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(54) **REFILLABLE BAG-ON-VALVE SYSTEM**

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(57) **ABSTRACT**

One embodiment relates to a system including a first bag-on-valve aerosol container including a first valve comprising a first valve stem, and a body having an aperture extending therethrough from a first end of the body to a second end of the body. The aperture is sized to accept the first valve stem at the first end of the body. The aperture is also sized to accept a second valve stem at the second end of the body; the body sized to accept the first valve stem and a second valve stem at the same time. Other embodiments are described and claimed.

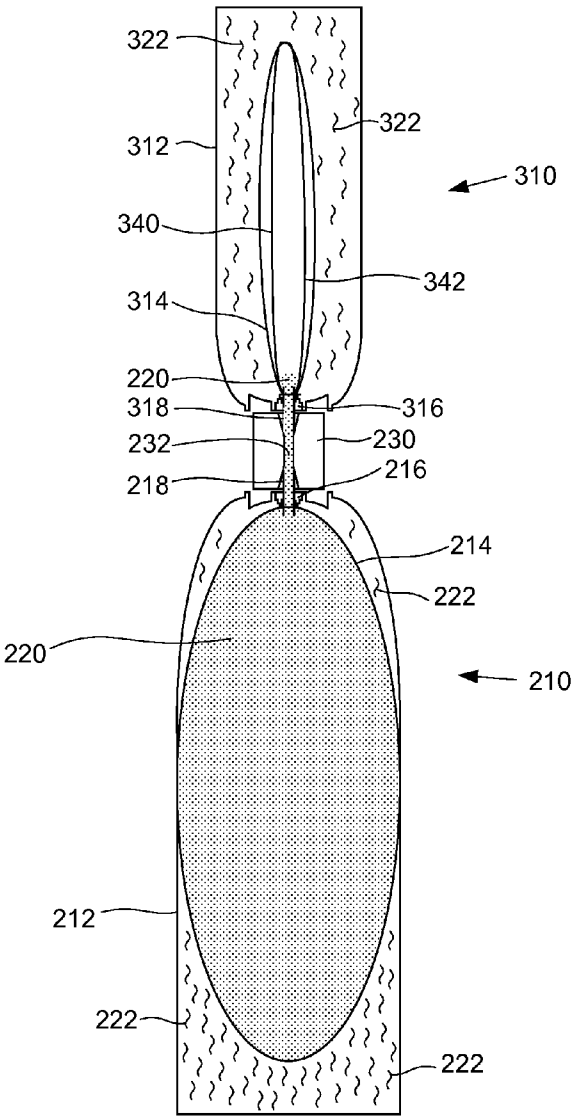

Fig. 1

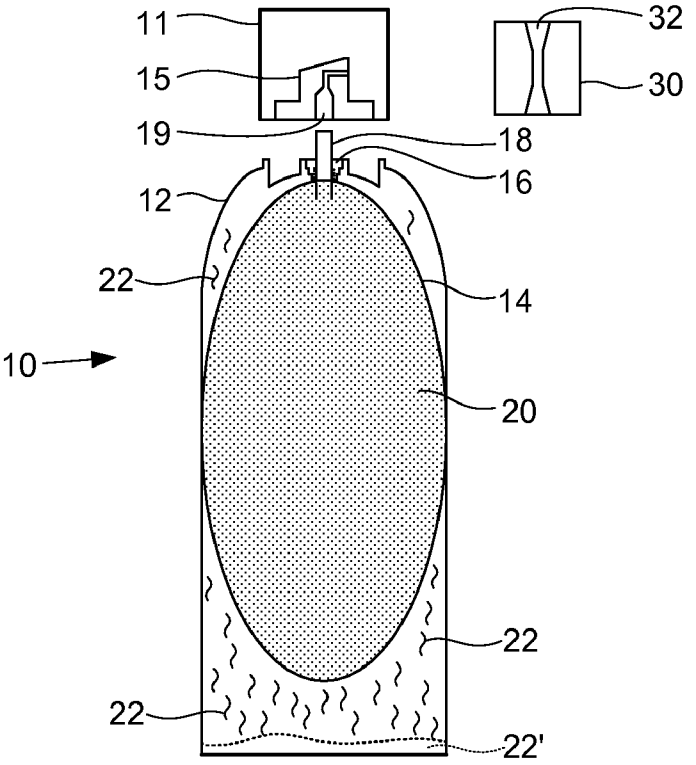
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Fig. 2

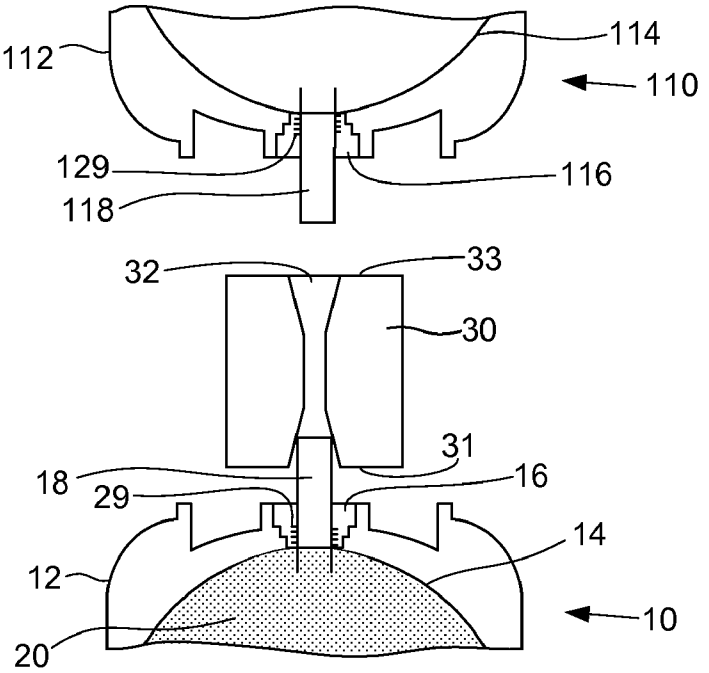
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Fig. 3

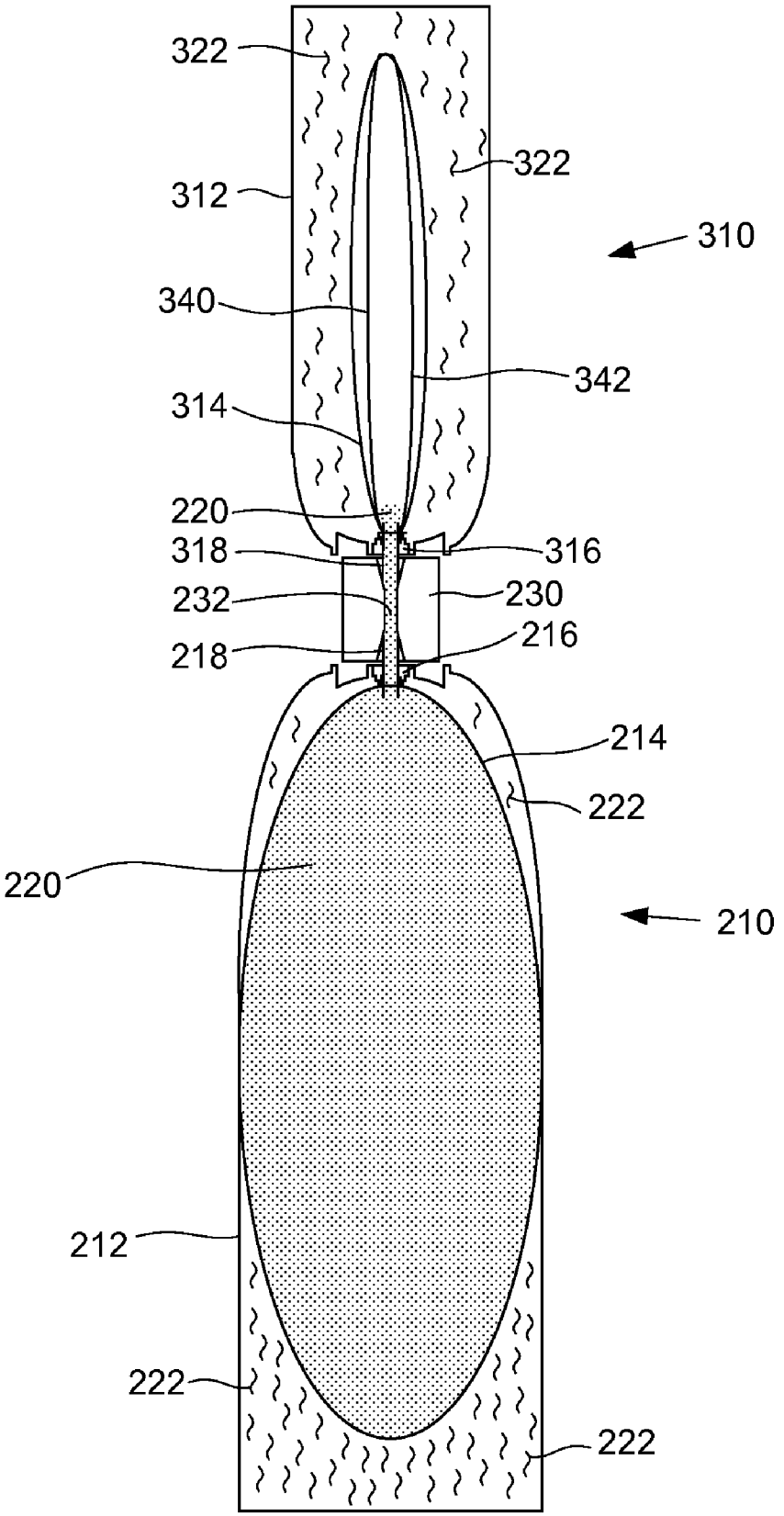
322
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Fig. 4(A)

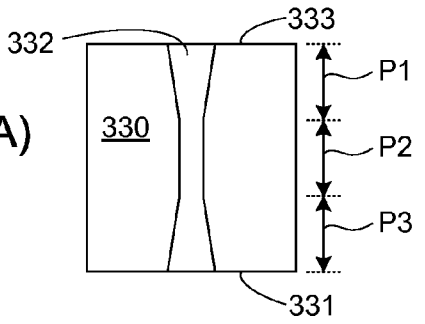


Fig. 4(B)

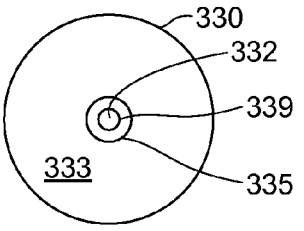


Fig. 5

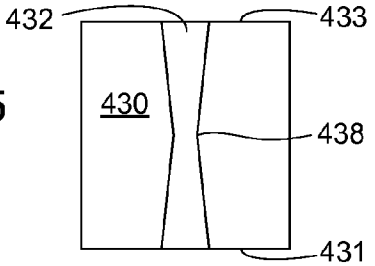


Fig. 6

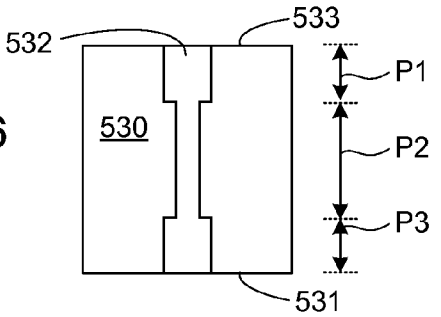


Fig. 7

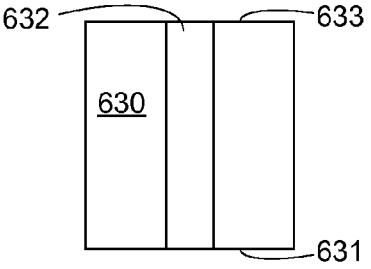
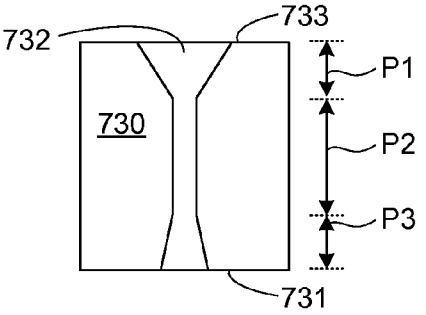


Fig. 8



REFILLABLE BAG-ON-VALVE SYSTEM

BACKGROUND

[0001] For certain types of products, an aerosol can is used to deliver the product. Aerosol containers may include a variety of configurations, including, for example, piston-in-can and bag-in-can designs. One example of a bag-in-can design includes a flexible bag within a can, wherein the flexible bag has an open end sealingly connected to an aerosol valve. Such a configuration is commonly referred to as a bag-on-valve (BOV) design. The product is typically filled into the flexible bag and a propellant (for example, liquid or compressed gas) is positioned in the can outside of the bag between the bag outer wall and the inner wall of the can. When the valve is actuated, the force applied to the bag from the propellant causes the product to be transmitted through the valve to the environment outside the can. The can is configured so that the propellant remains in the can after the product has been transmitted through the valve and out of the can.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] Certain embodiments of the invention are described with reference to the accompanying drawing which, for illustrative purposes, are schematic and not necessarily drawn to scale.

[0003] FIG. **1** illustrates a view of a bag-on-valve aerosol container and a body used for transmitting a product into or out of the container, in accordance with certain embodiments.

[0004] FIG. **2** illustrates a view of portions of two bag-on-valve aerosol cans and a body used for transmitting a product from one can to the other can, with the body positioned between the cans, in accordance with certain embodiments.

[0005] FIG. **3** illustrates a view of two bag-on-valve aerosol cans and a body used for transmitting a product from one can to the other can, with the body positioned between the cans, in accordance with certain embodiments.

[0006] FIGS. **4**(A)-**4**(B) illustrate side cross sectional and top down views of the structure of a body used for transmitting a product from one bag-on-valve aerosol can to another bag-on-valve aerosol can, in accordance with certain embodiments.

[0007] FIGS. **5-8** illustrate side cross sectional views of the structure of a body used for transmitting a product from one bag-on-valve aerosol can to another bag-on-valve aerosol can, in accordance with certain embodiments.

DETAILED DESCRIPTION

[0008] Certain embodiments of the present invention relate to devices, systems, and methods used for transmitting a product from one aerosol container to another container. The aerosol container may in certain embodiments be a bag-on-valve container, in which a pressurized gas in a can applies a pressure to a bag positioned in the can, to force the product out of the can when a valve is actuated. Such products may include, but are not limited to, health and cosmetic formulations, for example, hair care products, shaving products, sun protection factor (SPF) products, and skin care products.

[0009] FIG. **1** illustrates a bag-on-valve container **10** including a can **12** having a bag **14** positioned therein. At an end of the container **10** is a valve **16**, which includes valve stem **18** extending outward. The bag **14** is coupled to the valve **16** so that a product **20** in the bag **14** can be transmitted through the valve **16** when the valve **16** is opened by actuation. The valve **16** may be actuated by applying a force to the valve stem **18**, which acts to open the valve **16**. In certain embodiments, the product **20** may be selected from hair care products, shaving products, sun protection products, and skin and baby products, cleansers, and other lotions and sprays. Any suitable bag-in-valve container and valve mechanism may be used. Such valve mechanisms may include the use of a spring, such as spring **29** and spring **129**, as illustrated, for example, in FIG. **2**. Suitable containers and valve mechanisms are available from SeaquistPerfect Dispensing, of Cary, Ill.

[0010] A propellant **22** is positioned in the can **12**, to apply a pressure to the bag **14**. The propellant **22** may be any suitable propellant, including, but not limited to, compressed gases and/or liquefied hydrocarbons. FIG. **1** illustrates wavy lines **22** to indicate a propellant in gas form. FIG. **1** also illustrates that if the propellant is a liquefied hydrocarbon, a quantity of the liquefied hydrocarbon **22'**, as indicated by the hatched line, will also be present in the can. Examples include, but are not limited to, nitrogen, air, and hydrocarbons. The valve **16** may be actuated by applying a force to the valve stem **18**. The container **10** may also include an spray top **15** adapted to be removeably coupled to the valve stem **18**, and a cap **11** that fits over the spray top **15**. The spray top **15** permits the user to direct the spray of product towards the side of the can by applying a force to the spray top **15**, which in turn transmits a force to the valve stem **18** to actuate the valve **16** and transmits the product through the valve stem **18** and the spray top **15**. The spray top **15** includes an aperture **19** that follows a path through the spray top **15** that includes a bend that directs the spray of product to the side.

[0011] FIG. **1** also illustrates a body **30** including an aperture **32** extending therethrough. The body **30** may be coupled to the valve stem **18** when the spray top **15** is not positioned on the valve stem **18**. The body **30** is shaped so that the valve stem **18** can be accepted into the aperture **32**. The body **30** may be formed from any suitable material through which a IS product such as, for example, a cosmetic product, may flow, including, but not limited to, polymers, metals, ceramics, glass, and composite materials.

[0012] FIG. **2** illustrates the container **10** and body **30** of FIG. **1**, together with a second container **110**, the second container including a bag **114** positioned therein, a valve **116**, and a valve stem **118** extending outward, in accordance with certain embodiments. The second container **100** may in certain embodiments be a different size than the first container **10** and contain a different sized bag **114** therein. As illustrated in FIG. **2**, the valve stem **18** from the container **10** extends into the aperture **32** at a lower end **31** of the body **30**. The valve stem **118** of the container **110** is aligned to be inserted into the aperture **32** at an upper end **33** of the body **30**.

[0013] The aperture **32** extending through the body **30** as illustrated in the embodiment of FIG. **2** has substantially frusto-conical shaped portions separated by a cylindrical shaped portion. The aperture **32** extends upward from the lower end **31** of the body in a frusto-conical manner for a distance into the body **30**. The aperture also extends downward from the upper surface **33** in a frusto-conical manner for a distance into the body **30**. The aperture **32** has its largest diameter where it intersects with the upper end **33** and the lower end **31** of the body **30**. In the embodiment shown in FIG. **2**, the frusto-conical shapes extending from each of the ends **31**, **33** extend a distance of less than one half the length of the body **30**. A central portion of the aperture **32** between

the frusto-conical portions is cylindrical shaped. Other sizes and shapes for the various portions of the aperture **32** are also possible.

[0014] In addition, the second container **110** may include a propellant that applies a different pressure to the bag **114** than the pressure applied to the bag **14** by the propellant in the first container **10**. By having a different pressure in each of the containers **10**, **110**, when each is coupled to the body **30** and actuated, the bag having a higher pressure applied to it will deliver product to the bag in the other can. When a compressed gas propellant (for example, nitrogen or air) is used, the bag in the can being filled will either be filled to its capacity or be filled until the pressure in each can is equalized. If a liquified hydrocarbon propellant (for example, isopentane, isobutene, or dimethyl ether) is used, a constant pressure is applied to the bag regardless of the quantity of product in the can. As a result, when a liquefied hydrocarbon is used, the bag being filled (the bag with the lower pressure) will either be filled to its capacity or filled until the supply can is empty of product. This is because the hydrocarbon propellant is present in an equilibrium state of liquid and vapor in the can. In certain embodiments, the propellant in one of the containers **10**, **110** has a pressure that is about 15 percent to about 150 percent greater than the pressure in the other of the containers **10**, **110**.

[0015] FIG. **3** illustrates an embodiment in which a larger container **210** delivers product **220** to a smaller container **310** thorough a body **230**, in accordance with certain embodiments. The container **210** includes a bag **214** that can hold a greater volume of product than the bag **314** in the container **310**. As a result, if one uses up most or all of the contents in the container **310**, it may be refilled using the container **210** and the body **230**. As seen in FIG. **3**, when the valves **216** and **316** are each engaged, the product **220** flows from the bag **214** in can **212** through the aperture **332** in the body **230** to the bag **314** in the can **312**. The pressure **222** in the can **212** should be sufficient to ensure that a large enough force is applied to the bag **214** so that the product can flow through the valve **216** and the body **230** and into the bag **314** when the valves **216** and **316** are actuated. The pressure in the can **312** should be small enough so that it allows for the product **220** to be delivered into the bag **314**, yet be large enough so that after the bag **314** is filled with product **220**, the product **220** will flow through the valve **316** when actuated by the user.

[0016] It should be appreciated that the actual pressure applied to the bag in the container will vary as the product is delivered into or out of the can when a compressed gas (e.g. nitrogen, air, etc.) is used as the propellant. This is because as the bag is emptied of product, the bag will fold up, thus increasing the volume between the bag and the can. As this increased volume is filled with the compressed gas, the pressure on the bag decreases. When a liquid hydrocarbon propellant is used, the pressure to the bag in the container remains generally constant as the product is delivered into or out of the can, because the liquid hydrocarbon propellant is present in the can in an amount to ensure equilibrium state of liquid and vapor. As a result, as the bag is emptied of product and begins to fold up, the increased volume between the bag and the can will be filled with additional vapor from the volatile hydrocarbon liquid, thus keeping the pressure constant.

[0017] As the product is used up, the volume inside the can between the bag and the interior walls of the can changes as the bag collapses due to the decreased amount of product therein. As illustrated in FIG. **3**, because the bag **314** in can **312** of container **310** is almost empty, the bag **314** has folded up in the can **312** due to the application of pressure from the propellant **322**. The bag **314** may include a number of fold regions, for example, fold regions **340**, **342**. As the bag **314** is filled, these fold regions **340**, **342** will unfold and the bag **314** will expand into the interior of the can **312**. In one embodiment using a compressed gas, when a can includes a bag that is substantially empty of product, the pressure on the bag may be about 20 psi. When the bag is substantially filled with product and the volume inside the can between the can and the bag is decreased, the pressure on the bag may be in the range of about 90 psi to 120 psi. Other pressures may also be used. Certain embodiments using hydrocarbon propellants may use lower pressures, for example, in a range of about 70 psi to about 90 psi. It should be appreciated that different types of products may require different pressures to be used, depending on factors such as, for example, the viscosity of the product. For example, certain embodiments may utilize a spray pressure of about 35 psi and higher in order to atomize products such as hair sprays. Products such as shampoos may utilize a lower dispensing pressure, for example, about 20 psi and higher.

[0018] The body through which the product is transmitted from one container to another container may have a variety of configurations in addition to the configuration of the body **30** illustrated in FIGS. **1**-**3**. The body itself may take a variety of shapes including, but not limited to, cylindrical. The aperture extending through the body may also have a variety of shapes and angles. FIGS. **4**(A) through **8** illustrate examples of shapes for the aperture extending through a body, in accordance with certain embodiments.

[0019] FIGS. **4**(A) and **4**(B) illustrate a body **330**, including an aperture **332** extending therethrough. The height of the body **330** may be separated into regions P**1**, P**2**, and P**3** as illustrated in the side cross-sectional view of FIG. **4**(A). Within upper region P**1**, the aperture **332** has a frusto-conical shape having a larger diameter at the top end **333** of the body **330**. Within central region P**2**, the aperture **332** has a cylindrical shape. Within lower region P**3**, the aperture **332** has a frusto-conical shape having a larger diameter at the bottom end **331** of the body **330**. Thus, the aperture **332** includes a cylindrical shaped central interior region with frusto-conical shaped regions on either side of the central interior region. FIG. **4**(B) illustrates a top down view of the body **330**. The circles **335**, **339** illustrate the diameter of the aperture **332** at the top surface **333** and in the central region P**2**.

[0020] FIG. **5** illustrates a side cross-sectional view of a body **430**, including an aperture **432** extending therethrough. The aperture **432** includes a frusto-conical portion extending from the top end **433** to a central region **438** of the body **430**, with a larger diameter at the top end **433**. The aperture also includes a frusto-conical portion extending from the bottom end **431** to the central region **438** of the body **430**, with a larger diameter at the bottom end **431**. Thus, the aperture in this embodiment includes only the two frusto-conical portions, which meet in the central region **438** of the body **430**.

[0021] FIG. **6** illustrates a side cross-sectional view of a body **530**, including an aperture **532** extending therethrough. The height of the body **530** may be separated into regions P**1**, P**2**, and P**3**. Within upper region P**1**, the aperture **532** has a cylindrical shape. Within central region P**2**, the aperture **532** has a cylindrical shape with a smaller diameter than that in region P**1**. Within lower region P**3**, the aperture **532** has a cylindrical shape having the same diameter as that in the

upper region P1. Thus, the aperture **532** includes a smaller diameter cylindrical shaped central interior region with larger diameter cylindrical shaped regions on either side of the central interior region.

[0022] FIG. **7** illustrates a side cross-sectional view of a body **630**, including an aperture **632** extending therethrough. The aperture **632** is cylindrical shaped for its entire length, from the top end **633** to the bottom end **631** of the body **630**. In this embodiment, the diameter of the cylindrical shaped aperture **632** does not change within the body **630**.

[0023] FIG. **8** illustrates a side cross-sectional view of a body **730**, including an aperture **732** extending therethrough. The height of the body **730** may be separated into regions P1, P2, and P3. Within upper region P1, the aperture **732** has a frusto-conical shape having a larger diameter at the top end **733** of the body **730**. Within central region P2, the aperture **732** has a cylindrical shape. Within lower region P3, the aperture **732** has a frusto-conical shape having a larger diameter at the bottom end **731** of the body **730**. Thus, the aperture **732** includes a cylindrical shaped central interior region with frusto-conical shaped regions on either side of the central region. The frusto-conical shaped portions of the aperture **732** have different diameters at the upper end **733** and lower end **731** of the body **730**. This allows cans having a wide range of valve stem sizes to be used.

[0024] Embodiments may include systems or kits including a body for transferring a product from one bag-on-valve container to another bag-on-valve container, and a bag-on-valve container. Such a system may include, for example, a relatively small container. The user may then separately obtain another container, such as a larger volume container containing the product, and then refill the smaller container when needed. Alternatively, systems or kits may include both a small container and a large container, together with the body for transferring the product between containers. Embodiments may also include the body alone. As noted above, the body may have a variety of configurations, depending on the specific features of the valves and cans used.

[0025] Embodiments may include one or more of the following advantages. First, embodiments permit a container to be reused instead of being discarded after one use. Second, embodiments provide for improved convenience because a user can, for example, carry a small container with them during the day and then refill it from a large container (which is kept at home) when necessary. Third, once the user has the small container and the body for transferring product, then the user can purchase large containers used for refill. Purchasing large containers is likely to be more economical for the user. Fourth, certain embodiments may utilize a compressed gas that is non-volatile, such as nitrogen or air. The use of such gases in an aerosol container is environmentally safe. In one specific use, a small container including a non-volatile compressed gas may be suitable for use in an airplane, whereas a container including a liquefied hydrocarbon may not be suitable. Other advantages may also be present in various embodiments.

[0026] The exact form of embodiments may change depending on factors such as the size and type of valve used, and the shape of the valve stem and the bottle. For example, while the apertures in certain embodiments are circular in cross section, other shapes are possible depending on, for example, the shape of the valve stem used. The sizes and angles of the surfaces of the body defining the aperture may also be varied from those illustrated. In addition, while the bodies in the various configurations are illustrated as rectangular in cross section, other shapes are possible. Furthermore, the shape and size of the various components (can, valve, body) may be different from those illustrated. Since there may be many modifications without departing from the scope of the invention, the examples set forth herein are not intended to limit the invention but to illustrate certain aspects of the invention more clearly.

[0027] It will, of course, be understood that modifications of embodiments of the present invention, in its various aspects, will be apparent to those skilled in the art. The scope of the invention should not be limited by the particular embodiments described above. In addition, the terms "including", "comprising", "having" and variations thereof mean "including, but not limited to", unless expressly specified otherwise. A listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. An ordering of operations does not necessarily mean that the operations must be carried out in the listed order. The terms "a", "an" and "the" mean "one or more", unless expressly specified otherwise.

What is claimed is:

1. A system comprising:

a first bag-on-valve aerosol container including a first valve comprising a first valve stem; and

a body including an aperture extending therethrough from a first end of the body to a second end of the body, the aperture sized to accept the first valve stem at the first end of the body, the aperture also sized to accept a second valve stem at the second end of the body; the body sized to accept the first valve stem and a second valve stem at the same time.

2. The system of claim **1**, further comprising a second bag-on-valve aerosol container including a second valve comprising a second valve stem.

3. The system of claim **2**, wherein the first aerosol container and the second aerosol container are different sizes.

4. The system of claim **1**, wherein the aperture at the first end of the body includes a first width, and the aperture at the second end of the body includes a second width, and the first width equals the second width.

5. The system of claim **1**, wherein the aperture at the first end of the body includes a first width, and the aperture at the second end of the body includes a second width, and the first width is different than the second width.

6. The system of claim **1**, wherein the aperture includes a first width at the first end of the body, a second width at the second end of the body, and a third width at a central portion of the body, wherein the third width is smaller than the first width and the second width.

7. The system of claim **1**, wherein the aperture includes a larger width at the first end of the body than at a central portion of the body, and wherein the aperture includes a larger width at the second end of the body than at the central portion of the body.

8. The system of claim **1**, wherein the aperture includes a frusto-conical shaped portion extending from the first end of the body to an interior region of the body spaced away from the first end, and wherein the aperture includes a frusto-conical shaped portion extending from the second end of the body to an interior region of the body spaced away from the second end.

9. The system of claim **1**, wherein the body comprises a cylindrical shape.

10. The system of claim **2**, wherein the first aerosol container and the second aerosol container each contain a product therein, the product selected from the group consisting of a shaving gel, a shaving cream, a hair gel, a hair spray, a shampoo, an sun protection product, and a cleansing product.

11. A method for filling a first bag-on-valve aerosol container from a second bag-on-valve aerosol container, comprising:

providing a first container comprising a bag-on-valve aerosol container, the first container including a first valve stem;

providing a second container comprising a bag-on-valve aerosol container, the second container including a second valve stem;

providing a body including an aperture extending therethrough from a first end of the body to a second end of the body;

positioning the body and the first container so that the valve stem of the first container is accepted into the aperture at the first end of the body;

positioning the body and the second container so that the valve stem of the second container is accepted into the aperture at the second end of the body; and

actuating the valve on the first container and actuating the valve on the second container so that a product is transferred from one of the first container and the second container to the other of the first container and the second container through the body.

12. The method of claim **11**, wherein the actuating the valve on the first container and actuating the valve on the second container is carried out for a time sufficient so that one of (i) equalizing a pressure between the first container and the second container, and (ii) filling one of the first container and the second container with the product, occurs.

13. A body adapted to fit first and second bag-on-valve aerosol spray containers at the same time, comprising:

a body including an aperture extending therethrough from a first end of the body to a second end of the body,

the aperture sized to accept a first valve stem from a first bag-on-valve aerosol spray container at the first end of the body;

the aperture also sized to accept a second valve stem from a second bag-on-valve aerosol spray container at the second end of the body; and

wherein the body is sized to accept the first valve stem from the first bag-on-valve aerosol spray container and the second valve stem from the second bag-on-valve aerosol container at the same time.

14. The body of claim **13**, wherein the aperture at the first end of the body includes a first width, and the aperture at the second end of the body includes a second width, and the first width equals the second width.

15. The body of claim **13**, wherein the aperture at the first end of the body includes a first width, and the aperture at the second end of the body includes a second width, and the first width is different than the second width.

16. The body of claim **13**, wherein the body comprises a cylindrical shape.

17. The body of claim **13**, wherein the aperture includes a first width at the first end of the body, a second width at the second end of the body, and a third width at a central portion of the body, wherein the third width is smaller than the first width and the second width.

18. The body of claim **13**, wherein the aperture includes a larger width at the first end of the body than at a central portion of the body, and wherein the aperture includes a larger width at the second end of the body than at the central portion of the body.

19. The body of claim **13**, wherein the aperture includes a frusto-conical shaped portion extending from the first end of the body to an interior region of the body spaced away from the first end, and wherein the aperture includes a frusto-conical shaped portion extending from the second end of the body to an interior region of the body spaced away from the second end.

20. The body of claim **19**, wherein the aperture further includes a cylindrical shaped portion positioned between the frusto-conical shaped portions

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