US 20080223478A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2008/0223478 A1

(43) Pub. Date: Sep. 18, 2008

Hantsoo et al.

(54) METHOD OF AND APPARATUS FOR THE BOTTOM-UP FILLING OF BEVERAGE CONTAINERS

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(21) Appl. No.: **12/050,934**

(22) Filed: **Mar. 18, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/895,474, filed on Mar. 18, 2007.

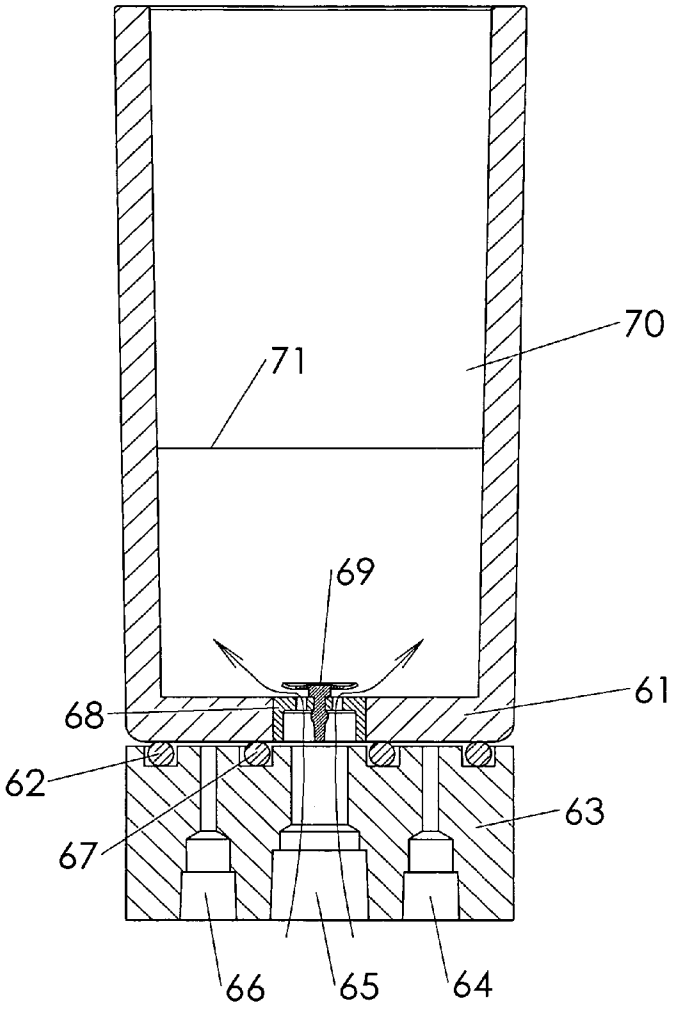
Publication Classification

(51) **Int. Cl.**
B65B 3/04 (2006.01)

(52) **U.S. Cl.** **141/2**; 220/86.1; 141/21

(57) **ABSTRACT**

A method and apparatus are disclosed for filling specially-designed beverage containers from the bottom through a one-way port. One embodiment of the invention employs an umbrella valve (**19**) mounted in a perforated stopper (**18**), which is interference-fitted into the bottom of a beverage container (**11**). When brought into contact with concentric o-ring seals (**12**,**17**) on a fluid delivery assembly (**13**), vacuum suction (**14**, **16**) fixtures the beverage container (**11**) down to the fluid delivery assembly (**13**), creating a liquid-tight channel for fluids to be fed through. Fluids originate in a pressurized reservoir and are fed through a fluid feed-in (**15**), forcing the umbrella valve (**19**) open and allowing flow of fluid into the interior volume (**20**) of the beverage container. Upon completion of filling, the reservoir is depressurized, allowing the umbrella valve (**19**) to snap shut. The beverage container (**11**) can now be decoupled from the fluid delivery assembly (**13**) and employed as desired. Other embodiments are described and shown.



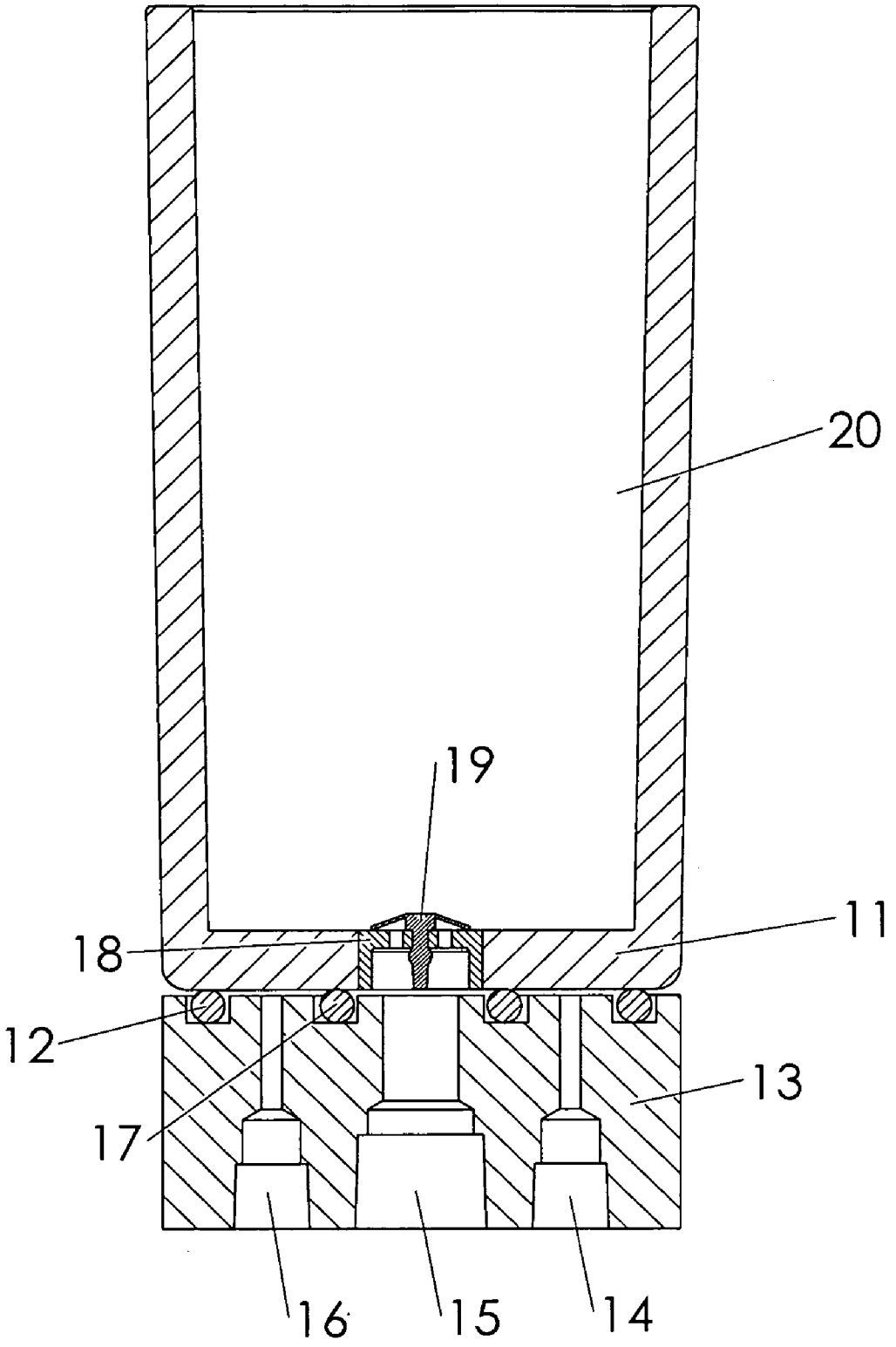


Figure 1

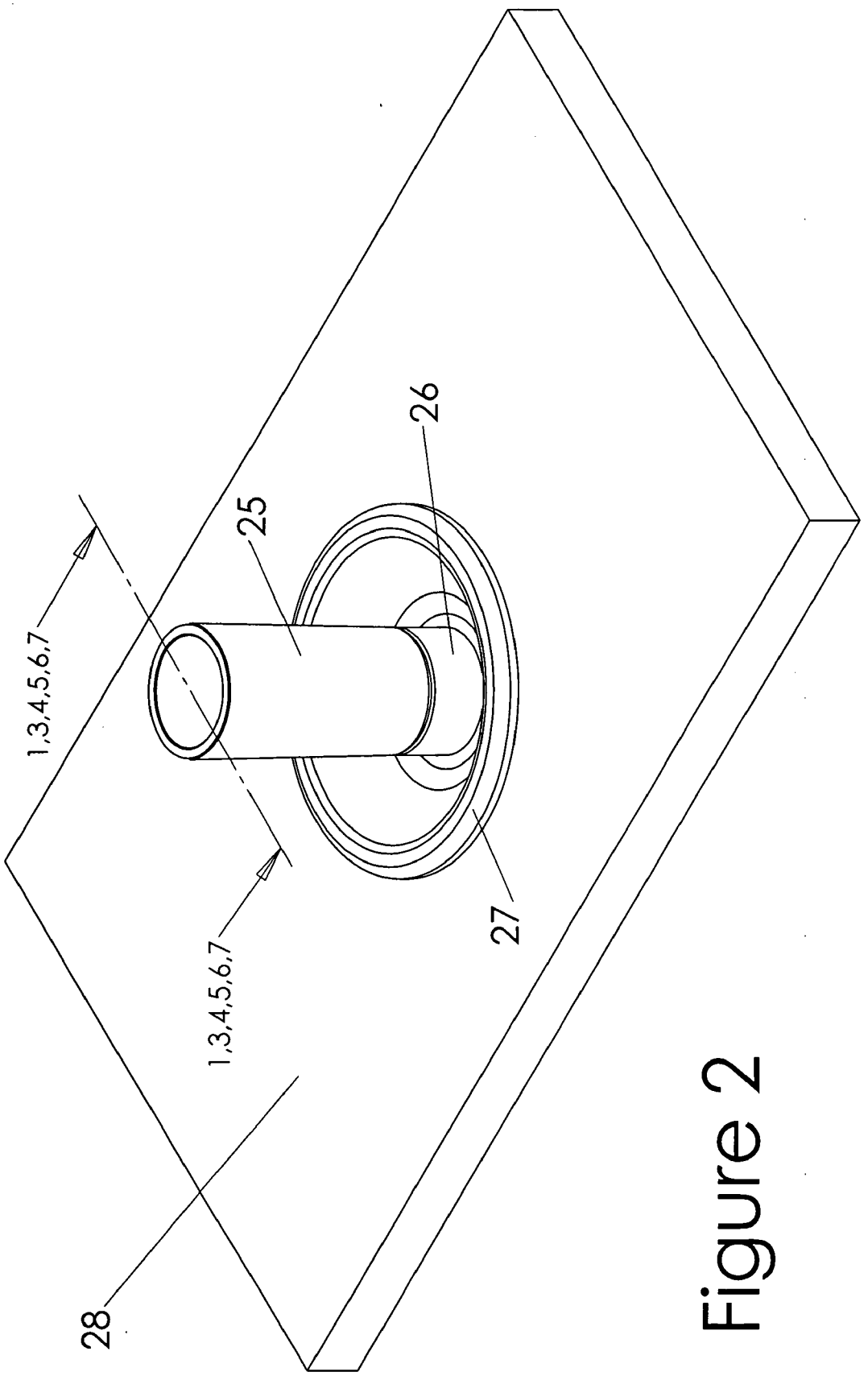


Figure 2

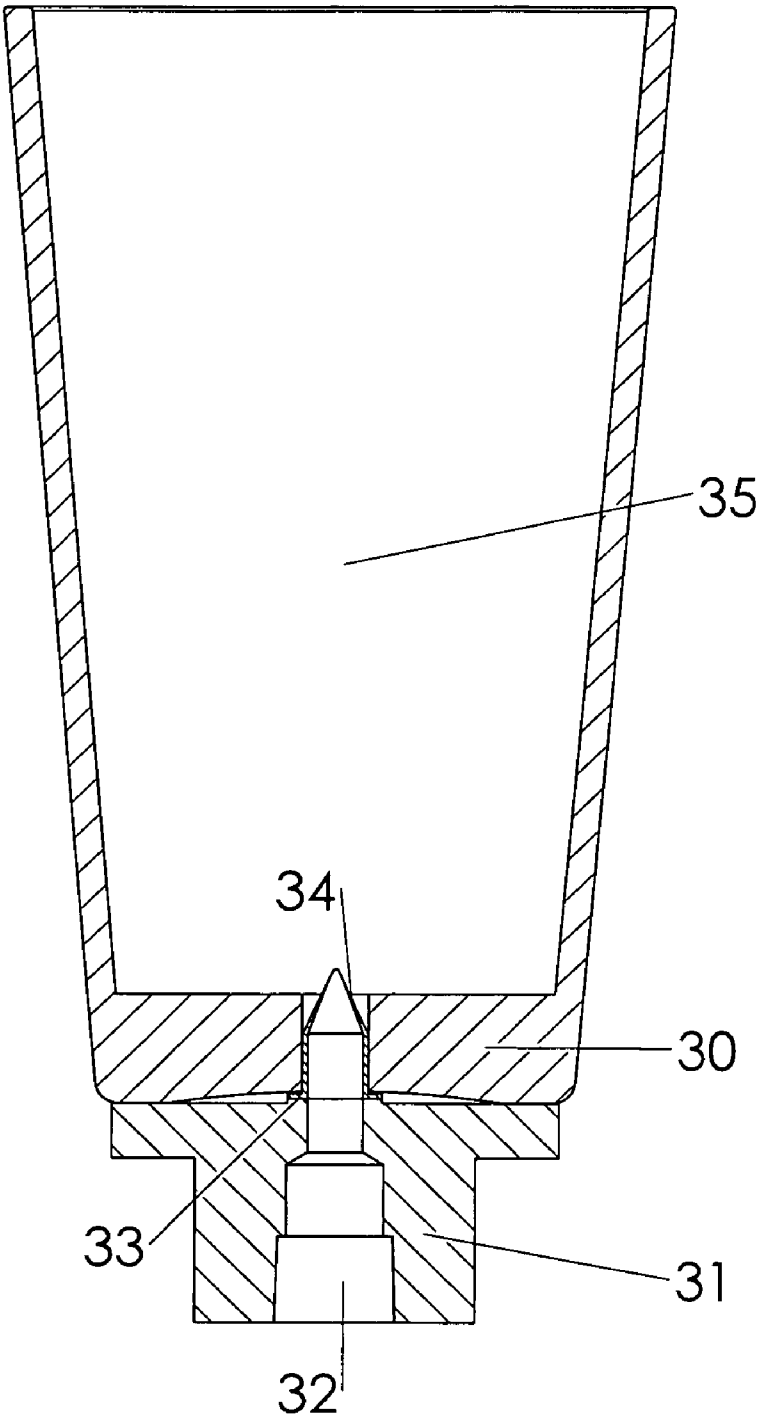


Figure 3

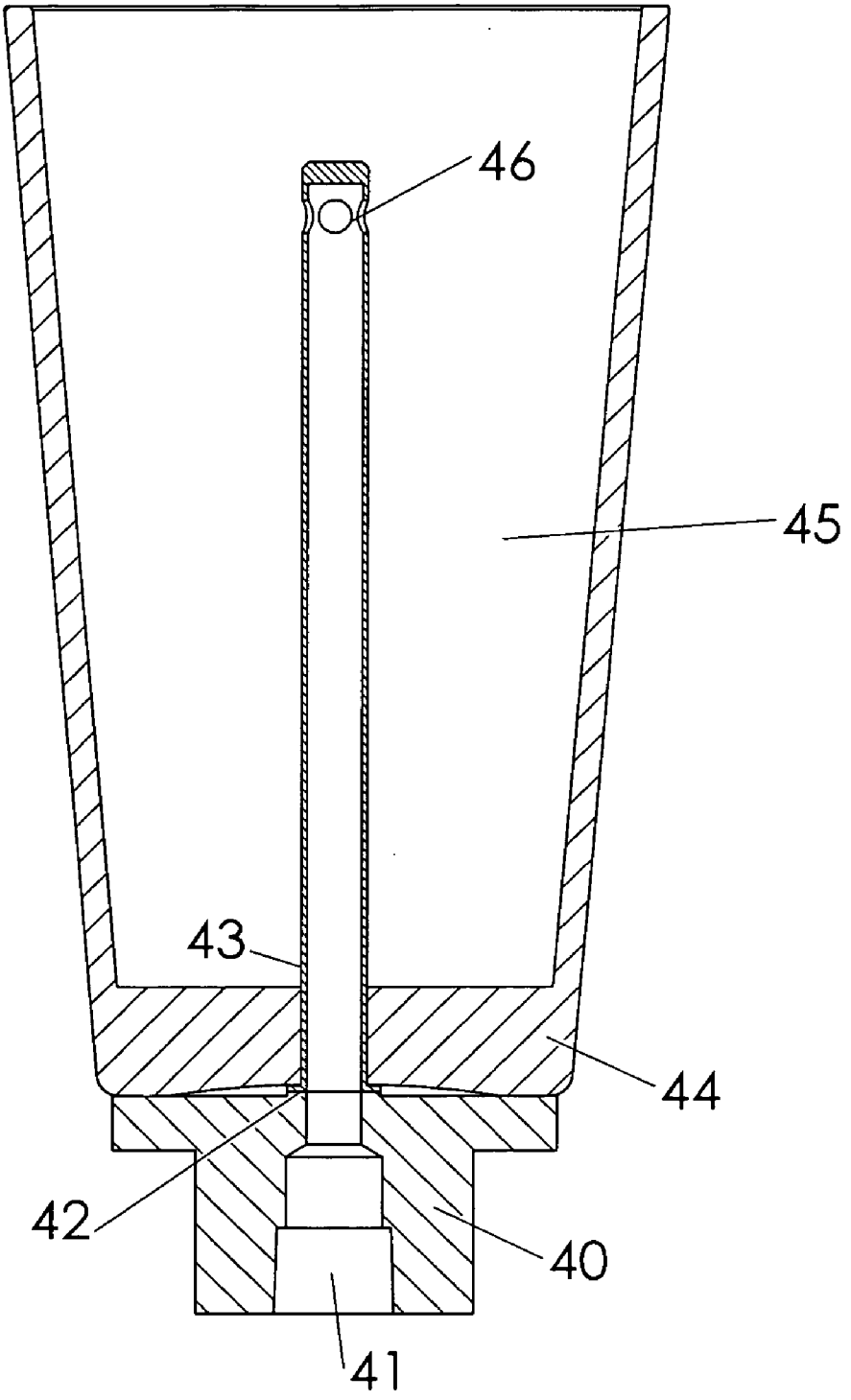


Figure 4

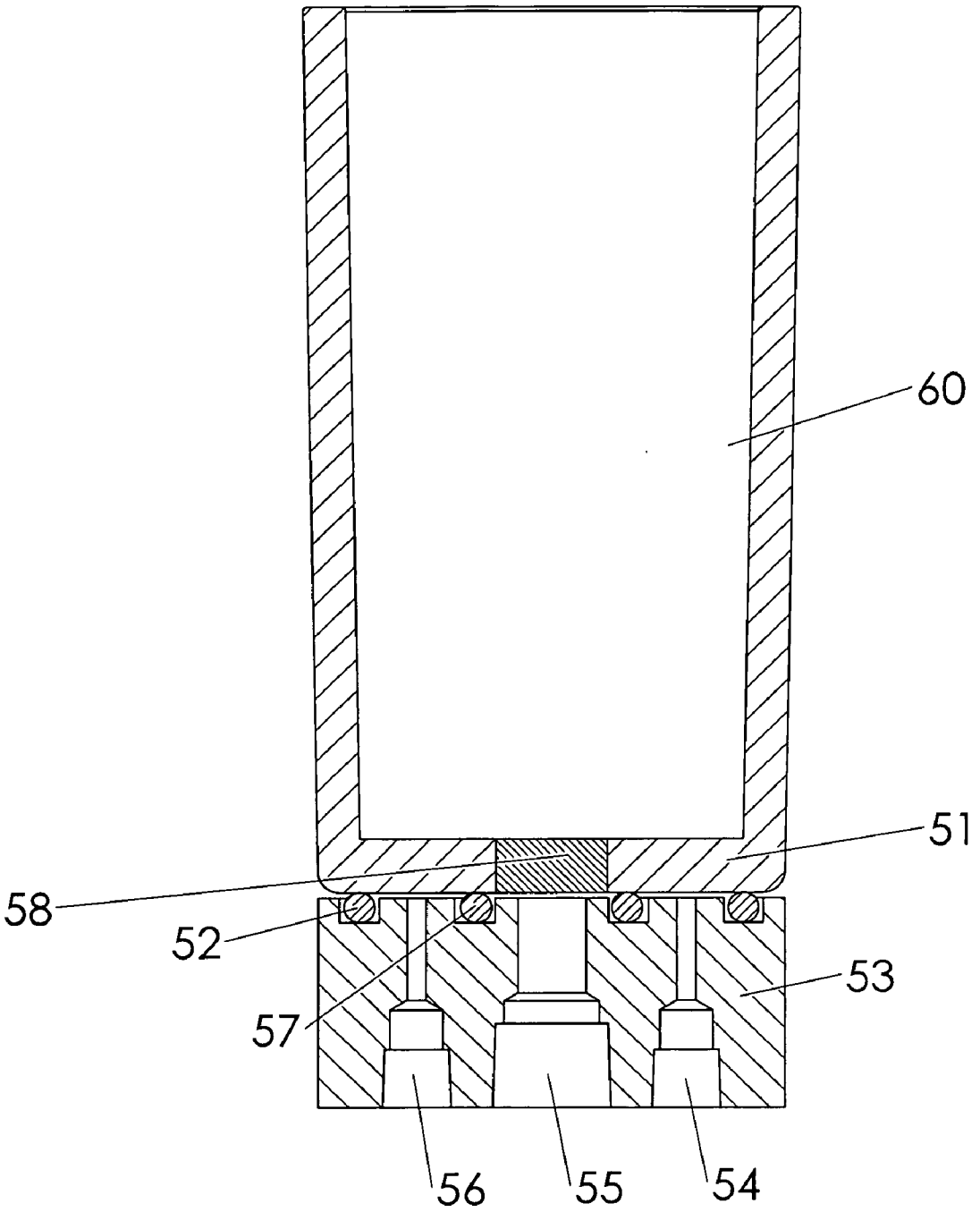


Figure 5

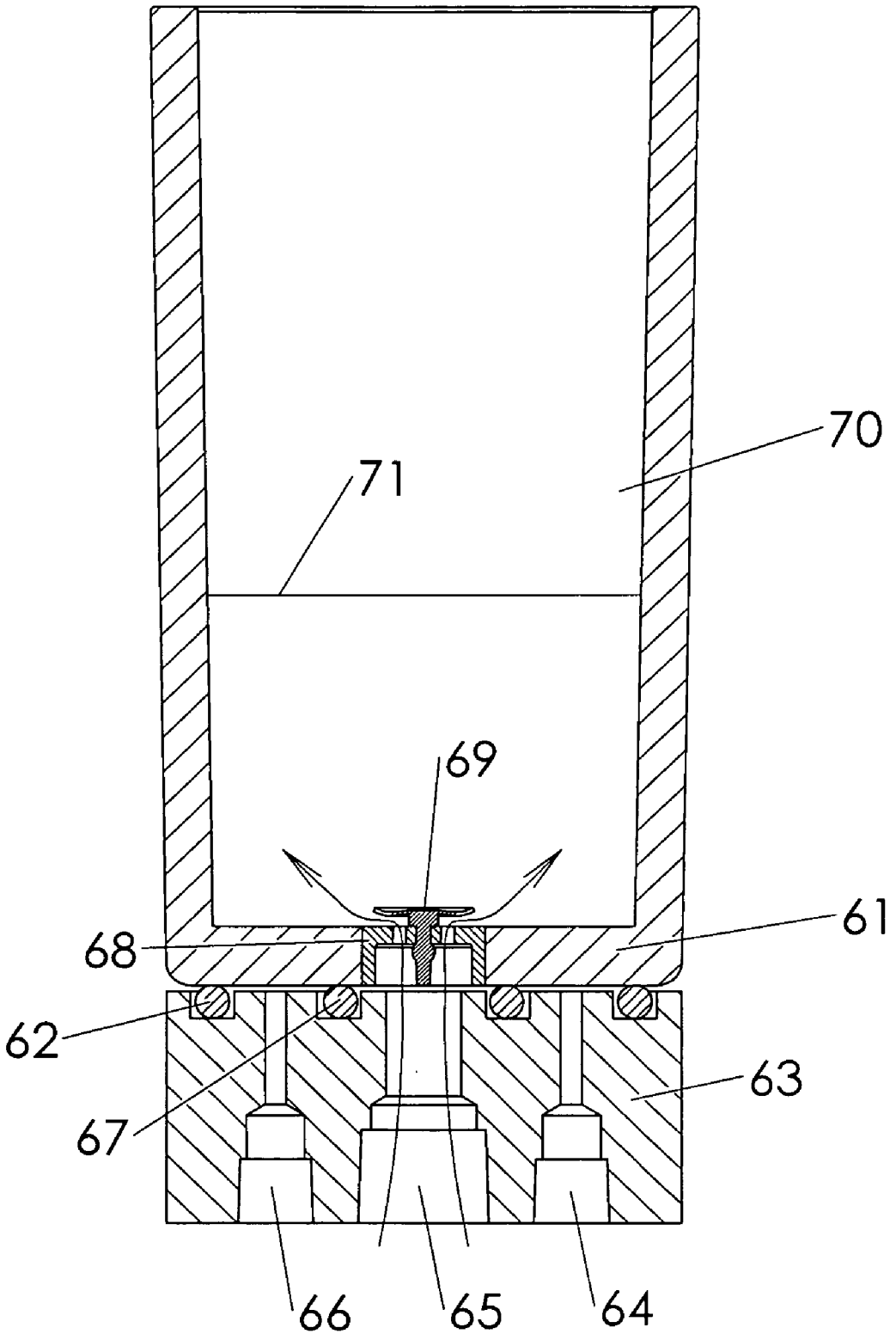


Figure 6

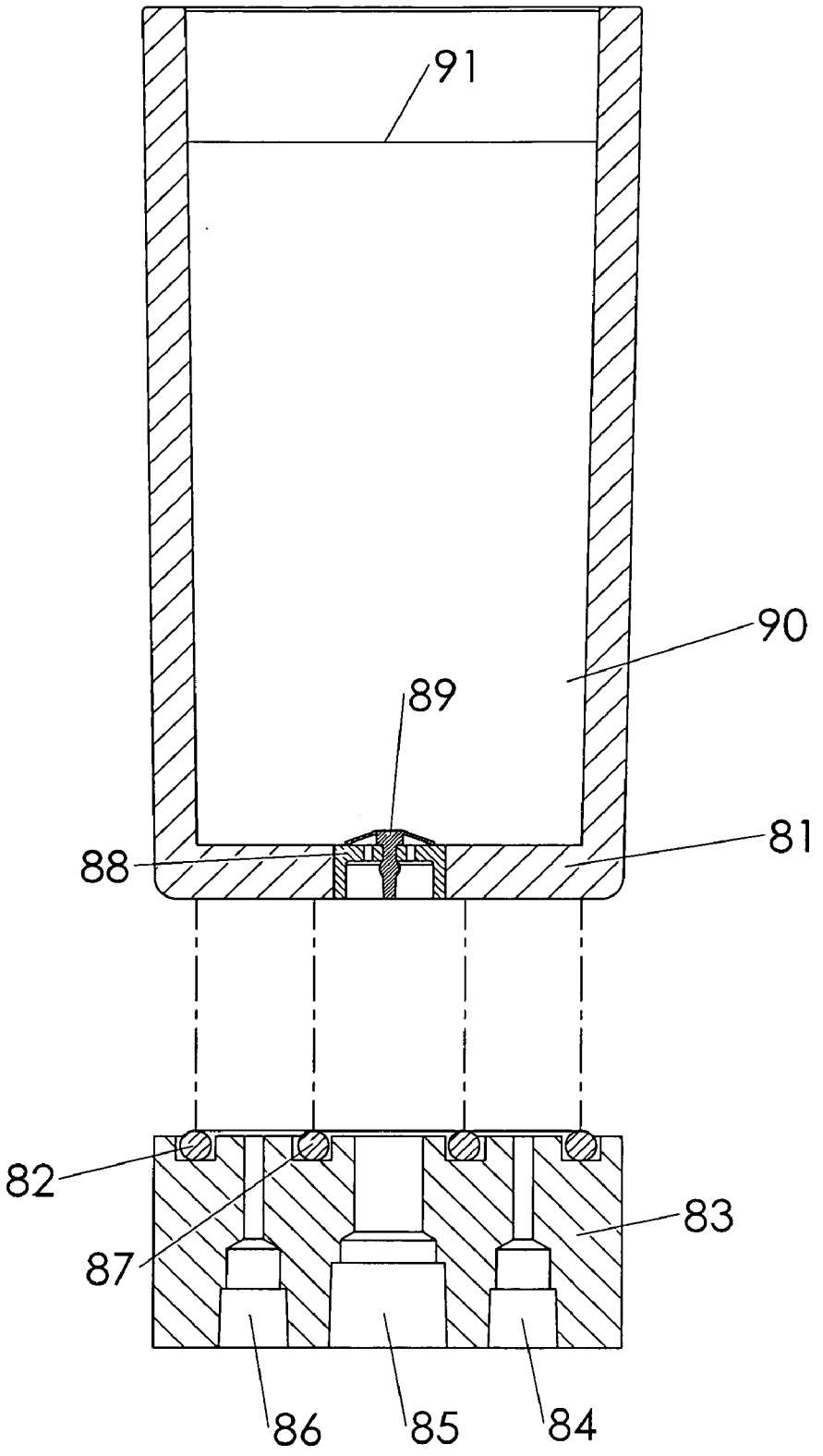


Figure 7

METHOD OF AND APPARATUS FOR THE BOTTOM-UP FILLING OF BEVERAGE CONTAINERS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of provisional patent application No. 60/895,474, filed 18 Mar. 2007 by the present inventors, fully incorporated herein by reference for all purposes.

FEDERALLY SPONSORED RESEARCH

[0002] Not applicable

SEQUENCE LISTING

[0003] Not applicable

FIELD OF INVENTION

[0004] This invention relates to beverage service equipment. Specifically, this invention relates to beverage containers designed to allow fluids to be introduced through the bottom of the beverage container rather than through the main opening (mouth) of the beverage container, and to the associated interfacing and fluid-feeding hardware.

BACKGROUND

[0005] Conventional methods of dispensing and serving beverages have historically relied on the introduction of liquids through a main opening (mouth) in the top of the container, above the plane of the free surface of the full liquid volume. As beverage service has become more specialized, shortcomings in traditional methods of beverage dispensing have become apparent.

[0006] In retail and foodservice settings, beverage dispensing hardware has become ubiquitous. Traditional soda fountain machines occupy a considerable amount of countertop area, and usually occupy a high vertical profile in order to accommodate internal plumbing and in order to accommodate the full height of a cup under a fill nozzle. Goepfert (U.S. Pat. No. **7,086,566**) addresses the issue of high-profile beverage dispensers by placing some of the hardware under a counter, but a large vertical profile is still required above the counter to accommodate the height of a glass. Farkas (U.S. Pat. No. 5,044,171) similarly places components under a countertop, but a tall profile remains above the counter.

[0007] Other methods for eliminating large beverage hardware have been invented. A multitude of inventions, such as Reichenberger's (U.S. Pat. No. 4,162,028) and Kado's (U.S. Pat. 7,311,266) have centered on gun-based beverage dispensers. While these dispensers eliminate large-profile hardware from the bartop, the dispensing heads tend to be fragile, droppable, and operable only by bartenders as opposed to by end consumers.

[0008] As a result of the large space requirements and fragility of much beverage dispensing hardware, certain potential markets have been completely ruled out. For instance, beverage dispensers are not installed on cinema seat armrests due to the large physical bulk of present beverage dispensing hardware.

[0009] Where conventional soda fountain and post-mix machines are not in use, considerable countertop and shelf space is often dedicated to the storage of bottles instead. Regardless of the means, conventional beverage dispensing can be highly inefficient in its use of space.

[0010] The flow regimes of dispensing beverages into containers is likewise an area of development. Certain beverages, especially carbonated beverages, benefit from specialized flow regimes during dispensing, either to encourage or mitigate the formation of froth.

[0011] For instance, some beverages suffer from an excess accumulation of froth upon dispensing into a conventional beverage container because of turbulent mixing associated with a jet of liquid impinging on a free surface. This shortcoming has been addressed by Younkle (U.S. Pat. No. 7,040, 359) simply by retrofitting an existing beverage dispenser; however, said apparatus must protrude into the dispensed beverage, causing potential sanitary issues and impeding access under the tap. Nelson (U.S. Pat. No. 6,397,909) also addresses froth formation, but his design poses similar sanitary and access issues. For other types of beverages, froth is desired. Jamieson (U.S. Pat. No. 5,203,140) addresses controlled froth generation, but his approach requires a lid independent of the beverage container, which in turn requires cleaning.

[0012] As beverage service has found new physical settings, conventional hardware set has shown corresponding shortcomings. For instance, in-flight beverage service on airliners requires the flight attendant to hold a bottle above a cup steadily enough to prevent spillage, often while contending with a jerky ride. Nybakke et al. (U.S. Pat. No. 6,234,364) propose several improvements, but the issue of relative inertial motion between pouring container and cup still remain unresolved. Filling cups while standing in a moving aircraft requires considerable skill and practice.

[0013] Mixing beverages requires the use of specific hardware, such as stirring sticks, spoons, and shakers. These methods of agitation increase the total number of implements necessary to prepare a mixed beverage, in addition to generating trash or dirtying silverware. While prior inventions sought to address these shortcomings, these methods suffer from cross-contamination issues, excessive complexity, or requiring that a specialized piece of hardware be installed on a countertop. Daniels, Jr. (U.S. Pat. 6,527,433) discloses a beverage mixing apparatus which not only requires dedicated countertop space, but also which requires cleaning after each use to prevent cross-contamination. Bhavnani (US Patent 20060126431), Rubenstein (US Patent 20010036124), Schindlegger Jr. (U.S. Pat. Nos. 5,911,504 and 5,720,522), Sampson (U.S. Pat. No. 5,425,579), and Calhoun et al. (U.S. Pat. No. 4,435,084) all propose beverage containers with integral moving agitators, which are subject to wear, breakage, and difficulty in cleaning.

[0014] Cuthbertson et al. (U.S. Pat. No. 6,471,390) propose a gas based mixing scheme integrated into a mug. However, moving parts are again subject to wear and difficulty in cleaning. Furthermore, manual pumping actuated on the handle of a container may be difficult to achieve while simultaneously holding the beverage container and preventing spillage.

[0015] Previous inventions have incorporated means of outflow mitigation into beverage containers, but none for the express purpose of filling the beverage container. De Sole (U.S. Pat. No. 3,355,047) discloses a system of outflow mitigation into the bottom of a baby bottle, but for the purpose of pressure equalization in a closed volume. Likewise, Flinn (U.S. Pat. No. 5,433,353) discloses a water bottle fitted with a check valve at its bottom, for the purpose of pressure equal-

ization and flow control out of the bottle. Manganiello et al. disclose a similar arrangement (U.S. Pat. No. 7,163,113 B2). Cuthbertson et al. (U.S. Pat. No. 6,471,390) include a poppet valve in a beverage container, but for the purposes of preventing liquid uptake into an air-handling system. A multitude of inventions include check valves on their lids for the purposes of spill prevention: Manganiello (U.S. Pat. Nos. 6,050,455 and 6,422,415), Belcastro (U.S. Pat. Nos. 5,890,620 and 6,276,560), and Bunn et al. (U.S. Pat. No. 7,222,759).

[0016] In conclusion, insofar as the inventors are aware, no system of dispensing beverages formerly developed provides a method of filling beverage containers from the bottom up in order to prevent spillage, control the formation of froth, save countertop space, and facilitate mixing.

SUMMARY

[0017] Embodiments of the present invention address at least some of the drawbacks set forth above. In one embodiment, the present invention comprises of two parts: a beverage container (especially a glass) with an open top, a hole or permeable material penetrating through the bottom or sidewall of the beverage container, and a means of outflow mitigation (usually a one-way valve); and a mating fluid delivery assembly, which forms a seal to the beverage container and provides a pressurized flow of fluid which passes through the beverage container's hole or permeable channel and fills the beverage container. The hole or permeable channel may be engineered specifically to either promote or mitigate foaming. Embodiments of the present invention may provide a method of filling beverage containers from the bottom up in order to prevent spillage, control the formation of froth, save countertop space, and/or facilitate mixing.

[0018] The means of outflow mitigation of the beverage container may or may not be a one-way valve, which allows flow into the bottom of the beverage container, but not out of the bottom of the beverage container. One-way valves of the duckbill, umbrella, and poppet types are all examples of suitable means of outflow mitigation. If not a one-way valve, the beverage container's valve must be both normally closed and actuable from the mated position; certain spring-loaded and mechanical valves may be employed to such effect. In order to fill a beverage container with such a valve, the valve must be actuated open when filling is initiated.

[0019] In addition to forming a seal and providing a path for pressurized fluid, the fluid delivery assembly may also incorporate an upstream valve mechanism, which is actuated in order to initiate filling. The fluid delivery assembly can be fitted with an electrical valve mechanism for electronic actuation, a mechanical valve mechanism for manual actuation, a pneumatic valve mechanism for pneumatic actuation, or any other means of initiating pressurized fluid delivery. If the fluid delivery assembly is not fitted with a valve mechanism, provisions must be made in the upstream fluid plumbing to modulate fluid flow on and off.

[0020] As an alternative embodiment to a valve in the beverage container, the container could incorporate a weir or perforated tube which accepts flow from the fluid delivery assembly beneath the beverage container and dispenses the liquid above the filled free surface height in the beverage container. In this case, geometry mitigates outflow of fluid out of the weir and back out the bottom of the beverage container.

[0021] It is possible that the permeable material and the means of backflow prevention are achieved with the same, single piece of material. In this embodiment, the beverage container includes a hole distinct from the beverage container's mouth. The hole is filled with a fine porous material, such as sintered stainless steel. With the porosity of this material selected correctly, fluid coming from the fluid delivery assembly can be pressurized sufficiently to flow through the permeable material; however, the small hydrostatic pressure of the fluid at the bottom of the beverage container is insufficient to allow appreciable flow back out the bottom of the beverage container.

[0022] As a means of mixing beverages contained in said beverage container, gas-phase fluids (such as nitrogen or carbon dioxide) can be introduced through the fluid delivery assembly, using bubble-induced turbulent mixing to stir beverage components together. By flowing gas bubbles through a beverage, more effective mixing can be effected than with conventional stirring hardware. In addition, the need for a clean or disposable agitator is eliminated.

[0023] A further understanding of the nature and advantages of the invention will become apparent by reference to the remaining portions of the specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. **1** is a cross-sectional view of an embodiment of the beverage container and the fluid delivery assembly, mated together and sealed to one another.

[0025] FIG. **2** is an isometric view of the assembly of FIGS. **1**,**3**,**4**,**5**,**6**, and **7**, mounted as intended in a countertop, and fitted with a bowl to catch spilled liquids.

[0026] FIG. **3** is a cross-sectional view of an embodiment of the beverage container and the fluid delivery assembly wherein an alternative type of one-way valve is employed.

[0027] FIG. **4** is a cross-sectional view of an embodiment of the beverage container and the fluid delivery assembly wherein a perforated tube is employed as a means of backflow prevention.

[0028] FIG. **5** is a cross-sectional view of an embodiment of the beverage container and the fluid delivery assembly wherein a permeable or semipermeable channel is employed as a means of backflow prevention.

[0029] FIG. **6** is a cross-sectional view of the embodiment of FIG. **1**, with the fluid delivery assembly in fluid communication with the beverage container, and actively feeding fluid into the beverage container.

[0030] FIG. **7** is a cross-sectional view of the embodiment of FIG. **1**, with the check valve in the bottom of the filled beverage container closed, and with the beverage container decoupled from the fluid delivery assembly.

DETAILED DESCRIPTION

REFERENCE NUMERALS

[0031] **11** beverage container

[0032] **12** outer elastomeric o-ring seal

[0033] **13** fluid delivery assembly main body

[0034] **14** vacuum pressure feed-in

[0035] **15** pressurized fluid feed-in

[0036] **16** vacuum gage attachment point

[0037] **17** inner elastomeric o-ring seal

[0038] **18** perforated stopper with mount holes for an umbrella check valve, which hermetically mates with the beverage container through an interference fit

[0039] **19** umbrella check valve

[0040] **20** interior volume of beverage container

[0041] **25** beverage container mated to fluid delivery assembly, as installed in a countertop
[0042] **26** fluid delivery assembly main body, as installed in a countertop
[0043] **27** liquid leakage catch bowl
[0044] **28** countertop
[0045] **30** beverage container
[0046] **31** fluid delivery assembly main body
[0047] **32** pressurized fluid feed-in
[0048] **33** sealing boss integral with fluid delivery assembly main body
[0049] **34** elastomeric one-way duckbill valve
[0050] **35** interior volume of beverage container
[0051] **40** fluid delivery assembly main body
[0052] **41** pressurized fluid feed-in
[0053] **42** sealing boss integral with fluid delivery assembly main body
[0054] **43** weir tube
[0055] **44** beverage container
[0056] **45** interior volume of beverage container
[0057] **46** flow perforations at top of weir tube
[0058] **51** beverage container
[0059] **52** outer elastomeric o-ring seal
[0060] **53** fluid delivery assembly main body
[0061] **54** vacuum pressure feed-in or vacuum gage attachment point
[0062] **55** pressurized fluid feed-in
[0063] **56** vacuum pressure feed-in or vacuum gage attachment point
[0064] **57** inner elastomeric o-ring seal
[0065] **58** permeable solid which mates to the beverage container through an interference fit
[0066] **60** interior volume of beverage container
[0067] **61** beverage container
[0068] **62** outer elastomeric o-ring seal
[0069] **63** fluid delivery assembly main body
[0070] **64** vacuum pressure feed-in or vacuum gage attachment point
[0071] **65** pressurized fluid feed-in
[0072] **66** vacuum pressure feed-in or vacuum gage attachment point
[0073] **67** inner elastomeric o-ring seal
[0074] **68** perforated stopper with mount holes for an umbrella check valve, which hermetically mates with the beverage container through an interference fit
[0075] **69** umbrella check valve in the open position; fluid streamlines pass underneath said umbrella check valve
[0076] **70** interior volume of beverage container
[0077] **71** free surface of beverage
[0078] **81** beverage container
[0079] **82** outer elastomeric o-ring seal
[0080] **83** fluid delivery assembly main body
[0081] **84** vacuum pressure feed-in or vacuum gage attachment point
[0082] **85** pressurized fluid feed-in
[0083] **86** vacuum pressure feed-in or vacuum gage attachment point
[0084] **87** inner elastomeric o-ring seal
[0085] **88** perforated stopper with mount holes for an umbrella check valve, which hermetically mates with the beverage container through an interference fit
[0086] **89** umbrella check valve
[0087] **90** interior volume of beverage container
[0088] **91** free surface of beverage

Operation

[0089] All embodiments lend themselves to installation as depicted in FIG. **2**, which generalizes a space-saving in-counter mounting scheme. A fluid injector assembly (**26**) is attached to a flanged liquid leakage catch bowl (**27**). The catch bowl is recessed into a countertop (**28**). A beverage container (**25**) is mated to the fluid delivery assembly (**26**) in order to fill it.
[0090] In the embodiment of FIG. **1**, an elastomeric umbrella valve (**19**) is fitted into a plastic stopper (**18**) with flow perforations. As assembled, the umbrella valve and perforated plastic stopper comprise an outflow mitigation device. The assembly of the umbrella valve and perforated plastic stopper are interference-fitted into a hole in the base of the beverage container (**11**), in order to form a liquid-tight seal between the beverage container (**11**) and the perforated plastic stopper (**18**).
[0091] In the embodiment of FIG. **3**, an elastomeric one-way duckbill valve (**34**) is interference-fitted directly into a hole in the base of the beverage container (**30**), forming a liquid-tight seal. In the embodiment of FIG. **4**, an elastomeric perforated weir tube (**43**) is interference-fitted directly into a hole in the base of the beverage container (**44**), forming a liquid-tight seal. In the embodiment of FIG. **5**, a permeable or semipermeable insert (**58**), such as sintered bronze or microporous polymer, is interference-fitted directly into a hole in the base of the beverage container (**51**), forming a substantially liquid-tight seal under the hydrostatic pressures present at the bottom of the beverage container when full.
[0092] In the embodiment of FIG. **1**, when the beverage container (**11**) is brought into contact with the mating fluid delivery assembly (**13**), a concentric planar o-ring seal (**12**, **17**) is engaged between the beverage container and the fluid delivery assembly. Vacuum suction is supplied (**14**) and an electronic vacuum sensor is attached (**16**). Mechanical pressure in the embodiment of FIG. **1** is developed in the space between the concentric o-ring seals (**12**, **17**) as soon as vacuum suction is able to engage. Bringing the flat bottom of a beverage container into contact with the o-rings (**12**, **17**) sucks the beverage container down firmly into place and registers a pressure change on the electronic vacuum sensor. The resulting electronic signal can be used to actuate an electronic fill valve mechanism upstream of the fluid delivery assembly. The compressed inner o-ring (**17**) prevents leakage of the fluid which is to be introduced.
[0093] In the embodiments of FIGS. **3** and **4**, the compressed elastomeric faces of the respective backflow prevention devices (**34**, **43**) against the faces of integral sealing bosses (**33**, **42**) on the fluid delivery assemblies (**31**, **40**) prevent leakage of the fluid being introduced. In the embodiments of FIGS. **3** and **4**, gravity or sustained manual mechanical downforce by the user is required in order to effect a reliable seal between the fluid injector assembly and the beverage container. In the embodiment of FIG. **5**, concentric o-rings (**52**, **57**) are employed to effect a seal between the fluid delivery assembly and the beverage container using vacuum pressure, in the same manner as the embodiment of FIG. **1**.
[0094] Filling is initiated in one of two ways. If constantly-pressurized fluid is being delivered, a valve mechanism directly upstream of the fluid delivery assembly is actuated open, allowing the constantly-pressurized fluid to flow into

the fluid delivery assembly (**15**, **32**, **41**, **55**, **65**, **85**). If dynamically-pressurized fluid is being delivered, a fluid reservoir upstream of the fluid feed-in (**15**, **32**, **41**, **55**, **65**, **85**) is pressurized in order to initiate filling. In either case, pressurized fluid consequently flows from the upstream reservoir and through the fluid delivery assembly (**13**, **31**, **40**, **53**, **63**, **83**). Because of the seal formed between the fluid delivery assembly and the beverage container, the fluid continues upward, through the beverage container's hole or permeable surface, through its outflow mitigation device (**18**, **19**, **34**, **43**, **58**, **68**, **69**, **88**, **89**), and into the beverage container's interior volume (**20**, **35**, **45**, **60**, **70**, **90**), filling it.

[0095] While filling, embodiments employing a one-way valve are forced into fluid communication with the fluid delivery assembly by the inflowing fluid, as depicted in FIG. **6**. Fluid flows into the beverage container's interior volume (**70**) through the open check valve (**69**). As long as the feed pressure exceeds the hydrostatic head due to the free surface height (**71**), filling will continue and the valve (**69**) will remain open.

[0096] Filling is stopped by either closing the valve upstream of the fluid delivery assembly, by depressurizing the fluid reservoir, or, if applicable, by actuating the outflow mitigation device closed.

[0097] If the beverage container's valve is a one-way valve (**19**, **34**, **69**, **89**), it will close automatically when flow from the fluid delivery assembly stops. If the beverage container uses a weir device (**43**) for outflow mitigation, outflow from the beverage container will be stemmed automatically, by geometry. If the beverage container uses a permeable channel for outflow mitigation (**58**), outflow from the beverage container will be stemmed automatically, by lack of differential pressure. If the means of outflow mitigation is manually actuated, the beverage container's outflow mitigation device must be actuated closed upon completion of filling in order to prevent leakage.

[0098] As depicted in FIG. **7**, when the beverage container (**81**) is brought out of physical contact with the fluid delivery assembly (**83**), the seal (**82**, **87**) between the two is broken and the beverage container can poured from, drunk from, or employed as desired.

Advantages

[0099] From the description above, a number of advantages of some embodiments of our method and apparatus for the bottom-up filling of beverage containers become evident:

[0100] (a) Countertop area is used more efficiently as compared to conventional post-mix and tap-type beverage dispensers.

[0101] (b) The vertical profile required of beverage dispensing hardware is effectively reduced to zero, allowing beverage service installations in previously unfeasible locations.

[0102] (c) Engineered outflow mitigation devices can fine-tune flow into beverage containers, controlling foam and turbulence from container to container.

[0103] (d) As the beverage container is solidly coupled to the fluid delivery assembly during filling, there is little risk of spillage, even given a bumpy or jerky reference frame.

[0104] (e) Passage of gas-phase fluids through the outflow mitigation device can effectively agitate beverages, obviating the need for mechanical stirring.

Conclusion, Ramifications, and Scope

[0105] Accordingly, the reader will see that the method and apparatus for the bottom-up filling of beverage containers

[0106] can be used to save countertop space and in turn allow beverage dispensing hardware to enter into previously inaccessible and impractical locations;

[0107] can be used to fill as well as mix a beverage in a single feed with the same set of hardware;

[0108] and, due to its robustness and small number of moving parts, shift the role of beverage service away from bartenders and toward end consumers.

[0109] Although the description above contains many specificities, these should not be construed as limiting the scope of the embodiment but merely as providing illustrations of some of the presently preferred embodiments.

[0110] For example and not limitation, the filling opening of the beverage container may be contained on a bottom surface or a side surface of the container. In some embodiments, there may be one or more openings for receiving fluid. These openings may all be on the bottom surface of the vessel. Optionally, they may be only on the side. Optionally, they may be both on the bottom and the side. The present invention is not limited to any particular shape or size of the beverage container. The beverage fluid filling apparatus maybe a stationary system or it may be a system in motion. By way of example and not limitation, the filling apparatus may have a spoke and wheel configuration with a filler at the end of each spoke to engaged to one or more beverage container. Like a lazy-susan, the wheel configuration allows different beverages to be rotated to the desired location for easy access for a user. Others may use a conveyor belt design to allow beverage containers to be moved for ease of service or merely for entertainment value. Optionally, a single opening into the beverage container may be sized and/or shaped to receive one or more nozzles or fluid inputs. By way of nonlimiting example, the opening may be oval or racetrack shaped and receive a nozzle of matching shape that seals against the walls of the opening. The nozzle may have a septum that provides input from one liquid from one half of the nozzle and a different fluid or beverage from the other half. Optionally, the nozzle may have a coaxial configuration with a tube in the center and an outer tube surrounding the inner tube. It should be understood that the nozzle or input is not limited to any particular cross-sectional shape. It may be circular, triangular, square, polygonal, hexagonal, other shaped, and/or combinations of the above.

[0111] Thus, the scope of the embodiment should be determined by the appended claims and their legal equivalents, rather than and shown.

We claim:

1. A beverage container, comprising:

a vessel defining an interior volume with a hole or permeable channel penetrating through a wall of the vessel, with said hole or permeable channel distinct from an existing mouth of the vessel and located beneath the free surface of fluid in said beverage container when full;

an outflow mitigation apparatus fitted to said hole or permeable channel.

2. The beverage container of claim **1** wherein the outflow mitigation apparatus comprises of a duckbill valve.

3. The beverage container of claim **1** wherein the outflow mitigation apparatus comprises of an umbrella valve.

4. The beverage container of claim **1** wherein the outflow mitigation apparatus comprises of a permeable membrane.

5. The beverage container of claim **1** wherein the beverage container includes more than one hole or permeable channel and at least one outflow mitigation apparatus per hole or permeable channel.

6. The beverage container of claim **1** wherein the outflow mitigation apparatus has a first configuration to receive fluid when engaged with a fluid delivery apparatus and a second configuration to prevent fluid leakage when disengaged from a fluid delivery apparatus.

7. A fluid delivery system for use with one or more beverage containers, the system comprising:

a beverage container defining an interior volume with a hole or permeable channel penetrating through a wall of the beverage container, with said hole or permeable channel distinct from an existing mouth of the beverage container and located beneath the level of fluid in the beverage container when full;

a leakage prevention member for sealing with the impermeable outer surface of said beverage container;

a fluid delivery assembly comprising of one or more passages through which pressurized fluid can be brought into the interior volume said beverage container, where the passage is in fluid communication with at least one fluid source.

8. The fluid delivery system of claim **7** comprising a plurality of beverage containers and fluid delivery assemblies, sealed to one another and brought into fluid communication with one another through said holes or permeable channels, permitting flow of fluids into said interior volumes of said beverage containers.

9. The fluid delivery system of claim **7** in which said fluid delivery assembly is oriented beneath the bottom of said beverage container.

10. The fluid delivery system of claim **7** in which gas-phase fluids are flowed through said fluid delivery assembly and employed in agitating the contents of said beverage container.

11. The fluid delivery system of claim **7** in which, when the container is decoupled, allows independent operation of said beverage container through said existing mouth without leakage through said hole or permeable channel.

12. A beverage container filling method comprising:

providing a beverage container having an opening distinct from a mouth of the container from which a user drinks or pours the beverage, wherein the opening is configured to allow fluid to enter but prevent fluid from leaking out the opening once inside the beverage container;

filling of said beverage container through the opening distinct from the mouth, without leakage.

13. The method of claim **13** wherein filling comprises of bottom up filling.

14. The method of claim **13** wherein filling comprises of side filling.

15. The method of claim **13** wherein the opening is located beneath a free surface of fluid that is delivered into the beverage container.

16. The method of claim **13** wherein filling comprises of introducing fluid below a level of fluid inside the beverage container.

17. The method of claim **13**, wherein mechanical force is developed between the beverage container and said fluid delivery assembly in order to develop a seal therebetween, allowing bottom-up filling of said beverage container without leakage.

18. The method of claim **13** wherein the filling occurs in a pressurized manner to induce fluid mixing inside the container.

19. The method of claim **13** wherein the filling occurs in a directional manner to induce fluid mixing inside the container.

20. The method of claim **13** further comprising minimizes frothing of the fluid by introducing fluid into the container at a level beneath a free surface of fluid already in the container.

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