Nov. 13, 1951 P. E. LUTHER 2,574,746

LIQUID FILLER VALVE

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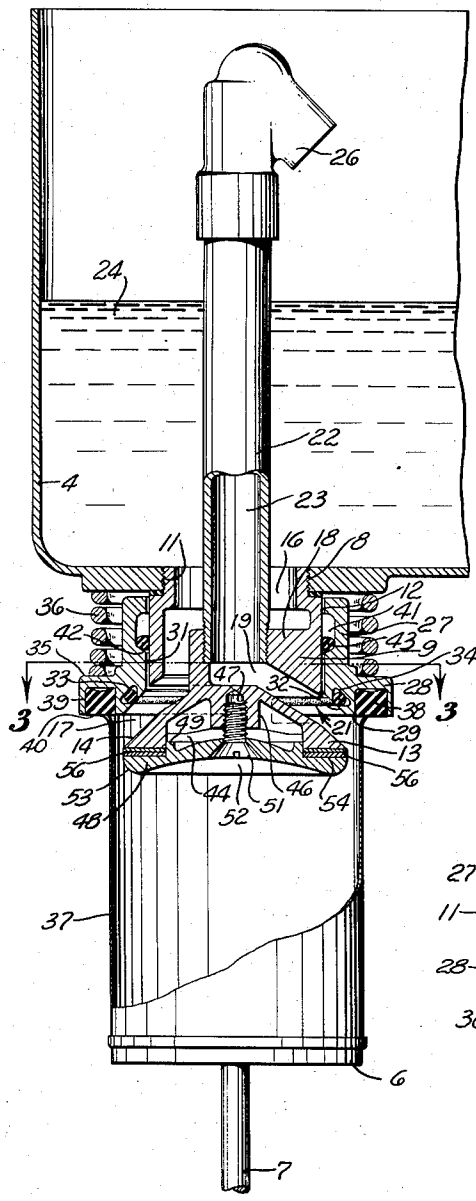


FIG. 1.

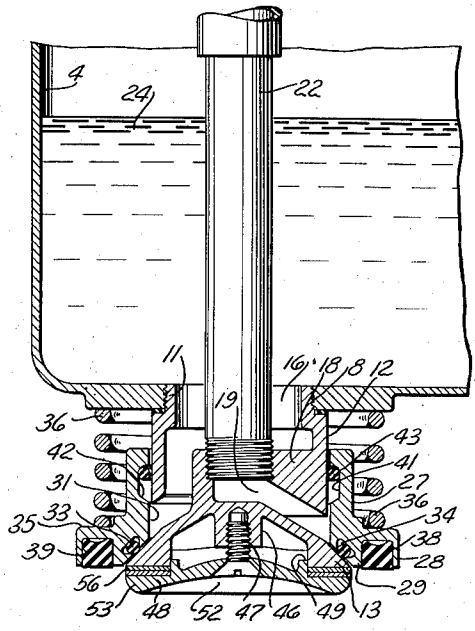


FIG. 2.

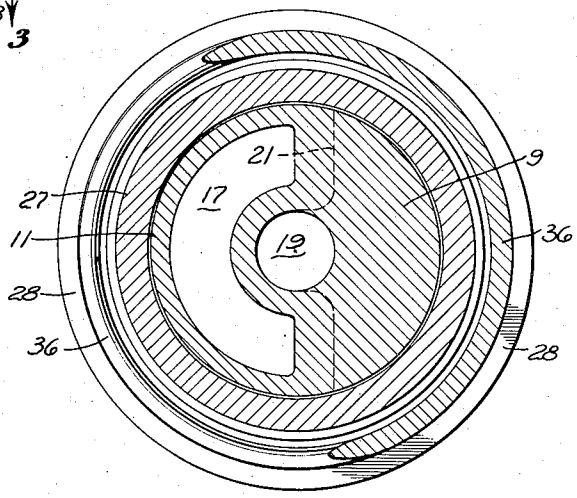


FIG. 3.

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LIQUID FILLER VALVE

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3 Claims. (Cl. 226—124)

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This invention relates to liquid filler valves of the general type known and used in can-filling machines to charge, with syrup or other liquid, open top cans or similar containers which have or have not been previously partially filled with quantities of another substance.

An object of the invention is to provide a valve of the class described wherein a large area of the valve parts, which actually enter the can or container and are exposed to the liquid and other contents thereof, is arranged to resist accumulation thereon of quantities of liquid or adherence thereto of particles or other components of the container contents so that excessive dripping of the valve during substitution of containers thereunder and fouling of the container handling mechanism with displaced particles are reduced to a minimum.

Another object of the invention is to provide a valve of the type referred to including a displacement member, capable of entering the can or container to engage and compact the initial contents thereof, which is designed to minimize contusion usually resulting from such engagement by establishment of an air cushion between the displacement member and the said contents of the can or container.

A further object of the invention is to provide a valve of the character referred to which is arranged to direct a flowable charge into a container occupied by a previously placed quantity of comparatively solid material in such a manner that the former material is caused to flow for the most part upwardly through the mass of the latter material and in this manner most completely purge from the latter mass any quantities of air which may be entrapped therein.

Still another object of the invention is to provide, in a valve of the class described, a displacement member capable of entering the can or container to be charged with liquid and to control the level to which the can or container may be filled, such displacement member being readily adjustable as to volumetric content so that corresponding adjustments in the height of said level may be had.

Another object of the invention is to provide a valve of the class described which is arranged to measure and control the volumetric contents of the liquid entering the can or container independently of the pressure or elevation head of such liquid above such container.

A still further object of the invention is to provide, in the mechanism of a valve of the nature referred to including relatively telescoping

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valving members, an improved seal for obviating leakage between the members.

It is a further object of the invention to provide a filling valve which will operate to press the more solid contents of a container below the sealing rim thereof so that none of the contents may press so tightly against the cover, which is subsequently applied to the container, as to exclude liquid from permeating therebetween, thus obviating the danger of subsequent bruising or discoloration of the portion of said solid contents engaging the cover.

Yet another object of the invention is to provide a valve of the aforesaid type which will permit changing of the seal between the valve and the container without the necessity of emptying the liquid supply tank or bowl.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

Referring to the drawing:

Figure 1 is a vertical sectional view of the improved valve of my invention installed in a can filling machine, only the essential parts of the latter being shown which contribute to a complete understanding of the invention. The valve is here shown in open position in the act of filling a can.

Figure 2 is a view similar to Figure 1 but omitting the lower portion of the latter and showing the valve in closed condition.

Figure 3 is an enlarged horizontal sectional view taken in the plane indicated by the line 3—3 of Figure 1.

The improved valve of my invention is designed particularly for use in the turret type of filling machine having an elevated supply bowl or tank from the bottom of which depends a circularly arranged group of valves each of which is superposed over an associated can supporting platform, all of the foregoing elements being arranged to rotate about a common vertical axis and in so doing cyclically raising and lowering successive containers supported on the platforms so as to open and close related valves and thereby allow fluid in the tank to flow into and fill the containers. All of these operations occur in a unit rotational movement of the machine so that the

latter may be included in a continuously moving conveyor system transporting the containers from the initial filling stage or machine to the unit which finally caps the containers. As herein illustrated, the fluid supply bowl is indicated by the numeral 4 and one of the group of container supporting platforms is designated by the numeral 6, the vertically movable lifting rod 7 thereof being fitted with suitable guides and can actuators which are not shown since their construction is familiar to those skilled in the art. Formed in the bottom of the bowl 4 and vertically aligned with the container supporting platforms 6 is a plurality of preferably threaded openings 8 in each of which is mounted a valve depending from the tank and axially vertically aligned with a container supporting platform 6. Each valve, in its preferred form of construction, comprises a body 9 having at its upper end a threaded stem portion 11 engaged in the correspondingly threaded opening 8, having a medial downwardly extending cylindrical guide portion 12 and a diametrically enlarged head portion 13 at the lower end thereof. The head portion 13 comprises the closure member of the valve, the upper radially extending face 14 thereof being substantially frusto-conical in form and intersecting the periphery of the guide portion 12 of the body. Extending axially of the body 9 is a charging passage 16 opening at its upper end into the bowl 4 and terminating at its lower end in a charging port 17 disposed at the junction of the valve face 14 with the periphery of the guide portion 12 and extending along about 180 degrees of arc of the latter. Projecting into the passage 16 from a side of the body 9 is an integral abutment 18 of the latter having therein a passage 19 communicating with a venting port 21 separated from and disposed diametrically opposite to the charging port 17. The upper portion of the abutment 18 is bored and threaded to receive a vent riser tube 22 whose bore 23 communicates with the passage 19. The riser tube 22 is long enough to vertically extend above the highest anticipated level of the liquid 24 which may be placed in the bowl 4 and is provided at its upper end with a discharge nozzle 26 opening to the atmosphere and directed downwardly toward the body of liquid.

Vertically slidable on the guide portion 12 of the valve body 9 is a sleeve 27 having an outwardly directed peripheral flange 28 at its lower end and being further provided at the intersection of the flange bottom surface 29 and the periphery of the sleeve bore 31 with a frusto-conical valve seat 32 complementary and engageable with the valve face 14 of the fixed valve body 9. A sealing ring 33 of rubber or other resilient material is seated in a peripheral groove 34 formed in the valve seat surface 32 and is engageable by the valve face 14 to effect a fluid-tight connection between the fixed and relatively movable members of the valve. Normally, the valve is held in closed condition, this being accomplished by a compression-resistant coil spring 36 which is interposed between the bottom of the bowl 4 and the confronting face 35 of the flange 28. Opening of the valve is effected by the open top container 37 which may be positioned thereunder, the bottom of the latter resting on the subjacent supporting platform 6 and the upper marginal lip 40 bearing, in sealing engagement, against an annular rubber gasket 38 confined in a supporting groove 39 formed in the lower transaxial face of the flange 28. As is well known to those skilled in the art, the platforms 6 are actuated, during a rotational movement of the filling machine, to cyclically rise and fall, thus forcing the sleeve 27 upwardly sufficiently to open the valve so as to permit flow of syrup, or other liquid which may be contained in the bowl, downwardly through the passage 16 and the port 17 into the container and to allow air which may be displaced by the entering liquid to rise and flow upwardly through the port 21 and the riser tube passage 23 to the atmosphere. Descent of the container after being filled, will effect lowering of the sleeve 27 to close the valve thereby simultaneously shutting off flow of liquid from the tank and the outward egress of air from the container. Since there will be considerable pressure exerted by the liquid, when the valve is open, on the perimetral joint between the body 9 and the sleeve 27 due to the hydrostatic head of the liquid in the tank and the shock incurred when the downward flow of liquid is suddenly stopped as the container becomes filled, it is necessary to provide an efficient leakproof seal between the aforesaid relatively movable parts. Such a seal may be effected by providing one of the members, preferably the sleeve 27, with a peripheral groove 41 in the bore wall thereof, the said groove being formed with a lower side surface 42 inclined inwardly and downwardly toward the axis of the sleeve to create an annular pocket of V-shaped cross-sectional form in conjunction with the confronting peripheral surface of the valve body 9. In the annular chamber thus defined by the groove 41 and the periphery of the valve body, is disposed a sealing ring 43 of rubber or similar resilient material which, during relative axial movements of the sleeve and the fixed valve body, is arranged to roll axially or slide from one end of the groove 41 to the other end thereof. In Figure 1 it will be seen that when the sleeve 27 is raised to its uppermost position when the valve is open, the sealing ring 43 will be disposed in the lower end of the groove 41 and will be wedged between the angularly inclined surface 42 thereof and the periphery of the valve body. Thus a desirable compression of the sealing ring is effected which tightly seals the interstice between the valve body and sleeve thereby precluding the leakage of any liquid exteriorly of the valve.

It will also be noted that the sleeve bore 31 is of slightly larger diameter than the cylindrical guide portion 12 of the valve body, thereby permitting sufficient play therebetween to insure proper operation of the valve even if the container 37 is not in proper axial alignment with the bowl 4.

As containers 37 are presented to the filling valves, the fruit or other initially placed contents of the containers often have appreciable quantities of air entrapped under or between the particles thereof which if not completely driven out may become sealed in the container and cause undesirable variations in the head space of the filled containers. The action of the improved filling valve of my invention, when opened, is to cause the liquid from the bowl 4 to flow radially outwardly over the lower lip of the valve 13 and to engage the inner side wall of the container 37 near the top thereof so as to flow downwardly therealong and to rise from the bottom of the container upwardly through the mass of the contents. Thus any air which may be entrapped as aforesaid will be forced upwardly and will be completely vented to the atmosphere as was

previously described. In order to get a specified weight of fruit or other contents into the containers it is often necessary that the latter be initially packed so that the uppermost sections or particles thereof protrude upwardly beyond the plane of the container rim 40 so that when the sealing lid is placed on the container the latter will be compactly filled. In many types of filling valves previously available, the fixed portion of the valve which is designed to enter the open top of the container is deeply concavedly upwardly dished to serve primarily as a compression head for squeezing the protruding contents downwardly below the plane of the container rim and secondarily as a director for outflowing air into the vent riser tube which communicates with the central portion of the compression head concavity. An additional function of the compression head is to displace a predetermined portion of the internal volume of the container so that when the latter is completely filled with liquid and the compression head is subsequently withdrawn, the level of the contents and its enveloping liquid will fall to a desired level below the upper rim and thus obviate any slopping over of the containers during their following movements through the filling machine or to the mechanism which applies the sealing lids thereto. In many of the previously available filling valves, due to the depth of the concavity in the packing head, the upper portion thereof extends above the upper level of container. Also, adhering liquid may drip from the head after the latter has been withdrawn from the container with the result that such drippage will fall on an unoccupied platform 6 and be picked up by the external surface of the succeeding empty container which is fed onto the contaminated platform. In addition to this, particularly when smaller fruits or berries or diced larger fruits are being packed, fragments of entire sections of fruit may adhere to the head and thereafter fall to the platform 6 and become squashed by a subsequently placed container. These undesirable features are created in part by the suction created by the container pulling away from the valve and the suction on the liquid in the vent tube. This suction tends to rapidly pull down the column of liquid in the vent tube with resultant splashing of such liquid in the head and over the edges of the container.

In the improved filling valve of my invention, I provide the lower end of the valve head 13 with a circular recess 44 extending axially vertically into the head, in the central bottom portion of which is provided a boss 46 having a screw threaded socket 47 therein. Subjacently overlying the valve head, I provide a displacement disk or end wall 48 provided with a marginal circular lip 49 entering the recess 44, for centering the disk 48 with the valve head, and further having a screw 51 passing therethrough which engages in the threaded socket 47 to removably secure the displacement disk to the valve head. The displacement disk is formed to provide a comparatively shallow concave recess 52 which merges into a rounded marginal rim 53 of equivalent diameter to the valve head. The recess 52 is in fact shallow enough whereby the bottom face of the end wall is substantially flat. Radially exteriorly of the lip 49, the plane face of the displacement disk forms a shoulder 54 paralleling and confronting the lower transaxial plane face of the valve head and between these two surfaces is placed one or more ring shims 56 and

by varying the number of such shims a selective vertical relative positioning between the displacement disk and valve head may be effected. Although it is preferred that sheet material be utilized for the shims 56 it is within the scope of the invention to use rubber or other yieldable material therefor which may be compressed or divided, by tightening the screw 51 to provide the desired relative positional adjustment between the displacement disk and the valve head. It will thus be seen that the only operation required in my valve to change the volumetric contents of the can is to add or remove the shims 56, while in old type valves, several adjustments were necessary.

In the operation of filling the container with liquid, air which was trapped in the concavity 52 during the flow of liquid into the container, will compress and form an air cushion between the bottom of the valve head and the uppermost contents of the container. Due to this compression of the entrapped air it will be seen that a minimized area of the displacement disk will come in actual contact with the filling liquid with the result that when the container is lowered away from the filling valve, no appreciable degree of drippage will occur due to the rim off of adhering liquid. Furthermore the pressure of the air cushion will act to push the contents of the container away from the displacement disk and prevent adherence to the disk of particles of the container contents so that the aforesaid undesirable contamination of succeeding containers will be entirely eliminated. A marked feature of advantage in the construction of the container-entering portion of the valve structure is the minimized vertical thickness necessary in the displacement disk and its associated parts which is necessary to provide the desired compression of the container contents and the cushioning effect of the disk against the contents. These are realized due to the comparatively shallow nature of the concavity 52 which effects the desired results without the necessity of the valve head being inserted so far into the receptacle that crushing of the contents may occur. In addition, the upper level of the initial contents of the container will, with but small movement of the valve head into the receptacle, be desirably compressed below the plane of the upper rim of the latter so that after insertion of the liquid the latter will completely cover the initial contents. Thus after being lidded the said initial contents will not engage the lid with such pressure as to be bruised or possibly discolored after the receptacle is subsequently opened. A further advantage which accrues from lessening the degree of valve head penetration into the container is the lessening of danger of slopping over of liquid when the filling machine is run at comparatively high operational speed, a condition which is prevalent in those machines in which rather deep penetration of the valve or displacement head into the container is necessary.

It will be seen that the valve of my invention is capable of being readily adjustable to vary the final level of liquid in the container this being accomplished by increasing or decreasing the volumetric bulk of the displacement disk and valve head by adding or removing shims 56 or by expanding or contracting the shim spacer in the event that compressible material is used for the latter. Due to the improved construction of my valve, it will also be seen that the shims 56 or the can sealing gasket 38 may be changed without

the necessity of draining the bowl 4, the sealing ring 33 preventing any flow of liquid from the bowl when the valve is in closed position. In many machines the displacement of the insertion portion of the valve may be accomplished only by varying the vertical stroke of the container toward and from the valve but in such machines this can only be accomplished with the resulting undesirable variation in spring pressure. Too great a pressure on the spring between the bowl and valve is apt to cause bending on the marginal rim or flange on the container when the container is urged against the valve. It should also be noted that the liquid level in the bowl 4 does not affect the volumetric content of the filled can because when the valve is closed at the end of its cycle, the liquid in the airvent tube cannot drain into the container. With many of the old type valves, upon closing of the valve, such liquid in the vent tube was permitted to drain into the can, and as the height of the liquid in said tube is directly proportional to the height of liquid in the bowl, it is apparent that variations in bowl liquid levels would produce similar variations in the final amount of liquid permitted to enter the container.

I claim:

1. In an apparatus for depressing and leveling relatively solid material in open-top containers and for filling the unoccupied space therein with liquid, a relatively fixed body provided with a depending head insertable in the container from the top and having a vertically adjustable end wall with a substantially flat bottom face forming a continuation of said wall and being of sufficient area to overlie substantially all of the solid material in the container and presenting to said material a solid surface over its entire area, a member around said body having a seat for engagement with the container rim, said body having therein separate liquid and air passages, and said body and member having valve and seat surfaces providing extensions of said passages to the periphery of said head and immediately adjacent the sides of the container, means for opening and closing said passages, means extending between said solid surface and said head for securing said wall and said face in adjusted position on said body, and said end wall and face being so arranged on the body that in all of the vertically adjusted positions of the wall the entire area of the face will be disposed in no higher plane than the rim of the container when operatively held against the member.

2. In an apparatus for depressing and leveling relatively solid material in open-top containers and for filling the unoccupied space therein with liquid, a relatively fixed body including a head insertable in the container and provided with a separate end wall having a substantially flat bottom face forming a continuation of said wall and being of sufficient area to overlie substantially all of the solid material in the container and presenting to said material a solid surface over its entire area, said end wall and the associated part of the head having interiorly-disposed vertically-slidable telescoping portions, vertically variable spacing means interposed between said wall and head part outwardly of said telescoping portions and providing a seal therebetween and to said portions, means accessible from the bottom face of said end wall for securing said end wall and said face and head part together in vertically adjusted relation and with the spacing means therebetween, a member around said body having a seat for engagement with the container rim, said body having therein separate liquid and air passages, and said body and member having surfaces providing extensions of said passages to the periphery of said head and adjacent the sides of the container, means for opening and closing said passages, and said end wall and face being so arranged on the body that in all the vertically adjusted positions of the wall the entire area of the face will be disposed in no higher plane than the rim of the container when operatively held against the member.

3. In an apparatus for depressing and leveling solid material in open-top containers and for filling the unoccupied space therein, a relatively fixed body provided with a depending head insertable in the container from the top and having an end wall with a substantially flat horizontal bottom face of nearly the same area as the cross-sectional area of the container and presenting to said material a solid surface over the entire face, said face forming a continuation of said wall, a vertically slidable member around said body and having an annular seat for engagement with the container rim, said body and member having opposed valve and valve-seat surfaces providing extensions for separate air and liquid passages in said body, said passages having upper and lower ends and the lower ends being at the periphery of said body above the bottom face of the end wall, means for opening and closing said passages, and means extending between said solid surface and said head to vertically vary the position of said end and wall and face on the body so as to vary the depth of insertion of said solid surface in the container with a given operative position of the container with respect to the sliding member.

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