Nov. 13, 1956 R. H. BREEBACK 2,770,263

METHOD AND APPARATUS FOR FILLING CONTAINERS WITH A LIQUID

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Fig. 1.

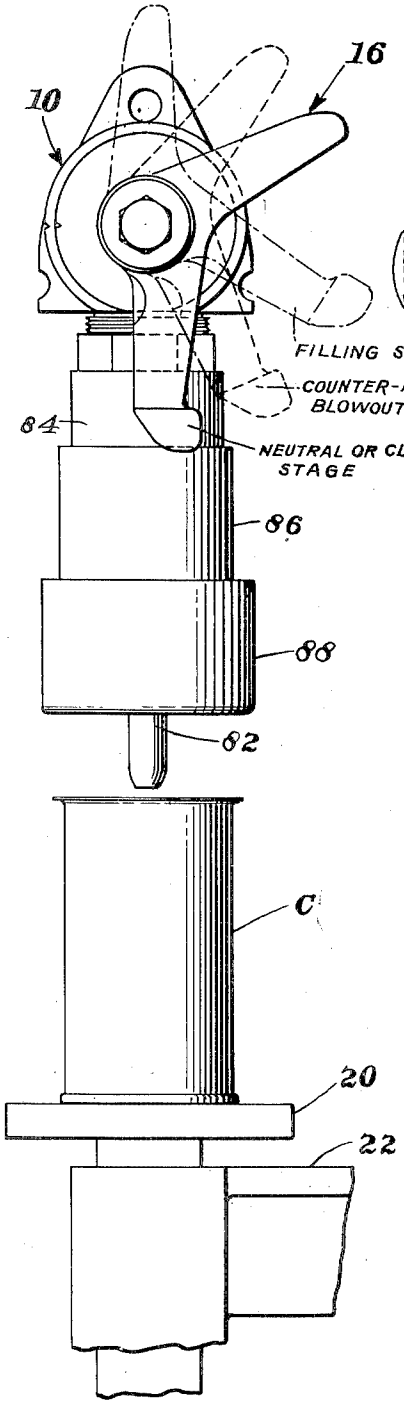
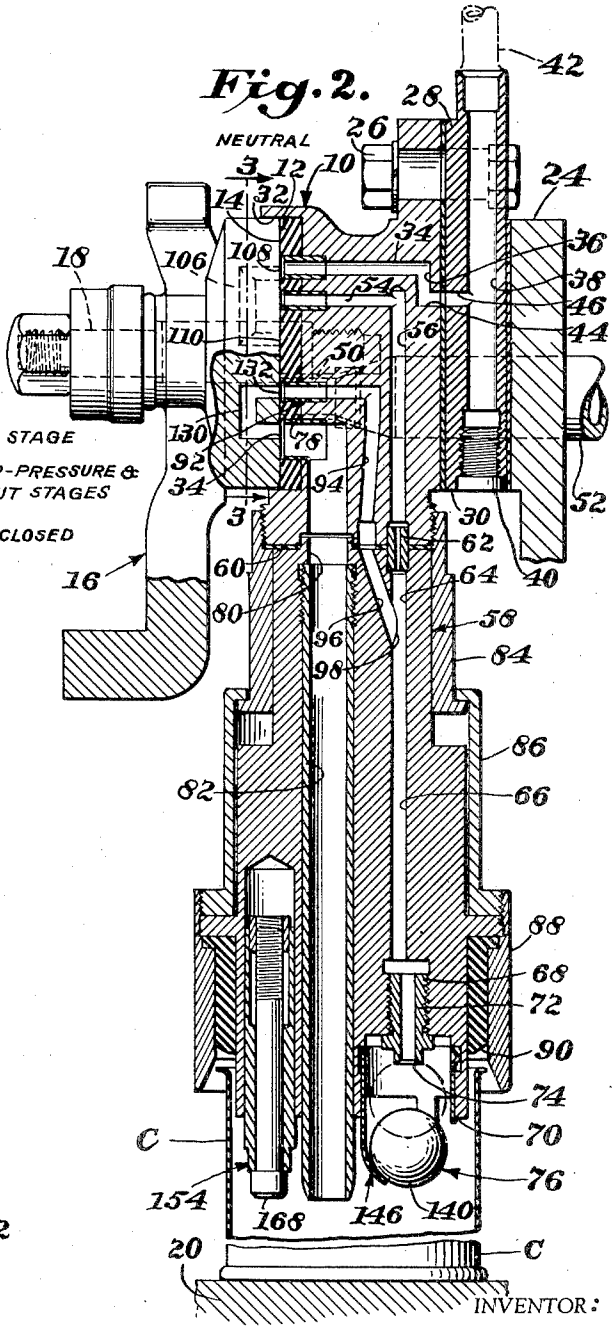


Fig. 2.



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METHOD AND APPARATUS FOR FILLING CONTAINERS WITH A LIQUID

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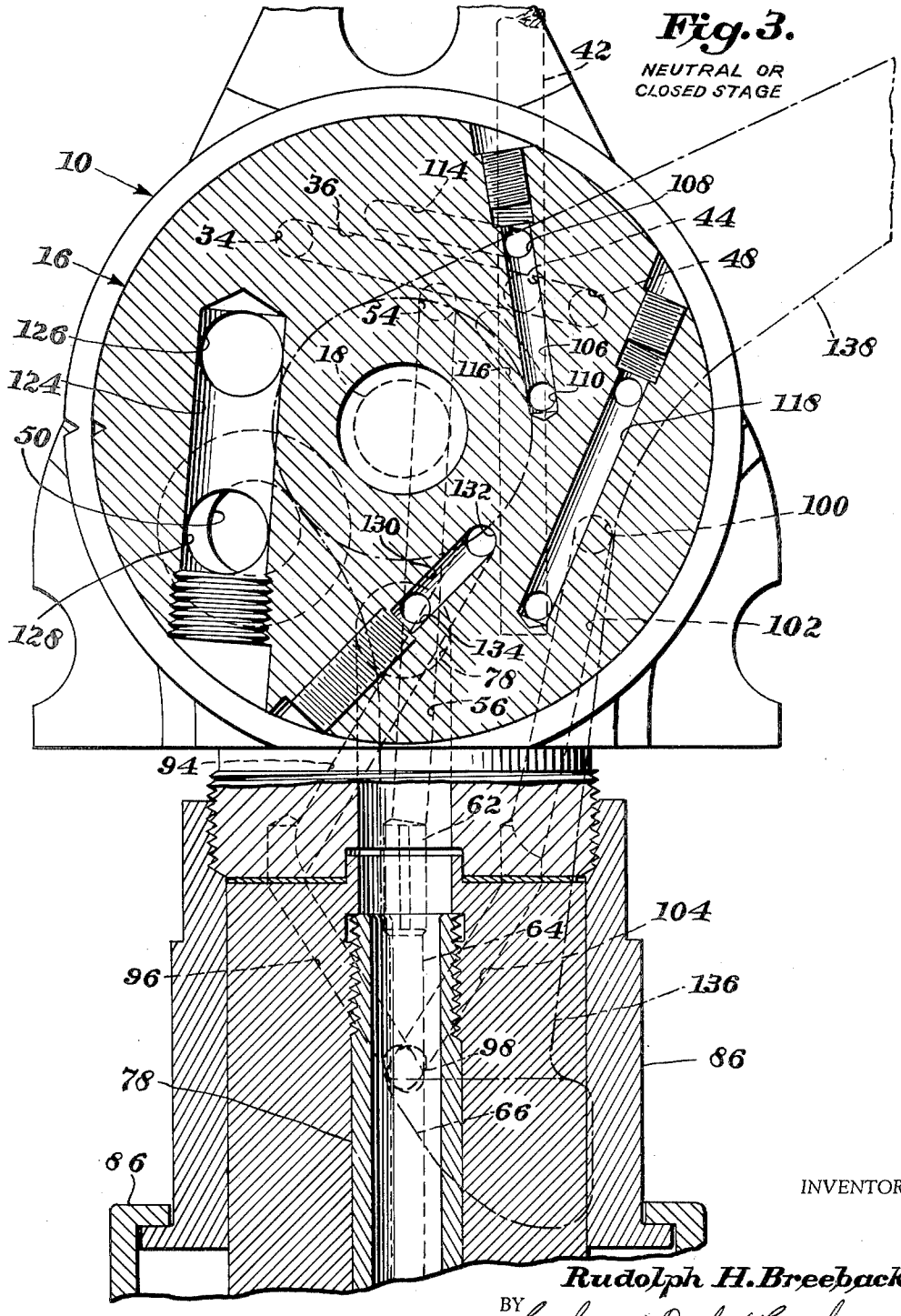


Fig. 3.

NEUTRAL OR CLOSED STAGE

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Nov. 13, 1956 R. H. BREEBACK 2,770,263

METHOD AND APPARATUS FOR FILLING CONTAINERS WITH A LIQUID

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Fig. 5.

FILLING STAGE

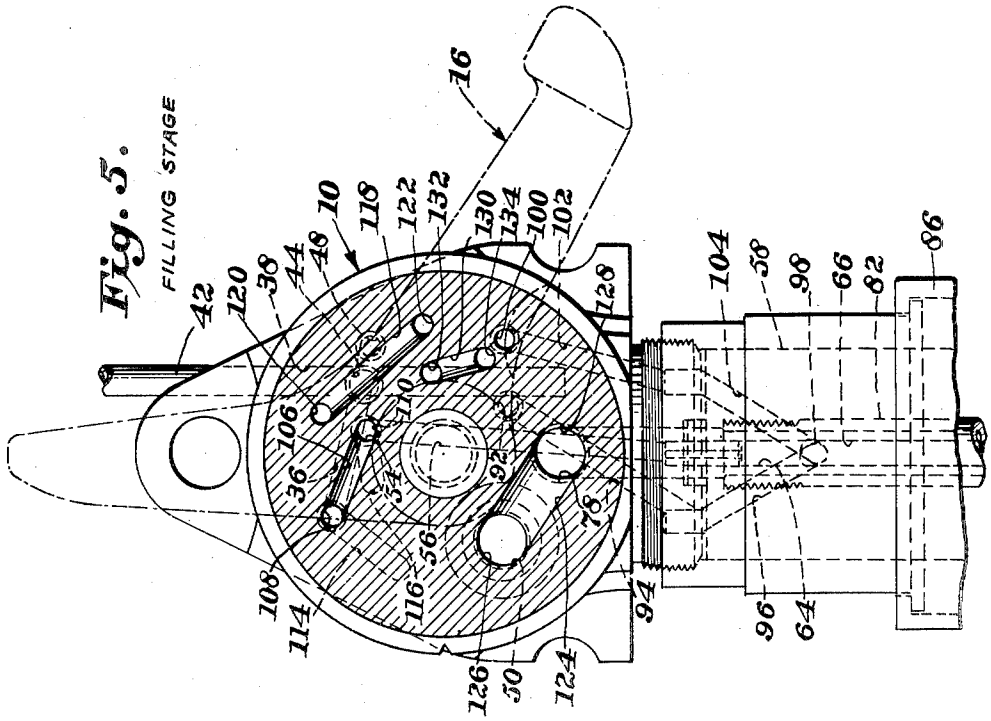
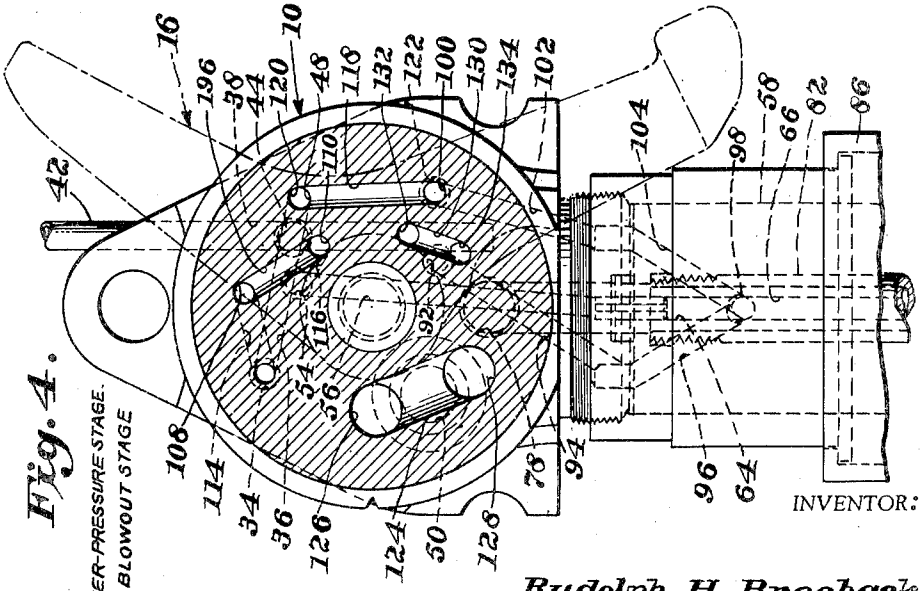


Fig. 4.

COUNTER-PRESSURE STAGE AND BLOWOUT STAGE



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METHOD AND APPARATUS FOR FILLING CONTAINERS WITH A LIQUID

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Fig. 6.

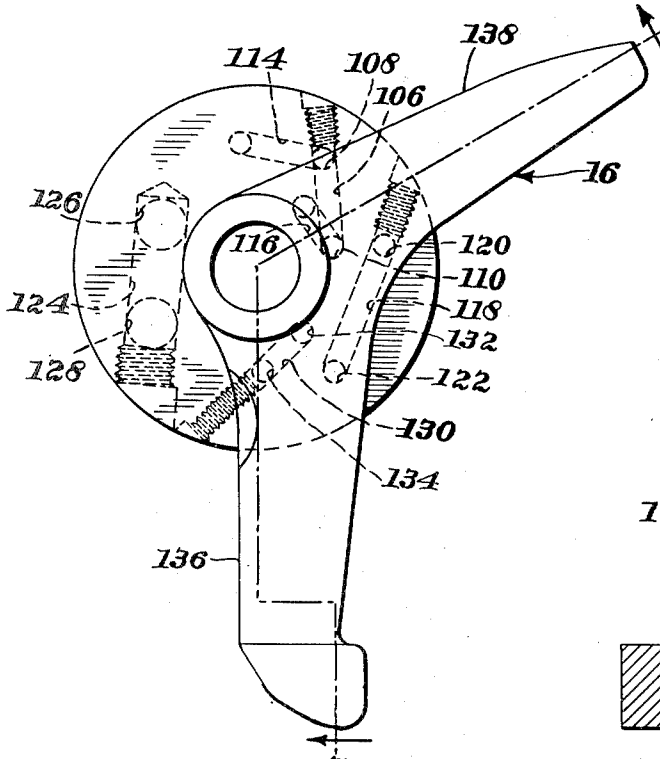


Fig. 7.

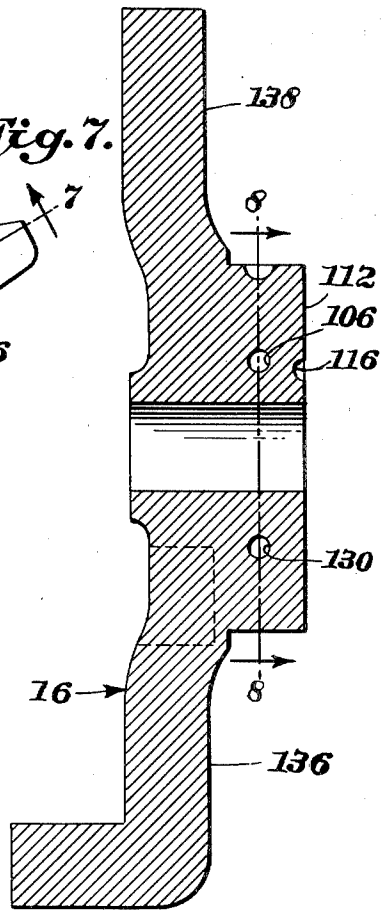


Fig. 8.

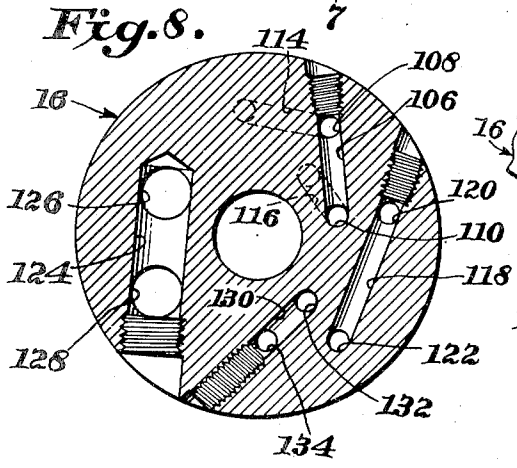
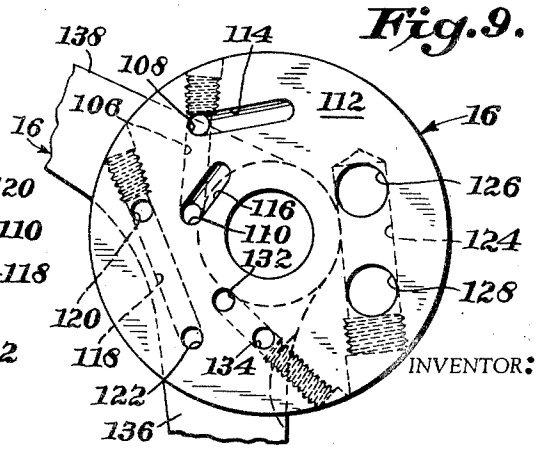


Fig. 9.



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METHOD AND APPARATUS FOR FILLING CONTAINERS WITH A LIQUID

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Fig. 10.

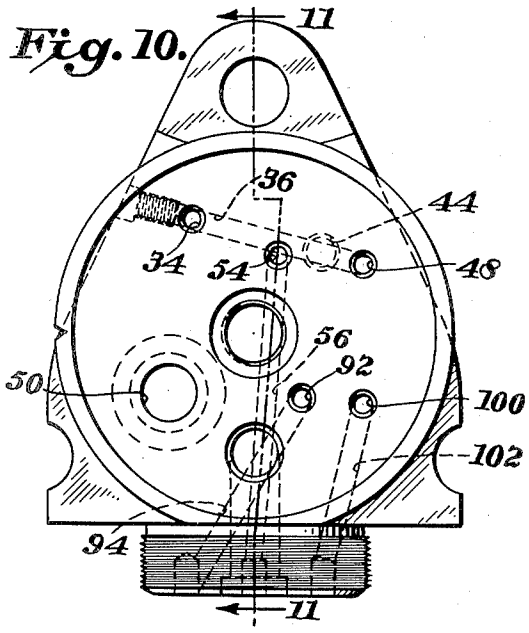


Fig. 11.

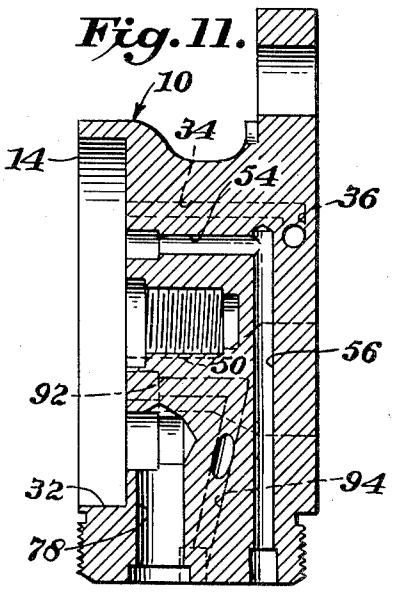


Fig. 12.

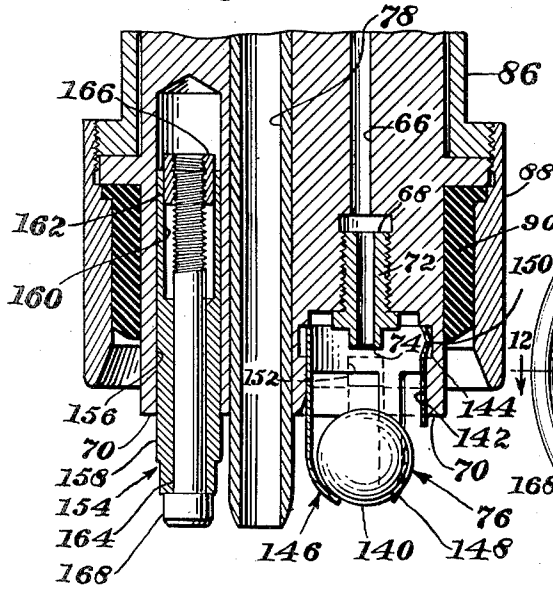
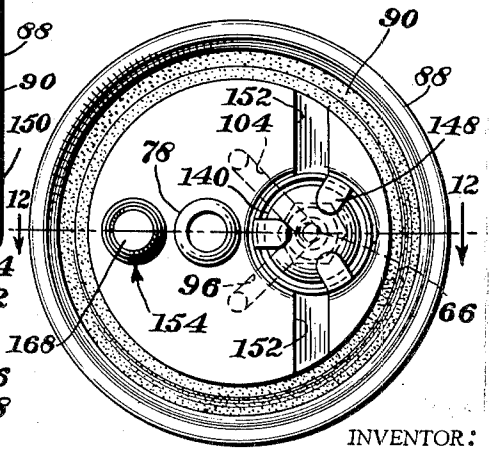


Fig. 13.



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United States Patent Office 2,770,263 Patented Nov. 13, 1956

2,770,263

METHOD AND APPARATUS FOR FILLING CONTAINERS WITH A LIQUID

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Application March 3, 1954, Serial No. 413,819

25 Claims. (Cl. 141—6)

The present invention relates to a method and apparatus for filling containers with a liquid.

The present invention primarily relates to a beverage filling machine of the rotary type disclosed in my copending application Serial No. 319,970 filed November 12, 1952, now Patent No. 2,728,511, dated Dec. 27, 1955, and entitled "Filling Machines." In the aforementioned application, the filling machine disclosed is of the rotary type wherein the filling head includes a rotary disk valve including upwardly and downwardly extending operating arms and which arms are arranged to contact with fixed trips spaced about the rotary path of the filling table. Although the filling head disclosed in the present application is particularly adapted for use with a rotary filling machine and is of the rotary disk valve type, it is well within the scope of the present invention that the filling head disclosed herein could be used with filling machines other than rotary and with filling heads having other than a rotary disk type valve.

In the filling of containers with a carbonated liquid, including beer, a disadvantage of prior filling heads is that the liquid flow tube or nozzle retains liquid therein when the filling valve is operated to the closed position and the filled container is removed from the filling head. The liquid retained in the filling nozzle or tube after each container has been filled is known in the beverage industry as the "prime." Heretofore, the "prime" left in the flow tube after a container has been removed from the filling head is emptied into the next container placed under the filling head during the filling cycle for that container. If the carbonated liquid is wild or unstable during filling operation, the "prime" will trickle out of the filling tube after the container is removed from the filling head and before another container is placed thereon. Further, if the filling head is operated without a container, as sometimes occurs when there is a break in the line of containers being fed to the machine, the filling tube warms up and the gas in the carbonated liquid expands causing the "prime" in the filling tube to be forced therefrom. The "prime" which trickles out of the filling tube runs onto the platform of the filling machine and onto the floor causing an unsightly appearance and unsanitary condition around the filling machine. In addition, the loss of liquid from a loss of "prime" amounts to a considerable quantity over a period of time.

Therefore, an object of the present invention is the provision of a filling machine having filling heads wherein the liquid flow tube nozzle is provided with means to release the "prime" into the container being filled so that there will be no liquid in the flow tube or nozzle after the container has been filled and removed from the filling head.

Another object of the present invention is the provision of a method and a filling head wherein the liquid normally retained in the filling tube after a filling operation is released into the container below the surface of liquid in the container. By releasing the "prime" in the filling tube below the surface of the liquid in the container, no air will be entrained in the operation and agitation of the carbonated liquid is substantially eliminated.

Still another object of the present invention is the provision of a method and a filling head wherein the diameter of the filling tube may be increased so that the output of filled containers may be increased. The release of the liquid usually entrapped in the filling tube during the filling operation attained by the present invention enables the use of larger diameter filling tubes. Consequently, more liquid can be flowed through a filling head during a given period of time to thereby enable more containers to be filled within a given period. Also, use of a tube of large diameter permits the liquid to be flowed with minimum agitation.

In the filling of containers with carbonated liquids, it is desirable to so handle the filling operation that the height of filling can be accurately and uniformly controlled. It heretofore has been proposed to control the height of filling by means of a ball float valve adapted to close the vent passage by rise of liquid in the container. However, it has been found that in filling of containers with certain beverages, such as beer, the foam may lift the float to close off the vent, with the result that the actual height of liquid has little control upon the ball float.

A further object of the present invention is the provision of a filling head wherein the actual height of filling will be determined only by the actual height of liquid in the container. The present invention contemplates the use of a float valve but provides a new and novel means of mounting the float valve so that it will accurately control the height of fill by rise of liquid regardless of foam in the container.

A still further object of the present invention is to provide a mounting for a ball float valve, whereby, the ball float valve may be easily removed and disassembled for cleaning or replacement purposes.

In filling containers with carbonated liquids, the headspace remaining in the container is oftentimes critical. Further, in rotary filling machines where a plurality of filling heads are utilized the level of filled containers sometimes varies.

Therefore, an additional object of the present invention is the provision of a displacement means on the filling head body which may be adjusted so that the height of fill may be varied. By having an adjustable displacement member, an individual adjustment between various filling heads on a filling machine may be made so that each filling head will fill containers to the exact same level and a desired headspace may be maintained.

Other objects and advantages of the invention will be apparent from the following specification, claims and accompanying drawings:

In the drawings:

Figure 1 is a front elevation of a filling head of the present invention and showing a container supported on a container supporting platform in alignment with the filling head;

Figure 2 is a diagrammatic sectional view of the Figure 1 filling head illustrating a number of the flow passages through the filling head and disclosing the filling valve in the neutral or closed position;

Figure 3 is a sectional view taken on line 3—3 of Figure 2, and showing the filling disk valve in the neutral or closed stage position, the view being on a larger scale than both Figures 1 and 2;

Figure 4 is a section similar to that of Figure 3 but on a reduced scale showing the filling disk valve in the position it occupies for the counterpressure stage as well as for the blowout stage;

Figure 5 is a view similar to Figure 3 but on a reduced

scale showing the filling disk valve in the filling stage position;

Figure 6 is a front elevational view of the disk valve included in the present invention;

Figure 7 is a section on the line **7—7** of Figure 6;

Figure 8 is a section on the line **8—8** of Figure 7 exposing flow passages of the disk valve;

Figure 9 is a view of the seat face of the disk valve, that is, looking toward Figure 7 from the right;

Figure 10 is an elevation of the seat face of the filling head body;

Figure 11 is a sectional view on the angled line **11—11** of Figure 10;

Figure 12 is an enlarged fragmentary view of the lower portion of the filling head body on the line **12—12** of Figure 13 and showing in cross-section the adjustable displacement member and the ball float mounting means; and

Figure 13 is a plan view of Figure 12 looking from the bottom upwardly.

The embodiment of the invention disclosed herein is intended for use in filling beer or other carbonated beverages but it will be understood that other beverages may be filled with the arrangements of the invention. Further, the filling head disclosed herein is of the type used in filling containers such as cans but it is intended that the invention herein could be practiced in the art of filling bottles or the like.

Referring to Figures 1 and 2, the filling head of the present invention includes a body **10** having a gasket **12** inserted in its outer circular recessed face so that the outer surface **14** of the gasket thereby forms the seat of the body **10**. The body **10** is secured to the periphery of a reservoir carrying superstructure of a filling machine (not shown) in any suitable manner or in a manner such as described in the application of Rudolph H. Breeback, Serial No. 213,950, filed March 5, 1951, now Patent No. 2,701,675, dated February 8, 1955. A disk type valve **16** is rotatable upon a stud **18** projecting centrally from the seat face **14**. As will be explained later in the specification, the body **10** and disk valve **16** are provided with flow passages adapted to be aligned or non-aligned by movement of the disk valve through the several positions indicated by the dotted lines in Figure 1 to first establish counterpressure in a container to be filled, then cause liquid to flow into the container while the air or gas in the container is delivered to the upper portion of a liquid and gas reservoir of the filling machine, and thereafter close the passages and cause the "prime" of liquid remaining in the liquid flow tube or nozzle to be released into the container just filled. After the container has been filled, it is lowered from sealing engagement with the body **10** and it is at this time with disk valve **16** in the neutral or closed position that the liquid remaining in the liquid flow tube will drain beneath the surface of the liquid in the container so that the flow tube will be emptied when the container is removed from the container supporting platform. After the container has been removed from a container supporting platform **20**, the disk valve **16** may be moved to blowout position, which is the same as the counterpressure position, to cause gas to flow from the gas containing portion of the reservoir through the gas passages to thereby clear the passages of any foam or liquid therein before another container is moved upwardly into engagement with the filling head.

Each filling head of the filling machine will have a container supporting platform **20** in alignment therewith, the container supporting platforms being vertically reciprocal in the rotary filling table **22** to thereby raise and lower containers such as the illustrated can C, with respect to the filling head. The container supporting platforms may be moved upwardly and downwardly in proper timed sequence with the filling head and infeed and take off conveyors in any suitable manner such as by air pressure cylinders on the platforms and cams in the path of rotation of the filling table **22**.

As previously stated, in accordance with the usual practice, the rotary filling table **22** includes a superstructure positioned above the filling platforms **20**. Such a structure is shown in Robert J. Stewart et al. Patent No. 2,202,033, issued May 28, 1940. The superstructure will comprise a centrally located reservoir for liquid and a superposed body of gas. The superstructure also includes a horizontally extending skirt including a peripheral vertical flange **24**, as best shown in Figure 2. A plurality of filling heads are secured to the flange **24** and each of the filling heads is provided with a depending flow tube or nozzle which is vertically aligned with a corresponding platform **20** of the filling table **22**.

The filling head includes the filling head body **10** secured by the bolt **26** to the outer planar face **28** of a mounting plate **30**. As best shown in Figure 2, the mounting plate **30** is secured to the flange **24** of the superstructure by bolts (not shown) or the like. The outer surface of body **10** is circularly recessed as indicated at **32** and the gasket **12** is positioned in the recess so that the outer surface of the gasket forms the seat face **14**. Gasket **12** is apertured to provide for the body passages which open to recess **32**.

Referring to Figures 2, 10 and 11, filling head body **10** includes a horizontal gas passage **34** extending from the recess **32** to an angularly extending passage **36**. A vertically extending bore **38** is provided in mounting plate **30** and is closed at its lower end by a plug **40**. The upper end of bore **38** is counter-bored to receive the vent tube **42** which extends to the gas containing portion of the liquid and gas reservoir. The angularly extending passage **36** communicates with a rearwardly extending gas passage **44** which in turn communicates with the rear face **28** of body **10**. Mounting plate **30** is provided with a horizontal passage **46** which communicates at its forward end with the passage **44** and at its rearward end with the bore **38**. As best shown in Figure 10, a second gas passage **48** extends horizontally through body **10** to recess **32** from gas passage **36**. As is now evident, both the passages **34** and **48** open to the mounting plate bore **38** via the angularly extending passage **36**.

A liquid passage **50** of usual form extends from recess **32** of body **10** rearwardly to its rear face where it is enlarged. A liquid tube **52** is adapted to be received in the enlarged portion of liquid passage **50** and extends to the liquid portion of the gas and liquid reservoir.

The passages described above comprise the gas and liquid passages leading from the reservoir to the seat face of filling head body **10**.

Body **10** of the filling head is provided with a lower downwardly depending portion indicated by the numeral **58** and having a horizontal face **70**. Since the lower body portion **58** is made separate from the upper portion of body **10**, a gasket **60** is provided with suitable apertures therein for alignment with the liquid and gas passages in the upper and lower body portions.

Lower body portion **58** is retained in position with the upper portion of body **10** by means of a flanged sleeve **84**, a flanged adaptor **86** and a threaded sleeve **88**. The elements just mentioned provide a clamping action so that the body portion **58** is held in place with the upper portion of body **10**. Threaded sleeve **88** also retains a resilent and compressible sealing ring or gasket **90** which is adapted to engage the top of container C and form a seal therewith.

Referring now to the passages which extend from the seat face of filling head body **10** through lower body portion **58** to its horizontal face, and as best shown in Figures 2, 10 and 11, a gas passage **54** extends rearwardly from the body seat face and opens to a vertical passage **56**, which extends downwardly to communicate with a passage **64** in the lower downwardly extending portion **58** of body **10** (Figure 2). Also, at the lower end of the upper por-

tion of body 10 and between the passage 64 of lower body portion 58 and passage 56 of the upper portion of body 10, a bushing 62 is provided, the bushing being provided with a smaller bore than the just mentioned passages to thereby restrict the flow through passages. Bushing 62 aligns passage 56 with the passage 64 in the lower body portion 58.

Passage 64 is in communication with a vertical passage 66 in the lower body portion 58, as indicated at 98, which in turn is in communication with an enlarged threaded bore 68 in the lower horizontal face 70 of body portion 58. A threaded plug 72 having a bore therethrough is adapted to be threaded into the threaded bore 68 and provides a valve seat 74 for a ball float valve generally indicated 76. A more detailed description of the ball float valve and its novel mounting will follow later in the specification.

A right angled liquid passage 78 extends from the filling head body seat face horizontally and then downwardly to open communication with a vertical passage 80 in lower body portion 58 which supports the filling tube or nozzle 82. Filling tube or nozzle 82 extends below the lower horizontal face 70 of body portion 58 and is of the usual form.

As best shown in Figures 3, 4, 5, 10 and 11 a second gas passage 92 extends horizontally from seat face 14, rearwardly through body 10 and downwardly as indicated at 94 to the lower portion 58 of body 10. Where the passage 92 meets the body portion 58, it is in communication with a passage 96 therein which opens into communication with passage 66 as indicated at 98 (Figures 3, 4 and 5).

A third gas passage also extends from the seat face 14 horizontally rearwardly and downwardly as indicated at 102 to communicate with the passage 104 in the lower portion 58 of body member 10. Passage 104 like passage 96 is in open communication with gas passage 66 as indicated at 98 (Figures 3, 4 and 5). Consequently, it will be noted, that there are three gas passages in body member 10 leading from the seat face to a common point 98 in the lower portion 58 of the body and at this junction point, then a single passage 66 extends vertically downwardly to the lower face 70.

Disk valve 16 is best shown in detail in Figures 6 to 9, inclusive, and is also shown in the diagrammatic sections in Figures 2 to 5, inclusive. Referring to Figures 6 and 9, disk valve 16 includes a passage 106 which, as indicated in Figure 2, is of U-shape to include two ports 108 and 110 opening to the seat face 112 of the valve as best shown in Figure 9. Seat face 112 of valve 16 has a straight line groove 114 formed therein and extending in a generally clockwise direction (as viewed in Figure 9) from the port 108. As is also shown in Figure 9, the seat face 112 is provided with a straight line groove 116 extending from port 110. Groove 116 extends toward groove 114 but does not connect therewith. It will be observed that grooves 114 and 116, in effect, form extensions of ports 108 and 110 respectively.

A second U-shaped gas passage 118 is formed in disk valve 16 including ports 120 and 122 at its opposite ends and which ports open to the seat face 112 of the valve. Dick valve 16 also includes a U-shaped liquid passage 124 including ports 126 and 128 opening to the seat face and arranged to bridge the liquid passages 50 and 78 of body 10.

Further, disk valve 16 is provided with a third U-shaped gas passage 130 having ports 132 and 134 opening to its seat face. It is this passage which is adapted to bridge liquid passage 78 and gas passage 94 when the disk valve is in the neutral or closed stage, thus, placing the upper end of the liquid flow tube into communication with the headspace of the container.

In accordance with the usual practice, disk valve 16 is provided with a lower downwardly extending operating arm 136 and an upper operating arm 138. The operating arms 136 and 138 are adapted to engage trips on the filling machine frame to move the valve from a closed position to a counterpressure position, then to a filling and venting position, then to a closed position, then to a blowout position, and finally to a closed position prior to another filling operation sequence. Since the disk valve and means of operating are substantially similar as that disclosed in Rudolph H. Breeback application Serial No. 319,970, filed November 12, 1952, a detailed description of the disk valve operation other than alignment of the flow passages in various stages of the filling cycle, will not be repeated in this specification.

Referring now to Figures 12 and 13, the ball float valve assembly 76 is of the type which provides a ball float 140 adapted to rise upon the rise of liquid in the container C to close off the vent passage 66 when it seats on the valve seat 74. When the ball has been seated on valve seat 74, no more gas or air from the container can be vented and, thus, the flow of liquid to the container will cease. Disk valve 16 will then be operated to close the liquid flow passages so that the container can be removed from the filling head.

The novel means of mounting the ball float valve 140 will now be discussed in detail. The horizontal face 70 is provided with an enlarged bore 142 having a counterbore 144 at its upper end. The upper portion of bore 142 will be in communication with gas passage 66 through the bore in the threaded plug 72. A substantially cylindrical ball float cage 146 having downwardly and inwardly depending fingers 148 is provided at its upper end with a projection 150. Cage 146 is made preferably of sheet metal and is substantially resilient to allow it to be compressed and inserted into bore 142 having its projection 150 snap into place in counter-bore 144. By providing a removable cage which may be snapped into and out of position on the lower portion 58 of body 10, the ball float 140 may be easily and quickly removed and replaced or cleaned merely by slipping the cage out of bore 142.

In filling containers with liquids which are capable of foaming, there is always the possibility that the foam will form a seal between the ball float 140 and the bore 142 as the float is rising due to a rise of liquid in the container. Should this occur, an inaccurate fill height of the container would result. Therefore, grooves 152 are provided in the horizontal face 70 in the lower body portion 58 of body element 10. Communicating with bore 142, the grooves 152 are sufficiently deep so that there is no chance of a seal being formed between the ball and the wall of bore 142.

To further insure accurate fill and, also, to provide a means for individually adjusting the height of fill of the particular filling head on a filling machine having a plurality of heads, a displacement member generally indicated at 154 is provided. The displacement member 154 is adapted to fit into a bore 156 extending upwardly from the horizontal face 70 and closed at its upper end. Displacement member 154 includes a tubular sleeve 158 rigidly secured in bore 156 in any suitable manner. The upper end of tubular sleeve 158 is provided with an enlarged counter-bore 160 which rigidly supports the internally threaded nut 162. A bolt member 164 threaded at one end as indicated at 166 is adapted to be received in the tubular sleeve 158 and threaded into the nut 162. The head of bolt 164 is knurled as indicated at 168 to provide a better gripping surface for threading the bolt into and out of nut 162 to thereby vary the headspace in a filled container by varying the displacement within the container C.

In the operation of the filling head of the present invention, the various stages of the filling of a filling machine incorporating the present invention will be discussed in detail under the headings of Counterpressure Stage, Filling Stage, Closed or Neutral Stage and Blowout Stage.

Counterpressure stage

The container is placed onto platform **20** when the disk valve **16** is in the closed or neutral position. The position of the passages of disk valve **16** with respect to the passages in body **10** will be as shown in Figure 3. A more detailed description of the valve in the closed or neutral position will be described later in the specification under the heading "Closed or Neutral Stage."

After the container C has been placed on container supporting platform **20**, the table **22** will rotate and as it rotates the container will be raised by platform **20** into sealing engagement with the gasket **90** of the filling head. After container C has been properly sealed against the filling head, the lower arm **136** of disk valve **16** will engage a stationary trip member on the filling machine frame to move it counterclockwise to the counterpressure position indicated in the dotted lines on Figure 1. When disk valve **16** is in the counterpressure position, the liquid and gas passage of the valve will have the relationship disclosed in Figure 4.

In more detail, the disk valve liquid passage **124** will have its ports **126** and **128** partially aligned with liquid flow passage **50** of body **10**. However, no flow of liquid can occur in this position because the liquid flow passage of disk valve **16** is not in alignment with liquid flow passage **78** in body **10**.

On the other hand, the flow of gas to the container from the gas containing portion of the liquid and gas reservoir, can occur through both the gas passages **106** and **118** of disk valve **16**. With respect to the passage **106**, the outer end of its groove **114** will be aligned with the port **34** which extends rearwardly through the body **10** and opens to the passages **36**, **44** and **46**. The outer end of the other groove **116** extending from the disk valve passage **106** will be aligned with the port **54** of the passage **56** leading to the common gas passage **66**. This will provide one line of gas flow through valve **16**.

A second line of gas flow will also occur through the filling head and its valve because the valve passage **118** will have its port **120** aligned with body port **48** and passages communicating therewith and extending to the vent **42** and its port **122** aligned with the body port **100** and passages communicating therewith and extending to the passage **66**.

Gas may now flow downwardly from the filling reservoir to the filling head through the vent tube **42**, into the mounting plate bore **38**, and port **46** to the angular extending passage **36** in the rear of body **10**. Gas then flows to the right and left through passage **36**, the right hand flow moving through the disk valve port **120** and the left hand flow moving through groove **114** in the seat face **112** of the disk valve, then through passage **106** and groove **116** to the body passage **56**. The gas moving downwardly through body passage **56** will flow therethrough into the passage **66** and from there through the bore of the threaded plug **72** into the container. On the other hand, gas flowing through port **120** will flow downwardly through passage **102**, then through passage **104** to its junction at **98** with the passage **66**, and then downwardly into the container through passage **66**. It will be observed that counterpressure is thus established in the container through two passages extending substantially from the mounting plate port **46** to the upper portion of passage **66**. Therefore, counterpressure may be established in the container with a minimum period of time so that a greater proportion of the filling cycle may be used for the liquid flow stage.

Filling stage

When the filling head moves from the counterpressure position, disk valve **16** will be operated by another stationary trip on the filling machine frame to move the same to the filling position.

Referring to Figure 5, it will be observed that the disk valve liquid passage **124** now has its port **126** in alignment with the liquid flow passage **50** of body **10** and the other port **128** of passage **124** in alignment with liquid passage **78** leading from body seat face **14** and downwardly to the filling tube or nozzle **82**. Therefore, liquid may flow from the liquid portion of the reservoir through inlet tube **52** (Figure 2) and passage **50** to the disk valve **16** and then to filling tube or nozzle **82** through liquid passage **78**.

At the same time that liquid is entering the container, the gas or air within the container will return to the reservoir by the following passages:

Gas will pass through the bore of the threaded plug **72** to the vertical gas passage **66**, the restricted bore of bushing **62**, the gas passages **56** and **54** to the body seat face **14**. The gas or air will then pass through the groove **116** to the passage **106** in disk valve **16** and from there the gas will pass through the passage **36** in body **10** to the port **46** and bore **38** of mounting plate **30**. From the bore of the plate **30** the gas will pass upwardly through the vent tube **42** to the gas containing portion of the reservoir.

It will be observed from Figure 5 that the gas passage **118** of the disk valve will not be in alignment with any ports in body **10**. Also, the grooves **116** and **114** in the seat face **112** of the disk valve will have no flow therethrough.

As previously stated, the flow of liquid in a container will continue until the level of liquid reaches a desired level. At this time the flow will be preliminarily stopped by the ball float valve **140** seating against valve seat **74** to close off the vent. At this time, the disk valve will then be moved to closed position as hereinafter described to thereby prevent further flow of liquid into the container.

Closed or neutral stage

When the filling head reaches a closing trip on the filling machine, the disk valve will be rotated clockwise from the position of Figure 5 to the position of Figure 3. In this latter position liquid flow passage **124** in disk valve **16** will not bridge the liquid flow passages **50** and **78** in body **10**. Also, the two gas passages **106** and **118** in disk valve **16** will be out of communication with the respective gas flow passage in the body element **10**.

By prior practice, when the disk valve reached the closed position a certain amount of liquid was trapped in the filling nozzle or tube **82** and liquid passage **78** by a vacuum and/or capillary action within the liquid flow tube or nozzle. Normally this liquid or "prime" trapped after the filling of a "first" container was blown into the next (or "second") container placed under the head when such second container was counterpressured. However, if the liquid was in an unstable state, after the first container had been removed from the container supporting platform **20**, the liquid trapped in liquid passage **78** and filler tube **82** would trickle onto the filling machine structure. On the other hand, if no container was present under a filling head and the machine continued operation or if shut down, the liquid remaining in the filling tube of the filling head would become heated and expand and, thus, also trickle out onto the machine and floor. This unsightly and unsanitary condition and waste has been eliminated in the filling head of the present invention, by placing the portion of the nozzle or filling tube **82** above the liquid therein, into open communication with the headspace in the container. Thus, when the container is lowered, there will be no vacuum to retain the liquid in the liquid passage **78** and the nozzle **72** and, the liquid will flow out of the tube beneath the surface of the liquid in the container. By flowing liquid beneath the surface of the liquid in container C, there will be no undue agitation or entrapment of air therein.

To accomplish the above result, the disk valve **16** is provided with the U-shaped passage **130** having the ports **132** and **134**. As best shown in Figures 2 and 3, in the closed position, the port **132** in disk valve **16** will

be aligned with the passages **94** and **96** in body element **10**. The passage **96** which is in open communication at **98** with the vertical gas passage **66** leading to the horizontal face of the lower portion of the body **10**, leads to the headspace of the container. The other port **134** of passage **130** will be in open communication with flow passage **78** and liquid flow tube **82**. Thus, when the disk valve **16** is in the neutral position and, when the container begins to lower from the filling head, ball float **140** will be released from seat **74** and thus putting the headspace of the container into communication with the liquid in the passage **78** and flow tube **82**. This is accomplished through the passages **66**, **96**, **94** to the port in the seat face of body **10**. Passage **94** is in communication with the port **132** of passage **130** while the other port **134** of passage **130** will be in communication with the liquid passage **78** of body **10**. As the container is lowered, the headspace in the container will be increased, thus, decreasing the headspace pressure. Since the headspace in the container is in communication with the liquid in passage **78** and flow tube **82**, the liquid trapped therein will immediately flow into the container, leaving the liquid flow passage and tube empty for the start of another filling cycle.

Not only does this provision eliminate waste of liquid and prevent an unsightly and unsanitary condition, it also permits making the diameter of the filler tube **82** larger than has heretofore been accomplished. In past practice, the filler tube was made of a rather small diameter for the purpose of retaining the liquid therein after a container has been removed so that there would be little or no chance of the liquid spilling onto the filling machine. By the practice of the present invention, the filling tube may be made larger in diameter and, consequently, the speed at which a container is filled may be greatly increased, thus, increasing the output of the filling machine. The advantage of making the liquid flow passages and nozzle of increased diameter is of great importance to modern day beverage plants because a machine having large diameter liquid flow passages and high output may be the same size as a filling machine having small diameter liquid flow passages. In other words, in the past, to increase the output of a rotary filling machine, the number of heads was increased, thus, increasing the overall diameter of the machine. Since space in modern plants is of such importance, it is impractical to increase output by increasing the number of heads on the filler and, thus, increase the overall diameter. Consequently, by use of the filling head of the present invention, the rotary speed of the machine can be increased as the portion of arc of travel necessary to fill a container can be decreased by use of larger diameter liquid flow passages and nozzles. As previously explained, there will be no increase in agitation of the beverage during filling even though quantity will be increased because the rate of flow of liquid is not increased.

Blowout stage

After the container C has been lowered from the filling head and removed from the container supporting platform **20**, disk valve **16** is momentarily operated in a counterclockwise direction to align the gas passages so that they may be blown out in preparation for filling another container. The passages during the blowout stage are aligned as illustrated in Figure 4 and are identical with the flow passages used during counterpressure. In other words, gas will flow downwardly from the gas containing portion of the filling reservoir through the mounting plate port to the two separate paths in body **10** and disk valve **16** and then to the vertical passage **66**.

The blowout stage is very brief and will terminate as soon as the filling head moves past a second closing trip which again causes the flow passages to close as previously described under the section entitled "Closed or neutral stage."

The terminology used in the specification is for the purpose of description and not limitation, the scope of the invention being defined in the claims.

I claim:

1. In a container filling machine, a filling head element, a container supporting element arranged to move the container into and out of sealing engagement with the filling head element, said filling head element including a liquid flow nozzle and a container venting means arranged to be closed by rise of liquid in the container, a displacement member depending from said filling head element and adapted to be received within the container, said displacement member being adjustable whereby height of fill of liquid in the container may be varied, and valve means on said filling head element, said valve means being operated to place said liquid flow nozzle in communication with said container venting means after the container has been filled whereby liquid in said liquid flow nozzle will flow into the container as the container is being removed from said filling head element.

2. In a container filling machine, a filling head element, a container supporting element arranged to move a container into and out of sealing engagement with the filling head element, said filling head element including a liquid flow nozzle and a container venting means, and valve means on said filling head element, said valve means being operated to place said liquid flow nozzle in communication with said container venting means after the container has been filled whereby liquid in said liquid flow nozzle will flow into the container as the container is being removed from said filling head element.

3. A container filling machine of the character described in claim 2 wherein said container venting means is arranged to be closed by rise of liquid in the container.

4. A container filling means of the character described in claim 2 including a displacement member depending downwardly from said filling head element and adapted to be received within the container, said displacement member being adjustable whereby the height of fill of liquid in the container may be varied.

5. A container filling machine of the character described in claim 2 wherein said liquid flow nozzle projects into the container when the container is in sealing engagement with said filling head element, and wherein said valve means is operated to place said liquid flow nozzle into communication with said container venting means after the container has been filled and when the liquid flow nozzle is below the level of liquid in the container.

6. In a container filling machine, a filling head element, a container supporting element arranged to move a container into and out of sealing engagement with the filling head element, said filling head element including a body having a valve seat and a downwardly extending portion with a horizontal face, a filling nozzle projecting downwardly from said body, said body being provided with a liquid flow passage extending from the valve seat to said nozzle, said body also being provided with a gas flow passage extending from the valve seat to the horizontal face of said body, said body including passages extending from the valve seat and adapted to be connected to a source of liquid and gas, and a valve member rotatable on said valve seat to one position connecting said liquid and gas flow passages respectively with the passages leading to the source of liquid and gas and to another position connecting said liquid and gas passages in open communication with each other.

7. A container filling machine of the character described in claim 6 wherein said filling nozzle is below the level of liquid in the container after the container is filled when said valve connects the liquid flow passage in open communication with the gas passage.

8. A container filling machine of the character described in claim 6 wherein the liquid and gas passages are connected to each other prior to the movement of the

container out of sealing engagement with said filling head element, and wherein means are provided to close said gas passage upon rise of liquid in the container and to open said gas passage when the container is moved out of sealing engagement with the filling head element.

9. A container filling machine of the character described in claim 6 wherein a displacement member depends downwardly from the horizontal face of said body and is adapted to fit into the container when the container is in sealing engagement with said body, said displacement member being adjustable whereby the height of fill of liquid in the container may be varied.

10. In a container filling machine for filling containers with a carbonated liquid and having a reservoir for the liquid and a superposed body of gas, a filling head element, a container supporting element arranged to move the container into and out of sealing engagement with the filling head element, a liquid flow nozzle projecting downwardly from said filling head element and having the lower portion thereof adapted to be inserted into the container and beneath the liquid therein when the container is filled, venting means in said filling head element for venting the gas in the container during filling, said filling head including valve means connecting said liquid flow nozzle with the liquid in the reservoir and said vent means with the gas superposing the liquid in the reservoir during liquid flow, and said valve means connecting said liquid flow nozzle in open communication with said venting means when liquid flow to the container and venting of the container is stopped.

11. A container filling machine of the character described in claim 10 wherein said valve means connects the liquid flow nozzle to the venting means while the lower portion of said liquid flow nozzle is beneath the liquid in the container.

12. A container filling machine of the character described in claim 10 wherein the venting means is closed by rise of liquid in the container.

13. A container filling machine of the character described in claim 12 wherein the venting means closed by the rise of liquid in the container is opened upon movement of the container out of sealing engagement with said filling head thereby placing the liquid flow nozzle in communication with headspace in the container through said venting means.

14. In a filling head for filling containers with a carbonated liquid, a body element provided with a portion adapted for sealing engagement with a container, said body element including a liquid passage extending therethrough and adapted to connect the liquid containing portion of a gas and liquid reservoir with a container, said body element further including a gas passage extending therethrough and adapted to connect the gas containing portion of the gas and liquid reservoir with the container, and valve means cooperating with said liquid and gas passages and operable to open said passages and establish liquid flow to the container and return flow of gas to the reservoir, said valve means then being operable after the container is filled and before the container is removed from the filling head to close off each of said liquid and gas passages from the reservoir at a point spaced from the container and to place said liquid passage and gas passage in communication with each other between the container and said point whereby liquid remaining in said liquid passage will flow into the container when the container is being removed from the filling head.

15. In a filling head for filling containers with a carbonated liquid, a body element provided with a valve seat and a downwardly extending portion with a horizontal face and adapted for sealing engagement with a container, said body element including at least one gas passage opening to said valve seat and adapted to communicate with the gas containing portion of a gas and liquid reservoir, said body element further including a liquid passage opening to said valve seat and adapted to communicate with the liquid portion of a gas and liquid reservoir, said body portion further including a second liquid passage communicating between and opening to the valve seat and the horizontal face thereof and a second gas passage communicating between and opening to the valve seat and the horizontal face thereof, a valve member cooperating with said valve seat and including a gas passage and a liquid passage therein, said valve member further including a third passage therein, said valve member being operable to align its gas passage with the first and second gas passages of said body element and to align its liquid passage with the first and second liquid passages of said body element to establish flow of liquid and return of gas, and then operable to move its liquid and gas passages out of alignment with the liquid and gas passages respectively in said body element and to align its third passage with the second liquid and gas passages of said body element thereby establishing communication between the same.

16. In a filling head for filling containers with a liquid, a body element provided with a downwardly extending portion having a horizontal face and adapted for sealing engagement with a container, said body element including a liquid flow nozzle extending downwardly from said horizontal face and a liquid passage therethrough adapted to communicate between said nozle and the liquid of a liquid reservoir, said body element further including an enlarged bore extending upwardly theerin from the horizontal face thereof and having a counter-bore at the upper end thereof, said body element including a gas passage adapted to communicate with said enlarged bore, valve means cooperating with said liquid and gas passages for establishing liquid flow and gas return flow therethrough, ball float means supported in said enlarged bore for closing said gas passage upon rise of liquid in the container, said ball float means including a substantially cylindrical cage member of resilient material having downwardly extending and inwardly turned fingers, said cage member having a projection on its upper end and adapted to spring fit into position in said enlarged bore with the projection extending into said counter-bore, a ball float supported by the fingers in said cage and adapted to raise vertically to close said gas passage.

17. A filling head of the character described in claim 16 wherein the downwardly extending portion of said body element is provided with an annular container-mouth engaging element and wherein the horizontal face of said body element is provided with grooves communicating with the enlarged bore.

18. In a filling head for filling containers with a liquid, a body element provided with a downwardly extending portion having a horizontal face, said body element including a liquid flow nozzle extending from said horizontal face and liquid flow passages connected with said flow nozzle, said body element having a bore therein closed at one end and extending upwardly from the horizontal face thereof, a displacement member supported in said bore, said displacement member including a tubular sleeve element mounted in said bore with a portion thereof extending downwardly from said horizontal face, said sleeve element being internally threaded, and an adjustable displacement element threadedly engaging said internally threaded sleeve element.

19. A method of filling containers with carbonated liquid comprising flowing the liquid into the container from a liquid source under pressure and simultaneously flowing the gas within the container to the source of liquid, closing such flow communication at a point between the container and the liquid source to thereby leave a liquid column between said point and the container, and placing the upper portion of said liquid column in communication with the headspace of the container.

20. A method of the character described in claim 19 including the further step of flowing the liquid column into the container and simultaneously increasing the headspace of the container.

21. A method of the character described in claim 19 including the further step of flowing the liquid column into the container below the surface of liquid therein.

22. A method of the character described in claim 19 including the further step of flowing the liquid column into the container below the surface of liquid therein and simultaneously increasing the headspace of the container.

23. A method of filling containers with carbonated liquid comprising flowing the liquid into the container from a liquid source under pressure and simultaneously flowing the gas within the container to the source of liquid, closing such flow communication at a point between a container and the liquid source to thereby leave a liquid column between said point and the container, placing the upper portion of said liquid column in communication with the headspace of the container, and reducing pressure within the headspace of the container and simultaneously flowing the liquid column into the container.

24. A method of the character described in claim 23 wherein the liquid column is flowed into the container below the surface of liquid therein.

25. In a container filling machine, a filling head, a container supporting element arranged to move a container into and out of sealing engagement with the filling head element, said filling head element including a liquid flow nozzle and a container venting means, valve means on said filling head element, said valve means being operable to cause flow of liquid through said liquid flow nozzle into the container while venting gas therefrom through said venting means, said valve means then being operable after the flow of liquid has been stopped to place said liquid flow nozzle in open communication with the headspace in the container whereby liquid in said flow nozzle will flow therefrom into the container when the container is being removed from said filling head element.

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