June 21, 1955 C. L. DAY ET AL 2,711,279

FILLING NOZZLE FOR APPARATUS FOR FILLING CONTAINERS WITH LIQUID

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Fig. 1.

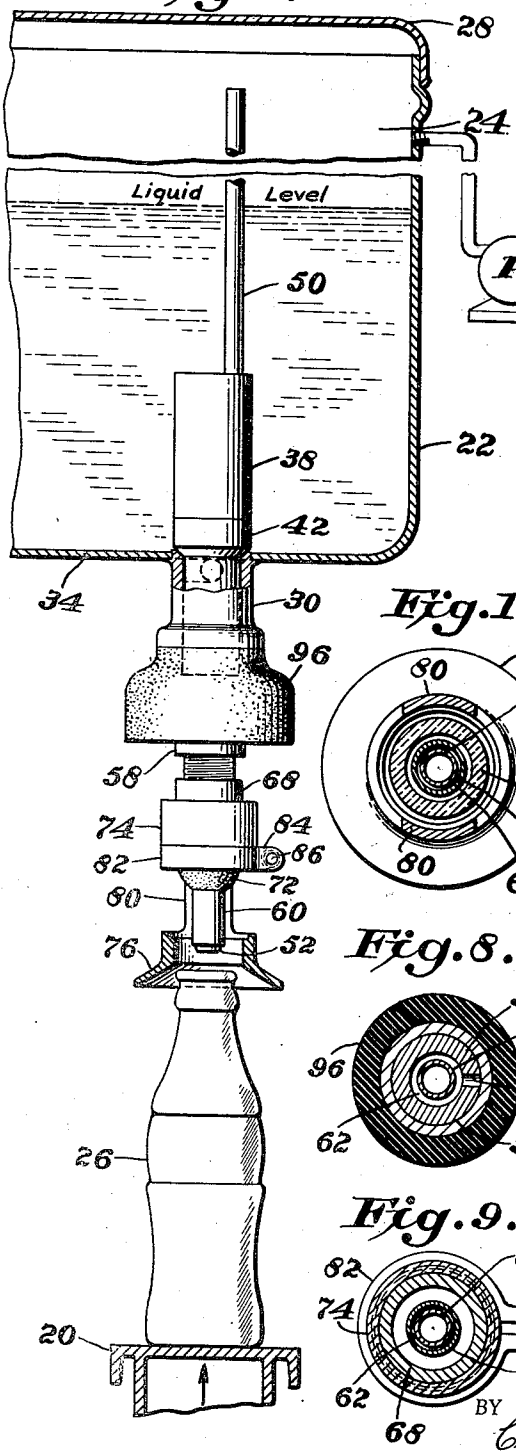


Fig. 4.

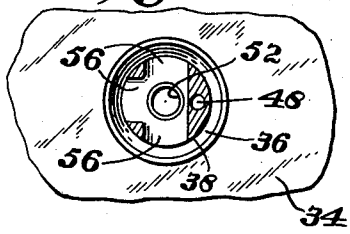


Fig. 5.

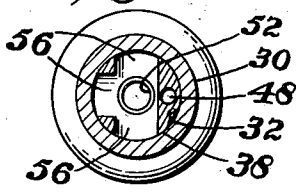


Fig. 6.

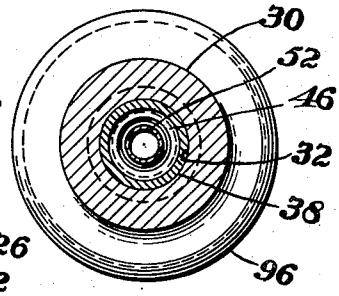


Fig. 10.

Fig. 7.

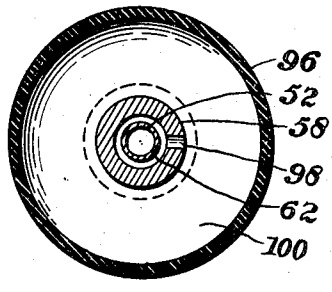


Fig. 8.

Fig. 9.

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Fig. 2.

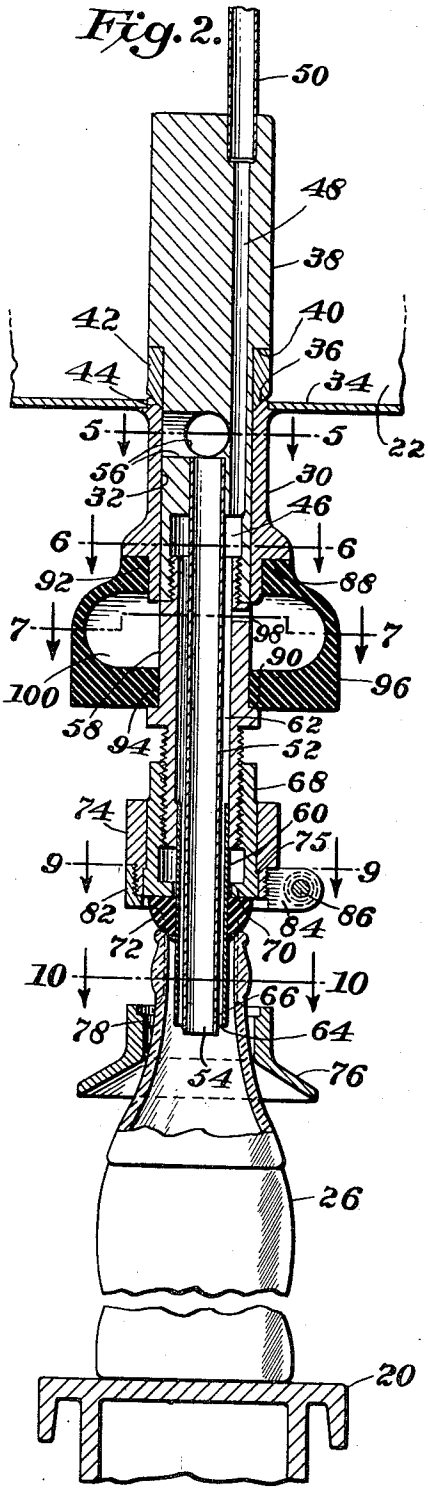
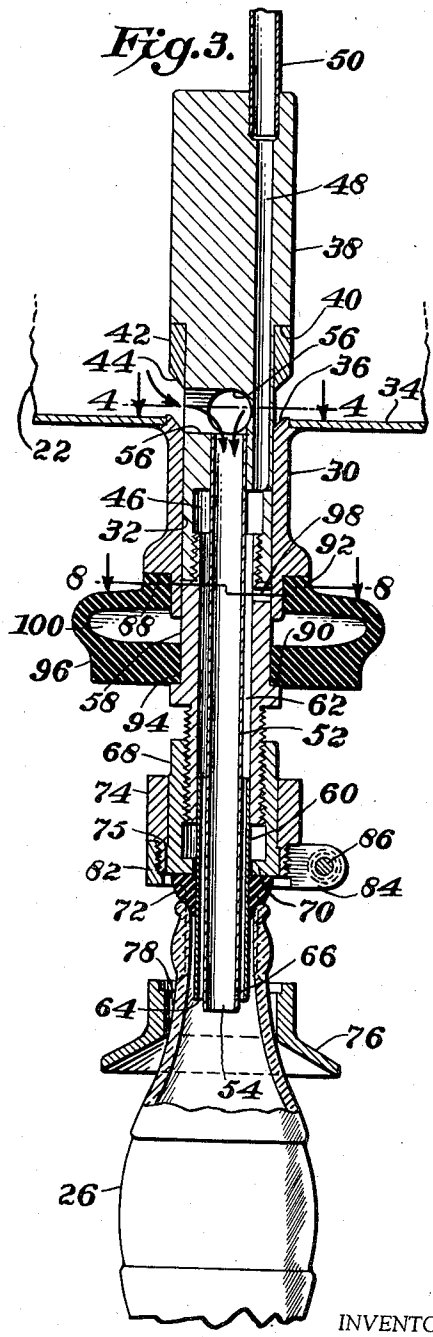


Fig. 3.



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FILLING NOZZLE FOR APPARATUS FOR FILLING CONTAINERS WITH LIQUID

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8 Claims. (Cl. 226—116)

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

The filler nozzle of such machines incorporates a valve which is opened by the engagement and movement of a portion of the nozzle by the container to be filled, to thus automatically permit liquid to flow from the reservoir through the nozzle and into the container. In order to prevent overflow of the container being filled, the nozzle 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 the air from the container during the filling thereof with liquid. Accordingly, the filling head must also be constructed to incorporate such a vent. The vent usually leads to the air space above the liquid in the reservoir, which space, for use with filler nozzles 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 nozzle to automatically close the valve and stop the flow of liquid.

Filler nozzles 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 may be easily taken apart and cleaned for sanitary reasons, as when filling containers with various types of beverages, of providing a nozzle which is dripless to avoid a messy, unsanitary condition of the filling machine, and of preventing blocking of the vent passage with liquid.

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

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

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

It is a further object of this invention to provide a nozzle of the type described that can easily and quickly be disassembled for cleaning purposes and can be reassembled in an extremely short time, such nozzle being of such simplified construction that all parts thereof, when disassembled, may be reached and readily cleaned with a brush to thereby provide an extremely sanitary construction.

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

Figure 1 is a fragmentary elevational view, partly in section, of a portion of a container filling machine illustrating a filler nozzle embodying this invention in operative position over a container to be filled.

Figure 2 is an enlarged vertical sectional view of the filler nozzle illustrated in Figure 1 showing the container engaged therewith in position to start a filling operation.

Figure 3 is a view corresponding to Figure 2, showing the position of the parts of the filler nozzle when open to permit liquid to flow therethrough during the filling operation.

Figures 4 and 8 are sectional views taken on the correspondingly numbered section lines of Figure 3.

Figures 5, 6, 7, 9, and 10 are sectional views taken on the correspondingly numbered section lines of Figure 2.

Referring now to the drawings, there are shown in Figure 1 a filling platform **20** and 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 air space **24** above the liquid in the reservoir **22** is maintained under a reduced pressure by means of suitable vacuum producing means, such as a pump P. A small mouthed beverage bottle **26** is shown on the platform **20** in position to be filled, but it will be realized that a filler nozzle embodying this invention is adapted for use 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 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, with an upwardly-facing frusto-conical valve seat **36**.

A valve body **38** is mounted for vertical slidable movement within the bore **32** of the downspout **30**, as shown best in Figures 2 and 3, and has an enlarged upper portion forming a shoulder **40** against which an annular detachable valve head **42**, preferably of rubber, is seated. The lower end of the valve head **42** has a frusto-conical valve surface **44** complementary to and seating on the valve seat **36**. The reduced lower portion of the valve body **38** fits snugly within the bore **32** of the downspout **30** and extends downwardly to a point adjacent the lower end of the latter. The lower end of the valve body **38** is provided with a central circular recess **46** and extending vertically upwardly through the valve body from the recess **46** is a bore **48**. A vent pipe **50** is mounted in a counterbore in the upper end of the bore **48** and extends upwardly into the reduced pressure air space **24** over the liquid in the reservoir **22**.

Mounted in a central counterbore in the lower end of the valve body **38** and depending therefrom through the recess **46** is a relatively long filling tube **52** having an open lower end forming a liquid discharge opening **54**.

Several lateral ports **56**, three as illustrated in the drawings, are provided in the reduced lower portion of the valve body **38**, immediately beneath the sealing surface **44** of the valve head **42**, for communication with the upper end of the filling tube **52**. These ports **56**, when the valve body **38** is seated on the valve seat **36** as shown in Figure 2, are disposed completely within the bore **32** of the downspout **30**.

A sleeve **58** is threadedly engaged within the recess **46** at the lower end of the valve body **38** and depends therefrom in concentric spaced relation over the filling tube **52**. Secured to and depending from the lower end of the sleeve **58** is a concentric open-ended vent tube **60**, which

terminates, at its lower end, a slight distance above the lower end of the filling tube **52**. The interior diameters of both the sleeve **58** and the vent tube **60** are greater than the exterior diameter of the liquid tube **52** to provide an annular passageway **62** therebetween that communicates, at its upper end, with the circular recess **46** and thereby with the lower end of the bore **48** through the valve body **38**. The annular passageway **62**, recess **46**, bore **48**, and vent pipe constitute a vent passage having an annular inlet **64** for placing the interior of a container being filled with liquid in communication with the air space **24** in the reservoir. A small lateral port **66** is provided in the lower end of the filling tube **52** a slight distance above the lower end of the vent tube **60** to thereby provide communication between the interior of the filling tube, just inside its outlet **54**, and the vent passage, just inside the latter's inlet **64**.

Threadedly mounted on the lower portion of the sleeve **58** and depending somewhat therefrom is an adjusting nut **68** having an inturned flange **70**, adjacent its lower end, closely surrounding the vent tube **60**. Snugly mounted on the vent tube **60** and seated against the flange **70** is an annular sealing gasket or pad **72**. This pad is adapted to engage and seal the mouth of a container from the surrounding atmosphere during the filling operation. The threaded engagement of the nut **68** with the sleeve **58** provides a method by which the gasket **72** may be adjusted vertically relative to the sleeve to thereby afford a convenient method of adjusting the filling height or head space of the container.

Slidably mounted for vertical movement on the nut is a sleeve **74** having an externally threaded lower end. Engageable shoulders **76** on the lower ends of the sleeve **74** and the nut **68** serve to limit the downward movement of the sleeve relative to, and to support the sleeve from, the nut. A bell-shaped guide **76** having a central circular opening **78** depends from and is supported by the sleeve **74** by means of a pair of upright legs **80**, shown best in Figures 1 and 10, secured to an internally threaded split collar **82** threaded onto the lower end of the sleeve **74** and having a pair of radially extending ears **84** through which a bolt **86** may be threaded for clamping the collar **82** securely to the sleeve **74**. The purpose of this guide **76** is to correctly center the mouth of the container to be filled directly beneath the vent tube **60** and the filling tube **52**, in case the container is improperly positioned upon the filling platform **20**. In the latter event, the guide **76** serves to move the container into correctly centered position with respect to the vent and filling tubes. It is to be noted that if the mouth of the container is too large to go through the central circular opening **78** in the guide, the latter will rise, by reason of the vertically sliding mounting of the sleeve **74** on the nut **68**, to permit the container mouth to engage with the sealing gasket **72**.

The lower end of the downspout **30** is formed with a downwardly facing annular shoulder **88**, while the intermediate portion of the sleeve **58** is formed with an upwardly facing shoulder **90**. Seated against these shoulders **88** and **90** and snugly embracing the downspout **30** and the sleeve **58** are the upper and lower rims **92** and **94**, respectively, of an annular resilient bellows-like sealing element **96**, preferably made of rubber or other appropriate material. This element **96** provides a seal for the telescoping joint between the valve body **38**, and the sleeve **58** threaded thereon, and the downspout **30**. The sleeve **58** has a lateral port **98** therethrough, normally positioned immediately beneath the lower end of the downspout **30**, and affording communication between the vent passage and the interior chamber **100** of the resilient sealing element **96**. The purpose of this port **98** will be described later.

The operation of the filler valve is as follows: With a container **26** positioned on the filling platform **20**, as illustrated in Figure 1, the filling machine operates to raise the platform and lift the container over the filling and vent tubes and into sealing engagement with the gasket **72**, as shown in Figure 2, to thereby seal the interior of the container from the outside atmosphere. Because the vent passage is constantly open, the interior of the container is thereupon placed under the reduced pressure of the reservoir air space **24**. In the event that the container **26** is improperly centered on the filling platform **20**, the guide **76** serves to correctly center the mouth of the container for reception of the lower ends of the vent tube **60** and filling tube **52**. 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** and permitting liquid to flow, by gravity, into the container. Simultaneously, the air displaced from the container by the inflowing liquid flows upwardly through the vent passage into the air space **24**. In this connection, it will be noted that the annular inlet **64** to the vent passage is positioned slightly above the circular discharge outlet **54** of the filling tube **52** to prevent the liquid flowing from the filling tube 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 lower end of the vent tube **60**, at which time the filling operation will cease. Liquid will continue to rise through the vent passage, however, until it reaches the level of the liquid in the reservoir **22**. At this point the container **26** is now filled and ready to be withdrawn.

When the filling platform **20** lowers and the filled container **26** starts its withdrawing or downward movement, the weight of the valve assembly, aided by the spring-like action of the resilient bellows-like element **96**, maintains the seal between the mouth of the container and the annular gasket **72** until the valve head **42** seats on its seat **36**. In this connection it will be noted that the lateral port **98** in the sleeve **58**, when the valve assembly is in its uppermost position, is disposed within the lower end of the downspout **30** to thereby interrupt the communication between the vent passage and the chamber **100** within the resilient bellows-like element **96** to prevent liquid rising through the vent passage from entering the chamber **100**. Downward movement of the valve assembly, however, serves to uncover the port **98** to prevent the resilient bellows-like element **96** from becoming suction-bound and retarding downward movement of the valve assembly.

As the filling platform **20** continues to lower, the valve head **42** will seat upon its seat **36** and simultaneously the container mouth will break away from its engagement with the annular gasket **72**. At this instant the reduced pressure within the air space **24** of the reservoir becomes effective to suck the liquid standing in the vent passage up into the reservoir **22**, thus clearing the vent passage of liquid in preparation for the next filling cycle. It is pointed out that the pressure in the air space **24** is not low enough to prevent the filled container from breaking, by gravity, its sealing engagement with the gasket **72**.

After the mouth of the container **26** is disengaged from the annular gasket **72**, liquid will be suspended within the filling tube **52**, and depending upon its viscosity and surface tension, such liquid will tend to dribble or drip from the lower end or outlet **54** of the filling tube. The provision of the lateral port **66** in the lower end of the filling tube **52**, however, prevents any such dribbling because such port **66** permits the reduced pressure in the air space **24**, i. e., the suction of the vent passage, to act at the lower end of the filling tube **52** to withdraw any liquid that might tend to drip therefrom. Such withdrawn liquid is, of course, returned to the reservoir **22** up through the vent passage.

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

The construction of the parts of the nozzle facilitates the ease of disassembly for cleaning and reassembly in operating position in the reservoir downspout **30**. The valve body **38**, together with the parts mounted thereon,

may readily be unscrewed from the sleeve **58** and withdrawn upwardly out of the downspout **30**. The sleeve **58**, together with the parts supported thereon, may then be pulled downwardly out of engagement with the lower rim **94** of the resilient bellows-like element **96** and separately disassembled for cleaning. The bellows-like element **96** may then be pulled downwardly from engagement with the downspout **30** and removed for cleaning. Reassembly of the filler nozzle will be obvious from the above description.

It will thus be seen that the objects of the invention have been effectively accomplished. It will be realized, however, that various changes in the specific embodiment illustrated will be apparent to one skilled in the art. Therefore, this invention embraces all modifications which are encompassed by the spirit and scope of the following claims.

We claim:

1. A filler nozzle for container filling apparatus having a filling platform and a superposed liquid reservoir under reduced pressure, at least one of which is vertically movable, said nozzle comprising: a vertically movable body having means movable therewith and defining a liquid passage and a vent passage extending therethrough for communication, respectively, with the liquid in the reservoir and the reduced pressure air space thereabove, said passages having adjacent outlets at their lower ends for insertion into a container to be filled; valve means controlling said liquid passage above its said outlet and opening upon upward movement of said body; means on said body for sealingly engaging the mouth of a container to be filled and for raising said body for relative advancing movement between the container and the reservoir; and means providing communication between said passages immediately above their outlets.

2. The structure defined in claim 1 in which the lower ends of the passages are formed by an inner liquid tube enclosed by a concentric vent tube terminating, at its lower end, a slight distance above said liquid tube.

3. A filler nozzle for container filling apparatus having a filling platform and a superposed liquid reservoir under reduced pressure, at least one of which is vertically movable, said nozzle comprising: a downspout depending from the reservoir and having an upwardly facing valve seat; a valve body slidably mounted in said downspout and seating on said seat; a pair of concentric tubes depending from said body for insertion into a container to be filled, the inner tube providing a filling passage and the space between said tubes providing a vent passage, said outer tube terminating, at its lower end, slightly above said inner tube; a lateral inlet port in said body below said seat and communicating with said inner tube; a passage in said body extending upwardly above the level of the liquid in the reservoir and communicating, at its lower end, wth said space between said tube; means on said outer tube sealingly engageable with the mouth of a container to be filled; an annular bellows secured to and between the lower end of said downspout and said valve body; and means defining a port normally providing communication between said vent passage and the interior of said bellows, said last-mentioned port being closed upon upward movement of said valve body.

4. The structure defined in claim 3 including a lateral port in the inner tube slightly above the lower end of the outer tube.

5. A filler nozzle for container filling apparatus having a filling platform and a superposed liquid reservoir under reduced pressure, at least one of which is vertically movable, said nozzle comprising: a downspout depending from the reservoir and having an upwardly facing valve seat adjacent the upper end thereof; a valve body slidably mounted in said downspout and having a passage extending upwardly therethrough, a valve surface seating on said seat, and a lateral port below said surface; an open-ended filling tube depending from said body and communicating with said port, said filling tube having a small lateral port adjacent the lower end thereof; a vent pipe constituting an extension of said valve body passage and extending above the level of the liquid in the reservoir; a sleeve threaded to the lower end of said body and extending in spaced concentric relation about said filling tube, the space between said sleeve and tube being in communication with said valve body passage; an open-ended vent tube secured to and depending from said sleeve in spaced concentric relation about said filling tube, said vent tube terminating slightly above the lower end of said liquid tube; an annular bellows having one end thereof secured to the lower end of said downspout and the other end thereof secured to said sleeve; and an annular gasket on said vent tube for sealing engagement with the mouth of a container to be filled.

6. The structure defined in claim 5 including means mounting the annular gasket for vertical adjustment on the vent tube.

7. The structure defined in claim 5 including a lateral port in the sleeve immediately below the lower end of the downspout and communicating with the interior of the bellows.

8. In a filler nozzle for vacuum-venting filling machines the combination of an open-ended inner filler tube and an open-ended concentric outer vent tube, said tubes providing a downwardly facing filling opening surrounded by a vent opening spaced slightly above said filling opening, valve means controlling said filler tube above said filling opening, and a lateral port in said filler tube slightly above said filling opening and in communication with the space between said filling and vent tubes above said vent opening.

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