Jan. 5, 1943. C. E. KERR 2,307,223

FILLING VALVE

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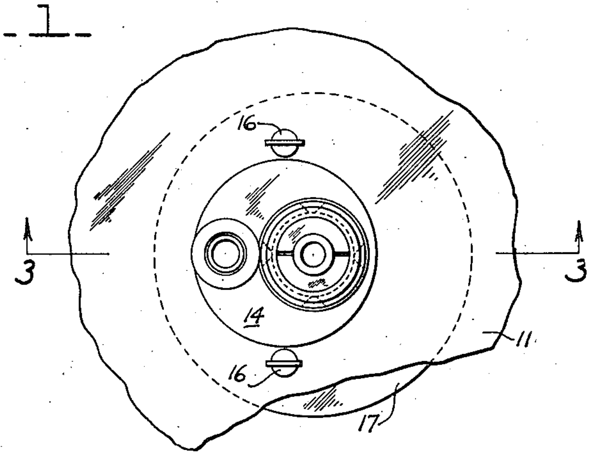
Fig. 1.



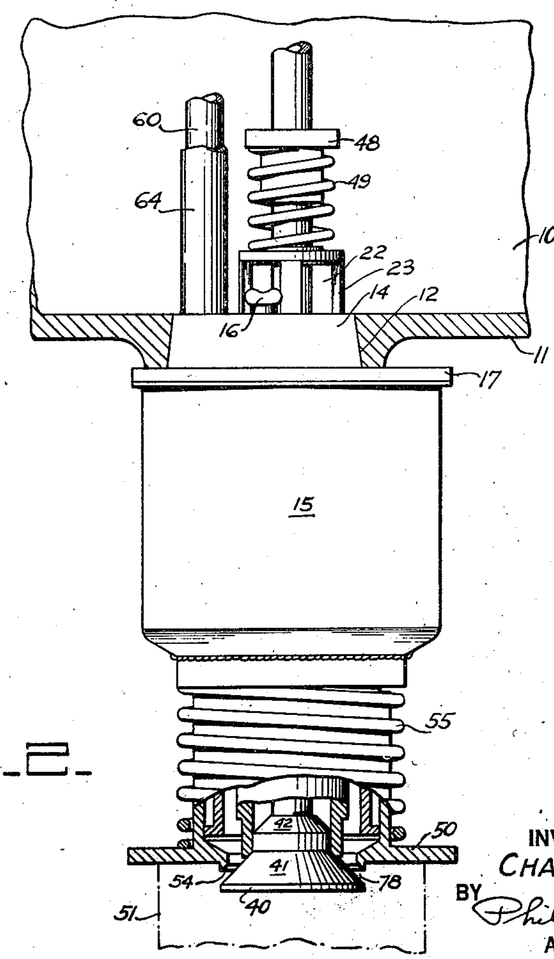


Fig. 2.

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FILLING VALVE

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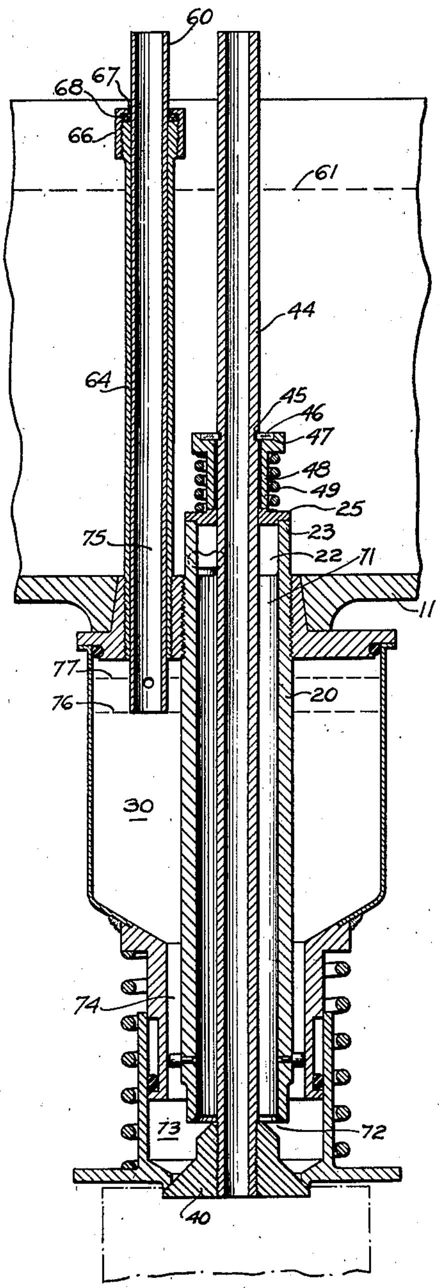

Fig. 3.

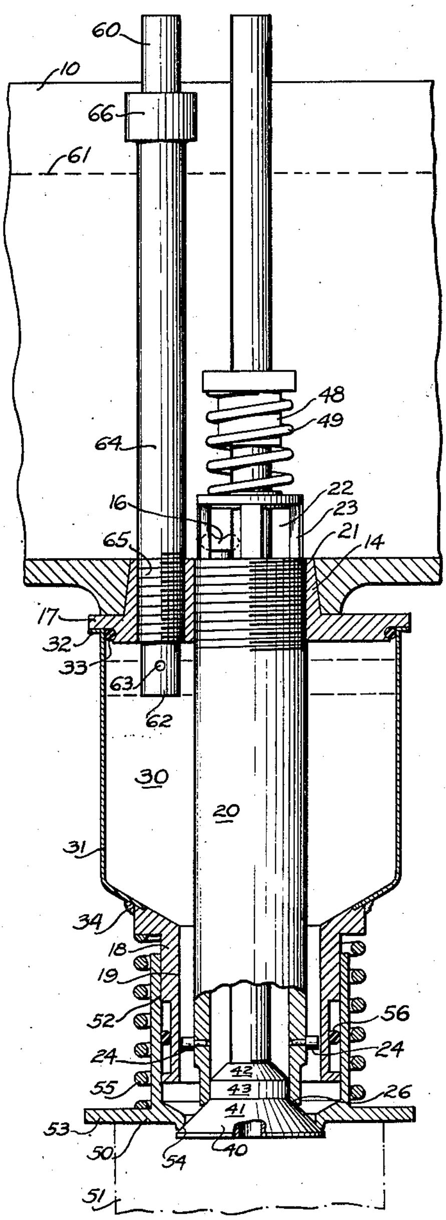

Fig. 4.

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FILLING VALVE

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7 Claims. (Cl. 226—108)

This invention relates to valves for use in machines which mechanically fill containers such as cans and bottles. A well-known type of machine for this purpose employs a revolving reservoir with a series of valves around its bottom. The containers are carried around in holders on a turret under the reservoir, and a cam way beneath the turret causes the holders to raise the containers into engagement with the valves which release fluid from the reservoir into the containers. A machine of this type is shown in U. S. Patent No. 1,355,015 issued October 25, 1920, to A. R. Thompson.

The particular use of such a machine with which this invention is concerned is the injection of a measured quantity of fluid into each container.

The object of the invention is to provide a valve which is simple in construction and automatic in operation.

Another object is to provide a valve which will inject the fluid into the container without foaming and which will not drip after the container has been removed.

A further object is to provide a valve which will accurately measure the quantity of fluid to be injected in each container and which is readily adjustable to vary the quantity.

The invention is disclosed as embodied in a valve adapted for use in filling cans.

Fig. 1 is a plan view of the valve mounted in the bottom of the reservoir.

Fig. 2 is a side elevation of the valve with the upper end broken off and the lower end in section.

Fig. 3 is a complete vertical section of the valve taken in the plane indicated by arrows 3—3 in Fig. 1.

Fig. 4 is a similar view with certain parts in elevation.

The valve is mounted as a unit in the bottom of the reservoir. In Fig. 2 the bottom 11 of the reservoir 10 is provided with a tapered aperture 12 in which a correspondingly tapered head 14 of the valve body 15 is held by thumb screws 16 (Fig. 1) which are threaded through the bottom 11 and into the flange 17 of the head 14. When the screws 16 are unscrewed the valve can be removed as a unit from the bottom of the reservoir.

Referring to Fig. 4, a tube 20 is threaded into the head 14 at 21. The upper end of the tube is milled out to provide fluid inlets 22 between posts 23. The lower end of the tube 20 can be closed by a valve 40.

A measuring chamber 30 surrounds the tube 20. The wall 31 of this chamber is secured at its upper edge 32 to the flange 17 of the head 14 and sealed by a seal 33. The wall 31 is secured at its lower edge 34 to the foot 18 of the valve body. The foot 18 has a cylindrical bore 19 of greater diameter than the tube 20 which has pins 24 to maintain cylindrical bore 19 concentric with tube 20.

A lift 50 is operated by the can 51 to actuate the valve. The lift 50 has a sleeve 52, which telescopes on the foot 18, a flange 53, which contacts the lip of the can 51, and a seat 54 for the valve 40. Compression spring 55 is interposed between a shoulder on the foot 18 and the flange 53 of the lift 50. A sealing ring 56 prevents fluid leakage between the foot 18 and the lift 50 which slides telescopically thereon.

A vent tube 60 extends up above the fluid level 61 in reservoir 10 and down into the measuring chamber 30. Near the lower end 62 of vent tube 60 a small hole 63 is drilled. This hole regulates the amount of fluid in the measuring chamber in a manner which will presently be described. In order to vary the position of this hole in the chamber 30 the vent tube 60 is mounted for vertical adjustment in a mounting tube 64 threaded into the head 14 at 65. The mounting tube 64 extends above the fluid level 61 in the reservoir 10 where it is provided with a cap 66. Referring to Fig. 3, the cap 66 is apertured at 67 to accommodate vent tube 60 and is threaded onto the end of mounting tube 64. Within the cap 66 there is packing 68. The position of regulator hole 63 in measuring chamber 30 is adjusted by loosening cap 66 and raising or lowering vent tube 60 in its telescopic mounting 64. The adjustment is maintained by tightening the cap 66 which presses the packing against vent tube 60 to hold it in place and to prevent leakage between the tube and the mounting. This adjustment can be made without removing the valve unit from the machine and without draining the reservoir because the adjusting cap 66 is located above the fluid level 61.

The construction of the valve 40 will now be described. The valve head is formed of two cone frustums 41, 42, (Fig. 4) joined by a cylindrical section 43. An annular groove is cut in the valve stem 44 at 45 (Fig. 3) to receive a split washer 46 which fits into an annular seat 47 formed in the upper end of a sleeve 48. A compression spring 49 is interposed between a shoulder on the sleeve 48 and an apertured disc 25 which seats on the posts 23 and centers the valve stem 44 in the tube

20. The valve may be dismantled while the valve body is in place in the reservoir or after it has been removed as a unit therefrom by pulling the valve stem upward while holding the sleeve 48 down against the disc 25 and then removing the split washer 46. Sleeve 48, disc 25, and spring 49 can then be lifted up off the stem 44 and the valve 40 can be withdrawn downwardly from the tube 20, after which the lift 50 and its spring 55 can be removed from the foot 18 of the valve body. Thus all the moving parts are held together by the split washer 46.

The valve spring 49 is weaker than the lift spring 55 so that when the can is removed from the valve, as shown in Fig. 3, the spring 55 presses lift 50 down, which, by contact of its seat 54 with valve head 41, draws valve stem 44 down until the lower end of sleeve 48 strikes disc 25. The other extreme position of valve 40 is shown in Fig. 4 where the can 51 has raised lift 50 against spring 55, permitting valve spring 49 to lift valve stem 44 until the valve head 41 is seated in the lower end of tube 20, which is provided with a conical seat 26. Further raising of the can 51 (Fig. 2) results in lifting the lift seat 54 up off the valve head 41.

The operation of the valve is as follows: The reservoir 10 is filled with the fluid to be injected into the cans. The fluid level is automatically maintained at level 61 (Fig. 3) by a suitable means such as is usually employed in machines of this type. Fluid is admitted through inlets 22 to annular passage 71 and through port 72 to the displacement chamber 73 formed within the lift and through annular passage 74 to measuring chamber 30. By filling the chamber from the bottom up the fluid is introduced into the chamber without foaming. The fluid rises rapidly in the measuring chamber, displacing air through passage 75 in the vent tube, and this rapid rise of the fluid level continues until it reaches the level 76 of the end of the vent. As the fluid rises above level 76 air can escape only through small orifice 63 and consequently the pressure of the air in chamber 30 above level 76 increases. When the fluid reaches the level 77 of the top of orifice 63, escape of air from the chamber is cut off and the air entrapped in the top of the chamber in under pressure resulting from the head in passage 71 and the reservoir, the head being the vertical distance from level 77 in the measuring chamber to level 61 in the reservoir. This is the condition which exists in the valve just before the can lifts, as illustrated in Fig. 3.

When the can starts to raise lift 50, the cylindrical portion 43 (Fig. 4) of the valve closes the port 72, so that the upward movement of the lift causes fluid to be displaced out of the displacement chamber 73. As a result, the fluid in vent passage 75 rises until it overflows at the top. After valve head 41 contacts seat 26, the upward movement of the valve is arrested and the lift 50, in rising further, opens port 78 (Fig. 2) through which the measured quantity of fluid is injected against the can wall to avoid foaming in the can. The fluid flows smoothly into the can because as soon as the vent pipe is drained the head on the port 78 is only the falling head in the chamber 30 above. The port 72 being closed at this time, the fluid is not under the pressure of the head in the reservoir 10. The air is vented out of the can through the hollow valve stem 44.

To vary the quantity of fluid injected, the vent tube 60 is adjusted to alter the position of regulator orifice 63. For example, if less quantity is desired, the tube is lowered, thus lowering level 77.

It has been found that accurate measurement of the fluid can be obtained by this structure. There are three features which contribute to this result: First, the operation of the valve is independent of the fluid level in the reservoir. The fluid can be at any level in the reservoir and the valve will operate just the same. Second, the regulator orifice gives a sharp cut-off when filling the measuring chamber. Third, the vent tube drainage remains a constant factor because the tube is always filled to overflowing when the valve is closing, or, in other words, by the time the valve head 41 reaches its seat 26, the vent tube 60 is entirely filled with fluid.

While I have described a particular embodiment of the present invention, it will be obvious that various changes and modifications may be made in the details thereof without departing from the spirit of the present invention and the scope of the appended claims.

Having thus described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. A valve for injecting a measured amount of fluid from a reservoir to a container, comprising a chamber, a tube having an opening into the reservoir, the other end of said tube constituting a port through which the fluid passes into said chamber, a valve stem mounted in said tube for axial movement therein, a cylindrical head on said stem adapted to enter said tube and close said port, a lift adapted to be engaged by the container, said lift having a discharge port therein, and a conical head on said valve stem adapted to close said discharge port.

2. A valve for injecting a measured amount of fluid from a reservoir into a container, a measuring chamber, means to provide a port through which fluid is admitted from the reservoir to said chamber, a vent tube having an opening in said measuring chamber and an opening to the atmosphere above the fluid in the reservoir, a lift adapted to be raised by the container, said lift having a discharge port therein disposed coaxially with said inlet port through which the measured quantity of fluid is discharged from said measuring chamber into the container, valve closure means controlled by said lift comprising a sliding closure for said inlet port adapted to close said inlet port at the beginning of the upward movement of said lift, and a closure seating on said discharge port adapted to open said discharge port at the end of the upward movement of said lift, both said ports remaining closed during the intermediate part of the upward movement of said lift.

3. A valve for injecting a measured amount of fluid from a reservoir to a container comprising, a measuring chamber, a vent therefor comprising a tube having an orifice in said chamber and an opening to the atmosphere above the fluid in the reservoir, means to adjust said tube to vary the position of said orifice in said chamber, means to provide an inlet port through which fluid is admitted from the reservoir to said measuring chamber, a cylindrical lift telescopically mounted on the body of the valve having a flange for contact with the container, said lift having a discharge port therein, valve closures for said ports controlled by said lift so that the inlet port closure closes the inlet port at the beginning of

the telescopic movement of said lift, and so that the discharge port closure maintains the discharge port closed at the beginning of the telescopic movement of said lift, whereby the upward movement of said lift causes fluid to be displaced from said chamber into said vent tube, said inlet and discharge ports remaining closed until said vent tube has been filled with fluid from said chamber and the fluid has overflowed into the reservoir.

4. A valve for discharging a measured amount of fluid from a reservoir into a container comprising, a measuring chamber, means to provide an inlet port to admit fluid from the reservoir into said measuring chamber, means to provide a vent for said chamber to permit the fluid to be admitted thereto and to determine the level of fill therein, fluid displacing means including a member having telescopic movement with respect to a fixed part of the valve body, said displacing means being operable to displace fluid from said measuring chamber into said vent after said chamber has been filled with fluid to the level determined by said vent, a lift actuated by engagement with the container and forming an integral part with said telescopic member, said lift having a discharge port therein for releasing fluid from said measuring chamber into the container, said inlet and outlet ports being disposed coaxially, valve means including a common closure member having a portion to seat on said discharge port, and a cylindrical portion to close said inlet port by sliding therein, said valve means being controlled by the movement of said lift.

5. A device for delivering a measured quantity of liquid from a reservoir to a container comprising a chamber having an inlet port for communication with said reservoir and a discharge port, a vent tube having an upper end disposed above the liquid level in said reservoir and a lower end opening into the upper portion of said chamber, a lift for operation by said container, valve means operable in response to elevation of said lift to close said inlet port and open said discharge port, and means operable in response to elevation of the lift to displace sufficient liquid out of said chamber and into said vent tube to cause the latter to fill and overflow prior to each opening of said discharge port whereby the amount of liquid contained in the vent tube which drains back into the chamber as the latter discharges is constant irrespective of variations in the level of liquid in said reservoir.

6. A device for delivering a measured quantity of liquid from a reservoir to a container comprising a chamber having an inlet port for communication with said reservoir and a discharge port, a vent tube having an upper end disposed above the liquid level in said reservoir and a lower end opening into the upper portion of said chamber, a lift for operation by said container, valve means operable in response to elevation of said lift to close said inlet port and open said discharge port, and movable liquid displacing means operable by said lift to displace liquid out of said chamber into said vent tube, the movement of said displacing means and the elevation of the upper end of said vent tube being so correlated that the displaced liquid fills the vent tube to overflowing whereby the amount of liquid contained in the vent tube which drains back into the chamber as the latter discharges is constant irrespective of variations in the level of liquid in said reservoir.

7. A device for delivering a measured quantity of liquid from a reservoir to a container comprising means forming a chamber having an inlet port for communication with said reservoir, a vent tube having an upper end disposed above the liquid level in said reservoir and a lower end opening into the upper portion of said chamber, a sleeve in open communication with said chamber forming means and having slidable telescopic relation therewith, said sleeve having a discharge port therein, valve means normally closing said discharge port and leaving said inlet port open, a lift associated with said sleeve for operation by a container to elevate the sleeve, means operable in response to elevation of said sleeve to actuate said valve means to close said inlet port and hold the discharge port closed during the initial portion of the elevation of the sleeve whereby said sleeve is caused to displace liquid from said chamber into said vent tube and cause the latter to overflow, and means for causing said valve means to open said discharge port upon further elevation of the sleeve to permit the liquid contained in said chamber, sleeve and vent tube to discharge into a container in operative engagement with said lift.

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