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(54) **ADAPTOR FOR CONNECTING A FLUID PACKAGE TO A DISPENSER BOTTLE**

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(57) **ABSTRACT**

Adapters, systems, and methods are provided that can be used to refill a fluid dispenser bottle. An adapter is used to connect a fluid package to a dispenser bottle. The adapter includes a duct configured to convey a fluid being transferred from the fluid package to the dispenser bottle; a fluid package coupler coupled with the duct and configured to couple with the fluid package so as to place the duct in fluid communication with the fluid package; a dispenser bottle coupler coupled with the duct and configured to couple with the dispenser bottle so as to place the duct in fluid communication with the dispenser bottle; and at least one orifice disposed offset from the duct for venting the dispenser bottle when fluid is transferred from the fluid package to the dispenser bottle.

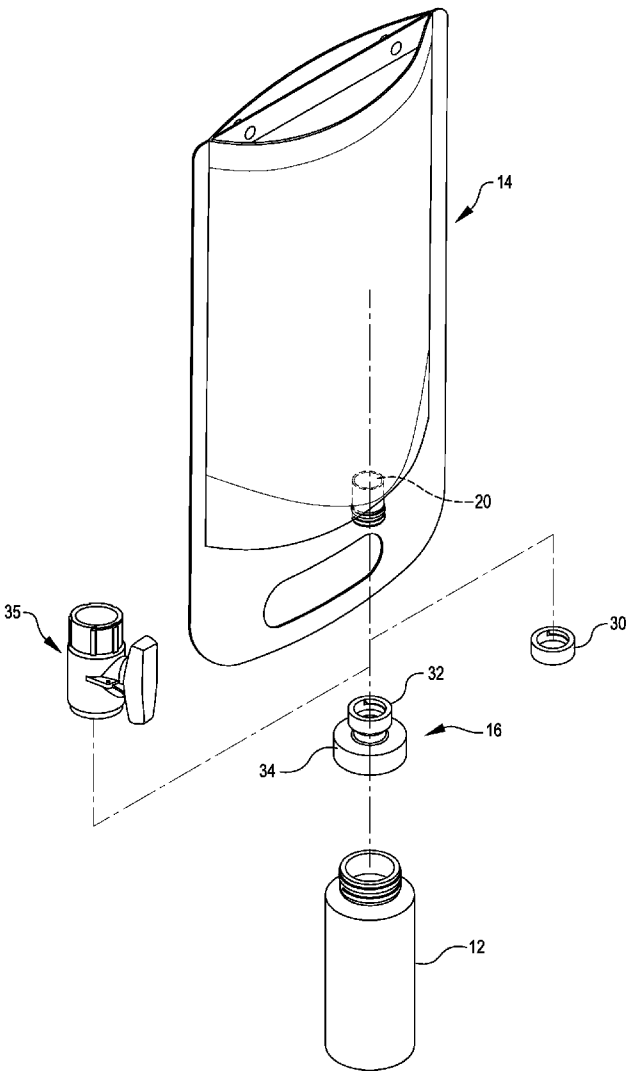


FIG. 1

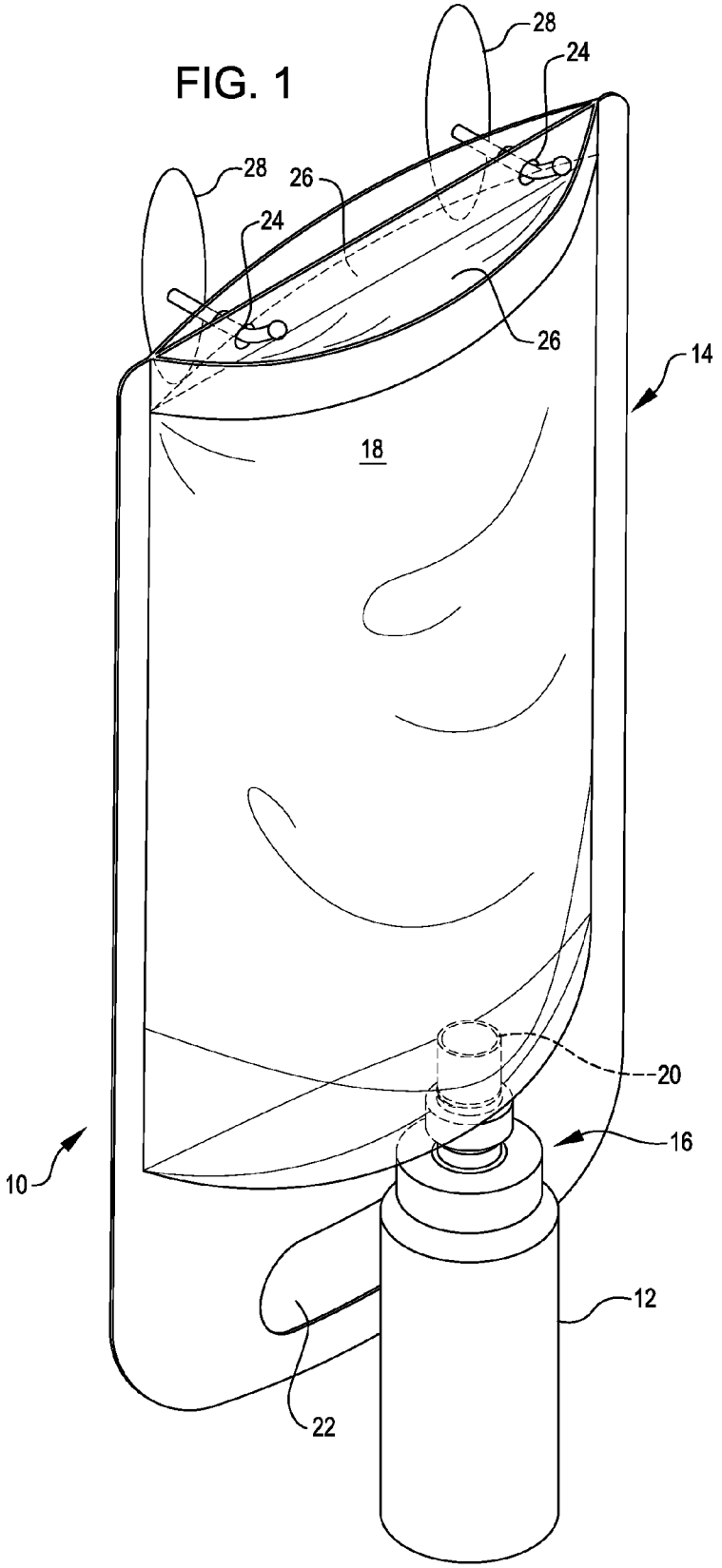


FIG. 2

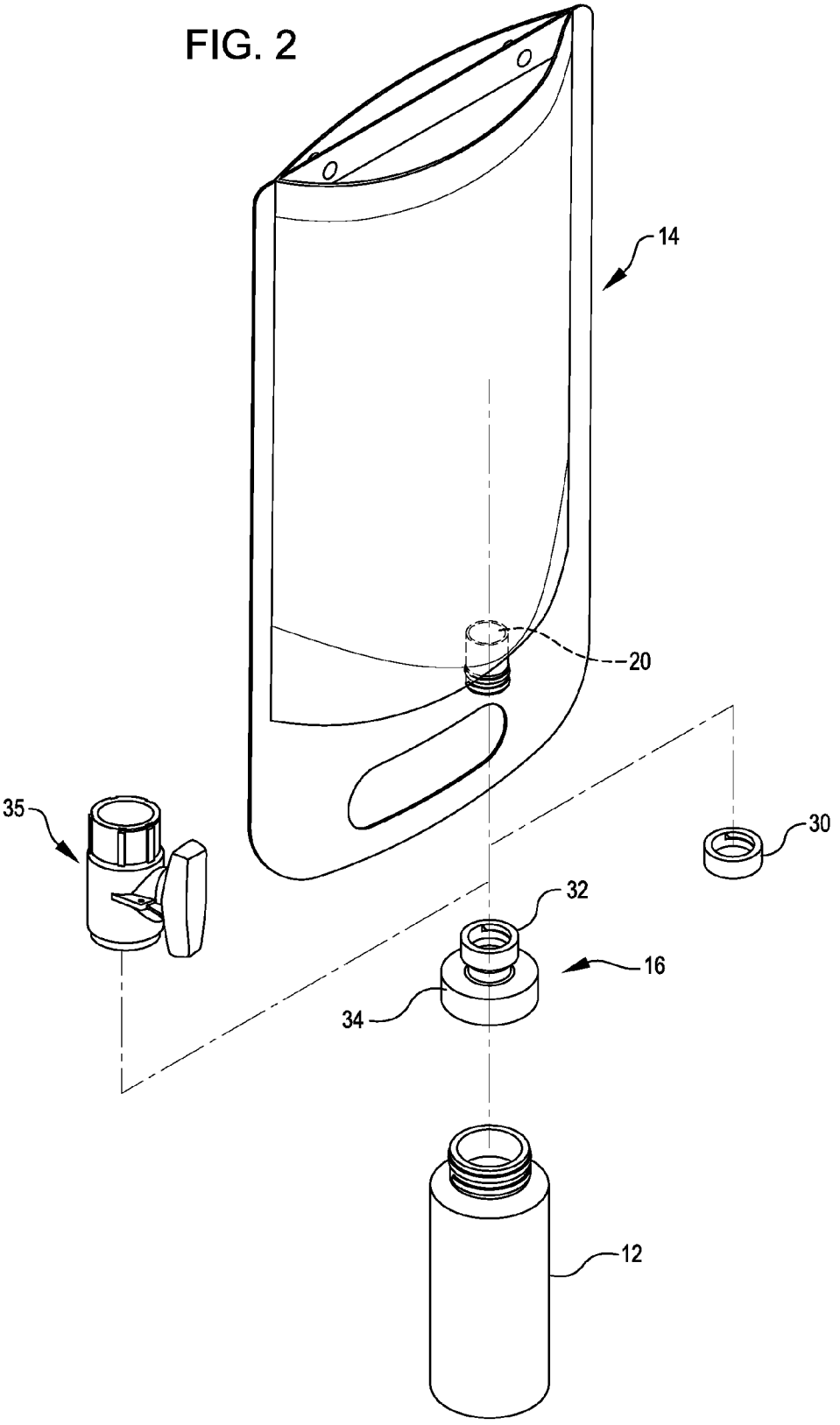


FIG. 3

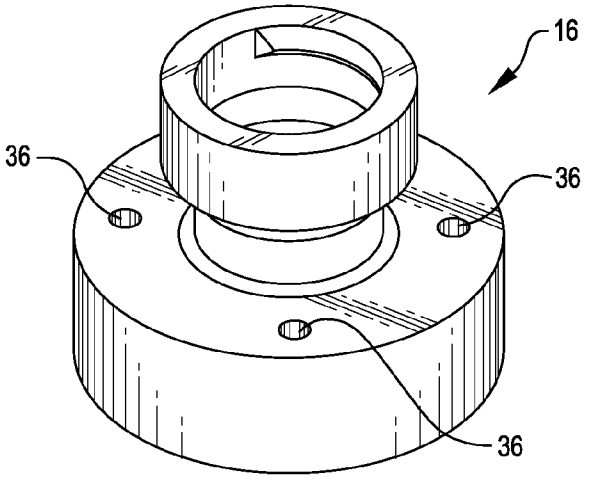


FIG. 4

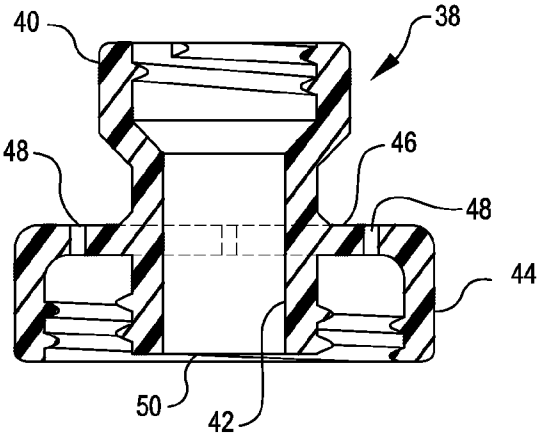


FIG. 5

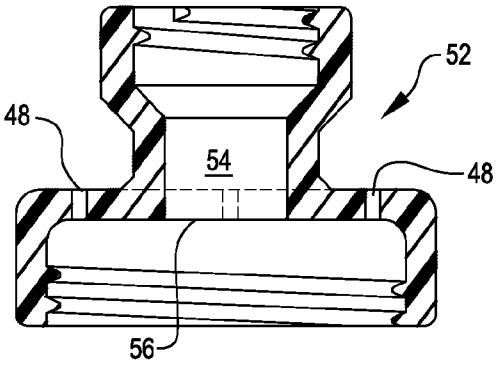


FIG. 6

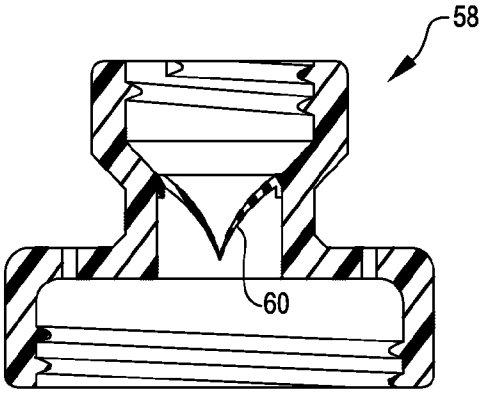


FIG. 7

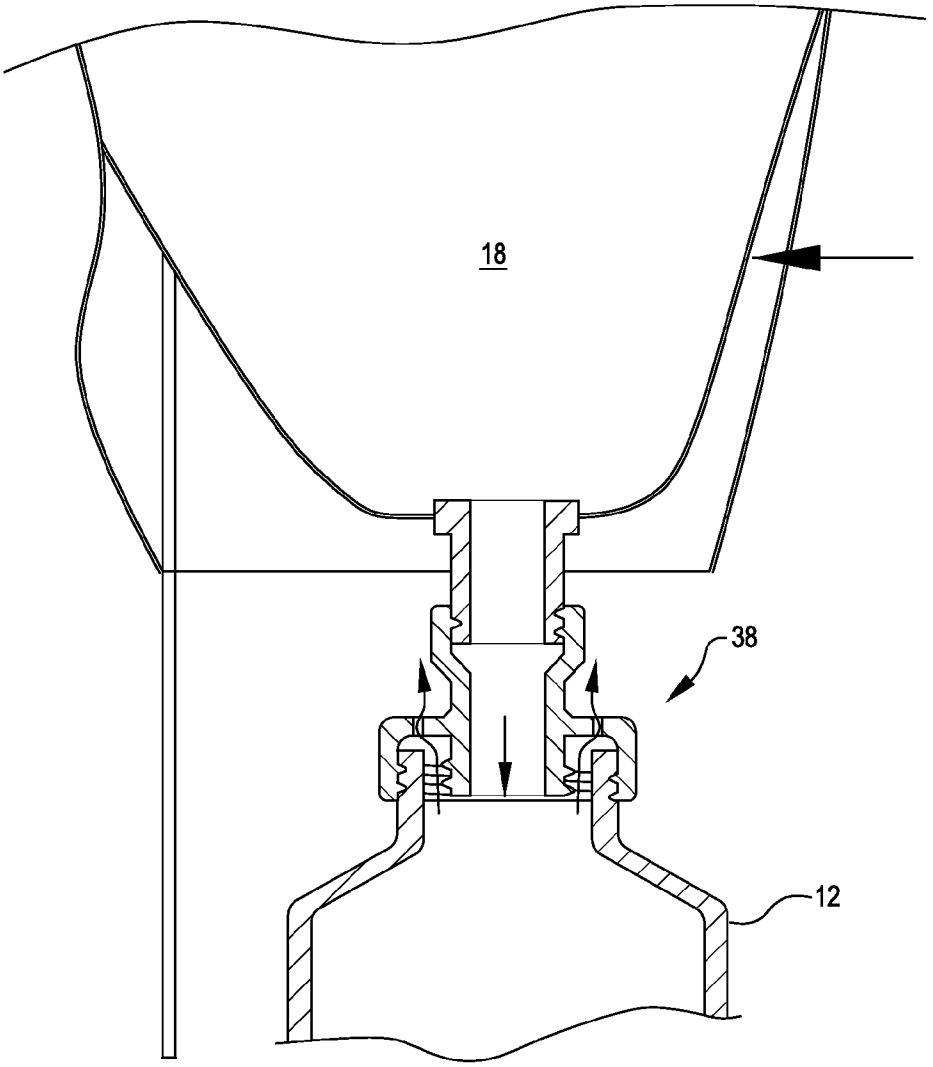
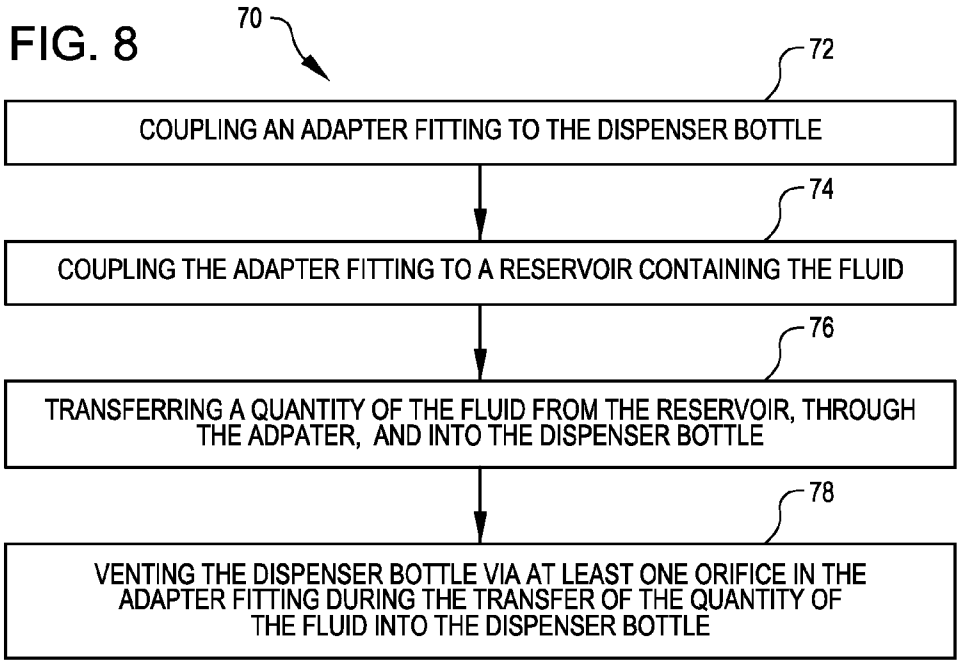


FIG. 8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72
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COUPLING THE ADAPTER FITTING TO A RESERVOIR CONTAINING THE FLUID
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TRANSFERRING A QUANTITY OF THE FLUID FROM THE RESERVOIR, THROUGH THE ADPATER, AND INTO THE DISPENSER BOTTLE
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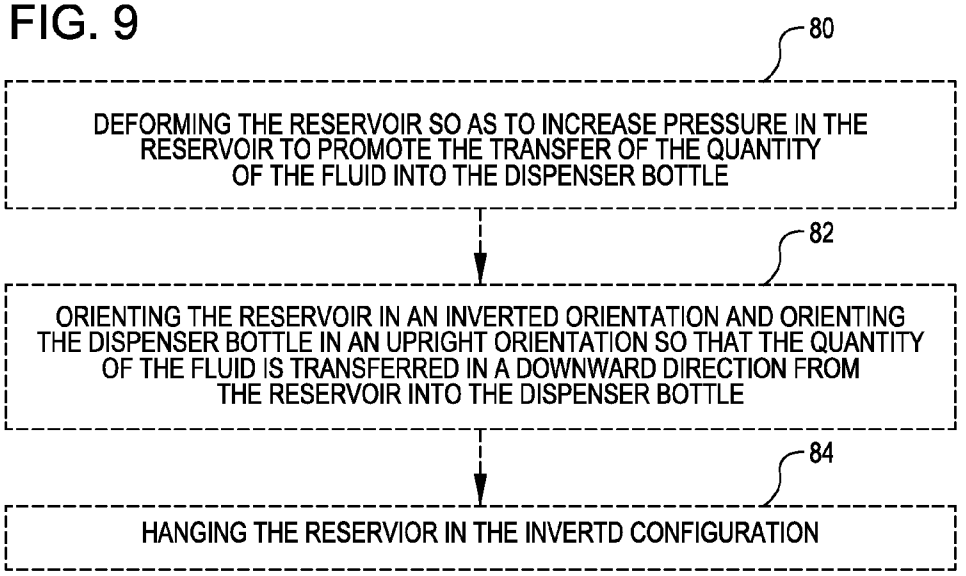
VENTING THE DISPENSER BOTTLE VIA AT LEAST ONE ORIFICE IN THE ADAPTER FITTING DURING THE TRANSFER OF THE QUANTITY OF THE FLUID INTO THE DISPENSER BOTTLE

FIG. 9


80
DEFORMING THE RESERVOIR SO AS TO INCREASE PRESSURE IN THE RESERVOIR TO PROMOTE THE TRANSFER OF THE QUANTITY OF THE FLUID INTO THE DISPENSER BOTTLE
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HANGING THE RESERVIOR IN THE INVERTD CONFIGURATION

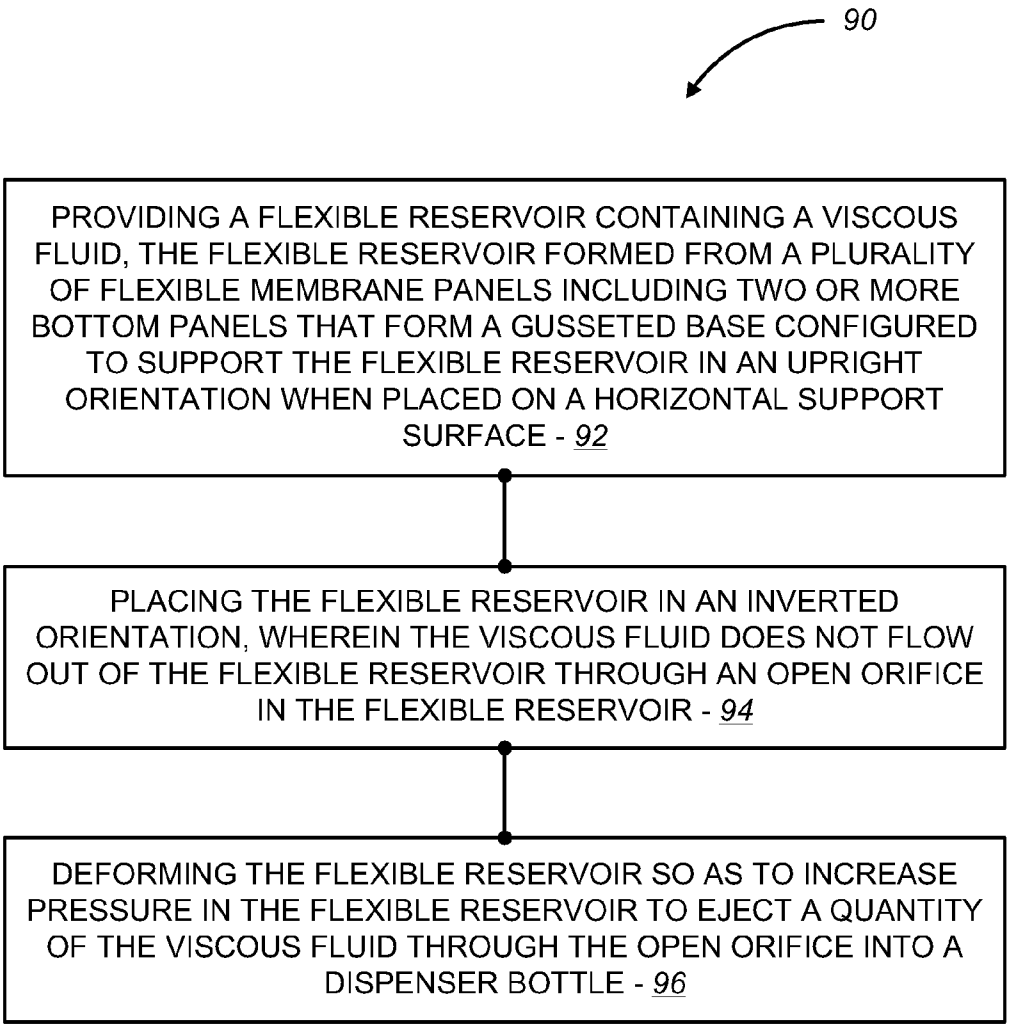
90
PROVIDING A FLEXIBLE RESERVOIR CONTAINING A VISCOUS FLUID, THE FLEXIBLE RESERVOIR FORMED FROM A PLURALITY OF FLEXIBLE MEMBRANE PANELS INCLUDING TWO OR MORE BOTTOM PANELS THAT FORM A GUSSETED BASE CONFIGURED TO SUPPORT THE FLEXIBLE RESERVOIR IN AN UPRIGHT ORIENTATION WHEN PLACED ON A HORIZONTAL SUPPORT SURFACE - 92
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FIG. 10

ADAPTOR FOR CONNECTING A FLUID PACKAGE TO A DISPENSER BOTTLE

BACKGROUND

[0001] The present invention relates generally to refilling a fluid dispenser bottle, and more particularly to adapters, systems, and methods that can be used to refill a dispenser bottle.

[0002] There are a wide variety of fluids that are dispensed from dispenser bottles. Such fluids include edible fluids such as ketchup, mustard, barbeque sauce, mayonnaise, etc., as well as a many other fluids. These other fluids include both viscous and non-viscous fluids. Exemplary viscous fluids include ultrasound gels used to ultrasonically couple ultrasound transducers (e.g., an imaging transducer, a therapeutic transducer) with a patient.

[0003] Existing dispenser bottles include dispenser bottles configured to be hand held. Such a hand-held dispenser bottle is often flexible so that the fluid can be dispensed by squeezing the bottle to discharge the fluid through a dispenser nozzle. The amount of fluid held in such a dispenser bottle may be, however, relatively modest given weight and size constraints consistent with ease of use. As a result, a large number of such dispenser bottles, following dispensing of the fluid there from, become emptied of the fluid to a point that inhibits further effective dispensing of the fluid without refilling of the dispenser bottle.

[0004] Unfortunately, existing approaches used to refill dispenser bottles may be less than desirable due to being time consuming, messy, expensive, and/or inconvenient. For example, some ultrasound gels are relatively viscous and can be somewhat sticky, thereby making it a more difficult and time consuming effort to refill a dispenser bottle with such an ultrasound gel. In many applications, such as medical applications employing ultrasound gels, the expense associated with refilling a dispenser bottle is greater due to the high cost of the personnel involved. As a result, it may be more economical to just discard the dispenser bottle once it becomes depleted rather than incur the expense associated with refilling the dispenser bottle. Such an approach, however, results in a good deal of wasted material (e.g., the dispenser bottle, any residual fluid in the dispenser bottle) as well as associated disposal issues and expense.

[0005] Accordingly, improved approaches for refilling dispenser bottles are desirable. Such improved approaches should provide for convenient and economical refilling of dispenser bottles, especially where viscous and possible sticky fluids such as some ultrasound gels are involved.

BRIEF SUMMARY

[0006] The following presents a simplified summary of some embodiments of the invention in order to provide a basic understanding of the invention. This summary is not an extensive overview of the invention. It is not intended to identify key/critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some embodiments of the invention in a simplified form as a prelude to the more detailed description that is presented later.

[0007] Adapters, systems, and methods are provided that can be used to refill a dispenser bottle. The disclosed adapters, systems, and methods provide for convenient and economical refilling of dispenser bottles, and can be particularly beneficial when used in conjunction with refilling dispenser bottles used to dispense a viscous and/or somewhat sticky fluid, such as an ultrasound coupling gel. While embodiments of the adapters, systems, and methods disclosed herein are described primarily in conjunction with ultrasound coupling gels, such adapters, systems, and methods can be used in conjunction with any suitable fluid, both edible and non-edible.

[0008] Thus, in one aspect, an adapter is provided for connecting a fluid package to a dispenser bottle. The adapter includes a duct, a fluid package coupler, a dispenser bottle coupler, and at least one orifice. The duct is configured to convey a fluid being transferred from the fluid package to the dispenser bottle. The fluid package coupler is coupled with the duct and configured to couple with the fluid package so as to place the duct in fluid communication with the fluid package. The dispenser bottle coupler is coupled with the duct and configured to couple with the dispenser bottle so as to place the duct in fluid communication with the dispenser bottle. And the at least one orifice is disposed offset from the duct. The at least one orifice vents the dispenser bottle when fluid is transferred from the fluid package to the dispenser bottle.

[0009] In many embodiments, the duct is configured to discharge the transferred fluid into the dispenser bottle so that the discharged fluid does not inhibit the venting of the dispenser bottle through the at least one orifice. For example, the duct can be configured to discharge fluid transferred from the fluid package to the dispenser bottle offset from the at least one orifice. The duct can extend beyond both ends of the at least one orifice. And the duct can extend into the dispenser bottle when the dispenser bottle coupler is coupled with the dispenser bottle. The duct can have a discharge cross section from which fluid transferred from the fluid package to the dispenser bottle is discharged, the discharge cross section having an area less than an area of a receiving cross section of the dispenser bottle across which the discharge fluid passes.

[0010] In many embodiments, the adapter includes one or more threaded interfaces. For example, the fluid package coupler can include a threaded interface configured to couple with a complimentarily configured threaded interface of the fluid package. And the fluid package coupler can include a female coupler configured to couple with a male coupler of the fluid package. The dispenser bottle coupler can include a threaded interface configured to couple with a complementarily configured threaded interface of the dispenser bottle. And the dispenser bottle coupler can include a female coupler configured to couple with a male coupler of the dispenser bottle.

[0011] In many embodiments, the adapter includes multiple orifices, which are used to vent the dispenser bottle during refilling. For example, the adapter can include a plurality of orifices, each of the orifices being disposed offset from the duct. In many embodiments, the adapter includes four orifices. And in many embodiments, the orifices are uniformly distributed around the duct.

[0012] The adapter can include a fluid control valve that can be used to control fluid flow between the fluid package and the dispenser bottle. For example, the adapter can include a one-way valve configured to inhibit fluid flow from the dispenser bottle to the fluid package. The adapter can include a valve operable to control flow of the fluid through the duct. And the adapter can include a rotary valve operable to control flow of the fluid through the duct.

[0013] In another aspect, a system is provided for refilling a dispenser bottle with a fluid. The system includes a reservoir for storing a quantity of the fluid and an adapter configured to

couple the reservoir with the dispenser bottle. The adapter includes a duct, a reservoir coupler, a dispenser bottle coupler, and at least one orifice. The duct is configured to convey a quantity of the fluid being transferred from the reservoir to the dispenser bottle. The reservoir coupler is coupled with the duct and is configured to couple with the reservoir so as to place the duct in fluid communication with the reservoir. The dispenser bottle coupler is coupled with the duct and is configured to couple with the dispenser bottle so as to place the duct in fluid communication with the dispenser bottle. And the at least one orifice is disposed offset from the duct. The at least one orifice vents the dispenser bottle when the quantity of the fluid is transferred from the reservoir into the dispenser bottle. The system can include a valve operable to control flow of the fluid through the duct. And the system can include a rotary valve operable to control flow of the fluid through the duct.

[0014] In many embodiments, the reservoir is flexible so that it can be deformed using hand pressure to increase pressure within the reservoir to promote transfer of fluid from the reservoir to the dispenser bottle. The reservoir can include a plurality of impermeable membrane panels that are bonded together to form a flexible fluid retaining body. The membrane panels can include, for example, two or more bottom panels that form a gusseted base configured so that the reservoir will remain in an upright orientation when placed on a horizontal support surface.

[0015] The reservoir can include other suitable features. For example, the reservoir can include an inlet/outlet port configured to couple with the reservoir coupler so as to place the reservoir in fluid communication with the duct. The reservoir can include at least one hanging feature, such as at least one hanging opening that is configured to receive a support member so that the reservoir can be suspended in an inverted orientation in which the inlet/outlet port is oriented to discharge fluid downward into the dispenser bottle. And the reservoir can include a carrying handle, such as a carrying handle opening disposed in an area having a top panel of the reservoir bonded to a side panel of the reservoir.

[0016] In another aspect, a method is provided for refilling a dispenser bottle with a fluid. The method includes coupling an adapter fitting to the dispenser bottle; coupling the adapter fitting to a reservoir containing the fluid; transferring a quantity of the fluid from the reservoir, through the adapter fitting, and into the dispenser bottle; and venting the dispenser bottle via at least one orifice in the adapter fitting during the transfer of the quantity of the fluid into the dispenser bottle.

[0017] The method can further include acts used to promote the transfer of the fluid from the reservoir to the dispenser bottle. For example, the method can include deforming the reservoir so as to increase pressure in the reservoir to promote the transfer of the quantity of the fluid into the dispenser bottle. The method can include orienting the reservoir in an inverted orientation and orienting the dispenser bottle in an upright orientation so that the quantity of the fluid is transferred in a downward direction from the reservoir into the dispenser bottle. And the method can include hanging the reservoir in the inverted orientation.

[0018] In another aspect, a method is provided for refilling a dispenser bottle with a viscous fluid. The method includes providing a flexible reservoir containing the viscous fluid, the flexible reservoir formed from a plurality of flexible membrane panels including two or more bottom panels that form a gusseted base configured to support the flexible reservoir in an upright orientation when placed on a horizontal support surface; placing the flexible reservoir in an inverted orientation, wherein the viscous fluid does not flow out of the flexible reservoir through an open orifice in the flexible reservoir; and deforming the flexible reservoir so as to increase pressure in the flexible reservoir to eject a quantity of the viscous fluid through the open orifice into the dispenser bottle.

[0019] For a fuller understanding of the nature and advantages of the present invention, reference should be made to the ensuing detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. **1** is a perspective view illustrating a system for refilling a dispenser bottle, the system including a reservoir and an adapter fitting coupling the reservoir to the dispenser bottle, in accordance with many embodiments.

[0021] FIG. **2** is an exploded perspective view illustrating components of the system of FIG. **1** as well as an optional valve, in accordance with many embodiments.

[0022] FIG. **3** is a perspective view of an adapter fitting for use in refilling a dispenser bottle, in accordance with many embodiments.

[0023] FIG. **4** is a cross-sectional view illustrating an adapter fitting for use in refilling a dispenser bottle, in accordance with many embodiments.

[0024] FIG. **5** is a cross-sectional view illustrating another adapter fitting for use in refilling a dispenser bottle, in accordance with many embodiments.

[0025] FIG. **6** is a cross-sectional view of an adapter fitting for use in refilling a dispenser bottle, the adapter fitting including a one-way check valve, in accordance with many embodiments.

[0026] FIG. **7** is a cross-sectional view illustrating deformation of a flexible reservoir to promote fluid flow into the dispenser bottle and venting of the dispenser bottle during refilling of the dispenser bottle, in accordance with many embodiments.

[0027] FIG. **8** is a simplified diagram listing acts of a method for refilling a dispenser bottle with a fluid, in accordance with many embodiments.

[0028] FIG. **9** is a simplified diagram listing additional acts that can be used in the method of FIG. **8**, in accordance with many embodiments.

[0029] FIG. **10** is a simplified diagram listing acts of a method for refilling a dispenser bottle with a viscous fluid, in accordance with many embodiments.

DETAILED DESCRIPTION

[0030] In the following description, various embodiments of the present invention will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the embodiments. However, it will also be apparent to one skilled in the art that the present invention can be practiced without the specific details. Furthermore, well-known features may be omitted or simplified in order not to obscure the embodiment being described.

[0031] Referring now to the drawings, in which like reference numerals represent like parts throughout the several views, FIG. **1** shows a system **10** for refilling a dispenser bottle **12**, in accordance with many embodiments. The system **10** includes a fluid package **14** that can be suspended in an

inverted orientation as illustrated in FIG. **1**, and an adapter fitting **16** that is used to couple the fluid package **14** with the dispenser bottle **12**.

[0032] The fluid package **14** includes a flexible reservoir **18**, an inlet/outlet port **20**, a carrying handle opening **22**, and two hanging openings **24**. The flexible reservoir **18** is formed from a plurality of impermeable membrane panels that are bonded together along perimeter portions of the panels. The impermeable membrane panels include two bottom panels **26** that form a base to support the fluid package in an upright orientation when the fluid package is placed on a horizontal support surface. Each of the two bottom panels **26** is bonded into both a side panel of the flexible reservoir **18** and to the other bottom panel, thereby forming a base that includes two bonded strips between the bottom panels **26** and a respective side panel of the flexible reservoir **18** and a bonded strip between the two bottom panels **26**. These three bonded strips provide a stable gusseted base that supports the fluid package **14** in the upright orientation when the fluid package **14** is placed on a horizontal support surface. The two hanging openings **24** are disposed at the bottom of the fluid package in a perimeter portion of the bottom panel **26**, which is bonded to a perimeter portion of a side panel of the flexible reservoir **18**. While two bottom panels **26** are shown forming the gusseted base, more than two bottom panels can also be used to form a stable gusseted base, thereby providing additional bonded strips.

[0033] The inlet/outlet port **20** is disposed at the top of the flexible reservoir **18** adjacent to the carrying handle opening **22**. The top of the flexible reservoir **18** can include a top panel that is bonded to side panels of the flexible reservoir **18** along perimeter portions of the top and side panels. The inlet/outlet port **20** can be bonded into the flexible reservoir **18**. For example, a length of the top panel perimeter portion can be bonded around a perimeter portion of the inlet/outlet port **20** and a length of a side panel perimeter portion can be bonded around the remaining perimeter portion of the inlet/outlet port **20**. The inlet/outlet port **20** provides a fluid path through which the flexible reservoir **18** can be filled with fluid and through which fluid can be transferred from the flexible reservoir **18** to refill the dispenser bottle **12**. The carrying handle opening can be disposed in a perimeter portion of a side panel. And for added strength, the carrying handle opening can be disposed in an area where a perimeter portion of the side panel is bonded to a perimeter portion of the top panel.

[0034] While the fluid package **14** is described as having the flexible reservoir **18**, any suitable type of reservoir can be used. For example, a suitable non-flexible reservoir can be used. When a non-flexible reservoir is used, a means for increasing pressure within the non-flexible reservoir can be used to promote transfer of fluid from the non-flexible reservoir to the dispenser bottle **12** during the refilling of the dispenser bottle **12**.

[0035] In FIG. **1**, the fluid package **14** is shown in an inverted orientation that can be used to promote transfer of fluid from the flexible reservoir **18** into the dispenser bottle **12**. The fluid package **14** is suspended in the inverted orientation from support members **28** that engage the hanging openings **24**. The dispenser bottle **12** is suspended from the adapter fitting **16**, which is suspended from the fluid package **14**.

[0036] FIG. **2** illustrates an exploded perspective view of components of the system **10**. An inlet/outlet port cap **30** can be coupled with the inlet/outlet port **20** to prevent fluid from escaping the fluid package **14** when the fluid package **14** is not being used to refill the dispenser bottle **12**. The inlet/outlet port cap **30** can have an internal thread configured to interface with a complementarily configured external thread of the inlet/outlet port **20**. The adapter fitting **16** includes a fluid package coupler **32** that is configured similar to the inlet/outlet port cap **30** so that the fluid package coupler **32** can be attached to the inlet/outlet port **20**.

[0037] The adapter fitting **16** includes a dispenser bottle coupler **34**. The dispenser bottle coupler **34** is configured to couple to the dispenser bottle **12**. For example, the dispenser bottle coupler **34** can have an internal thread configured to interface with a complementarily configured external threaded portion of the dispenser bottle **12**.

[0038] The system **10** can optionally include a valve **35** that is operable to control flow of the fluid from the fluid package **14**. The valve **35** can be incorporated in any suitable way. For example, the valve **35** can be added in-line between the inlet/outlet port **20** and the adapter fitting **16** by coupling one end of the valve **35** to the inlet/outlet port **20** and the other end of the valve **35** to the adapter fitting **16**. As another example, the valve **35** can be an integral part of the adapter fitting **16**. Any suitable type of valve can be used as the valve **35**. For example, the valve **35** can be a rotary valve, for example, a ball valve. Inclusion of the valve **35** may be especially beneficial where the fluid in the fluid package **14** is substantially non-viscous.

[0039] FIG. **3** shows a perspective view of the adapter fitting **16**. The adapter fitting **16** includes four orifices **36** (three shown and one hidden from view), which vent the dispenser bottle **12** when fluid is transferred from the fluid package **14** to the dispenser bottle **12**. The orifices **36** place the inside of the dispenser bottle **12** in fluid communication with the atmosphere, thereby providing a venting path for the discharge of air from the dispenser bottle **12** during the refilling of the dispenser bottle **12**.

[0040] FIG. **4** shows a cross-sectional view of another adapter fitting **38**, in accordance with many embodiments. The adapter fitting **38** includes a fluid package coupler **40**, a duct **42** attached to the fluid package coupler **40**, a dispenser bottle coupler **44**, and a partition **46** that attaches the dispenser bottle coupler **44** to the duct **42**. The partition **46** has multiple orifices **48** distributed around the duct **42**.

[0041] The fluid package coupler **40** has internal threads configured to interface with complimentarily configured external threads of the fluid package. When the fluid package coupler **40** is coupled to the input/output port **20**, the duct **42** is placed in fluid communication with the fluid reservoir of the fluid package. While a threaded interface is shown, any other suitable known coupling interface can be used to couple the adapter fitting **38** to the input/output port **20**.

[0042] The duct **42** extends beyond both ends of the orifices **48**. A discharge cross section **50** of the duct **42** is offset from the orifices **48**, which may help to keep the fluid being transferred away from the orifices **48** and thereby avoid plugging the orifices **48** or escaping through the orifices **48**. The discharge cross section **50** has a cross-sectional area that is less than an area of a receiving cross section of the dispenser bottle across which fluid discharged from the duct **42** passes. The discharge cross section **50** is also offset laterally from the orifices, which also serves to keep the fluid that is discharged from the duct from plugging the orifices and/or escaping from the orifices.

[0043] The extended duct **42** includes external male threads that match the external male threads of the input/output port **20** so that the inlet/outlet port cap **30** can be coupled with the extended duct **42**. Such a configuration allows the adapter fitting **38** to remain attached to the fluid package **14** while also preventing fluid from escaping the fluid package **14** when the fluid package **14** is not being used to refill the dispenser bottle **12**. While a threaded interface is shown, any other suitable known coupling interface can be used to couple the inlet/outlet port cap **30** to the extended duct **42**.

[0044] FIG. **5** shows a cross-sectional view of another adapter fitting **52**, in accordance with many embodiments. The adapter fitting **52** is configured similar to the adapter fitting **38**, but has a duct **54** that, while not extending beyond both ends of the orifices **48** as in the adapter fitting **38**, is offset from the orifices **48** and has a discharge cross section **56** that has a cross-sectional area that is less than an area of a receiving cross section of the dispenser bottle **12** across which fluid discharged from the duct **54** passes.

[0045] The inlet/outlet port **20** and/or the duct **42**, **54** can be configured based on the viscosity of the fluid in the fluid package **14** so that the fluid does not flow out of the fluid package **14** without an increase in internal pressure within the fluid package **14**. For example, such an increase in pressure can be selectively caused by squeezing or otherwise deforming the fluid package **14** to force the fluid out through the inlet/outlet port and/or the duct **42**, **54**. With such a configuration, the dispenser bottle need not be coupled to the fluid package **14**, but can be held underneath and the fluid selectively squirted into the dispenser bottle by selectively deforming the fluid package **14**. Other means of increasing pressure within the fluid package can also be used, such as injecting pressurized air into the fluid package **14**.

[0046] FIG. **6** shows a cross-sectional view of another adapter fitting **58**, in accordance with many embodiments. The adapter fitting **58** is configured similar to the adapter fitting **52** of FIG. **5**, but includes a one-way valve **60** that inhibits flow of the fluid from the dispenser bottle **12** into the reservoir **18**.

[0047] FIG. **7** illustrates venting of the dispenser bottle **12** during refilling of the dispenser bottle **12**, in accordance with many embodiments. With the fluid package **24** in the inverted orientation and the dispenser bottle **12** attached to the fluid package **14** via the adapter fitting **16**, the reservoir **18** is deformed (e.g., using hand pressure), thereby forcing fluid from the reservoir **18** through the adapter fitting **16** into the dispenser bottle **12**. The fluid is discharged from the adapter fitting duct into the dispenser bottle **12** at the discharge cross section of the duct. Because the discharge cross section of the duct has a cross sectional area that is less than the area of the receiving cross section of the dispenser bottle, air in the dispenser bottle that is displaced by the incoming fluid has a pathway to reach the orifices and be vented there from. The configuration of the adapter fitting provides for continuous venting of the displaced air in the dispenser bottle during refilling of the dispenser bottle.

[0048] FIG. **8** lists acts of a method **70** for refilling a dispenser bottle with a fluid, in accordance with many embodiments. The method **70** includes coupling an adapter fitting to the dispenser bottle (act **72**); coupling the adapter fitting to a reservoir containing the fluid (act **74**); transferring a quantity of the fluid from the reservoir, through the adapter, and into the dispenser bottle (act **76**); and venting the dispenser bottle via at least one orifice in the adapter fitting during the transfer of the quantity of the fluid into the dispenser bottle (act **78**).

[0049] FIG. **9** lists additional acts that can be used in the method **70** of FIG. **8**, in accordance with many embodiments. As optional acts, the method **70** can also include deforming the reservoir so as to increase pressure in the reservoir to promote the transfer of the quantity of the fluid into the dispenser bottle (act **80**); orienting the reservoir in an inverted orientation and orienting the dispenser bottle in an upright orientation so that the quantity of the fluid is transferred in a downward direction from the reservoir into the dispenser bottle (act **82**); and hanging the reservoir in the inverted orientation (act **84**).

[0050] The method **70** can be practiced using any suitable reservoir, adapter fitting, and dispenser bottle. For example, the method **70** can be practiced using the reservoirs, adapter fittings, and dispenser bottles described herein.

[0051] FIG. **10** lists acts of a method **90** for refilling a dispenser bottle with a viscous fluid, in accordance with many embodiments. The method **90** includes providing a flexible reservoir containing the viscous fluid, the flexible reservoir formed from a plurality of flexible membrane panels including two or more bottom panels that form a gusseted base configured to support the flexible reservoir in an upright orientation when placed on a horizontal support surface (act **92**); placing the flexible reservoir in an inverted orientation, wherein the viscous fluid does not flow out of the flexible reservoir through an open orifice in the flexible reservoir (act **94**); and deforming the flexible reservoir so as to increase pressure in the flexible reservoir to eject a quantity of the viscous fluid through the open orifice into the dispenser bottle (act **96**). Act **94** can be accomplished by, for example, hanging the flexible reservoir in the inverted orientation.

[0052] The method **90** can be practiced using any suitable reservoir and dispenser bottle. For example, the method **90** can be practiced using the reservoirs and dispenser bottles described herein. And method **90** can also be practiced using the adapter fittings described herein.

[0053] Other variations are within the spirit of the present invention. Thus, while the invention is susceptible to various modifications and alternative constructions, certain illustrated embodiments thereof are shown in the drawings and have been described above in detail. It should be understood, however, that there is no intention to limit the invention to the specific form or forms disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention, as defined in the appended claims.

[0054] The use of the terms "a" and "an" and "the" and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms "comprising," "having," "including," and "containing" are to be construed as open-ended terms (i.e., meaning "including, but not limited to,") unless otherwise noted. The term "connected" is to be construed as partly or wholly contained within, attached to, or joined together, even if there is something intervening. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be

performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate embodiments of the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0055] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. Variations of those preferred embodiments may become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventors expect skilled artisans to employ such variations as appropriate, and the inventors intend for the invention to be practiced otherwise than as specifically described herein. Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.

[0056] All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by reference and were set forth in its entirety herein.

What is claimed is:

1. An adapter for connecting a fluid package to a dispenser bottle, the adapter comprising:

a duct configured to convey a fluid being transferred from the fluid package to the dispenser bottle;

a fluid package coupler coupled with the duct and configured to couple with the fluid package so as to place the duct in fluid communication with the fluid package;

a dispenser bottle coupler coupled with the duct and configured to couple with the dispenser bottle so as to place the duct in fluid communication with the dispenser bottle; and

at least one orifice disposed offset from the duct for venting the dispenser bottle when fluid is transferred from the fluid package to the dispenser bottle.

2. The adapter of claim **1**, wherein the duct is configured to discharge fluid transferred from the fluid package to the dispenser bottle offset from the at least one orifice.

3. The adapter of claim **1**, wherein the duct extends beyond both ends of the at least one orifice.

4. The adapter of claim **3**, wherein the duct extends into the dispenser bottle when the dispenser bottle coupler is coupled with the dispenser bottle.

5. The adapter of claim **1**, wherein the duct has a discharge cross section from which fluid transferred from the fluid package to the dispenser bottle is discharged, the discharge cross section having an area less than an area of a receiving cross section of the dispenser bottle across which the discharged fluid passes.

6. The adapter of claim **1**, wherein the fluid package coupler comprises a threaded interface configured to couple with a complementarily configured threaded interface of the fluid package.

7. The adapter of claim **6**, wherein the fluid package coupler comprises a female coupler configured to couple with a male coupler of the fluid package.

8. The adapter of claim **1**, wherein the dispenser bottle coupler comprises a threaded interface configured to couple with a complementarily configured threaded interface of the dispenser bottle.

9. The adapter of claim **8**, wherein the dispenser bottle coupler comprises a female coupler configured to couple with a male coupler of the dispenser bottle.

10. The adapter of claim **1**, wherein the at least one orifice comprises a plurality of orifices, each of the orifices being disposed offset from the duct.

11. The adapter of claim **10**, wherein the orifices comprise four orifices.

12. The adapter of claim **11**, wherein the orifices are uniformly distributed around the duct.

13. The adapter of claim **1**, further comprising a one-way valve configured to inhibit fluid flow from the dispenser bottle to the fluid package.

14. The adapter of claim **1**, further comprising a valve operable to control flow of the fluid through the duct.

15. The adapter of claim **1**, further comprising a rotary valve operable to control flow of the fluid through the duct.

16. A system for refilling a dispenser bottle with a fluid; the system comprising:

a reservoir for storing a quantity of the fluid; and

an adapter configured to couple the reservoir with the dispenser bottle, the adapter comprising

a duct configured to convey a quantity of the fluid being transferred from the reservoir to the dispenser bottle,

a reservoir coupler coupled with the duct and configured to couple with the reservoir so as to place the duct in fluid communication with the reservoir,

a dispenser bottle coupler coupled with the duct and configured to couple with the dispenser bottle so as to place the duct in fluid communication with the dispenser bottle, and

at least one orifice disposed offset from the duct for venting the dispenser bottle when the quantity of the fluid is transferred from the reservoir into the dispenser bottle.

17. The system of claim **16**, wherein the reservoir is flexible so that it can be deformed using hand pressure to increase pressure within the reservoir to promote transfer of fluid from the reservoir to the dispenser bottle.

18. The system of claim **17**, wherein the reservoir comprises a plurality of impermeable membrane panels bonded together to form a flexible fluid retaining body.

19. The system of claim **18**, wherein the membrane panels include two or more bottom panels forming a gusseted base for the reservoir, the gusseted base configured so that the reservoir will remain in an upright orientation when placed on a horizontal support surface.

20. The system of claim **18**, wherein the reservoir comprises:

an inlet/outlet port configured to couple with the reservoir coupler so as to place the reservoir in fluid communication with the duct; and

at least one hanging opening, each hanging opening being configured to receive a support member so that the reservoir can be suspended in an inverted orientation in which the inlet/outlet port is oriented to discharge fluid downward into the dispenser bottle.

21. The system of claim **18**, wherein the reservoir comprises a carrying handle opening disposed in an area having a top panel of the reservoir bonded to a side panel of the reservoir.

22. The system of claim **16**, further comprising a valve operable to control flow of the fluid through the duct.

23. The system of claim **16**, further comprising a rotary valve operable to control flow of the fluid through the duct.

24. A method for refilling a dispenser bottle with a fluid, the method comprising:

coupling an adapter fitting to the dispenser bottle;

coupling the adapter fitting to a reservoir containing the fluid;

transferring a quantity of the fluid from the reservoir, through the adapter fitting, and into the dispenser bottle; and

venting the dispenser bottle via at least one orifice in the adapter fitting during the transfer of the quantity of the fluid into the dispenser bottle.

25. The method of claim **24**, further comprising coupling the adapter fitting to the dispenser bottle.

26. The method of claim **24**, further comprising deforming the reservoir so as to increase pressure in the reservoir to promote the transfer of the quantity of the fluid into the dispenser bottle.

27. The method of claim **26**, further comprising orienting the reservoir in an inverted orientation and orienting the dispenser bottle in an upright orientation so that the quantity of the fluid is transferred in a downward direction from the reservoir into the dispenser bottle.

28. The method of claim **27**, comprising hanging the reservoir in the inverted orientation.

29. A method for refilling a dispenser bottle with a viscous fluid, the method comprising:

providing a flexible reservoir containing the viscous fluid, the flexible reservoir formed from a plurality of flexible membrane panels including two or more bottom panels that form a gusseted base configured to support the flexible reservoir in an upright orientation when placed on a horizontal support surface;

placing the flexible reservoir in an inverted orientation, wherein the viscous fluid does not flow out of the flexible reservoir through an open orifice in the flexible reservoir; and

deforming the flexible reservoir so as to increase pressure in the flexible reservoir to eject a quantity of the viscous fluid through the open orifice into the dispenser bottle.

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