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DISPENSING NOZZLE

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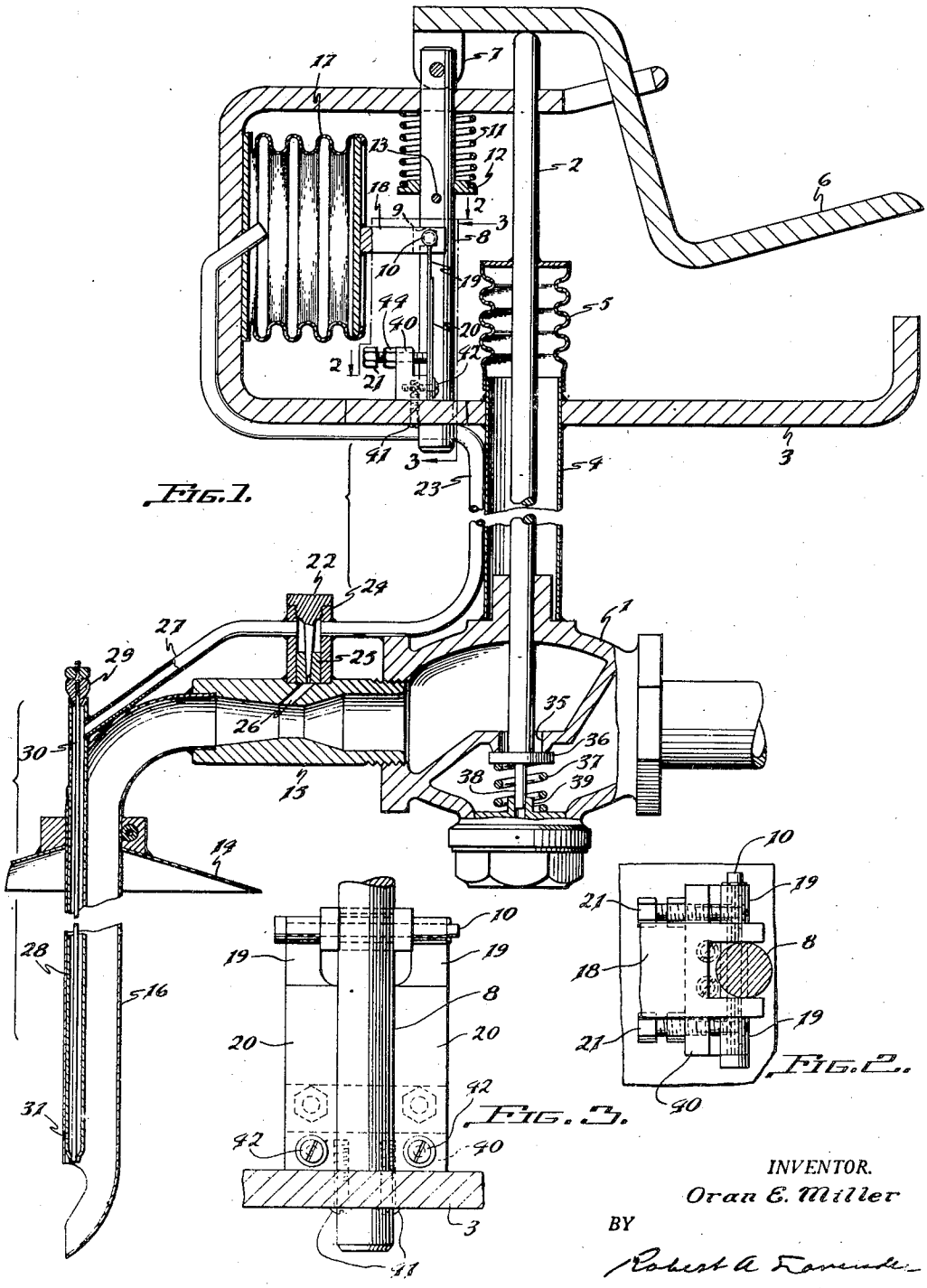


FIG. 1.



FIG. 2.



FIG. 3.

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## DISPENSING NOZZLE

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11 Claims. (Cl. 62—1)

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This invention relates to liquid dispensing apparatus and is particularly concerned with a liquid dispensing nozzle of the type used for filling containers or the like wherein the dispensing nozzle embodies a valve which is manually opened and which automatically closes in response to the container becoming filled up with liquid being dispensed to avoid overflowing and splashing.

The device of my invention is particularly suited to the dispensing of a readily vaporizable liquid such as for example, liquid nitrogen which is commonly used in liquid nitrogen traps for freezing out moisture in vacuum systems, the liquid nitrogen being at a very low temperature and being very well suited to this purpose. The liquid nitrogen vaporizes very readily and when dispensing it some of it passes through the dispensing nozzle in vapor form, particularly when the operation of filling a trap or other container is begun.

A primary object of my invention is to provide a liquid dispensing nozzle of the type described so constructed and arranged that the automatic closing mechanism of the nozzle will not operate in response to an initial flow of vapor of the liquid being dispensed.

Another object of my invention is to provide a liquid dispensing nozzle having automatic shutoff mechanism so arranged that it will respond to filling up of a container into which liquid is being dispensed but will not respond to vapor of the liquid.

Another object of my invention is to provide a dispensing nozzle having an automatic shutoff mechanism comprising a pressure system controlled by rising of the liquid level in a container into which the liquid is being dispensed and having an automatic venting means associated with the pressure system so arranged that vapor of the liquid being dispensed will not actuate the shutoff mechanism.

Another object of my invention is to provide a dispensing nozzle with an automatic shutoff mechanism comprising a pressure system having a thermally controlled vent so arranged that the vent is operated automatically in response to the fluid being dispensed so that vapor of the liquid dispensed will not operate the shutoff mechanism.

Further objects and numerous advantages of my invention will become apparent from the following detailed description and annexed drawing wherein Figure 1 is a cross sectional view of a dispensing nozzle embodying my invention.

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Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a view taken along line 3—3 of Fig. 1.

As pointed out above, my invention is particularly suited to dispensing liquid nitrogen into liquid nitrogen traps or the like but it is to be understood that the nozzle is not limited to use with this particular fluid. The following detailed description describes the invention in connection with the dispensing of liquid nitrogen into traps in a vacuum system.

Referring to Fig. 1, numeral 1 designates the liquid nitrogen dispensing valves, the valve having a stem 2 extending upwardly into the housing 3 within which is the manual and automatic mechanism for operating the dispensing valve. The valve 1 is of conventional construction, the inlet being at the right and the outlet at the left and the port being designated 35. The valve member 36 seats upwardly and is urged in seating direction by a coil spring 37 which surrounds a guide stem 38 which extends downwardly from the valve member into a guide bearing 39 in the lower part of the valve casing. As shown, the housing 3 is separate from the valve body, being connected thereto by a tube 4 with the valve stem sealed by a Sylphon bellows 5. The stem 2 may be depressed to open the valve 1 by means of a handle 6 which has a lug 7 which fulcrums on the top of frame 3 and to which is linked a latch member 8 which has a notch 9 in its center portion adapted to engage a roller on a rod or pin 10 forming a detent. Surrounding the member 8 is a coil spring 11 which bears against a disc 12 held in place by a cotter pin 13.

The operation of the parts as so far described is that when it is desired to open the valve 1, handle 6 is merely depressed and this causes the handle to turn about its pivot, that is, fulcrum 7, the stem 2 being thus depressed to move valve 1 in opening direction against biasing spring 37 which normally urges it in closing direction. When handle 6 is released spring 37 seats valve member 36.

The outlet of the valve 1 is connected to a Venturi tube 15 having a restricted throat, the venturi being connected to the dispensing nozzle 16, and the nozzle carrying a shield 14 which protects against splashing.

The mechanism for automatically closing the valve 1 when the trap is filled with liquid nitrogen includes a Sylphon bellows 17 within the housing 3, the movable end of the bellows 17 carrying a yoke member 18 which engages the pin or rod 10 so as to be operable to pull it out of the notch 9 when

the bellows collapses. The rod 10 extends transversely through the arms of yoke 18 and the roller on rod 10 is between the yoke arms so as to reduce friction in movement into and out of notch 9. (See Figs. 2 and 3.)

The ends of rod 10 are engaged on the ends of spring brackets 19 extending upwardly from the bottom of housing 3, the ends of the brackets being narrowed as may be seen on Fig. 3 and they are curled over, that is around the ends of rod 10 outside of yoke 18. Pin 10 has a head at one end and a cotter pin at the other to hold it in place. Adjacent each bracket 19 is a slightly shorter leaf spring 20 and the spring brackets and leaf springs are supported from a right angle bracket 40 attached to the bottom of casing 3 by screws 41, the spring brackets and leaf springs being attached to bracket 40 by screws 42. Numeral 21 designates adjusting screws extending transversely through bracket 40 and their ends bearing against spring brackets 19. The position of screws 21 may be set by lock nuts as shown at 44. The purpose of adjusting screws 21 is to adjust the force required to move the upper ends of spring brackets 19 and pin 10 to the left, that is out of notch 9. Where screws 21 are screwed against members 19 and 20 the force tends to bend or spring these members to the right (Figs. 1 and 2). Thus a greater force is required to move the upper ends of members 19 to the left. Screws 21 are similarly adjusted and in this way the force required to pull pin 10 out of notch 9 is adjusted. Spring brackets 19 form resilient tie members which through the detent formed by pin 10 restrain upward movement of member 8 when pin 10 is engaged in notch 9 in member 8.

The interior of the bellows 17 is connected by tube 23 to a member 24 having an internal recess which communicates through an orifice member 25 and a channel 26 with the restricted throat of the venturi. Numeral 22 indicates a screw threaded plug engaging member 24 and having a needle valve extending into the orifice in member 25 whereby the orifice can be variably adjusted. The recess within member 24 also communicates by means of a tube 27 with a vertical tube 28 extending downwardly within the vertical portion of the nozzle 16. At the upper end of tube 28 is a valve member 29 carried on the end of a rod 30 mounted longitudinally within the tube 28. The tube 28 and the rod 30 are made of materials having different coefficients of expansion so that the valve 29 is normally away from its seat to vent the tubes, but when the cold expanding nitrogen comes in contact with the tube 28 and rod 30, the thermal contraction of the different metals causes valve member 29 to seat, thus closing the vent. The purpose of the structure just described will become apparent below.

In operation when it is desired to fill a liquid nitrogen trap with liquid nitrogen, the nozzle 16 is inserted into the trap, and then the valve 1 is opened by depressing handle 6 in the manner described above. As the level of liquid nitrogen in the liquid trap rises, it immerses the lower end of the nozzle 16 covering a small orifice 31 which communicates with the interior of tube 28. When this happens, the valve 1 will automatically close in a manner about to be described. When liquid nitrogen is flowing through the valve 1, and through venturi 15, a reduced pressure is produced in its restricted throat which tends to reduce the pressure in member 24, and also within the bellows 17 which communicates



by way of tube 23, depending upon the setting of needle valve member 22. When orifice 31 is above the level of liquid nitrogen, however, there is very little evacuation, that is, reduction of pressure and bellows 17 does not function. However, when orifice 31 becomes covered, the pressure within the bellows 17 is reduced in the manner described, and it collapses, moving yoke member 18 and pin 10 to the left so that the pin is pulled out of notch 9 unlatching the latch mechanism, and when this happens, the valve 1 automatically closes. That is, the spring 37 which is part of valve 1 moves the stem 2 upwardly moving fulcrum 7 bodily upwardly and pulling member 8 upwardly against the force of spring 11. If the handle 6 is now released by the operator, the spring 11 will return the latch mechanism, and the fulcrum 7 back into the positions shown on Fig. 1 with the rod 10 relatching into the notch 9 as soon as bellows 17 again expands. By adjusting needle valve member 22 the system can be regulated so that orifice 31 must definitely be immersed before the bellows 17 functions.

The purpose of the valve member 29 and the vent in the tube is to prevent the automatic mechanism operating to close the valve in response to the initial flow of vaporized liquid nitrogen which passes through the valve 1 when it is first opened. If the tube connections were not vented by valve member 29 when valve 1 is first opened, this initial flow of vaporized liquid nitrogen might produce such a vacuum in venturi 15 as to operate the bellows mechanism causing it to close the valve. By the time that the initial flow of vaporized liquid nitrogen has passed, valve member 29 will have seated sealing the vent and thus preparing the system to automatically operate when the trap becomes filled with liquid nitrogen.

From the foregoing those skilled in the art will observe that I have provided an improvement which renders the nozzle adaptable to use with highly vaporizable liquids and which is positive in action although utilizing a minimum of parts.

The foregoing disclosure is representative of the preferred form of our invention and it is intended that it be interpreted in an illustrative rather than a limiting sense, and that the scope of the invention be determined only in accordance with the claims appended hereto.

I claim:

1. In a fluid dispensing apparatus for highly volatile fluids in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means associated with the valve for closing the valve in response to the filling up of a container into which liquid is being dispensed and means associated with the automatic shut-off mechanism for controlling the operability of said mechanism, said latter means normally maintaining said mechanism inoperable, but being responsive to the temperature of the fluid being dispensed to render said mechanism operable upon the dispensing of fluid having a temperature lower than a predetermined value.

2. In a fluid dispensing apparatus for highly volatile fluids in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means associated with the valve for closing the valve in response to the filling up of the container into which liquid is being dispensed and thermostatic

means associated with the automatic shut-off mechanism responsive to the temperature of the fluid being dispensed and so arranged that the shut-off mechanism is rendered unresponsive to an initial flow of vapor of the liquid being dispensed when a filling operation of the container or the like is begun.

3. In a fluid dispensing apparatus for highly volatile fluids in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means associated with the valve for closing the valve in response to the filling up of a container into which liquid is being dispensed, said automatic shut-off means comprising a pressure system and means comprising a thermostatic valve associated with the pressure system and responsive to the temperature of the fluid being dispensed, the thermostatic valve being so arranged that it controls the pressure system in a manner to render the system initially ineffective to operate in response to flow of vapor of the liquid being dispensed.

4. In a fluid dispensing apparatus for highly volatile fluids in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means associated with the valve for closing the valve in response to the filling up of a container into which liquid is being dispensed, said automatic shut-off means comprising a pressure system and means comprising a thermostatic valve associated with the pressure system, said thermostatic valve having a normal open position, wherein said pressure system is maintained ineffective to operate said automatic shut-off means, and a closed position, wherein said pressure system is permitted to operate said automatic shut-off means, said thermostatic valve being responsive to the temperature of the fluid being dispensed to automatically close upon the dispensing of a cold fluid.

5. In a fluid dispensing apparatus for highly volatile fluids in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means associated with the valve for closing the valve in response to the filling up of a container into which liquid is being dispensed, said automatic shut-off means comprising a pressure system and means comprising a normally open thermostatic valve associated with the pressure system for normally venting said system whereby the system is rendered ineffective to operate to close said control valve, said thermostatic valve closing in response to the temperature of the fluid being dispensed to render said system effective.

6. In a fluid dispensing apparatus for a highly volatile fluid, in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means associated with the valve for closing the valve in response to the filling up of a container into which liquid is being dispensed, said automatic shut-off means comprising a pressure system, means comprising an automatic valve associated with the pressure system and movable to a normal position wherein the pressure within said system is maintained at a value ineffective to operate said shut-off means, and means responsive to the temperature of the fluid being dispensed for moving said thermostatically controlled valve from said normal position to a position wherein said pressure is permitted to operate said shut-off means.

7. In a fluid dispensing apparatus for a highly volatile fluid, in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means including a vacuum chamber associated with said valve for closing said valve in response to the attainment of a critical vacuum within said chamber, a Venturi section communicating with said chamber for establishing a vacuum therein in response to fluid flow, a first atmospheric vent disposed adjacent the tip of said nozzle and communicating with said chamber, a second atmospheric vent disposed at a point remote from the tip of said nozzle and also communicating with said chamber, valve mechanism associated with said second vent, and means for controlling the position of said valve mechanism in response to the temperature of the fluid being dispensed.

8. In a fluid dispensing apparatus for a highly volatile fluid, in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means including a vacuum chamber associated with said valve for closing said valve in response to the attainment of a critical vacuum within said chamber, a Venturi section communicating with said chamber for establishing a vacuum therein in response to fluid flow, a first atmospheric vent disposed adjacent the tip of said nozzle and communicating with said chamber, and a second atmospheric vent disposed at a point remote from the tip of said nozzle and also in communication with said chamber, said means associated with second vent comprising a valve mechanism responsive to the temperature of the fluid being dispensed for controlling the effectiveness of said second vent in reducing the vacuum of said chamber.

9. In a fluid dispensing apparatus for a highly volatile fluid, in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means including a vacuum chamber associated with said valve for closing said valve in response to the attainment of a critical vacuum within said chamber, a Venturi section communicating with said chamber for establishing a vacuum therein in response to fluid flow, a first atmospheric vent disposed adjacent the tip of said nozzle and communicating with said chamber, and a second atmospheric vent disposed at a point remote from the tip of said nozzle and also communicating with said chamber, means associated with said second vent including a normally open valve mechanism responsive to the temperature of said fluid for closing said second vent and permitting the attainment of the critical vacuum of said chamber.

10. In a fluid dispensing apparatus for a highly volatile fluid, in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means including a vacuum chamber associated with said valve for closing said valve in response to the attainment of a critical vacuum within said chamber, a Venturi section communicating with said chamber for establishing a vacuum therein in response to fluid flow, a first atmospheric vent disposed adjacent the tip of said nozzle and communicating with said chamber, and a second atmospheric vent disposed at a point remote from the tip of said nozzle and also communicating with said chamber, means associated with said second vent including an automatic valve mechanism responsive to the temperature of the fluid being dispensed for controlling the

effectiveness of said second vent in reducing the vacuum in said chamber.

11. In a fluid dispensing apparatus for a highly volatile fluid, in combination, means forming a dispensing spout or nozzle, a control valve associated therewith, automatic shut-off means including a vacuum chamber associated with said valve for closing said valve in response to the attainment of a critical vacuum within said chamber, a Venturi section communicating with said chamber for establishing a vacuum therein in response to fluid flow, a first atmospheric vent disposed adjacent the tip of said nozzle and communicating with said chamber, and a second atmospheric vent disposed at a point remote from the tip of said nozzle and also communicating with said chamber, means associated with said second vent including a normally open automatic



valve mechanism responsive to the temperature of said fluid for closing said second vent and permitting attainment of the critical vacuum in said chamber.

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