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C. L. DAY ET AL
FILLING VALVE FOR APPARATUS FOR FILLING
CONTAINERS WITH LIQUID
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Fig. 1.

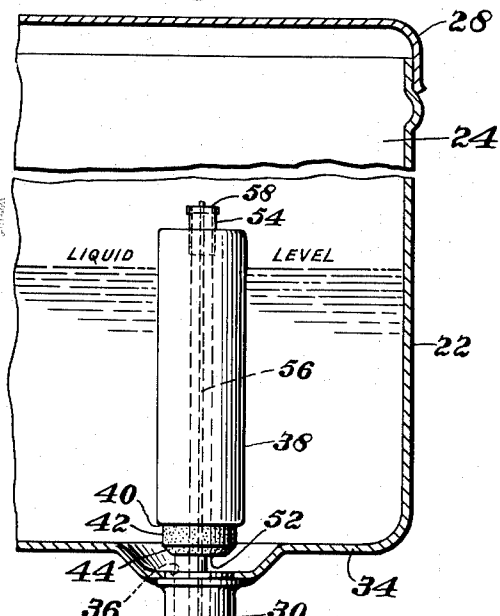


Fig. 2.

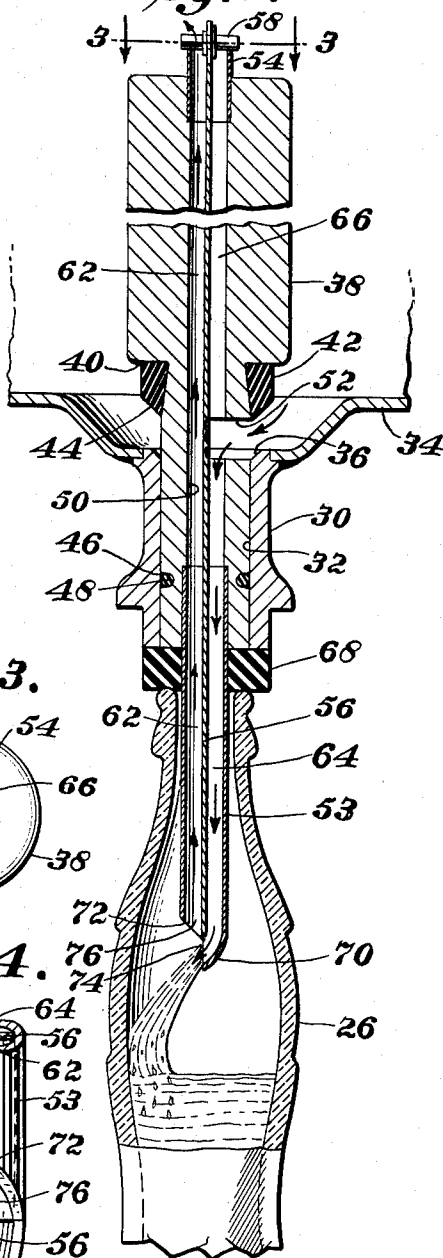


Fig. 3.

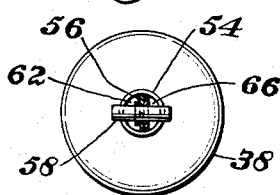


Fig. 4.

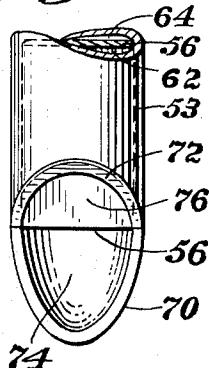
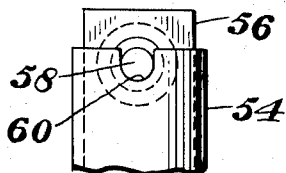


Fig. 5.



INVENTORS

Carl L. Day, Jr.
Leo F. Pahl,

BY *Cushman, Parkey & Cushman*
ATTORNEYS.

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**FILLING VALVE FOR APPARATUS FOR FILLING
CONTAINERS WITH LIQUID**

Carl L. Day and Leo F. Pahl, Baltimore, Md., assignors
to Crown Cork & Seal Company, Inc., Baltimore, Md.,
a corporation of New York

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6 Claims. (Cl. 226—124)

This invention relates to a filling nozzle or head for filling containers with non-carbonated or still liquid. More particularly, this invention relates to an improved filling head for conventional automatic bottle filling machines of the type which have a filling platform, on which the bottle to be filled is positioned, and a superposed liquid reservoir, the gas or air space of which is under reduced pressure. In such machines, which usually are of the rotary type, the filling platform customarily lifts to raise the bottle into engagement with the filling head which depends from the liquid reservoir, though in some machines the liquid reservoir or the filling head may be lowered to accomplish such engagement.

The filling head of such machines incorporates a valve which is opened by the engagement and movement of a portion of the head with a container to be filled, to thus automatically permit liquid to flow from the reservoir through a filling passage in the head and into the container. In order to prevent overflow of the container being filled, the head is provided with an annular gasket or pad that is engageable with the mouth of the container to seal the same from the atmosphere. This seal creates the problem of properly venting air from the container during the filling thereof with liquid. Accordingly, the filling head must be constructed to incorporate a vent passage in addition to the filling or liquid passage. The vent passage usually leads to the airspace above the liquid in the reservoir, which space, for use with filling heads of the type under consideration, is under pressure less than atmospheric. Filling machines of this type are called vacuum machines. After the container has been filled, it is lowered from engagement with the head to automatically close the valve and stop the flow of liquid.

Filling heads of the aforementioned type present numerous problems which must be overcome to provide satisfactory operation without undue complexity. Among these problems may be mentioned those of providing a structure which easily may be taken apart and cleaned for sanitary reasons, as when filling containers with various types of beverages, of providing a head which is dripless to avoid a messy and unsanitary condition of the filling machine, of preventing blocking of the vent passage with the liquid, of providing a container-insertable tip which readily will enter the mouth of an off-center container without damage to the container or the tip, and of preventing undue foaming of readily-foaming liquids upon discharge into the container from the filling head. Additionally, another problem involves the construction of a filling head with a minimum of parts, in order to minimize crevices in which beverage residues may be deposited, for the purpose of meeting various sanitary codes for filling bottles with milk and similar beverages.

Accordingly, it is an object of this invention to provide an improved filling head for vacuum apparatus for filling containers with non-carbonated or still liquids.

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It is another object of this invention to provide a filling head of the type described which is dripless.

It is still another object of this invention to provide a filling head of the type described in which the liquid outlet and the vent inlet are so located and arranged as to prevent blocking of the vent during the filling operation.

It is still another object of this invention to provide a filling head of the type described that can easily and quickly be disassembled for cleaning purposes and can be reassembled in an extremely short time.

It is still another object of this invention to provide a filling head of the type described having a minimum of parts to thereby avoid joint crevices in which beverage residues may collect so as to render inspection and cleaning of the head an extremely simple operation.

It is still another object of this invention to provide a filling head of the type described which reduces to a minimum the foaming, during a filling operation, of readily-foaming liquids, such as soaps, etc.

It is a further object of this invention to provide a filling head of the type described with a simple container-insertable tip portion which readily centers a container during the inserting movement between the container and the filling head without damage to the container or to the tip.

Other objects and advantages of this invention readily will be apparent from the following description and accompanying drawings, in which:

Figure 1 is a fragmentary elevational view, partly in section, of a portion of a container filling machine illustrating a filling head embodying this invention in operative filling engagement with a container to be filled.

Figure 2 is an enlarged vertical sectional view of the filling head illustrated in Figure 1.

Figure 3 is a cross-sectional view taken on line 3—3 of Figure 2.

Figure 4 is an enlarged fragmentary side view of the tip portion of the filling head shown in Figure 2.

Figure 5 is an enlarged fragmentary side view of the extreme upper part of the filling head shown in Figure 2.

Referring now to the drawings, there are shown in Figure 1 a filling platform 20 and a superposed, preferably constant-level, liquid reservoir 22 that are conventional in automatic bottle filling machines of the type with which this invention is concerned. The airspace 24 above the liquid in the reservoir is maintained under a pressure less than atmospheric by means of suitable vacuum producing means, such as a pump (not shown). A small-mouthed beverage bottle 26 is shown on the platform 20 in filling position, but it will be realized that a filling head embodying this invention is adapted to fill all types of liquid containers, whether of glass or other material. The reservoir 22 is provided with a removable cover 28 and a depending annular boss or downspout 30 positioned directly over the filling platform 20. The downspout 30 has a smooth cylindrical bore 32 therethrough and is provided, adjacent the bottom wall 34 of the reservoir 22, with an upwardly facing frusto-conical valve seat 36.

A one-piece weighted valve body 38 is mounted for vertical slidable movement within the bore 32 of the downspout 30 and has an enlarged upper portion forming a shoulder 40 against which a detachable ring or annular valve head 42, preferably of rubber, is seated. The lower edge of the valve head 42 has a frusto-conical sealing surface 44 complementary to and seating on the valve seat 36. A reduced lower portion of the valve body 38 fits snugly within the bore 32 of the downspout 30 and extends downwardly to depend somewhat therebelow when the valve body is seated on the seat 36. Preferably, the reduced lower portion of the valve body 38 is provided

with a circumferential groove 46 having an O ring 48 positioned therein for providing a sealed sliding fit between the valve body 38 and the bore 32 of the downspout 30.

An axial bore 50 extends vertically through the valve body 38 which is provided, immediately below the valve head 42, with a lateral port 52. This port 52, when the valve body 38 is seated on the valve seat 36, is disposed completely within the bore 32 of the downspout 30, but when the valve body is lifted from its seat, as later described, the port 52 permits liquid to flow therethrough from the reservoir 22 into the bore 50. Mounted in a counterbore at the lower end of the bore 50 is a depending cylindrical tube constituting a tip 53 that is adapted to be inserted into the mouth of a container to be filled. The lower end of the tip 53 is of a particular configuration which will be described later in detail.

Mounted in a counterbore at the upper end of the bore 50 through the valve body 38 is a short cylindrical tube 54 which projects upwardly into the reduced pressure airspace 24 over the liquid in the reservoir 22. The tubes 53 and 54 and the bore 50 are of equal inner diameter for reasons later obvious. An elongated diametric partition 56 is suspended within the tubes 53 and 54 and the bore 50, to extend the entire length thereof, by means of a transverse supporting pin 58 which rests in opposite notches 60 formed in the upper edge of the tube 54, as shown best in Figure 5. Preferably, the partition 56 has an easy sliding fit within the bore 50 and the tubes 53 and 54 to permit ready assembly and disassembly of the partition therein and therefrom, yet a fit sufficiently tight to prevent appreciable leakage of fluid around the side edges of the partition. It will be noted that the lateral port 52 in the reduced portion of the valve body 38 communicates with the bore 50 only on one side of the diametric partition 56.

By reason of the foregoing construction, it will be seen that the space on one side of the partition forms a vent passage 62 providing communication between the interior of the container to be filled and the reduced pressure airspace 24 above the liquid in the reservoir 22. The space on the other side of the partition 56 forms a liquid or filling passage 64 extending downwardly from the lateral port 52 to the lower end of the tip 53 for flow of liquid therein, from the reservoir 22 through the port 52, and downward into the container 26 when the valve body 38 is raised off its seat 36, as later described. The continuation of the space on the said other side of the partition 56 above the lateral port 52 forms a separate vent passage 66 providing direct communication between the upper end of the filling passage 64 and the reduced pressure airspace 24 above the liquid in the reservoir 22, for reasons later described.

Snugly mounted on the tip 53 and seated against the projecting lower end of the valve body 38 is an annular sealing gasket or washer 68, of rubber or other appropriate material. This washer 68 is adapted to contact and seal the mouth of the container 26 from the surrounding atmosphere during the filling operation. Replacement of this washer 68 by others of different thickness affords a convenient method for adjusting the filling height or head space of the container. In this same connection it will be noted that when the valve body 38 is raised from its seat 36 during a filling operation, by engagement of a rising container with the washer 68, the upper surface of the washer 68 seats against the lower edge of the downspout 30 to thereby provide another seal, in addition to the sealing effect of the O ring 48, to prevent leakage between the valve body 38 and the bore 32 of the downspout during the filling operation.

The lower end of the tip 53 is of substantially ogival configuration for a substantially diametric half thereof, as indicated generally at 70, to thereby provide the filling passage 64 with a closed tapering container-insertable end. The other diametric half of the tip 53 terminates

in a bevelled cut-off open end 72 that is offset upwardly, or rearwardly, from the ogival closed end 70 of the filling passage 64. Preferably, the bevelled end 72 of the tip 53 is inclined upwardly and rearwardly from a point approximately adjacent the base of the ogival closed end 70. The dividing partition 56 extends downwardly to a point adjacent the base of the ogival closed end 70 to thus leave an open diametric side for the ogival closed end that constitutes a discharge outlet 74 for the filling passage 64, while the bevelled cut-off end 72 forms an inlet 76 for the vent passage 62. This construction serves to separate the liquid discharge outlet 74 and the vent inlet 76 to an extent sufficient to prevent blocking of the vent inlet with liquid during the filling operation. Additionally, it will be seen that this construction provides a filling tip that will readily enter and center a container improperly positioned on the filling platform 20 when the latter lifts the container into engagement with the filling head. Furthermore, it will be seen that because of the lateral location of the liquid discharge outlet 74 and the deflecting surface provided by the inner side of the closed ogival end 70, liquid will flow against the side of the container being filled, as shown in Figure 2, to thereby minimize foaming of readily-foaming liquids during the filling operation.

For manufacturing purposes, the tip 53 may be formed by spinning the end of a tube into a closed ogival shape and the closed ogival end subsequently cut away by axial and laterally slanted cuts to form the final tip illustrated. In this connection it will be realized that the specific configuration of the end of the tip 53 is useful in other types of filling heads, whether for vacuum-venting filling machines or atmospheric-venting filling machines.

The operation of the filling head is as follows: With the container 26 positioned on the filling platform 20, rotation of the filling table and reservoir 22 results in raising the platform to cause the container mouth to move upwardly over the filling tip 53 into sealing engagement with the gasket 68 to thereby seal the interior of the container from the outside atmosphere. Because the vent passage 62 is constantly open, the interior of the container 26 is thereby placed under the reduced pressure of the reservoir airspace 24. In the event that the container 26 is improperly centered on the filling platform 20, the configuration of the end of the filling tip 53 serves to properly center the mouth of the container for reception of the tip. Continued upward movement of the filling platform 20 serves to raise the entire valve assembly, thereby lifting the valve head 42 from its seat 36, as shown best in Figure 2, and permitting liquid to flow from the reservoir 22, by gravity, through the lateral port 52, down the filling passage 64, and out of the discharge outlet 74 into the container 26. Simultaneously, the air displaced from the container 26 by the inflowing liquid is forced upwardly through the vent passage 62 into the airspace 24. In this connection, it will be noted that the inlet 76 to the vent passage 62 is positioned slightly above the lateral discharge outlet 74 of the filling passage 64 to prevent the liquid flowing into the container from blocking or interfering with the venting of the container.

The container will continue to be filled until the level of the liquid therein reaches the vent inlet 76, at which time the filling operation will cease. Liquid will continue to rise through the vent passage 62, however, until it stands in both passages 62 and 66 at the level of the liquid in the reservoir 22. At this point the container 26 is filled and ready to be withdrawn. In normal practice, however, the timing of the filling machine is such that filling platform 20 is lowered and the container 26 withdrawn when the level of the liquid therein reaches the vent inlet 76, without an unnecessary rise of liquid in the passages 62 and 66.

When the filling platform 20 lowers and the filled container 26 starts its withdrawing or downward movement, the weight of the valve body 38 maintains the seal be-

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tween the mouth of the container and the gasket 68 until the valve head 42 seats on its seat 36. As the filling platform 20 continues to lower, simultaneously with the seating of the valve head 42, the container 26 will break away from its engagement with the gasket 68. At this instant the reduced pressure within the airspace 24 of the reservoir 22 becomes effective to suck any liquid standing in the vent passage 62 up into the reservoir, thus clearing the vent passage of liquid in preparation for the next filling cycle. It is pointed out that the pressure in the airspace 24 is not low enough, however, to prevent the filled container from breaking, by gravity, its sealing engagement with the gasket 68.

At the end of the downward movement of the valve assembly, liquid is trapped and stands within the filling passage 64 and the lateral port 52. Simultaneously with the breaking away of the container mouth from the gasket 68, the reduced pressure within the airspace 24 of the reservoir becomes effective, through the passage 66, to suck the liquid standing in the lateral port 52 and filling passage 64 up into the reservoir 22, thus preventing any drip of liquid from the tip 53 after the mouth of the container 26 is disengaged from the annular gasket 68 and the container is lowered completely away from the filling head. Thus, the suction effected through the passage 66 serves to prevent any messy or unsanitary condition of the filling machine because of after-drip from the tip 53.

Thereafter another container is positioned on the filling platform and the above described filling cycle is repeated.

The construction of the nozzle facilitates the ease of disassembly for cleaning and reassembly in operating position within the reservoir downspout 30. In order to disassemble the filling head, the gasket 68 is first pulled off of the tip 53 in order to permit the valve body 38, plus the remaining associated parts, to be removed upwardly from the downspout 30. Thereafter, the partition 56 may be pulled upwardly out of the tubes 53 and 54 and the bore 50, and a brush used to effectively clean the bore and the tubes. Additionally, the valve ring or head 42 may be pulled from its seat against the shoulder 40 and separately detached for cleaning. The reassembly of the filling head will be obvious from the above description.

It will thus be seen that the objects of the invention have been fully and effectively achieved. It will be realized, however, that the specific embodiment used to illustrate the principles of the invention is susceptible to various changes without departing from such principles. Therefore, this invention embraces all modifications which are encompassed by the spirit and scope of the following claims.

We claim:

1. A filling head for use with container filling apparatus having a filling platform, a superposed reduced-pressure liquid reservoir, one of which is vertically movable, an outlet in the bottom of the reservoir, and an upwardly-facing valve seat surrounding the outlet, said head comprising: a valve assembly mounted for vertical movement in the outlet for cooperation with the seat and depending through and below the outlet for insertion into the mouth of a container to be filled and extending upwardly into the reduced-pressure airspace in the reservoir above the liquid therein, said assembly having a vertical bore therethrough and a lateral port between the ends thereof for inflow of liquid upon upward movement of said assembly; and a removable diametric partition in said bore dividing the latter into a liquid passage for receiving liquid from said lateral port and a vent passage, both of said passages providing communication between the reduced-pressure airspace above the liquid in the reservoir and the container interior.

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2. The structure defined in claim 1 including supporting means secured to the upper end of the partition and engaging the valve assembly adjacent the upper end of the bore for suspending said partition therewithin.

3. In a filling head for vacuum-venting filling machines having a source of suction, a filling platform, and a superposed liquid reservoir, the combination of an assembly having a portion thereof adapted to depend from the reservoir for insertion into a container to be filled; means defining a vertical bore extending upwardly through said depending portion from the lower end thereof for communicating, at the upper end of said bore, with the source of suction, said bore having a lateral port for inflow of liquid from the reservoir; valve means controlling said inflow; and a removable diametric partition in said bore dividing the latter into a liquid passage for receiving liquid from said lateral port and a vent passage, both of said passages being adapted to communicate, at their lower ends, with the interior of the container and, at their upper ends, with the source of suction.

4. In a filling head for filling apparatus having a filling platform and a superposed liquid reservoir, at least one of which is vertically movable, the combination of a substantially cylindrical tip adapted to depend from the reservoir for insertion into a container to be filled, said tip having separate liquid and vent passages extending vertically therethrough, a substantially diametric half of the container-insertable end of said tip being of ogival configuration and the other half of bevelled cut-off configuration offset rearwardly of the apex of the ogival half to provide an open side to said ogival half, said cut-off half providing an inlet for said vent passage and the open inner side of said ogival half providing a discharge outlet for said liquid passage.

5. In a filling head for filling apparatus having a filling platform and a superposed liquid reservoir, at least one of which is vertically movable, the combination of a substantially cylindrical tip adapted to depend from the reservoir for insertion into a container to be filled, said tip having separate liquid and vent passages extending vertically therethrough, a substantially diametric half of the container-insertable end of said tip being tapered to a closed end and the other half terminating in a bevelled cut-off open end offset rearwardly of said tapered half, the inlet to said vent passage being provided by said cut-off open end and the outlet to said liquid passage being located in the diametric side of said tapered closed end.

6. For use in a filling head for filling apparatus having a filling platform and a superposed liquid reservoir, at least one of which is vertically movable, an outlet at the bottom of the reservoir and an upwardly-facing valve seat surrounding the outlet, the combination comprising: a valve assembly adapted to be positioned within said outlet for vertical slidable movement therein, said assembly having an upwardly-tapering exterior portion terminating in a downwardly-facing shoulder and a valve washer mounted on said portion against said shoulder, said washer having an interior surface complementary to said upwardly-tapering portion of said assembly and a lower end surface adapted for sealing engagement with the valve seat.

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