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(54) **CONNECT/DISCONNECT COUPLING FOR A CONTAINER**

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(57) **ABSTRACT**

A coupling assembly for removing contents of a container from an opening in the container. The coupling assembly includes a container insert coupled to the container opening, the container insert including an insert passage, and an insert vent path extending through the container insert. The coupling assembly also includes a unit including a unit cavity, a valve assembly positioned axially therein, and a unit vent path. When the unit is coupled to the container insert, the insert vent path mates with the unit vent path to create a complete vent path extending from within the container to a vent port on the unit, and the valve assembly opens to place the insert passage in fluid communication with the first unit cavity.

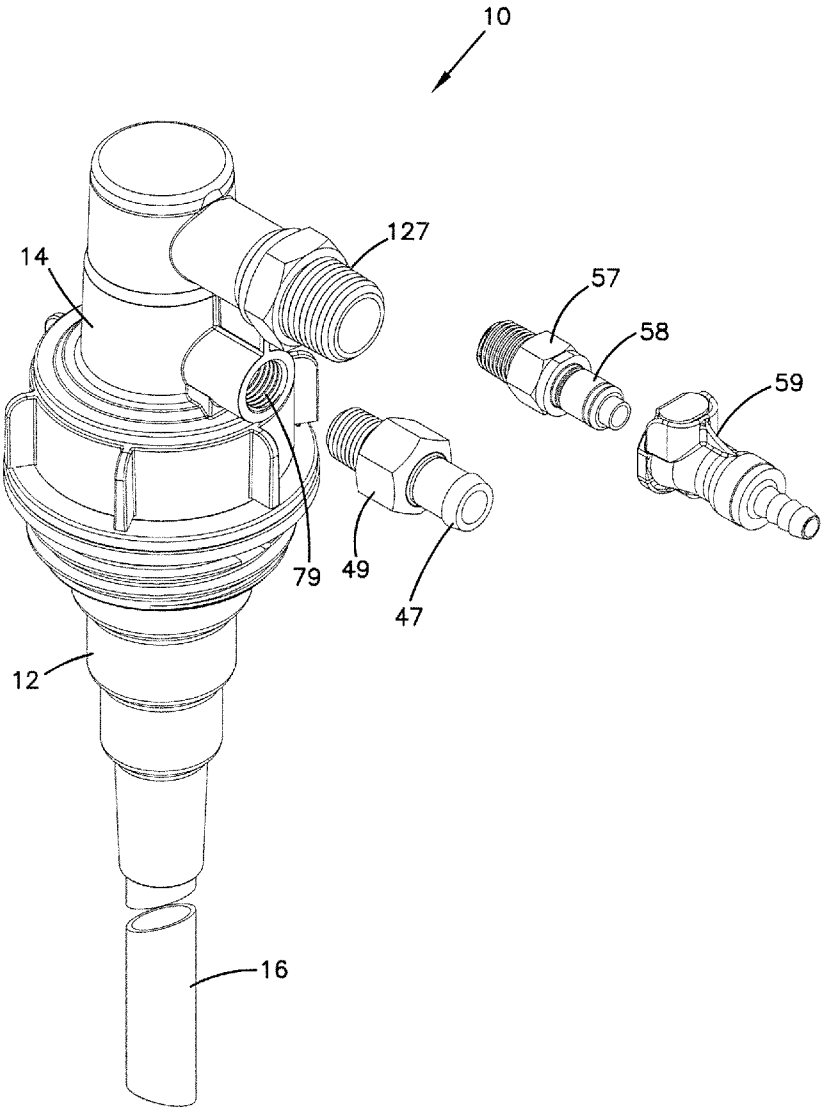
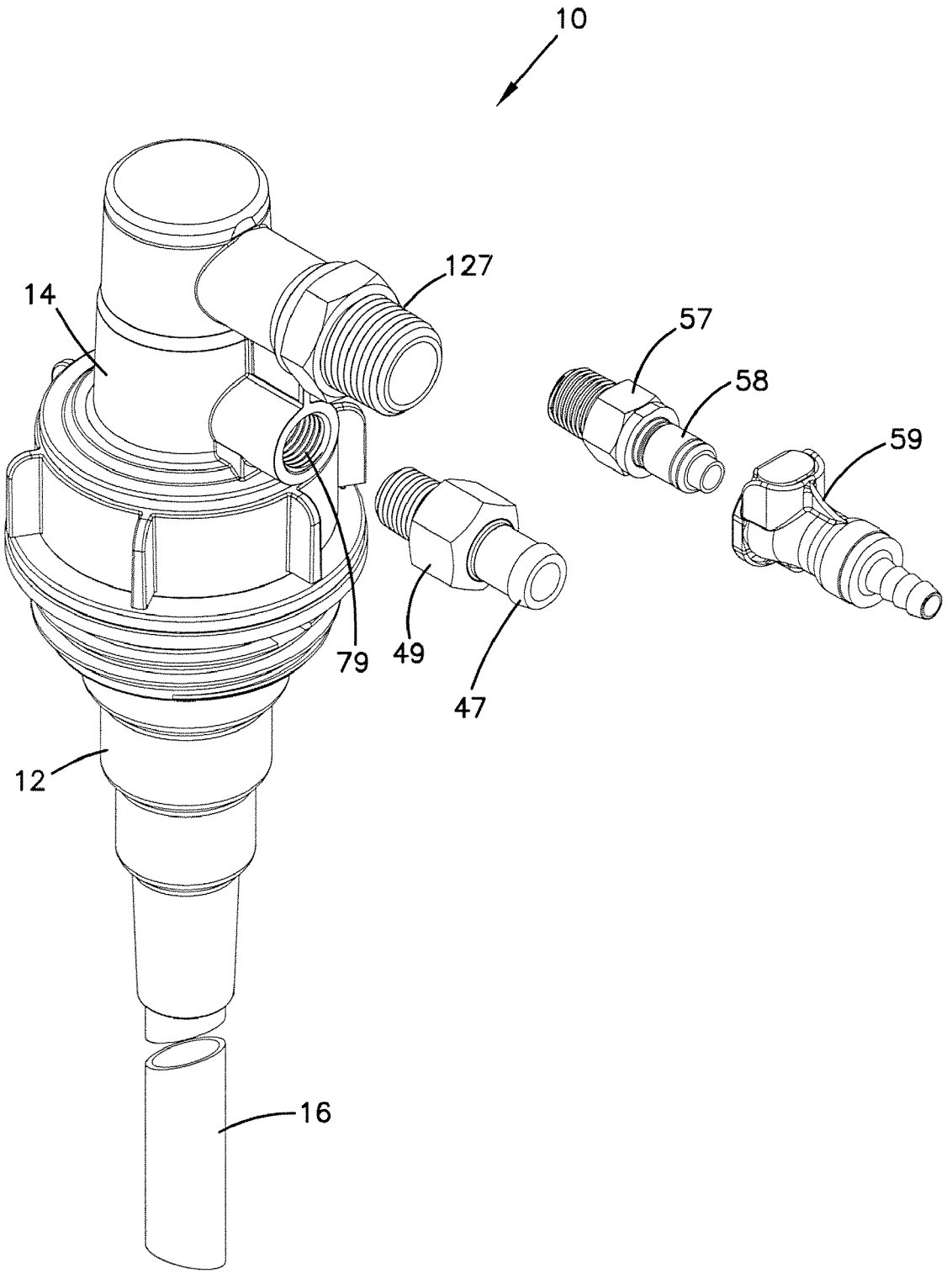


FIG. 1



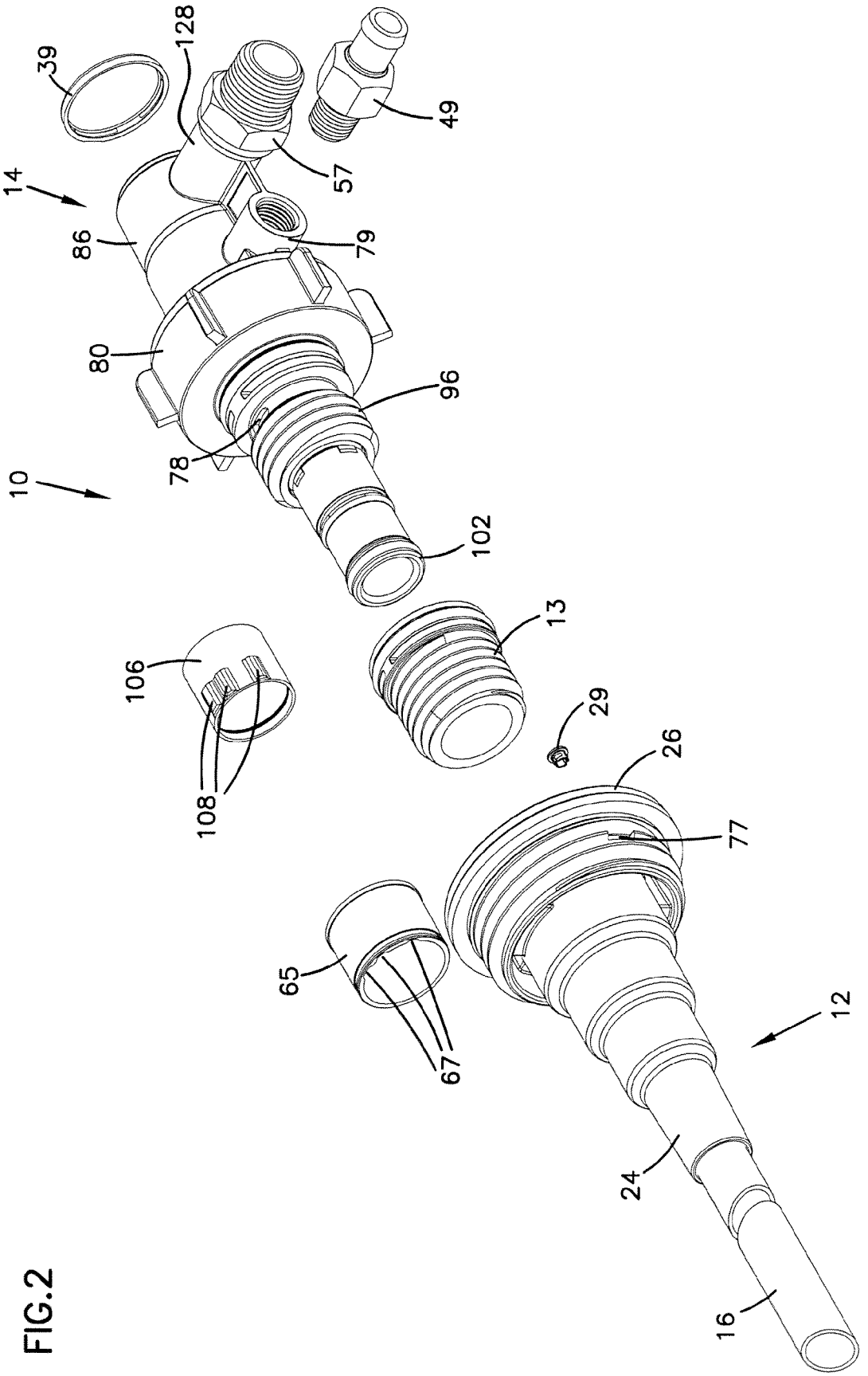

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FIG.2

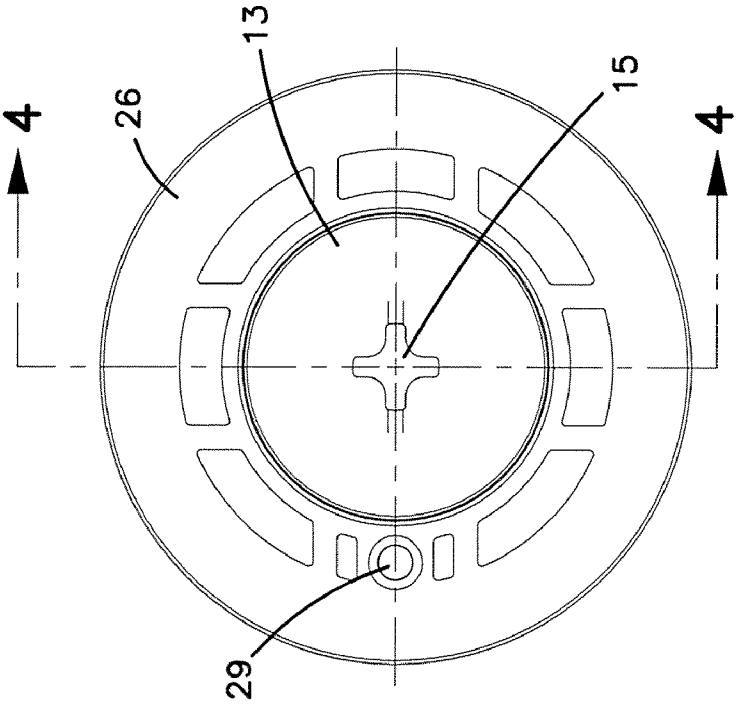


FIG.3

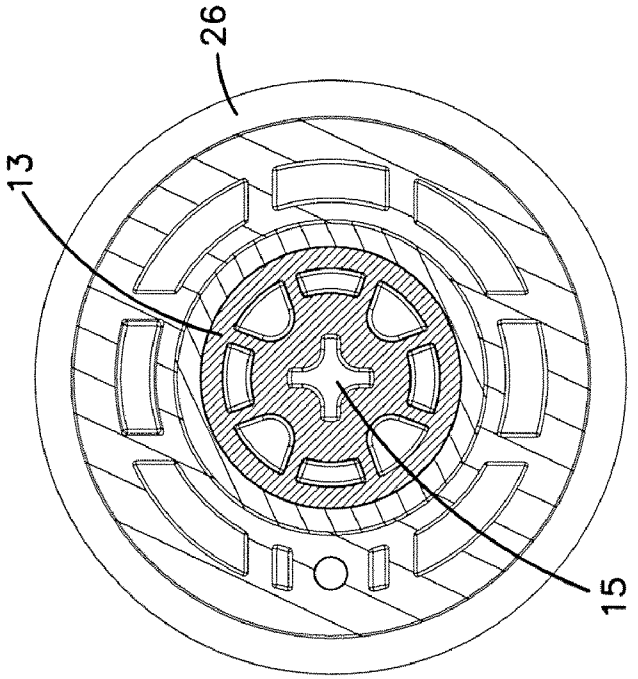


FIG.5

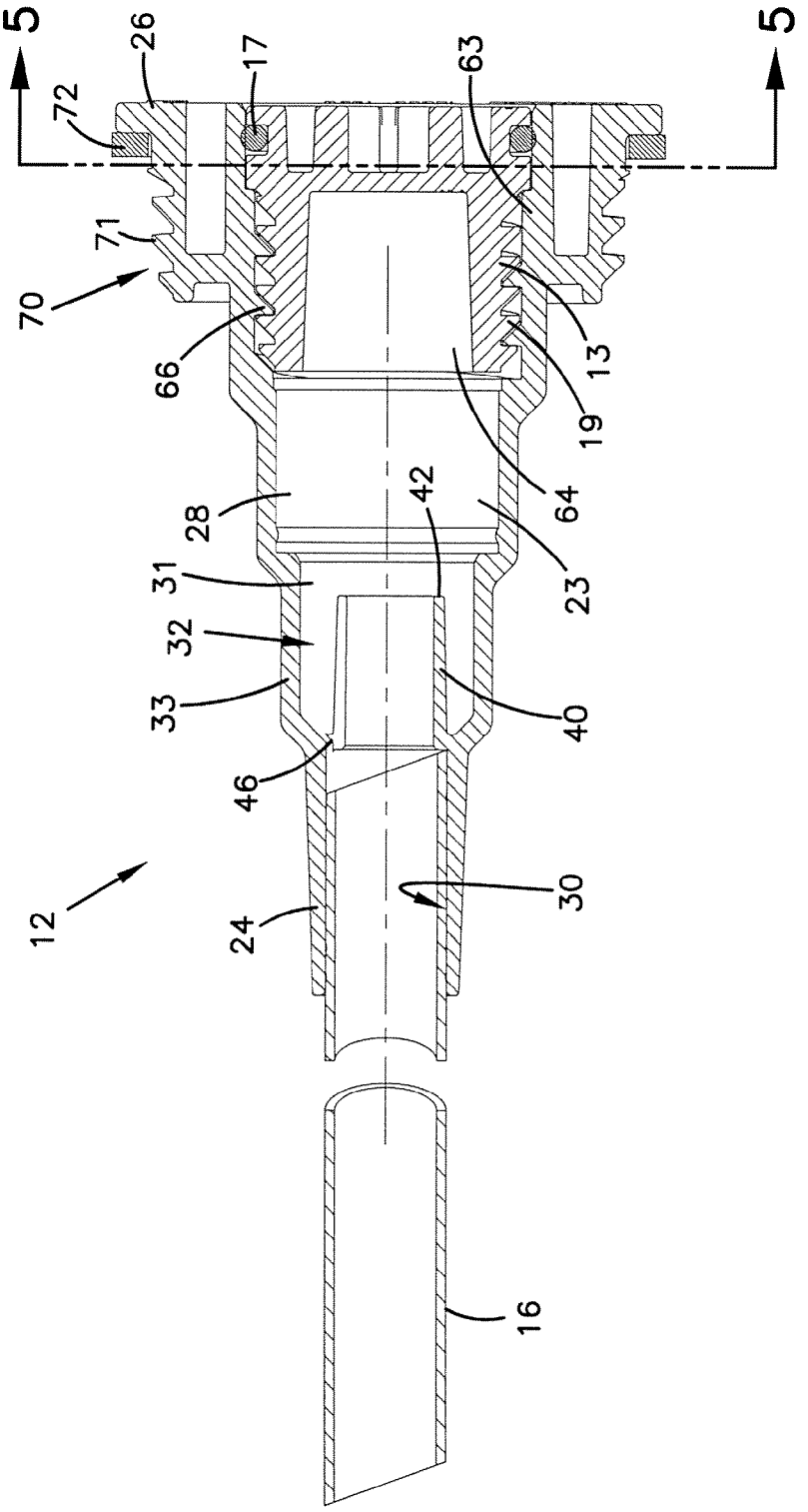
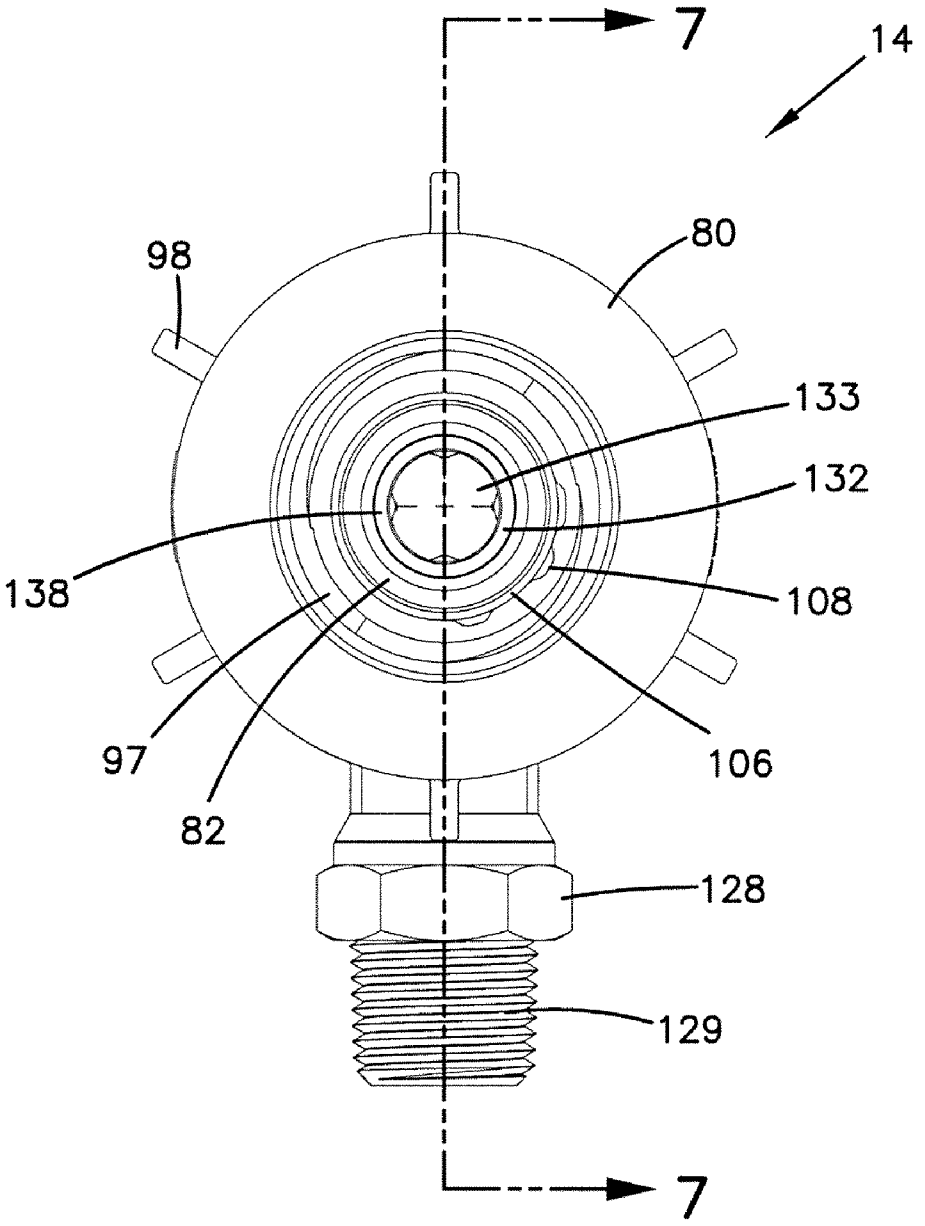


FIG.4

FIG.6



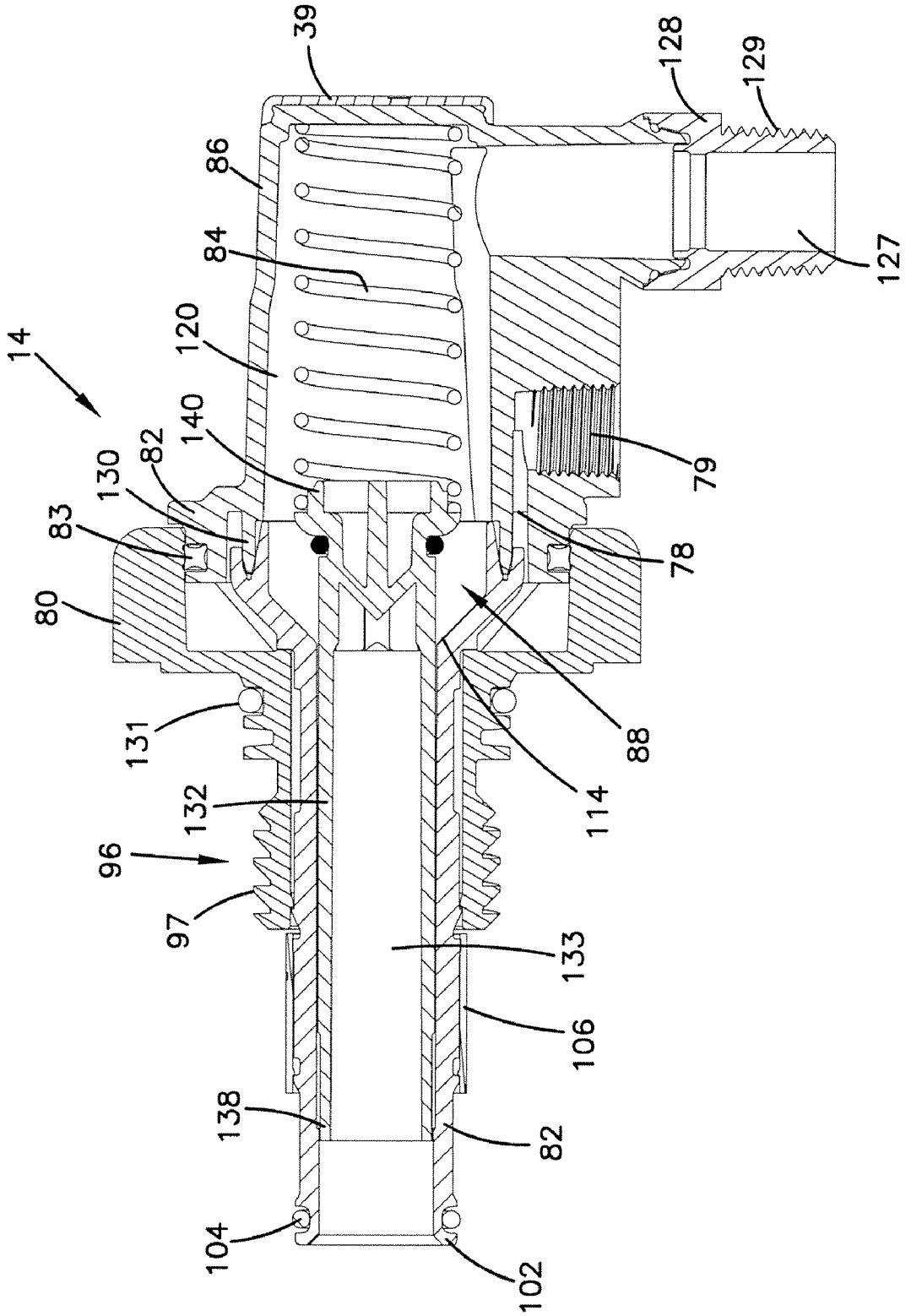

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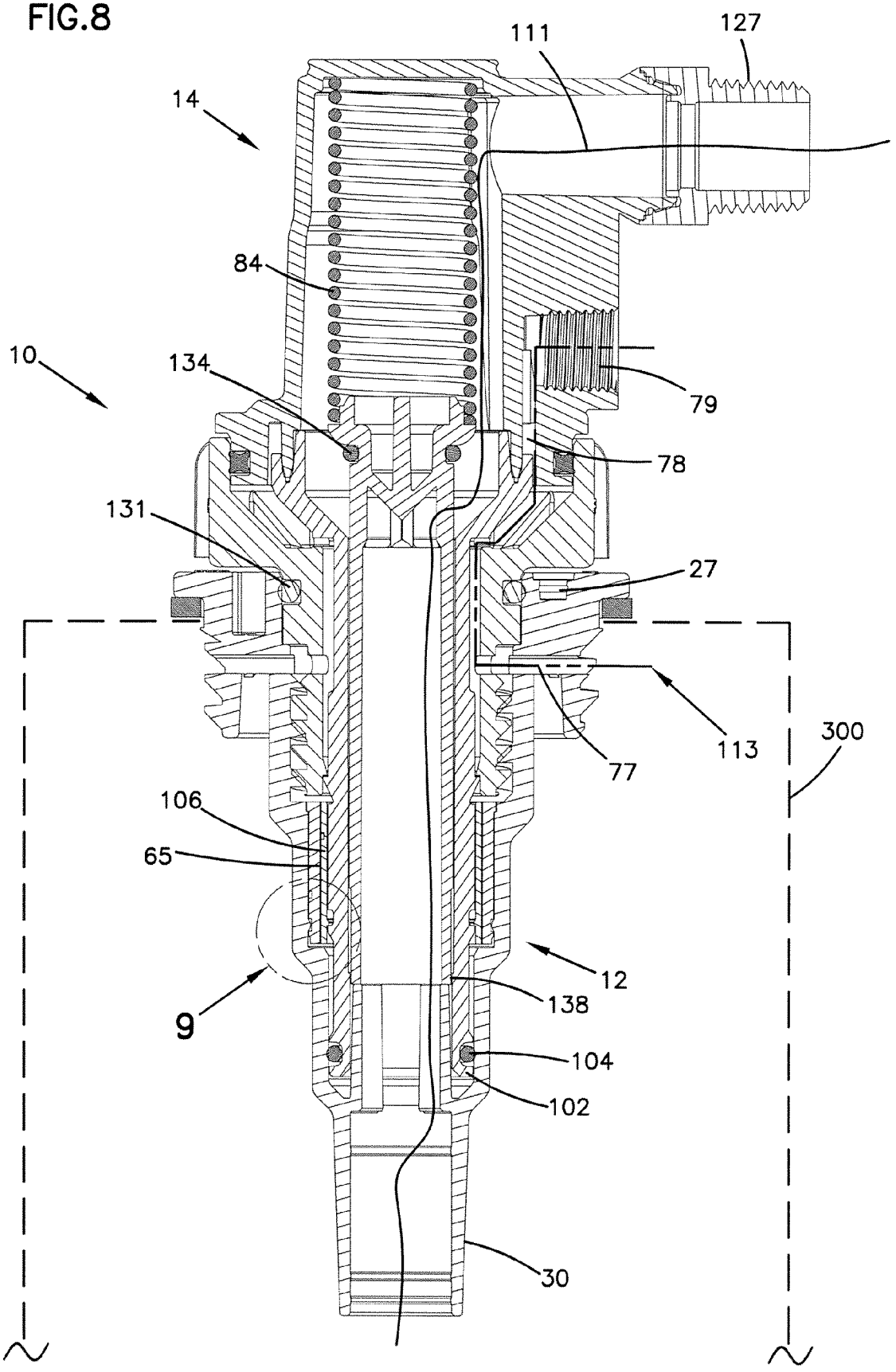
FIG.7

FIG.8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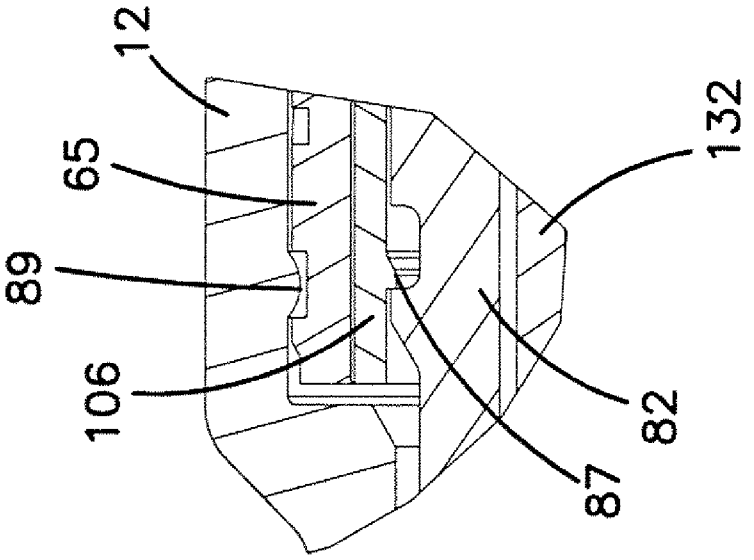

FIG.9

CONNECT/DISCONNECT COUPLING FOR A CONTAINER

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Patent Provisional Application Ser. No. 60/807,024 filed on Jul. 11, 2006, the entirety of which is hereby incorporated by reference.

[0002] This application is related to U.S. patent application Ser. No. 11/095,125 filed on Mar. 30, 2005, the entirety of which is hereby incorporated by reference.

BACKGROUND

[0003] A variety of industries use pails, drums, and larger Intermediate Bulk Containers ("IBC's" or "Totes") for the delivery of liquid chemical media. These containers typically have a variety of closure sizes and styles depending on the size and type of container. Some common closure types are threaded bung openings, snap-in, and crimp-in closures. Some example threaded bung openings include 2" buttress female and 2" NPS female (commonly used in 30 gal, 55 gal, and larger drums and IBC's), 63 mm male (commonly used in 5 gal jerry cans), and European Mauser.

[0004] There are a billion or more rigid containers and countless other types of semi-rigid and flexible containers produced each year around the world. In order to extract the contents of a container, most containers are simply tipped over so that the contents inside are emptied through one of the openings of the container or a simple valve inserted into the opening. Other containers have an opening in the bottom (typically the larger IBC's) that allow for a bottom dispense through a simple hand valve.

[0005] A percentage of the containers are emptied of their contents while the container remains upright using a top feed device such as a hand operated pump or a motor driven mechanical positive displacement pump that draws the contents out of the container via a dip-tube. Most of these containers are intended to be low cost "one way" containers (i.e., the containers are filled once and never seen again by the original filler). The containers may be refilled again by secondary fillers typically up to a maximum of five refills before the containers are destroyed or recycled.

[0006] An example life cycle of a container includes the following. Initially, pre-cleaned or in-housed cleaned containers are received. Next, the containers are clean room chemical filled and certified, and fitted with dust caps. Subsequently, the containers are shipped as dedicated containers to the user. Next, a dust cap is torn away and the user certifies the contents by checking extractables and/or particles levels, and the dispense head is installed. Next, the container contents are extracted, the dispense head is removed, and new dust caps are installed for the return trip. Subsequently, the empty container is shipped to a supplier. Finally, the clean container is returned for filling or for cleaning.

[0007] The basic system requirements for a dispense system for a container are defined by the following four factors: closed or open systems, reusable or disposable systems, industrial (low-purity) grade or high grade (ultra-pure) chemical systems, and Department of Transportation (DOT) or United Nations (UN) approved or unapproved systems.

[0008] Closed systems are designed to prevent exposure of a user to the contents of the container at any phase of the connection cycle (disconnected phase, connecting/disconnecting phase, and connected dispensing phase). Open systems have at least the following two design possibilities: 1) a system that allows the user to be exposed to the container contents (either liquid or vapors) when the connect/disconnect system is being connected or disconnected and/or when the system is in the connected/dispense phase, and 2) a system that allows air to enter the container when product is withdrawn or allows vapors to escape when the system is in the connected/dispensing phase.

[0009] Reusable systems typically include a dip tube that is intended to be used for many (100+) connection cycles. A reusable system may have to be removed several times from the container during its life to allow for cleaning. Disposable systems typically include a dip tube that is intended to be used less than five connection cycles and then thrown away. Disposable systems may be inserted into the container once with the intent of being disposed of along with the container.

[0010] Industrial (low-purity) grade (IPG) chemical systems make up about 80% of all chemicals supplied. Chemicals that fall under this category include those chemicals wherein the purity of the chemical is suitable for common chemical applications such as industrial cleaners, soaps, surfactants, clean-in-place (CIP) chemicals for dairy and food, dry cleaning and laundry, and agricultural pesticides and herbicides, as well as other general use applications. IPG containers must be delivered in a reasonably clean system but do not require the stringent clean requirements needed for handling Ultra Pure chemicals such as metallic extractability, total organic carbon (TOC), and particle contaminants. High grade (ultra-pure) chemical systems (HPG) applications make up about 20% of all chemicals supplied. Chemicals that fall under this category include chemicals wherein the purity of the chemical must meet criteria for which ultra filtration down to the parts per million (PPM), parts per billion (PPB), or even parts per trillion (PPT) of particles and/or metals. This classification typically involves such specialized applications as microelectronics, laboratory, and biopharmaceutical industries.

[0011] The specific product requirements that differentiate an IPG from an HPG system are primarily related to the materials of construction, handling procedures, and whether the system is "closed" or "open", as described above. As to materials of construction, metals are typically not allowed or desired to come in contact with the container contents. Plastic resins must be very clean and free from metallic contaminants, colorants, etc. These same standards apply for seals that may come into contact with the container contents.

[0012] As to handling procedures, the materials must be handled in a way that minimizes the transfer of contaminants to the piece parts or finished goods during production or shipping (e.g., mold release agents are not allowed), regrind plastic resin should not be used in components that have direct contact with the container contents, and lubricants are typically not permitted.

[0013] Whether the system is "closed" or "open" is relevant to the extent that Ultra-Pure chemicals often require minimum contact with oxygen. Typically, an inert gas "blanket" is maintained within the container above the container contents versus allowing air, which has a higher O_2 content, to enter the container and make up for the container contents that are removed. Typically this blanket gas will be nitrogen, CO_2, or other inert gas.

[0014] Whether or not a dispense system is DOT and/or UN approved relates to standards for shipping a combined container and closure system. This combination of container and closure system must be approved and certified by the DOT and/or the UN before being transported. Container with closure systems that are used "in house" therefore are required to meet different safety and other standards as opposed to container with closure systems that must be shipped over-the-road.

SUMMARY

[0015] One aspect of the present disclosure relates to a coupling assembly for removing contents of a container from an opening in the container. The coupling assembly includes a container insert coupled to the container opening and having first and second insert ends, the container insert including a first seal positioned adjacent to the first insert end to seal the container insert with respect to the container, and defining a first insert cavity with insert threads, a second insert cavity, a third insert cavity with an insert valve engagement member, and a dip tube engagement surface adjacent to the second insert end for engaging a dip tube that extends into the container, the container insert defining an insert passage extending from the first insert end to the second insert end and through the first, second, and third insert cavities, and the container insert defining an insert vent path extending through the container insert to the first insert cavity. The coupling assembly also includes a unit including first and second unit ends, and a coupling ring with threads positioned to engage the insert threads when coupled thereto and a first unit seal positioned to seal the container insert with respect to the first insert cavity, a coupling sleeve extending to the first unit end, a valve assembly positioned axially within the coupling sleeve, the valve assembly including a poppet member with first and second ends, the first end including a valve that seals against a shoulder formed in a first unit cavity defined by the unit, and a spring member positioned in the first unit cavity to force the valve into the closed position against the shoulder, and the unit defining a unit passage through the coupling sleeve and the first unit cavity to a unit port, and defining a unit vent path extending through the coupling sleeve to a vent port. When the unit is coupled to the container insert, the insert vent path mates with the unit vent path to define a complete vent path extending from within the container to the vent port, and the insert valve engagement member forces the poppet member against the spring member so that the valve unseats with respect to the shoulder to place the insert passage in fluid communication with the first unit cavity and the unit port.

[0016] The above summary is not intended to describe each disclosed embodiment or every implementation. Figures in the detailed description that follow more particularly exemplify embodiments. While certain embodiments will be illustrated and describing embodiments of the invention, the present disclosure is not limited to use in such embodiments.

DESCRIPTION OF THE DRAWINGS

[0017] Referring now to the drawings in which like reference numbers represent corresponding parts throughout:

[0018] FIG. **1** is a perspective view of an example coupling assembly with adapters, a connector, and a dip tube exploded therefrom;

[0019] FIG. **2** is a perspective view of the coupling assembly of FIG. **1** in exploded form;

[0020] FIG. **3** is a top view of an example container insert of the coupling assembly of FIG. **1**;

[0021] FIG. **4** is a cross-sectional view of the container insert of FIG. **3** taken along line **4-4**;

[0022] FIG. **5** is a cross-sectional view of the container insert of FIG. **4** taken along line **5-5**;

[0023] FIG. **6** is a bottom view of an example dispense unit of the coupling assembly of FIG. **1**;

[0024] FIG. **7** is a cross-sectional view of the dispense unit of FIG. **6** taken along line **7-7**;

[0025] FIG. **8** is a cross-sectional view of the coupling assembly of FIG. **1** coupled to an example container; and

[0026] FIG. **9** is an enlarged view of a portion of the coupling assembly of FIG. **8**.

DETAILED DESCRIPTION

[0027] In the following description of the illustrated embodiments, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration of embodiments. It is to be understood that other embodiments may be utilized as structural changes may be made without departing from the spirit and scope of the present disclosure.

[0028] An example coupling assembly **10** is shown and described with reference to FIGS. **1-9**. Coupling assembly **10** includes a container insert **12**, a dispense unit **14**, and a dip tube **16**. In example embodiments, container insert **12** and dispense unit **14** are configured for a quick connect/disconnect function relative to each other.

[0029] For example, as shown in FIG. **1**, dispense unit **14** includes a port **127** that is configured to accept an adapter **57** that is threaded therein. An opposite end of adapter **57** includes a connector structure **58** that is configured for connection with a connector **59**. In example embodiments, connector **59** is a quick connect/disconnect connector such as that disclosed in U.S. Pat. No. 6,231,089 filed on Mar. 10, 1999, the entirety of which is hereby incorporated by reference.

[0030] In addition, dispense unit **14** includes a vent port **79** that is configured to accept an adapter **49** that can be threaded therein. An opposite end of adapter **49** includes a barbed surface **47** for connection with a hose (not shown) that is, in turn, connected to a source of gas such as air.

[0031] In example embodiments, coupling assembly **10** provides a semi-closed system for dispensing and storing contents in a container. In the embodiment shown, coupling assembly **10** is not a closed system, in that dip tube **16** and container insert **12** do not have a shut-off valve. Coupling system **10** includes a shipping cap **13** that seals dip tube **16** and container insert **12** during shipping. Because there is no separate valve in dip tube **16** and container insert **12**, the contents of the container to which container insert **12** is coupled can be exposed to a user outside of the container during the typically brief time when shipping cap **13** is removed and dispense unit **14** is not yet connected to container insert **12**.

[0032] When in the connected state, the following three general configurations exist for managing the vapors and potential user contact with the container contents:

[0033] a fully open vent that provides air intake into the drum while vapors are allowed to escape through the same opening that the incoming air travels through;

[0034] a checked un-ported vent that is typically an air checking device control that is incorporated into the container insert or the dispense unit, allowing venting air into the container but not allow vapors or the container contents out through the vent opening; or

[0035] a ported vent that involves incorporation of an isolated and sealed air vent flow path through the container insert into the dispense unit, which would have an external port. For example, a barb flared (MPT) can be used and would allow the user to have potentially three options for managing the pressure conditions inside the drum as follows: (1) simply vent the vapors to atmosphere, (2) install a one-way check valve into the port that allows air into the drum, but not allow vapors out of the same port (this would provide for a sealed container in the event of a tip over condition), or (3) plumb the vapor flow path to a controlled location such as an air scrubber or filter (this option may provide a method for the end user to apply an inert layer of "blanket gas" to the container contents to prevent oxidation (e.g., nitrogen)).

Of these several options, a fully open vent does not provide a sealed container, although the option can be inexpensive. A ported vent option provides the most flexibility, although it can involve a compromise between flow capacity and expense. A checked unported vent is a solution between the fully opened vent and the ported vent options.

[0036] Coupling assembly **10** can include any of these venting options. In the examples described and shown herein, coupling assembly **10** includes the ported vent option.

[0037] Coupling assembly **10** can be suited for industrial pure grade (IPG) applications, although the use of certain materials can make coupling assembly **10** available for use with high purity grade (HPG) chemical systems as well. In example embodiments, coupling assembly **10** is also designed to be capable of being Department of Transportation (DOT) or United Nations (UN) Certified with a variety of different container sizes.

[0038] In example embodiments, it is desirable that the container is compatible with a plurality of chemicals and other container contents while minimizing the number of container insert configurations so as to minimize potential inventory while maximizing build lots. Two factors that influence this objective is the material selection for the container insert **12** and related seals (not shown), and the number of container interfaces. Both polyethylene and polypropylene can be used for the container insert material because of the very broad chemical compatibility and relatively low cost of these materials. Other materials for construction include high-density polyethylene (HDPE) or Teflon materials such as PTFE or PFA for applications related to high purity grade (HPG) chemical systems.

[0039] One consideration when choosing materials for container insert **12** is the DOT/UN Certification requirement that requires testing at 0° F., a temperature at which polypropylene materials often do not perform well. The materials may also be "Fluorinated," which is a process that exposes the finished polyethylene part to a Fluorine gas resulting in a part that has typically better chemical resistance than standard polyethylene materials.

[0040] In example embodiments, container insert **12**, dip tube **16**, and associated sealing member positioned between container insert **12** and the container are designed so that the combined cost of these features is such that it is cost effective to dispose of these components, for example, when the container is disposed of or after a limited number of uses.

[0041] In example embodiments, container insert **12** is a disposable part that has a life of about, for example, five to ten cycles. Container insert **12** can be designed to be a relatively low cost product. Alternatively, in other embodiments, container insert **12** can be constructed in a way so that it has a greater life cycle.

[0042] Dip tube **16** can be made from materials different from those used by container insert **12** or dispense unit **14**. For example, in industrial pure grade (IPG) applications, the dip tube can include a "rigid" polytube such as polypropylene, polyethylene, or a soft flexible TYGON type material. In example embodiments, dip tube **16** is about ⅜ to about ¾ inches in outer diameter. For high pure grade (HPG) applications, tubing can be made of a rigid type material such as FEP or PFA having dimensions of about ½ to about 1 inch in outer diameter with a wall thickness of about 0.06 to 0.07 inches.

[0043] In example embodiments, all of the components of coupling assembly **10** are made from a polymer material due to the relatively low cost and high resistance to wear and corrosion of these materials as compared to metals and other materials. This can include springs or other mechanisms that may be required in coupling assembly **10**. In some embodiments, coated metal materials or metal materials can be used at locations that are not exposed to the container contents. Some example materials for use in the springs include Hastelloy C, 316SS, PPS, PEEK, and PTFE/FEP encapsulated 316SS.

[0044] In the examples shown, coupling assembly **10** can be used for container applications that involve a "pump sucking" of the container contents from the container, so that coupling assembly **10** can be exposed to a slight vacuum pressure (e.g., of about −5 psi maximum). Typically, drum pressure ratings are about 15 psig for plastic materials and 36 psig for metal materials. In example embodiments, coupling assembly **10** is designed for use within a temperature range of about −32° to 140° F.

[0045] Coupling assembly **10** can be configured with features that reduce fluid spillage upon disconnect of the container insert **12** and the dispense unit **14**. In one embodiment, the fluid spillage at disconnect is minimized to levels less than 0.1 cc/disconnect range if possible.

[0046] Coupling assembly **10** can also configured to minimize the turbulence in the flow path through the coupling assembly. Agitation of the pump contents is minimized in order to avoid aeration of the pumped material and the generation of particles and degradation of flow performance. Coupling assembly **10** is also functional without the use of lubricant.

[0047] Referring now to FIGS. **1-5**, container insert **12** includes first and second ends **24**, **26**, an open passage **23** that defines a flow path, a dip tube engagement surface **30**, and a valve engagement member **32**.

[0048] Dip tube engagement surface **30** include ribs, channels or features on an internal or external surface of container insert **12** at first end **24** for connection of dip tube **16**. Valve engagement member **32** is positioned within a wall **33** forming a cavity **31** within passage **23** of container insert **12**. Valve engagement member **32** includes a wall structure **40** with an end **42** and a slot **46** formed therein. Slot **46** can be useful for facilitating draining of any fluids collected around

a wall structure **40**, thereby preventing fluids from puddling within container insert **12** and reducing the chance for exposure by the user to the container contents.

[0049] Second end **26** includes a wall **63** forming an open cavity **64** and includes a plurality of threads **66** formed thereon, a container engagement member **70**, and a sealing member **72**.

[0050] Container engagement member **70** can have any number of different sizes and features for connecting to a particular container opening. For example, member **70** can be in the form of a bung, cap, or pail cover, such as, for example, a two inch buttress bung, S56X4 buttress bung, S70X6 buttress bung, a two inch NPS or BSP bung, a DIN 61, an S63 cap, or a flex spout or other removable pail cover. In the example shown, container engagement member **70** includes a bung style male threaded portion having a plurality of threads **71** sized to fit within a common threaded opening of a container.

[0051] Seal member **72** provides a sealing function between container insert **12** and the container.

[0052] Shipping cap **13** is used to seal the container when dispense unit **14** is not coupled to the container insert **12**. Shipping cap **13** includes threads **19** formed on an outer surface thereof that are sized to engage internal threads **66** of second end **26** of container insert **12**. Shipping cap **13** also includes a sealing member **17**, such as an O-ring or similar structure, that is capable of forming a seal between an outer circumference surface of sealing member **17** and an inner surface of second end **26** of container insert **12**.

[0053] Shipping cap **13** also includes an actuator seat **15** that is configured for engagement by an off-the-shelf tool such as, for example, a #4 Phillips or a ⅜" flat standard screwdriver, or a standard square, hexagon, or torque type driving tool structure. Although it is possible to form actuator seat **15** with features that would require a specialized installation tool for installing and removing the container insert, or applying a specific amount of torque in doing so, the actuator seat **15** in the example shown is configured to provide a relatively reliable seal that can be established with a relatively low amount of torque using a relatively conventional tool available to most users. Thus, shipping cap **13** provides additional convenience for a user while minimizing the chances of damaging cap **13** or container insert **12** from the user over tightening shipping cap **13**, which may more frequently occur when using specialized tools.

[0054] In example embodiments, a keying scheme is used to assist the user in determining which dispense unit should be connected to a container insert of a container. In one example, no keying is provided. In another example, visual keys are provided on the dispense unit and container insert. In another example, visual and/or mechanical keys are provided. Example keying schemes are described below.

[0055] In example embodiments, a key member **65** (see FIG. **2**) is positioned within a cavity **28** of passage **23** of container insert **12**. Key member **65** includes a plurality of key slots **67** formed therein that correspond to keys formed in a mating portion of dispense unit **14**, as described below. In the example embodiment shown, key member **65** is a separate member that is snap fit (see detent **89** of container insert **12** shown in FIG. **9** that engages key member **65**) or otherwise coupled within cavity **28**. In alternative embodiments, key member **65** can be integrally formed within cavity **28** of container insert **12**. In example embodiments, key member **65** forms an interference fit with the walls of cavity **28** so that key member **65** can be rotated within cavity **28**. In this manner, key member **65** and dispense unit **14** attached thereto can be spun after dispense unit **14** is coupled to container insert **12** to, for example, change the direction of lines extending from dispense unit **14** (e.g., connector **59**).

[0056] Container insert **12** also includes a key **29** coupled to an exposed surface of insert **12** (see, e.g., port **27** in FIG. **8**). Key **29** can include text, color, or other indicia that indicates the contents of the container to which container insert **12** is coupled. In addition, dispense unit **14** includes a key ring **39** coupled thereto. See FIGS. **2** and **7**. Key ring **39** can include text, color, or other indicia that indicates the container to which dispense unit should be connected. For example, in one embodiment, key **29** and key ring **39** are both colored the same color so that visual confirmation that dispense unit **14** can be coupled to container insert **12** is provided. Such a configuration can be used in conjunction with the keying structures identified above and/or the smart technology described below to assure that the dispensing unit is connected to the proper container insert.

[0057] Container insert **12** includes a vent passage **77** defined adjacent to second end **26**. See FIGS. **2** and **8**. Vent passage **77** extends from between threads **71** of container engagement member **70** through wall **63** of container insert **12** and threads **66** to cavity **64**. Vent passage **77** facilitates venting of gas into and out of the container to which container insert **12** is attached, as described further below.

[0058] Referring now to FIGS. **1**, **6**, and **7**, dispense unit **14** includes a coupling ring **80**, a coupling sleeve **82**, a spring **84**, an adapter member **86**, and a valve assembly **88**.

[0059] Coupling ring **80** includes a drum insert engagement surface **96** having a plurality of threads **97**, and coupling ring **80** engages a seal **83** positioned between coupling ring **80** and coupling sleeve **82**.

[0060] Drum engagement surface **96** and associated threads **97** are configured to engage the plurality of threads **71** of container engagement member **70**. Actuator surface **98** (e.g., projections) is used by a user to rotate engagement surface **96** once threads **97** are in position for engagement with threads **71** of the container insert **12**. A seal **131**, such as an O-ring, is positioned adjacent on drum engagement surface **96** to form a seal between dispense unit **14** and wall **63** forming cavity **64** of container insert **12**.

[0061] A vent passage **78** extends through dispense unit **14** to vent port **79**. See FIGS. **2** and **8**. Specifically, vent passage **78** extends through coupling ring **80**, along a passage formed between a portion of ring **80** and coupling sleeve **82**, and to vent port **79**. Vent passage **78**, in conjunction with vent passage **77** of container insert **12**, provides a vent path between the inside of the container to which coupling **10** is attached and the environment outside of the container (i.e., a line attached to vent port **78**).

[0062] Coupling sleeve **82** includes first and second ends **100**, **102**, a sealing member **104**, a key member **106**, and a poppet sealing surface **114**. Sealing member **104**, such as an O-ring, is positioned at first end **102** and is configured to provide a fluid seal between first end **102** of the coupling sleeve **82** and the walls forming open cavity **28** of container insert **12**.

[0063] Key member **106** can be integrally formed into coupling sleeve **82**, or can be a separate member (as shown in FIGS. **2** and **7**) that is snap fit or otherwise coupled to the coupling sleeve **82** at a predetermined position (see detent **87** of key member **106** shown in FIG. **9** that engages

coupling sleeve **82**). Key member **106** includes a plurality of keys **108** that are sized and positioned to engage key slots **67** formed on key member **65** of container insert **12**. See FIGS. **6**, **8**, and **9**. If keys **108** are not aligned with key slots **67**, key member **106** cannot be inserted into key member **65**, thereby not allowing dispense unit **14** to be coupled to container insert **12**. Keying can be provided to, for example, stop the coupling of a dispense unit **14** to an improper container insert **12**.

[0064] Poppet sealing surface **114** extends within an interior diameter of the coupling sleeve **82** and provides a fluid seal between valve assembly **88** and coupling sleeve **82**. In some embodiments, poppet sealing surface **114** can be located at other positions along the length of coupling sleeve **82** depending on, for example, the size, shape, and position of various valve assembly members and the desired sealing surface defined by the valve assembly members.

[0065] Spring **84** is positioned within a bore **120** of adapter member **86** and provides a spring force against valve assembly **88**, thereby maintaining a seal between valve assembly **88** and coupling sleeve **82** when dispense unit **14** is in a closed or rest state. Valve assembly **88** is shown in an open state in FIG. **7**. Spring **84** can be made from any material suitable for the coupling assembly **10** application, and can include, for example, polymer materials, metal materials, or embedded metal materials.

[0066] Adapter member **86** includes an adapter portion **128** with a port **127** with threads **129**, and a coupler sleeve connection member **130**. Adapter portion **128** is sized to connect to a dispense line (not shown) via adapter **57** and connector **59**. See FIG. **1**. The adapter portion **128** can include structures on an external surface thereof that assist in providing a sealed connection with a dispense line, such as threads **129**. Connection member **130** can have any desired configuration for securing adapter member **86** to the coupling sleeve **82** with a releasable or a permanent connection.

[0067] Valve assembly **88** includes poppet **132** with a passage **133**, first and second ends **138**, **140**, and a sealing member **134** such as an O-ring. Poppet **132** is shaped to form a seal with poppet seat surface **114** of coupling sleeve **82**. Poppet **132** can seal with coupling sleeve **82** at various positions on poppet **132** such as, for example, on a slanted surface or on a surface extending parallel to an axis of dispense unit **14**. Sealing member **134** provides additional sealing function between valve assembly **88** and coupling sleeve **82**.

[0068] First end **138** of poppet **132** extends axially from valve assembly **88** of poppet **132** to first end **102** of coupling sleeve **82**. Second end **140** can include a plurality of openings adjacent to poppet **132** to promote flow of the container contents through valve assembly **88**. First end **138** of valve poppet **132** is configured to contact valve engagement member **32** of container insert **12**. In use, first end **138** of poppet **132** contacts valve engagement member **32** and moves poppet against the axial forces applied by spring **84** to open and close the valve assembly **88**. In the open position, passage **133** is in fluid communication with bore **120** and port **127**.

[0069] Referring now to FIGS. **8** and **9**, dispense unit **14** is shown coupled to container insert **12** to form coupling assembly **10**.

[0070] As dispense unit **14** is inserted into container insert **12**, keys **108** of key member **106** of dispense unit **14** are inserted into key slots **67** of key member **65** of container insert **12**. If keys **108** do not align with key slots **67**, the coupling of dispense unit **14** with container insert **12** is prevented. Otherwise, if keys **108** do align with key slots **67**, dispense unit **14** can be coupled to container insert **12**.

[0071] As dispense unit **14** is inserted, threads **97** of drum insert engagement surface **96** of coupling ring **80** engage threads **66** of wall **63** within cavity **64** of container insert **12**. Coupling ring **80** is rotated to thread dispense unit **14** onto container insert **12**. Seal **131** of drum engagement surface **96** forms a seal between dispense unit **14** and wall **63** forming cavity **64** of container insert **12** as dispense unit **14** is threaded onto container insert **12**.

[0072] In example embodiments, coupling ring **80** can rotate freely relative to the coupling sleeve **82**, thereby making it possible for key features **67**, **108** to remain in engagement with each other and continue to move axially relative to each other while the threads **97** rotate relative to the threads **66**.

[0073] As dispense unit **14** is threaded onto container insert **12**, dispense unit **14** moves axially such that first end **102** of coupling sleeve **82** is inserted into dispense unit **14** until seal **104** engages the wall forming cavity **31**. As coupling sleeve **82** is inserted, second end **138** of poppet **132** contacts end **42** of wall structure **40** of engagement member **32**. Wall structure **40** forces poppet **132** axially against spring **84** so that sealing member **134** is unseated from poppet seat surface **114** of coupling sleeve **82**.

[0074] In the coupled state as shown in FIG. **8**, container insert **12** is coupled to an example container **300**, and container insert **12** and dispense unit **14** together form a fluid path **111** from second end **24** of container insert **12** to port **127** of dispense unit **14**. In this manner, fluid can flow to/from container **300** coupled to container insert **12** to/from equipment coupled to port **127** of dispense unit **14**.

[0075] In addition, a vent path **113** is formed by vent passage **77** of container insert **12** and vent passage **78** of dispense unit **14**. In this manner, vent path **113** extends from within the container to which container insert **12** is coupled, through passages **77**, **78**, and to vent port **79** of dispense unit **14**.

[0076] In example embodiments, when a vacuum pressure condition exists within the container when, for example, fluid is being extracted, vent path **113** allows airflow from outside the container, through port **79**, passages **77**, **78**, and into the internal volume of the container. In one embodiment, a hose from an air compressor can be connected to port **79** to force air through vent path **113** to assist in the extraction of fluid from the container.

[0077] The sequence of connecting and valving functions for the coupling assembly **10** enables: 1.) proper keying of the container insert **12** and dispense unit **14** features, 2.) a positive connection between the container insert **12** and dispense units **14**, and 3.) opening of the valve for dispensing of the contents of the container.

[0078] As described above, in alternative embodiments, coupling assembly **10** includes a "smart reader" system for identifying information related to the container and the container contents to which container insert **12** and dispense unit **14** are coupled. For example, container insert **12** can include a radio frequency identification tag, and dispense unit **14** can include a radio frequency identification reader. The reader can read information from the tag related to the container, such as the size and certification, and information

related to the container insert such as, for example, certification ratings, number of uses, the contents of the container, the dates when the container was filled or emptied, and the length of time of connection between container insert **12** and dispense unit **14**. This information can be communicated to a remote location. Additional details regarding such a system can be found in U.S. patent application Ser. No. 11/095,125 filed on Mar. 30, 2005. Additional details regarding radio frequency devices incorporated into connectors is found in U.S. Pat. No. 6,649,829 filed on May 21, 2002, the entirety of which is hereby incorporated by reference.

[0079] In the examples shown, it can be advantageous in some embodiments to use a separate key member **106** that is coupled to coupling sleeve **82** of dispense unit **14**. A separate key member **106** can be produced for many different key configurations related to, for example, different container contents, industries, etc. Thus, the majority of dispense unit **14** components can be produced with a single design while only key member **106** is changed and separately coupled to coupling sleeve **82** for different keying configurations and applications. In other embodiments, the features of key member **106** can be integrally formed into the coupling sleeve **82**, which option may be well suited for high production of a single key configuration.

[0080] In example embodiments herein, the unit **14** is described as a "dispense" unit. However, in alternative embodiments, the unit and container insert can be used to fill or otherwise insert material into the container, as opposed to dispensing material from the container.

[0081] The above specification provides a complete description of the manufacture and use of the disclosed embodiments. Since many alternative embodiments can be made without departing from the spirit and scope of the present disclosure, the invention resides in the claims hereinafter appended.

What is claimed is:

1. A unit for a coupling assembly for removing contents of a container from an opening in the container, the unit comprising:

a main unit body including first and second unit ends;

a coupling ring with threads positioned to engage insert threads of a container insert when coupled thereto, the coupling ring being configured to rotate about the main unit body;

a first unit seal positioned to seal with respect to the container insert;

a coupling sleeve extending to the first unit end;

a valve assembly positioned axially within the coupling sleeve, the valve assembly including a poppet member with first and second ends, the first end including a valve that seals against a shoulder formed in a first unit cavity defined by the unit, and a spring member positioned in the first unit cavity to force the valve into a closed position against the shoulder;

wherein the unit defines a unit passage through the coupling sleeve and the first unit cavity to a unit port, and defines a unit vent path extending through the coupling sleeve to a vent port.

2. The unit of claim **1**, wherein, when the unit is coupled to the container insert, the coupling sleeve defines a unit keyed surface that mates with an insert keyed surface of the container insert.

3. The unit of claim **1**, wherein, when the unit is coupled to the container insert, the unit vent path mates with an insert vent path of the container insert to define a complete vent path extending from within the container to the vent port.

4. The unit of claim **1**, wherein, when the unit is coupled to the container insert, the poppet member is forced against the spring member so that the valve unseats with respect to the shoulder to place the first unit cavity and the unit port in fluid communication with an insert passage defined by the container insert.

5. The unit of claim **1**, further comprising an adapter including first and second adapter ends, the first adapter end of the adapter being configured to mate with the unit port, and the second adapter end being configured to mate with a connector.

6. The unit of claim **5**, wherein the connector is a quick connect/disconnect connector.

7. A coupling assembly for removing contents of a container from an opening in the container, the coupling assembly comprising:

a container insert configured to be coupled to the opening of the container and having first and second insert ends, the container insert including a first seal positioned adjacent to the first insert end to seal the container insert with respect to the container, and defining a first insert cavity with insert threads, a second insert cavity, a third insert cavity with an insert valve engagement member, and a dip tube engagement surface adjacent to the second insert end for engaging a dip tube that extends into the container, the container insert defining an insert passage extending from the first insert end to the second insert end and through the first, second, and third insert cavities, and the container insert defining an insert vent path extending through the container insert to the first insert cavity; and

a dispense unit including a main dispense body including first and second dispense ends, and a coupling ring with threads positioned to engage the insert threads when coupled thereto and a first dispense seal positioned to seal the container insert with respect to the first insert cavity, a coupling sleeve extending to the first dispense end, a valve assembly positioned axially within the coupling sleeve, the valve assembly including a poppet member with first and second ends, the first end including a valve that seals against a shoulder formed in a first dispense cavity defined by the dispense unit, and a spring member positioned in the first dispense cavity to force the valve into a closed position against the shoulder, and the dispense unit defining a dispense passage through the coupling sleeve and the first dispense cavity to a dispense port, and defining a dispense vent path extending through the coupling sleeve to a vent port;

wherein, when the dispense unit is coupled to the container insert, the insert vent path mates with the dispense vent path to define a complete vent path extending from within the container to the vent port, and the insert valve engagement member forces the poppet member against the spring member so that the valve unseats with respect to the shoulder to place the insert passage in fluid communication with the first dispense cavity and the dispense port

8. The coupling assembly of claim **7**, wherein the coupling ring is configured to rotate about the main dispense body.

9. The coupling assembly of claim **7**, further comprising an adapter including first and second adapter ends, the first adapter end of the adapter being configured to mate with the dispense port, and the second adapter end being configured to mate with a connector.

10. The coupling assembly of claim **9**, wherein the connector is a quick connect/disconnect connector.

11. The coupling assembly of claim **7**, further comprising a shipping cap that is configured to seal the dip tube and the container insert during shipping.

12. The coupling assembly of claim **11**, wherein the shipping cap includes cap threads formed on an outer surface thereof that are sized to engage the insert threads formed in the first insert cavity of the container insert, and a sealing member that seals with respect to the first insert cavity of the container insert.

13. The coupling assembly of claim **7**, further comprising a key coupled to an exposed surface of the container insert.

14. The coupling assembly of claim **13**, wherein the key is configured to provide a visual indicia of the contents of the container, and wherein the visual indicia corresponds to a key ring coupled to the dispense unit.

15. The coupling assembly of claim **7**, wherein, when the dispense unit is coupled to the container insert, the coupling sleeve defines a dispense keyed surface that mates with an insert keyed surface of the container insert.

16. The coupling assembly of claim **15**, wherein the insert keyed surface includes a plurality of keys that are sized and positioned to engage key slots formed in the dispense keyed surface when the dispense keyed surface mates with the insert keyed surface.

17. A method for dispensing contents of a container, the method comprising:

providing a container insert having first and second insert ends, the container insert including a first seal positioned adjacent to the first insert end to seal the container insert with respect to the container, and defining a first insert cavity with insert threads, a second insert cavity, a third insert cavity with an insert valve engagement member, and a dip tube engagement surface adjacent to the second insert end for engaging a dip tube that extends into the container, the container insert defining an insert passage extending from the first insert end to the second insert end and through the first, second, and third insert cavities, and the container insert defining an insert vent path extending through the container insert to the first insert cavity;

providing a unit including a main unit body including first and second unit ends, and a coupling ring with threads positioned to engage the insert threads when coupled thereto and a first unit seal positioned to seal the container insert with respect to the first insert cavity, a coupling sleeve extending to the first unit end, a valve assembly positioned axially within the coupling sleeve, the valve assembly including a poppet member with first and second ends, the first end including a valve that seals against a shoulder formed in a first unit cavity defined by the unit, and a spring member positioned in the first unit cavity to force the valve into a closed position against the shoulder, and the unit defining a unit passage through the coupling sleeve and the first unit cavity to a unit port, and defining a unit vent path extending through the coupling sleeve to a vent port;

coupling the container insert to an opening in the container; and

coupling the unit to the container insert such that the insert vent path mates with the unit vent path to define a complete vent path extending from within the container to the vent port, and the insert valve engagement member forces the poppet member against the spring member so that the valve unseats with respect to the shoulder to place the insert passage in fluid communication with the first unit cavity and the unit port.

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