means seating on a fill pipe and inlet fluid pressure precondition said lever actuated linkage for operation of said manual actuating link, and upon fluid pressure drop detected in said inlet pressure chamber below a predetermined lever or unseating of said sealing means from said fill pipe or fluid detection in said tube said linkage will be deactivated automatically positioning the valve mechanism in an inoperative position terminating fluid flow through the nozzle body.