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Taggart et al.

(54) **BEVERAGE DISPENSING ASSEMBLY**

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(63) Continuation-in-part of application No. 12/414,199, filed on Mar. 30, 2009, which is a continuation-in-part of application No. 12/264,023, filed on Nov. 3, 2008, which is a continuation-in-part of application No. 12/040,062, filed on Feb. 29, 2008, which is a continuation-in-part of application No. 12/014,875, filed on Jan. 16, 2008, which is a continuation-in-part of application No. 11/684,326, filed on Mar. 9, 2007.

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(51) **Int. Cl.**

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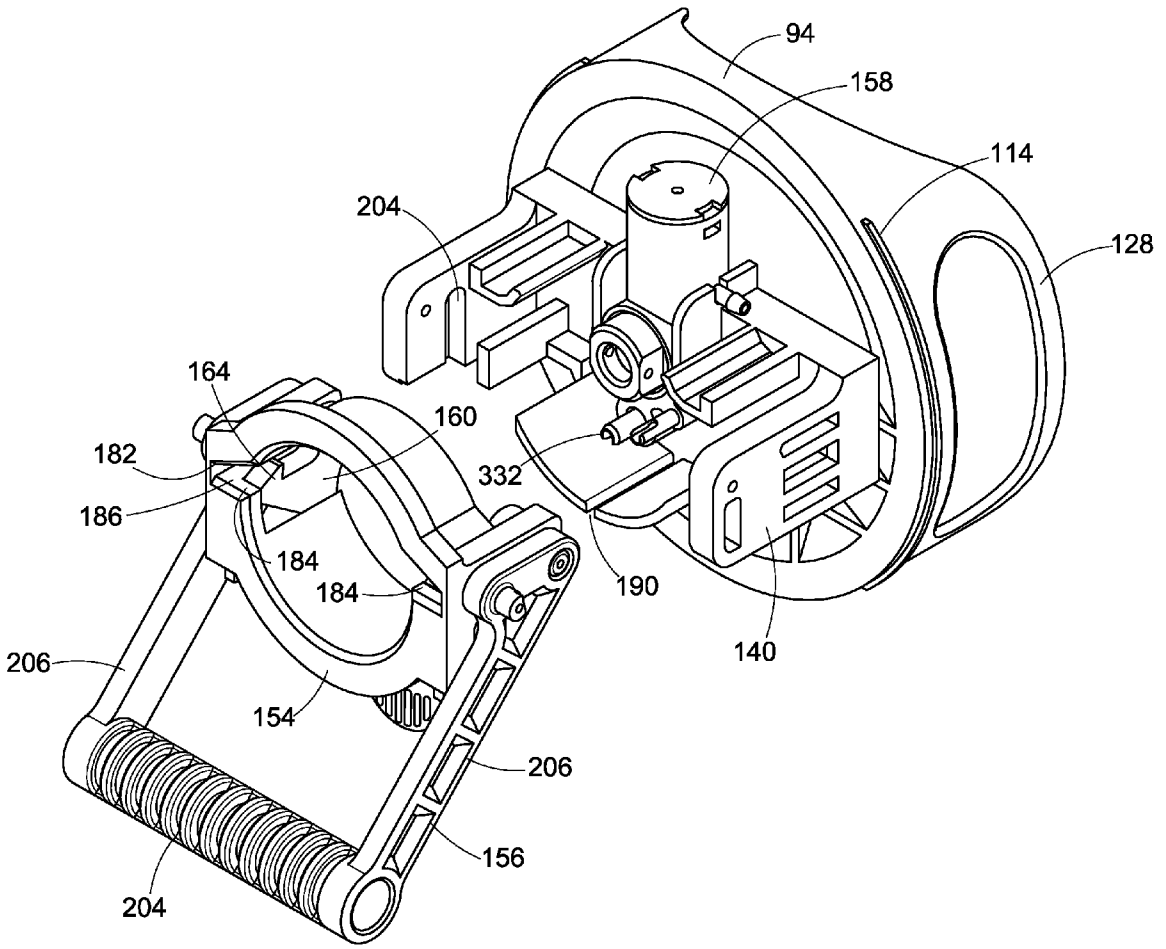
B65B 7/28	(2006.01)
B65B 43/40	(2006.01)
B65D 41/04	(2006.01)

(52) **U.S. Cl.** **220/260**; 215/44; 53/492; 215/329

(57) **ABSTRACT**

A regulator which can be used with a beverage dispensing assembly is disclosed. The regulator includes a seal and a moveable valve stem that cooperates with the seal. A beverage dispenser is also disclosed.



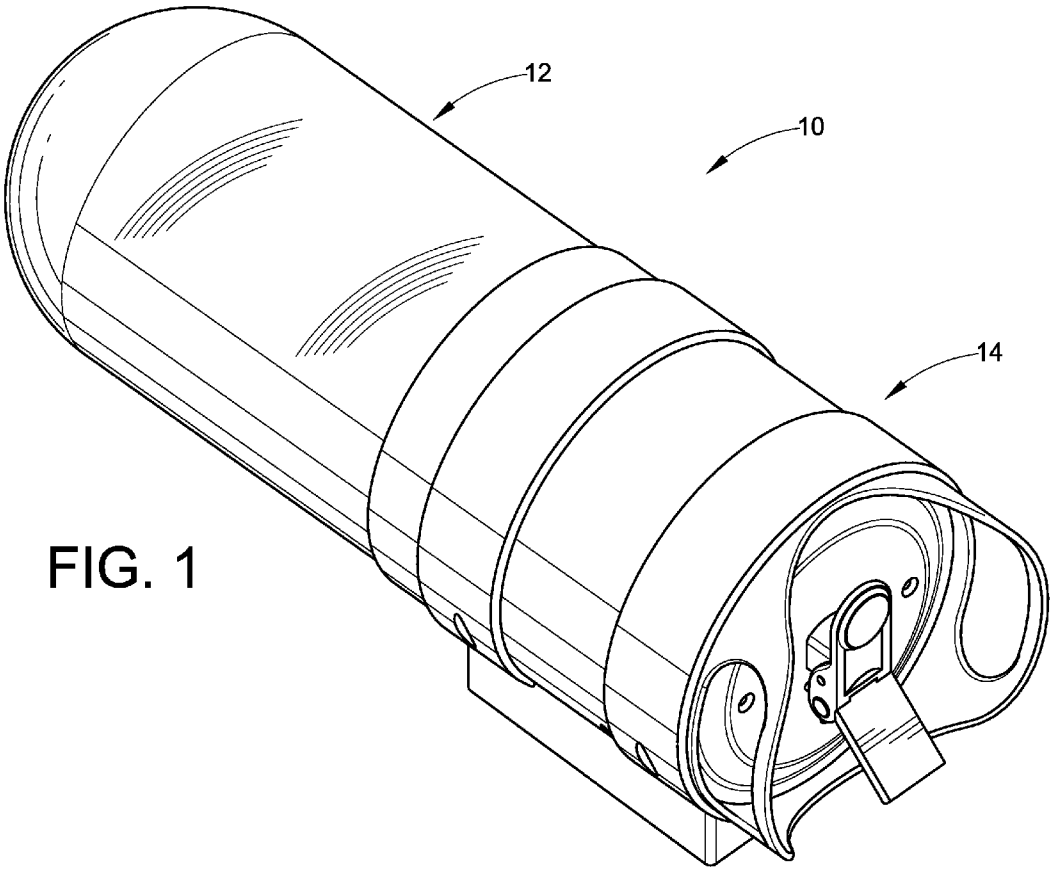
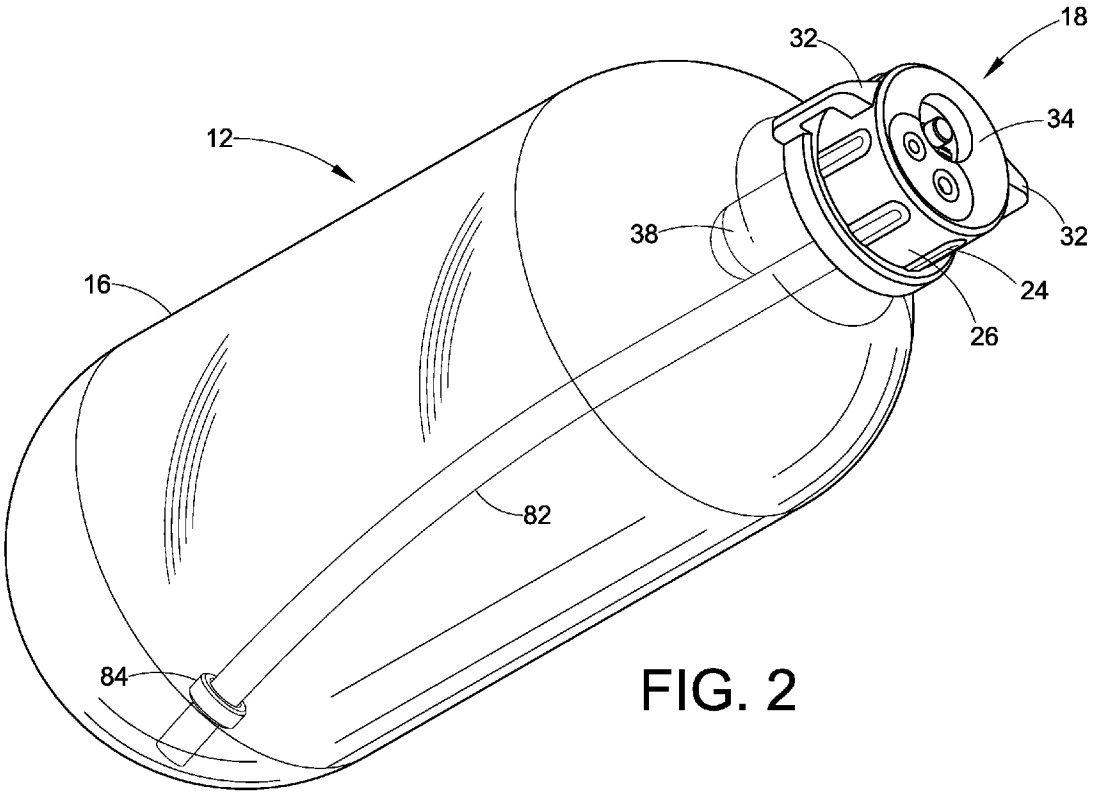


FIG. 1



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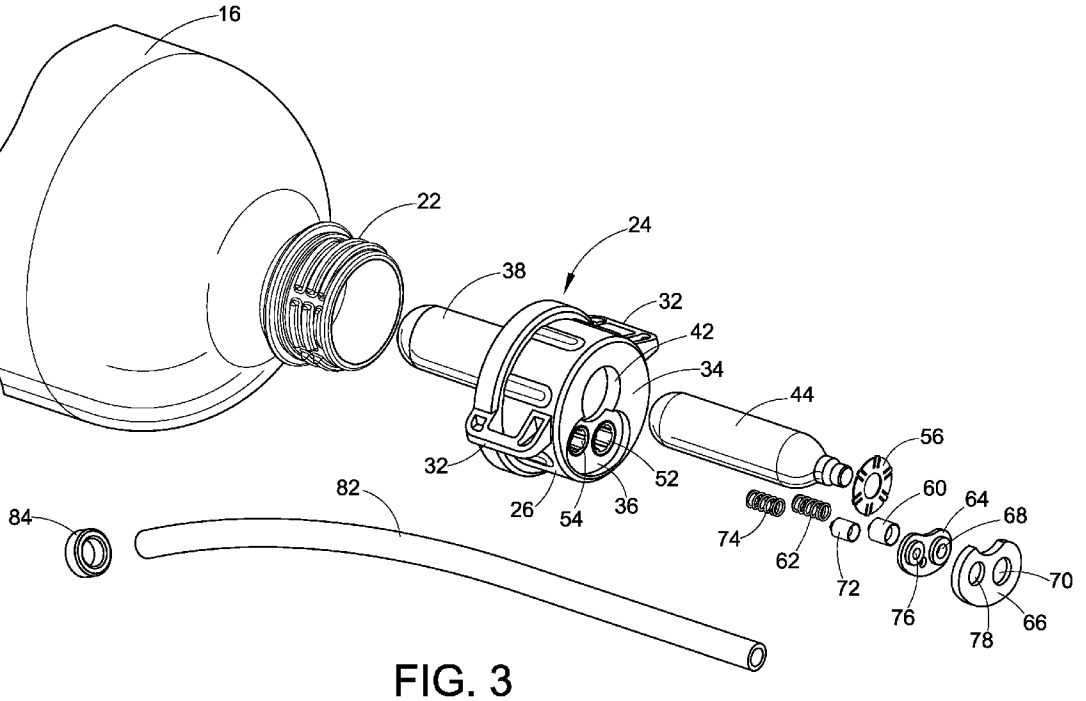
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FIG. 3

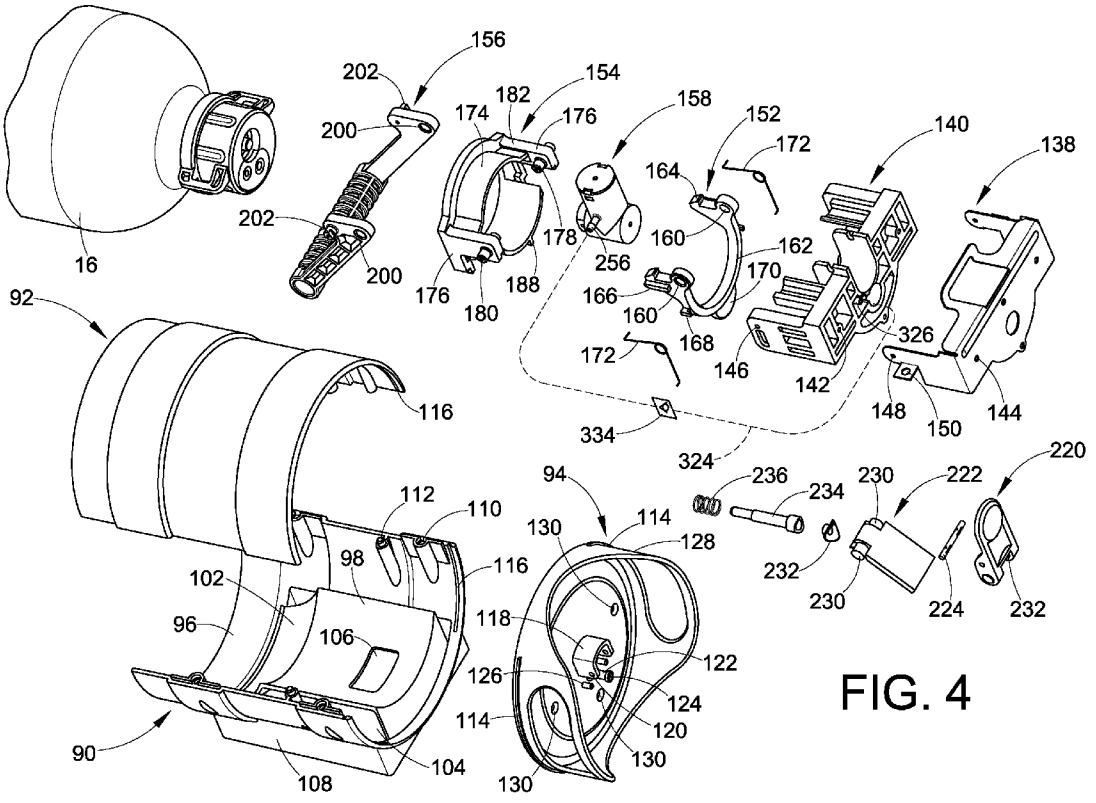
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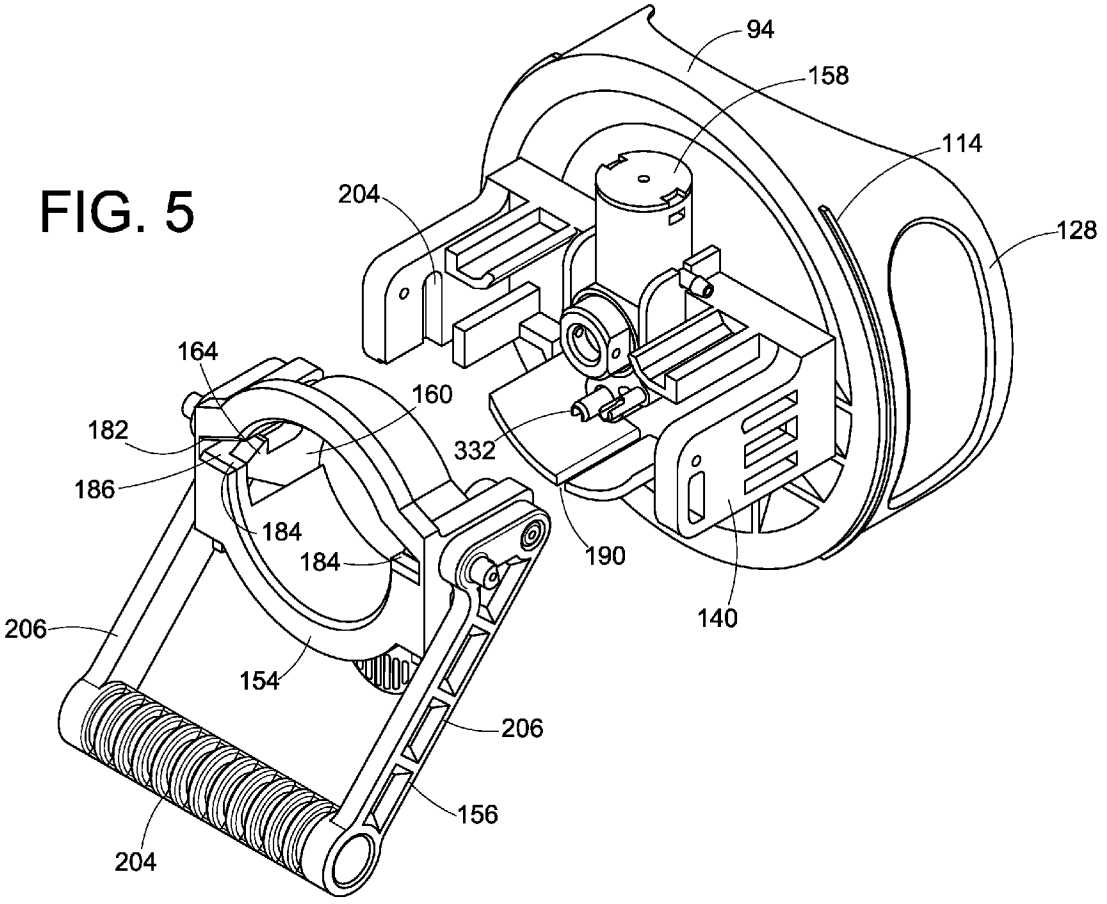
FIG. 4

FIG. 5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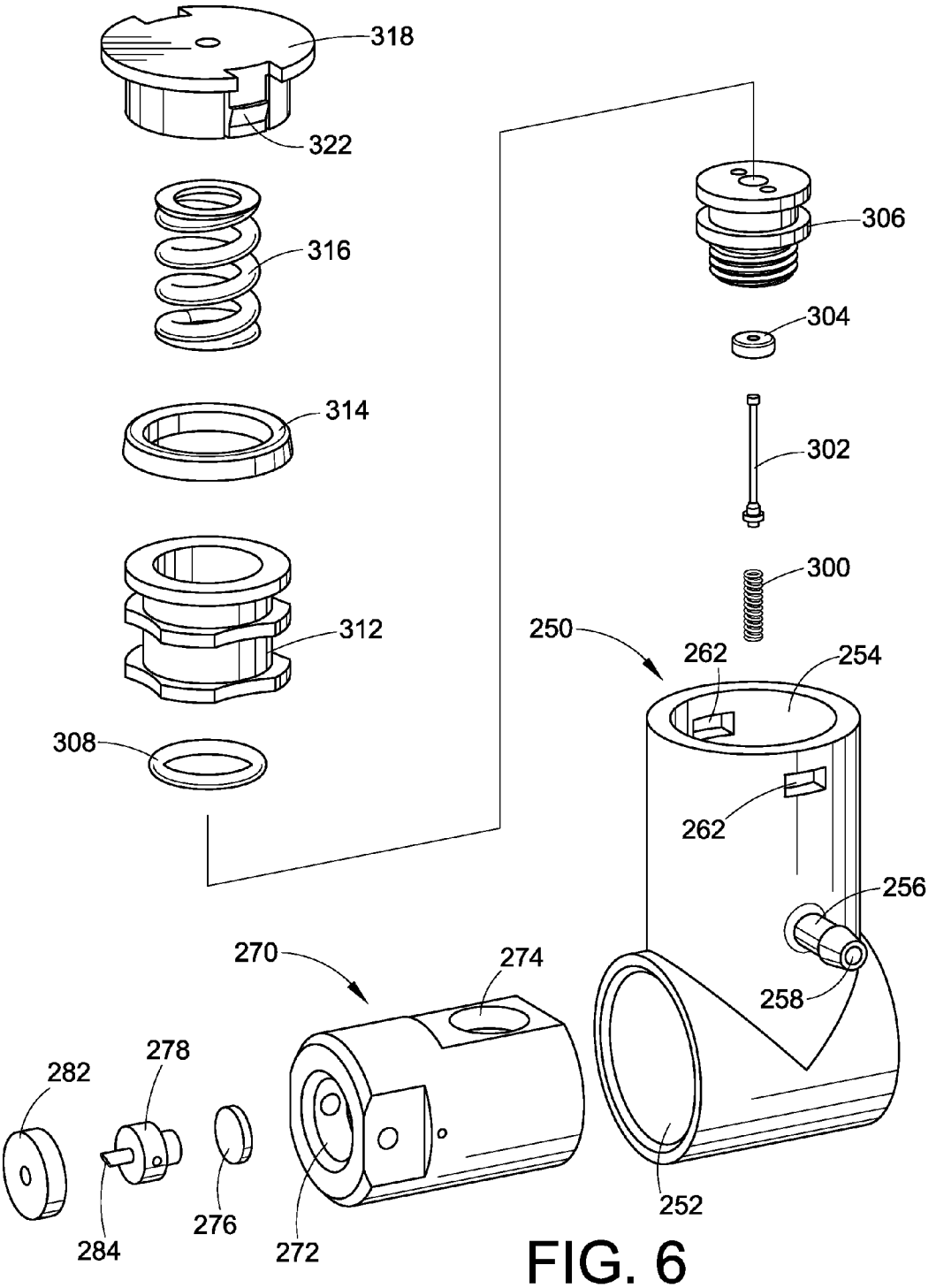
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FIG. 6

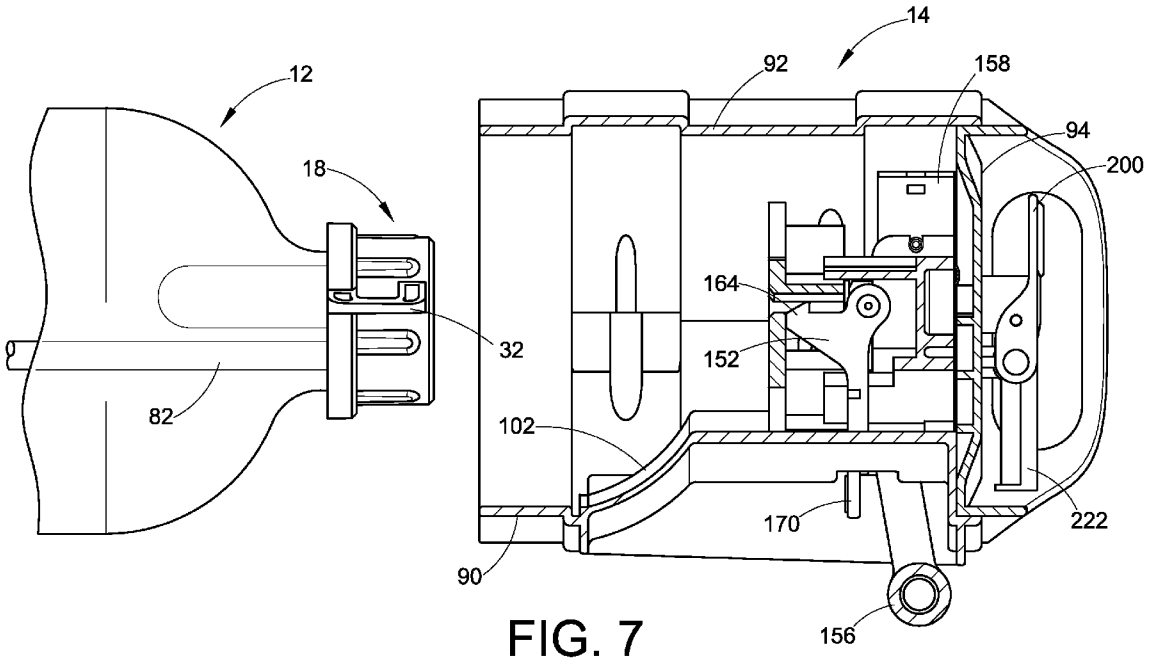
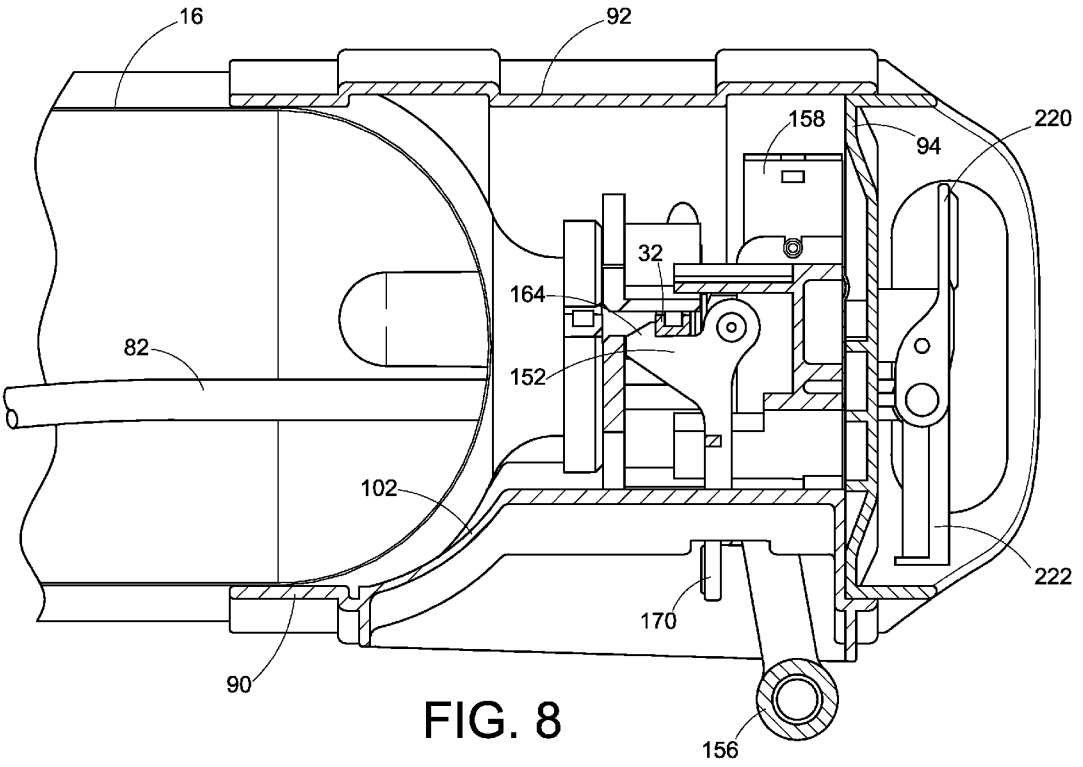


FIG. 7



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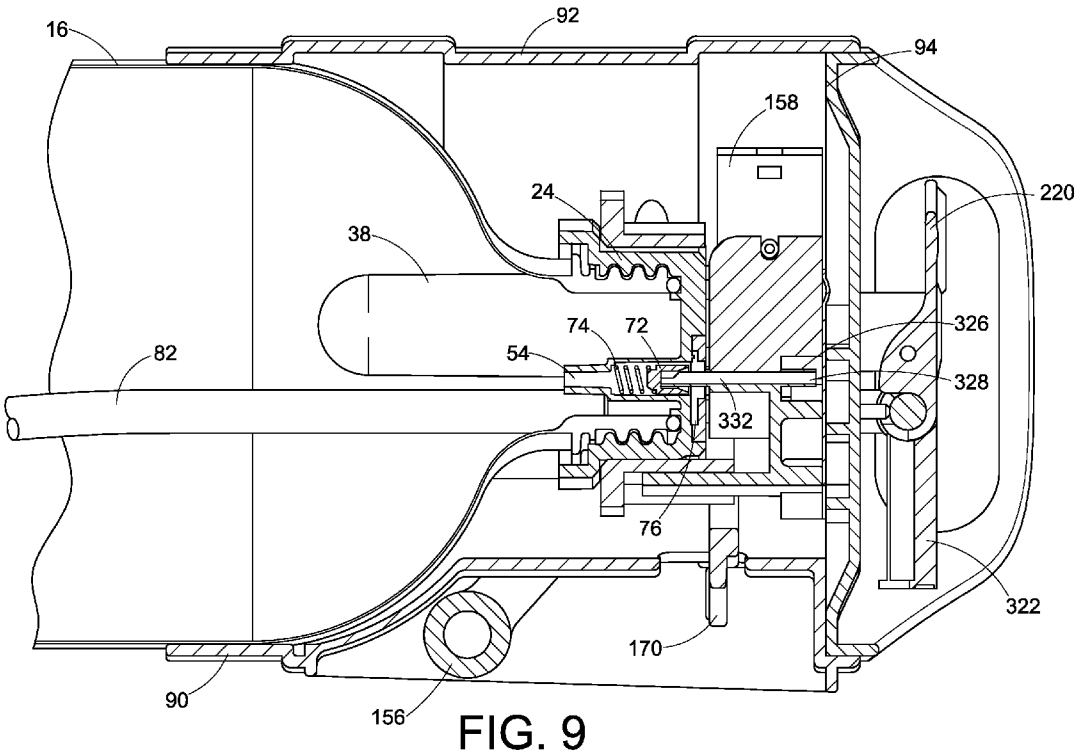

FIG. 9

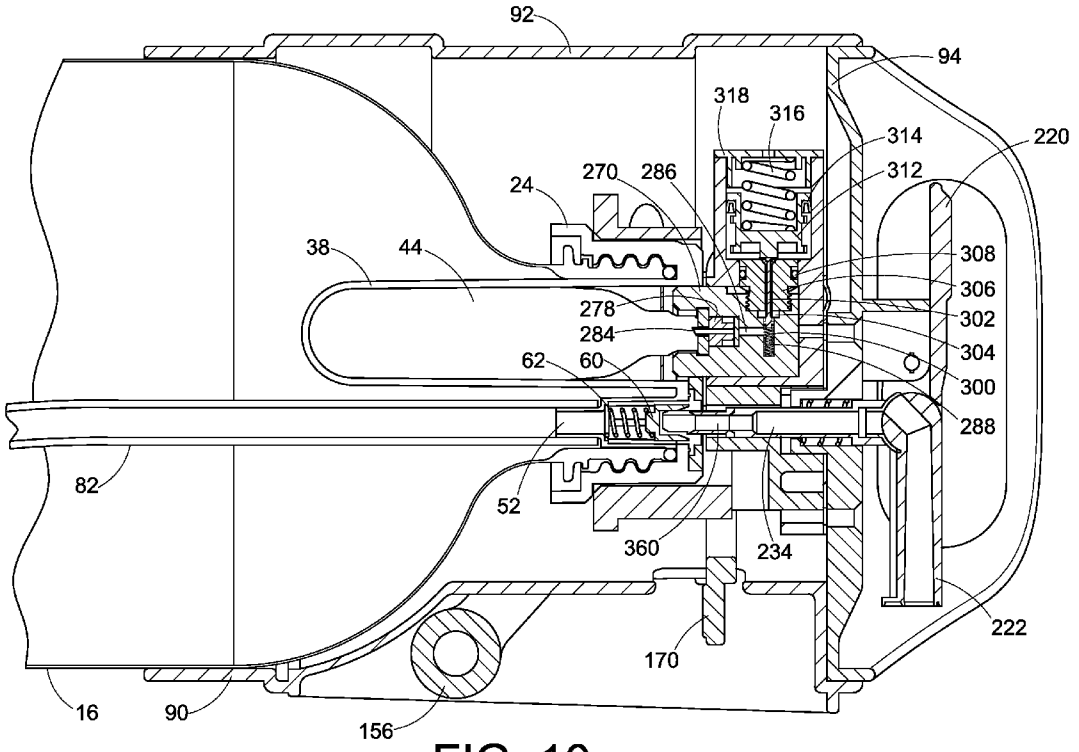
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FIG. 10

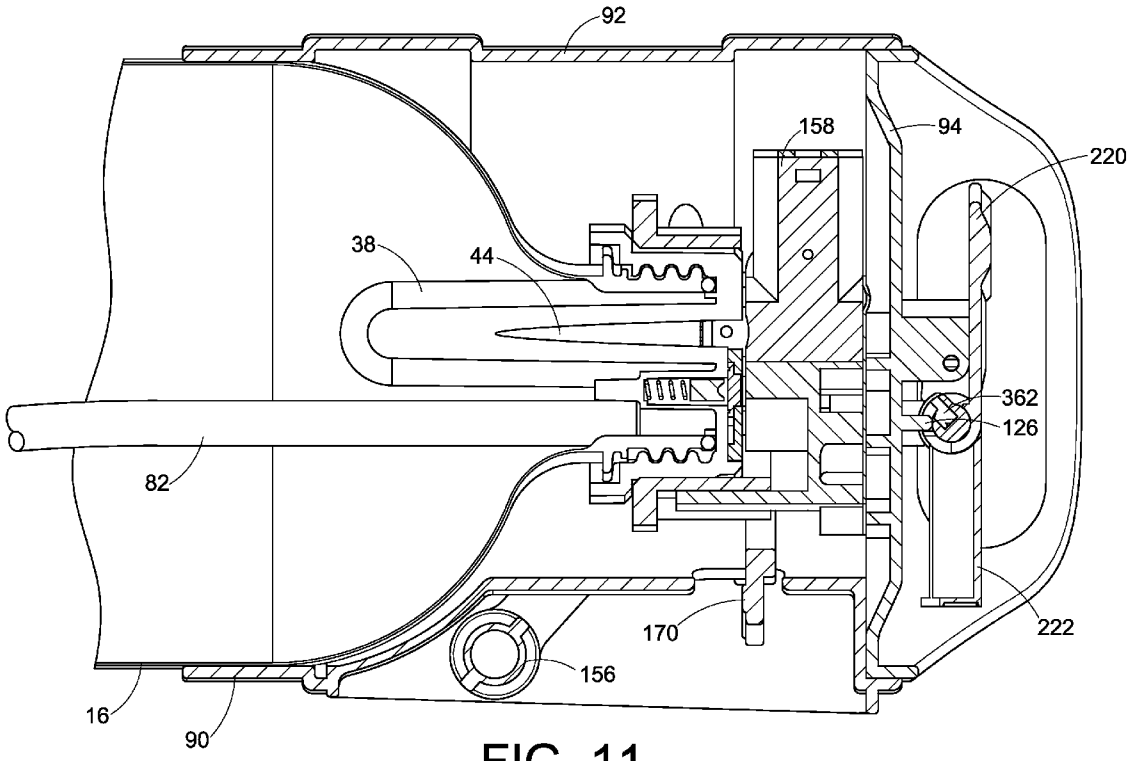

FIG. 11

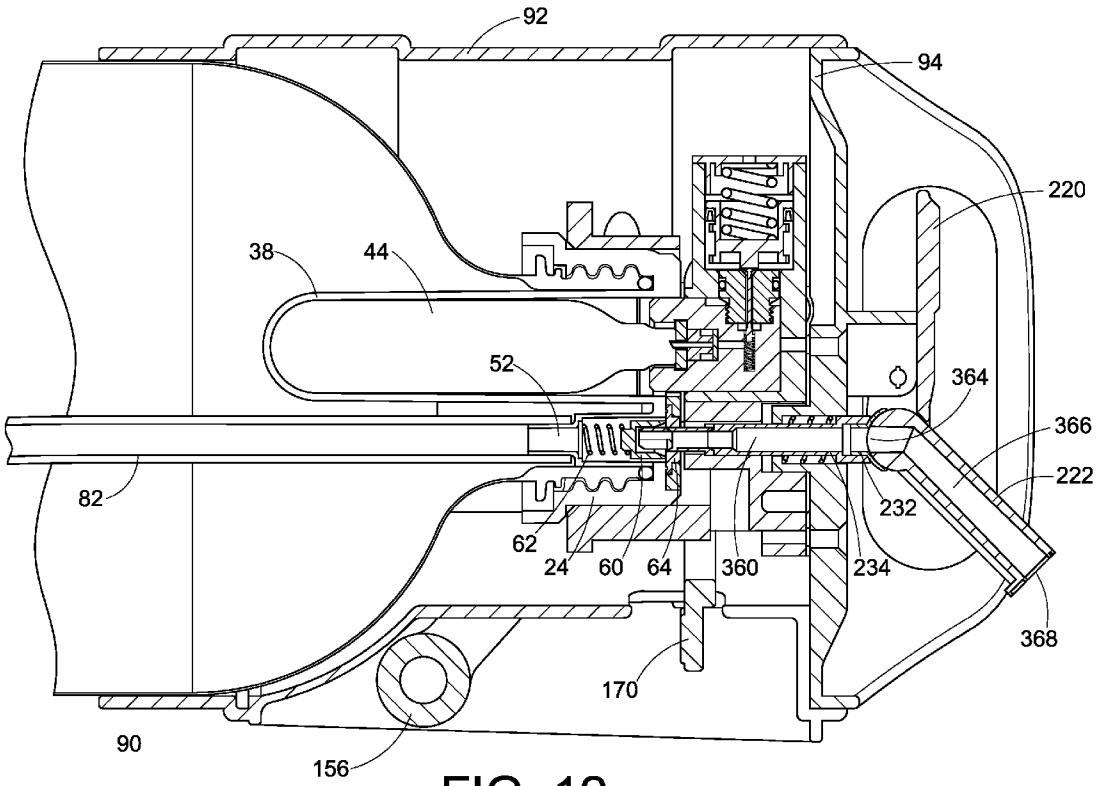
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FIG. 12

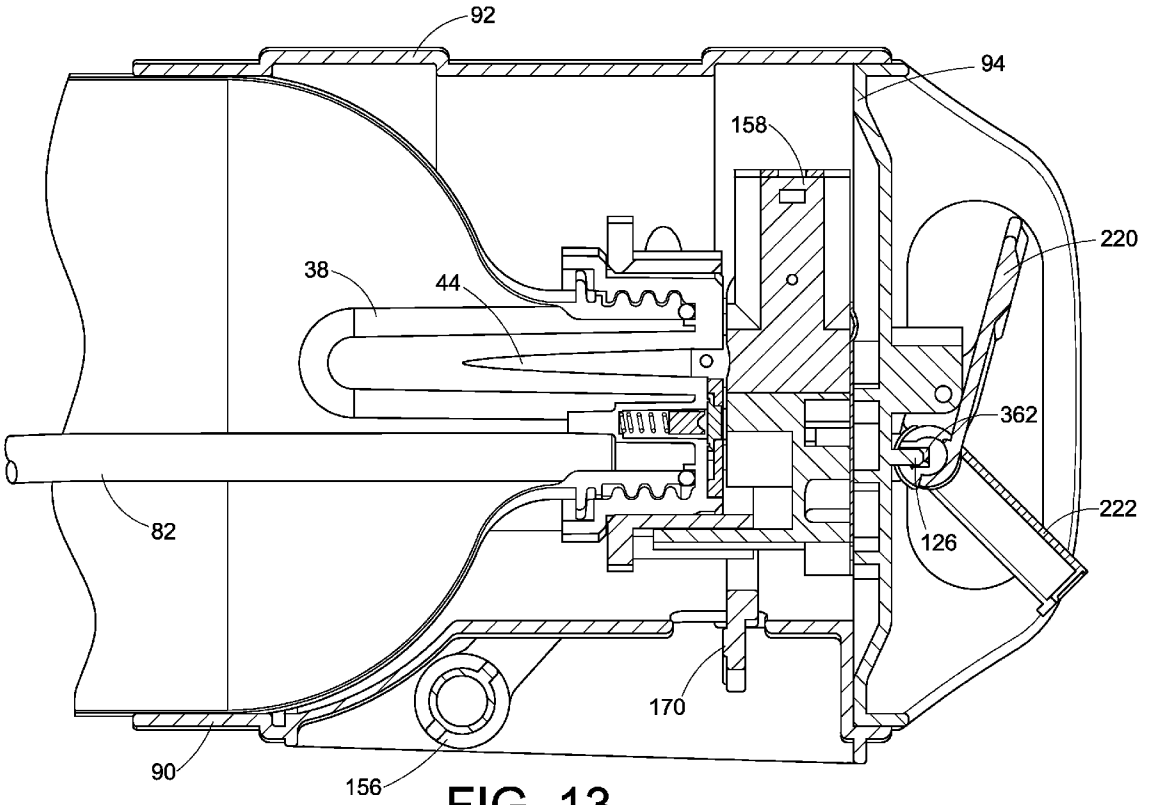

FIG. 13

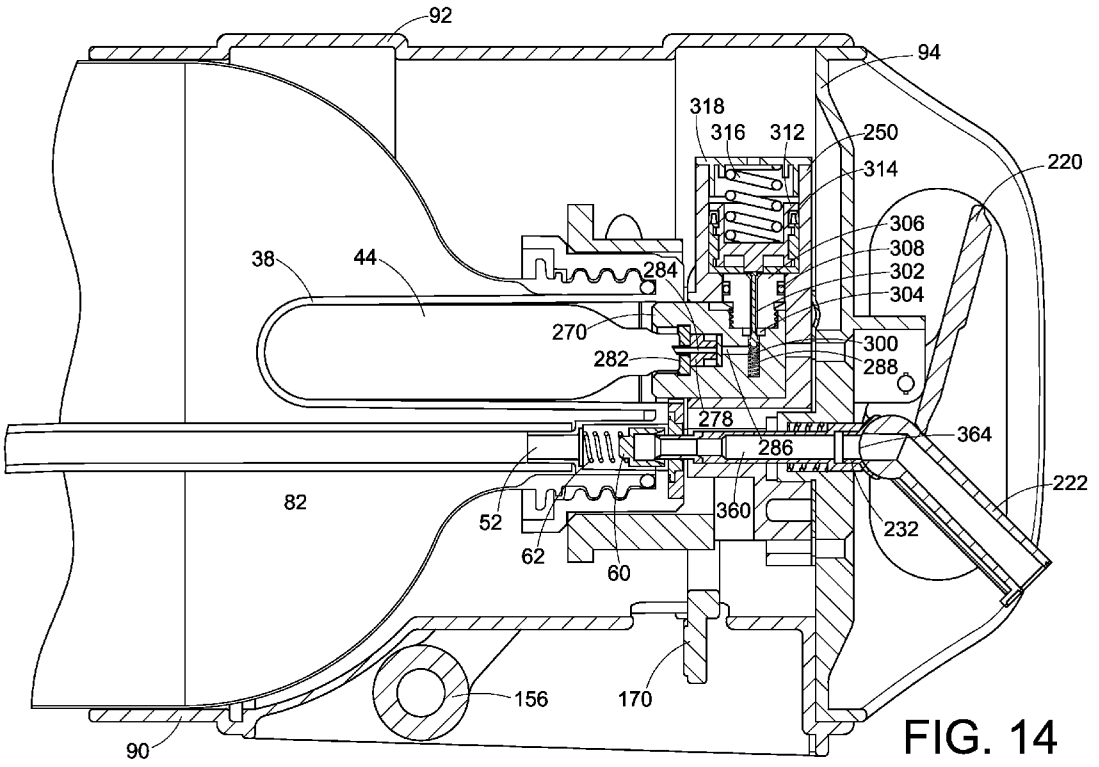
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FIG. 14

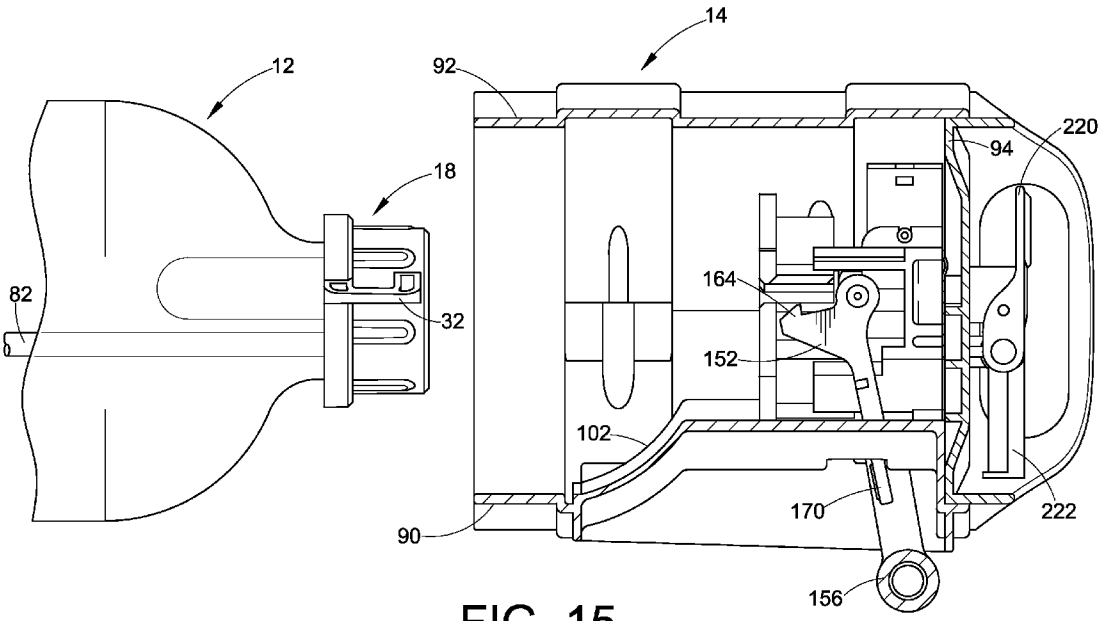


FIG. 15

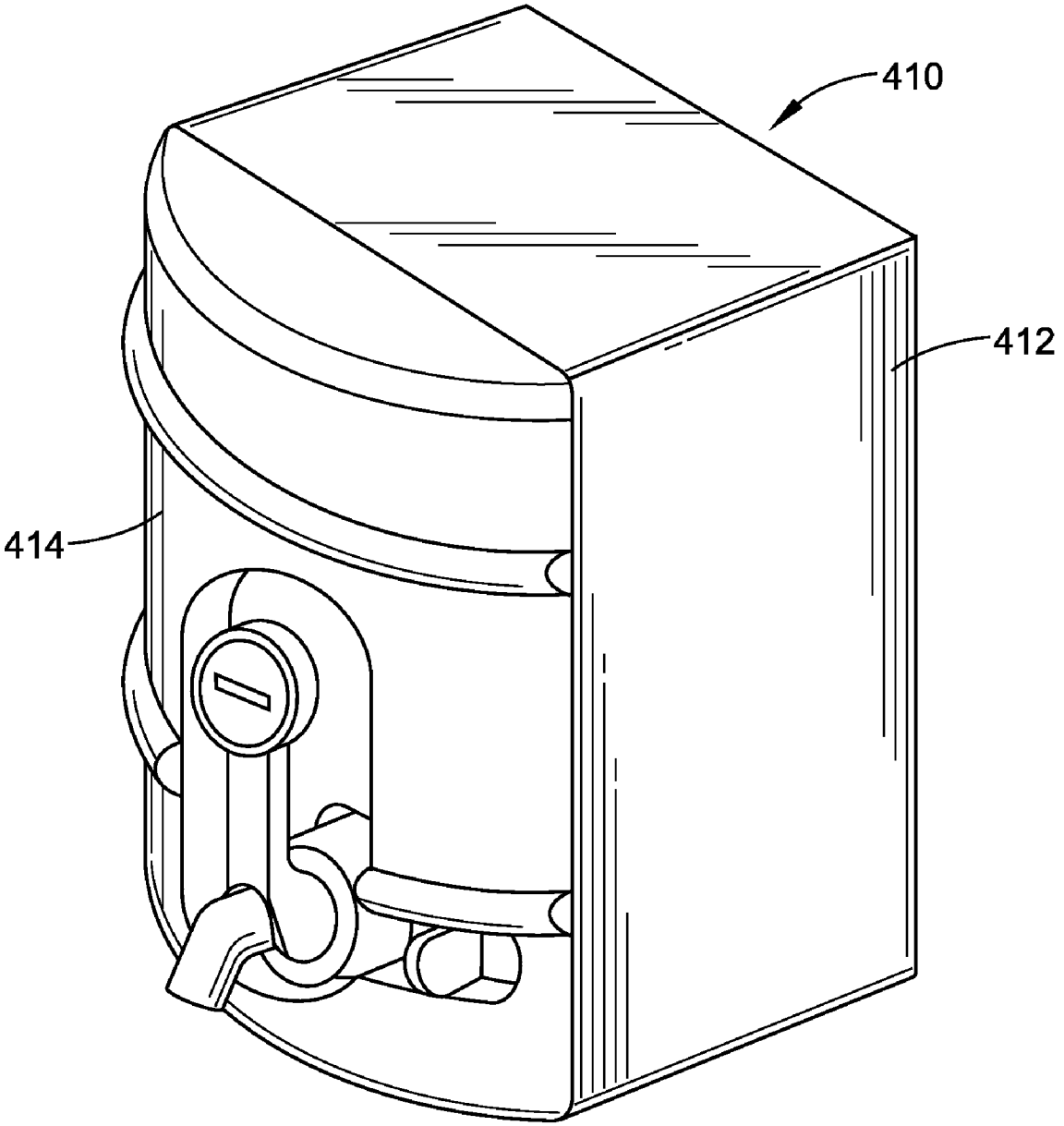


FIG. 16

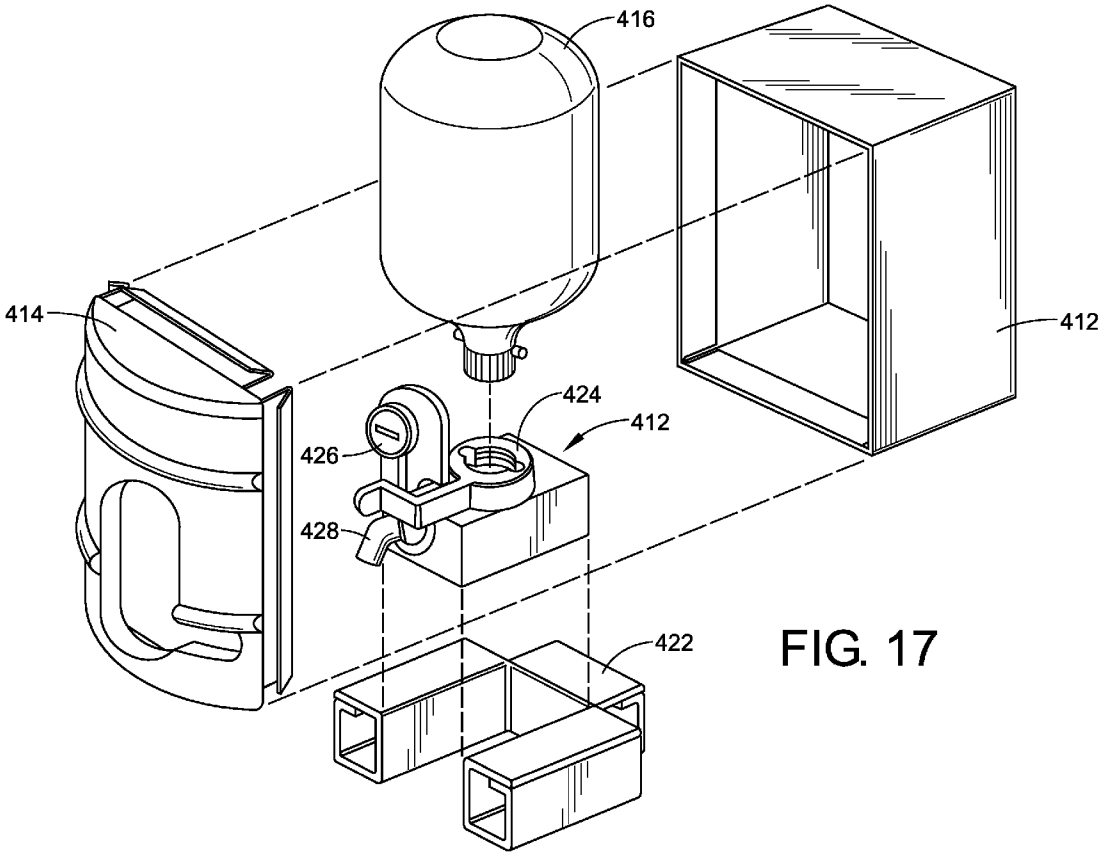


FIG. 17

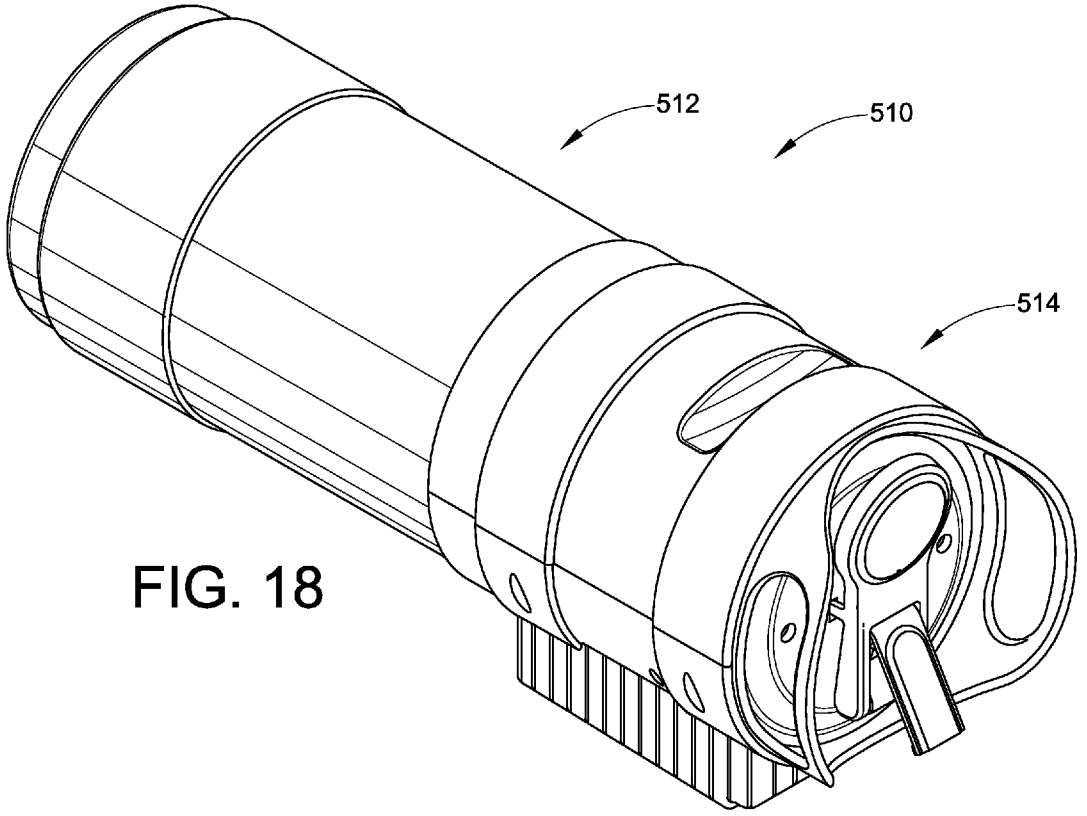
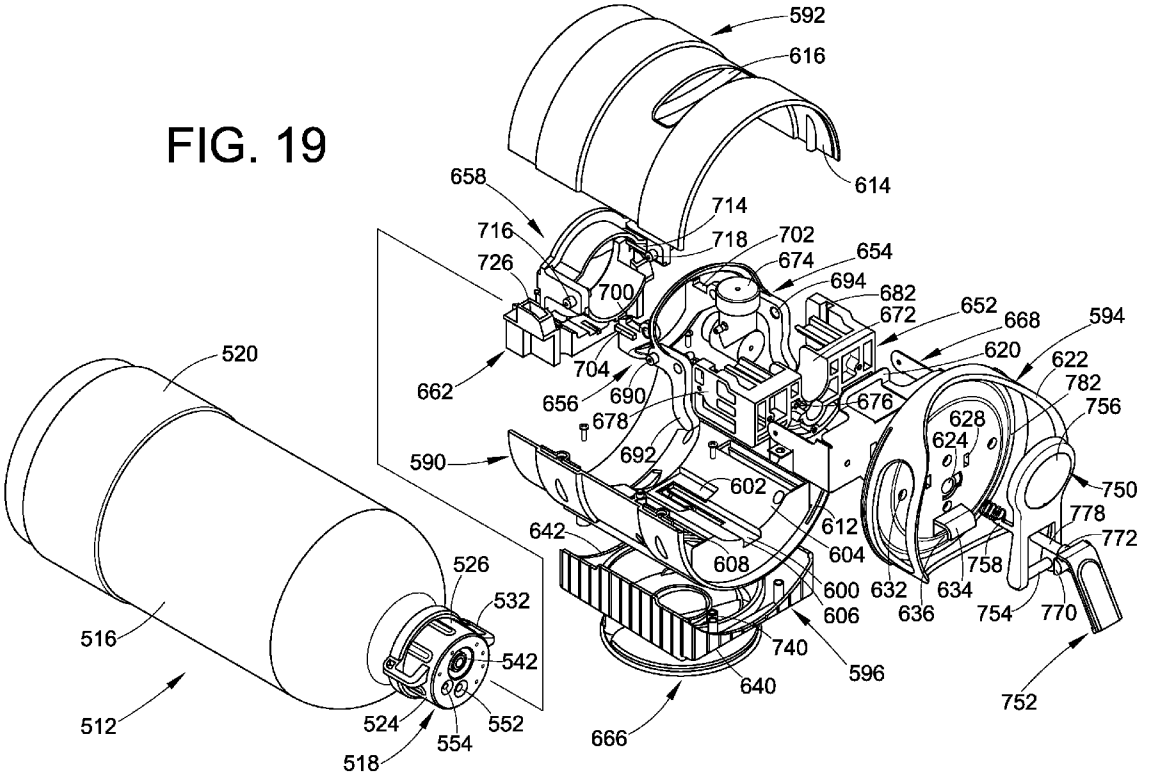


FIG. 18

FIG. 19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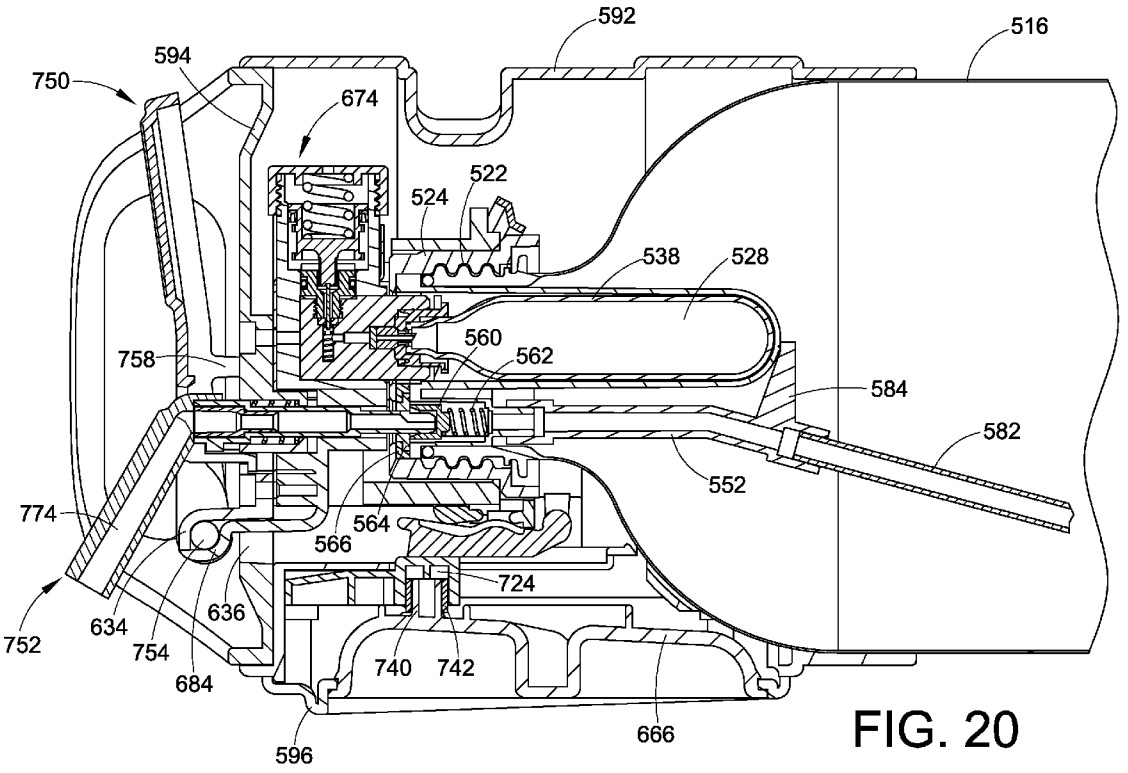
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FIG. 20

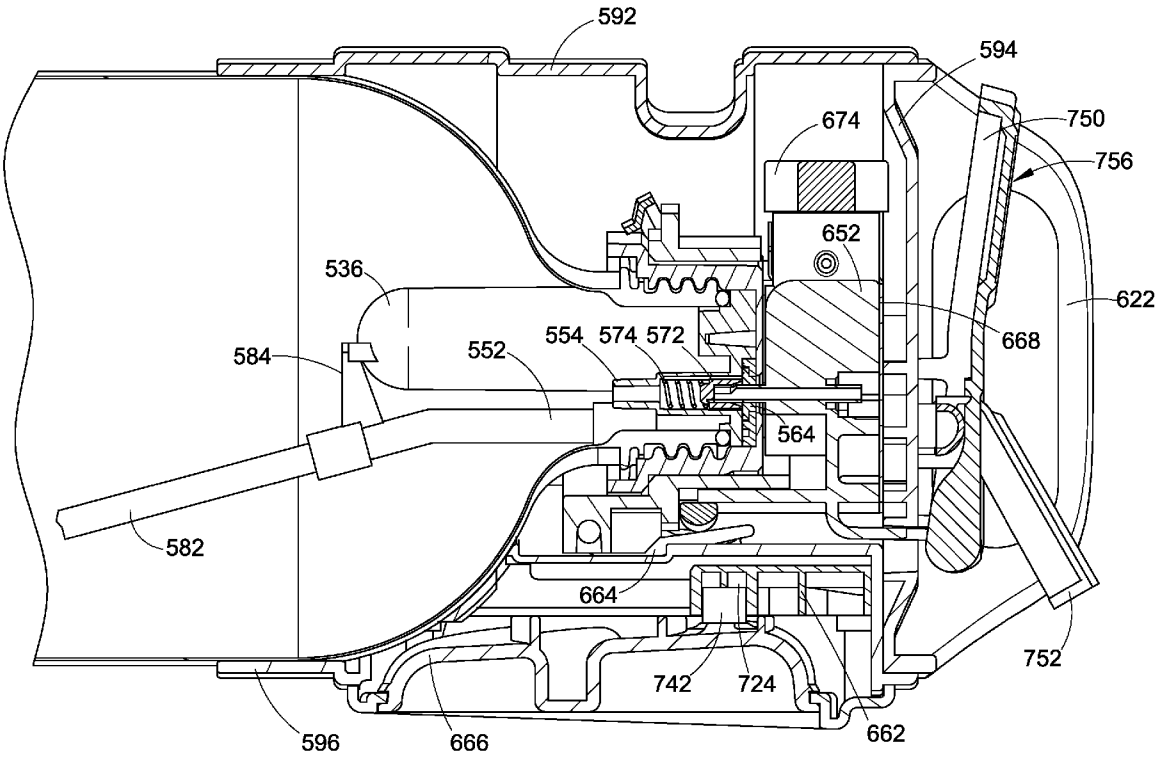
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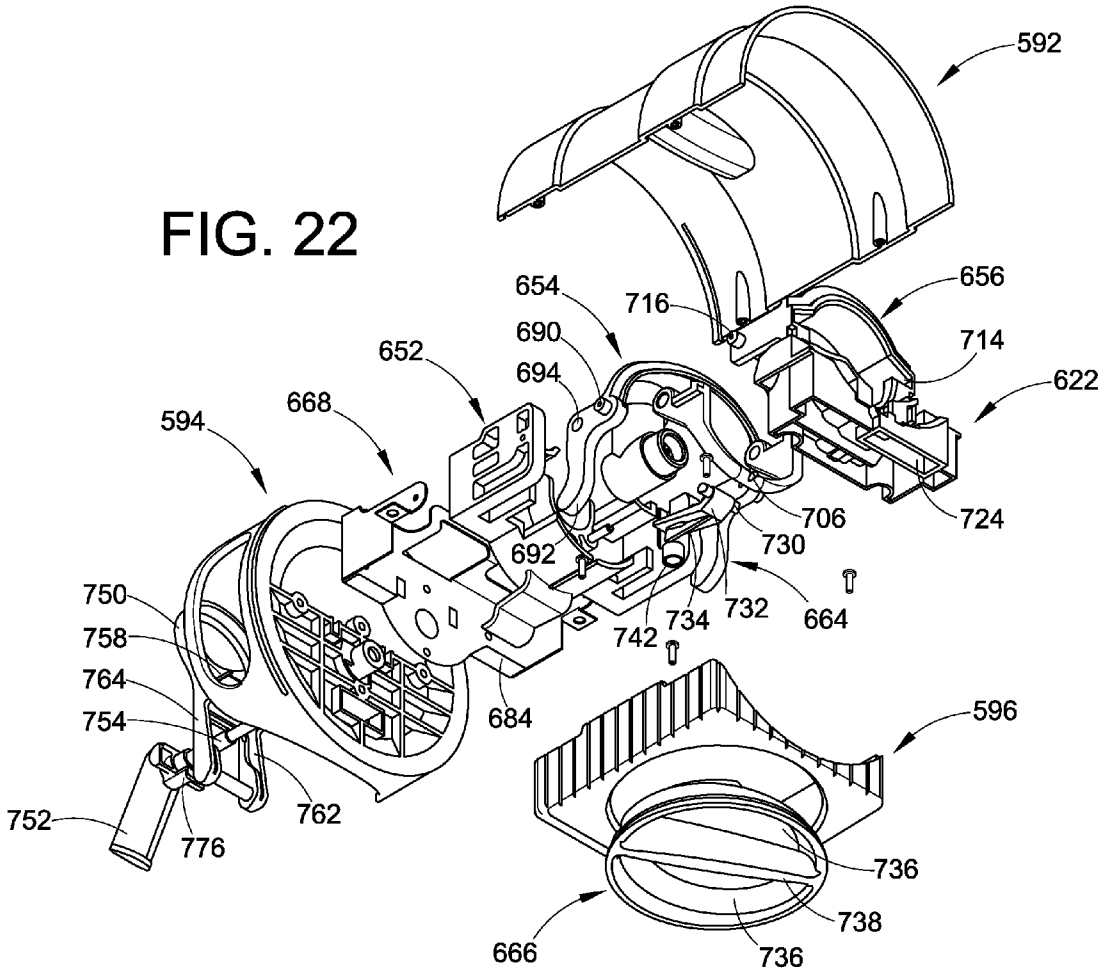
FIG. 21

FIG. 22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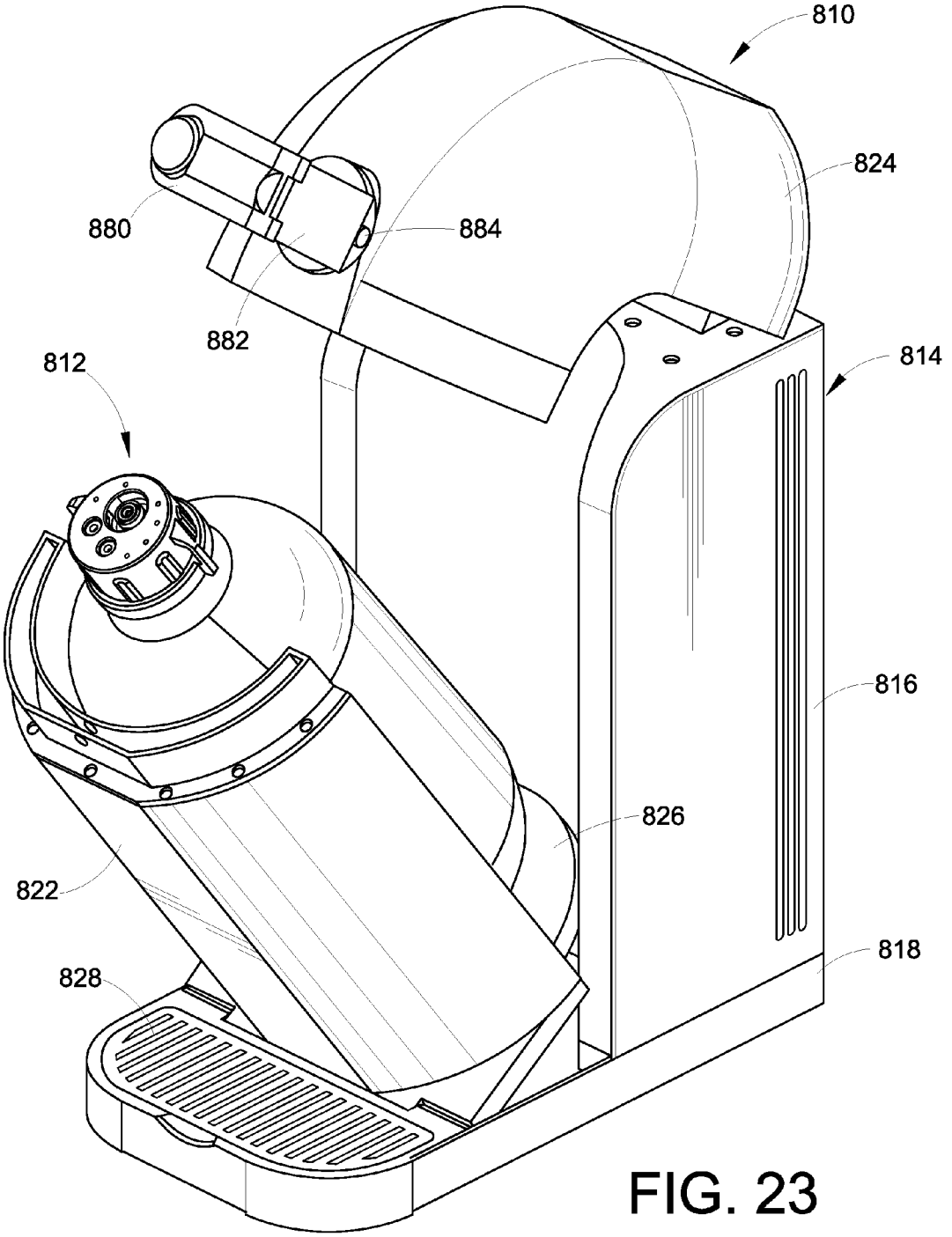

FIG. 23

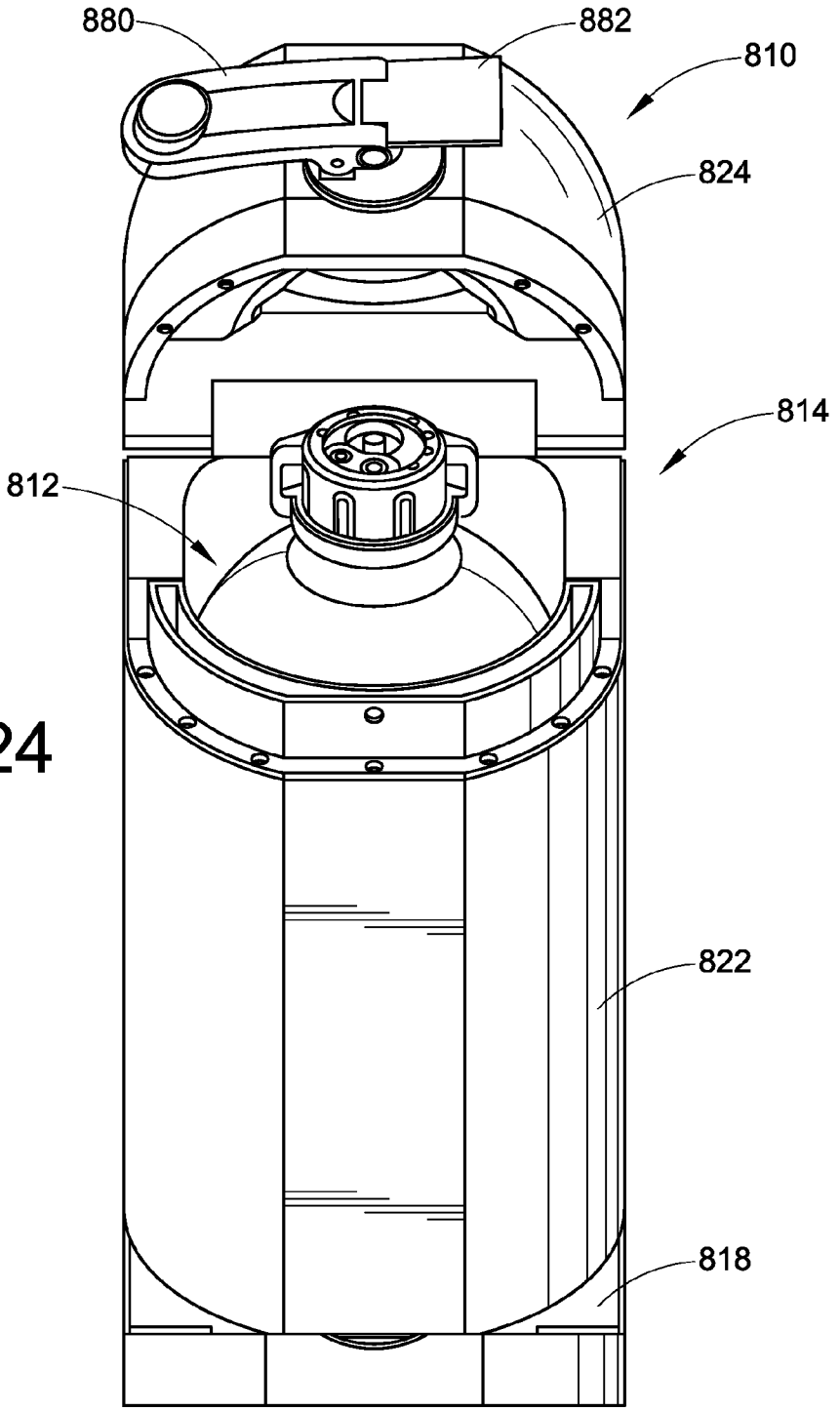

FIG. 24

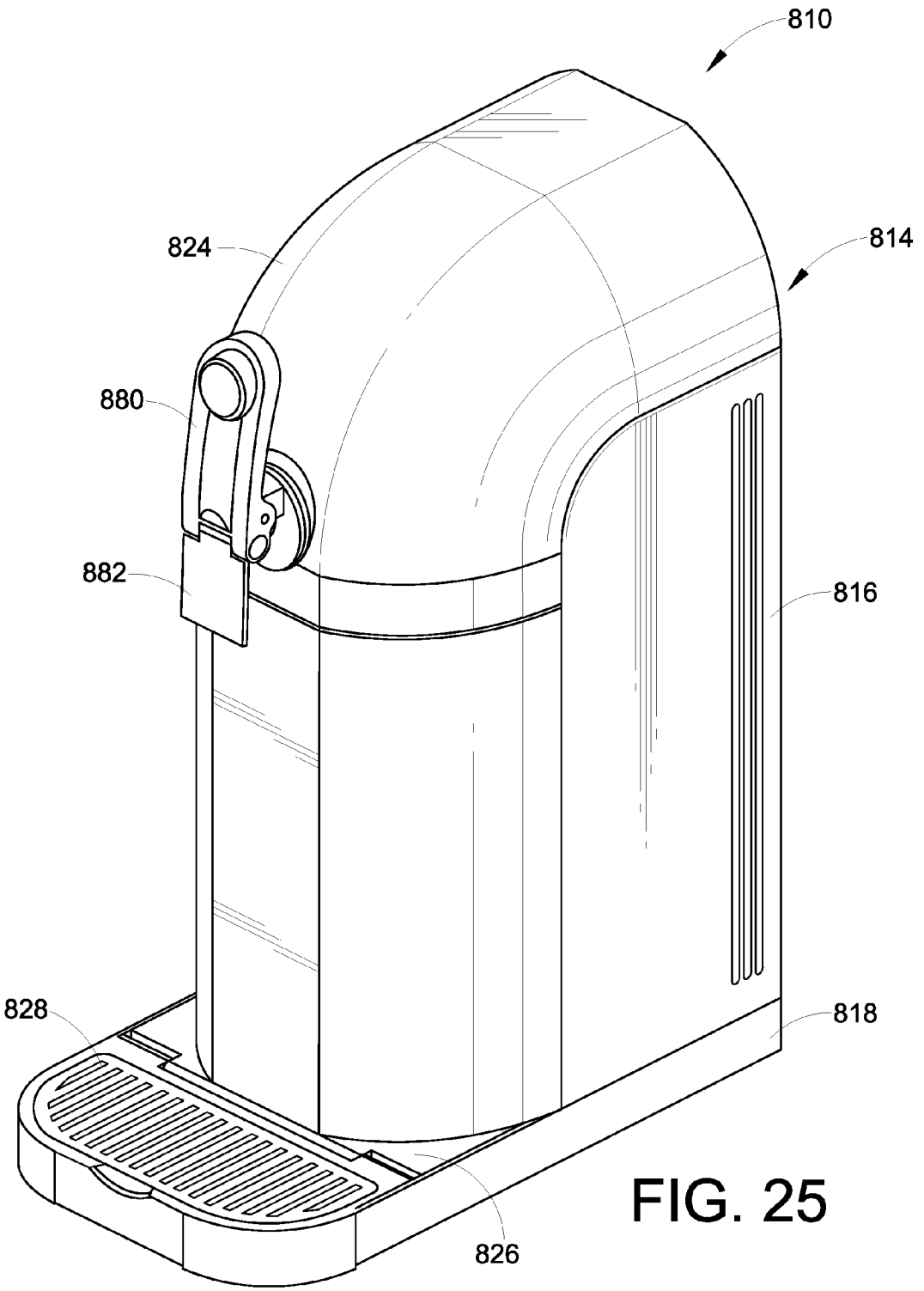

FIG. 25

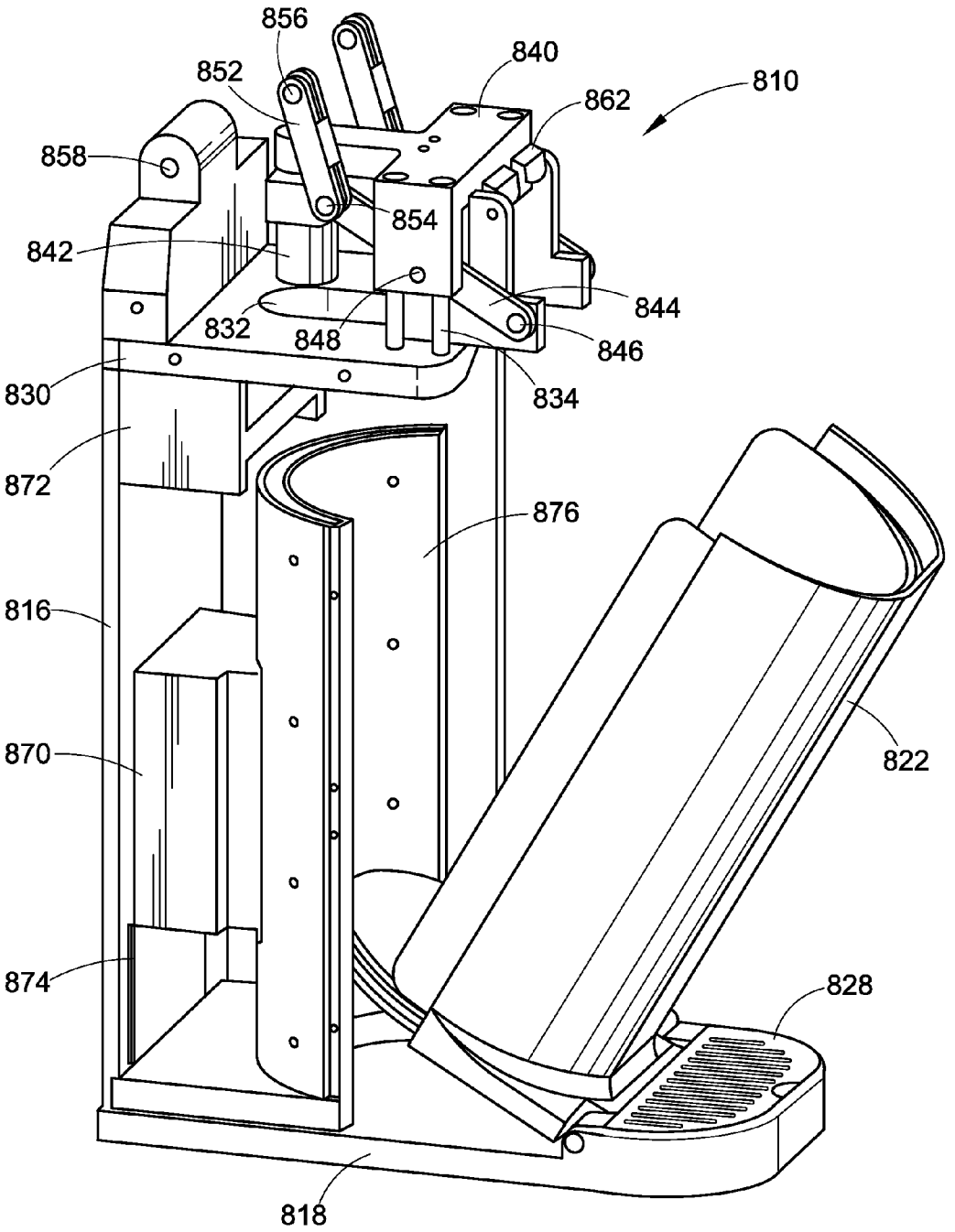
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FIG. 26

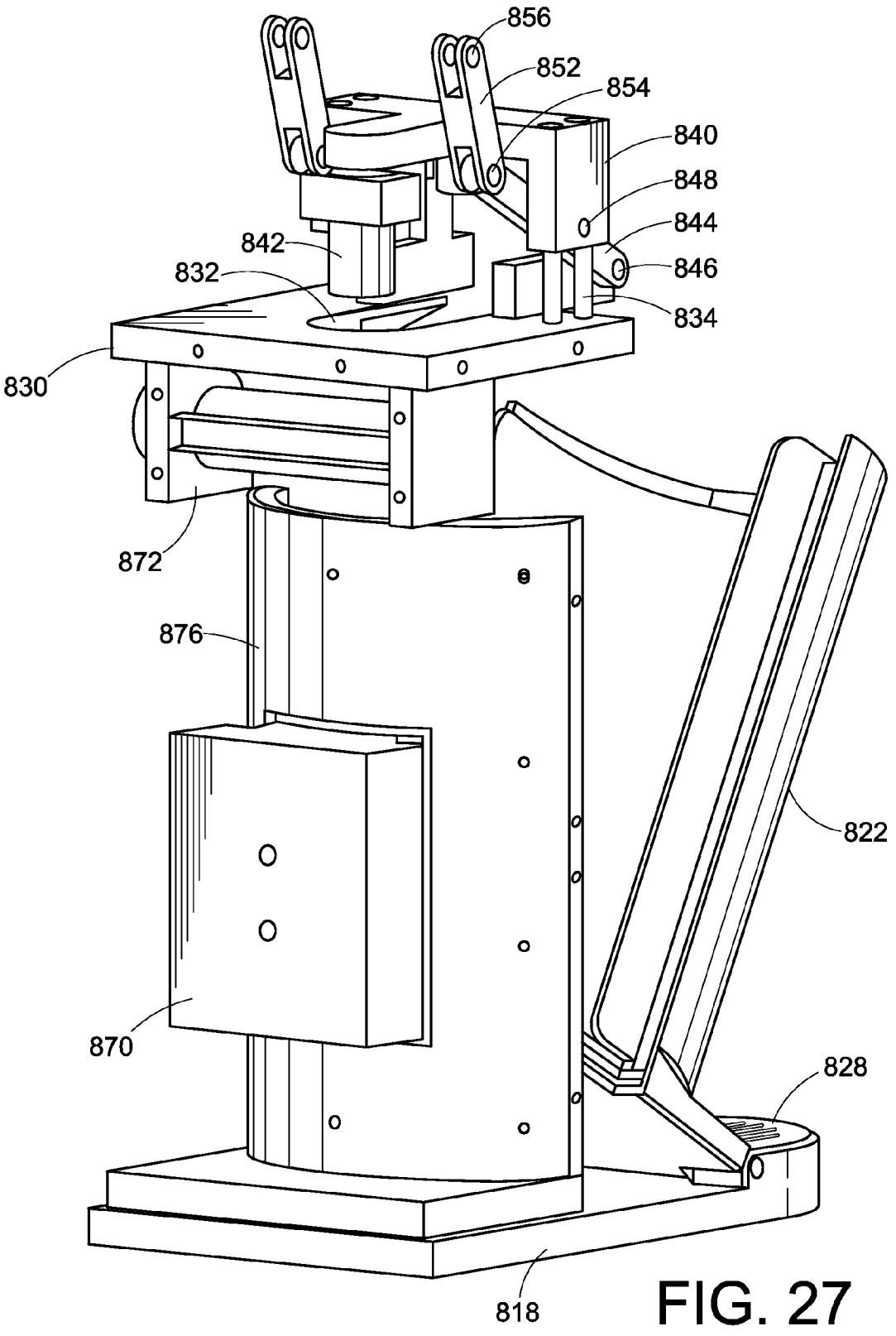
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FIG. 27

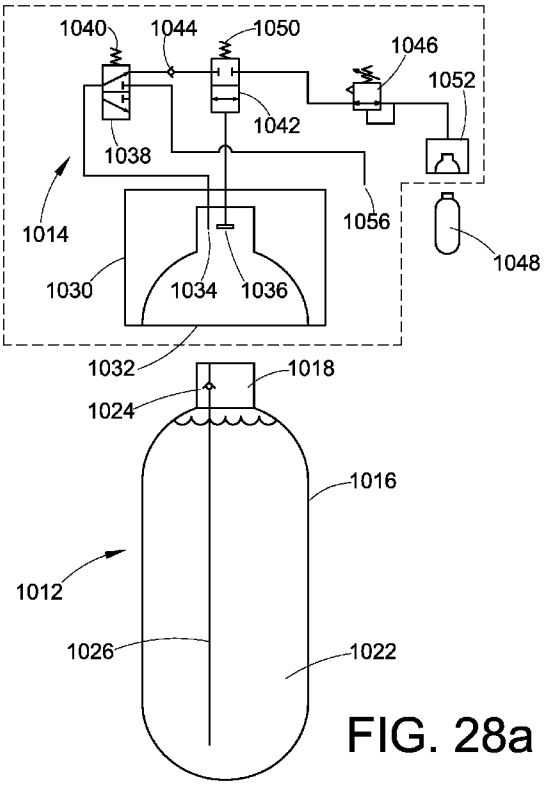

FIG. 28a

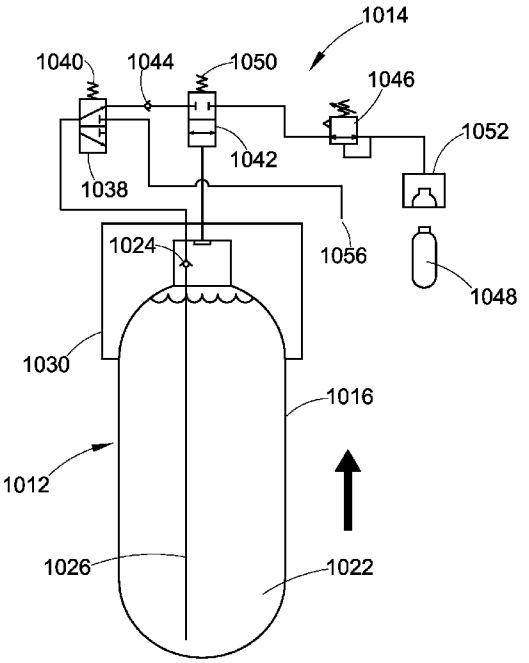

FIG. 28b

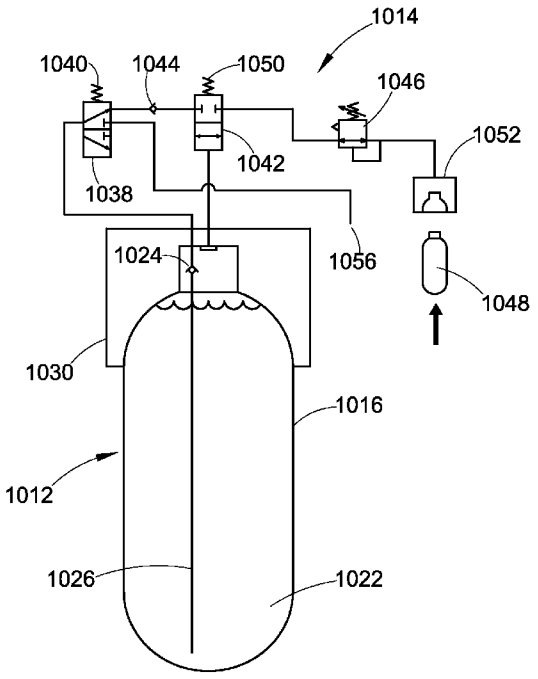

FIG. 28c

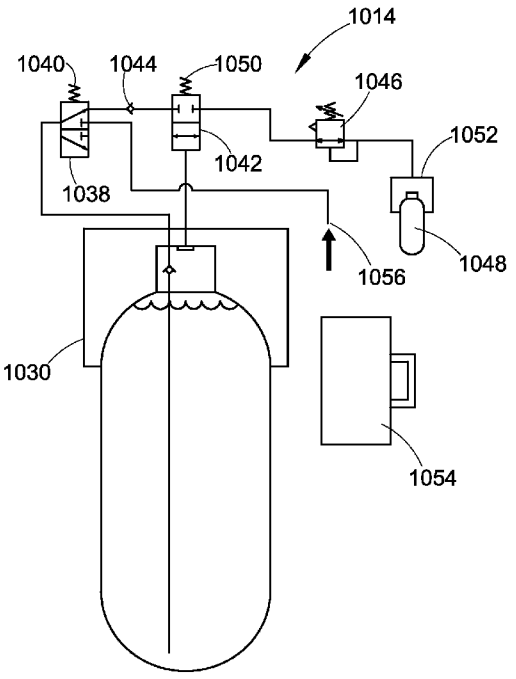

FIG. 28d

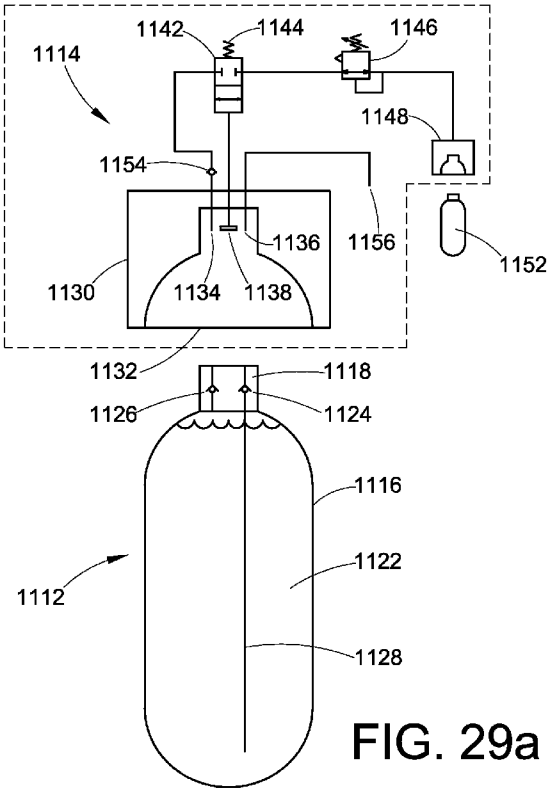

FIG. 29a

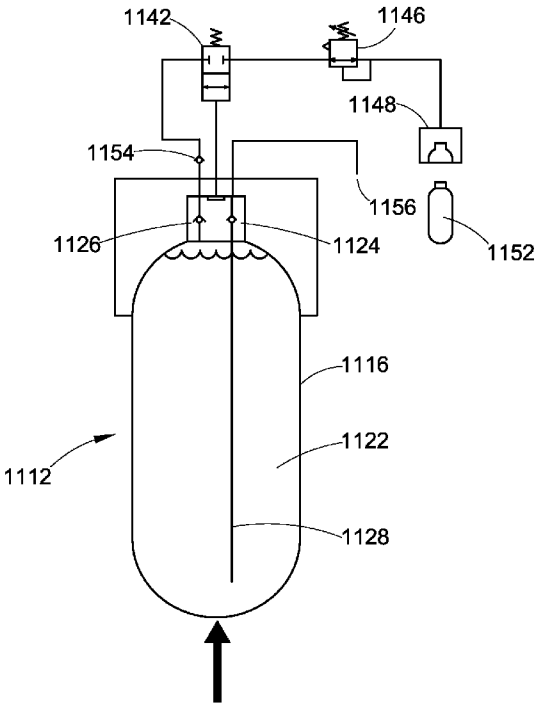

FIG. 29b

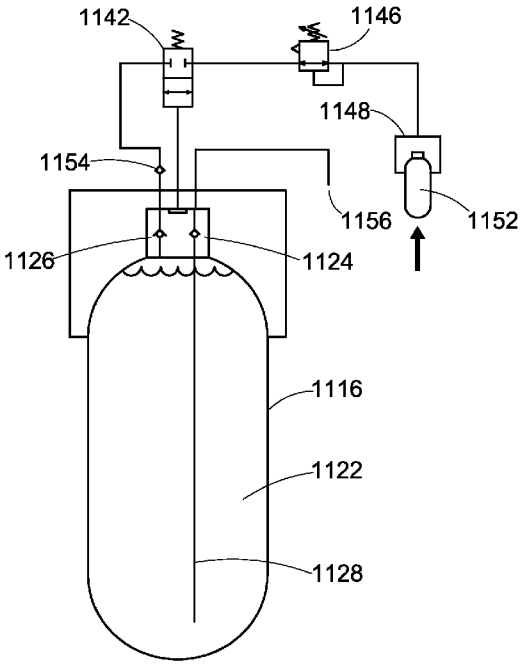

FIG. 29c

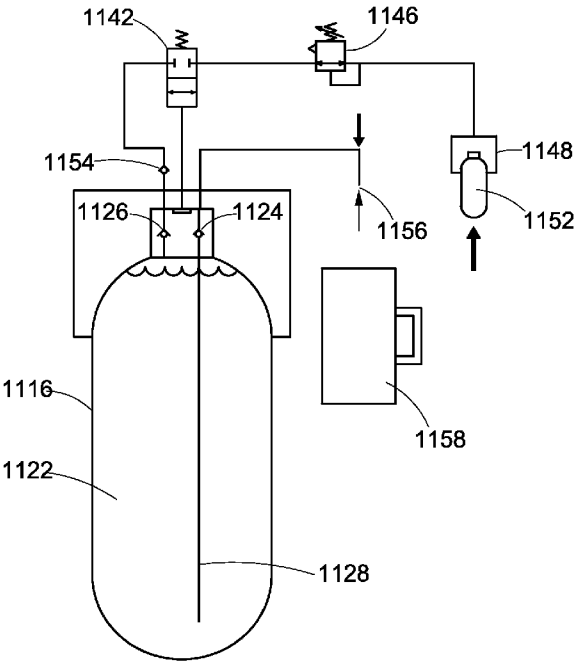

FIG. 29d

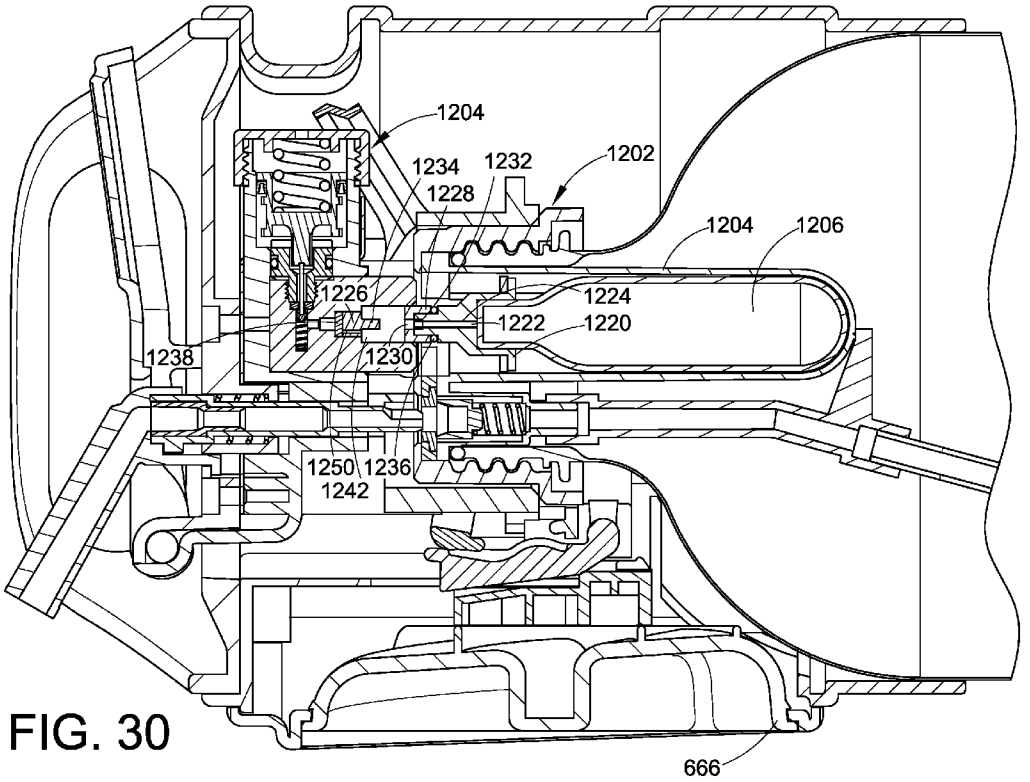
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FIG. 30

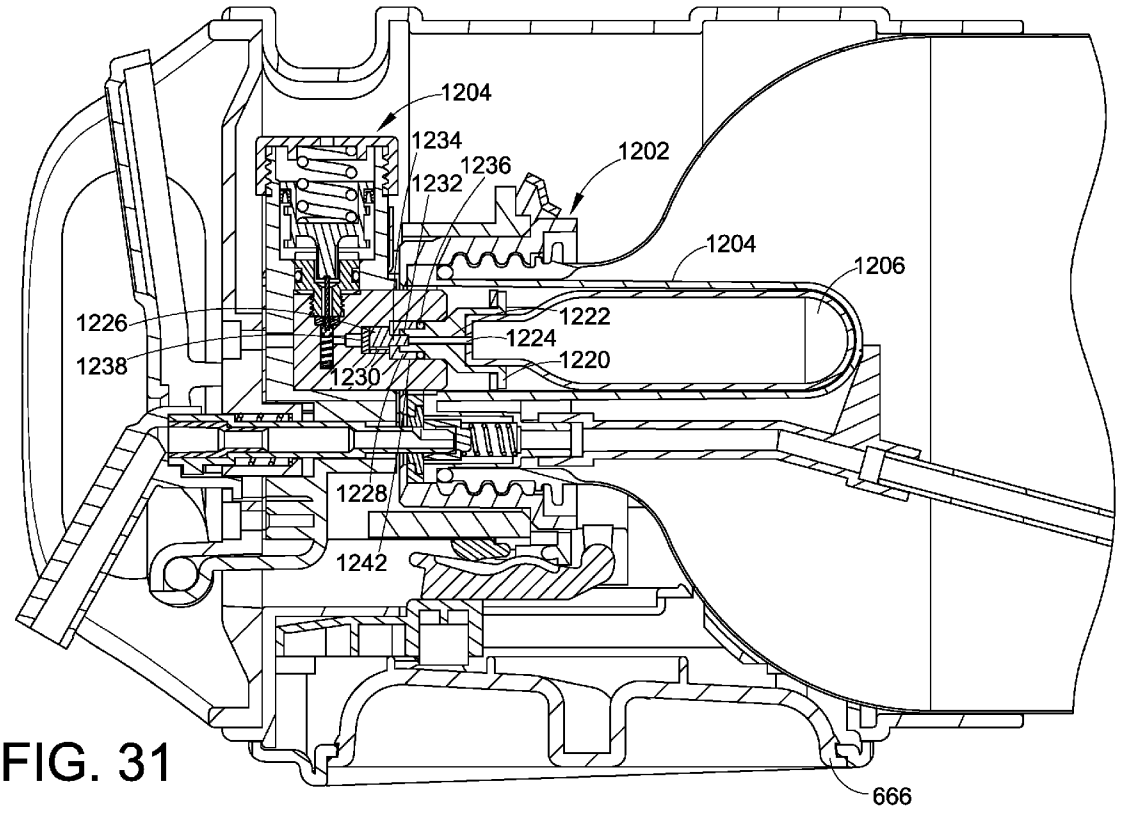
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FIG. 31

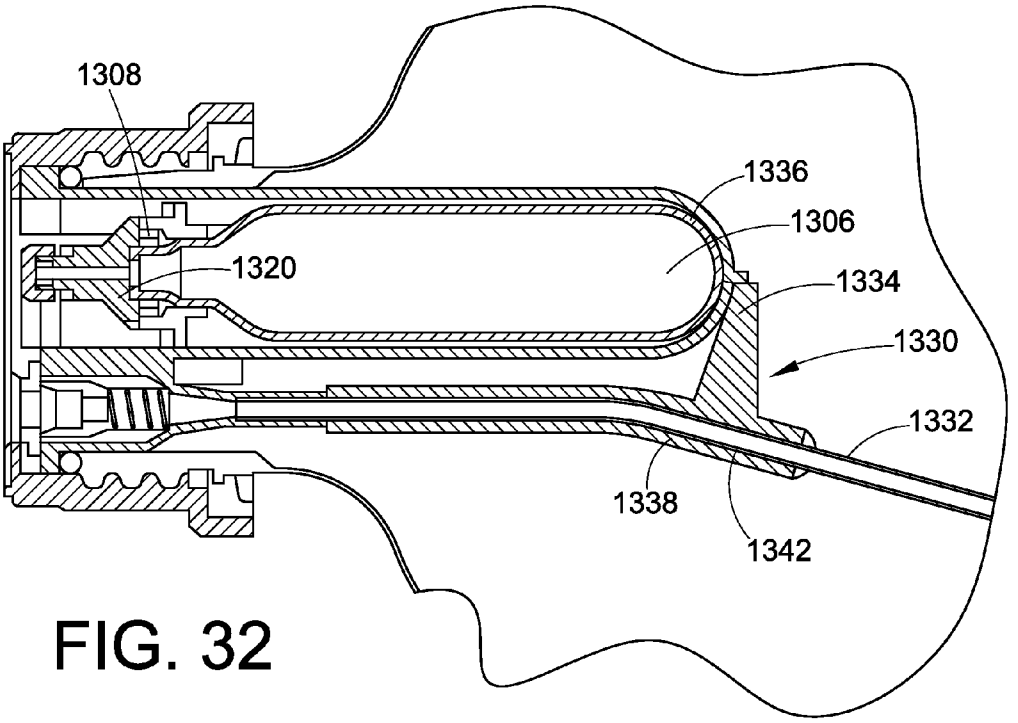
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FIG. 32

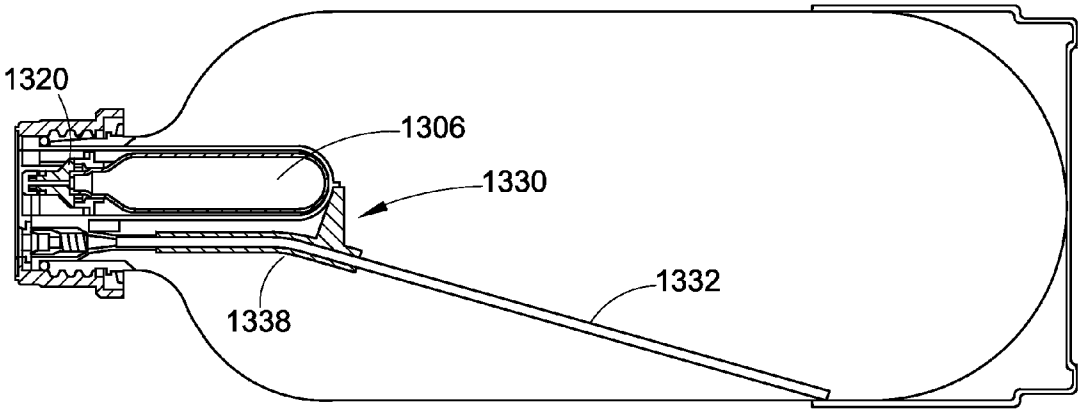
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FIG. 33

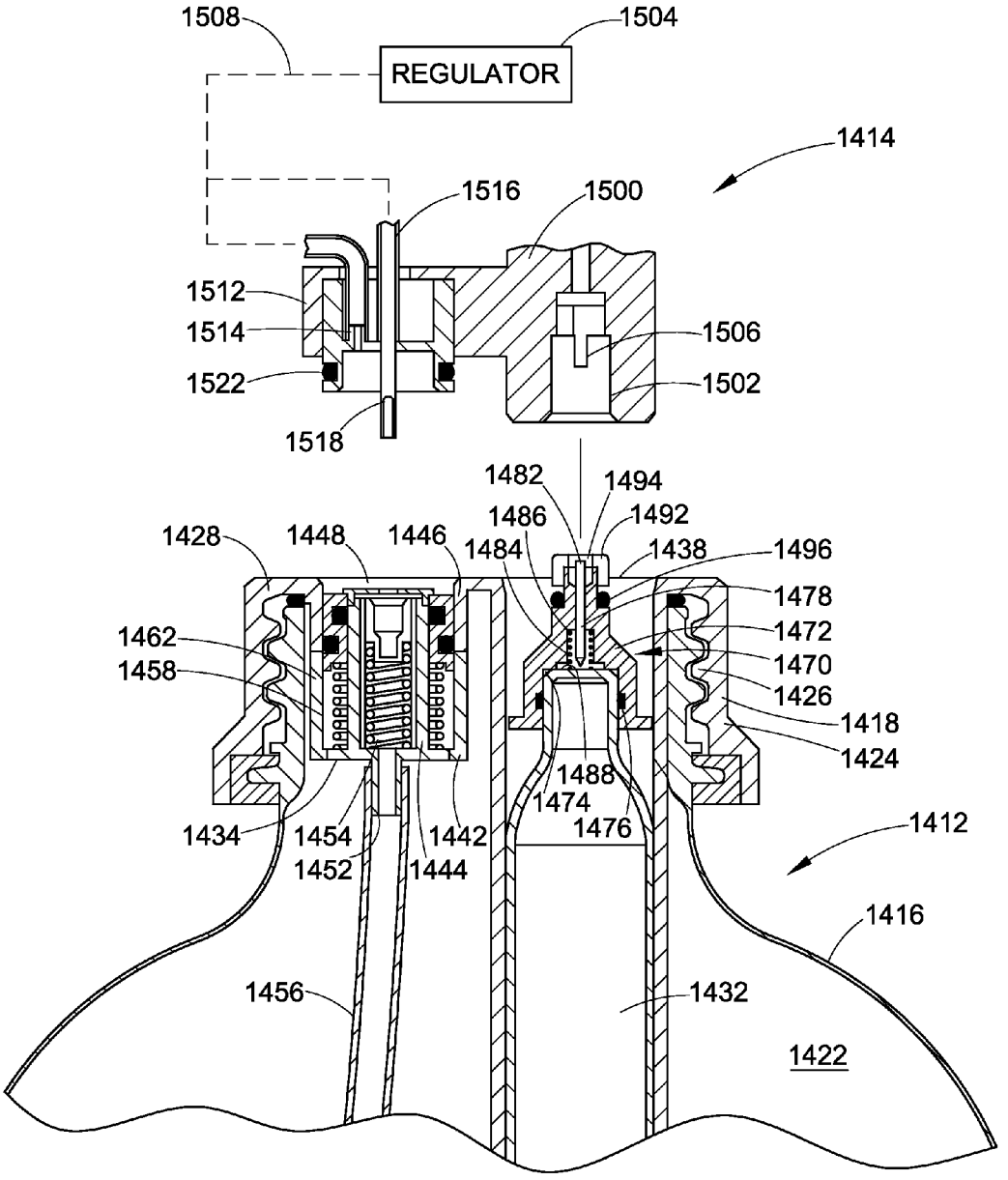
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FIG. 34

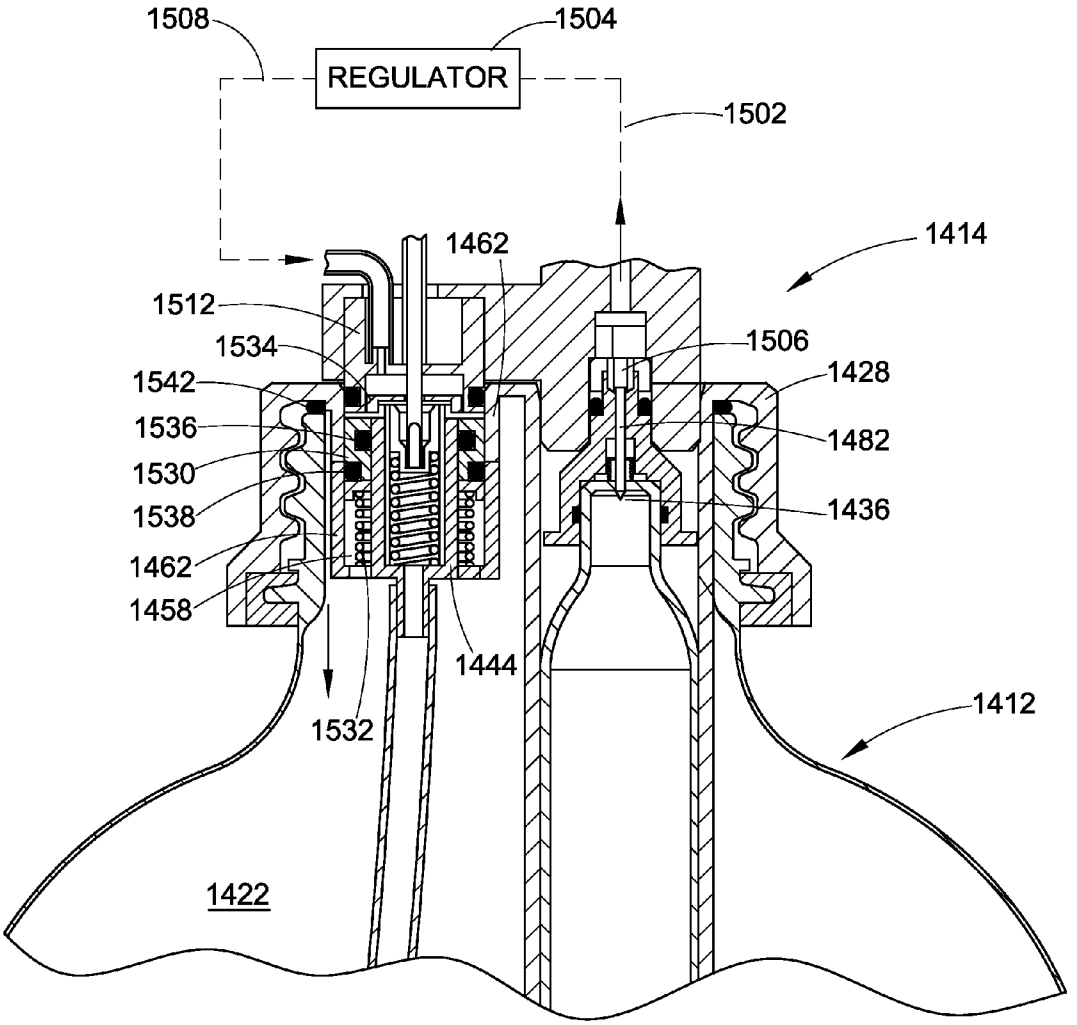
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FIG. 35

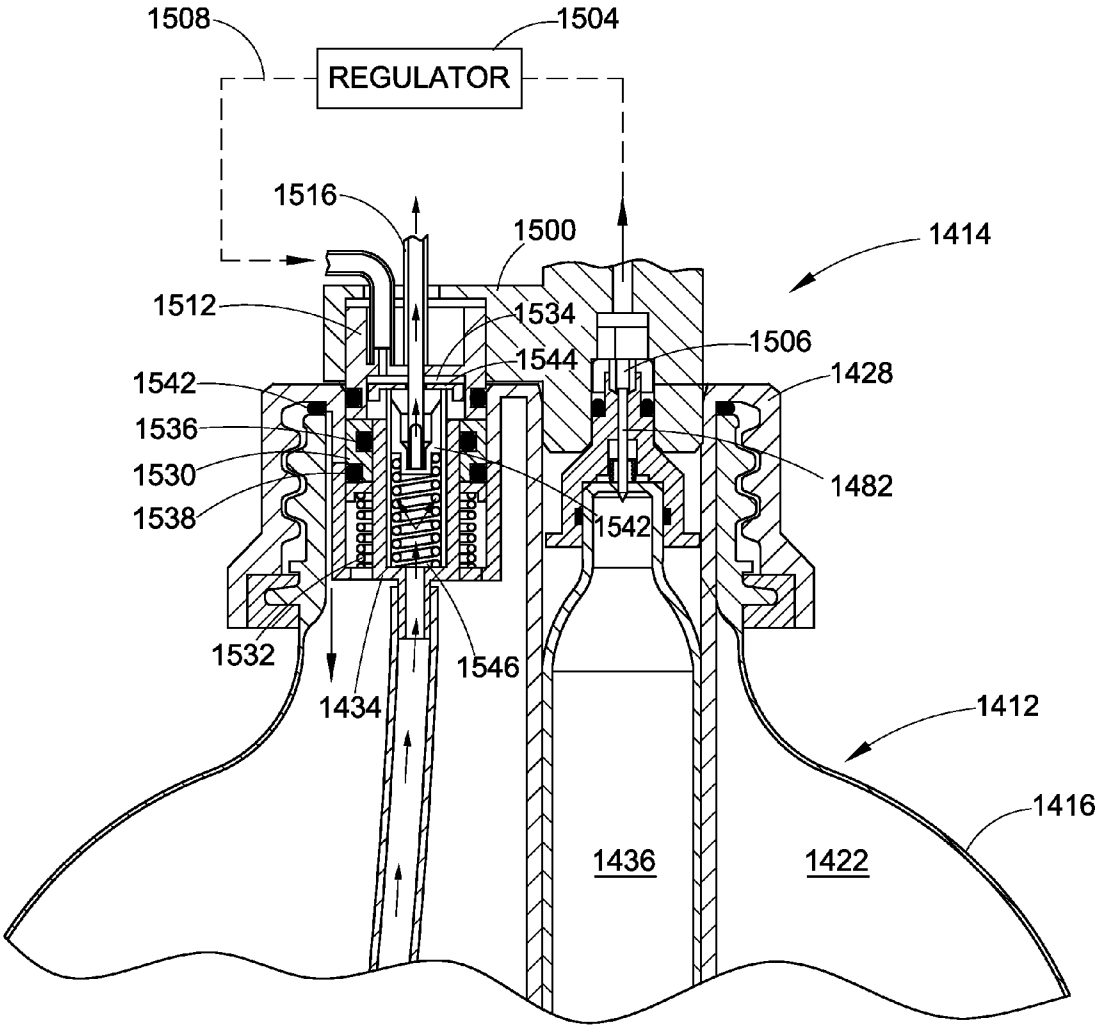
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FIG. 36

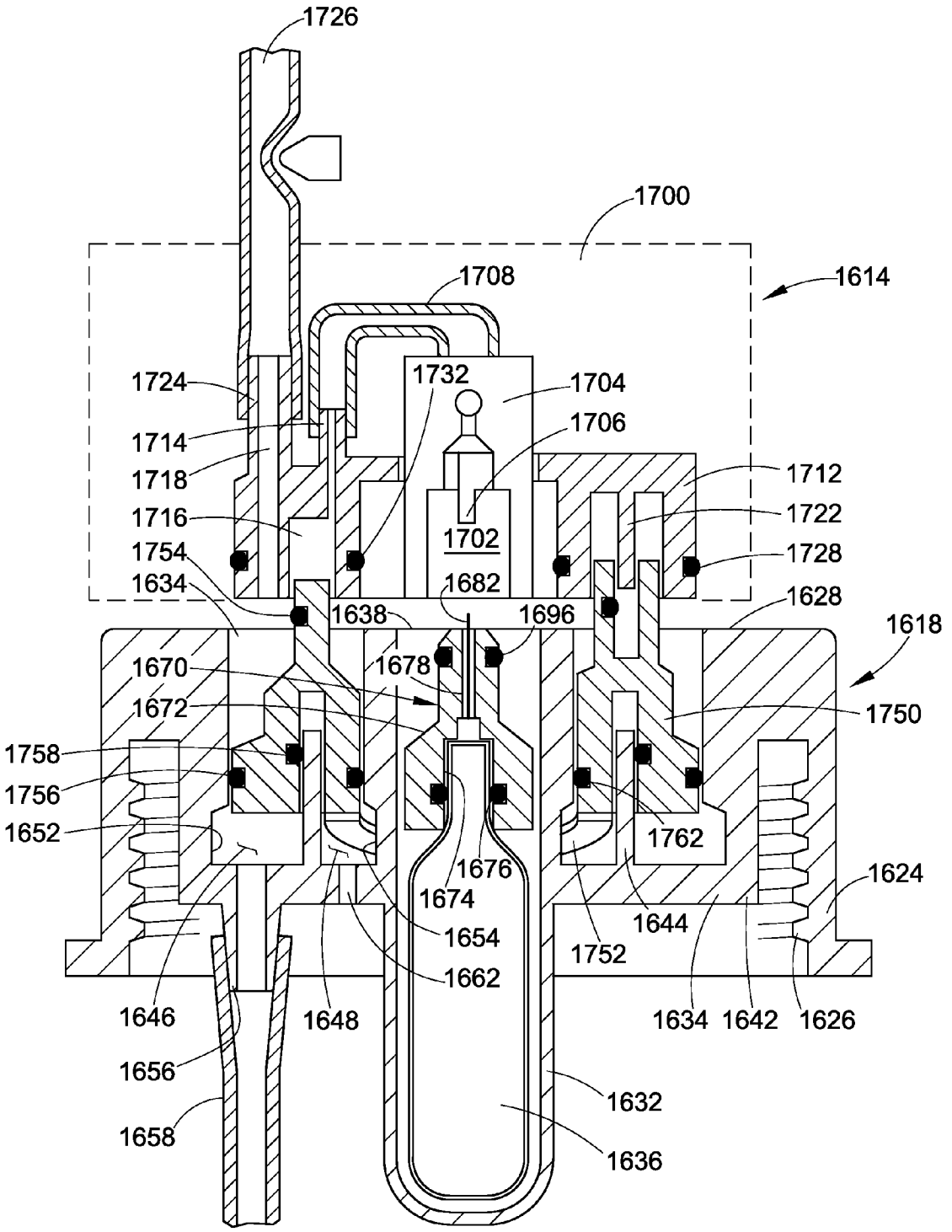
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FIG. 37

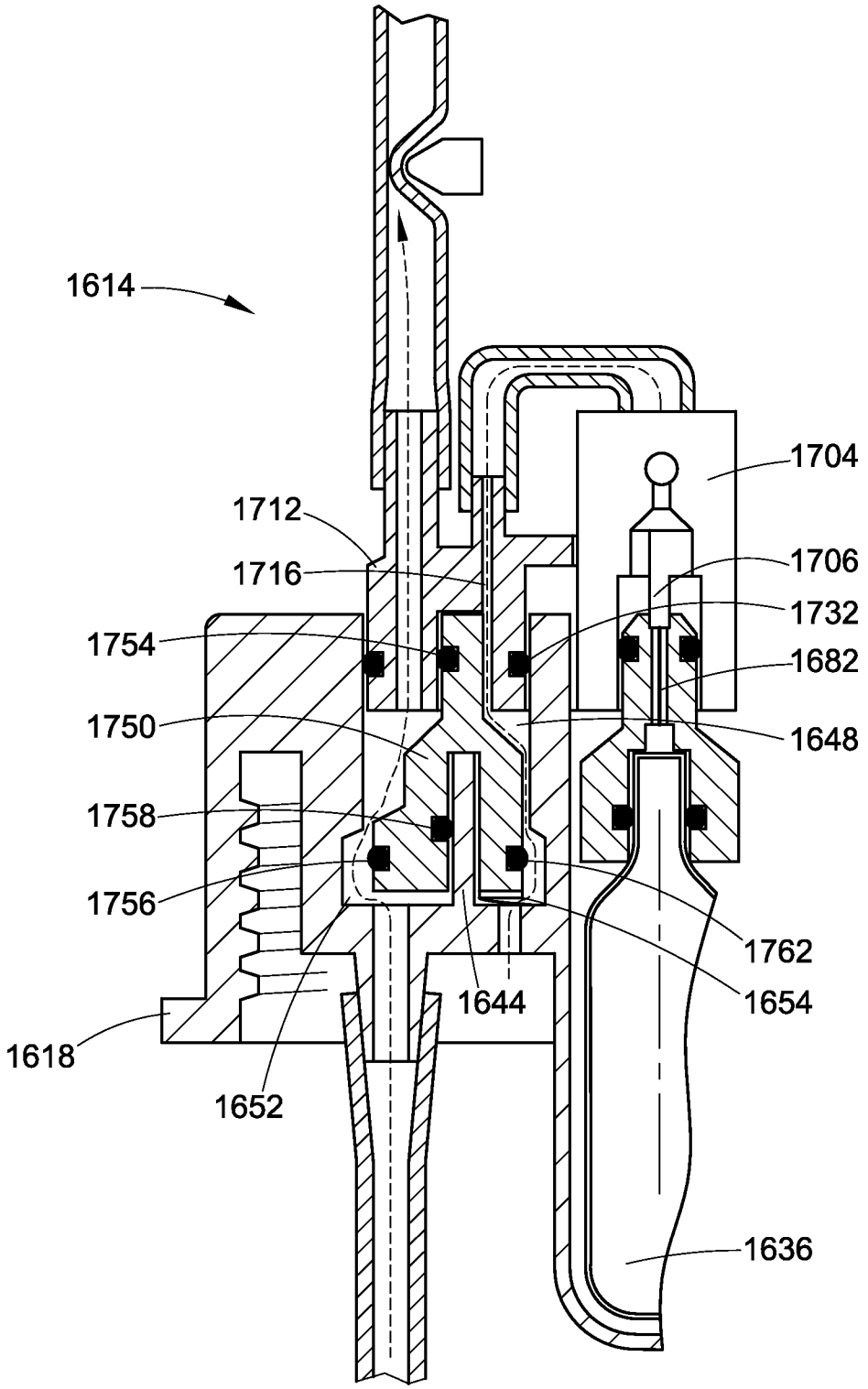
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FIG. 38

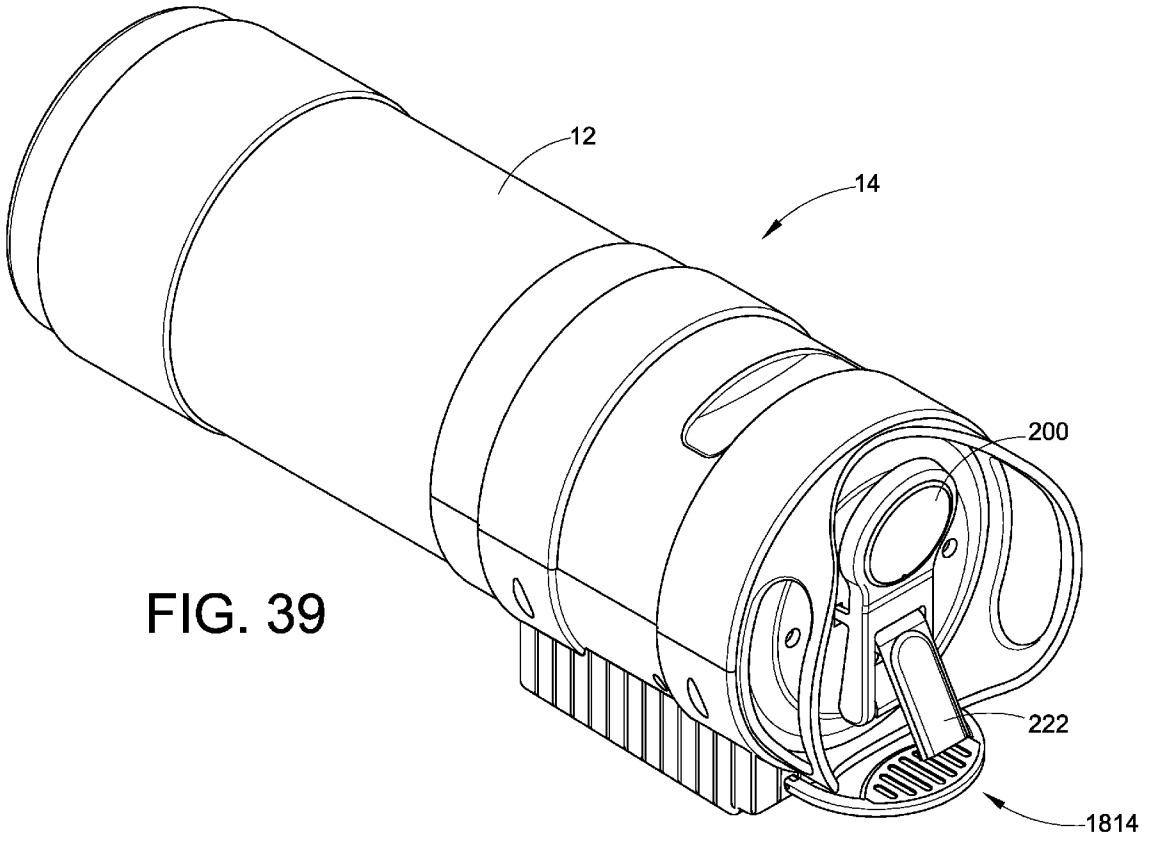

FIG. 39

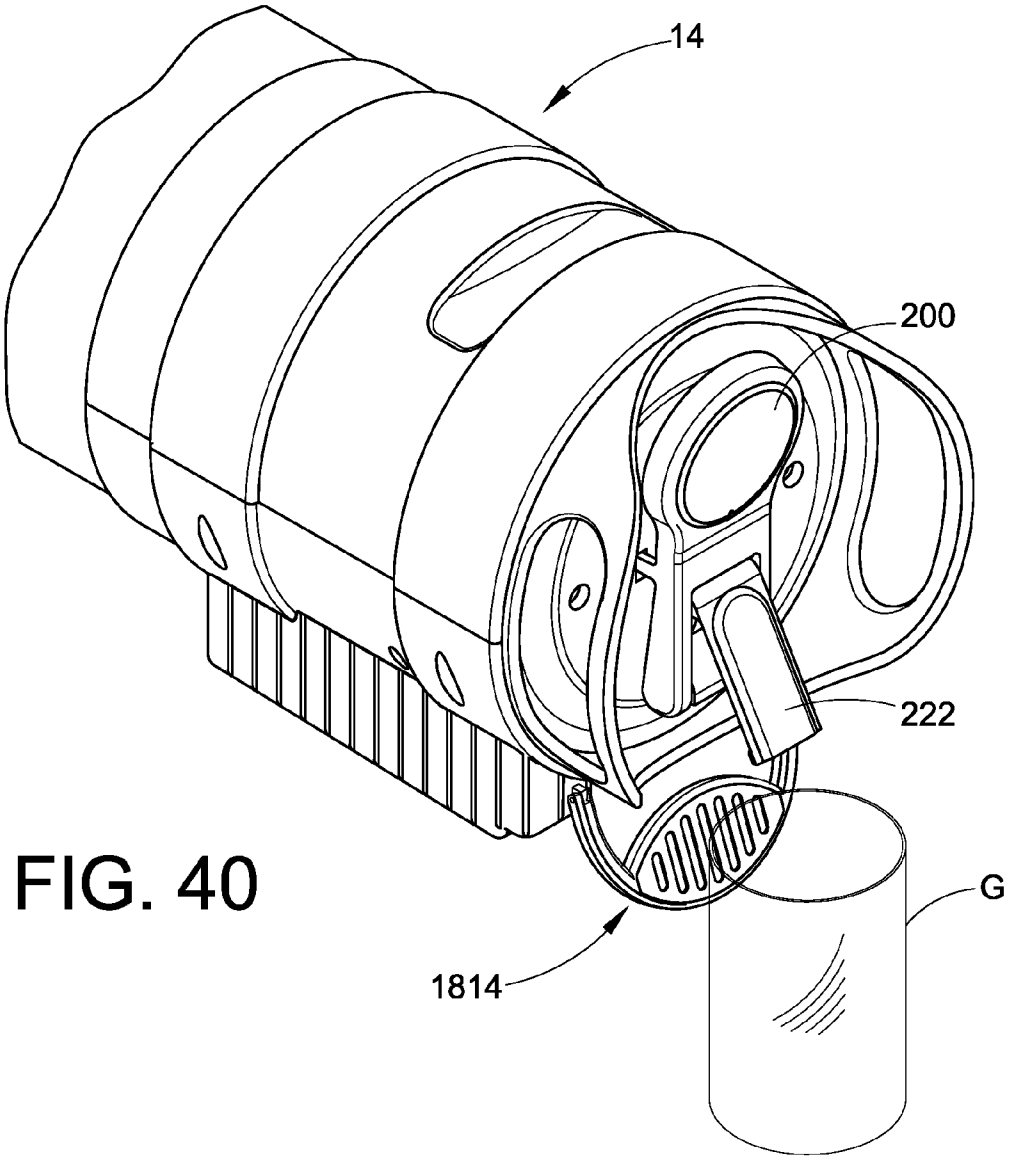

FIG. 40

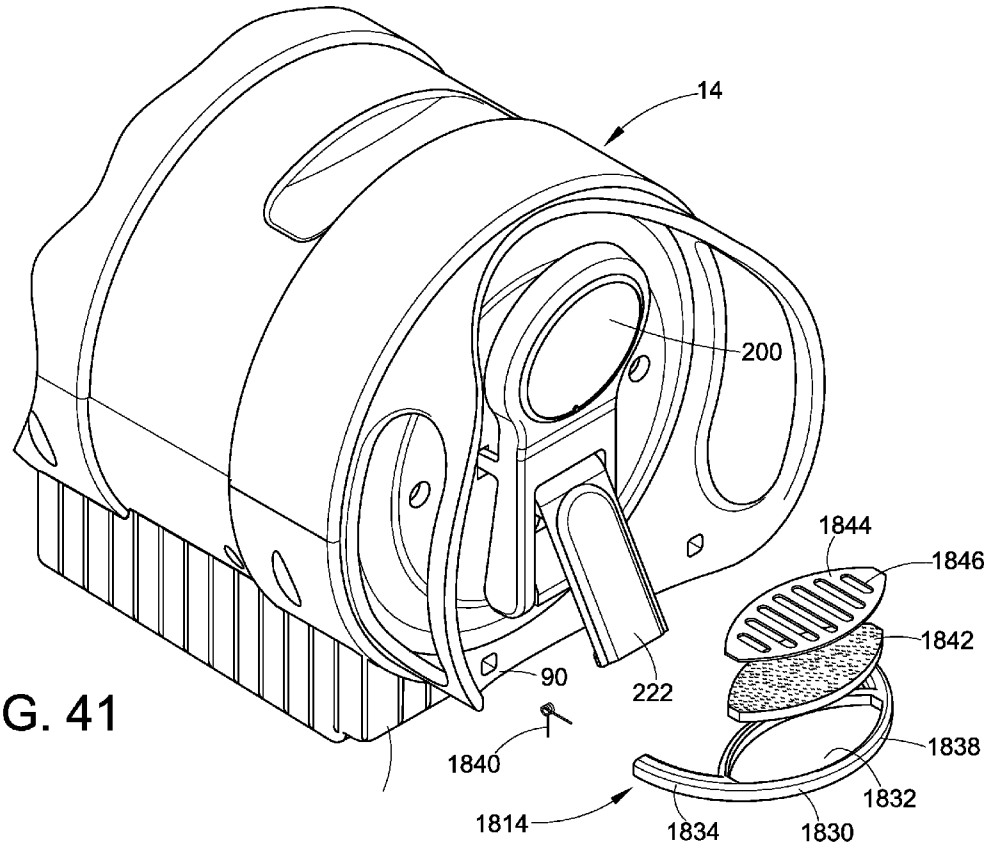

FIG. 41

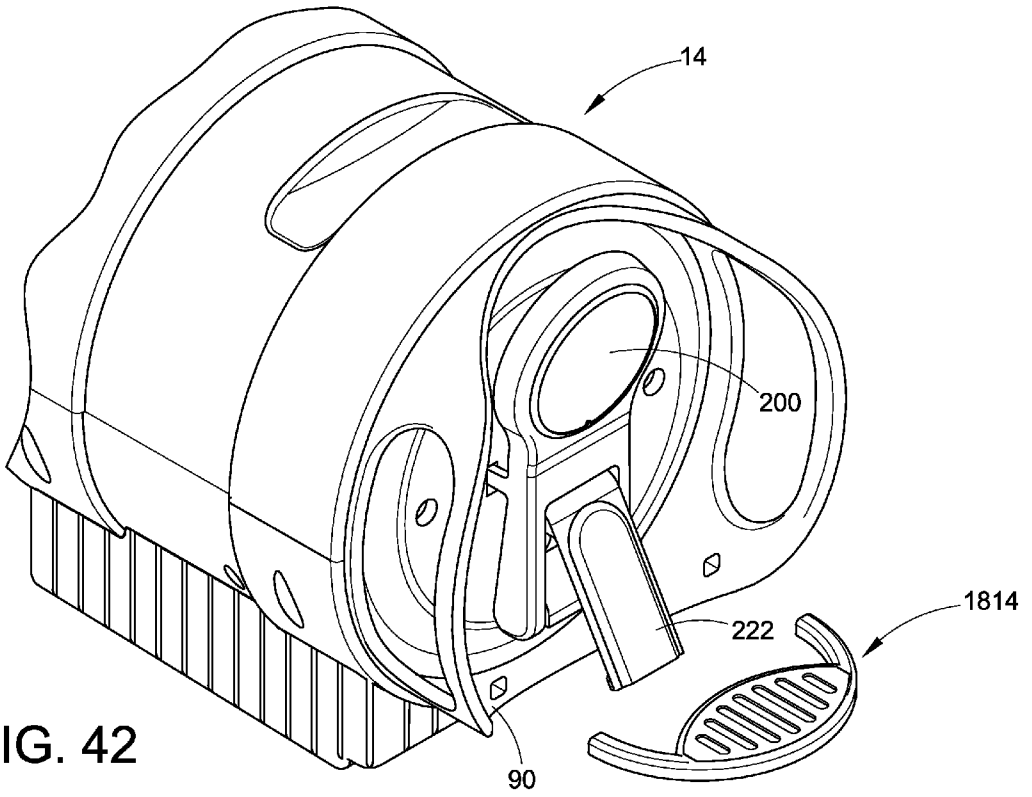

FIG. 42

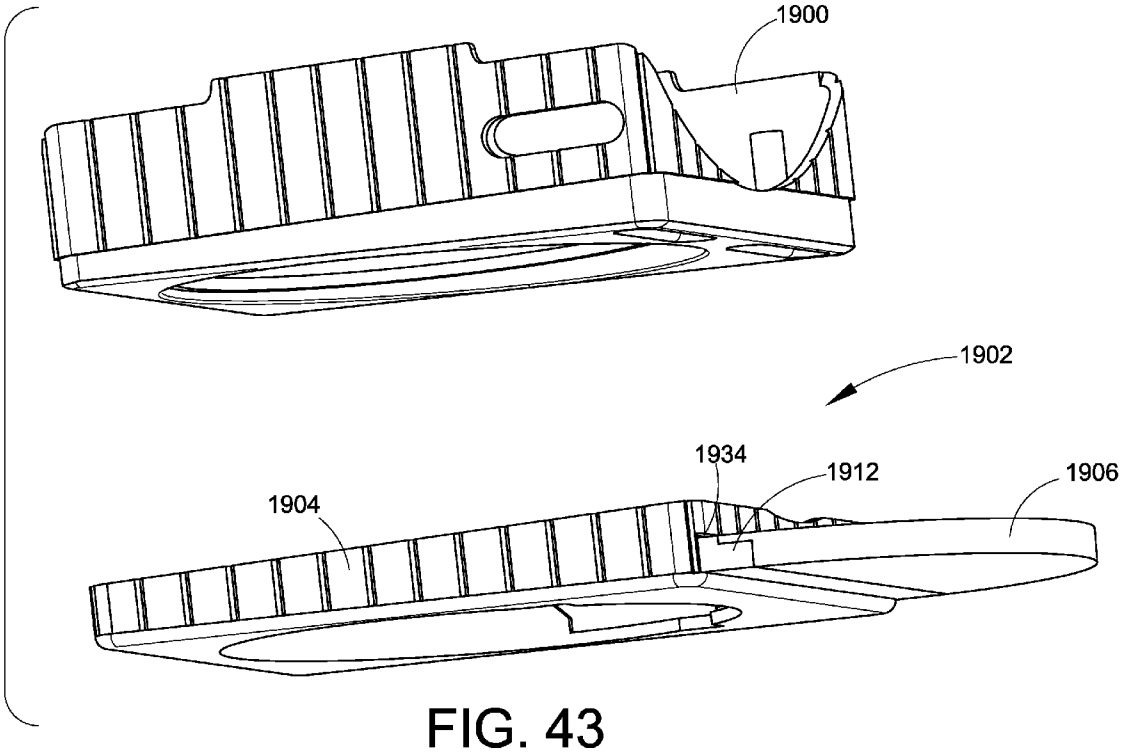

FIG. 43

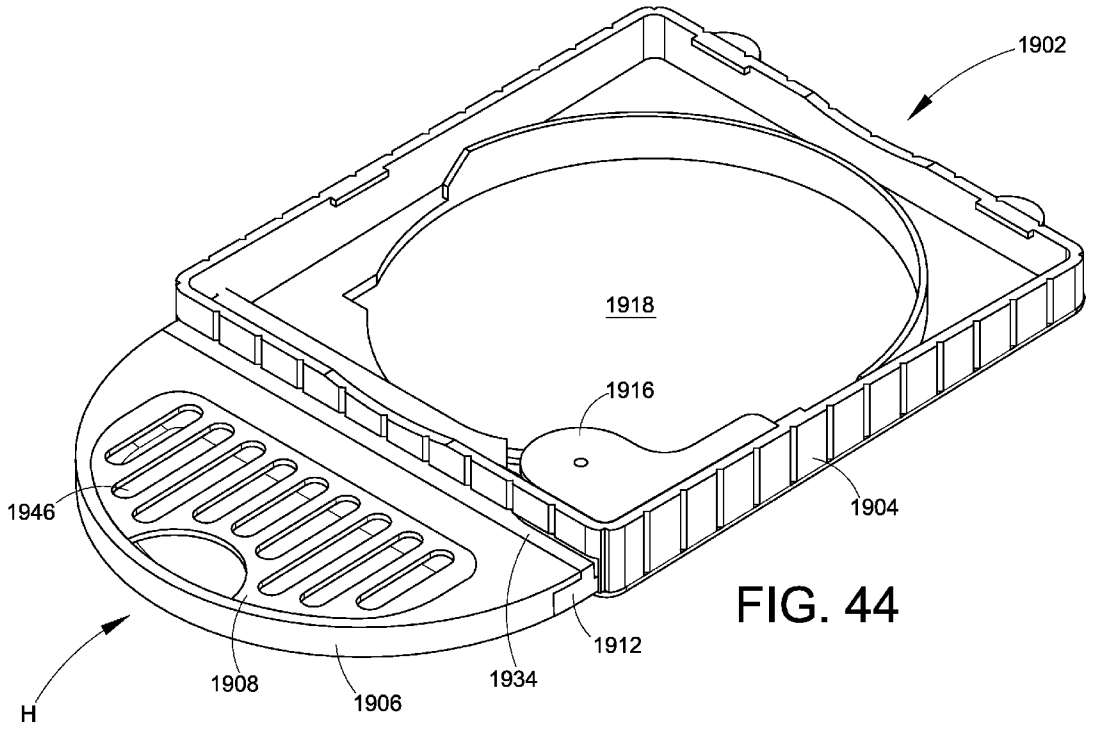

FIG. 44

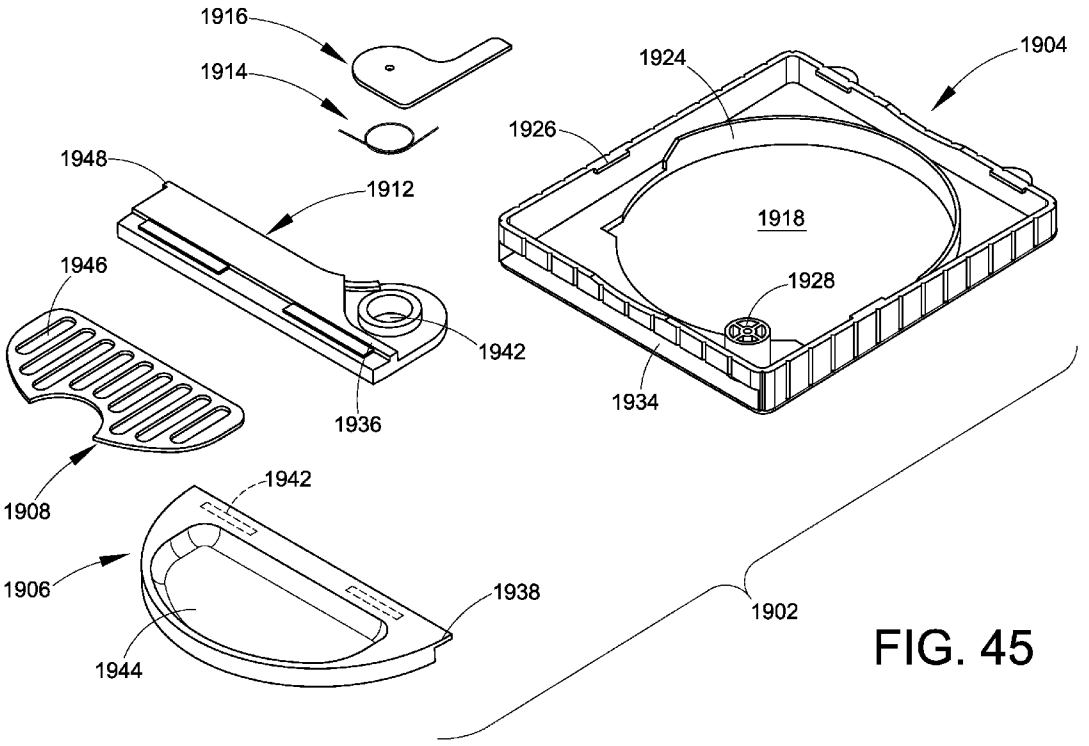
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FIG. 45

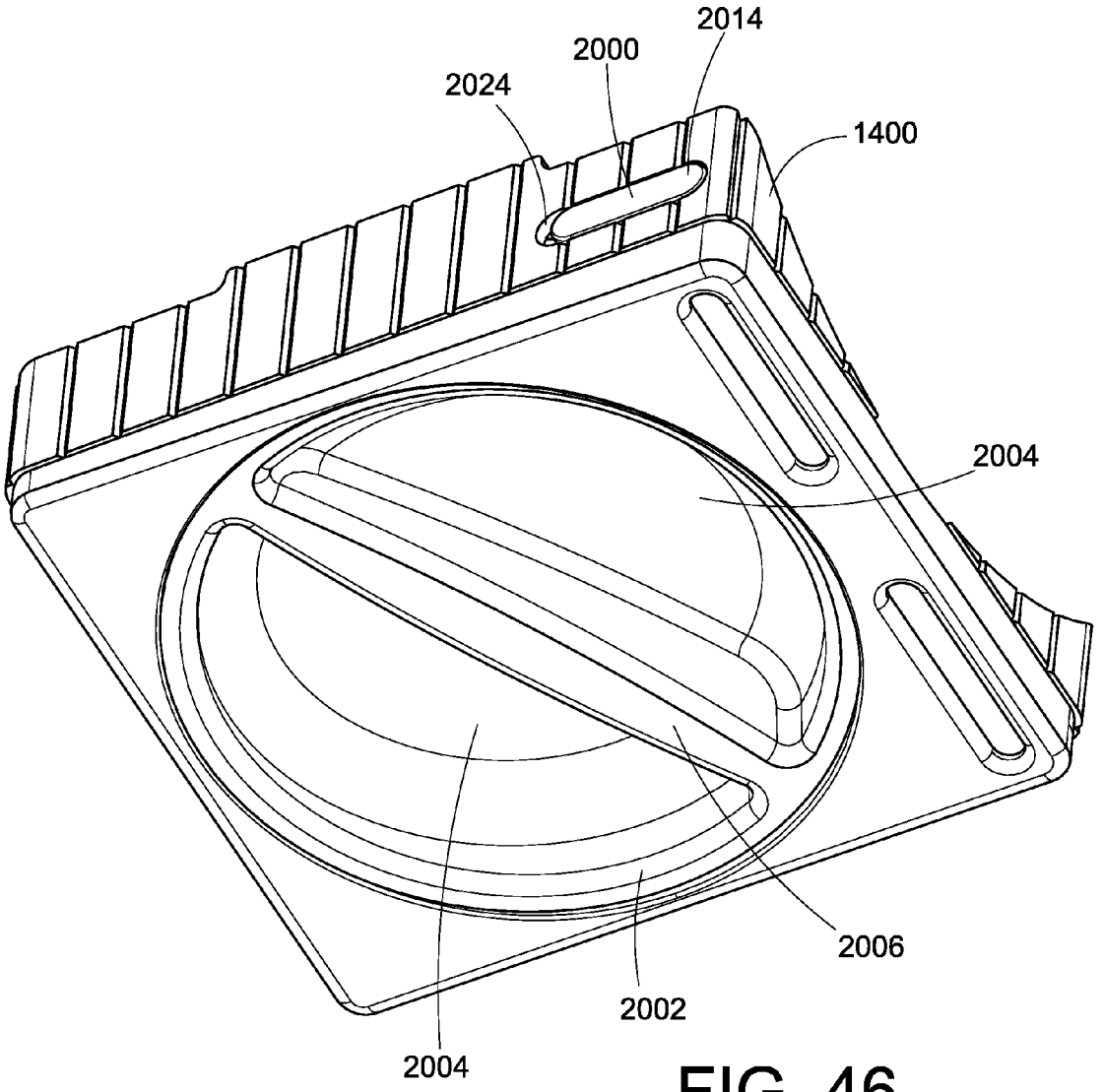

FIG. 46

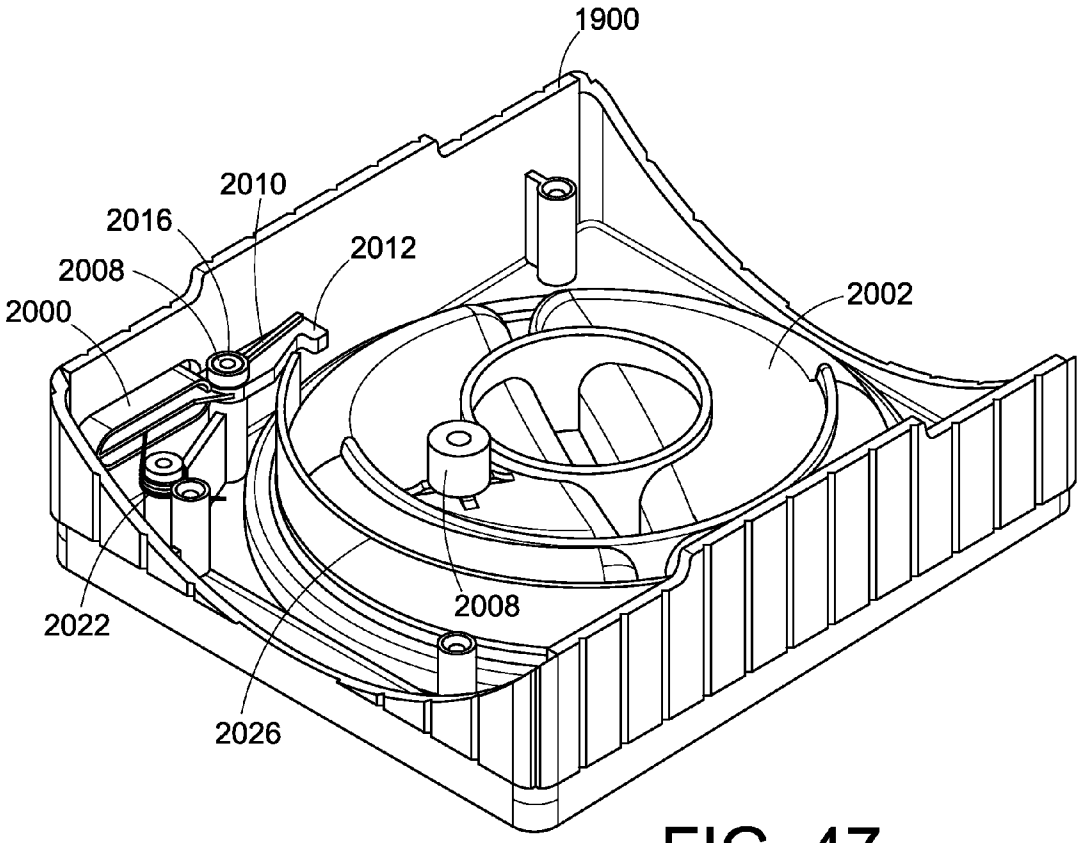

FIG. 47

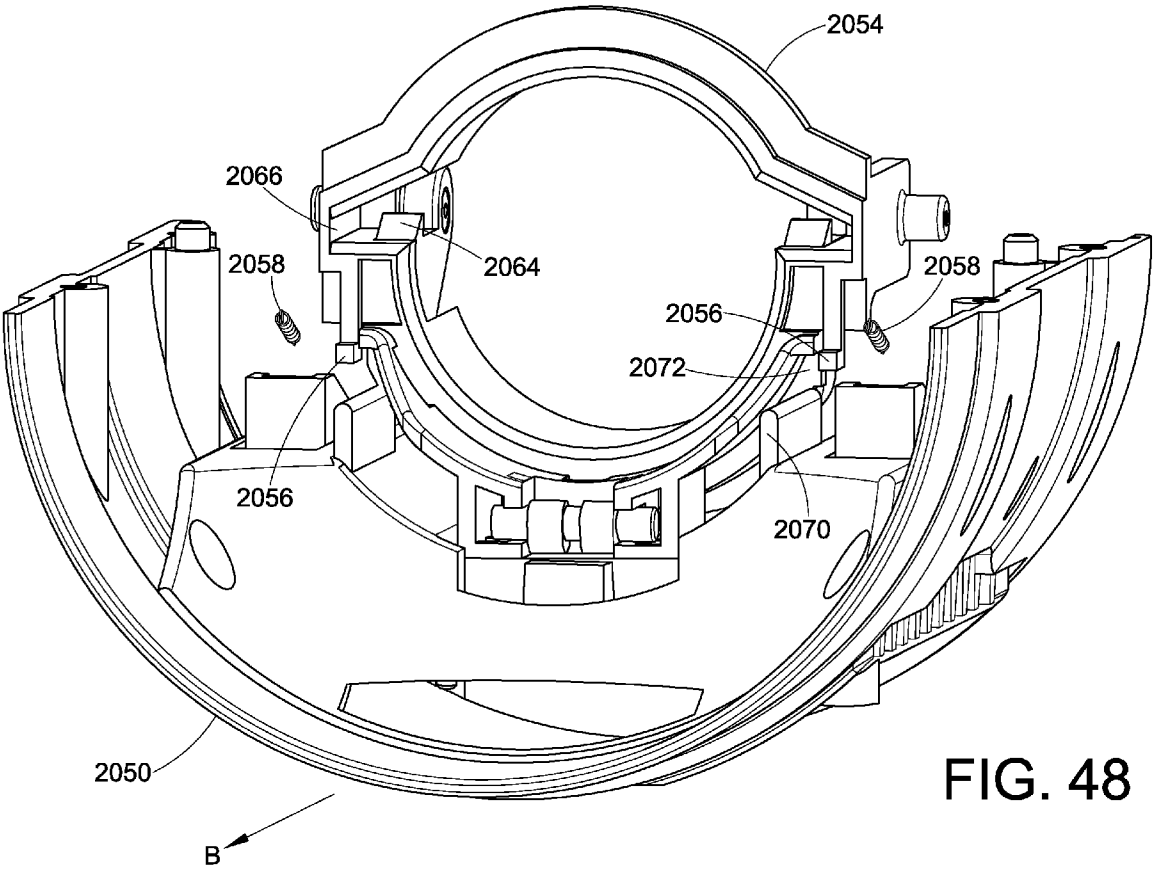

FIG. 48

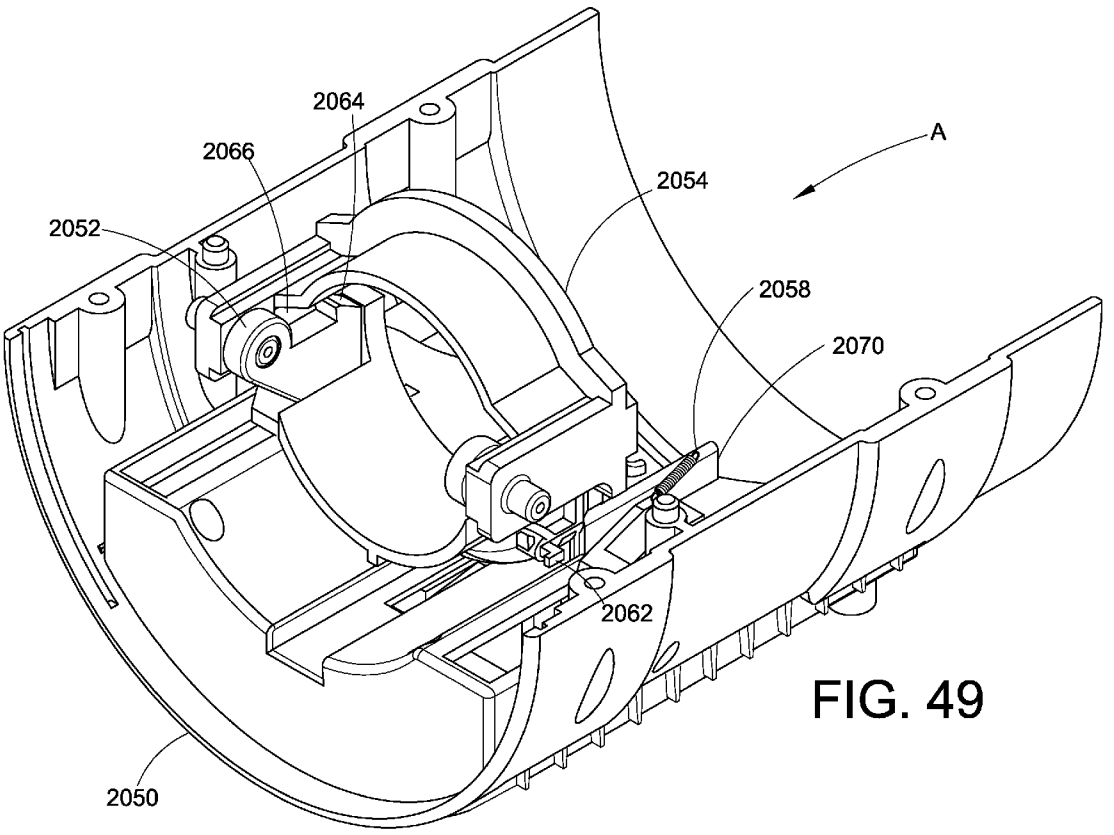

FIG. 49

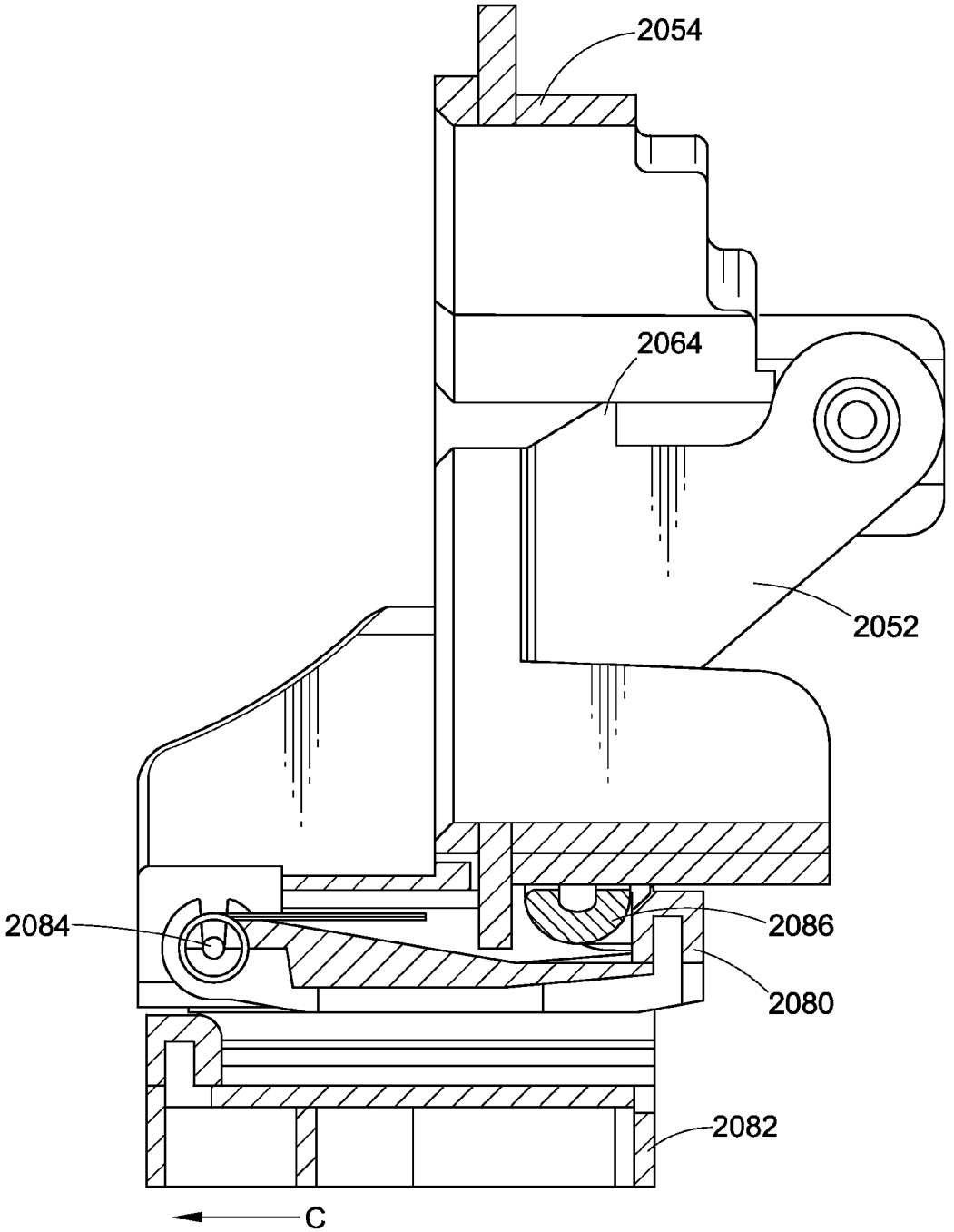

FIG. 50

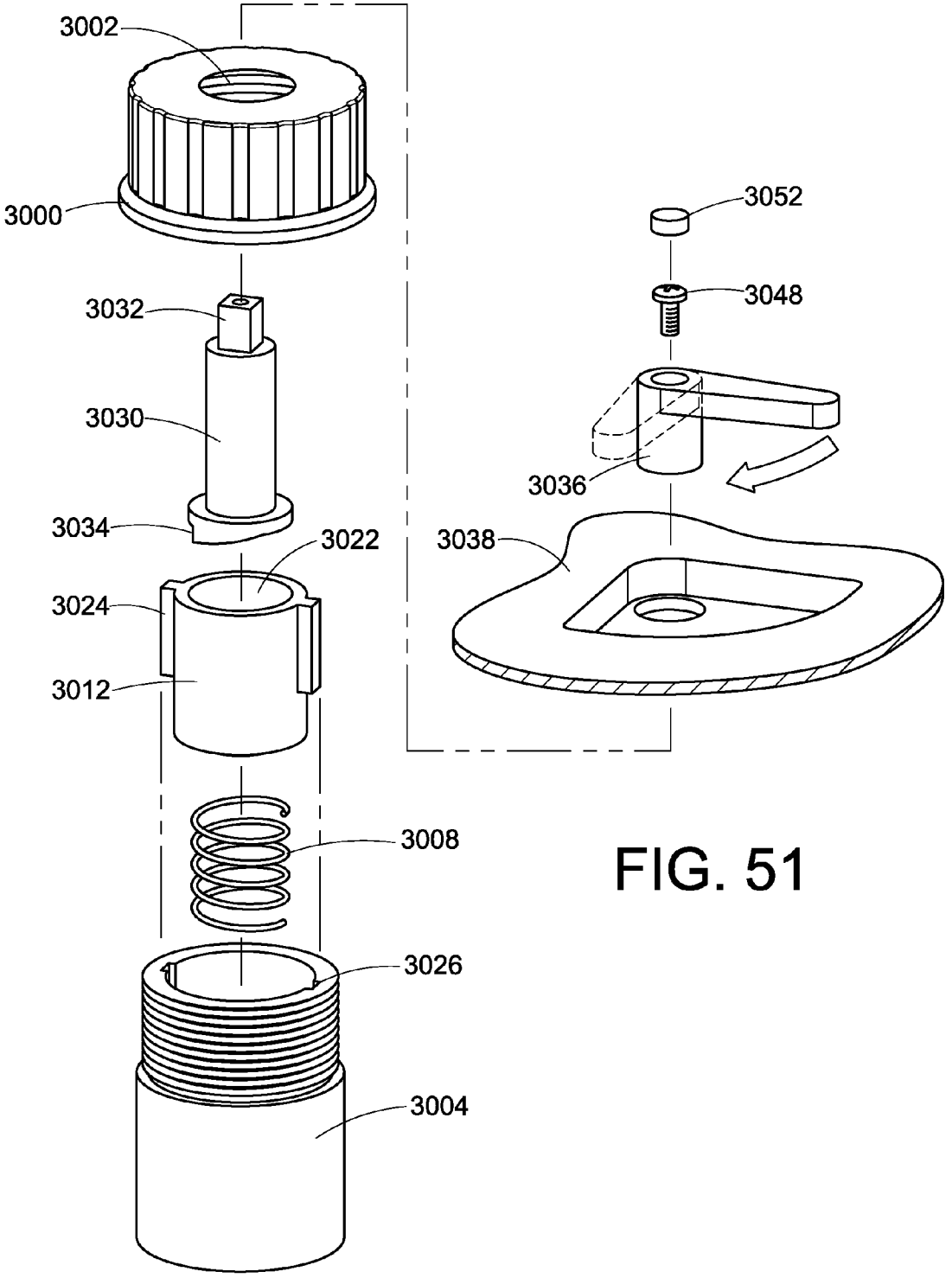
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FIG. 51

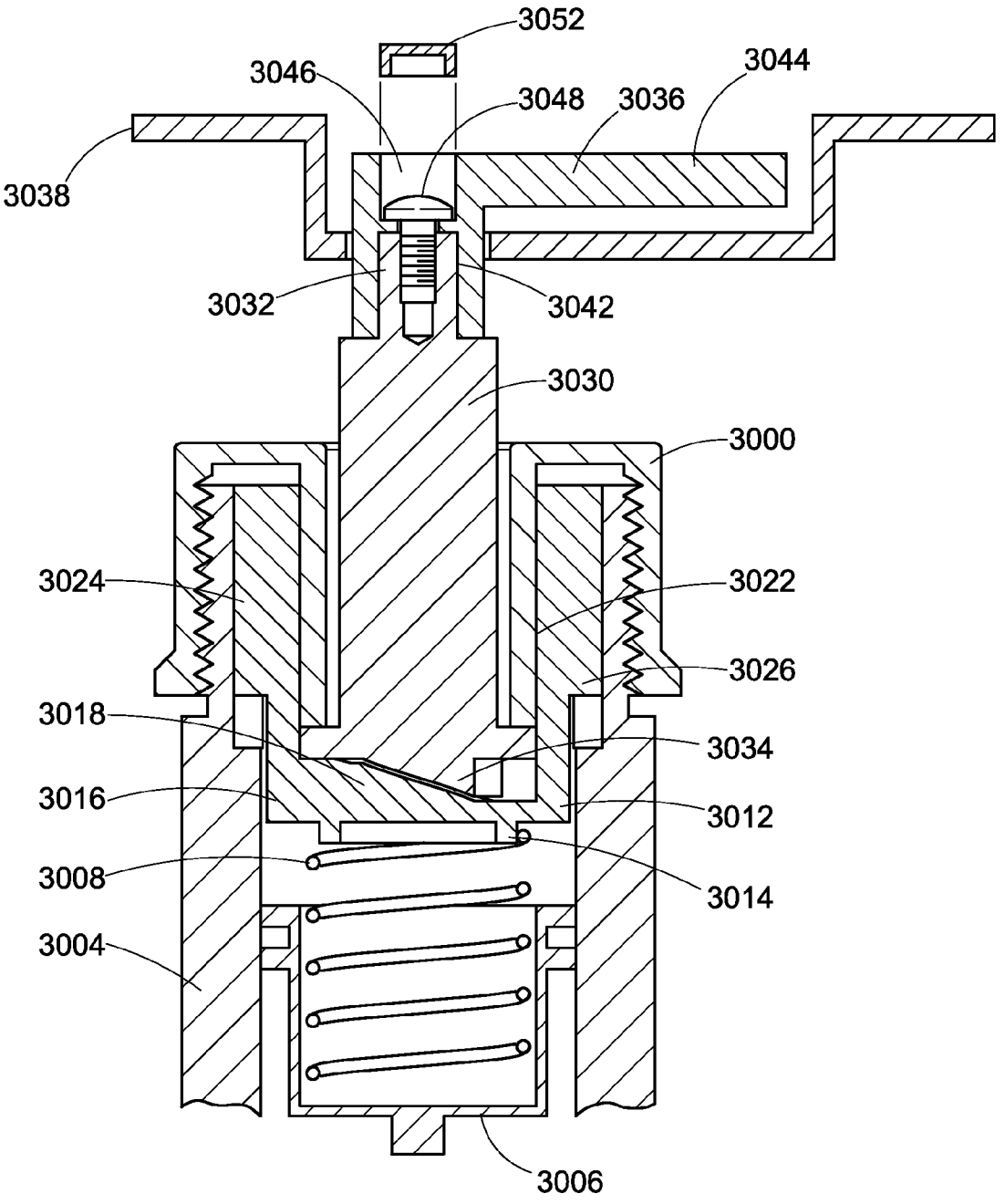
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FIG. 52

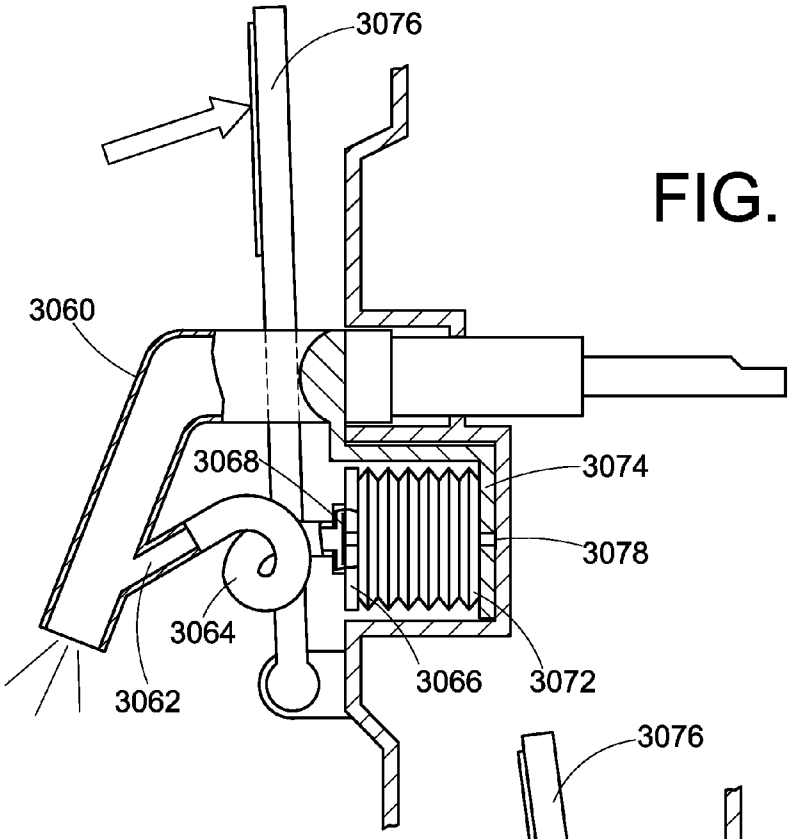
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FIG. 53

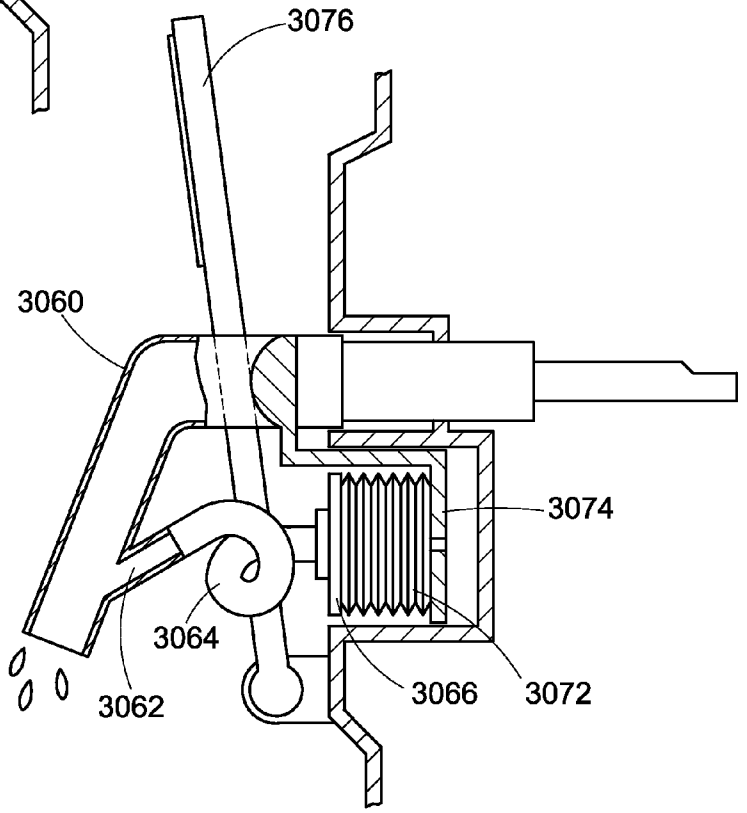
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FIG. 54

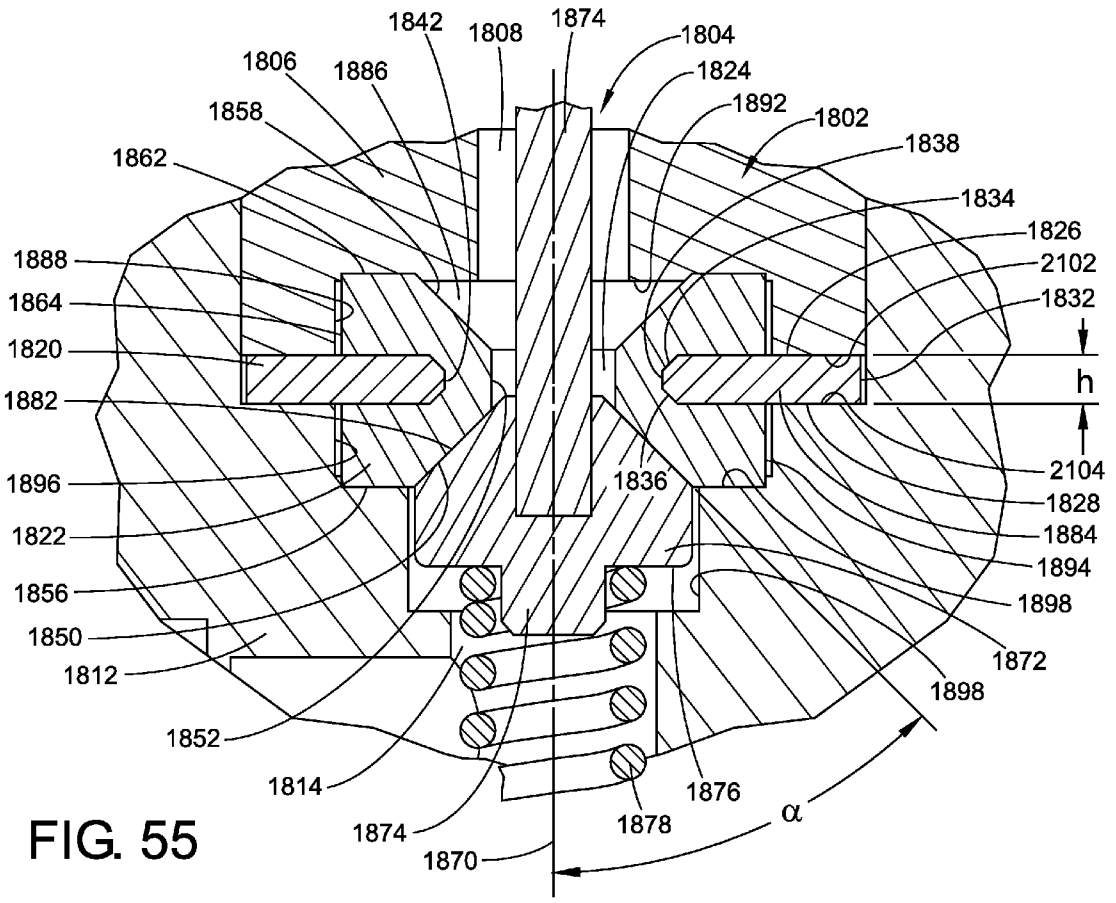
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FIG. 55

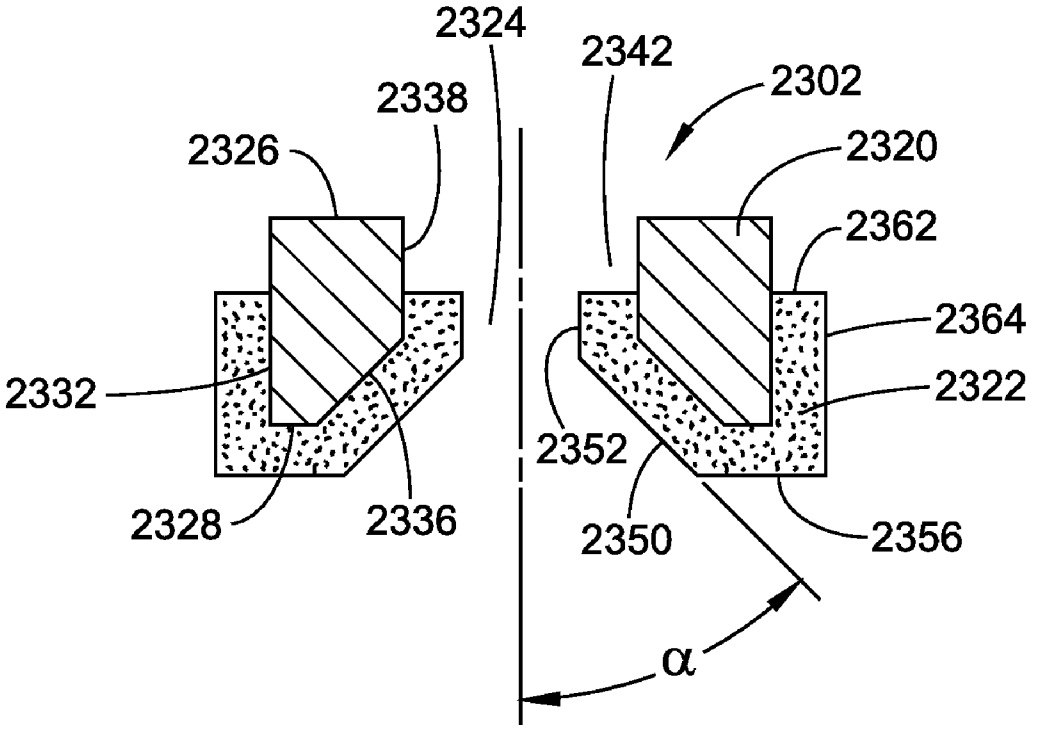
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FIG. 56

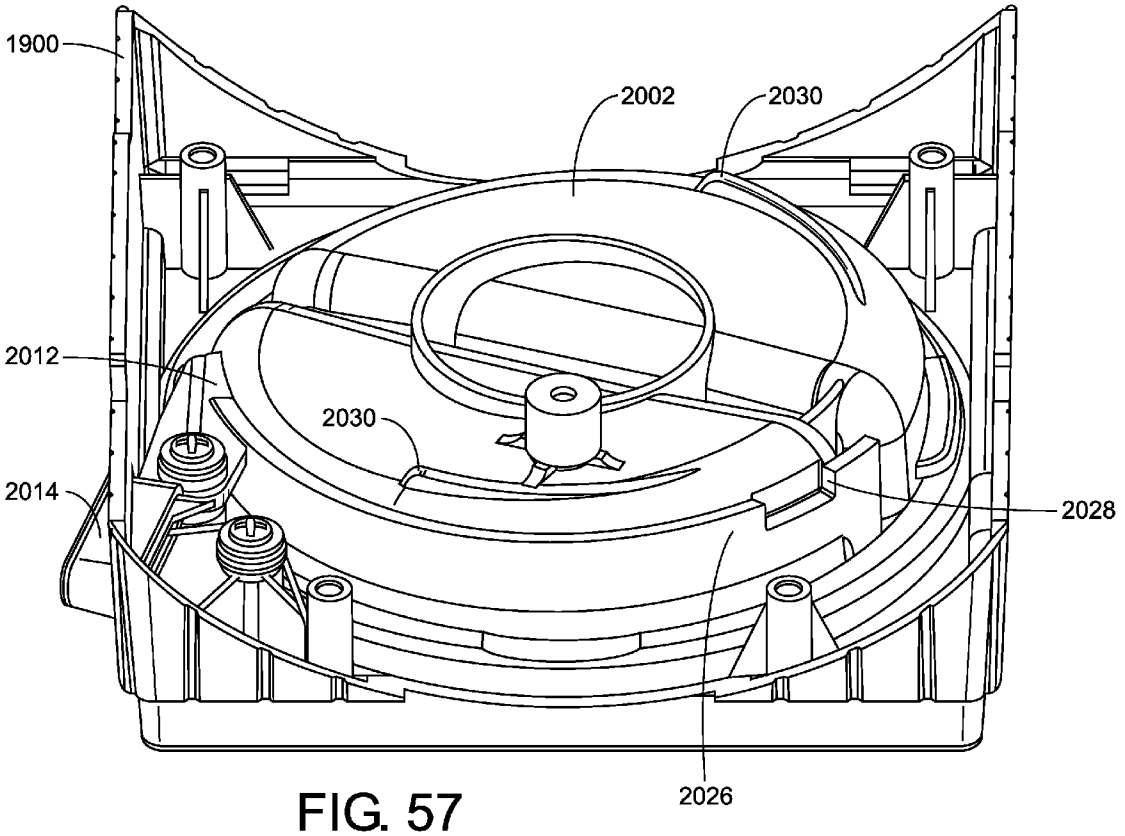

FIG. 57

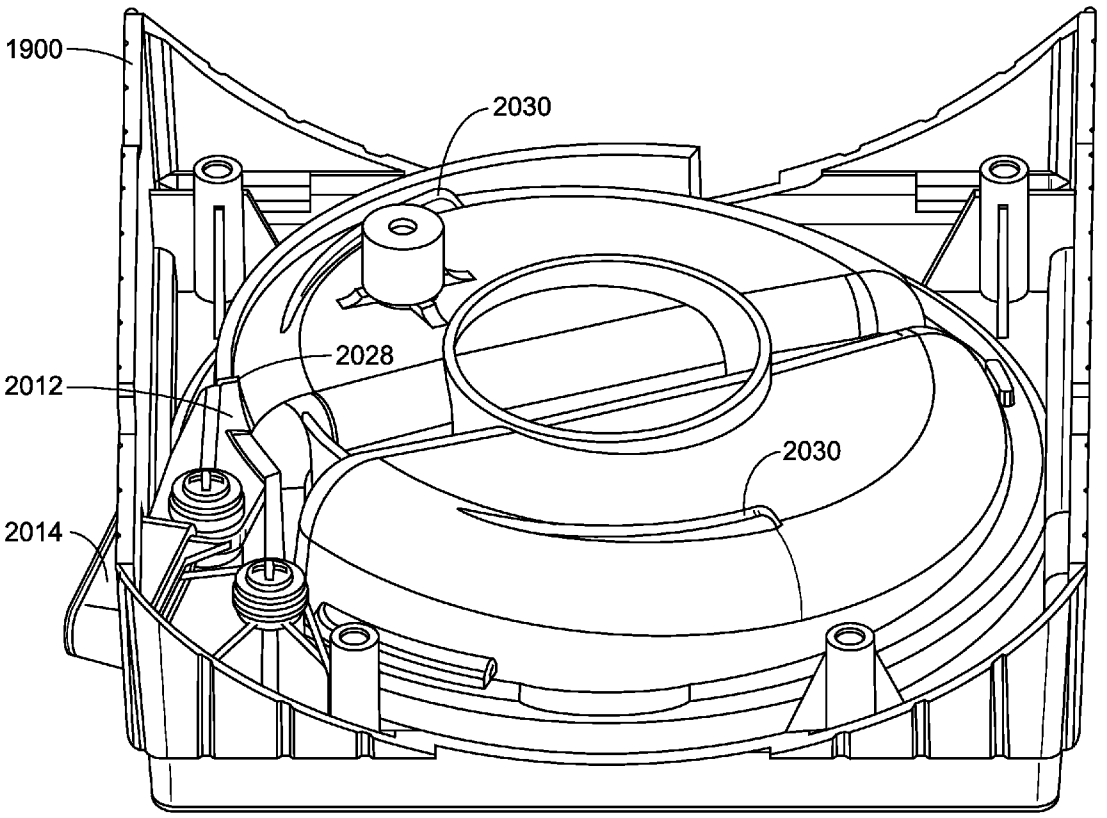

FIG. 58

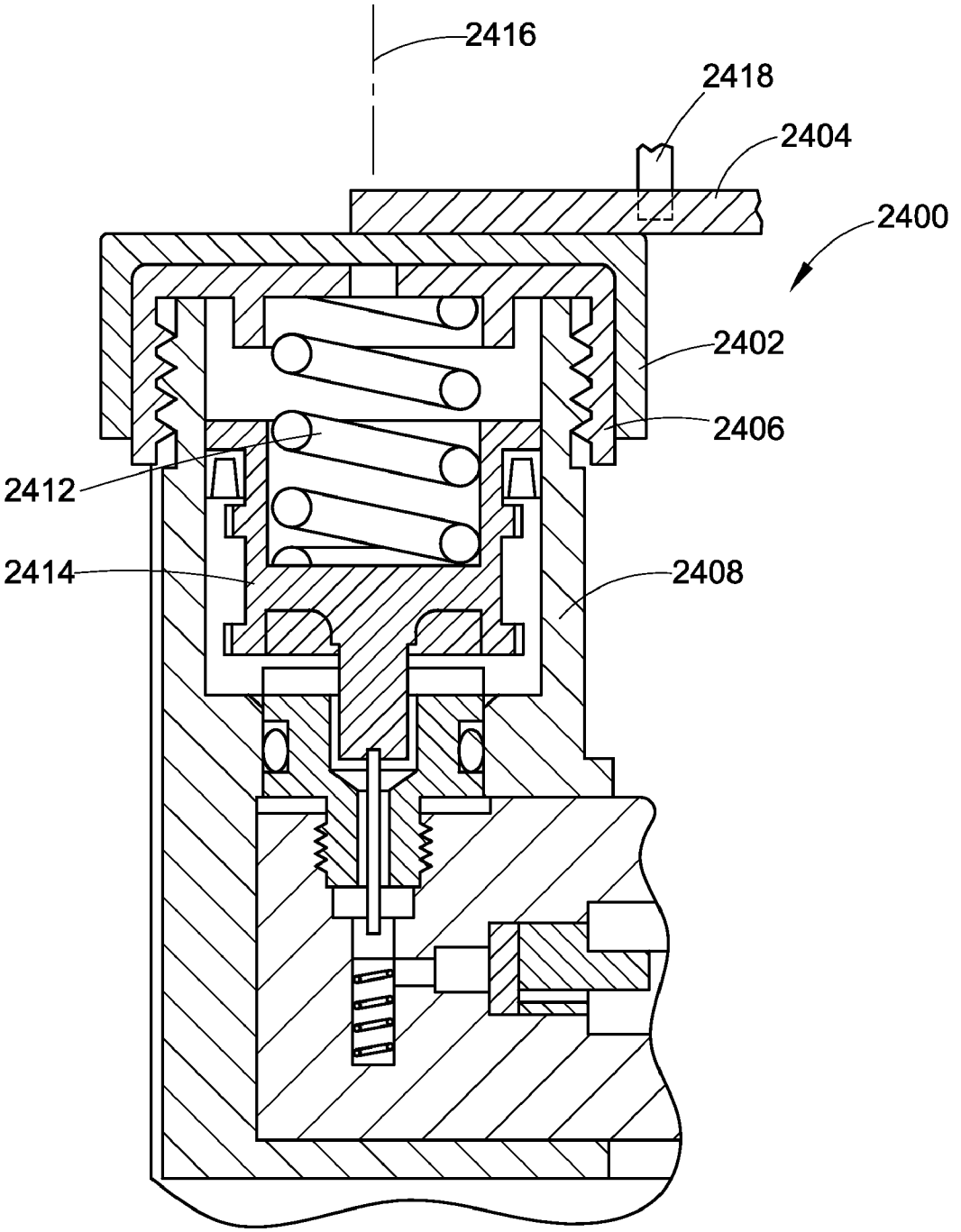

FIG. 59

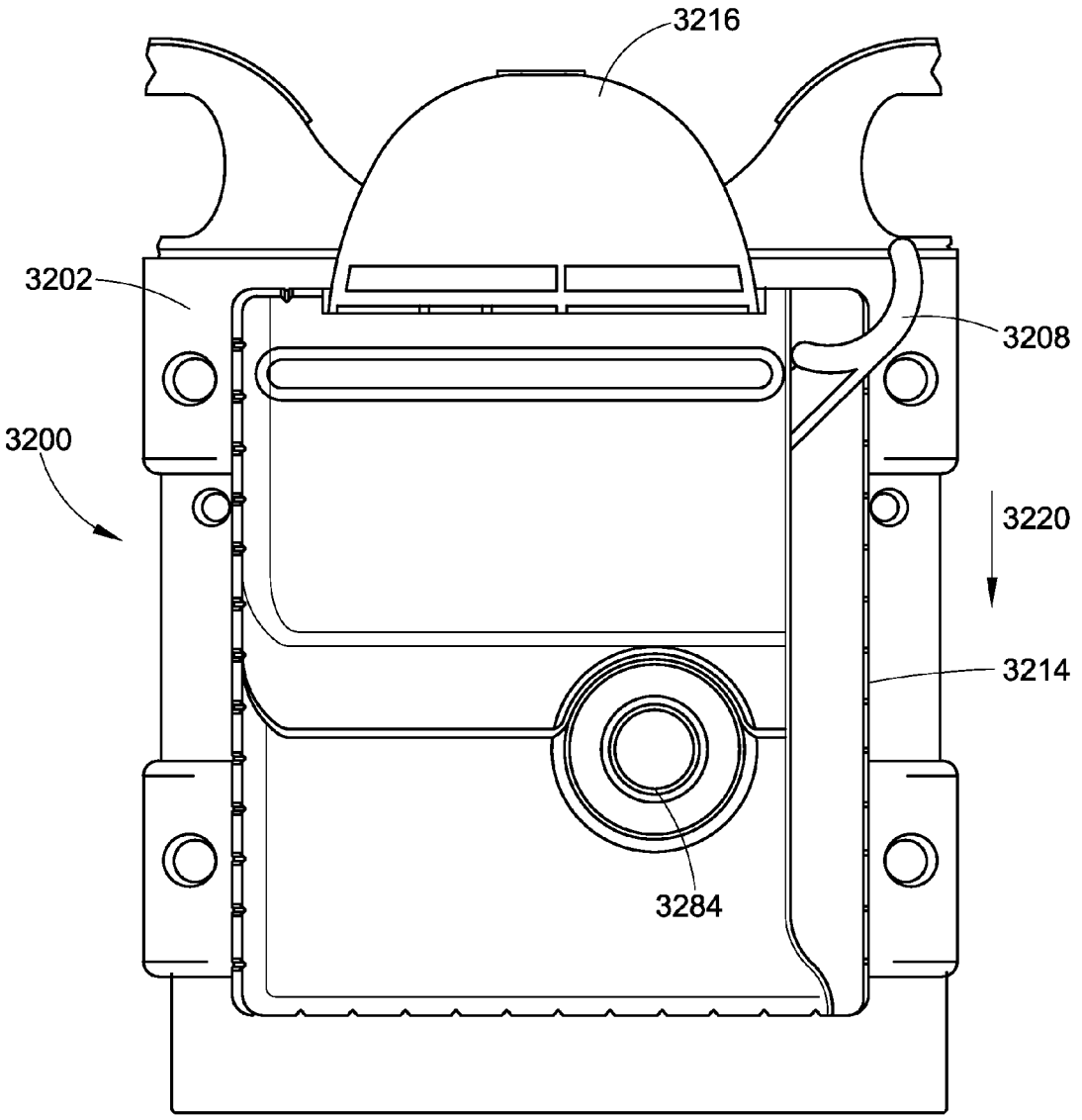

FIG. 60

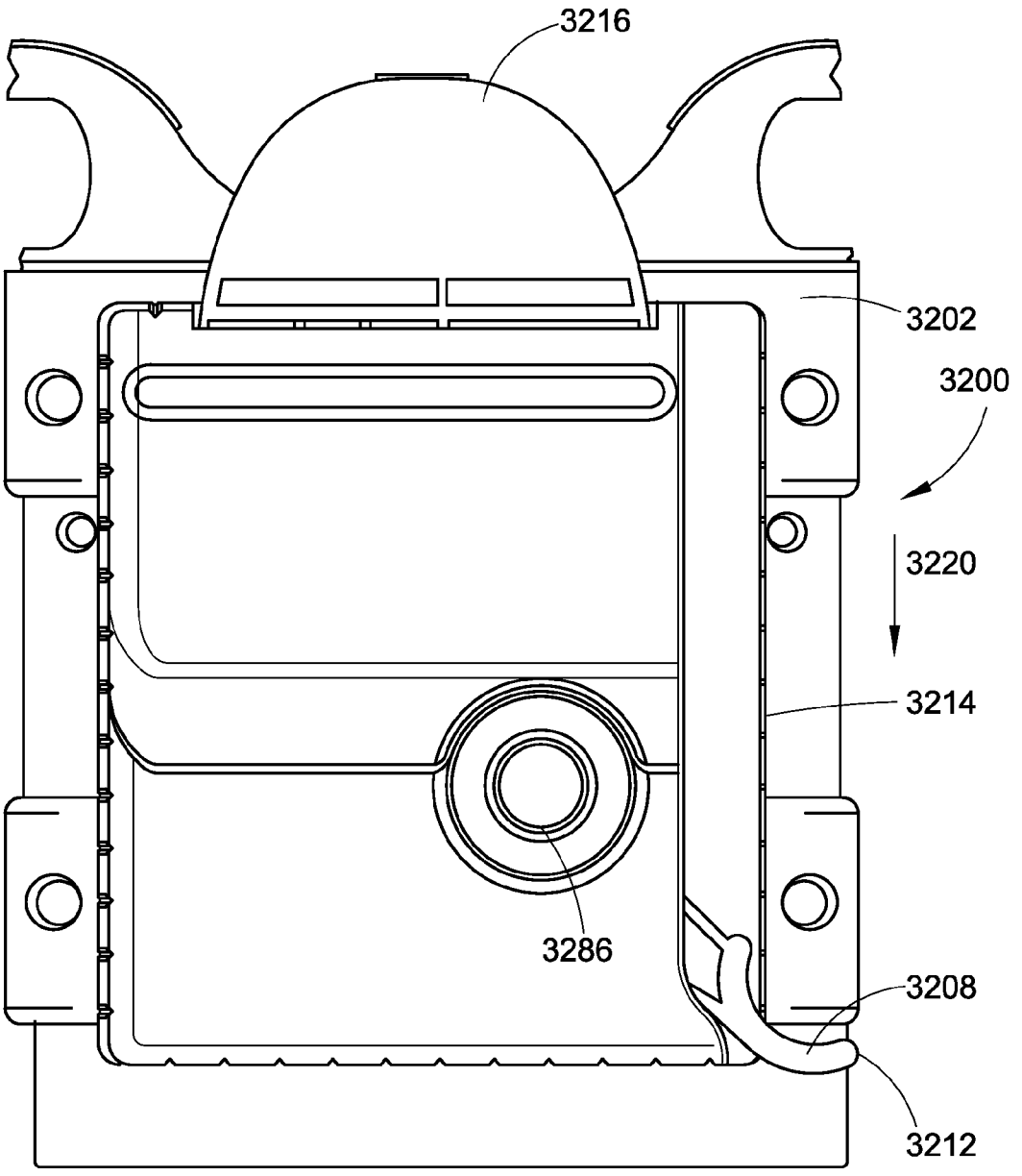

FIG. 61

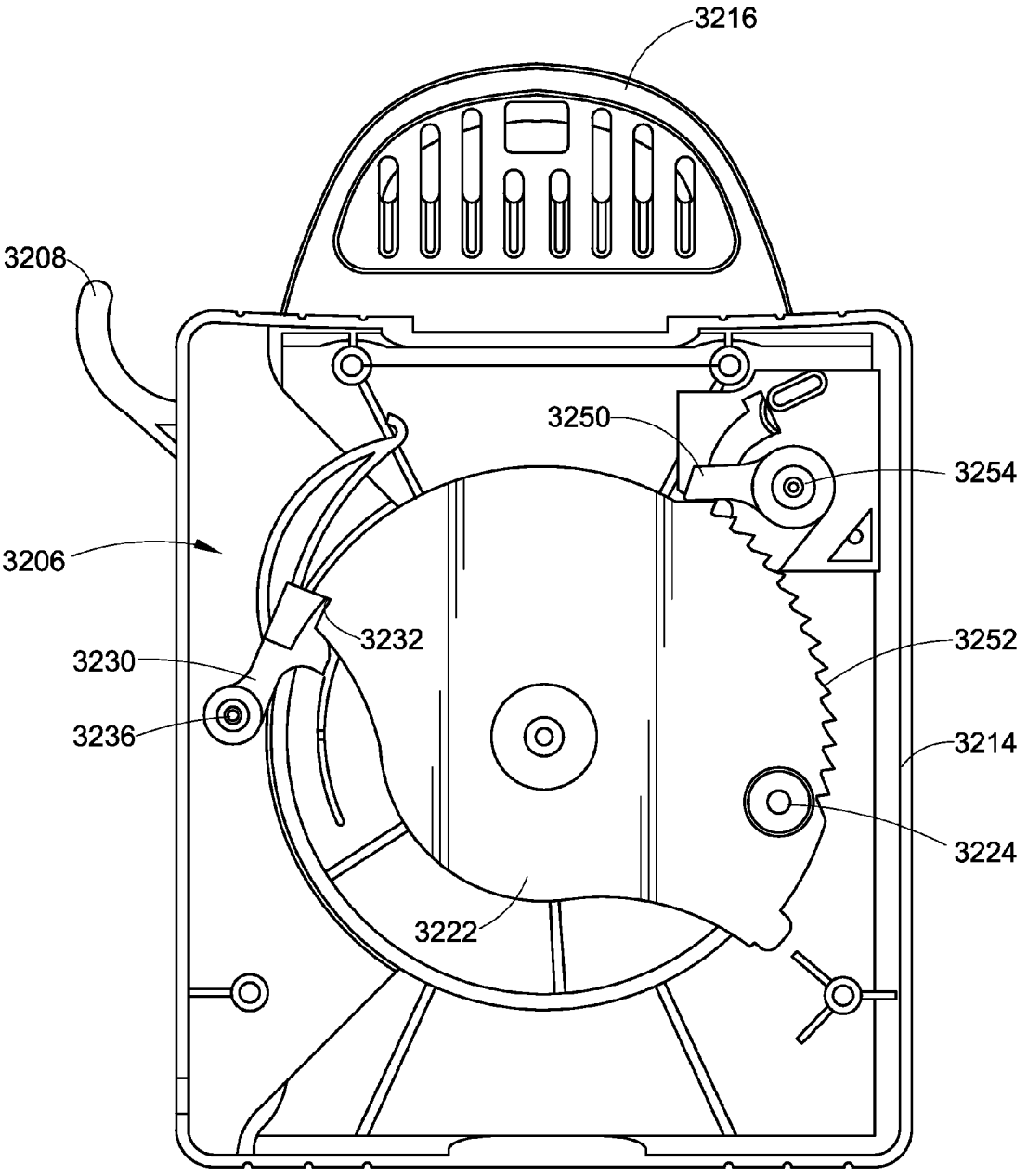

FIG. 62

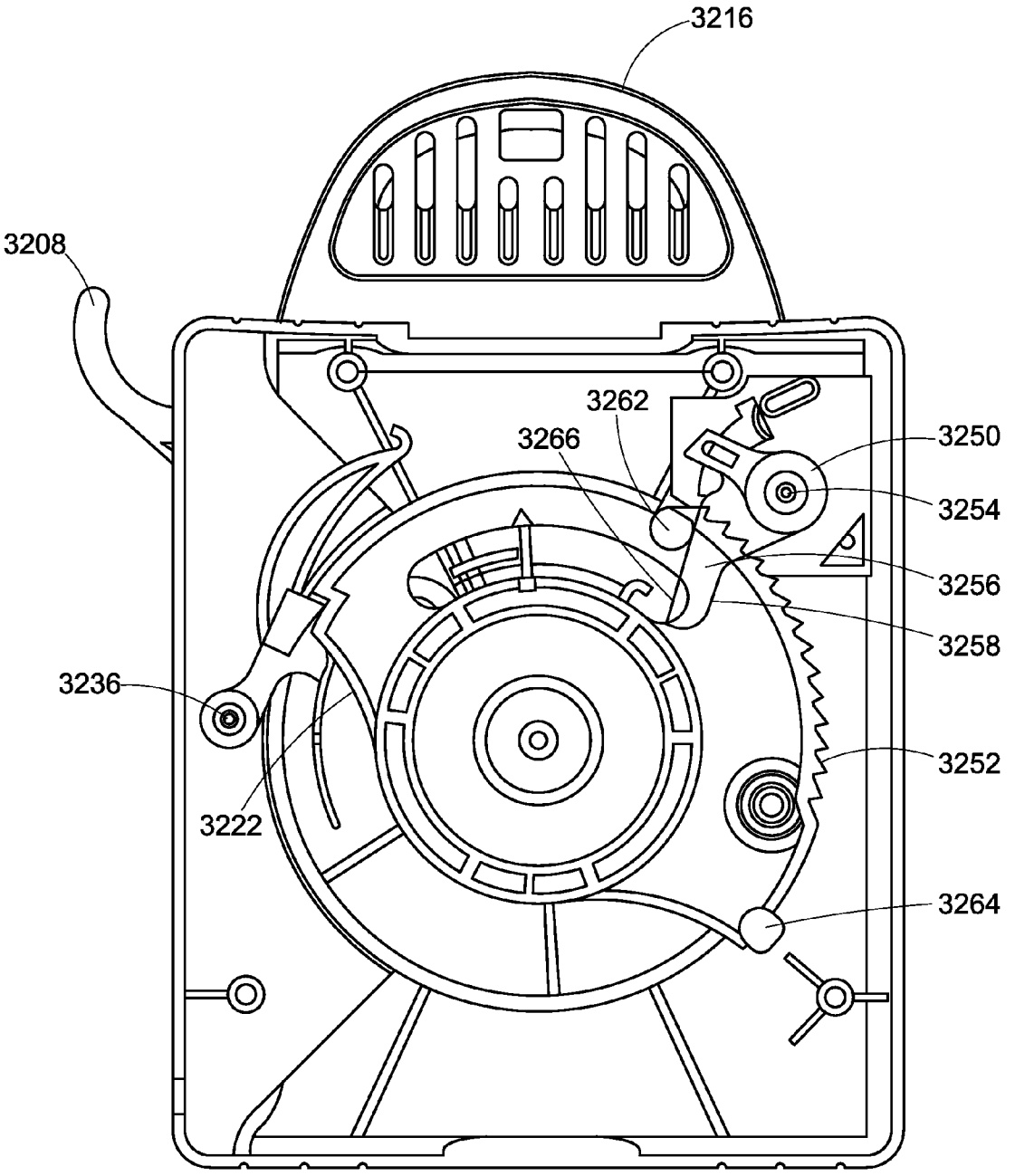

FIG. 63

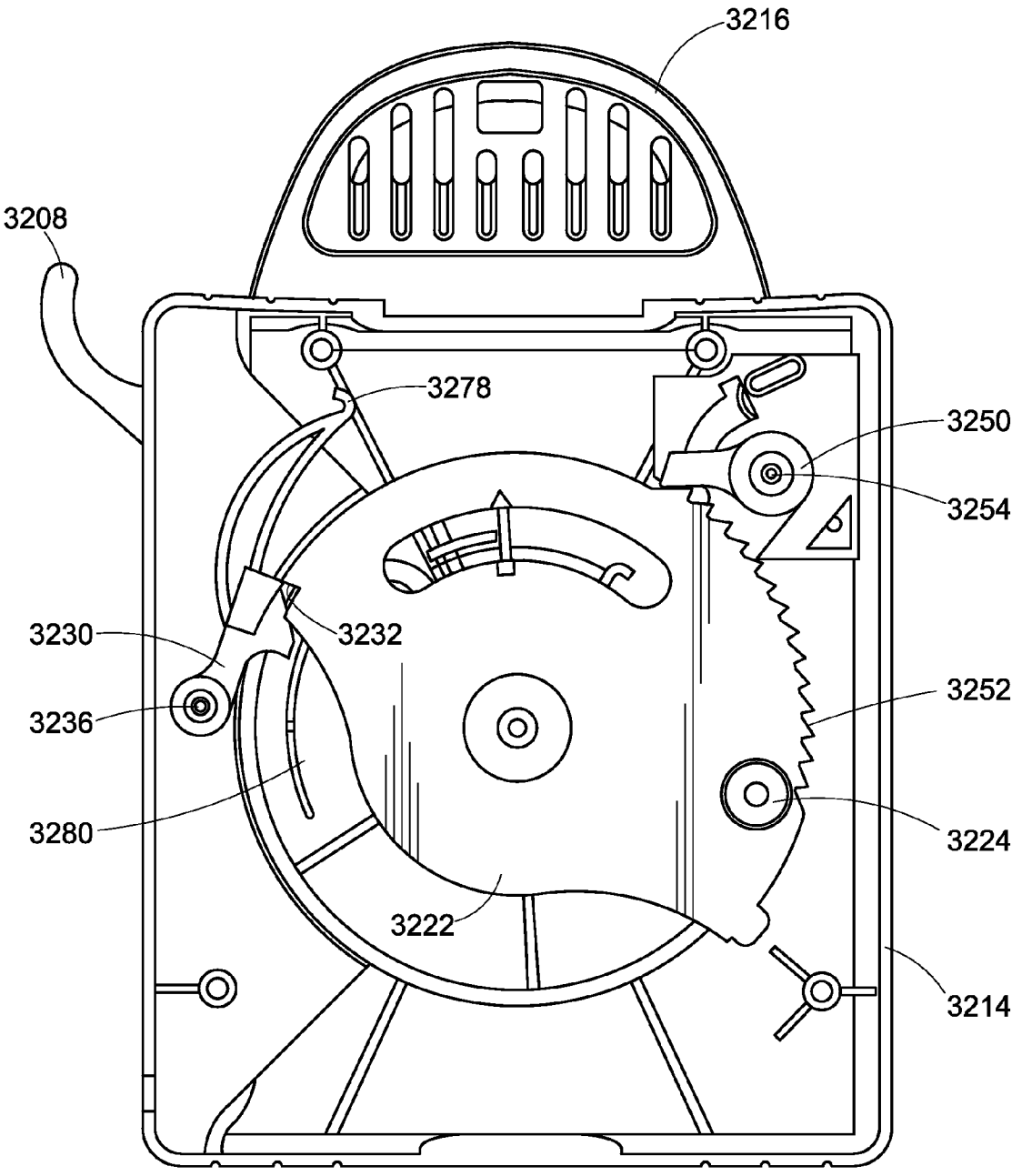
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FIG. 64

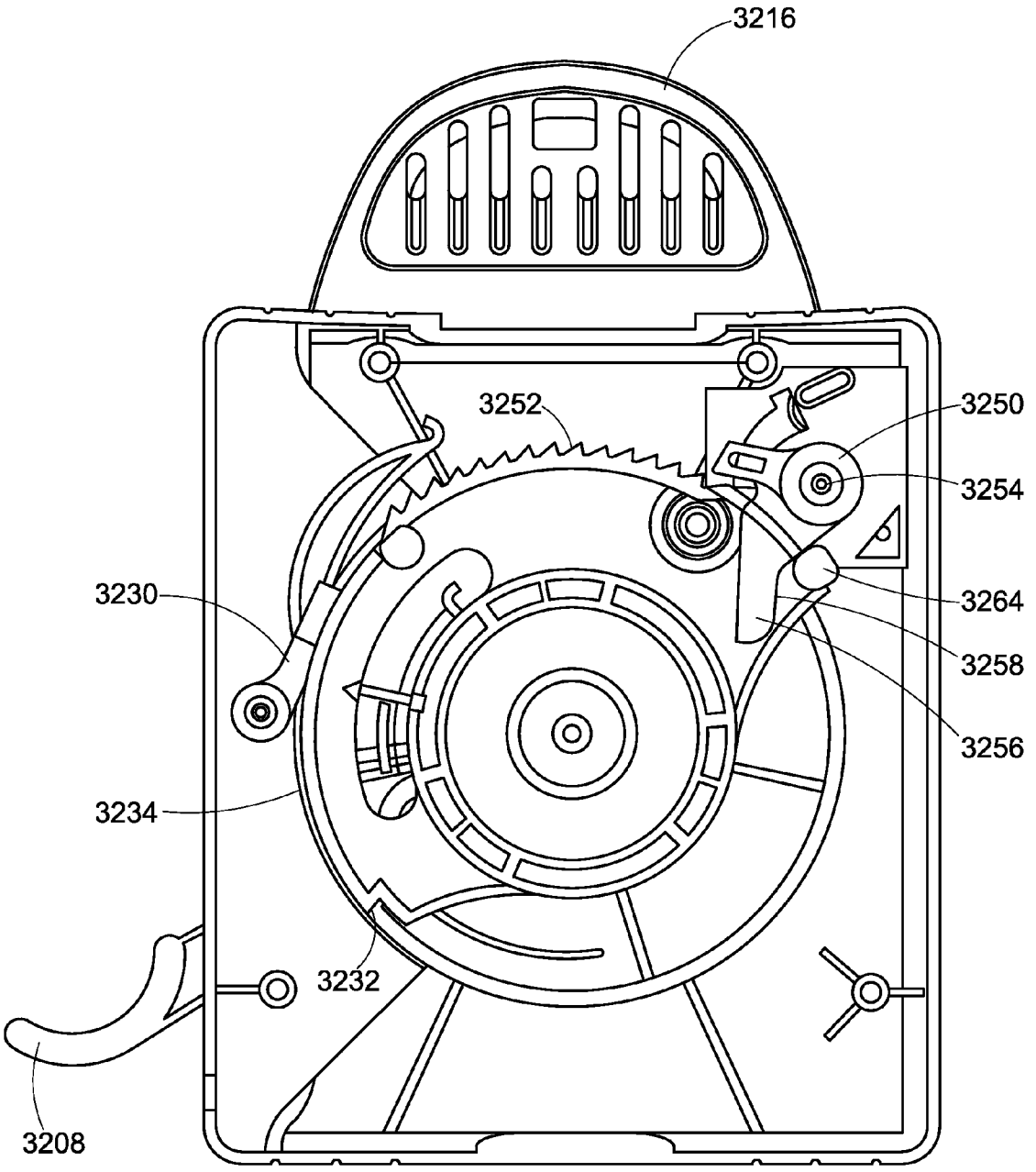

FIG. 65

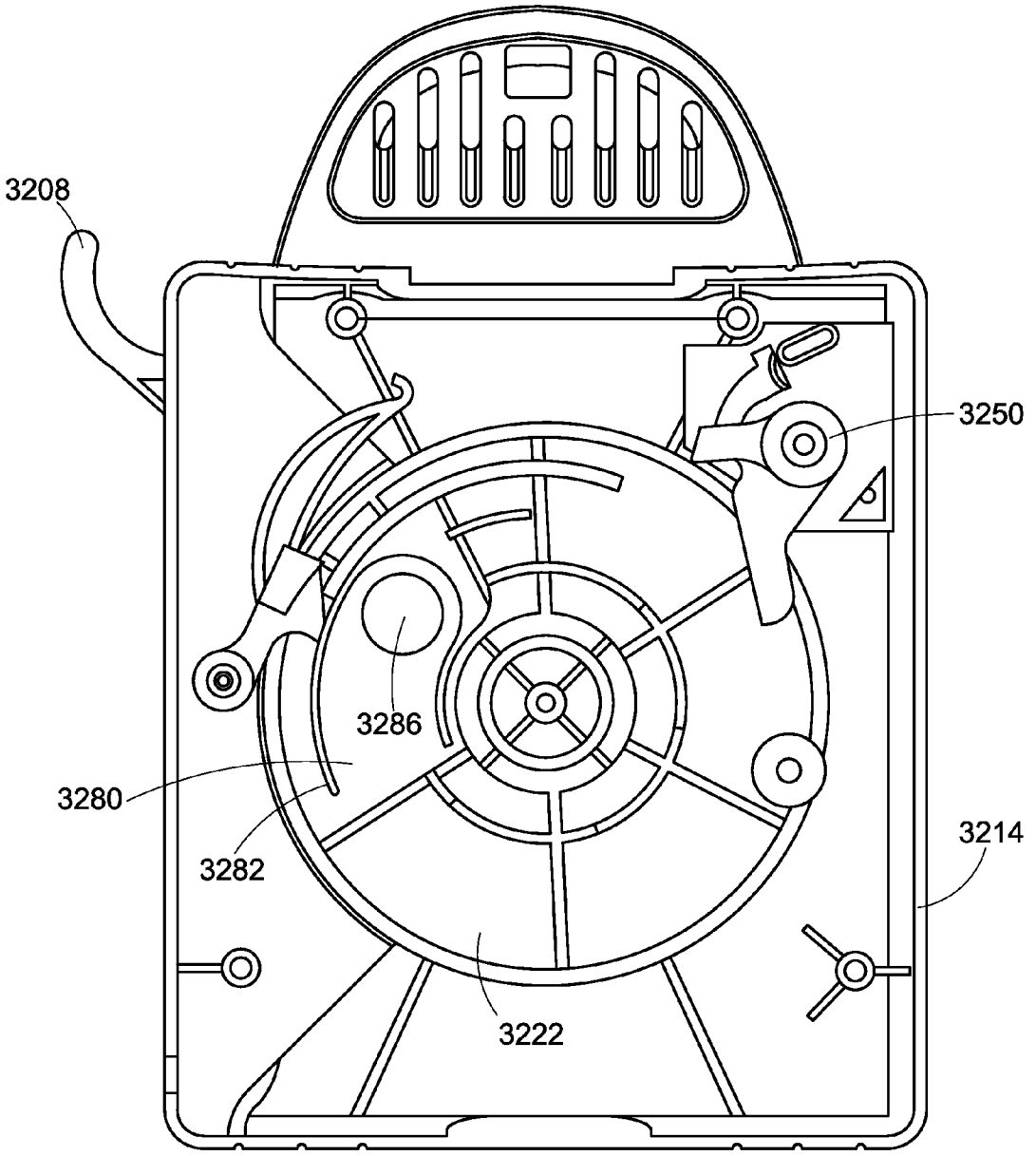

FIG. 66

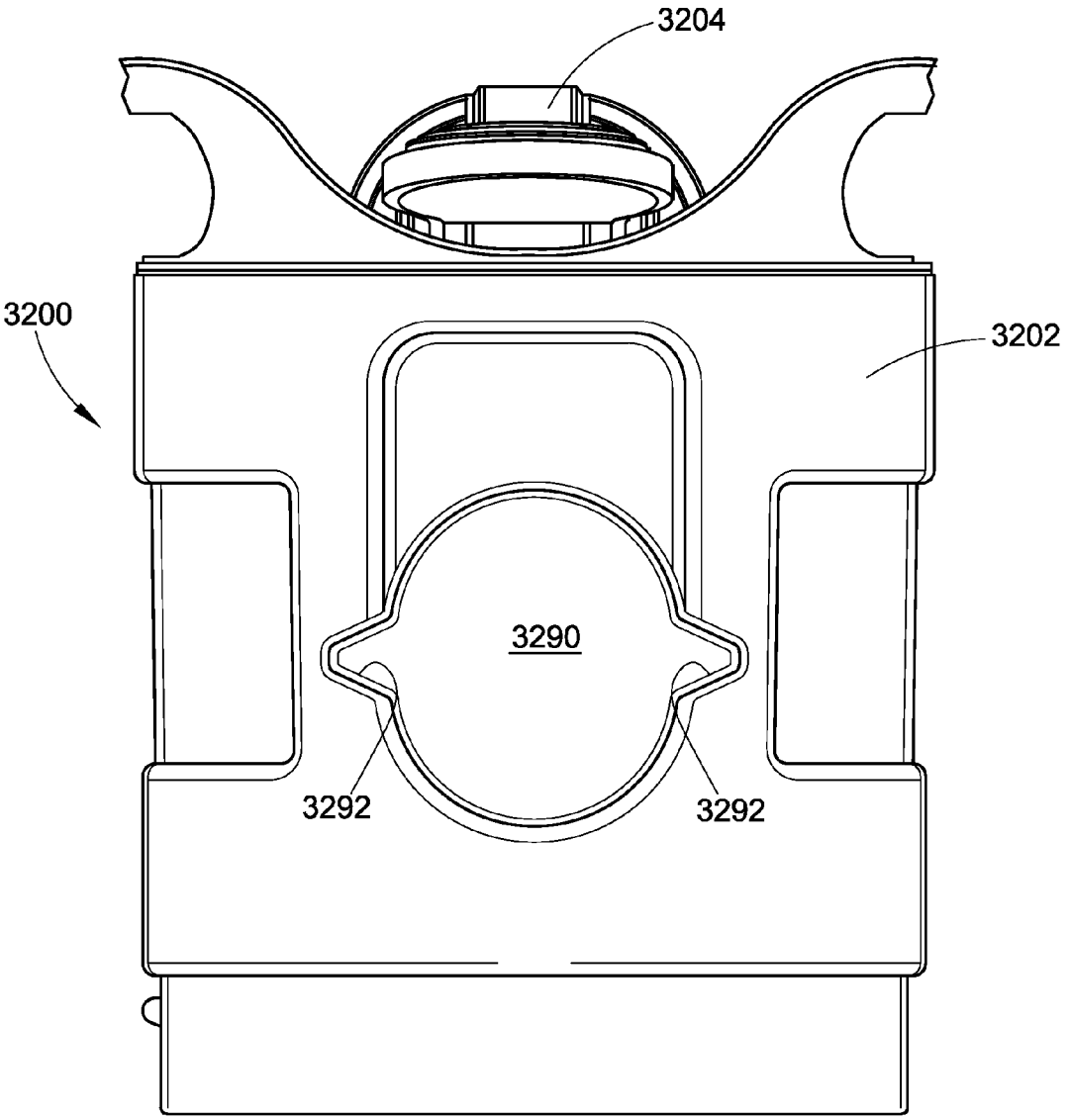

FIG. 67

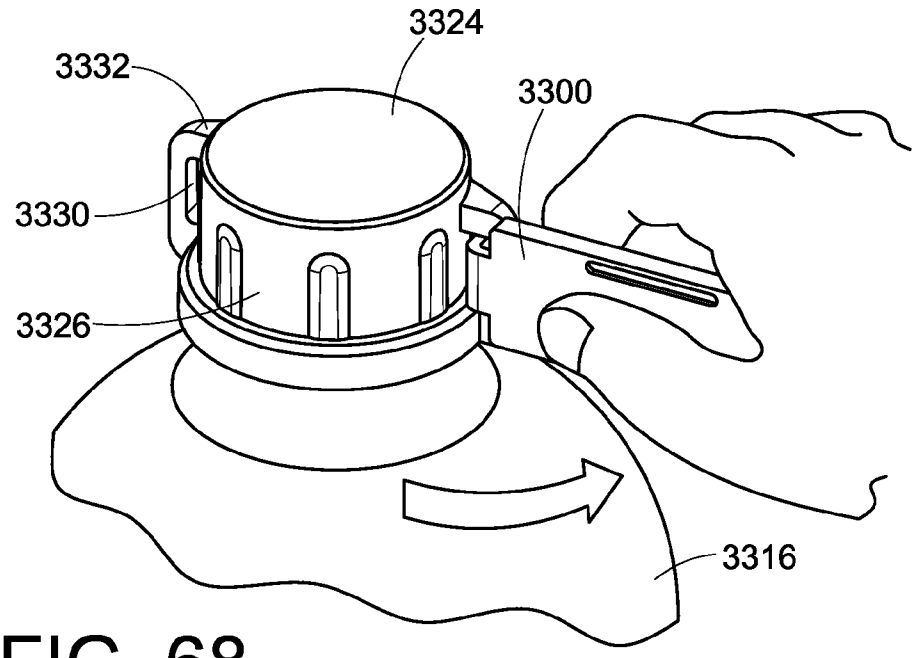
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FIG. 68

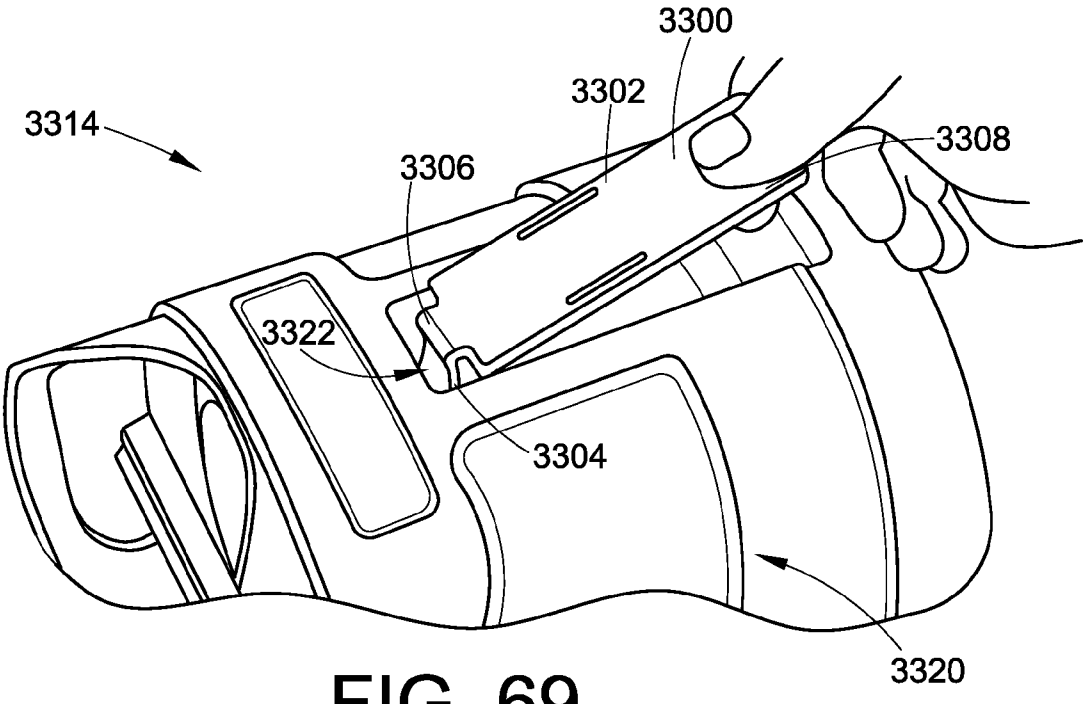
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FIG. 69

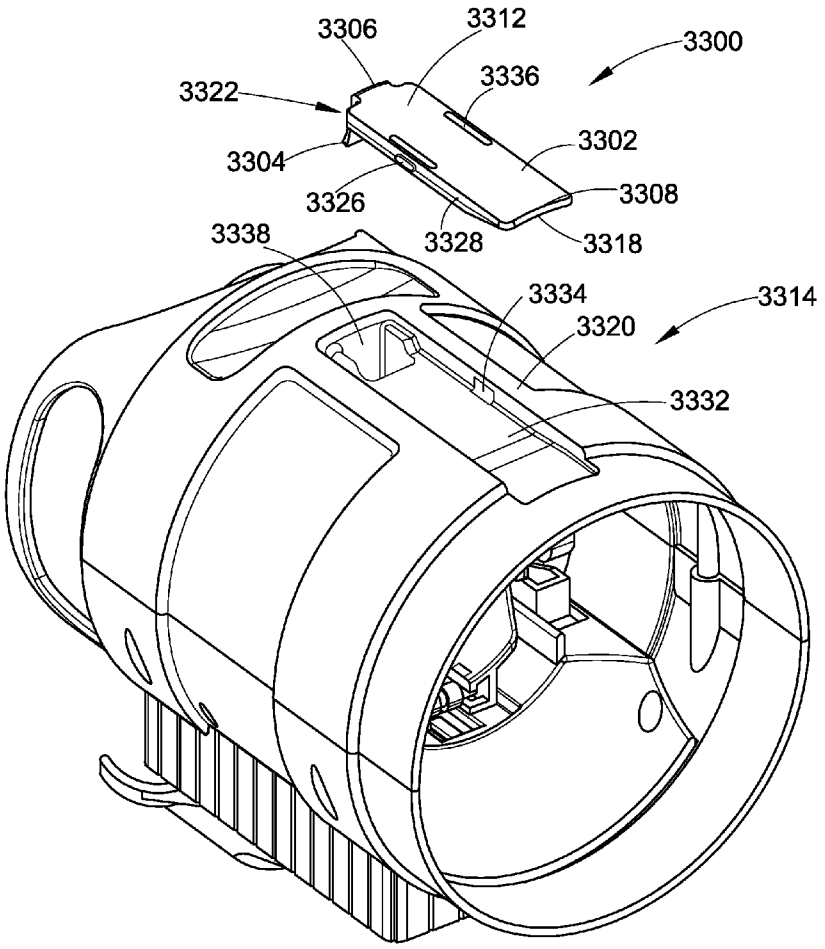
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FIG. 70

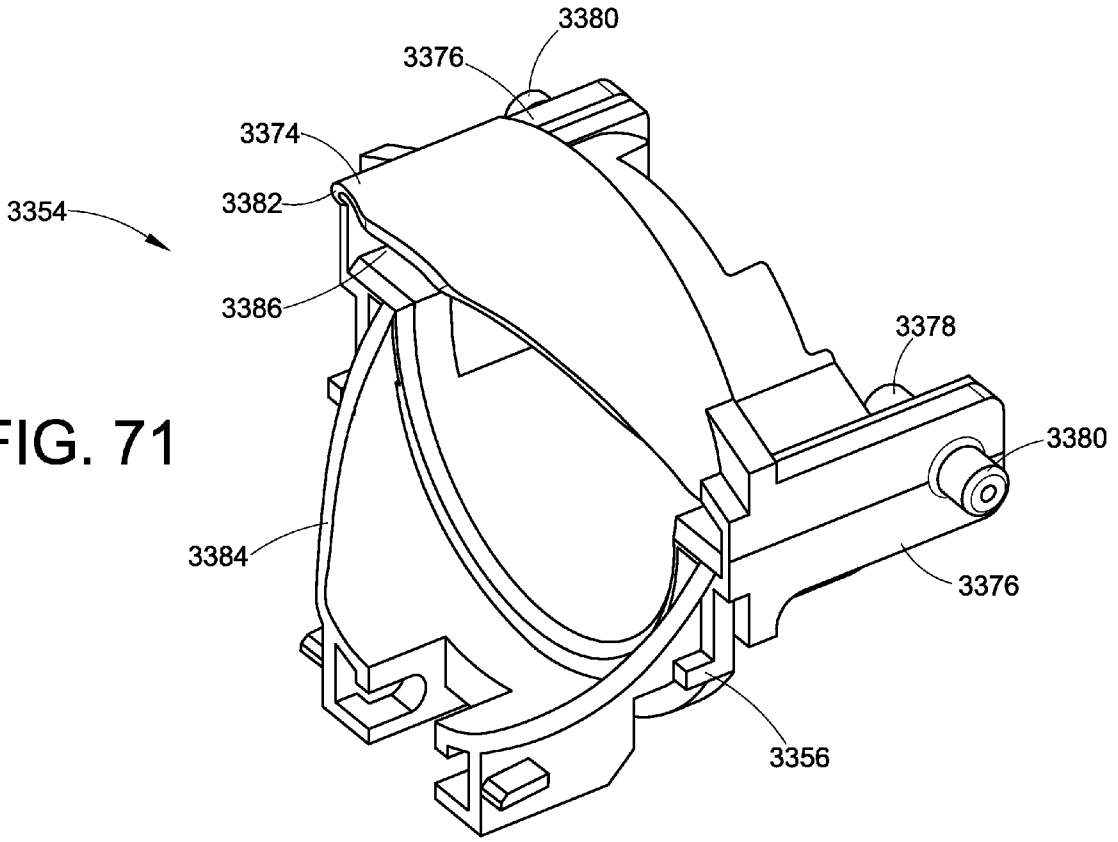

FIG. 71

BEVERAGE DISPENSING ASSEMBLY

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 12/414,199, filed Mar. 30, 2009, which is a continuation-in-part of U.S. patent application Ser. No. 12/264,023, filed Nov. 3, 2008, which is a continuation-in-part of U.S. patent application Ser. No. 12/040,062, filed on Feb. 29, 2008, which is a continuation-in-part of U.S. patent application Ser. No. 12/014,875, filed Jan. 16, 2008, which is a continuation-in-part of U.S. patent application Ser. No. 11/684,326, filed Mar. 9, 2007, all of which are incorporated herein by reference. This application also claims the benefit of U.S. provisional patent application Ser. No. 61/088,776, filed Aug. 14, 2008, which is also incorporated by reference herein.

BACKGROUND

[0002] Draft, or draught, beer and carbonated fountain drinks are typically delivered under pressure and include gas, typically nitrogen or carbon dioxide depending on the type of beverage, dissolved in the beverage. These beverages are typically enjoyed at restaurants, bars and other establishments where it makes sense to invest in the devices, e.g. taps, refrigerators, lines, pressure sources and fountain dispensers, that are required to dispense the beverage. To enjoy these beverages at home, typically a consumer must purchase a small portion of the beverage packaged in a can or a bottle. Often times this smaller portion found in a can or bottle is not as enjoyable as its draft or fountain counterpart.

[0003] Attempts have been made to provide a beverage dispenser capable of delivering portions of draft beer or a carbonated fountain drink, e.g., soda, where the dispenser is suitable for home usage. Previous approaches include a pressurized gas source, e.g., cartridge, within the liquid containing vessel, typically a bottle or can. In these known devices the gas pressure regulator, which regulates the pressure of the gas that is delivered to the beverage, is found within the liquid containing vessel. This arrangement of components results in the disposal of the costly gas pressure regulator after the beverage in the vessel has been consumed.

[0004] Other previous approaches have required the consumer to purchase or incorporate a separate tap and pressurizing system for delivering the beverage. Other approaches, for delivering beer particularly, also include providing a relatively large can, in relation to a typical 12 ounce can which is found in the United States, but these large cans of beer must be consumed relatively quickly, i.e. in at least two days, or the beer would become flat and no longer fresh.

SUMMARY

[0005] In view of the above, disclosed is a beverage dispenser that can deliver desired portions of a pressurized beverage from a vessel containing multiple portions and allow the beverage to stay fresh for a longer period of time as compared to many known beverage containers and dispensers. In one embodiment, a beverage dispensing assembly that is capable of dispensing a beverage charged with a gas fits onto a shelf in a conventional household refrigerator. The beverage dispensing assembly comprises a sealed disposable container assembly that contains the beverage and a dispensing assembly that cooperates with the container assembly to unseal the container assembly and dispense portions of the beverage from the container assembly. The container assembly connects to the dispensing assembly in a manner to allow for disconnection of the container assembly from the dispensing assembly when the beverage has been dispensed from the container assembly and replacement of an empty or nearly empty container assembly with a new sealed container assembly.

[0006] A system for dispensing metered portions of a beverage charged with a gas includes a bottle assembly and a dispensing assembly. The bottle assembly includes a bottle and a cap assembly. The bottle includes a neck defining an outlet. The cap assembly includes a pressurized gas cartridge, a beverage valve and a gas valve. The cap is configured to attach onto the neck of the bottle to close the bottle. The pressurized gas cartridge is received in the cap. The beverage valve in the cap allows a desired portion of beverage to leave the bottle and the gas valve allows pressurized gas to enter the bottle. The dispensing assembly is configured to cooperate with the bottle assembly to dispense the beverage from the bottle. The dispensing assembly includes a housing, a spout, and a pressure regulator. The housing supports the bottle, the spout and the pressure regulator. The spout is in fluid communication with the beverage valve for dispensing fluid from the bottle. The pressure regulator is in fluid communication with the pressurized gas cartridge and the gas valve. The pressure regulator receives pressurized gas from the pressurized gas cartridge at a first pressure and delivers pressurized gas to the bottle through the gas valve at a second pressure.

[0007] A dispensing assembly for delivering a metered amount of beverage from an associated container that holds the beverage includes a housing, a spout, and a pressure regulator. The housing is configured to receive an associated sealed container storing a beverage. The housing is dimensioned so that the housing and the associated container that the housing is configured to receive fit into an associated conventional household refrigerator and onto a conventional refrigerator shelf. The spout connects to the housing. The spout includes an inlet for receiving beverage from the associated container and an outlet for dispensing beverage. The pressure regulator connects to the housing. The pressure regulator is configured to communicate with an associated pressurized gas cartridge and the associated container to receive pressurized gas from the associated gas cartridge at a first pressure and to deliver pressurized gas to the associated container at a second pressure that is lower than the first pressure.

[0008] A disposable container assembly for dispensing a portioned amount of fluid beverage includes a container and a cap. The container stores a beverage. The cap connects to the container for sealing the beverage in the container. The cap includes a cartridge receptacle disposed in the container when the cap is connected to the container.

[0009] A disposable container assembly for use with a dispensing assembly that dispenses beverage under pressure includes a sealed disposable bottle, a sealed pressurized gas cartridge, a first plug and a second plug. The sealed disposable bottle includes a gas inlet and a beverage outlet. The sealed pressurized gas cartridge is received in the bottle and arranged to be pierced by an associated dispensing assembly when the bottle is loaded into the associated dispensing assembly. The first plug blocks a passage in communication with the beverage outlet. The first plug precludes the egress of beverage from the bottle when in a closed position and allows the egress of beverage from the bottle when in an open position. The second plug blocks a passage in communication

with the beverage outlet. The second plug precludes the egress of beverage from the bottle when in a closed position and allows the ingress of gas into the bottle when in the open position.

[0010] A disposable draft beverage refill bottle assembly for use with a dispenser includes a bottle, a cap, a first member, and a second member. The bottle contains a draft beverage. The cap connects to the bottle and contains the beverage in the bottle. The cap includes first and second passages for providing selective communication between inside the bottle and ambient. The first member is disposed in the first passage and has a first operating position that precludes the draft beverage from leaving the bottle and a second operating position that allows the draft beverage to leave the bottle. The second member is disposed in the second passage and has a first operating position that precludes the draft beverage from leaving the bottle and a second operating position that allows pressurized gas to enter the bottle.

[0011] A cap for a bottle containing a draft beverage includes a side wall, an end wall, a passage and a cartridge receptacle. The side wall has an inner surface that is generally axially symmetric with respect to a symmetrical axis. The end wall is disposed at or adjacent an end of the side wall. The passage is formed through the end wall generally aligned with the symmetrical axis. The cartridge receptacle is at least partially surrounded by the side wall.

[0012] A container assembly for holding a pressurized beverage to be dispensed using an associated dispenser includes a sealed container, a sealed gas cartridge, and a sealed passage. The sealed container stores the beverage under pressure. The sealed gas cartridge is disposed in the container. The sealed passage is arranged to be unsealed when the container is loaded into the associated dispenser and to be unsealed when the associated dispenser is in a dispense operating position.

[0013] A cap assembly for a bottle containing a beverage under pressure includes a cap, a gas cartridge, a first normally closed valve and a second normally closed valve. The cap includes a first passage and a second passage. The gas cartridge is received in the cap. The first normally closed valve is disposed in the first passage. The second normally closed valve is disposed in the second passage.

[0014] A system for dispensing servings of a beverage charged with a gas includes a sealed bottle and a dispenser. The sealed bottle contains a beverage charged with gas and includes a first sealed passage and a second sealed passage each in communication with inside of the bottle. The dispenser cooperates with the bottle to dispense the beverage from the bottle. The dispenser includes a housing, a spout, a pressure regulator, a first spike and a second spike. The housing receives the bottle. The spout is in fluid communication with the first passage for dispensing the beverage from the bottle. The pressure regulator is in fluid communication with the second passage for delivering pressurized gas to inside the bottle. The first spike unseals the first passage and the second spike unseals the second passage.

[0015] A container for beer comprises a bottle, a cap, a gas cartridge, a gas valve member, and a beer valve member. The cap connects with the bottle to close the bottle. The cap includes a gas cartridge receptacle, a gas inlet passage and a beer outlet passage. The gas cartridge is in the gas cartridge receptacle. The gas valve member is in the gas inlet passage and is displaceable from a closed position into an open position to allow gas to enter the bottle. The beer valve member is in the beer outlet passage and is displaceable from a closed position into an open position to allow beer to leave the bottle.

[0016] A dispenser includes a regulator, a housing, a high pressure gas inlet passage, a push rod, a low pressure gas outlet passage, a beverage outlet passage, a valve and a movable tap handle. The regulator is configured to receive gas at a first pressure and to deliver gas at a second, lower, pressure. The high pressure gas inlet passage is in the housing and is in communication with ambient when the dispenser is not connected with an associated container storing a beverage to be dispensed using the dispenser. The push rod is in or adjacent the gas inlet passage for displacing an associated piercing pin in an associated container cap for piercing an associated pressurized gas cartridge for delivering gas into the gas inlet passage. The low pressure gas outlet passage is downstream from the regulator for connecting with a low pressure gas inlet passage in the associated container cap for delivering low pressure gas into the associated container. The valve is associated with the beverage outlet passage for controlling flow of beverage through the beverage outlet passage. The movable tap handle operates the valve.

[0017] A beverage dispenser includes a dispenser housing, a spout connected to the housing, and a drip tray mounted to the housing below the spout. The drip tray is movable.

[0018] A beverage dispenser can include a housing, a spout, a movable handle mechanism, and an indicator. The housing is configured to cooperate with an associated container holding a beverage that is to be dispensed. The spout is supported by the housing and is configured to be in fluid communication with the container. The movable handle mechanism is also supported by the housing and configured to cooperate with the housing and the associated container for drawing the housing and the associated container together. The indicator is supported by the housing. The indicator has a first setting for indicating that the spout is connected with the associated container and a second setting for indicating that the spout is not connected with the associated container.

[0019] A beverage dispenser can also include a housing, a spout, a movable handle mechanism, and a retainer. The housing is configured to cooperate with an associated container holding a beverage that is to be dispensed. The spout is supported by the housing and configured to be in fluid communication with the associated container. The movable handle mechanism is also supported by the housing and configured to cooperate with the housing and the associated container for drawing the housing and the associated container together. The retainer is also supported by the housing and configured to engage the associated container for drawing the housing and the associated container together. The retainer is movable between a first position and a second position. When in the first position and the associated container is not engaged with the retainer, the retainer is positioned to preclude connection of the associated container with the retainer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. **1** is a perspective view of a beverage dispensing assembly.

[0021] FIG. **2** is a perspective view of a bottle assembly of the beverage dispensing assembly shown in FIG. **1**.

[0022] FIG. **3** is an exploded view of the bottle assembly shown in FIG. **2**.

[0023] FIG. **4** is an exploded view of a dispensing assembly of the beverage dispensing assembly shown in FIG. **1**.

[0024] FIG. **5** is a perspective view of a locking lever, an alignment bracket and a bottle retainer assembled together and removed from a frame of the dispensing assembly depicted in FIG. **4**.

[0025] FIG. **6** is an exploded view of a regulator of the dispensing assembly that is shown in FIG. **4**.

[0026] FIGS. **7-15** depict the steps involved in loading the bottle assembly into the dispensing assembly, dispensing beverage and removing the empty bottle assembly.

[0027] FIG. **7** is a cross-sectional view of the bottle assembly prior to insertion into the dispensing assembly.

[0028] FIG. **8** is a cross-sectional view of the bottle assembly connected to the dispensing assembly with a locking lever in an unlocked position.

[0029] FIG. **9** is a cross-sectional view of the beverage dispensing assembly with the handle in a locked position.

[0030] FIG. **10** is a cross-sectional view similar to FIG. **9**, but showing different components of the beverage dispensing assembly in cross section.

[0031] FIG. **11** is a cross-sectional view similar to that shown in FIGS. **9** and **10** showing a spout of the beverage dispensing assembly in a locked position.

[0032] FIG. **12** is a view similar to FIG. **11**, however, the spout is rotated into an open position.

[0033] FIG. **13** is a cross-sectional view similar to FIGS. **11** and **12**, but a tap handle is rotated to a dispense position.

[0034] FIG. **14** is a cross-sectional view similar to FIG. **13**, but taken to show different components of the beverage dispensing assembly in cross-section.

[0035] FIG. **15** is a cross-sectional view depicting the bottle assembly being removed from the dispensing assembly.

[0036] FIG. **16** is a perspective view of an alternative embodiment of a beverage dispensing assembly.

[0037] FIG. **17** is an exploded view of the assembly shown in FIG. **16**.

[0038] FIG. **18** is a perspective view of an alternative embodiment of a beverage dispensing system.

[0039] FIG. **19** is an exploded view of the beverage dispensing system shown in FIG. **18**.

[0040] FIG. **20** is a cross-sectional view of the beverage dispensing assembly shown in FIG. **18** taken along a longitudinal axis of the assembly.

[0041] FIG. **21** is a cross-sectional view taken parallel to the cross-sectional view shown in FIG. **20**, but spaced radially therefrom.

[0042] FIG. **22** is a perspective view of the beverage dispensing assembly depicted in FIG. **18**. The bottle assembly and the lower housing are not shown.

[0043] FIG. **23** is a perspective view of an alternative embodiment of a beverage dispensing system shown in an open position.

[0044] FIG. **24** is a front view of the beverage dispensing assembly shown in FIG. **23**.

[0045] FIG. **25** is a perspective view of the beverage dispensing system shown in FIG. **23** in a closed position.

[0046] FIG. **26** shows a view of the internal components of the beverage dispensing assembly shown in FIG. **23**.

[0047] FIG. **27** is an alternative view showing the internal components of the beverage dispensing assembly shown in FIG. **23**.

[0048] FIGS. **28***a*-**28***d* are schematic depictions of an alternative embodiment of a beverage dispensing system.

[0049] FIGS. **29***a*-**29***d* are schematic depictions of an alternative embodiment of a beverage dispensing system.

[0050] FIG. **30** is a cross-sectional view of a beverage dispensing assembly showing a stage in the process of piercing of a gas cartridge.

[0051] FIG. **31** is a cross-sectional view of the beverage dispensing assembly showing a later stage in the process of piercing a gas cartridge.

[0052] FIG. **32** is a cross-sectional view of a container for use with a beverage dispensing system.

[0053] FIG. **33** is a cross-sectional view of a container for use with a beverage dispensing system, FIG. **33** shows the entire container in cross section.

[0054] FIG. **34** is a schematic cross-sectional view of a beverage dispenser and another embodiment of a container that cooperates with the dispenser.

[0055] FIG. **35** shows the dispenser and container of FIG. **34** where the dispenser is connected with the container in a first operating position where low pressure gas is being delivered into the container.

[0056] FIG. **36** shows the dispenser and container of FIG. **34** connected and in a third operating position where a beverage is being dispensed from the container.

[0057] FIG. **37** is a schematic cross-sectional view of a dispenser and another embodiment of a cap for a container.

[0058] FIG. **38** is a partial schematic cross-sectional view of the dispenser and cap shown in FIG. **37** in an operating position.

[0059] FIG. **39** is a perspective view of a beverage dispenser and a container containing a beverage that is being dispensed by the beverage dispenser.

[0060] FIG. **40** is a perspective view of the beverage dispenser dispensing a beverage into a glass where a drip tray of the beverage dispenser is moved from the position shown in FIG. **39**.

[0061] FIG. **41** is a perspective view of the beverage dispenser and an exploded view of the drip tray for the beverage dispenser.

[0062] FIG. **42** is a perspective view of the beverage dispenser showing the drip tray detached from the beverage dispenser.

[0063] FIG. **43** is a perspective view of a drip tray assembly removed from a base of a housing for a beverage dispensing assembly.

[0064] FIG. **44** is a perspective view of the drip tray assembly.

[0065] FIG. **45** is an exploded view of the drip tray assembly shown in FIG. **44**.

[0066] FIG. **46** is a lower perspective view of the base shown in FIG. **43** and a movable handle mechanism and an indicator supported by the base.

[0067] FIG. **47** is an upper perspective view of the base shown in FIG. **46** along with the movable handle mechanism and an indicator.

[0068] FIG. **48** is a rear perspective view of a lower housing, a retainer, and an alignment bracket for a beverage dispenser.

[0069] FIG. **49** is an upper perspective view of the assembly shown in FIG. **48**.

[0070] FIG. **50** is a cross-sectional view taken through the retainer and alignment bracket shown in FIG. **48** and also through a slide and lever that cooperate with the alignment bracket.

[0071] FIG. **51** is an exploded view of a pressure adjustment mechanism, which allows for the adjustment of gas pressure that exits a beverage dispensing assembly.

[0072] FIG. **52** is a cross-sectional view of the pressure adjustment mechanism shown in FIG. **51**.

[0073] FIG. **53** is a schematic depiction of a drip ejection device for a beverage dispensing assembly shown in a first operating state.

[0074] FIG. **54** is the drip ejection device of FIG. **53** shown in a second operating state.

[0075] FIG. **55** is a cross-sectional view of a portion of a regulator similar to the regulator shown in FIG. **6**.

[0076] FIG. **56** is another embodiment of a seal for use with a regulator similar to the regulator shown in FIG. **6**.

[0077] FIG. **57** is an upper perspective view of the base shown in FIG. **46** along with the movable handle mechanism, where the movable handle mechanism includes an additional cut-out as compared to that shown in FIG. **47**. The handle mechanism is shown in a first position.

[0078] FIG. **58** is an upper perspective view of the base shown in FIG. **57** with the handle mechanism shown in a second position.

[0079] FIG. **59** is a cross-sectional view of a gas pressure regulator with an alternative embodiment of an adjustment mechanism.

[0080] FIG. **60** is a bottom plan view of an alternative embodiment of a beverage dispenser that includes a new mechanism for drawing a beverage container into the beverage dispenser. The mechanism is shown in a first operating position.

[0081] FIG. **61** is a bottom plan view similar to FIG. **60** showing the mechanism in a second operating position.

[0082] FIG. **62** is a top plan view of the mechanism for drawing the beverage container toward the beverage dispenser shown in a first operating position.

[0083] FIG. **63** is a top plan view of the mechanism shown in FIG. **62** with a portion of a rotatable hub removed to show more components or features of the mechanism.

[0084] FIG. **64** is a top plan view of the mechanism shown in FIG. **62** with the mechanism moving into an intermediate operating position.

[0085] FIG. **65** is a top plan view of the mechanism shown in FIG. **62** with the same portion removed as that shown in FIG. **63**. The mechanism is shown in the second operating position.

[0086] FIG. **66** is another top plan view of the mechanism shown in FIG. **62** with more portions of the mechanism removed to show further internal components and features of the mechanism.

[0087] FIG. **67** is a top plan view of the dispenser shown in FIG. **60**.

[0088] FIG. **68** is a perspective view of a removal tool, a cap and a bottle.

[0089] FIG. **69** is a perspective view of the removal tool being removed from a dispenser.

[0090] FIG. **70** is a perspective view of the removal tool removed from the dispenser.

[0091] FIG. **71** is a perspective view of an alignment bracket found in the dispenser shown in FIG. **70**.

DETAILED DESCRIPTION

[0092] A beverage dispensing assembly **10**, per the embodiment depicted in FIG. **1**, includes a bottle assembly **12** and a dispensing assembly **14**. The dispensing assembly **10** as shown in FIG. **1** is dimensioned and configured so that it fits into a conventional household refrigerator. More particular to the embodiment depicted in FIG. **1**, the beverage dispensing assembly **10** is configured to rest in a generally horizontal configuration, e.g., the axis of symmetry for the bottle of the assembly resides generally parallel to a plane of the refrigerator shelf upon which the beverage dispensing assembly **10** will rest. Moreover, the beverage dispensing assembly **10** that is depicted in FIG. **1** has a height that is limited in its greatest dimension so that the beverage dispensing assembly can fit onto a conventional household refrigerator shelf, typically, a middle shelf where an upper shelf resides above the shelf upon which the beverage dispensing assembly **10** resides. The length, or depth, of the assembly is also limited to less than about 40 cm so that the refrigerator door can close and seal. The beverage dispensing assembly **10** can have dimensions that are roughly equal to the dimensions of a 12 pack of beverage cans sold in a cardboard or paperboard box where the cans are stacked 6 by 2, which is more particularly described, for example, in U.S. Pat. No. 6,484,903.

[0093] Alternatively, the bottle assembly **12** and the dispensing assembly **14** can be configured in a manner to allow the beverage dispensing assembly **10** to reside in a generally vertical configuration, for example, where the beverage dispensing assembly may be received in a shelf found in a refrigerator door of a conventional household refrigerator. Other possible configurations also exist that are within the scope of the invention.

[0094] The beverage dispensing assembly **10** is useful in delivering metered portions of draft beer or fountain soda, both of which will be referred to as a draft beverage, without requiring the consumer to purchase a keg and tap assembly in the case of draft beer or a fountain dispenser and other equipment required to dispense fountain soda. The beverage dispensing assembly **10** provides a disposable, which is meant to include recyclable, bottle assembly where inexpensive components are disposed or recycled and the costlier components, e.g. a pressure regulator, is not thrown away. The assembly delivers a fresh tasting beverage each time over an extended period of time, e.g. at least about 21 days.

[0095] With reference to FIG. **2**, the bottle assembly **12** includes a bottle **16** and a cap assembly **18**. The bottle assembly **12** fits into the dispensing assembly **14** (FIG. **1**) and is manufactured to be disposable or recyclable. A consumer purchases the beverage dispensing assembly **10** and dispenses the beverage. After the beverage is dispensed and consumed, the consumer removes the empty bottle assembly **12** from the dispensing assembly **14** and buys a replacement bottle assembly to fit into the dispensing assembly.

[0096] The bottle **16** as shown in the depicted embodiment is a blow molded axially symmetric bottle having an externally threaded neck **22** (FIG. **3**). In the depicted embodiment, the bottle can be manufactured to have an internal volume of between about 1 liter and about 5 liters, and even larger if desired. The larger the internal volume allows a manufacturer to spread the cost associated with the cap assembly **18** over a larger amount of beverage, which drives down the unit cost of the beverage. Other materials for the bottle **16** can be used, but plastic is easily recyclable and the threaded neck **22**, which could be modified so that it does not include threads, allows for easy removal of the cap assembly **18** when all the beverage has been dispensed. This allows for separation of the cap assembly **18** from the bottle **16** so that the dissimilar materials used in the cap assembly can be separated from the bottle. The diameter of the bottle **16** in the depicted embodiment is between about 7 cm and about 16 cm, which is typically less than the height of a shelf in a conventional household refrig-

erator. Where the beverage dispensing assembly **10** is configured to be placed into a door of a conventional household refrigerator, the diameter of the bottle **16** can be between about 13 cm and about 18 cm. The assembly **10** has a length measured along a central axis of about 33 cm to about 40 cm, which is less than the depth of the refrigerator compartment of a conventional household refrigerator so that the beverage dispensing assembly can sit on the shelf horizontally. In the depicted embodiment, the bottle **16** is clear and/or translucent to allow the consumer to see the beverage inside the bottle. If desired, the bottle can be opaque, especially where the bottle is made from a material other than plastic.

[0097] The cap assembly **18** covers the opening through which the bottle **16** is filled with beverage and retains the beverage in bottle **16** during shipment. In the depicted embodiment, the cap assembly includes openings for dispensing the beverage and providing pressurized gas to the beverage, which will be explained in more detail below. In alternative embodiments, the passages for dispensing the beverage and for providing pressurized gas to the bottle can be formed in the bottle—one non-limiting example being passages formed near and radially offset from the neck **22**. With reference back to the embodiment depicted in FIG. **3**, the cap assembly **18** generally includes a cap **24**, a pressure source, and valve assemblies. These can also be located in the bottle, if desired.

[0098] The cap **24** threads on to the threaded neck **22** of the bottle **16**. The cap **24** could connect to the bottle in other manners, e.g. a bayonet connection, a snap fit, or welding. With reference back to the embodiment of FIG. **3**, the cap **24** includes a generally cylindrical side wall **26** having internal threads **28** (FIG. **8**) formed on an inner surface for threadingly engaging the threaded neck **22**. The cap **24** also includes two catches **32** that extend outwardly from the cylindrical side wall **26** of the cap **24**. The catches **32** are generally U-shaped bars and the terminal portions attach to the cylindrical side wall **26** to define an opening to facilitate attaching the bottle assembly **12** to the dispensing assembly **14** in a manner that will be described in more detail below.

[0099] The catches **32** align with a chord that is offset from the diameter of a circular end wall **34** of the cap and intersects the diameter of an opening **42** that leads to a cartridge receptacle **38** (described below). The circular end wall **34** at an upper end of the cylindrical side wall **26**, includes a valve seat recess **36** and, in the depicted embodiment, three openings, which will be described in more detail below. The cap **24** also includes a cartridge receptacle **38** that receives the pressure source for the beverage dispensing assembly **10**. A cartridge receptacle opening **42**, which is one of the three openings in the circular end wall **34**, leads to a cavity that is defined by the cartridge receptacle. The cartridge receptacle **42** is offset from a rotational axis of the cap **24**, i.e. the axis about which the cap **24** rotates to be screwed onto or removed from the threaded neck **22** of the bottle **16**. The cartridge receptacle **38** is configured to receive a conventional 12 ounce CO_2 cartridge **44**. In other embodiments, the cartridge receptacle **38** can take other configurations to allow it to receive pressurized gas cartridges, for example, nitrogen cartridges or CO_2 cartridges that have a different volume. The cartridge receptacle **38** is closed with the exception of the opening **42** in the circular end wall **36** so that the internal compartment of the cartridge receptacle is not in communication with the bottle **16** when the cap **24** is connected to the threaded neck **22**.

[0100] The cap **24** also includes a beverage outlet passage **52** and a pressurized gas inlet passage **54**, each of these passages being in communication with a separate opening, mentioned above, formed in the circular end wall **34**. Each passage **52** and **54** extends through the cap **24** such that each passage is in communication with the internal volume of the bottle **16**. Each passage **52** and **54** is sealed after the beverage manufacturer has filled the bottle **16** to transport the bottle from the manufacturer to the retailer. In one example, foil, or other sealing device such as rubber, plastic and the like, can act as a plug to block the passages **52** and **54** to prevent the egress of beverage from the bottle during shipment. In another example, valve assemblies, which will be described in more detail below, are used to seal the passages **52** and **54**.

[0101] As mentioned above, the pressure source in the depicted embodiment is a conventional CO_2 cartridge **44** that fits into the cartridge receptacle **38**. The type of cartridge used in the depicted embodiment is pierced in a manner that will be described later. A locking clip **56** retains the cartridge **44** in the cartridge receptacle **38**. The locking clip **56** in the depicted embodiment includes a central opening that receives the neck portion of the cartridge and a peripheral portion that engages the side wall of the cartridge receptacle. The cartridge **44** can be retained in other manners.

[0102] With continued reference to FIG. **3**, the beverage outlet valve assembly includes a plug **60** and a biasing member, such as a spring **62**, that biases the plug into a closed position. The plug **60** acts against a seal **64** that is retained by a seal retainer **66** that both fit into the valve seat recess **36** formed in the circular end wall **34** of the cap **24**. The seal retainer **66** is welded to the cap **24** in the present embodiment. The spring **62** and the valve plug **60** are positioned inside the beverage outlet passage **52** and the spring **62** urges the plug **60** towards the seal **64**. The seal **64** includes a first opening **68** that aligns with the beverage outlet passage **52**. Similarly, the seal retainer includes a first opening **70** that aligns with the first opening **66** and the seal **64** and the beverage outlet passage **52** in the cap **24**. These openings **68** and **70** and the beverage outlet passage **52** are blocked when the plug **60** is moved into the closed position. As most clearly seen in FIG. **8**, the beverage outlet passage **52** is stepped to allow the spring **62** to seat in the outlet passage **52** and bias the plug **60** towards the seal **64** thus blocking the beverage outlet passage **52**. If desired, the spring can be removed and the plug **60** can be biased by the pressurized beverage in the bottle **16**.

[0103] In a similar fashion, as seen in FIG. **3** the pressurized gas valve assembly includes a plug **72** that is biased by a spring **74** towards the seal **64**. The seal **64** includes a second opening **76** that aligns with the pressurized gas inlet passage **54**. The seal retainer **66** also includes a second opening **78** that aligns with both the second opening **76** in the seal **64** and the pressurized gas inlet **54** that is formed in the cap **24**. The plug **72** seals against the seal **64** to prevent the beverage and gas from leaving the bottle **16** through the pressurized gas inlet **54** until the plug **72** is moved away from the seal. As seen in FIG. **8**, the gas inlet passage **54** is also stepped to provide a seat for the spring **74**. If desired, the spring can be removed and the plug **72** can be biased by the internal pressure of the pressurized beverage in the bottle.

[0104] A hollow flexible dip tube **82** attaches to the cap **24** and is communication with the beverage outlet passage **52**. A dip tube weight **84** attaches at a distal end of the dip tube. The dip tube **82** extends from the cap **24** a length that is slightly greater than the length of the bottle **16** that is found below the

threaded neck **22**. Accordingly, the dip tube **82**, which is made from a flexible material, can have a slight curvature such that the dip tube resides at a lower most location in the bottle to allow for full evacuation of the bottle **16** as beverage is dispensed from the bottle. In the depicted embodiment, the dip tube weight **84** is a ring that receives the dip tube. The dip tube weight can take alternative configurations and attach to the dip tube in alternative manners.

[0105] As discussed above, the cap assembly **18** retains the draft beverage in the bottle during shipment and includes components that allow for the dispensing of metered portions of a pressurized and/or carbonated beverage from the bottle **16**. Some or many of the components depicted in the cap assembly can be placed in the dispensing assembly, for example the valve assemblies and the CO_2 cartridge. The usefulness of providing the valve assemblies in the cap **24**, as opposed to putting these assemblies in the dispensing assembly **14**, is if some beverage remains in the bottle **16**, the bottle assembly **12** can still be removed from the dispensing assembly **14** because the plugs **60** and **72** are biased towards a closed position that prohibits the beverage and gas from leaving the bottle.

[0106] As discussed above, the dispensing assembly **14** receives the bottle assembly **12**. The bottle assembly **12** is designed to be removed from the dispenser assembly **14** after the beverage has been dispensed, or earlier if desired, and replaced with a new bottle assembly. The dispenser assembly **14** includes more of the expensive components of the system and is designed to be reused with many different bottle assemblies.

[0107] With reference to FIG. **4**, the dispensing assembly includes a housing, which in the depicted embodiment includes a base or lower housing **90**, a lid or an upper housing **92**, and a face plate or front housing **94**. The housing portions **90**, **92**, and **94** attach to one another to form a generally cylindrical housing as seen in FIG. **1**. The housing can take other configurations and can be made from a fewer or greater number of components. In the depicted embodiment the housing is made of a plastic material, but other materials can be used.

[0108] The lower housing is generally half-cylindrical and includes a curved base surface **96**. A forward platform **98** begins at a location is axially spaced from a rear edge of the base housing (with respect to the front face **94**) and extends towards the front edge of the base **90** to almost the front face **94** when the housing portions are connected to one another. The forward platform **98** is radially spaced from the base surface **96** and is also curved. A concave ramp **102** connects the inner base surface **96** to the forward platform **98**. The ramp **102** has a curvature that is complementary to the curvature of the bottle **16** between its widest diameter portion and the threaded neck **22**. As seen FIG. **8**, for example, the portion of the bottle where its diameter progressively decreases towards the threaded neck **22** abuts against the ramp **102** when the bottle assembly **12** is fully inserted into the dispensing assembly **14**.

[0109] The forward platform **98** is also separated from the inner base surface **96** by openings **104** (only one is visible in FIG. **4**) on each side of the platform that is generally parallel to a central axis of the housing. The forward platform **98** also includes a central generally rectangular opening **106**. Each of the openings **104** and **106** allows for components that allow for the mounting of the bottle assembly **12** into the dispensing assembly **14** to be accessible by the consumer. These components will be described in more detail below.

[0110] The base housing **90** also includes an integral base **108** extending downwardly that provides a planar support surface for the beverage dispensing assembly **10**. The planar support surface is slightly inclined so that the rearward portion of the bottle **16** is lower than the forward portion of the bottle to allow the beverage to puddle towards the inlet of the dip tube **82** to promote full evacuation. Fastener openings **110** are provided in the base housing **90** for attaching the lid **92** to the base housing. The base housing **90** can attach to the lid in other conventional manners. Also, support posts **112** are formed in the base housing **90**, the function of which will be described below.

[0111] The lid **92** is generally half-cylindrical in shape. It includes a plurality of fastener openings (not visible) that align with the fastener openings **110** in the base housing **90** to attach the lid to the base housing. When the lid **92** is attached to the base housing **90** the diameter of the housing is slightly larger than the maximum diameter of the bottle **16**, see for example FIG. **7**.

[0112] The face plate **94** is sandwiched between the base housing **90** and the lid **92**. In the depicted embodiment, the face plate includes ridges **114** that are received in notches **116** formed in the base housing **90** and the lid **92** that fix the face plate in an axial direction. The face plate **94** also includes an external mounting extension **118** that extends outwardly from and is generally centrally located in the face plate. The mounting extension **118** has a generally upside-down U-shaped configuration and includes aligned pin openings **120** on each side of the U-shape. The face plate **94** also includes a generally centrally located boss **122** that defines a passage **124** through which components involved in beverage dispensing extend, which will be described in more detail below. Small posts **126** are positioned on opposite sides of the boss **122** and are generally aligned with one another. The face plate **94** also includes handles **128** extending outwardly from the face plate on opposite sides of the face plate and a plurality of fastener openings **130** that extend through the face plate.

[0113] The fastener openings **130** in the face plate **94** allow for the attachment of a frame cover **138** and a frame **140** against an inner surface of the face plate, as seen in FIG. **5**. The frame **140** includes a plurality of fastener openings **142** that align with fastener openings **144** in the frame cover **138** and fastener openings **130** the face plate **94** to receive fasteners (not shown) for attaching the frame and frame cover to the face plate. The frame **140** includes additional fastener openings **146** that align with fastener openings **148** in the cover **138** to attach the two together. The frame cover **138** also includes openings **150** that receive support posts **112** to fix the cover and the frame **140** in the housing. The frame **140** provides a support for components of the dispenser assembly **14** that provide the connection between the bottle assembly **12** and the dispenser assembly **14**.

[0114] A bottle retainer **152**, an alignment bracket **154**, and a locking lever **156** cooperate with the frame **140** to connect the bottle assembly **12** to the dispensing assembly **14**. A pressure regulator **158**, which will be described in more detail below, also cooperates with the frame **140**, the bottle retainer **150**, the alignment bracket **152** and the locking lever **154**.

[0115] The bottle retainer **152** in the depicted embodiment includes a generally U-shaped member **162** with openings **160** formed at opposite ends. The openings **160** provide a means for attaching the bottle retainer **152** to the alignment

bracket **154**. Catches **164** extend from each end of the U-shaped member **162** near the openings **160** towards the alignment bracket **154**. Ridges **166** extend from the outer side of the bottle retainer between the end of each catch **164** and each opening **160**. Also, spring catches **168** are formed underneath each opening on the U-shaped member. A tab **170** extends downwardly from the center of the U-shaped member **162**, which is the lower most portion of the bottle retainer **152** as depicted in FIG. **4**. Springs **172** bias the bottle retainer in a rotational direction towards the bottle assembly **12**.

[0116] The alignment bracket **154** in the depicted embodiment includes a circular section **174** and two appendages **176** extending from diametrically opposite sides of circular section **174** towards the bottle retainer **152** when finally assembled. A first pair of inwardly extending axle posts **178** extend towards each other from each distal end of each appendage **176**. Each axle post **178** is received in a respective opening **160** of the bottle retainer **152**. A second pair of axle posts **180** extend outwardly from each appendage **176** and are generally coaxial with the first axle posts **178**.

[0117] The circular section **174** of the alignment bracket **154** is configured to receive the circular cap **24** that connects to the bottle **16**. Outer ends of an upper portion of the circular section **174** form upper and lower alignment surfaces **182** and **184**, respectively, extend inwardly from each appendage **176** and towards the bottle retainer **152** to define a channel **186** (FIG. **5**) that receives the catches **32** formed in the cap. The lower alignment surfaces **184** do not extend along the central axis of the circular section **174** as great a distance as compared to the upper alignment surfaces **178** (see FIG. **5**), which allows the catches **164** of the bottle retainer **152** to engage the catches **32** on the cap **24**, in a manner that will be described in more detail below. The alignment bracket **154** also includes a lower downwardly extending ridge **188** aligned with a central axis of the circular section **170** that is received in linear notch **190** formed in the frame **140**. Both the alignment bracket **154** and the bottle retainer **152** are configured to move linearly with respect to the frame **140** in a manner that will be described in more detail below.

[0118] The locking lever **156** is also generally U-shaped in configuration and includes openings **200** that receive respective mounting posts **180** of the alignment bracket **154**. The locking lever **156** also includes outwardly protruding posts **202** that are received in vertical slots **204** (FIG. **5**) formed in the frame **140**. The posts **202** include a flattened section so that the posts **202** lock into a locked position or an unlocked position when a hand grip **204**, which is disposed between two appendages **206** that include the openings **200** and the mounting posts **202**, is moved from an unlocked position toward a locked position, which will be described in more detail below.

[0119] With reference to FIG. **4**, the dispensing assembly **14** also includes a tap handle **220** and a spout **222** that each attach to the face plate **94** of the housing. The tap handle **220** is rotated with respect to the face plate **94** to dispense a metered portion of a pressurized beverage from the bottle **16** through the spout **222**. The tap handle **220** attaches to the mounting extension **118** of the face plate **94** via a pin **224** that is received in openings **226** in the tap handle and in the openings **120** provided in the mounting extension **116** on the face plate **94**. The spout **222** is formed to include hubs **230** that are received in receptacles **232** formed in the tap handle **220**.

[0120] The tap handle **220** and the spout **222** cooperate with a hollow seal **232**, a beverage valve actuator **234** and a spring **236** to dispense metered portions of a beverage from the bottle **16** in a manner that will be described in more detail below.

[0121] As discussed above, the beverage dispensing assembly **10** is capable of providing pressurized gas to the bottle **16** so that the contents of the bottle stay fresh over an extended period of time. The gas pressure also propels the beverage. The pressure regulator **158** that is shown above cooperates with the pressure source found in the cap assembly **18** to provide pressurized gas to the inside of the bottle. The pressure regulator **158** receives gas at a first pressure from the pressure source and delivers at a second pressure, which is lower than the first pressure, to the bottle **16**.

[0122] With reference to FIG. **6**, the regulator **156** includes a regulator body **250** that includes a first (horizontal) cylindrical opening **252** having a symmetrical axis extending along a first direction and a second (vertical) cylindrical opening **254** that is communication with the first cylindrical opening **252** and includes a symmetrical axis that is perpendicular to the symmetrical axis of the first cylindrical opening. A nipple **256** extends from the regulator body and includes a passage **258** that is in communication with the vertical passage **254** in the regulator body. The regulator body **250** also includes two rectangular openings **262** that are diametrically opposed from one another and disposed adjacent an upper end of the vertical opening **254**.

[0123] The horizontal cylindrical opening **252** receives a piercing mechanism housing **270**. The piercing mechanism housing **270** includes a generally horizontal cylindrical passage **272** that connects with a generally vertical cylindrical passage **274**. The vertical passage **274** in the piercing mechanism housing **270** aligns with the vertical passage **254** of the regulator body **250** when the piercing housing mechanism **270** is received in the horizontal passage **252**. In the depicted embodiment, internal threads are provided in the vertical passage **274** of the piercing mechanism housing **270**.

[0124] The piercing mechanism housing **270** receives a filter **276**, a piercing pin **278**, and gasket **282** in the horizontal passage **272**. The piercing pin **278** is hollow and includes a passage **284** extend through the piercing pin that communicates with a smaller horizontal passage **286** in the piercing mechanism housing **270** and a smaller vertical passage **288** in the piercing mechanism housing **274** (FIG. **14**). The piercing pin **278** also includes a sharp edge that extends outwardly from the piercing mechanism housing **270** so as to pierce the pressurized gas cartridge **44** (FIG. **3**) in a manner that will be described in more detail below.

[0125] The vertical passage **254** in the regulator body **250** receives a small spring **300**, a valve pin **302**, a valve seal **304**, a plug **306**, an O-ring **308**, a piston **312**, a piston seal **314**, a larger spring **316** and a cap **318**. With reference to FIG. **14**, the spring **300** is received in the smaller vertical passage **288** of the piercing mechanism housing **270**. A lower portion of the valve pin **302** is also received in the vertical opening **288**. The valve seal **304** includes an opening for receiving the valve pin, as does the plug **306**. The plug **306** includes a threaded portion that is threaded into the larger vertical opening **274** of the piercing mechanism housing **270**. An O-ring **308** surrounds the plug **306** and contacts a circular side wall of the regulator body **250**.

[0126] The cap **318** includes a pair of resilient tabs **322** that snap into the rectangular openings **262** of the regulator body

250. The larger spring **316** biases the piston **312** downwardly in the piston seal contacts an outer surface of the piston **312** and an inner surface of the regulator body **250**.

[0127] Pressurized gas (under high pressure—about 850 psig) exits the cartridge **44** through the passage **284** and into the smaller horizontal passage **286** of the piercing mechanism housing **270**. The spring **300** biases the valve stem **302** against the seal **304** closing the vertical passage through the plug **306**. Lower pressure (P_L), which is equal to the pressure of the beverage in the bottle **16** (about 16 psig, but can be anywhere between about 5 psig to about 35 psig) is in a chamber defined above the O-ring **308**. After some of the beverage has been dispensed (or at the initial charge), the pressure above the O-ring **308** drops below P_L. The upper spring **316** then biases the piston **312** which presses down on the valve stem **302** unseating the valve stem from the seal **304**. Gas then moves through the passage in the plug **306** and out the nipple **256** until P_L is again reached above the O-ring **308**, which moves the piston **312** against the spring **316**. A hose **324** (depicted schematically in FIG. **4**), attaches to a corresponding nipple **326** formed in the frame **140** having an internal passage **328** (FIG. **9**) to deliver pressure at or about P_L to the bottle. A rearwardly extending hollow cartridge spike **332** extends from the frame **140** and is received in the gas inlet passage **54** to provide pressurized gas to the internal volume of the bottle **16**. The rearwardly extending hollow spike **332** also defines a portion of the passage **328** that is defined by the nipple **326** on the frame **140**. A check valve **334** (depicted schematically in FIG. **4**) is provided in the circuit between the pressure regulator **156** and the internal volume of the bottle **16**. The check valve **334** prevents the beverage from flowing into the regulator when the pressure just downstream of the outlet of the nipple **256** on the regulator **158** is in equilibrium with the pressure inside the bottle **16**. The check valve **334** is configured to open when there is about 2 psi to about 3 psi pressure differential across the check valve. In the depicted embodiment the check valve is a duck bill type check valve with the bill being disposed towards the bottle **16** in the circuit.

[0128] The operational sequence of the beverage dispensing assembly **10** will be described in more detail with reference to FIGS. **7-15**. With reference to FIG. **7**, the bottle assembly **12** is advanced into the dispenser assembly **14** by the consumer. With reference to FIG. **8**, as the bottle assembly **12** is advanced towards the front plate **94** of the dispenser housing, the bottle retainer **152** rotates counter clockwise under spring pressure until the bottle assembly is fully advanced. The bottle retainer **152** then rotates back clockwise so that the catches **164** on the bottle retainer cooperate with the catches **32** on the cap **24** to retain the cap **24** and thus the bottle assembly **12**. The locking lever **156** is shown in the unlocked position in FIG. **8**.

[0129] With reference to FIG. **9**, the locking lever **156** is advanced from the unlocked position to a locked position. The cartridge spike **332** advances into the gas inlet passage **54** formed in the cap **24** and opens the corresponding gas valve assembly by displacing the gas valve plug **72** from the seal **76**. Accordingly, pressurized gas from the CO_2 cartridge **44** can enter the internal volume of the bottle **16**.

[0130] With reference to FIG. **10**, which shows the same operational state as that shown in FIG. **9**, when the locking lever **156** is moved from the unlocked position (shown in FIG. **8**) to the locked position, the pointed edge **284** of the piercing pin **278** punctures the cartridge **44**, thus providing communication between the cartridge **44** and the inside of the bottle **16**. As also seen in FIG. **10**, the beverage valve actuator **234**, which is hollow and includes a passage **360** is inserted into the beverage outlet passage **52**; however, the beverage outlet valve assembly is still in the closed position. The beverage valve actuator **234** also acts as a spike to unseal the beverage outlet passage **52**.

[0131] FIG. **11** shows the same state as FIGS. **8** and **9** while showing the spout **222** in a locked position. With the spout in the locked position, the tap handle **220** can not be rotated until the spout **222** is rotated outward (i.e. counterclockwise). Rotating the spout **222** outward aligns the pins **126** (also seen in FIG. **4**) with channels **362** formed in the spout **222**, thereby allowing the tap handle **220** to push the spout **222** towards the bottle cap **24**.

[0132] With reference to FIG. **12**, the spout **222** has been rotated outward resulting in alignment of the beverage passageways. The passageway **360** defined in the beverage valve actuator **234** aligns with a beverage inlet **364** that is communication with a beverage passageway **366** and a beverage outlet **368** all formed in the spout **222**. With reference to FIG. **13**, the tap handle **220** is rotated clockwise to the dispense position resulting in the translation of the spout **222** and the beverage valve actuator **234** (FIG. **12**) towards the bottle cap **24**. The beverage valve assembly disposed in the cap is opened allowing beverage to flow under pressure from the bottle **16** to the spout **222**. As shown in FIG. **13**, the channel **362** in the spout **222** aligns with the pins **126** that extend outwardly from the face plate **94**. With reference to FIG. **12**, the beverage valve actuator **234** is translated towards the bottle cap **24** such that the plug **60** is moved away from the seal **64** opening the valve assembly allowing beverage to flow from inside the dip tube **82** through the beverage outlet passage **52** into the passage **360** formed in the beverage valve actuator **234** and into the beverage inlet **364** through the passage **366** and out the beverage outlet **368** of the spout **222**.

[0133] With reference to FIG. **15**, when the contents of the bottle **16** have been fully dispensed or if a consumer simply wishes to remove the bottle assembly **12** from the dispenser assembly **14**, the locking lever **156** is moved back into the unlocked position and the bottle retainer **152** is rotated counter clockwise by the consumer depressing the tab **170** so that the bottle assembly **12** can be removed from the dispenser assembly.

[0134] FIGS. **1-15** depict only one example of a beverage dispensing assembly with great particularity. Alternative embodiments were discussed throughout the description. The invention is not limited to simply the embodiment discussed above. For example, the beverage dispensing assembly **410** is shown in FIGS. **16** and **17**. The beverage dispenser assembly includes a housing having a rear box-shaped portion **412** and cover **414**. As seen in FIG. **17**, the housing encloses a bottle for **416**, a dispenser mechanism for **18**, and a spacer **422**. The bottle **416** can be a blow molded bottle similar to the one described above. The dispenser mechanism **412** includes a pressure source such as a cartridge similar to the cartridge **44** described above. A rotatable lock assembly **424** can be provided on the dispenser mechanism to prevent accidental dispensing of the product and to prevent dispensing of the product during shipment. A tap handle **426** and a spout **428** that are similar to those described above can also be provided with a dispenser mechanism for **418**.

[0135] To dispense the beverage, the locking mechanism **424** is rotated which allows the bottle **416** to drop onto the dispenser mechanism which results in a seal that caps the

bottle to be broken and a seal on the pressure cartridge to also be broken. This would result by gravity because of the weight of the beverage being contained in the bottle **416**. The tap handle **426** can actuate a valve to allow for selective dispensing of beverage through the spout **428**.

[0136] Another embodiment of a beverage dispensing assembly **510**, also referred to as a beverage dispensing system, is depicted in FIG. **18**. In this embodiment, the beverage dispensing assembly **510** includes a bottle assembly **512**, which is very similar to the bottle assembly **12** depicted in FIG. **2**, and a dispensing assembly, which is also somewhat similar to the dispensing assembly **14** depicted in FIGS. **1-15**. The dispensing system **510** that is shown in FIG. **18** is also dimensioned and configured to fit into a conventional household refrigerator similar to the dispensing assembly that has been described above. The dimensions of the beverage dispensing assembly **510** shown in FIG. **18** can be the same as those that have been described for the beverages dispensing assembly **10** described with reference to FIGS. **1-15**.

[0137] With reference to FIG. **19**, the bottle assembly **512** includes a bottle **516** and a cap assembly **518**. The bottle assembly **512** fits into the dispensing assembly **514** in much the same manner as the bottle assembly **12** fits into the dispensing assembly **14** that has been described above with reference to FIGS. **1-15**. A consumer purchases the beverage dispensing assembly **510** and dispenses the beverage. After the beverage is dispensed and/or consumed, the consumer removes the empty bottle assembly **512** from the dispensing assembly **514** and buys a replacement bottle assembly to fit into the dispensing assembly.

[0138] The bottle **516** is the same as the bottle **16** that has been described above. A lower support **520** can receive a lower end of the bottle **516** and to provide further structural integrity to the bottle as well as provide a flat support surface.

[0139] The cap assembly **518** covers the opening through which the bottle **516** is filled with a beverage and retains the beverage in the bottle during shipment. The cap assembly **518** includes openings for dispensing the beverage and providing pressurized gas to the beverage.

[0140] The cap assembly **518** generally includes a cap **524**, a pressure source **528** (FIG. **20**), and valve assemblies. The pressure source and the valve assemblies can also be located in the bottle, as opposed to in the cap assembly, if desired.

[0141] As seen in FIGS. **20** and **21**, the cap **524** threads onto a threaded neck **522** of the bottle **516**. The cap **524** can connect to the bottle in other manners, e.g. a bayonet connection, a snap fit or welding. The cap **524** includes a generally cylindrical side wall **526** having internal threads formed on an inner surface for threadingly engaging the threaded neck **522**. With reference back to FIG. **19**, the cap **524** also includes two catches **532** that extend outwardly from the cylindrical side wall **526** of the cap **524**. The catches **532** are generally U-shaped bars having terminal portions that attach to the cylindrical side wall **526** to define an opening to facilitate attaching the bottle assembly **512** to the dispensing assembly **514**.

[0142] The catches **532** are similar to the catches **32** that have been described above in that they align with a chord that is offset from the diameter of a circular end wall **534** of the cap and intersect the diameter of an opening **542** that leads to a cartridge receptacle **538**. The cap **524** also includes the cartridge receptacle **538** that receives the pressure source **528** for the beverage dispensing assembly **510**. The cartridge receptacle opening **542**, which is one of three openings in the circular end wall **534**, leads to a cavity that is defined by the cartridge receptacle. The cartridge receptacle **538** is offset from a rotational axis of the cap **524**. The cartridge receptacle **538**, similar to the cartridge receptacle **38** that has been described above, is configured to receive a conventional twelve ounce CO_2 cartridge, which serves as a pressure source. The cartridge receptacle **538** is closed with the exception of the opening **542** in the circular end wall **536** so that the internal compartment of the cartridge receptacle is not in communication with the bottle **516** when the cap **524** is connected to the threaded neck **522**.

[0143] With reference back to FIG. **19**, the cap **524** also includes a beverage outlet passage **552** and a pressurized gas inlet passage **554**, similar to the passages formed in the cap **24** that has been described above. Each of these passages **552** and **554** is in communication with a separate opening formed in the circular end wall **534**. Each passage **552** and **554** extends through the cap **524** such that each passage is in communication with the internal volume of the bottle **516**, in a similar manner to the passages **52** and **54** that have been described above. Moreover, each passage can be sealed using foil or another sealing device such as rubber, plastic and the like to block the passages **552** and **554** to prevent the egress of beverage from the bottle during shipment. The foil, or other sealing device, can be referred to as a plug since it blocks the passage. The valve assemblies that are used to block the passages **552** and **554** as depicted in FIGS. **20** and **21** are the same as the valve assemblies that have been described to seal the passages **52** and **54**, described above. With reference to FIG. **20**, the beverage outlet valve assembly includes a plug **560** and a biasing member **562** that biases the plug into a closed position. The plug **560** acts against a seal **564** that is retained by a seal retainer **566**. The seal retainer **566** can be welded to the cap **524**. The spring **562** and the valve plug **560** are positioned inside the beverage outlet passage **552** and the spring **562** urges the plug **560** towards the seal **564**. If desired, the spring can be removed and the plug **560** can be biased by the pressurized beverage in the bottle **516**.

[0144] As seen in FIG. **21**, the pressurized gas valve assembly includes a plug **572** that is biased by a spring **574** towards the seal **564**. If desired, a separate seal can be provided for the pressurized gas valve assembly and the beverage valve assembly. The plug **572** seals against the seal **564** to prevent the beverage and gas from leaving the bottle **516** through the pressurized gas inlet **554** until the plug **572** is moved away from the seal. As seen in FIG. **21**, the gas inlet passage **554** is also stepped to provide a seat for the spring **574**. The spring can be removed and the plug **572** can be biased by the internal pressure of the pressurized beverage in the bottle; however, if pressure is lost inside the bottle the valve assembly may not seal. The gas valve assembly can also be replaced by foil or a similar device that acts as a plug.

[0145] A hollow dip tube **582** extends into the bottle **516** and is in communication with the beverage outlet passage **552**. The beverage outlet passage **552** can bend downwardly at about a thirty degree angle from horizontal so that the dip tube **582** extends towards the rear lower end of the bottle **516** when the bottle is situated horizontally. A support **584** can attach to the cartridge receptacle **536** to provide some rigidity to the distal end of the beverage outlet passage **552**. The dip tube **582** can be made from a flexible material similar to the dip tube **82** that has been described above.

[0146] The dispensing assembly **514** receives the bottle assembly **512**. The bottle assembly **512** is designed to be

removed from the dispenser assembly **514** after the beverage has been dispensed from the bottle, or earlier if desired, and replaced with a new bottle assembly. The dispenser assembly **514** includes more of the expensive components of the beverage dispensing system and is designed to be reused with many different bottle assemblies.

[0147] With reference to FIG. **19**, the dispensing assembly **514** includes a housing, which in the depicted embodiment includes a lower housing **590**, an upper housing **592**, a face plate **594**, and a base **596**. The housing can take other configurations and can be made from a fewer or greater number of components. The housing that is depicted in FIG. **19** is made of plastic, but can be made of other materials.

[0148] The lower housing **590** is generally half-cylindrical, similar to the lower housing **90** described above. The lower housing **590** includes a central recess **600** that extends from a forward end of the lower housing rearwardly and leads into a larger rectangular recess **602** that is disposed at a rearward end of an upper platform **604** of the lower housing **590**. A central slot **606** extends through the upper platform **604** in the central recess **600** and the rearward rectangular recess **602** from adjacent a rearward edge of the upper platform **604** and terminates before reaching the forward edge of the upper platform. The central slot **606** is axially aligned with the central axis of the housing. The lower housing **590** also includes outer axial slots **608** that are spaced from the central slot **606**.

[0149] The upper housing **592** is generally half-cylindrical in shape so that when it is connected to the lower housing **590** a generally cylindrical housing is formed. The upper housing **592** attaches to the lower housing **590** in much the same manner as the upper housing **92** attaches to the lower housing **90** in the dispenser assembly that was described above. Accordingly, further description of how the two components attach to one another is not provided. The upper housing **592** includes radial recesses **614** that are similar to radial recesses **612** in the lower housing **590** for attaching the face plate **594** to the lower housing and the upper housing. The upper housing **592** also includes a recess **616** where a user can insert his hands when dispensing beverage from the dispensing assembly as well as when loading a new bottle assembly **512** into the dispenser assembly **514**. The finger recess **616** is disposed on the upper surface of the upper housing **592**.

[0150] The face plate **594** is generally circular. The face plate includes small ribs **620** that fit into the axial slots **608** and **612** formed in the lower housing **590** and the upper housing **592**, respectively. Handles **622** are also provided on opposite sides of a diameter of the circular face plate **594**. The handles **622** are similar to the handles described with reference to the face plate **594** above. The face plate **594** also includes a central opening **624**. Rectangular openings **628** are positioned above the central opening **624** and are equidistantly spaced from the central opening **624**. Fastener openings **632** are also found on the face plate. The face plate **594** also includes an extension **634** that is disposed below the central opening **624** and is bisected by a diameter that runs through the central opening. The extension **534** is similar to a flange having a L-shape that is projected downwardly. A rectangular opening **636** is disposed beneath the extension **634**.

[0151] The base **596** is generally a box-shaped component having forward and rearward side walls **640** that are formed to have a saddle shape for receiving the lower housing. A circular opening **642** is formed in a lower wall of the base **596**.

[0152] With reference to FIG. **19**, a frame **652**, a connector **654**, a bottle retainer **656**, an alignment bracket **658**, a slide **662**, a lever **664** (visible in FIGS. **21** and **22**), and a knob **666** all cooperate with one another to attach the bottle assembly **512** to the dispenser assembly **514** so that a beverage can be dispensed. The knob **666** acts as a movable handle component that is operably connected to the bottle assembly to draw the bottle assembly toward the gas spike and the beverage spike.

[0153] As seen in FIG. **21**, a frame cover **668** is sandwiched between the face plate **594** and the frame **652** in a similar manner as in the embodiment described above. The frame **652** attaches to the face plate **594** and provides a structure to allow the moving components of the dispenser assembly to bring the bottle assembly **512** into engagement with the pressure source and the dispensing system of the beverage dispensing assembly. With reference to FIG. **19**, the frame **652** includes a curved recess **672** that receives a pressure regulator **674** (that is very similar to the pressure regulator **158** described above and therefore further description will not be provided). The frame also includes a nipple **676** to allow for the connection of a hose **678** (shown in phantom) that is in communication with the pressure regulator **674** to allow for high pressure gas that enters the pressure regulator **674** to be released into the internal compartment of the bottle **516** at a lower pressure after traveling through the pressure regulator. The frame **652** also includes vertical slots **682** on opposite sides of the frame, which is similar to the frame that has been described above with reference to FIGS. **1-15**. The frame **652** also includes a lower tongue **684** (FIGS. **20** and **22**) that extends from a lower end of the frame. The tongue **684** extends through the lower rectangular opening **636** formed in the face plate **594** and cooperates with the extension **634** formed on the face plate in a manner that will be described in more detail below.

[0154] The connector **654** is a generally U-shaped member. The connector **654** includes outwardly protruding posts **690** that are received in the vertical slots **682** of the frame **652**. L-shaped cam arms **692** depend downwardly from where the outwardly protruding posts are found on the connector. The connector **654** also includes openings **694** at the top of each cam arm.

[0155] The bottle retainer **656** is also a generally U-shaped component. As opposed to the connector **654**, the U-shaped bottle retainer **656** extends so that the U-shaped portion extends downwardly. Loops **700** are formed at opposite terminal ends of the bottle retainer **656**. Hooks **702** are spaced rearwardly with respect to the loops **700** (per the orientation where the face plate **594** is the front of the assembly). The loop **700** provide a means for attaching the bottle retainer **656** to the alignment bracket **658**. Ridges **704** extend from the outer side of the bottle retainer between the end of each hook **702** and the corresponding loop **700**. With reference to FIG. **22**, a spring pin **706** is formed along an axis of symmetry of the U-shaped bottle retainer. The spring pin **706** receives a compression spring (not shown) that biases the bottle retainer **656** into an open position with respect to the alignment bracket **658**. In the depicted embodiment, the bottle retainer **656** is biased towards the face plate **594** and away from the alignment bracket **658**. The connector can be biased open in other manners, e.g. a torsion spring.

[0156] As seen in FIGS. **19** and **22**, the alignment bracket **658** is a generally cylindrical component having a generally circular opening that leads into offset slots **714**. The alignment bracket **658** is very similar in configuration with the alignment bracket **154** that is described with reference to

FIGS. **1-15**. The slots **714** are configured to receive the handles **532** of the cap assembly **518** when the bottle assembly **512** is inserted into the dispenser assembly **514**. The alignment bracket **658** also includes a pair of outwardly protruding posts **716** that are received in the openings **694** of the connector **654** for attaching the connector **654** to the alignment bracket **658**. The alignment bracket also includes inwardly protruding posts **718** that are received in the loops **700** of the bottle retainer **656**.

[0157] With reference to FIG. **22**, the slide **662** includes a transverse notch **724** that is elongated in a direction that is transverse to the direction of travel of the slide **662**. The transverse notch **724** allows the knob **666** to cooperate with the remainder of the components so that when the knob is rotated the pressure regulator **674** comes into fluid communication with the internal compartment of the bottle **516**. With reference back to FIG. **19**, the slide **662** also includes openings **726** that are configured to receive the cam arms **692** of the connector **654**.

[0158] When the dispenser assembly **514** is assembled, the slide **662** is disposed below the lower housing **590** and the cam arms **692** of the connector **654** extend through the outer axial slots **608** formed in the lower housing thus connecting the connector **654** to the slide **662**. The slide **662** moves in an axial direction in response to rotation of the knob **666**.

[0159] With reference to FIG. **22**, the lever **664** includes an integrally formed axle **730** that rests in an appropriate recess formed in the lower housing **590**. The lever **664** includes a chamfered rear contact surface **732** that is contacted by the slide **662** when the slide moves transversely towards the lever. The lever **664** also includes a rib **734** that extends downwardly from the lever and is aligned with the axis in which the slide moves.

[0160] The knob **666** is generally circular in configuration. The knob includes two recesses **736** to define a handle **738** that is easily gripped by a user of the device. A pin **740** extends upwardly from an inner surface of the knob **666**.

[0161] Rotation of the knob **666** results in the pin **740** and a bushing **742** (received on pin **740**) moving from an outer end of the notch **724**, with respect to a central axis of the dispenser assembly, towards an inner end of the notch. This results in the slide **662** moving transversely towards the face plate **594**. The slide **662** contacts the lever **664**, which presses against the bottle retainer **656** rotating the bottle retainer so that the biasing force of the spring **708** is overcome and the hooks **702** engage the catches **532** of the cap assembly **518**. Further movement of the slide **662** results in the over center cam arms **692** riding over the appropriately shaped openings **726** far enough so that an over-center type latch is formed between the connector **654** and the slide **662**.

[0162] With reference back to FIG. **19**, the dispensing assembly **514** also includes a tap handle **750** and a spout **752** that each attach to the face plate **594** of the housing. The tap handle **750** is rotated with respect to the face plate **594** to dispense a metered portion of a pressurized beverage, or other liquid, from the bottle **516** through the spout **752**. The tap handle **750** includes an integrally formed axle **754** at a lower end and a contact surface **756** disposed at an upper end. The contact surface **756** can be depressed so that the tap handle **750** rotates about the integral axis **754** to dispense beverage. The integral axis **754** is captured by the extension **634** on the face **594** plate and the tongue **684** of the frame **652**, as more clearly seen in FIG. **20**. The tap handle **750** also includes rearwardly extending barbs **758** that are received in the rectangular openings **628** to limit movement of the contact surface **756** of the tap handle away from the face plate **594**. More clearly seen in FIG. **22**, the tap handle **750** also includes recesses **762** formed on a rear surface of legs **764** that are interconnected by the integral axis **754**. The recesses **762** cooperate with the spout **752** in a manner that will be described in more detail below.

[0163] With continued reference to FIG. **19**, the spout **752** includes shoulders **770** having a rounded surface that allows the spout **752** to be trapped between the recesses **762** formed on a rear surface of the tap handle **750** and the face plate **594**. A central hollow fitting **772** extends rearwardly from the shoulder **770** and is in fluid communication with a hollow outlet passage **774** (FIG. **20**) that extends forwardly from the shoulder. As more clearly seen in FIG. **22**, the spout **752** also includes a locking finger **776** that is received in the crescent-shaped opening **626** formed in the face plate **594**. As can be seen in FIG. **19**, the crescent-shaped opening **626** includes a wider opening adjacent the three o'clock position with respect to the central opening **624**. Accordingly, the spout **752** can be rotated counterclockwise so that the locking finger **776** no longer engages a rear surface of the face plate **594** so that the spout can be removed from the assembly and cleaned. Alternatively, the spout **752** can include a resilient locking finger **776** having a bump at a distal end. The spout can be inserted into an opening, similar to the crescent-shaped opening **626** without having to rotate the spout. In this embodiment the distal bump can ride over the face plate **594** when inserted into the opening and engage the face plate to remain in place.

[0164] A rigid tube **778** fits onto the hollow fitting **776** and extends into the dispensing assembly and into the frame **652** (see FIG. **20**). A spring **782** biases the rigid tube **778**, the spout **752**, and thus the tap handle **750** away from the face plate **594**. With reference to FIG. **20**, to dispense a beverage a user presses against the contact surface **756** which results in the tap handle **750** rotating towards the face plate **594** about the integral axle **754**. This rotational movement results in the rigid tube **778** pressing against the beverage valve assembly thus opening the outlet passage to allow beverage to flow from an internal compartment of the bottle **516** out the outlet passage **774** of the spout. The rigid tube **778**, which also acts as a beverage outlet passage, has a notch **780** formed in an upper distal section. When the tap handle **750** is at the rest position, the notch **780** moves away from the seal **564** and ambient pressure can enter the rigid tube **778** to flush out the tube after dispensing.

[0165] As discussed above the beverage that is dispensed is pressurized. The pressure regulator **674** receives pressurized gas from the cartridge **528** received in the cartridge receptacle **538** at a higher pressure and delivers pressurized gas at a lower pressure to the internal compartment of the bottle **516**.

[0166] With reference to FIG. **20**, when the knob **666** is rotated thus bringing the bottle assembly **512** towards the dispenser assembly **514**, the gas cartridge in the cartridge receptacle **538** is also pierced in much the same manner as the embodiment described above. In the depicted embodiment, a seal can be provided and shipped with the bottle assembly **512** that is pierced by the piercing pin of the pressure regulator **674**. High pressure gas exits the gas cartridge and enters the pressure regulator **674** and is dispensed through the outlet nipple **676** traveling through the hose **678** and into a passage formed in the frame **652**. The pressurized gas enters the bottle **516** to propel the beverage from the bottle (when the beverage

valve assembly is open) as well as to maintain the desired carbonation in the bottle after some of the contents of the bottle have been dispensed.

[0167] With reference to FIG. **23**, an alternative embodiment of a beverage dispenser system **810** is disclosed. The system **810** includes a bottle assembly **812**, which is similar to the bottle assembly **12** described with reference to FIGS. **1-15** and therefore further description will not be provided, and a dispenser assembly **814**.

[0168] The dispenser assembly **814** includes a housing made up of a rear housing section **816**, a base **818**, a front door **822** and a lid **824**. The rear housing section **816** connects to the base **818**. The front door **822** and the lid **824** both pivot with respect to the stationary rear housing section **816** and the base **818**. A platform **826** connects to the front door **822** and rotates therewith. The platform **826** supports the bottle assembly **812** during loading of the bottle assembly into the dispenser assembly **814**. The base **818** can be formed to include a recess covered by a drip tray **828**.

[0169] FIGS. **23** and **24** depict the door **822** and the lid **824** in an open position. When these components are in the open position, the bottle assembly **812** can be loaded into and removed from the dispenser assembly **814**. As most clearly seen in FIG. **24**, when the door **822** is moved into the open position, the door does not advance beyond the plane of the sidewalls when opened. In other words, the door **822** pivots about a horizontal axis in contrast to the door swinging in a vertical axis towards one of the sides of the stationary rear housing **816**. Such a configuration facilitates the loading and unloading of the bottle assembly **812** into the dispenser assembly **814** while limiting the amount of spaced required when one is attempting to load or unload a bottle assembly **812** from the dispenser assembly **814**. If the door were to rotate about a vertical axis, clearance would need to be provided to the sides of the stationary housing section **816**. By having the front door **822** pivot about a horizontal axis, the path traversed by the front door is much the same path that is traversed when one places a glass on the drip tray **828** to dispense a beverage from the system **810**. This path will be typically left open on the countertop or table that supports the assembly **810**. Moreover, the configuration shown in FIGS. **23-25** does not require repositioning of the dispensing system **810** in order to load or unload a bottle assembly **812** from the beverage dispenser assembly **814**.

[0170] The lid **824** also rotates about a horizontal axis. By having the lid **824** rotate about a horizontal axis and the front door **822** rotate about a horizontal axis, the distance that the lid must travel with respect to the rear housing is limited to provide the required clearance for removing the bottle assembly **812** from the dispenser assembly **814**. Accordingly, the dispenser system **812** can be conveniently located on a countertop underneath wall mounted cabinets and the bottle assembly **812** can be loaded into the dispenser assembly **814** while the dispenser system **810** remains underneath the wall mounted cabinets. Similarly, when the lid **824** is in the open position, the lid does not advance beyond the plane defined by the sidewalls of the stationary section **816**.

[0171] With reference to FIG. **26**, some of the internal components of the beverage dispensing system shown in FIG. **23** are disclosed. The system includes a frame **830** that attaches to the rear housing section **816** at an upper end thereof. The frame **830** cantilevers forward from the rear housing section **816**. The frame includes a U-shaped slot **832** that receives the cap of the bottle assembly **812**. Vertical guides **834** extend upwardly from the frame.

[0172] A piercing block **840** is received on the vertical guides **834** so that the pierce block can move up and down on the vertical guides. The piercing block **840** includes a beverage passage and a gas passage, which are not visible in the figures. The gas passage is in fluid communication with a pressure regulator **842**, which is similar to the pressure regulators described above in that it receives pressurized gas from a gas cartridge in the bottle assembly **812** of a first pressure and delivers pressurized gas to the internal compartment of the bottle assembly at a lower pressure. The gas passage inlet may include a valve that is normally closed and is opened when the pierce block **840** is brought towards the bottle assembly **812** to in the bottle assembly.

[0173] A lower linkage set **844** is pivotally connected to the frame **832** at a pin **846**. Each linkage of the lower linkage set **844** also includes a slot (not visible) that receives a pin **848** that connects the linkage set **844** to the piercing block **840**. Each linkage of the lower linkage set **844** connects to a respective linkage of an upper linkage set **852** at a pin **854**. An upper end of each linkage of the upper linkage set **852** includes an opening **856** that allows this linkage set to pivotally attach to the lid **824** (FIG. **23**). The lid **824** also attaches to the rear housing section **816** via a pin (not visible) that is received in an opening **858** formed in the rear housing section **816**. As the lid **824** is rotated from the open position towards the closed position the linkage sets **852** and **844** cooperate with the frame **830** to move the piercing block **840** towards the bottle assembly **812**. The piercing block **840** includes a piercing pin (similar to the piercing pin described above) that pierces the gas cartridge in the bottle assembly **812**. The piercing block **840** also includes spikes that pierce the gas valve assembly and the beverage valve assembly, respectively. A biased lid lock **862** can cooperate with the lid **824** to retain the lid in a closed position. In this embodiment, it is the lid **824** that acts as a movable handle component that is operably connected to the beverage spike and the gas spike to move each spike towards the bottle assembly.

[0174] The beverage dispensing system **810** can also include a chilling device **870** that can be used to chill the contents of the bottle assembly. In the depicted embodiment, the chilling device **870** is a Peltier device, but other refrigeration type devices including ones that use compressors can also be used. A fan **872** attaches to the rear housing section **816**. An aluminum back panel **876** connects to the chilling device **870** so that the contents of the bottle **812** can be cooled. The front door **822** can be made from an insulated material such as an insulating plastic.

[0175] With reference back to FIG. **23**, the dispensing system **810** includes a tap handle **880** and a spout **882**. As seen when comparing FIG. **23** to **25**, the tap handle **880** and the spout **882** can rotate from an unlocked position (shown in FIG. **23**) to a locked position (shown in FIG. **25**). The spout **822** includes a beverage outlet passage **884** that is in fluid communication with the beverage passage found in the piercing block **840** so that when the tap handle **880** is rotated towards a dispense position, which can either be by pulling or pushing, this actuates the beverage valve actuator in the bottle assembly to open to allow fluid to be dispensed from the system. The beverage passage in the sliding piercing block **840** and the outlet passage **884** of the spout **882** can be connected via a hose or via a direct connection. Similarly, the pressure regulator **842** can also be in fluid communication

with the internal compartment of the bottle assembly **812** through a hose or through a direct connection in the piercing block **840**.

[0176] The embodiment depicted in FIGS. **1-15** and **18-22** depict the bottle assembly being brought towards the gas spike and the beverage spike through the movement of a movable handle component (e.g. handle **156** and knob **666**). The embodiment depicted in FIGS. **23-27** depict the gas spike and the beverage spike being brought towards the bottle assembly through the movement of a movable handle component (e.g. lid **824** and/or tap handle **880**). The embodiments depicted in FIGS. **1-15** and **18-22** can be modified to move the spikes toward the bottle assembly through the operation of a movable component in a similar manner to the embodiment shown in FIGS. **23-27**.

[0177] With reference to FIGS. **28***a-d*, an alternative embodiment of a beverage dispensing system is schematically depicted. In the embodiment shown in FIGS. **28***a-d*, a bottle assembly **1012** (similar to bottle assembly **12**) cooperates with a dispenser **1014**. The bottle assembly **1012** includes a bottle **1016** and a cap **1018** that closes an internal compartment **1022** of the bottle. A one-way check valve **1024** is disposed in the cap **1018** and is in communication with a dip tube **1026** that extends into the internal compartment **1022**.

[0178] In the embodiment depicted, the dispenser **1014** includes a housing **1030** that defines a vessel receptacle **1032**. A dual-purpose gas and beverage spike **1034** is disposed in the vessel receptacle **1032**. A plunger **1036**, or similar actuator, is also disposed in the vessel receptacle **1032**. The gas/beverage spike **1034** is in fluid communication with a two-way two-position valve **1038** biased into an initial position by a spring **1040**. The plunger **1036** mechanically operates a two-position valve **1042** that is in communication with the two-way two-position valve **1038** separated by a one-way check valve **1044** that checks fluid from flowing from the two-way two-position valve **1038** toward the two-position valve **1042**. A pressure regulator **1046** (similar to the pressure regulators described above) is also in communication with the valves **1038** and **1042** as well as a pressure source **1048**, which in the depicted embodiment is a gas cartridge similar to the gas cartridges described above. The gas cartridge **1048** is received in a cartridge receptacle **1052** that includes a piercing mechanism similar to the piercing mechanisms described above. Different than the embodiments described above, the gas cartridge **1048** is not received in the bottle **1016**. The two-position valve **1042** is biased toward a blocked position by a spring **1050**.

[0179] With reference to FIG. **28***b*, the bottle assembly **1012** is brought towards the dispensing assembly **1014**, or vice versa, which results in the plunger **1034** actuating the two-way valve **1042** to position it to an open state. The gas/beverage spike **1034** opens the one-way check valve **1024**. Pressurized beverage in the internal compartment **1022** is precluded from escaping past the check valve **1044**.

[0180] With reference to FIG. **28***c*, the gas cartridge **1048** is loaded into the cartridge receptacle **1052** to supply pressurized gas to the internal compartment **1022**. The cartridge **1048** is pierced when loaded into the receptacle **1052**.

[0181] With reference to FIG. **28***d*, the two-way two-position valve **1038** is moved into its second position so that beverage is dispensed into a dispensing vessel **1054**. The pressurized gas from the pressure source **1048** is enough to propel the beverage out of the internal compartment **1022** and through the lines to an outlet **1056**. When the two-way two-position valve **1038** moves back to a biased initial position, the pressure source **1048** recharges the pressure in the internal compartment **1022** of the bottle **1016** to the pressure at which the pressure regulator **1046** delivers pressure, which is approximately 15 psig.

[0182] With reference to FIGS. **29***a-d*, an alternative embodiment of a beverage dispensing system is shown. In this embodiment, a bottle assembly **1112** cooperates with a dispensing assembly **1114**. In this embodiment, the bottle assembly includes a bottle **1116** closed by a cap **1118** that closes off an internal compartment **1122**. The cap includes a first check valve **1124** and a second check valve **1126**. A dip tube **1128** is also disposed in the internal compartment **1122** and is in communication with the first check valve **1124**.

[0183] The dispensing assembly **1114** includes a housing **1130** that defines a vessel receptacle **1132**. A gas port (spike) **1134** and a beverage port (spike) **1136** are disposed in the receptacle **1132**. A plunger **1138** is also disposed in the vessel receptacle **1132**. A normally closed two-position valve **1042** is operated by the plunger **1138** and is biased into a closed position by a spring **1144**. A pressure regulator **1146** is in fluid communication with the valve **1142** and a cartridge receptacle **1148**. The gas check valve **1126** in the cap **1118** and the valve **1142** are also in fluid communication.

[0184] With reference to FIG. **29***b*, when the bottle assembly **1112** is moved towards the dispensing assembly **1114**, or vice versa, the beverage port (spike) **1136** opens the first check valve **1124**.

[0185] With reference to FIG. **29***c*, when the cartridge **1152** is loaded into the cartridge receptacle **1148**, the cartridge is pierced and pressurized gas is delivered to the pressure regulator **1146** and into the internal compartment **1112** of the bottle **1116** through the two position valve **1144** and the check valves **1154** and **1126**.

[0186] With reference to FIG. **29***d*, the beverage check valve **1124** is opened to dispense beverage out an outlet **1156** and into a vessel **1158**.

[0187] In lieu of providing a one-way check valve and operating the one-way check valve as shown in FIG. **29***d*, an on/off spigot can be provided and the beverage port **1136** can be a spike that opens the check valve **1124** when the bottle assembly **1112** is inserted into the dispensing assembly **1114**, or vice versa.

[0188] FIGS. **30** and **31** disclose an alternative embodiment of the beverage dispensing assembly where the seal between the pressurized gas source and the pressure regulator becomes a disposable component. This can better maintain the seal between the pressurized gas source and the pressure regulator as compared to placing the seal in the pressure regulator and re-using the seal over and over. Where the seal is found in the pressure regulator, the seal can deform over time, which can result in leakage between the pressurized gas source and the pressure regulator. This is undesirable.

[0189] FIG. **30** depicts a beverage assembly having the same components and configuration as the beverage assembly described with reference to FIGS. **18-22**, except for the cap assembly **1202** and the pressure regulator **1204**. The cap assembly **1202** threads onto the bottle similar to the cap assembly **18** described above. The cap assembly includes a gas cartridge receptacle **1204** that receives a gas cartridge **1206**. The gas cartridge **1206** can be brought towards the pressure regulator **1204** in any of the manners described above, e.g. through movement of a handle **156** described above or through movement of a knob **666** which is similar to

the knob shown in FIG. **19**. The manner in which the gas cylinder **1206** is brought towards the pressure regulator **1204** is more particularly described above. Alternatively, the pressure regulator **1204** could be brought towards the gas cylinder **1206**.

[0190] In the embodiment depicted in FIGS. **30** and **31**, a gas cylinder cap **1220** threads onto the gas cylinder **1206**. An axial passage **1222** extends through the gas cylinder cap **1220**. A pin **1224** is received in the passage **1222** and has a pointed end that punctures the cylinder and a flat head that provides a contact surface for a spike **1226** to contact the head. A cover **1228** receives an end of the gas cylinder cap **1220** and includes an opening **1230** having an O-ring seal **1232** disposed therein. A stem **1234** of the spike **1226** can fit through the opening **1230** and the O-ring seal **1232**. Another O-ring seal **1236** fits around the gas cylinder cap **1220** and extends radially outwardly from the radial outer surface of the cover **1228** and the gas cylinder cap **1220**. A filter **1238** is positioned downstream from the spike **1226** inside a passage **1242** formed in the pressure regulator **1204**. The remainder of the pressure regulator is similar to the pressure regulators described above.

[0191] With reference to FIG. **31**, when the gas cylinder **1206** is brought towards the pressure regulator **1204**, or vice versa, the stem **1234** of the spike **1226** fits into the opening **1230** of the cover **1228** to displace the pin **1224** to puncture the cylinder **1206**. The seals **1232** and **1236** prevent leakage. These seals are disposed when the container is removed. Pressurized gas passes from the gas cylinder **1206** through the opening **1222** around the pin **1224**. Gas passes through an axial opening **1250** in the spike **1226** and into the pressure regulator **1204**.

[0192] With reference to FIG. **32**, a gas cylinder **1306** having a threadless cartridge tip is shown. An O-ring gasket **1308** is disposed between the threadless cartridge tip of the gas cylinder **1306** and a gas cylinder cap **1320**. The remainder of the components shown in the embodiment shown in FIG. **32** are the same as the components shown in FIGS. **30** and **31**, except what is described below, and therefore for the sake of brevity, further description has not been provided. If desired, a face seal can be provided between the end of the tip of the cartridge and the surface in the gas cylinder cap around the gas outlet passage.

[0193] FIG. **32** also discloses a dip tube diverter **1330** that receives a dip tube **1332** similar to the dip tubes described above. The dip tube diverter includes a fin **1334** that contacts and extends from the gas cartridge receptacle **1336**. The dip tube diverter **1334** also includes a tubular portion **1338** that includes a passage **1342** that receives the dip tube **1332**. As more clearly seen in FIG. **33**, the dip tube diverter **1330** imposes a desired bend upon the dip tube **1332**. The design shown in FIGS. **32** and **33** also results in one less sealed interface as compared to the design shown in FIGS. **30** and **31**. This design also provides a gentle, smooth directional change by virtue of a gradual bend formed in the passage **1342** of the tubular portion **1338** of the dip tube diverter **1330**. The remainder of the components for the container and cap assembly shown in FIGS. **32** and **33** are the same or very similar to those described above; therefore, for the sake of brevity further description has not been provided.

[0194] With reference to FIG. **34**, an alternative embodiment of a beverage dispensing system is schematically depicted. FIG. **34** shows a container **1412** cooperating with a dispenser **1414**. The container **1412** includes a bottle **1416** and a cap **1418** that encloses an internal compartment **1422** of the bottle.

[0195] The cap **1418** includes a cylindrical side wall **1424** having internal threads **1426**. A circular end wall **1428** is located at an upper end of the cylindrical side wall **1424**. The cap **1418** also includes a cartridge receptacle **1432** and a beverage and gas valve receptacle **1434**. The cartridge receptacle **1432** is configured to receive a conventional twelve ounce CO2 cartridge **1436** and terminates at a cartridge receptacle opening **1438**. The beverage and gas valve receptacle **1434** is formed having a base wall **1442**, which is circular in the depicted embodiment, an inner cylindrical wall **1444** that extends upwardly from the base **1442** and an outer cylindrical wall **1446**, which is coaxial with the inner cylindrical wall **1444** and also extends upwardly from the base **1442**. The beverage and gas valve receptacle **1434** terminates at the circular end wall **1428** of the cap **1418** at a beverage/gas valve opening **1448**. A nipple **1452** depends downwardly from the base **1442** and is connected with a passage (beverage or beer outlet passage) **1454** defined by the inner cylindrical wall **1444**. A dip tube **1456** attaches to the nipple **1452** and is connected with the passage **1454** defined by the inner cylindrical wall **1444**. A dip tube **1456** attaches to the nipple **1452** and extends downwardly into the bottle **1416**. An outer annular passage (low pressure gas inlet passage) **1458** is defined between the inner cylindrical wall **1444** and the outer cylindrical wall **1446** so that the outer annular passage **1458** can be isolated from the inner passage **1454**. Openings **1462**, which can be slots, are formed in the outer cylindrical wall **1446** to allow for a connection between the outer annular passage **1458** and the internal compartment **1422** of the bottle **1416**. This will be described in more detail below.

[0196] A cartridge cap assembly **1470** connects onto a tip of the pressurized gas cartridge **1436**. The cartridge cap assembly includes a cartridge cap **1472** having a cavity **1474** that receives the tip of the pressurized gas cartridge **1436**. An O-ring seal **1476** fits around the tip of the pressurized gas cartridge **1436** to seal the cavity **1474** from the internal compartment **1422** of the bottle **1416**. The gas cartridge cap **1472** includes a gas outlet passage **1478** that extends from an uppermost surface of the cap **1472** into the receptacle **1474**. The gas outlet passage **1478** is stepped having a lower section having a larger diameter than an upper section. A piercing pin **1482** is received in the gas outlet passage **1478**. The pin **1482** includes a shoulder **1484** that extends outwardly from a shank. The shoulder **1484** cooperates with the stepped gas outlet passage **1478** so that the pin is retained within the gas outlet passage if the container **1412** is removed from the dispenser **1414**. A seal **1486** is disposed above the shoulder **1484** (per the orientation shown in FIG. **34**) and a spring **1488** is disposed below the shoulder, and both the seal **1486** and the spring **1488** surround the pin. The spring **1488** acts against the tip of the gas cartridge **1436** and biases the pin **1482** away from the gas cartridge to seal the upper section (smaller diameter) of the gas outlet passage **1478** with respect to the receptacle **1474**. This allows the container **1416** to be removed from the dispenser **1414** and the pressurized gas in the pressurized gas cartridge **1436** is precluded from emptying into the atmosphere because of the seal **1486**.

[0197] A retainer **1492** connects to an uppermost end of the cap **1472** and includes an opening **1494** that is aligned with and connected with the gas outlet passage **1478**. A seal **1496** is disposed below the retainer **1492** around the cap **1472**.

[0198] The dispenser **1414** includes a dispenser housing **1500** that connects with the cap **1418** to dispense the beverage from the internal compartment **1422** of the bottle **1416**. The dispenser **1414** can be similar to the dispensers described above, e.g. dispensing assembly **14**. The dispenser **1414** includes many components similar to those described with regard to the dispensers above, therefore a detailed description of each of the components in the dispenser **1414** is not provided.

[0199] A high pressure gas inlet passage **1502** is found in the housing **1500**. The high pressure gas inlet passage **1502** is in communication with ambient when the dispenser **1414** is not connected with the container **1416**. The high pressured gas inlet passage is also connected with a regulator **1504**, which can be similar to the regulator **158** that has been described above. A push rod **1506** is located in the gas inlet passage **1502** (the push rod could also be located adjacent the gas inlet passage). The push rod **1506** displaces the pin **1482** to pierce the pressurize gas cartridge **1436** to deliver high pressure gas to the regulator **1504** via the high pressure gas inlet passage **1502**. A low pressure gas outlet passage **1508** is downstream from and connected to the regulator **1504**. The low pressure gas outlet passage **1508** connects with the low pressure gas inlet passage, which is the outer annular passage **1458** found in the beverage and gas valve receptacle **1434** formed in the cap **1424**. The regulator **1504** is configured to receive gas at a first pressure and to deliver gas at a second, lower, pressure to the internal compartment **1422** of the bottle **1416**. The low pressure gas outlet passage **1508** connects to a movable valve actuator **1512** that is operated by a tap handle (not shown in FIG. **34**) similar to the tap handle **200**, which has been described above. The low pressure gas outlet passage **1508** connects to a nipple **1514** formed in the valve actuator **1512**.

[0200] A beverage outlet passage **1516** is also found in the housing **1500** and connects with the movable valve actuator **1512**. The beverage outlet passage **1516** also connects with a beverage spike **1518** formed as a part of the valve actuator **1512**. The movable valve actuator **1512** has a seal **1522** that surrounds the movable valve actuator. The movable valve actuator **1512** is received in the beverage and gas valve receptacle **1434** and the seal **1522** seals against an internal surface of the outer cylindrical wall **1446**. FIG. **34** depicts the dispenser **1414** not yet connected to the container **1412**. Different than the embodiments described above, the gas inlet passage **1458** is coaxial with the beverage outlet passage **1454**.

[0201] With reference to FIG. **35**, the container **1412** and the dispenser **1414** are now connected with one another; either the container **1412** has been brought towards the dispenser **1414** or the dispenser has been brought toward the container, or both have moved in relation to one another. In this state, the push rod **1506** has contacted the pin **1482** so that the gas cartridge **1436** is now pierced. Accordingly, high pressure gas exits the pressurized gas cartridge **1436** and is traveling towards the regulator **1504**. The valve actuator **1512** displaces a valve member **1530** that resides in the outer annular chamber **1458**, which also acts as a low pressure gas inlet passage. A spring **1532** urges the valve member **1530** upwardly (per the orientation shown in FIG. **35**) where it is retained by a retainer **1534**. The valve member **1530** carries an inner seal **1536** that contacts the inner cylindrical wall **1444** and an outer seal **1538** that contacts the outer annular wall **1462**. In the state shown in FIG. **35**, the outer seal **1538** is moved, due to contact by the valve actuator **1512**, into the area of the outer annular wall **1446** that includes the slot **1462**. Accordingly, low pressure gas from the regulator **1504** flows through the low pressure gas outlet passage **1508** in the dispenser **1414** and into the outer annular passage **1458**, which acts as a gas inlet passage, through the slots **1462** and into the internal compartment **1422** of the bottle **1416**. The inner seal **1536** and an upper seal **1542**, which is between the circular end wall **1428** of the cap **1424** and the annular upper edge of the bottle **1416**, isolates the pressurized gas within the internal compartment **1422** of the bottle **1416**.

[0202] With reference to FIG. **36**, the valve actuator **1512** is further displaced into the beverage and gas valve receptacle **1434** to displace a beverage valve member **1542** away from a seal **1544** disposed underneath the retainer **1534**. The beverage valve member **1542** is located inside the inner passage **1454**, which also acts as a beverage outlet, and is biased by a spring **1546** toward the seal **1544**. With the beverage valve member **1542** displaced away from the seal **1544** by movement of the valve actuator **1512**, which is controlled by the tap handle (not shown), the beverage is displaced through the dip tube **1456** and out the beverage outlet passageway **1516**. Releasing the tap handle (not shown—similar to tap handle **200**) returns the system to the state shown in FIG. **35**.

[0203] With reference to FIG. **37**, another alternative embodiment of a beverage dispensing system is schematically depicted. FIG. **37** shows a portion of a dispenser **1614** cooperating with a cap **1618** which can be connected to a bottle (not shown—similar to bottle **1416** in FIG. **34**) to enclose an internal compartment of the bottle. The cap **1618** includes a cylindrical side wall **1624** having internal threads **1626**. A circular end wall **1628** is located at an upper end (per the orientation shown in FIG. **37**) of the cylindrical side wall **1624**. The cap **1618** also includes a cartridge receptacle **1632** that is configured to receive a conventional CO2 cartridge **1636** and terminates at a cartridge receptacle opening **1638**. The gas cartridge receptacle **1632** is coaxial with a beverage and gas valve receptacle **1634**.

[0204] The beverage and gas valve receptacle **1634** is formed having a lower base wall **1642**, which is circular in the depicted embodiment. An inner wall **1644**, which is cylindrical in the depicted embodiment, extends upwardly from the base wall **1634**. The inner wall **1644** divides the beverage and gas valve receptacle **1634** into a beverage chamber **1646** and a gas chamber **1648**. The cap **1618** is also formed to have a notch **1652** formed in the beverage chamber and a notch **1654** formed in the gas chamber. The cap also includes a nipple **1656** that depends from the base wall **1634** and is connected to the beverage chamber **1652**. A dip tube **1658** connects to the nipple. An opening **1662** is formed through the base wall **1634** and is connected to the gas chamber **1648**.

[0205] A cartridge cap assembly **1670** connects onto a tip of the pressurized gas cartridge **1636**. The cartridge cap assembly **1670** includes a cartridge cap **1672** having a cavity **1674** that receives the tip of the pressurized gas cartridge **1636**. An O-ring seal **1676** fits around the tip of the pressurized gas cartridge **1636** to seal the cavity **1674** from the internal compartment of the bottle that is attached to the cap **1618**. The gas cartridge cap **1672** includes a gas outlet passage **1678** that extends from an uppermost surface of the cap into the receptacle **1674**. A piercing pin **1682** is received in the gas outlet passage **1678** and can be retained in the manner as described above with reference to FIGS. **34-36**. A seal **1696** is

disposed around the cap **1672** to seal the cap against a surface of the dispenser **1614** when the cap is moved towards the dispenser, or vice versa.

[0206] The dispenser **1614** includes a dispenser housing **1700** (depicted schematically) that connects with the cap **1618** to dispense the beverage from the internal compartment of the bottle (not shown) that is closed by the cap. The dispenser **1614** can be similar to the dispensers described above, e.g. the dispensing assembly **14**. The dispenser **1614** includes many components similar to those described above with regard to the dispensers above. Therefore a detailed description of each of the components in the dispenser is not provided.

[0207] A high pressure gas inlet passage **1702** is found in the housing. The high pressure gas inlet passage **1702** is in communication with ambient when the dispenser **1614** is not connected with the container or the cap **1618**. The high pressure gas inlet passage is also connected with a regulator **1704**, which can be similar to the regulator **158** that has been described above. A push rod **1706** is located in the gas inlet passage **1702** (the push rod can also be located adjacent the gas inlet passage). The push rod **1706** displaces the pin **1682** to pierce the pressurized gas cartridge **1636** to deliver high pressure gas to the regulator **1704** via the high pressure gas inlet passage **1702**. A low pressure gas outlet passage **1708** is downstream from and connected to the regulator **1704**. The low pressure gas outlet passage **1708** connects with the low pressure gas inlet passage, which has been referred to above as the gas chamber **1648**. The regulator **1704** is configured to receive gas at a first pressure and to deliver gas at a second, lower, pressure to the internal compartment of the bottle that is closed by the cap **1618**. The low pressure gas outlet **1708** connects to a movable valve actuator **1712** that is operated by a tap handle (not shown in FIG. **37**, but similar to the tap handle **200** described above). The low pressure gas outlet passage **1708** connects to a nipple **1714** formed in the valve actuator **1712**. The nipple **1714** connects to an inner annular chamber **1716**. The movable valve actuator **1712** also defines an outer annular chamber **1718** that is isolated from the inner annular chamber **1716** by an internal wall **1722**. A nipple **1724** extends upwardly from the movable actuator **1712** and is connected with the outer annular chamber **1718** and also with a beverage outlet passage **1726**. The movable valve actuator includes an external O-ring seal **1728** and an internal O-ring seal **1732**.

[0208] With reference to FIG. **38**, the container having the cap **1618** attached thereto and the dispenser **1614** are now connected with one another; either the cap **1618** has been brought towards the dispenser **1614** or the dispenser has been brought toward the cap, or both have moved in relation to one another. In this state, the push rod **1706** has contacted the pin **1682** so that the gas cartridge **1636** is now pierced. Accordingly, high pressure gas exits the pressurized gas cartridge **1636** and travels towards the regulator **1704**. The movable valve actuator **1712** displaces a valve member **1750** that resides in the beverage and gas valve receptacle **1634**. As more clearly seen in FIG. **37**, a spring **1752** urges the valve member **1730** upwardly (per the orientation shown in FIG. **37**).

[0209] The valve member includes a number of seals for isolating the chambers of the movable valve actuator **1712** and the cap **1618**. Per the orientation shown in FIG. **37**, an upper seal **1754** acts against an outer wall of the gas chamber **1716** of the movable valve actuator **1712** and the inner O-ring **1732** on the movable valve actuator **1712** acts against the inner annular surface of the gas chamber **1648** in the cap **1618** to isolate the low pressure gas from ambient. A lower outer O-ring seal **1756** acts against an outer wall of the beverage chamber **1646** in the cap **1618** and an intermediate O-ring seal **1758** acts against the cylindrical inner wall **1644** in the beverage chamber **1646** to isolate the beverage chamber when in the non-dispense state (FIG. **37**). An inner O-ring seal **1762** acts against an inner surface of the gas chamber **1648** and with the intermediate seal **1758** isolates the gas chamber **1648** when the cap **1618** is not attached to the dispenser. With reference to FIG. **38**, with the valve actuator **1712** pressed against the valve member **1750**, the lower inner annular seal **1762** falls into the notch **1654** formed in the gas chamber **1648** which allows lower pressure gas from the regulator **1704** to enter into the internal compartment of the bottle closed by the cap **1618**. The outer annular seal **1756** falls into the notch **1652** in the beverage chamber **1646** which allows beverage to exit the internal compartment of the bottle closed by the cap. In this embodiment, the gas cartridge receptacle **1632** is coaxial with the gas chamber **1648** and the beverage chamber **1646**. Another way of stating this is that the gas inlet passage is coaxial with the beverage (beer) outlet passage and the gas cartridge receptacle is coaxial with the gas inlet passage and the beverage (beer) outlet passage. This allows the cap to be oriented in any orientation when being inserted into the dispenser and does not require an indexing means to align the cap with the dispenser, as compared to the embodiments described above.

[0210] With reference to FIG. **39**, the dispenser **14** and the container **12** are the same as those shown in FIG. **1** except for the addition of a drip tray **1814**. Since the dispenser **14** and the container **12** are fully described above, therefore further description of these devices is not provided herein.

[0211] With reference to FIG. **39**, the drip tray **1814** is useful in catching droplets or drips of beer, or another beverage, that collect in an outlet passage of the spout **222** of the dispenser. These drips collect because of the surface tension of the liquid, particularly beer or another beverage, that is being dispensed. These droplets or drips of beverage can exit the outlet passage of the spout a few seconds after the tap handle **200** is no longer being actuated. Since the operator of the dispenser **12** would typically remove his glass from underneath the spout during this time, these drips will fall on anything that is beneath the spout. The drip tray **1814** is provided to catch these drips. Because of the novel orientation of the dispenser **14** and that the dispenser is configured to fit horizontally on a household refrigerator shelf, this makes it difficult to locate a drip tray far beneath the spout where drip trays are typically located to provide access for a glass underneath the spout.

[0212] This can become apparent with reference to FIG. **40** where if the drip tray **1814** were not moveable, the orientation of the glass G into which the beer is being dispensed would have to be more nearly horizontal as compared to the nearly vertical orientation shown in FIG. **40**. A nearly horizontal orientation, obviously, will not work where it is desired to fill up a full glass of beer. In view of this, the drip tray **1814** is moveable between a first position, which is shown in FIG. **39**, and a second position, which is shown in FIG. **40**. When the drip tray **1814** is in the first position, the drip tray is positioned below the spout **222** to capture fluid drips falling vertically from the spout. When the drip tray is in the first position, the drip tray is positioned to prohibit, for example, a pint glass, a

12 ounce glass or 7 ounce glass, into which the beverage is being dispensed from being at least substantially filled by receiving beverage from the spout. If the drip tray **1814** was not movable, then the glass G would have to be in the nearly horizontal orientation that has been described above. When in the second position (FIG. **40**), however, the drip tray **1814** is positioned to allow a pint glass, or the other glasses mentioned above, to be filled, or nearly filled, by receiving beverage from the spout.

[0213] In the illustrated embodiment, the drip tray **1814** pivots about a horizontal axis between a first position and a second position. Translational movement, as well as pivotable movement within a plane, is also contemplated. As seen in FIG. **40**, the drip tray can pivot less than 90 degrees from horizontal when in the second position.

[0214] With reference to FIG. **41**, the drip tray **1814** includes a base **1830** that defines a well **1832** that collects the drips of beverage falling from the spout **1816**. Arms **1834** extend from the portion of the base **1830** that defines the well **1832** towards a dispenser housing **90** for connecting the drip tray **14** to the dispenser housing. The base **1830** includes a chamfered front edge **1838** that is tapered in such a manner that when one approaches the spout with a glass, the chamfer of the front edge **1838** results in the drip tray **1814** being urged downwardly from substantially horizontal to provide the operator of the dispenser access to the spout **222** for filling the glass G. In the illustrated embodiment, the chamfered front edge is, beginning at an upper edge, chamfered downwardly and away from the dispenser housing. The front edge of the base **1830** can also have an arcuate shape that approximates the curve of a typical glass that holds beer or other beverage to provide an indication to the user of where to place the glass so that the drip tray pivots or moves as required to provide access to the spout. A spring **1840**, which can be replaced by a or include a known dampening mechanism, can urge the drip tray **1814** from the second position (FIG. **40**) toward the first position (FIG. **39**).

[0215] Desirably, the volume of the well **1832** is at least about 30 ml and less than about 150 ml. Typically it is desirable to provide the volume of the well to be able to accommodate the drips from the average number of pours (servings) that are to be served from the container **12** (FIG. **1**) until the container is empty. This is based on approximately 2 to 3 drips per pour or serving.

[0216] In the embodiment illustrated in FIG. **41**, the drip tray also includes a sponge **1842** received in the well **1832**. The sponge **1842** can include antimicrobial material as well as a deodorizer, such as charcoal. The volume of the open voids of the sponge **1842** is at least about 15 ml and can be less than about 150 ml. The total volume of the sponge (solid and void space) is slightly less than the total volume of the well and the sponge is shaped to have a configuration similar to that of the well. The sponge **1842** can absorb the beverage that drips onto the drip tray and retain the beverage within the confines of the well when the drip tray **1814** is rotated downwardly, such as that shown in FIG. **40**, as well as when the dispenser **14** is rotated 90 degrees so that the rear end of the container **12** shown in FIG. **1** rests on its surface, e.g., a counter top, when the dispenser is removed from the container.

[0217] The drip tray **1814** also includes a tray cover **1844**. In the embodiment depicted FIGS. **39-42**, the drip tray cover **1844** includes a plurality of slots **1846** through which the drips fall onto the sponge **1842**, of if the sponge is not provided, into the well **1832**. The tray cover **1844** has a peripheral configuration similar to that of the well **1832** so that the tray cover covers the well. A tray cover receptacle can be provided around the periphery of the well **1832** so that the tray cover **1844** is flush with the uppermost surface of the base **1830**. The tray cover **1844** connects with the base **1830** in a manner so that the tray cover **1846** does not detach and fall from the base when in the second position (FIG. **40**). For example, a ledge can be formed in the base **1830** and the cover **1844** can fit under the ledge.

[0218] With reference to FIG. **42**, the drip tray **1814** is releasably connected to the dispenser housing **90** such that the drip tray can be removed from and attached to the dispenser housing without the use of hand tools. For example, axles (not visible) can be formed at the end of each arm **1834** that are received in sockets (not visible) formed on the dispenser housing to allow for pivotal movement about the axles. A similar connection can be made where the axles are formed on the dispenser housing and the sockets are formed on the arms **1834**. The drip tray **1814** can attach to the dispenser housing in other conventional manners.

[0219] With reference to FIG. **43**, a base **1900**, which is similar to the base **596** described above, is shown detached from a drip tray assembly **1902**. Accordingly, the drip tray assembly **1902** can be used with the dispensers that have been described above to capture any drips that fall out of the spout of the aforementioned dispensers. With reference to FIG. **45**, the drip tray assembly **1902** generally includes a drip tray housing **1904**, a drip tray **1906**, a grate **1908**, a carrier arm **1912**, a spring **1914**, and a spring cover **1916**. In the embodiment illustrated in FIGS. **43-44**, the drip tray **1906** is useful in catching droplets or drips of beverage that collect in an outlet passage of a spout of a beverage dispenser, such as those that have been described above.

[0220] The drip tray housing **1904** is generally box-shaped having an open top and a generally circular opening **1918** formed in a lower surface. The generally circular opening **1918** provides access to a movable handle mechanism, which will be described in more detail below, but is similar to the knob **666** described above. The circular opening **1918** formed in a lower surface of the box-shaped housing **1920** is bounded at its rear (rear being away from the spout of the dispenser) by a substantially semi-circular ledge **1924** that extends upwardly from and generally normal to the lower surface of the housing **1920**. Detents **1926** extend inwardly from upper edges of the box-shaped housing **1920** and provide a latching mechanism for connecting the drip tray assembly **1902** to the base **1900** (FIG. **43**). An axle post **1928** is provided within the box-shaped housing near a forward edge thereof. The axle post **1928** provides an annular surface and is received inside a circular opening **1932** formed in the carrier arm **1912**. The axle post **1928** defines a vertical axis about which the carrier arm **1912** and the drip tray **1906** pivot. The box-shaped housing **1904** also includes an elongate slot **1934** through which the drip tray **1906** and the carrier arm **1912** move.

[0221] The carrier arm **1912** connects to the box-shaped housing **1904** by receiving the axle post **1928** in the circular opening **1932**. A forward edge of the carrier arm **1912** extends forwardly and outwardly from the elongate notch **1934**. The carrier arm **1912** also includes notches **1936** formed in a forward edge of the carrier arm. The drip tray **1906** includes a rearwardly extending edge **1938** and protuberances **1942** (shown in phantom in FIG. **45**) extend downwardly from the ledge **1938**. The protuberances **1942** are received in the

notches **1936** formed in the carrier arm **1912** for connecting the drip tray **1906** to the carrier arm **1912**. The drip tray **1906** also includes a well **1944** for storing any drops that fall onto the grate **1908** that covers the drip tray.

[0222] The grate **1908** includes a plurality of slots **1946**. A portion of each slot **1946** of the grate **1908** is covered on a rear edge to contain liquid when the dispenser is in a vertical orientation, for example, when a new bottle or container is being loaded into the dispenser housing, which has been described above.

[0223] The spring **1914** acts against the box-shaped housing **1904** and the carrier arm **1912** to urge the carrier arm **1912** into a first position (shown in FIG. **44**). The drip tray **1906** and the carrier arm **1912** are movable into a second position where the drip tray moves through the elongate slot **1934** into the box-shaped housing **1904** by imposing a horizontal force (e.g. in the direction of arrow H) against the drip tray **1906**. Accordingly, the drip tray **1906** can move out of the way to allow a glass to be disposed beneath the spout so that the glass can be filled with a beverage. When the glass is removed and the force is no longer being applied against the drip tray **1906**, the spring **1914** biases the carrier arm **1912** toward the first position whereby the carrier arm rotates about a vertical axis that is concentric with the axle post **1928**. The carrier arm **1912** includes a distal extension **1948** that catches against the box-shaped housing to retain the carrier arm so that the drip tray is maintained in the first position (shown in FIG. **44**).

[0224] With reference to FIG. **46**, the base **1900**, which is also shown in FIG. **43**, is shown with an indicator **2000** having a first setting for indicating that the spout, e.g. spout **752** in FIG. **19**, of the dispenser, e.g. dispenser assembly **514** in FIG. **18**, is connected with the container, e.g. container **512** in FIG. **19**, and a second setting for indicating that the spout is not connected with the container. The base **1900** is similar to the base **596** described above. A movable handle mechanism, which in the embodiment depicted in FIG. **46** is a knob **2002** similar to the knob **666** described above, is supported by the base **1900** and configured to cooperate with the housing of the dispenser assembly that receives the container, such as the bottle **512** (FIG. **19**) described above for drawing the housing e.g., lower housing **590** and upper housing **592**, and the bottle together. The knob **2002** is generally circular in configuration and includes two recesses **2004** to define a handle **2006** that is easily gripped by a user of the dispenser. With reference to FIG. **47**, the knob **2002** includes an integrally formed pin **2008**, similar to the pin **740** described above, that extends upwardly from an inner surface of the knob. The pin **2008** acts the same as the pin **740** described above, and therefore further description thereof is not provided.

[0225] In the embodiment depicted in FIGS. **46** and **47**, the indicator **2000** is supported by the housing. More particular to the embodiment disclosed in FIGS. **46** and **47**, the indicator comprises an arm **2010** having a hook feature **2012** (FIG. **47**) and a button feature **2014** (FIG. **46**). The arm **2010** also includes an opening **2016** generally midway between the hook feature **2012** and the button feature **2014** that is received on an axle **2018** formed in the base **1900**. The axle **2018** is cylindrical and defines a vertical axis about which the arm **2010** pivots. A spring **2022** biases the arm **2010** so that the button feature **2014** (FIG. **46**) is urged outwardly through an opening **2024** formed in the base **1900**. The rotating knob **2002** also includes a cam surface **2026**. The arm **2010** is operably connected with the knob **2002** via the cam surface **2026**.

[0226] As explained above, the knob **2002** is rotated to bring the housing of the dispenser and the bottle towards one another. When the knob **2002** is turned to the full engaged position, i.e., where the bottle is pierced and ready for dispensing the beverage, the hook feature **2012** catches the end of the semicircular cam surface **2026** and the torsion spring **2022** biases the button feature **2014** through the opening **2024** to extend from outside of the base **1900**. This provides the user of the dispenser an indication that the bottle is properly connected and ready for dispensing. Moreover, in this position the spout of the dispenser is fluidly connected with the bottle and ready for dispensing.

[0227] The indicator **2000** can also be replaced by an indicator light that changes color or illuminates to indicate a change in state. For example a power source and circuitry could be provided so that when the bottle is properly connected with the dispenser so that a beverage can be dispensed, the light can illuminate green. When a bottle is not connected, or not properly connected, the light may not illuminate or a red light may illuminate. Other types of indicators can also be provided.

[0228] To remove the bottle from the dispenser, the operator presses the button feature **2014**, thus moving the hook feature away from the cam surface **2026**. With the hook feature **2012** away from the cam surface **2026**, the knob **2002** can be rotated to move the bottle away from the dispenser housing.

[0229] A ratchet mechanism (not shown) can also be provided to preclude reverse rotation of the knob **2002** once the cartridge in the container has been pierced. The button feature **2014** can be operably connected to the pawl of the ratchet so that when the button is depressed (similar to the orientation shown in FIG. **46**) the pawl is removed away from the ratchets which allows reverse rotation of the knob.

[0230] FIG. **48** discloses another manner in which the bottle assembly, e.g. the container **512** in FIG. **19**, can attach to the dispenser assembly, e.g. an assembly similar in configuration to the dispenser assembly shown in FIG. **19**. FIG. **48** shows a rear view (the front of the dispenser assembly being where the spout is located) of a lower housing **2050**, which is very similar in configuration to the lower housing **590** shown and described in FIG. **19**, a retainer **2052**, which is similar to the retainer **654** shown in FIG. **19** and described above, and an alignment bracket **2054**, which is similar to the alignment bracket **658** shown and described above.

[0231] The differences between the alignment bracket **2054** and the alignment bracket **658** and the retainer **654** and the retainer **2052** will be described in more detail seeing that the similarities are apparent in the figure. The alignment bracket **2054** includes downwardly depending hook features **2056** on opposite sides. One end of a coil spring **2058** attaches to each hook feature. The coil spring **2058** is shown removed from the hook feature **2056** for clarity purposes. With reference to FIG. **49**, the retainer **2052** also includes a hook feature **2062**. The opposite end of each coil spring **2058** connects with the hook feature **2062** on the retainer. The spring **2058** biases the retainer **2052** so that it pivots toward a direction where claws **2064** extend up into slots **2066** of the alignment bracket **2054**. The slots **2066** are configured to receive the handles **532** (FIG. **19**) of the cap assembly **518** (FIG. **19**) of the bottle assembly when the bottle assembly is inserted into the dispenser assembly. With reference to FIG. **49**, when the bottle assembly is inserted in the direction of arrow A the chamfered front edges of the hooks **2064** allow the retainer

2052 to pivot so that the handles 532 (FIG. 19) of the cap assembly for the bottle ride over the hooks and then retain the cap by engaging the handles.

[0232] To disengage the bottle from the alignment bracket and the bottle retainer, the lower housing 2050 includes ribs 2070. The retainer includes contact surfaces 2072 (one on each side) that contact the ribs 2070 when the bottle is pulled in the direction of arrow B (FIG. 48), which results in the retainer 2052 pivoting in a manner to release the claws from the handles 532 (FIG. 19).

[0233] To inhibit connection of the bottle to the dispensing assembly when the knob, for example knob 666 in FIG. 19 or knob 2002 in FIG. 46, is in the unclamped position, a lever 2080 (FIG. 50) can cooperate with a slide 2082 (similar to slide 662 shown in FIG. 19) and a spring 2084. The lever 2080 is in a similar position as the lever 664 shown more clearly in FIG. 22. When the knob is in the unclamped position, the slide 2082 is moved in the direction of arrow C in FIG. 50 and the spring 2084 biases the distal end of the lever 2080 so that it no longer engages a lower end 2086 of the retainer 2052. Accordingly, when the knob 2002 is in the unclamped position a bottle can be inserted into the alignment bracket and the retainer can be engaged by the retainer. However, when the knob is in the clamped position the slide 2082 is in the position shown in FIG. 50 and the distal end of the lever 2080 engages the lower end 2086 of the retainer 2052. In this position, the retainer 2052 cannot pivot which precludes the insertion of the bottle because the handles 532 (FIG. 19) cannot ride over the claws 2064, since the claws do not move. Because of this configuration, if one were to attempt to remove the bottle after it has been in its fully engaged position, this movement would be prohibited by the lever 2080 engaging the lower end 2086 of the retainer. The operator would move the knob to the unclamped position, which would result in the spring 2084 biasing the distal end of the lever 2080 away from a lower end 2086 of the retainer 2052. With the slide 2082 away from the distal end of the lever 2080, when the bottle is pulled out of the dispensing assembly the ribs 2070 can contact the contact surfaces 2072 of the retainer 2052 thus allowing the retainer to pivot so that the claws 2064 no longer engage the handles 532 (FIG. 19) of the cap assembly.

[0234] To inhibit damage to the bottle, e.g. the bottle 512 in FIG. 19, and to the dispensing assembly, the knob

[0235] FIG. 51 and FIG. 52 depict a pressure adjustment mechanism. The pressure adjustment mechanism is useful to compensate for differences in altitude above sea level. The regulator (for example the regulator 158 in FIG. 5) includes a piston that is biased by atmospheric pressure. Accordingly, differences in atmospheric pressure can result in different forces being exerted on the piston, which can result in different pressures of gas being ejected from the regulator. The mechanism shown in FIGS. 51 and 52 can compensate for these differences.

[0236] The pressure adjustment mechanism includes a screw cap 3000 that includes a threaded bore 3002. The screw cap 3002 threads onto a regulator housing 3004, which can be similar to the regulator housing 250 shown in FIG. 6. Similar to the regulator shown in FIG. 6, a piston 3006 (FIG. 52) is disposed in the regulator housing 3004 and is biased on its top projected area by atmospheric pressure. A spring 3008 also acts against the piston 3006. A translational member 3012 acts against the spring 3008 on an opposite end of the spring as the end that acts against the piston 3006. The translational member 3012 includes a spring seat 3014 that provides a locating feature for the spring. The spring seat 3014 depends downwardly from a base 3016, which is circular in the depicted embodiment. A cam 3018 extends upwardly from the base 3016. The translational member 3012 also includes a cavity 3022 and outwardly extending wings 3024. The wings 3024 are received in longitudinal notches 3026 formed in the regulator housing 3004. With reference to FIG. 52, by rotating the screw cap 3000 and threading it onto the regulator housing 3004, the biasing force of the spring 3008 against the piston 3006 can be adjusted. This can be set at the factory to result in a desired gas pressure being delivered from the regulator.

[0237] The pressure adjustment mechanism also includes a rotating member 3030 that includes an upper keyed extension 3032 and a downwardly depending cam 3034. The rotating member 3030 connects with a knob 3036 that is accessible from an outer surface of the dispenser housing 3038. The knob includes a non-circular cavity 3042 (FIG. 52) that receives the keyed extension 3032 of the rotating member 3030 so that rotation of the knob 3036 results in rotation of the rotating member 3030. The knob 3036 also includes an arm 3044 and a fastener opening 3046 for receiving a fastener 3048 to further connect the knob 3036 to the rotating member 3030. A cap 3052 can cover the fastener 3048.

[0238] To adjust the pressure of gas being dispensed from the regulator, the knob 3036 is rotated which in turn rotates the rotating member 3030. The cam 3034 on the rotating member 3030 contacts the cam 3018 on the translating member 3012, which can displace the translating member and compress the spring 3008 to provide a greater force on the piston 3006.

[0239] FIGS. 53 and 54 depict a drip ejection device that can be used with a beverage dispenser such as those described above. FIGS. 53 and 54 schematically depict a spout 3060, which can be similar to the spout 752 shown in FIG. 19. The spout 3060 provides an outlet passage for the beverage and includes in this embodiment a hollow connector 3062 near its outlet. Tubing 3064 connects at one end to the connector 3062 and at an opposite end to an end cap 3066. A one-way check valve 3068 can be connected with the end cap 3066, which only allows air or another gas to enter into the tubing 3064 flowing towards the spout 3060. The end cap 3066 is connected to a positive pressure device, which in the depicted embodiment is a bellows 3072. The bellows 3072 is acted upon by a rigid arm 3074 in the following manner.

[0240] FIG. 53 depicts a tap handle 3076 (similar to tap handle 750 in FIG. 19) depressed, which allows for fluid to enter into the spout 3060 to be dispensed. In this state, the bellows 3072 is expanded. FIG. 54 depicts the tap handle as being released, which stops the fluid from flowing through the spout 3060. Droplets may accumulate in the spout, but are expelled by air that has entered the bellows 3072 via a rear one-way check valve 3078 and traveling through the forward check valve 3072 and into the tubing 3064, through the connector 3062 and out the spout 3060. Accordingly, any drips that may have accumulated in the spout 3060 can be expelled into the glass before the glass has been removed by the operator of the device.

[0241] FIG. 55 depicts a cross-sectional view of an alternative embodiment of a portion of a regulator similar to the regulator 158 depicted in FIG. 5 (shown in exploded view in FIG. 6). FIG. 55 depicts an alternative seal 1802, which fits into the regulator in the same location as where the seal 304

fits into the regulator **158** and serves a similar function. FIG. **55** also depicts an alternative valve stem **1804**, which fits into the regulator in the same location as where the valve stem **302** fits into the regulator **158** and serves a similar function. As with the regulator **158** depicted in FIG. **5**, the regulator (only a portion of which is shown in FIG. **55**) includes a plug **1806**, which is the same as or very similar to the plug **306** shown in FIG. **6**. The plug **1806** includes a passageway **1808** through which gas, e.g. CO2 and/or nitrogen, can travel. As with the regulator **158** depicted in FIG. **5**, the regulator in FIG. **55** also includes a housing **1812**, which is the same as or very similar to the piercing mechanism housing **270**, shown in FIG. **6**. The housing **1812** includes a bore **1814** through which gas, e.g. CO2 and/or nitrogen, can travel. The plug **1806** threads into the housing **1812** within a regulator body (not shown), which is similar to the regulator body **250** shown in FIG. **6**. High pressure gas from a gas cartridge, e.g. the cartridge **44** shown in FIG. **3**, enters the bore **1814** and low pressure gas exits the regulator prior to being introduced into a container which contains a beverage. This has been described above in much detail, therefore further explanation is not provided.

[0242] In the embodiment depicted in FIG. **55**, the seal **1802** includes an annular rigid component **1820** and a flexible material **1822** secured to the rigid component and at least partially defining a passage **1824** through the seal. The valve stem **1804** seats against the seal **1802** to block the passage of gas through the passage **1824** of the seal.

[0243] The annular rigid component **1820** can be made of a rigid material such as a hard plastic or metal. The material that the rigid component is made of can have a Shore D hardness of at least about 50. The annular rigid component **1820** can have a planar annular upper surface **1826**, a planar annular lower surface **1828**, and a cylindrical outer surface **1832** extending between the upper surface and the lower surface. The rigid component **1820** can also include a tapered upper surface **1834**, a tapered lower surface **1836**, and an inner cylindrical surface **1838** extending between the tapered upper surface and the tapered lower surface. The inner cylindrical surface **1838** defines a circular opening **1842**.

[0244] The flexible material **1822** can be made from a flexible material, e.g. EPDM rubber. The flexible material can have a Shore A hardness of about 75. The flexible material **1822** attaches to the rigid component **1820**. The flexible material **1822** can be overmolded onto the rigid component **1820**. The flexible material **1822** can attach to the rigid component in other manners, e.g. an adhesive.

[0245] The flexible material **1822** includes a seating surface **1850** for the valve stem **1804** to seat against to block flow of gas through the passage **1824**. In the embodiment depicted in FIG. **55**, the seating surface **1850** is flared or conical. The seating surface **1850** extends between a cylindrical inner surface **1852**, which at least partially defines the passage **1824** through the seal **1802**, and an annular lower surface **1856**. The flexible material **1822** also includes an upper flared surface **1858** that extends between the cylindrical inner surface **1852** and an upper annular surface **1862**. The flexible material **1822** also includes a cylindrical outer surface **1864** that extends between the upper annular surface **1862** and the lower annular surface **1856**. In the depicted embodiment, the flexible material **1822** covers only a portion of the upper surface **1826** of the rigid component **1822** and only a portion of the lower surface **1828** of the rigid component. The flexible material, in the embodiment depicted in FIG. **55**, entirely covers the tapered upper surface **1834**, the tapered lower surface **1836**, and the inner cylindrical surface **1838**.

[0246] The seating surface **1850** of the flexible material is disposed at the angle α with respect to an axis **1870** in which the valve stem **1804** travels. The tapered lower surface **1836** of the rigid component **1820** is also disposed at an angle α with respect to the axis **1870** in which the valve stem **1804** travels. The tapered upper surface **1834** of the rigid component **1820** is also disposed at the angle α with respect to an axis **1870** in which the valve stem **1804** travels. The upper flared surface **1858** of the flexible material **1822** is also disposed at the angle α with respect to the axis **1870**.

[0247] The valve stem **1804** is received in the passage **1824** of the seal **1802**, the passageway **1808** of the plug **1806**, and the bore **1814** of the housing **1812**. The valve stem **1804** is moveable between an open position and a closed position. When in the closed position the valve stem **1804** precludes gas from passing through the passage **1824** of the seal **1802**. To block flow of gas through the passage **1824**, the valve stem **1804** includes a flared portion **1872** connected with a lower end of a cylindrical pin **1874**. The flared portion **1872** is generally conical. A cylindrical protuberance **1874** extends from a base surface **1876** of the flared portion **1872** and is coaxial with the pin **1874**. A spring **1878**, similar to the spring **300** in FIG. **6**, receives the protuberance **1874** and acts against the base surface **1876** to bias the valve stem **1804** upward into the closed position.

[0248] The flared portion **1872** of the valve stem **1804** defines a flared or conical surface **1882** that seats against the seating surface **1850** when the valve stem is in the closed position. The conical surface **1882** of the flared portion **1872** of the valve stem **1804** is also disposed at the angle α with respect to the axis **1870** in which the valve stem **1804** travels. Through the use of a conical surface acting against another conical surface, large fluid flow can travel through the passage **1824** even with a short valve stem stroke. The conical surfaces also accommodate for surface imperfections in that the valve seating is made over a larger surface area so that if any imperfections are found in either surface (seating surface **1850** or conical surface **1882**), the areas adjacent the imperfections can form the desired seal.

[0249] As mentioned above, a portion, which will be referred to as an extension **1884**, of the rigid component **1822** extends radially outward from the outer cylindrical surface **1864** of the flexible material **1822**. This extension **1884** is sandwiched between the plug **1806** and the housing **1812**. More particular to the design depicted in FIG. **55**, the plug **1806** includes a plug counterbore **1886** extending upwardly into the plug and communicating with the passageway **1808** in the plug. The plug counterbore **1886** is defined by a side surface **1888**, which is cylindrical in the depicted embodiment, and an annular plug counterbore base surface **1892**. The plug counterbore **1886** is coaxial with the passageway **1808** in the depicted embodiment. Likewise, in the design depicted in FIG. **55**, the housing **1812** includes a housing counterbore **1894** extending downwardly into the housing and communicating with the bore **1814** in the housing. The housing counterbore **1894** is defined by a side surface **1896**, which is cylindrical in the depicted embodiment, and an annular housing counterbore base surface **1898**. The housing counterbore **1894** is coaxial with the bore **1814** in the housing **1814**. The flexible material **1822** of the seal is sandwiched between the plug counterbore base surface **1892** and the housing counterbore base surface **1898**. More particularly, the flexible mate-

rial **1822** is compressed by the plug counterbore base surface **1892** and the housing counterbore base surface **1898**. The upper annular surface **1862** of the flexible material **1822** seals against the plug counterbore base surface **1892** and the lower annular surface **1856** of the flexible material seals against the housing counterbore base surface **1898**. This precludes high pressure gas from going around the seal **1802** (as opposed to through the passage **1824**) when the valve stem **1804** is in the closed position.

[0250] The extension **1884**, which is sandwiched between the plug **1806** and the housing **1812**, can operate as an assembly indexing feature. The rigid component **1822** of the seal can have a height h, measured parallel to the axis **1870**. This height h can be sized such that when the plug **1806** is screwed into the housing **1812** a lowermost base surface **2102** of the plug **1806** contacts the upper surface **1826** of the rigid component **1820** and an uppermost surface **2104** of the housing **1812** contacts the lower surface **1828** of the rigid component. When the aforementioned surfaces are in contact the flexible material **1822** forms the desired seals with the plug counterbore base surface **1892** and the housing counterbore base surface **1898**.

[0251] As mentioned above, the inner cylindrical surface **1842** of the rigid component **1820** can define an opening **1842**. The diameter of this opening **1842** can be smaller than the largest diameter of the tapered portion **1872** of the valve stem **1804**. This allows the valve stem **1804** to be retained by the rigid component **1820** as compared to the flexible material **1822**.

[0252] FIG. **56** depicts a cross-sectional view of an alternative embodiment of a seal **2302**, which can be used instead of the seal **1802** described in FIG. **55**. In the embodiment depicted in FIG. **56**, the seal **2302** includes an annular rigid component **2320** and a flexible material **2322** secured to the rigid component and at least partially defining a passage **2324** through the seal. The valve stem **1804** (FIG. **55**) can seat against the seal **2302** to block the passage of gas through the passage **2324** of the seal.

[0253] The annular rigid component **2320** can be made of a rigid material such as a hard plastic or metal. The material that the rigid component is made of can have a Shore D hardness of at least about 50. The annular rigid component **2320** can have a planar annular upper surface **2326**, a planar annular lower surface **2328**, and a cylindrical outer surface **2332** extending between the upper surface and the lower surface. The rigid component **2320** can also include a tapered lower surface **2336**, and an inner cylindrical surface **2338** extending between the upper surface **2326** and the tapered lower surface. The inner cylindrical surface **2338** defines a circular opening **2342**.

[0254] The flexible material **2322** can be made from a flexible material, e.g. EPDM rubber. The flexible material can have a Shore A hardness of about 75. The flexible material **2322** attaches to the rigid component **2320**. The flexible material **2322** can be overmolded onto the rigid component **2320**. The flexible material **2322** can attach to the rigid component in other manners, e.g. an adhesive.

[0255] The flexible material **2322** includes a seating surface **2350** for the valve stem **1804** (FIG. **55**) to seat against to block flow of gas through the passage **2324**. In the embodiment depicted in FIG. **56**, the seating surface **2350** is flared or conical. The seating surface **2350** extends between a cylindrical inner surface **2352**, which at least partially defines the passage **2324** through the seal **2302**, and an annular lower surface **2356**. The flexible material an upper surface **2362**, which is found on each side (inner and outer) of the rigid component **2320**. The flexible material **2322** also includes a cylindrical outer surface **2364** that extends between the upper annular surface **2362** and the lower annular surface **2356**. In the depicted embodiment of FIG. **56**, the flexible material **2322** covers only a portion of the inner surface **2352** of the rigid component **1822** and only a portion of the outer surface **2332** of the rigid component. The flexible material, in the embodiment depicted in FIG. **56**, entirely covers the tapered lower surface **2336** and the lower surface **2328** of the rigid component **2320**.

[0256] The seating surface **2350** of the flexible material is disposed at the angle α with respect to the axis **1870** (FIG. **55**) in which the valve stem **1804** (FIG. **55**) travels. The tapered lower surface **2336** of the rigid component **2320** is also disposed at an angle α with respect to the axis **1870** in which the valve stem **1804** travels.

[0257] With reference to FIGS. **55** and **56**, for the seal **2302** depicted in FIG. **56**, the seal is sandwiched between the plug counterbore base surface **1892** (FIG. **55**) and the housing counterbore base surface **1898** (FIG. **55**). The lower annular surface **2356** of the flexible material **2322** seals against the housing counterbore base surface **1898**. This precludes high pressure gas from going around the seal **1802** (as opposed to through the passage **1824**) when the valve stem **1804** is in the closed position.

[0258] FIG. **57** depicts the assembly shown in FIG. **47**, except for that the cam surface **2026** on the knob **2002** includes a notch **2028**. The assembly shown in FIG. **57** is similar in all other aspects to the assembly shown in FIG. **47**. As shown in FIG. **57**, when the knob **2002** is rotated to where the bottle is engaged with the dispenser and ready to dispense a beverage, the hook feature **2012** catches the end of the semicircular cam surface **2026** so that rotation of the knob in the clockwise direction (per the orientation in FIG. **57**) is precluded. As such, the operator pushes the button feature **2014**, which pivots the hook feature **2012** away from the end of the cam surface so that clockwise rotation of the knob **2002** is now allowed. With the hook feature **2012** away from the end of the cam surface **2026**, the bottle can be removed from the dispenser by rotating the knob in the clockwise direction.

[0259] The notch **2028** in the cam surface **2026** allows the hook feature **2012** to extend into the notch so that rotation of the knob **2002** is precluded when the hook feature **2012** is in the notch. The position shown in FIG. **58** can be referred to as the "loading" position where the components of the dispenser are arranged so that the bottle can be attached with the dispenser. By not allowing rotation of the handle from this "loading" position, the components that engage the bottle, e.g. the hooks **2064** shown in FIG. **50**, can be appropriately located to receive the bottle.

[0260] FIGS. **57** and **58** also depict additional cam surfaces **2030** that engage the slide, for example the slide **2082** shown in FIG. **50**, to stabilize the slide. The hook feature can operate in three positions. In a first position (see, for example, FIG. **57**) the moveable hook feature **2014** precludes movement of the knob handle **2002**. In a second position (for example in between the position shown in FIG. **57** and FIG. **58**) the moveable hook feature **2014** allows movement of the knob handle **2002**. In a third position (see, for example, FIG. **58**) the moveable hook feature **2014** precludes movement of the knob handle **2002**. The button feature **2012** can operate in a first operating position (extended from the housing **1900**) and

a second operating position (generally flush with the housing **1900**). When the button feature **2012** is in a first operating position, the moveable hook feature is in the first position. When the button feature **2012** is in the second operating position, the moveable hook feature **2014** is in the second position. When the button feature **2012** is again in the first operating position, the moveable hook feature **2014** is in the third position.

[0261] With reference to FIG. **59**, a portion of a regulator **2400**, which is similar in configuration to the regulators described above, can include an overcap **2402** and a lever **2404** connected to the overcap. The remaining components of the regulator are the same, or very similar to, the regulators described above. As with some of the embodiments of regulators described above, the regulator includes a cap **2406** that threads onto a regulator body **2408**. A spring **2412** acts against the cap **2406** and a piston **2414** biasing the piston downwards. The components of the regulator **2400** other than the overcap **2402** and the lever **2404** have been described in detail above, therefore further explanation is not provided.

[0262] The biasing force exerted by the spring **2412** on the piston **2414** can control the pressure at which gas exits the regulator **2400**. Accordingly, the further that the cap **2406** is threaded onto the regulator body **2408** the more pressure is exerted on the piston **2414** by the spring **2412**. The overcap **2402** can be fixed to the cap **2406** so that rotation of the overcap results in rotation of the cap. The lever **2404** can be fixed to the overcap **2402** so that rotation of the lever about an axis **2416** can result in rotation of the overcap **2402**, and thus rotation of the cap **2406**. Accordingly, adjustment of the pressure that gas exits the regulator **2400** can be adjusted by moving the lever **2404**. At least one stop **2418** can connect with the dispenser housing (not shown in FIG. **59**) to preclude further movement of the lever **2404**.

[0263] The pressure at which gas exits the regulator is a function of the pressure exerted by the spring **2412** on the piston **2414** and atmospheric pressure. As just one example, the cap **2406** can be threaded onto the regulator body **2408** at the factory to allow for gas at a desired pressure to exit the regulator **2400** when the regulator is at a certain elevation, e.g. sea level. If the beverage dispenser were used at another location, e.g. a few thousand feet or meters above sea level, the lever **2404** can be moved to change the biasing force of the spring **2412** on the piston **2414** to accommodate for the change in elevation.

[0264] With reference to FIGS. **60** and **67**, a beverage dispenser **3200**, which can be very similar to the beverage dispensers described in more detail above, includes a housing **3202** configured to cooperate with an associated container (such as container **12** shown in FIG. **1**) holding a beverage that is to be dispensed via the beverage dispenser. As seen in FIG. **67**, a spout **3204** is supported by the housing **3202** and is configured to be in fluid communication with the container. When the container is properly connected with the beverage dispenser, beverage from the container can be dispensed through the spout. The beverage dispenser **3200** differs from those described above in that it includes a different type of mechanism for drawing the housing **3202** of the beverage dispenser and the beverage container together.

[0265] With reference to FIG. **62**, the mechanism **3206** for drawing the housing **3202** and the associated container together includes a lever arm **3208** that is movable between at least two operating positions. The lever arm **3208** is movable into an engaged operating position where the container (for example container **12** in FIG. **1**) is in fluid communication with the spout (for example the spout **3204** shown in FIG. **67** or other spouts described above where the mechanism **3206** is incorporated into the above-described beverage dispensers). When in the engaged operating position (see FIG. **61**) an outermost end **3212** of the lever arm **3208** is disposed inwardly from an outermost surface of the container (see FIG. **1**) that is received by the beverage dispenser **3200**. This precludes accidental contact with the lever **3208** to inhibit accidental disengagement of the container from the dispenser.

[0266] The mechanism **3206** for drawing the housing **3202** and the container together is housed in a substantially rectangular housing **3214**, which can also include a housing for a pivoting drip tray **3216**, which has been described in more detail above, and is connected to the aforementioned housing **3202**. The housings **3202** and **3214** may be referred to below as a housing for the beverage dispenser.

[0267] The housing **3214** can be made as two separate components and similar to the housing shown in FIG. **43**. As seen when comparing FIG. **60** to FIG. **61**, the lever arm **3208** is movable between a first position (FIG. **60**) and a second position (FIG. **61**) along one side of the housing **3214**. This facilitates attachment of the beverage dispenser **3200** to the container in that an operator need only depress the lever **3208** in a general direction as designated by arrow **3220**, which is generally parallel to the side of the housing that the lever moves along. The lever **3208** is pivotally attached to the housing **3214**, but an operator can still depress the lever **3208** is the general direction of arrow **3220** to draw the housing **3202** toward the container.

[0268] With reference to FIG. **62**, the mechanism **3206** for drawing the housing **3202** and the associated container together also includes a rotatable hub **3222**. The lever arm **3208** cooperates with and is operatively connected to the rotatable hub **3222**. Movement of the lever arm **3208** results in rotational movement of the rotatable hub **3202**. The rotatable hub **3222** includes an integrally formed pin **3224**, similar to the pin **740** described above, that extends upwardly from an inner surface of the hub. The pin **3224** acts the same as the pin **740** described above, and therefore further description thereof is not provided.

[0269] The mechanism **3206** for drawing the housing **3202** and the container together also includes three mechanisms for precluding rotation of the hub **3222**. The mechanism **3206** includes a stop member **3230** pivotally attached to the housing **3214**. The hub **3222** includes a notch **3232** that cooperates with the stop member **3230** for precluding counterclockwise (per the orientation shown in FIG. **62**) movement of the hub **3222** when the lever arm **3208** is in the first operating position (shown in FIG. **62**). With the pin **3224** shown in the position in FIG. **62**, the container retaining mechanisms (e.g. retainer **2052** described above) are positioned to properly receive the cap of the container so that the cap is properly engaged with the beverage dispenser **3200** for proper unsealing of the dispenser. The stop member **3230** cooperating with the notch **3232** in the hub **3222** prevents movement of the retainer **2052** (FIG. **48**) and other mechanisms that engage the cap assembly of the container if the cap assembly and the retaining mechanisms are not properly aligned.

[0270] With reference to FIG. **63**, the housing **3202** will typically be slid over an upright bottle and pressed downwardly toward the bottle, whereby the wings **32** on the cap assembly **24** (FIG. **3**) will begin to engage mechanisms within the housing, for example the retainer **2052** (FIG. **49**), which

will result in rotational movement of the hub **3222**. Due to this rotational movement, the stop member **3230** can begin moving out of the notch **3232** (see FIG. **64**) and into a circumferential channel **3234**, which will allow for counterclockwise movement of the rotatable hub **3222**. The distal edge of the stop member **3230** is biased in a clockwise direction with respect to an axle **3236** about which the stop member pivots. A free end **3278** having a hook-like configuration of the stop member **3230** connects with a spring (not shown) to bias the stop member. Accordingly, when the lever **3208** and the rotatable hub **3222** are returned to the first operating position (see FIG. **62**) the distal end of the stop member **3230** can then engage the notch **3232** formed in the rotatable hub.

[0271] As discussed above, the mechanism **3206** for drawing the housing **3202** and the associated container together also includes another mechanism that prevents rotation of the rotatable hub **3222**. A pawl **3250** connects with the housing **3214**. The hub **3222** includes a ratchet **3252** having teeth that cooperate with the pawl **3250** to preclude rotational movement of the rotatable hub **3222** in the clockwise direction. The pawl **3250** and ratchet **3252** are useful in preclude an operator from attempting to disengage the beverage dispenser **3200** from the container after the seal in the container has been broken, especially the gas cartridge seal. The ratchet **3252** is disposed on an outer circumferential surface of the rotatable hub **3222** and extends a circumferential length long enough to allow the lever **3208** to travel from the first operating position (shown in FIGS. **60** and **62**) to the second operating position (shown in FIG. **61**). The pawl **3250** is biased in a counterclockwise position (per the orientation shown in FIG. **62**) about an axle **3254** about which the pawl rotates. With reference to FIG. **63**, the pawl **3250** also includes a leg **3256** defining a cam surface **3258**. Posts **3262** and **3264** disposed at opposite ends of the ratchet **3252** (posts **3264** is spaced a distance from where the ratchet teeth end). When the lever arm **3208** is in the first operating position (see FIG. **63**) the upper (per the orientation shown in FIG. **63**) post **3262** engages a straight surface **3266** of the leg **3256** of the pawl, thus pivoting the pawl away from the rack **3252**. With reference to FIG. **65**, with the lever **3208** shown in the second operating position, which is the operating position where the container has been spiked and the internal compartment of the container is in fluid communication with the spout **3204** (FIG. **67**), the lower (trailing) post **3264** engages the cam surface **3258** and also pivots the pawl away from the rack.

[0272] The mechanism **3206** includes another means for preventing unwanted movement of the lever arm **3208** from the second operating position (see FIG. **65**) toward the first operating position (see FIG. **63**). The rotatable hub **3222** can include a third stop mechanism. With reference to FIG. **66**, a resilient finger **3280** is formed in the rotatable hub **3222** and separated from the rotatable hub by cutouts **3282**. With reference back to FIG. **60**, the housing **3214** includes a circular opening **3284**. With reference back to FIG. **66**, the finger **3280** includes a distal protuberance **3286**. With the lever arm **3208** shown in the engaged position, where the beverage dispenser **3200** has pierced the beverage container and the beverage is in fluid communication with the spout, the distal protuberance **3286** extends through the opening **3284** (see FIG. **61**). Accordingly, to move the lever arm **3208** from the second operating position (FIG. **61**) toward the first operating position (FIG. **60**), an operator depresses the protuberance **3286** so that it no longer engages the housing **3214** around the opening **3284**. Accordingly, one can remove the dispenser **3200** from the beverage container.

[0273] With reference to FIG. **67**, the housing **3202** is shown including a recess **3290**. The recess is noncircular in configuration and is configured to engage the cap assembly (for example the cap assembly **24** shown in FIG. **3**). The recess includes wings **3292** that are configured to engage the wings **32** (FIG. **3**) of the cap assembly **24**. When the beverage container has been depleted, an operator can remove the beverage container from the dispenser **3200** and insert the cap assembly **24** into the recess **3290** aligning the wings **32** with the wings **3292** of the recess. The bottle **16** (FIG. **3**) can then be rotated thus removing the cap assembly from the bottle, which can facilitate recycling.

[0274] FIG. **68** depicts a removal tool **3300** for removing a cap **3324**, which can be similar to the cap **24** (FIG. **2**) or the cap **524** (FIG. **19**) described above, from a bottle **3316**, which can be similar to the bottle **16** (FIG. **2**) or the bottle **516** (FIG. **19**) also described above. A beverage dispensing system that includes the removal tool **3300** can include the bottle **3316** including a threaded neck (not visible in FIG. **68**), which can be similar to the neck **22** (FIG. **3**) or the neck **522** (FIG. **20**) described above. The beverage dispensing system can also include the cap **3324** threaded onto the neck of the bottle for containing a beverage in the bottle. The cap **3324** can include a catch **3332**, which can be similar to the catches **32** (FIG. **2**) or the catches **532** (FIG. **19**), extending outwardly from a cylindrical side wall **3326** of the cap. The catches **3332** (two are shown in FIG. **68**) are generally U-shaped bars where the terminal portions attach to the cylindrical side wall **3326** of the cap **3324** to define an opening **3330**. The catches **3332** and the opening **3330** cooperate with a dispenser **3314** (FIG. **69**), more particularly with components (described above) found in the dispenser, to connect the bottle **3316** with the dispenser. The cap **3324** for the beverage dispensing system that includes the removal tool **3300** can be a part of a cap assembly, which can be similar to the cap assembly **18** or the cap assembly **518** (both described above). The cap assembly (shown only schematically in FIG. **68**) can include the same components as the cap assemblies described above.

[0275] With reference to FIG. **69**, the beverage dispensing system that includes the removal tool **3300** can also include the dispenser **3314**, which is similar to the dispensers described above, e.g. the dispensing assemblies **14** and **514**. The dispenser **3314** in the beverage dispensing system that includes the removal tool **3300** operates in the same, or very similar manner, to the dispensing assemblies described above. In other words, the dispenser **3314** in the beverage dispensing system that includes the removal tool **3300** can cooperate with the cap **3324** to dispense the beverage from the bottle. Since the connection between the bottle and the dispenser are described in detail above, for the sake of brevity further description is not provided.

[0276] With reference to FIG. **69**, the removal tool **3300** in the depicted embodiment includes a handle **3302** and a projection **3304** that extends from a distal end **3306** of the handle. The distal end **3306** is opposite a proximal end **3308**. The removal tool **3300** can be made from plastic, or other substantially rigid material, and can be made so that the projection **3304** is integrally formed with the handle **3302**, e.g. the handle and the projection can be molded as a single unit.

[0277] With reference to FIG. **70**, the handle **3302** includes an external (first) surface **3312** and an internal (second) surface **3318**. The removal tool **3300** and the dispenser **3314** are

designed such that the external surface **3316** of the handle **3302** is generally flush with an external surface **3320** of the dispenser **3314** when the removal tool **3300** is connected with the dispenser, which will be described in more detail below.

[0278] The projection **3304** extends from the handle **3302**, more particularly the distal end **3306** of the handle **3302**, generally normal to the internal surface **3318**. With reference to FIG. **68**, the projection **3304** is configured to be received in the opening **3330** defined by the catch **3332** and the side wall **3326** of the cap **3324** to engage the cap for facilitating rotation of the cap by moving the removal tool. As most clearly seen in FIG. **69**, the projection **3304** includes a contoured distal surface **3322** that, in the depicted embodiment, has a curvature that generally follows the curvature, e.g. radius, of the side wall **3326** of the cap **3324**. This configuration of the contoured distal surface **3322** and the contour of the side wall **3326** facilitates a desirable interaction between the removal tool **3300** and the cap.

[0279] In the depicted embodiment, the removal tool **3300** selectively connects with the dispenser **3314**. See FIG. **69** where an operator is removing or disconnecting the removal tool **3300** from the dispenser **3314**. Moreover, the removal tool **3300** is configured to be disconnected from the dispenser **3314** and to cooperate with the cap **3324** to remove the cap from the bottle **3316**. In the illustrated embodiment, the removal tool **3300** includes protuberance **3326** extending from an edge **3328** of the handle **3302** for retaining the removal tool in a removal tool cavity **3332**. For the depicted embodiment, the removal tool **3300** includes two protuberances **3326** (only one visible in FIG. **70**) with one on each edge **3328**, which are the longer edges of the handle **3302**. The removal tool cavity **3332** includes a notch **3334** (the depicted embodiment includes two notches even though only one is visible in FIG. **68**) for cooperating with the protuberances **3326**. The protuberances **3326** can be received in the notches **3334** to attach the removal tool **3300** to the dispenser **3314**. Slots **3336** extend through the handle **3302** of the removal tool and are located near the protuberances **3326**. The slots **3336** allow the handle to flex so that the protuberances **3326** can be easily received in the notches **3334**.

[0280] In the illustrated embodiment, the removal tool cavity **3332** also includes a recessed well **3338**, which is recessed with respect to the remainder of the removal tool cavity **3332**. The recessed well **3338** is configured to receive the projection **3304** when the removal tool **3300** is received in the removal tool cavity **3332** and connected with the dispenser **3314**. The external surface **3312** of the handle **3302** is generally flush with the external surface **3320** of the dispenser **3314** when the projection **3304** is received in the recessed well **3338** and the removal tool **3300** is connected with the dispenser **3314**.

[0281] The removal tool **3300** shown in the figures can take other configurations that are still capable of facilitating the removal of a cap from a bottle. For example, the distal end of the handle could take the shape of a wrench having a configuration that could accommodate the cap so that the removal tool could be used to remove the cap from the bottle. With such a configuration, the shape of the removal tool cavity **3332** could change to accommodate this differently shaped removal tool. Moreover, the wrench-like removal tool could selectively connect with the dispenser in another manner.

[0282] With reference back to the illustrated embodiment, a method for removing the cap **3324** from the bottle **3316** can include inserting the removal tool **3300** into the opening **3330** of the cap and rotating the cap using the removal tool. More specifically, inserting the removal tool **3300** can include inserting the projection **3304** of the removal tool into the opening **3330** found in the cap **3324**. Rotating the removal tool **3300** can result in contacting the catch **3332** on the cap **3324** with the handle **3302**, more specifically the internal surface **3318** of the handle, of the removal tool **3300**. Rotating the removal tool **3300** can also result in the removal tool, more specifically the contoured distal surface **3322** of the projection **3304**, contacting the side wall **3326** of the cap **3324**. Since the contoured distal surface **3322** of the projection generally matches the curvature of the cylindrical side wall **3326** of the cap **3324**, the removal tool, when turned in a counter clockwise direction, can contact or engage both the catch **3332** and the side wall **3326** of the cap during rotation. The method for removing the cap **3324** from the bottle **3316** can also include removing or disconnecting the removal tool **3300** from the dispenser **3314**, as shown in FIG. **69**.

[0283] FIG. **71** depicts an alignment bracket **3354**, which is similar to the alignment bracket **154** and the alignment bracket **2054**, both described above. The alignment bracket **3354** in the depicted embodiment includes a circular section **3374** and two appendages **3376** extending from diametrically opposite sides of circular section **3374** towards a bottle retainer (not shown, but similar to the bottle retainer **152** or the bottle retainer **2052**) when finally assembled. A first pair of inwardly extending axle posts **3378** extend towards each other from each distal end of each appendage **3376**. Each axle post **3378** is received in a respective opening of the bottle retainer (not shown). A second pair of axle posts **3380** extend outwardly from each appendage **3376** and are generally coaxial with the first axle posts **3378**.

[0284] The circular section **3374** of the alignment bracket **3354** is configured to receive the circular cap **3324** that connects to the bottle **3316**. The circular section **3374** also defines channels **3386** that each receive a respective catch **3332** formed on the cap **3324**. The alignment bracket **3354** depicted in FIG. **71** is similar to the alignment bracket **2054** shown in FIG. **48** in that the alignment bracket **3354** includes hook features **3356** on opposite sides that can cooperate with a coil spring (not shown) similar to the coil spring **2058** described above. The alignment bracket **3354** depicted in FIG. **71** operates in a similar manner to the alignment bracket **2054** shown in FIG. **48**, with the exception that the alignment bracket **3354** includes a contoured edge, e.g. an upper (first) contoured edge **3382** and a second (lower) contoured edge **3384**, configured to contact the catches **3332**, for example, to direct the catches toward the respective channels **3386**.

[0285] The upper contoured edge **3382** can be located on a first (upper) side of the channels **3386** and the lower contoured edge **3384** can be located on a second (lower) side, which is opposite the upper side, of the channels. As seen in FIG. **71**, the alignment bracket **3354** is generally circular in a cross section and includes two channels **3386**, e.g. a first channel and a second channel. The channels **3386** are generally aligned with a chord that is offset from a diameter of the generally circular cross section of the circular section **3374**. In the depicted embodiment, the contoured edges **3382** and **3384** of the alignment bracket **3354** are configured such that where the bottle **3316** is inserted into the dispenser **3314** with the catches **3332** angularly offset from the channels **3382** less than about 60°, the catches contact the contoured edges and are directed toward the respective channels **3386**.

[0286] Beverage dispensing assemblies and systems have been described with reference to particular embodiments.

Many modifications and alterations will occur to those after reading the detailed description. The invention is not limited to only those embodiments that are disclosed above. Instead, the invention is broadly defined by the appended claims and the equivalents thereof.

1. A beverage dispensing system comprising:

a bottle including a threaded neck;

a cap threaded onto the neck of the bottle for containing an associated beverage in the bottle, the cap including a catch extending outwardly from a side wall of the cap to define an opening;

a dispenser cooperating with the cap to dispense the associated beverage from the bottle; and

a removal tool including a handle and a projection extending from the handle, the projection being configured to be received in the opening defined by the catch and the side wall of the cap to engage the cap for facilitating rotation of the cap by moving the removal tool.

2. The system of claim **1**, wherein the dispenser includes a removal tool cavity and the removal tool is selectively received in the removal tool cavity.

3. The system of claim **2**, wherein the removal tool includes a protuberance extending from an edge of the handle for retaining the removal tool in the removal tool cavity.

4. The system of claim **3**, wherein the removal tool cavity includes a notch for cooperating with the protuberance, wherein the protuberance is received in the notch.

5. The system of claim **2**, wherein the removal tool cavity includes a recessed well, the recessed well being configured to receive the projection.

6. The system of claim **5**, wherein an external surface of the handle is generally flush with an external surface of the dispenser when the projection is received in the recessed well.

7. The system of claim **1**, wherein the side wall of the cap is generally cylindrical and the projection of the removal tool includes a contoured distal surface generally following a curvature of the side wall of the cap.

8. A beverage dispensing system comprising:

a bottle including a threaded neck;

a cap threaded onto the neck of the bottle for containing an associated beverage in the bottle;

a dispenser cooperating with the cap to dispense the associated beverage from the bottle; and

a removal tool selectively connected with the dispenser, the removal tool being configured to be disconnected from the cap and to cooperate with the cap to remove the cap from the bottle.

9. The system of claim **8**, wherein the cap includes a catch extending outwardly from a side wall of the cap to define an opening and the removal tool includes a handle and a projection, wherein the projection is configured to be received in the opening defined by the catch and the side wall.

10. The system of claim **9**, wherein the dispenser includes a removal tool cavity and the removal tool is selectively received in the removal tool cavity.

11. The system of claim **10**, wherein the removal tool cavity includes a recessed well, the recessed well being configured to receive the projection.

12. A method for removing a cap from a bottle where the cap has an opening adjacent a side wall of the cap, the method comprising:

inserting a removal tool into the opening of the cap; and

rotating the cap using the removal tool.

13. The method of claim **12**, wherein inserting the removal tool includes inserting a projection of the removal tool into the opening.

14. The method of claim **12**, wherein rotating the removal tool includes contacting a catch on the cap with a handle of the removal tool.

15. The method of claim **14**, wherein rotating the removal tool includes contacting the side wall of the cap with a projection of the removal tool, the projection extending from an end of the handle.

16. The method of claim **14**, wherein contacting the side wall of the cap with the projection includes contacting the side wall of the cap with a curved distal surface of the projection, the curved distal surface of the projection generally matching a curvature of the side wall.

17. A beverage dispensing system comprising:

a bottle;

a cap connected with the bottle for containing an associated beverage in the bottle, the cap including a catch extending outwardly from a side wall of the cap;

a dispenser cooperating with the cap to dispense the associated beverage from the bottle, the dispenser including an alignment bracket and a retainer that cooperate with the cap to connect the cap with the dispenser, the alignment bracket including a channel for receiving the catch and the retainer including a hook for engaging the catch, wherein the alignment bracket includes a contoured edge configured to contact the catch to direct the catch toward the channel.

18. The system of claim **17**, wherein the contoured edge includes a first contoured edge located on a first side of the channel and a second contoured edge located on a second side, which is opposite the first side, of the channel.

19. The system of claim **18**, wherein the alignment bracket is generally circular in a cross section and includes a first channel and a second channel, the channels being generally aligned with a chord that is offset from a diameter of the generally circular cross section.

20. The system of claim **17**, wherein the contoured edge of the alignment bracket is configured such that where the bottle is inserted into the dispenser with the catch offset from the channel less than about 60°, the catch contacts the contoured edge and is directed toward the channel.

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