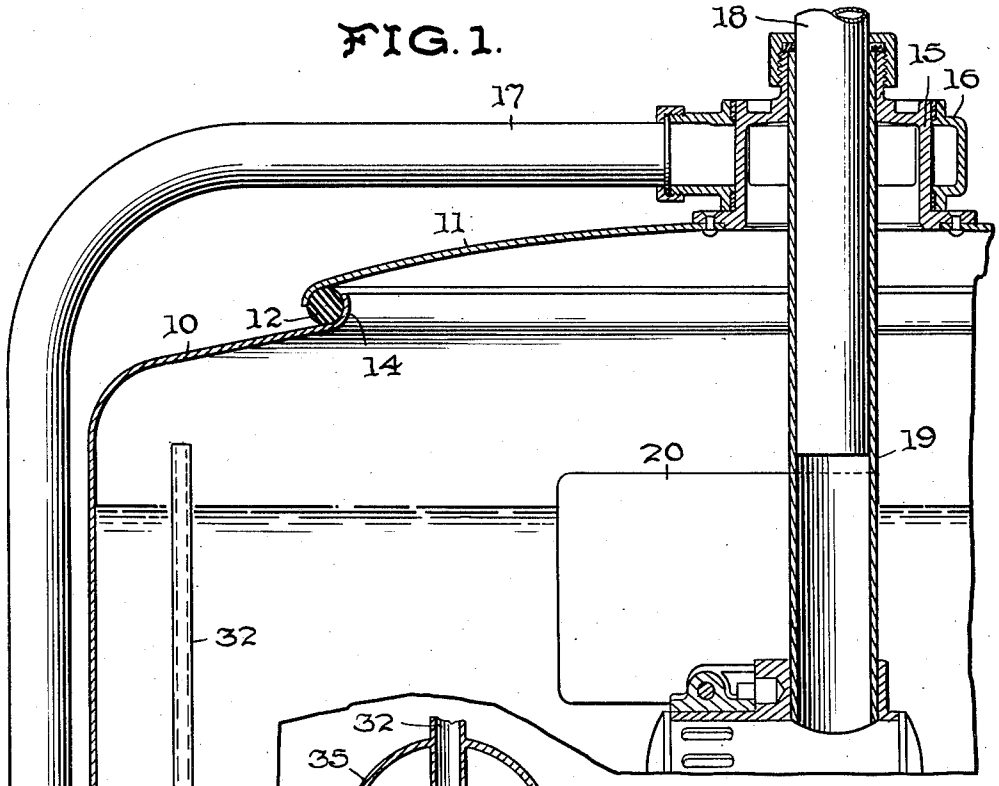
March 9, 1954 H. H. FRANZ 2,671,591

MECHANISM FOR FILLING CONTAINERS WITH A LIQUID

Filed July 3, 1952

FIG. 1.



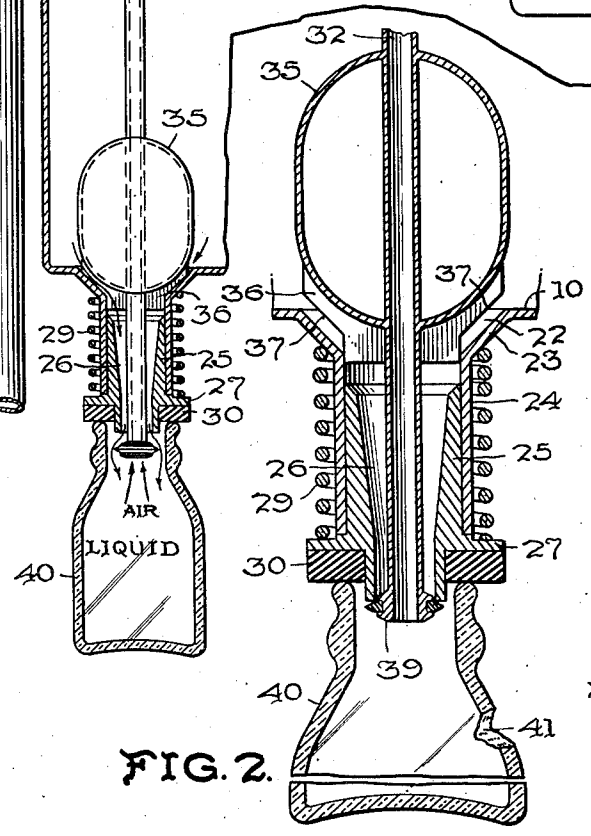
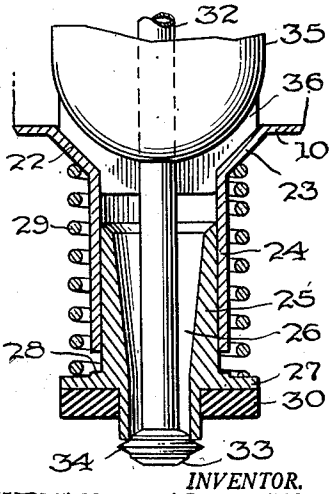


FIG. 2.

FIG. 3.



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MECHANISM FOR FILLING CONTAINERS WITH A LIQUID

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4 Claims. (Cl. 226—116)

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This invention relates broadly to an apparatus for filling, and more specifically to a mechanism for filling containers with a liquid such as milk.

In present day usage a method and apparatus which is commonly employed for rapidly filling containers with a liquid such as milk, and wherein such an operation must be performed under strict sanitary conditions, is disclosed in the patent to Stewart et al. 2,364,400, of December 5, 1944. The apparatus disclosed in the above mentioned patent includes a closed liquid reservoir with suitable means employed for maintaining a vacuum above the liquid level of the reservoir. In addition, the apparatus discloses a plurality of valves connected to and carried by the reservoir with suitable means embodied in each valve structure for actuating said valve as containers are delivered thereto.

It has been found from experience, when employing the method and apparatus of the Stewart et al. patent in the automatic filling of containers with a liquid, that when a broken or damaged container is delivered to one of the valve discharge ports that a large volume of air is delivered to the valve member. Such an air stream flows through the valve member and into the reservoir and becomes thoroughly entrained with the liquid therein. When such a situation occurs during the filling of containers with milk the air entrained within the milk is susceptible of producing an unsanitary condition, while at the same time the entrained air tends to cause the milk to be agitated and frothed, so that, upon the filling of subsequent bottles or containers the milk delivered to said containers is in a highly agitated condition. When containers have been filled with milk that has been agitated or frothed by an air stream it has been found that when the containers have stood for a while that the air would gradually escape so that the container, while appearing to be filled initially, now contains less than the full amount normally held by the container. Such a situation necessitates an additional filling or topping off of the various containers so as to bring the containers up to their prescribed liquid content.

The present invention is designed to prevent the passage of an air stream through the valve discharge port and into the liquid reservoir whenever a damaged or broken container is delivered to the discharge port.

One of the objects of the present invention is to provide a liquid filling apparatus having a discharge port with a valve member therein for closing said ports.

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Another object is to provide a discharge port in a liquid filling apparatus having a valve member with a vent tube which is actuated by atmospheric pressure for closing said port.

Another object is to provide an automatic liquid filling apparatus having a vent tube formed with a buoyant member for closing under atmospheric pressure a valve member slidably mounted in a discharge port when a broken or damaged container is presented to said port.

Still further objects are to provide a liquid filling apparatus which is economical of manufacture, simple in design and reliable and efficient in service.

Other objects and advantages more or less ancillary to the foregoing and the manner in which all of the various objects are realized will appear in the following description, which considered in connection with the accompanying drawings sets forth the preferred embodiment of the invention:

Referring to the drawings wherein the preferred embodiment of the invention is illustrated:

Figure 1 is a vertical sectional view through a filling tank and filling head with a bottle in filling position and the valve mechanism of the filling head in fully opened position;

Figure 2 is an enlarged vertical section through a filling head showing a damaged bottle engaging the filling valve mechanism with said valve in a closed position; and

Figure 3 is an enlarged vertical section through a filling head showing a filling valve mechanism in its closed or inoperative position.

Referring to Figure 1 there is shown a liquid supply reservoir 10 which is adapted to rotate in any well known manner. A cover 11 is provided for extending over a suitable aperture formed in the upper wall of the reservoir 10. A resilient gasket 12 is interposed between the outer peripheral edge of the cover 11 and an outwardly extending flange 14 formed on the upper wall of the reservoir 10, which flange defines the opening in said upper wall. The resilient gasket 12 is adapted to provide a substantially air tight engagement between the lid 11 and the flange 14 on the upper wall of the reservoir 10. An apertured boss 15 is secured by any suitable means to the cover 11 for rotation therewith and is positioned within a suitable fitting 16 which is connected to a vacuum line 17 for maintaining a sub-atmospheric condition within the reservoir above the surface of the milk therein. Milk is delivered to the reservoir 10 through a suitable pipe 18 which terminates in a tube 19 that is

supported within the central and upper portion of the boss 15. A suitable float valve 20 is connected to the lower end of the tube 19 for controlling the flow of milk into the reservoir and thus maintaining the reservoir 10 filled to a predetermined point as indicated in Figure 1.

The bottom surface of the reservoir 10 is provided with a series of circumferentially spaced pockets or depressions 22 which are defined by downwardly inclined portions 23 of the bottom surface of the reservoir 10. The downwardly inclined portions 23 of the reservoir 10 terminate in tubular shells or sleeves 24. Each pocket or depression 22 as defined by the downwardly inclined portion 23 of the reservoir 10, together with the shell 24 constitute a filling head unit or structure. As shown in Figures 2 and 3, the tubular shell portion 24 of the filling head unit has a valve member 25, which valve member is formed with a passageway 26 that communicates with the interior of the liquid reservoir 10 through the pockets 22. The lower end portion of the valve member 25 is provided with an outwardly projecting annular flange 27 which has an annular ledge 28, Figure 3, formed thereon, which engages the lower end of the tubular shell 24 for limiting the upward movement of the valve member within said shell 24. A coil spring 29 encircles the tubular shell 24 and is interposed between the annular flange 27 of the valve member 25 and the inclined surface 23 formed on the lower portion of the reservoir 10 for continuously urging the valve member downwardly or outwardly with respect to the tubular sleeve 24. The lower end portion of the valve member 25 has mounted thereon a resilient collar or gasket 30 which is positioned beneath and in abutting engagement with the flange 27 and is adapted to be engaged by a suitable container for urging the valve member 25 into the tubular sleeve 24 to effect the delivery of the milk from the reservoir 10 to said container.

A vent tube 32 extends through the passageway 26 of the valve member 25, and has formed on its outer surface at its lower end an enlarged annular projection or plug 33. The plug 33 is provided with an annular groove for the reception of a resilient sealing ring or member 34 which is adapted to engage the bottom or lower edge portion of the valve member 25 for effectively sealing or closing the passage 26. The outer or overall diameter of the vent tube 32 is less than the internal diameter of the passageway 26 at its lower or discharge end. Thus the spacing between the outer surface of the vent tube 32 and the inner surface of the valve member 25 is such as to permit the fluid to flow from the reservoir 10 to a suitable container positioned beneath the filling head structure. The vent tube 32 is of such a length as to project above the level of the liquid in the reservoir 10 so that any air flowing through the vent tube 32 will be delivered into the upper portion of the reservoir 10 above the level of the liquid contained therein. The vent tube 32 has formed thereon a buoyant member 35. The vent tube 32 and buoyant member 35 have secured thereto or formed integrally therewith along the lower surface of the member 35 and a portion of the tube 32 a plurality of spaced fins 36 which are formed with inclined outer edges 37 that are complementary to the inclined surfaces 23. The fins 36 are adapted to rest upon the inclined surfaces 23 of the filling head structure and said fins are relatively thin and so spaced on the member 35 and vent tube 32 as not to materially impede or restrict the passage of the milk from the reservoir 10 into the passageway 26 of the valve member 25 during the filling operation.

The vent tube 32 and buoyant member 35 constitute a vent tube assembly. The size of the buoyant member and the submerged weight of the vent tube assembly is such that the vent tube assembly slowly sinks in the liquid in the reservoir 10 until it finally rests lightly in the pockets 22 in the bottom of the reservoir rather than floats on the surface. Thus by forming the vent tube assembly of a size and weight that it will barely sink within the liquid, it requires only a small amount of force to move the vent tube assembly upwardly in the liquid in the reservoir 10.

In the operation of the present invention the fins 36 on the vent tube assembly normally engage the inclined surface 23 of the filling head structure and the spring 29 forces the valve member 25 downwardly until the lower end thereof engages the resilient member 34 carried by the plug 33 on the end of the vent tube 32. With the apparatus in this position, as shown in Figure 3, the valve mechanism is closed so that the milk within the liquid reservoir is incapable of being discharged through the filling head structure. There is, however, a continuous passage of air through the vent tube 32 into the upper portion of the liquid reservoir 10, from where it is withdrawn through the pipe 17 by the vacuum producing mechanism.

When a bottle or container 40, Figure 1, is presented to the filling head structure by suitable mechanism, not shown, the valve mechanism 25 will be raised within the tubular member 24 against the action of spring 29 as the bottle carrying mechanism raises the lip of the bottle into engagement with the resilient gasket 30. As the valve member 25 is raised within the tubular member 24 the air within the bottle is drawn through the vent tube 32 so as to equalize the air pressure within the bottle with that in the upper portion of the liquid reservoir 10, and milk is delivered from the reservoir 10 through the passageway 26 of the valve member 25 into the bottle 40. The method of filling a bottle or container during normal operation of the present invention follows the teachings disclosed in Stewart et al. Patent 2,364,400. Thus when the bottle 40 becomes filled the milk will be forced into the vent tube 32 until it reaches the level of the liquid in the reservoir 10. When this condition is reached additional milk is not delivered to the bottle 40 as a balanced condition now exists between the milk in the bottle and the milk in the reservoir 10. As the bottle, through its bottle actuating mechanism, is withdrawn from the filling head structure the spring 29 forces the valve member 25 downwardly until the lower end of the valve member engages the resilient member 34 carried by the plug 33 on the vent tube 32, at which time further discharge of milk through the passageway 26 is terminated. As the bottle 40 is gradually withdrawn from the lower end of the vent tube 32 the vacuum produced in the upper portion of the reservoir 10 draws the milk contained within the vent tube 32 into the reservoir until all of the milk within the vent tube 32 is delivered into the reservoir.

When a milk container or bottle 40 which is damaged or broken and thus has an aperture or opening 41, Figure 2, therein is presented to the filling head structure, the lip of the bottle engages the resilient member 30 and as the bottle actu-

ating mechanism continues to raise the bottle the valve member 25 is forced into the tubular sleeve 24 which would normally permit the delivery of the milk from the reservoir 10 through the passageway 26 and into the bottle 40. However, the air within the room wherein the milk filling apparatus is located flows through the aperture 41 and impinges upon the plug 33 and resilient member 34 and because of the excess of atmospheric pressure over the pressure existing within the reservoir forcing the vent tube and buoyant member 35 upwardly through the liquid in the reservoir 10 until the resilient member 34 engages the lower end of the valve member 25 for sealing the passage 26, as shown in Figure 2.

The extreme submerged lightness of the vent tube 32 and buoyant member 35 enables the excess of pressure, flowing through the aperture 41 in the bottle 40, to overcome the pressure of the milk in the reservoir 10 and to force the vent tube 32 and buoyant member 35 up through the liquid in the reservoir until the resilient member 34 engages the lower end of the valve 25 so as to close passageway 26 thereby preventing the passage of air through the passageway 26 and into the milk contained within the liquid reservoir 10.

What I claim is:

1. In a liquid filling machine, a liquid reservoir, means to maintain a body of liquid in said reservoir and an uninterrupted sub-atmospheric pressure condition above the surface of such liquid, a filling head on said reservoir for directing liquid to a container, said filling head including a valve member for controlling the flow of liquid from said reservoir, a vent tube projecting through said valve member and into said reservoir and terminating above the liquid in the reservoir, a buoyant member formed on said vent tube and submerged in said liquid, said vent tube being normally supported on said reservoir, a plug formed on the lower end of said vent tube engageable with said valve member for controlling the flow of liquid from said reservoir to said container.

2. In a filling machine, a reservoir, means to maintain a body of liquid in said reservoir and an uninterrupted sub-atmospheric pressure condition above the surface of such liquid, a filling head on said reservoir for directing liquid to a container, said filling head including a valve member for controlling the flow of liquid from said reservoir, a vent tube projecting through said valve member and communicating at its upper end with a portion of said reservoir above said liquid, a buoyant member formed on said vent tube and submerged in said liquid, said buoyant member being supported by said filling head, a plug formed on the end portion of said vent tube projecting through said valve member, the submerged weight of said vent tube and buoyant member in said liquid being such that atmospheric pressure acting on the net area of said plug will move said vent tube and buoyant member in said reservoir and said plug into engagement with said valve member.

3. In a filling machine, a reservoir, means to maintain a body of liquid in said reservoir and an uninterrupted sub-atmospheric pressure condition above the surface of such liquid, a filling head on said reservoir for directing liquid to a container, said filling head including a valve member for controlling the flow of liquid from said reservoir, a vent tube projecting through said valve member and communicating at its upper end with a portion of said reservoir above said liquid, a buoyant member formed on said vent tube and submerged in said liquid, a plurality of spaced fins provided on said vent tube and engageable with said reservoir to retain said buoyant member in spaced relation with said filling head, a plug formed on the end portion of said vent tube projecting through said valve member, the submerged weight of said vent tube and buoyant member in said liquid being such that atmospheric pressure acting on the net area of said plug will move said vent tube and buoyant member in said reservoir and said plug into engagement with said valve member.

4. In a filling machine, a reservoir, means to maintain a body of liquid in said reservoir and an uninterrupted sub-atmospheric pressure condition above the surface of such liquid, a filling head on said reservoir, a vent tube projecting through said filling head and communicating at its upper end with the portion of said reservoir above said liquid, a buoyant member formed on said vent tube and submerged in said liquid, said buoyant member being supported by said reservoir, an annular plug formed on the end portion of said vent tube projecting through said filling head, a movable valve member carried by said filling head and normally seated on said plug to prevent the flow of liquid from said reservoir, said valve member being unseated by a container positioned beneath said filling head to deliver liquid to the container, the submerged weight of said vent tube and buoyant member in said liquid being such that atmospheric pressure acting on the net area of said plug will raise said vent tube and buoyant member in said reservoir and move said plug into sealing engagement with said valve member if the container presented to said filling head is broken.

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