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(54) Title: HERMETICALLY SEALED CONTAINER SYSTEMS AND METHODS

(57) Abstract: In embodiments, a container holder is configured to prevent or reduce egress of fluid when closed, such that effervescence remains in a beverage or other liquid housed therein. In embodiments, the container holder can be reusable, insulated, hold different sized containers, and/or comprise visually distinguishing features.

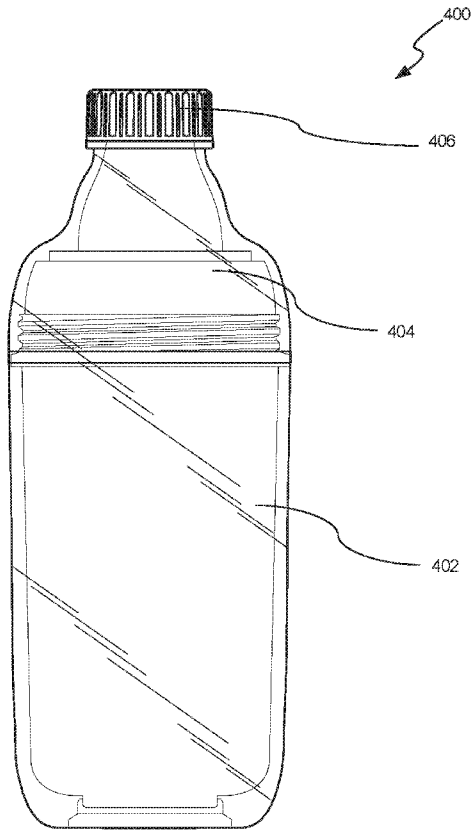


Fig. 7

WO 2016/205492 A1

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# HERMETICALLY SEALED CONTAINER SYSTEMS AND METHODS

## BACKGROUND OF THE INVENTION

Many beverages, such as soft drinks, energy drinks, water, or liquors, among others, are carbonated prior to sale. To maintain carbonation until the beverages are consumed, these beverages are often stored in a standard-sized, relatively vapor-impermeable container, such as an aluminum or plastic can or bottle. The beverage housed therein is often kept at a relatively high pressure compared with typical atmosphere, and once the container is opened the beverage begins outgassing.

Commonly used conventional containers, such as aluminum cans, cannot be closed once they have been opened. These containers typically have a frangible line defining an aperture, and the frangible line can be broken using a tab, pushing the portion of the can within the aperture into the container. Once the frangible line is broken, the beverage will continue to outgas until the beverage is "flat," or contains no more effervescence. Furthermore, because the beverage cannot be easily closed, it becomes difficult to transport such beverages once they have been opened, without spilling.

Conventional containers are often made of thin plastics or aluminum, which have low heat capacity and/or high heat transfer rates. As such, beverages that are desirably kept colder or warmer than ambient conditions often settle to room temperature quickly. In many beverages, increased temperature is also associated with a higher rate of outgassing due to the decreased solubility of $CO_2$ in liquids at increasing temperatures, resulting in the beverage going flat faster than if it were kept cold.

Thus, a solution is needed that can reduce or eliminate outgassing and provide spill protection for beverage containers once they have been opened, while still facilitating drinking from the container. Furthermore, a solution is needed that maintains the desired temperature of the beverage.

## FIELD OF THE INVENTION

Embodiments of the claimed invention relate to container attachments or adjuncts, and methods of their use. More particularly, embodiments of the claimed invention relate to container holders that prevent or reduce egress of pressurized vapor that can be emitted by a carbonated beverage, for example.

## DESCRIPTION OF THE RELATED ART

The need for thermal insulation of beverage containers has been recognized in addressed in various references. For example, U.S. Patent No. 1,939,777 (Humboldt) discloses a thermally-insulating protector sleeve that maintains warmth of a bottle for milk or infant formula.

The need to maintain carbonation has been addressed in, for example, U.S. Patent No. 4,456,134 (Cooper). Cooper discloses an expandable and contractible midsection, such that the available volume of head space for carbonation can be modified manually.

In addition to the need for maintaining the temperature of warm liquids as disclosed in Humboldt, the need to maintain the temperature of cold beverages has been disclosed in, for example, U.S Patent No. 6,554,155 ("Beggins").

Humboldt, Cooper, and Beggins all fail to address a need for low-maintenance, easy-use container that both insulates and maintains carbonation. Many summer recreational activities like boating, golfing, or bicycling are inherently active and opened beverages should desirably be kept both cold and carbonated in coolers on boats, golf carts, mounted beverage carriers on bicycles, or other settings in which conventional systems are unworkable.

First, there may be significant mechanical jostling, or containers may be shaken, arranged at a variety of angles or upside-down in small spaces. The complex manual adjustment system of Cooper is both unwieldy and can be inadvertently changed. In the process of pouring a carbonated beverage into a secondary container, much of the carbonation is lost.

Second, the carbonation containment systems of Cooper requires that the carbonated beverage be poured into a structure having an elastomeric or articulated sidewall, rather than remaining in its original container.

Third, conventional insulating systems such as those described in Humboldt and Beggins do not maintain carbonation because they are unable to contain carbonation. Traditional insulating systems such as Humbold and Beggins, or even Thermos® systems (e.g., Patent No. 4,427,123 (Komeda et al.)) are made of foam, vacuum-lined steel walls, or other structures that fail to conform to retail containers of carbonated fluids.

## SUMMARY OF THE INVENTION

In embodiments, a container holder is configured to prevent or reduce egress of fluid when the container/holder is closed, such that effervescence remains in a beverage or other liquid housed therein. In embodiments, the container holder can be reusable, insulated, configured to

hold or accommodate differently sized containers, and/or comprise visually identifying features. The container can both insulate and contain effervescence, without requiring the contents of standard-sized containers to be removed.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and desired objects of the present invention, reference is made to the following detailed description taken in conjunction with the accompanying drawing figures wherein like reference characters denote corresponding parts throughout the several views and wherein:

Fig. 1 is a perspective view of a container holder, according to an embodiment.

Fig. 2 is a plan view of the container holder of Fig. 1.

Fig. 3 is a perspective view of a dome of the container holder shown in Fig. 1, with internal components shown in phantom.

Fig. 4 is a wire drawing of a prior art, conventional aluminum can.

Fig. 5 is a wire drawing of a base of a container holder system, according to an embodiment.

Fig. 6 is a wire drawing of a dome configured to interact with the base of Fig. 5, according to an embodiment.

Fig. 7 is a perspective view of a container holder having distinguishing visual features, according to an embodiment.

Fig. 8 is a cross-sectional view of a dome of a container holder, according to an embodiment.

Fig. 9 is a plan view of a cap, according to an embodiment.

Fig. 10 is a cross-sectional view of a base of a container holder, according to an embodiment.

Fig. 11 is a perspective view of a base of a container holder system including an insert, with internal components shown in phantom, according to an embodiment.

Fig. 12 is a cross-sectional view of a dome according to an embodiment.

Fig. 13 is a cross-sectional perspective view of a container holder system housing a can, according to an embodiment.

Fig. 14 is a cross-sectional perspective view of the container holder system and can according to Fig. 13.

Fig. 15 is a cross-sectional view of the container holder system and can according to Figs. 13 and 14.

Fig. 16 is a perspective view of an alternative dome embodiment configured for use with conventionally-sized bottles.

While embodiments are amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

## DETAILED DESCRIPTION OF THE INVENTION

As described herein and shown in the Figures, a container holder is provided in embodiments which includes a gasket to prevent or reduce egress of carbonation from the container it holds. A fluid path can be retained between an aperture of the container and a mouth of the container holder. When the container holder is in a closed configureation, in embodiments, the container holder can be shaped substantially similar to a conventional bottle or other container, facilitating ease of use while also preventing or reducing carbonation egress and increasing portability of the contained fluid without spilling. In embodiments, the container can include a material, for example an insert, having high specific heat to maintain a desired beverage temperature and/or reduce carbonation outgassing. In embodiments, the container holder can be color-coded or otherwise marked to provide identifying features and distinguish the container from other containers. In embodiments, the container holder can be emptied and reused multiple times, reducing waste.

Fig. 1 is a perspective view of a container holder 100, which includes a base 102, a dome 104, and a cap 106. Base 102 is connected to dome 104 at a first threaded interface 108a. Similarly, dome 104 is connected to cap 106 at a second threaded interface 108b. Container holder 100, when assembled, defines an interior chamber, as shown in the following figures, and maintains a hermetic seal about that chamber.

Container holder 100 can provide a hermetic seal to contain a carbonated beverage or other

pressurized fluid, for example. In embodiments, container holder 100 can provide a sealed interface between its various components. For example, the threaded interfaces 108a and 108b can provide a fluid-tight seal. In other embodiments, one or more of the threaded interfaces 108a and 108b need not provide a fluid-tight seal. Rather, fluid-tight seals can be provided on the interior of container holder 100, for example. In embodiments, the location of the fluid tight seal (or seals) can be at the top rim of a can inserted into container holder 100, or at threaded interfaces 108a and/or 108b, for example. This can provide a barrier to fluid ingress or egress when the container holder 100 is used in a lake or pool or other body of water, or even in a cooler with melted ice in the bottom, for example.

Base 102 and dome 104 can be sized in such a way that standard aluminum cans, or plastic or glass bottles, can be housed therein, in some embodiments. Aluminum cans come in a variety of sizes, but there are only a few common sizes, or standards, that are used by almost all beverage bottlers and distributors. In embodiments, base 102 and dome 104 can be sized to house a standard 12-oz. can or a standard 16-oz. can. In North America, a standard 12-oz. aluminum can has a diameter of between about 202 to about 209 mm, and a height of about 604 mm, for example. Other standard sized cans, such as "mini keg" cans, "skinny" cans, or cans sold in other jurisdictions, can have different dimensions. In some cases, these cans can be made from steel, tin, plastic, or other materials other than aluminum. As such, the dimensions of container housing 100 can vary significantly, as described in more detail with respect to the following figures.

Tens of billions of recyclable aluminum and steel cans are supplied each year by companies like BALL CORPORATION of Broomfield, Colorado. These materials and standard sizes are typically used because they are relatively easier to recycle and cheaper to produce than many alternatives, such as shaped plastic bottles. However, aluminum and steel cans are typically not resealable, nor do they maintain a desired temperature well. Container housing 100 can be used to provide these benefits, and have any of a variety of shapes in embodiments, including a shape similar to a plastic bottle, as shown in Fig. 1. Furthermore, container holder 100 can be used multiple times sequentially with different cans, which are usually recycled or otherwise disposed of after only a single use.

These attributes of container holder 100 allow for the continued use of highly recyclable, low-cost aluminum and steel cans. Container holder 100 also facilitates choice by the consumer for a desired shape, color, or other physical attributes of the reusable container housing 100 that would be too expensive or impractical for bottlers to incorporate into single-use cans. In fact, some products are not available in bottles or any other alternatives to a can, and the container holder

100 can provide options for the consumer to customize the shape and other attributes of the product's containment. In various alternative embodiments to the container holder 100 shown in Fig. 1, other features such as handles, grips, other textures, and alternative closures can be incorporated, as will be readily appreciated by one of ordinary skill in the art.

Fig. 2 is a plan view of container housing 100, showing dome 104 having gasket 110, as well as cap 106. Gasket 110 is positioned within dome 104 in the embodiment shown in Fig. 2, and is substantially toroidal. This toroidal shape allows gasket 110 to fit snugly on a lip of standard-sized aluminum cans, in embodiments. In some embodiments, gasket 110 can be sized to correspond to a lip or other surface of a can that is housed within container housing 100.

Fig. 3 is a perspective view of the dome 104 of Figs. 1 and 2. In the view shown in Fig. 3, the cap 106 includes a second threaded interface 108b (connecting dome 104 and cap 106). In the embodiment shown in Figs. 1–3, first threaded interface 108a includes female threaded dome 104 and male threaded base 102. Second threaded interface 108b includes female threaded cap 106 and male threaded dome 104. In alternative embodiments, the relative placement of the threads as between these components can be altered. In still further embodiments, the connection between the various components of container housing 100 can include other connection mechanisms, such as hinges, clasps, buckles, magnetic connections, or any other fastening structures. In embodiments, the fastening structure used permits for non-destructive removal, so that the container housing 100 can be reused.

As shown in Fig. 3, second threaded interface 108b has a relatively low thread pitch. As such, threaded interface 108b can be finger-tightened until it is nearly, if not completely, hermetically sealed. In some embodiments, a gasket (not shown) can be provided along a flange 112 at the base of second threaded interface 108b. By tightening cap 106 (Figs. 1 and 2) until it is in contact with such flange 112 or gasket (not shown), fluid egress through threaded interface 108b can be reduced or eliminated, in embodiments.

Fig. 4 is a perspective view of a standard sized can 200. Can 200 is a standard-sized, conventional 12-fluid-ounce aluminum can. As shown in Fig. 4, can 200 has a can height HC and a can diameter DC. Can 200 includes a substantially cylindrical sidewall 202, upper taper 204, upper lip 206, and aperture 208. Can 200 further includes lower taper 210, lower lip 212, frustoconical section 214, and bottom 216. In the embodiment shown in Fig. 4, can height HC is between about 312 mm and about 710 mm, or more particularly between about 409 mm and about 417 mm, or more particularly about 413 mm. In the embodiment shown in Fig. 4, can

diameter DC can be between about 202 mm and about 307 mm, and more particularly about 211 mm. Upper lip 206 has a lip diameter DL that is between about 200 and about 209 mm, or more particularly between about 202 mm and about 206 mm, or more particularly about 202 mm, in embodiments.

Aperture 208 can be any of a number of sizes or shapes. For example, in some embodiments, aperture 208 can be a pull-tab aperture, a stay-on-tab aperture, a hole formed by a churchkey or other opening device, a wide mouth opening, or any other suitable opening. In some embodiments, aperture 208 is formed by the puncture or breakage of a frangible region. In others, such as those formed by a churchkey or other openers, aperture 208 is directly formed in the otherwise continuous can material. In embodiments, aperture 208 cannot be easily re-closed once it has been formed.

As described with respect to Figs. 1–3, container holder 100 can be configured to hold a can, or any of a variety of other standard or non-standard sizes. As such, an internal cavity defined by the container holder 100 can be substantially equal to or only slightly larger than aluminum can 200, in embodiments.

Gasket 110 (Figs. 1–3) can be sized and shaped such that it is adjacent to and/or compressed onto upper lip 206, to form a hermetic seal. In this way, fluid (such as the liquid contained by container 200 or vapor such as CO2 outgassed from that liquid) is retained within container housing 100 (Figs. 1–3).

Fig. 5 is a wire drawing of base 300. Base 300 is similar to base 102 previously described with respect to Figs. 1–3. Like base 102 of Figs. 1–3, base 300 can be used to at least partially contain a container such as an aluminum can, and base 300 can cooperate with other components to form a hermetic seal about that can to contain effervescence, maintain a desired temperature, or accomplish any of the other benefits previously described. In the embodiment shown in Fig. 5, base 300 defines interior walls 302 that are sized to receive a standard-sized can, such as the aluminum can 200 described with respect to Fig. 4. Base 300 of Fig. 5 includes features that provide advantages not previously described with respect to base 102 (Figs. 1–3). In particular, base 300 includes gutters 304, and grips 306.

Gutters 304 are elongated pathways extending along an interior walls 302. When a can or other object is inserted into base 300, assuming that the fit is somewhat tight, the ambient atmosphere can be trapped in base 300, preventing the can or other object from being fully inserted. Gutters 304 allow air egress while maintaining a tight fit between base 300 and the object housed

therein. This prevents or reduces undesirable relative movement between the object and the base 300 once the object is installed.

Grips 306 provide both stylistic and decorative purposes. As shown in Fig. 5, grips 306 are provided in a spiral about the base 300. Grips 306 are divots which enhance a user's ability to hold base 300, and can also be personalized or stylized as desired.

Similar to the structures previously described with respect to container holder 100, base 300 includes a threaded interface 308. As shown in Fig. 5, threaded interface 308 is a male threaded portion of base 300, which facilitates connection between base 300 and an adjacent component (not shown).

Fig. 6 shows one such potential adjacent component. As shown in Fig. 6, a dome 310 includes a first threaded portion 312, a first interior wall portion 314, a first flange 316, a second interior wall portion 318, a second flange 320, and a second threaded portion 322. Dome 310 defines a fluid flow path 324 through the second threaded portion 322 that can be opened or closed by use of a cap (e.g., cap 106 as previously depicted in Fig. 1). The other components of dome 310 combine to prevent or reduce fluid flow by any other route than flow path 324.

For example, first threaded portion 312 can be configured to mate with an adjacent threaded component, as previously described with respect to Fig. 5. In some embodiments, this connection can be fluid-tight.

Likewise, first interior wall 314 can be sized to fit a standard-sized aluminum can, in some embodiments. First interior wall 314 and an adjacent can, in embodiments, can form a substantially fluid-tight seal. Furthermore, engagement between first interior wall 314 and an adjacent can can prevent or reduce undesirable shifting of the can within dome 310. In some embodiments, first interior wall 314 can be shaped to provide engagement along a can, for example by including a concavity corresponding to the shape of an upper taper (e.g., upper taper 204 of Fig. 4).

First flange 316 provides another potential location to form a fluid-tight seal between dome 310 and an adjacent can. As previously described, first flange 316 can be positioned at an upper lip of a can. In embodiments, such as the embodiment previously depicted in Fig. 2, flange 316 can be a separate piece or component. In others, such as the embodiment shown in Fig. 6, first flange 316 is integrally formed in dome 310. In embodiments, first flange 316 can be formed of the same material as that which makes up dome 310. In embodiments, certain first flanges 316 are formed of a material such as rubber, silicone rubber, cork, or any other materials that provide a

good seal due to their compressibility, elasticity, and/or other rheological characteristics. This composition can be either the same as or different from the composition of the remainder of dome 310, in various embodiments.

In embodiments, dome 310 can be formed of a transparent material such as a tempered glass or a polymer, for example. By using a transparent material, the user of the system can see where the opening of the can is, which facilitates aligning the opening within dome 310 to ensure a proper pour.

Second interior wall 318 is also sized to fit a standard sized can, in embodiments. For example, second interior wall 318 can be configured to contain a "skinny" or "slim" standard-sized can. In contrast with the standard-sized 12 oz. can depicted in Fig. 4, a "skinny" can is typically taller and thinner.

According to one embodiment, second interior wall 318 can be sized to contain a SLEEK sized aluminum can produced by the BALL CORPORATION of Broomfield, Colorado. A 12 oz. can of the SLEEK line has a height of about 602 mm, compared with the standard sized 12 oz. can which has a height of about 413 mm. Furthermore, a 12 oz. can of the SLEEK line has a diameter of about 204 mm, compared with the standard sized 12 oz. can which has a diameter of about 211 mm.

As previously described with respect to first interior wall 314, second interior wall 318 can be shaped to mate with an expected can shape, such as a concavity corresponding to an upper taper (204, Fig. 4). Second interior wall 318 can form a substantially fluid-tight seal with a can in this way, preventing, reducing, or slowing a loss of effervescence in a beverage contained therein.

Second flange 320 can prevent or reduce egress of fluid from a can contained by second interior wall 318. This is similar to the seal previously described with respect to first flange 316. That is, for SLEEK or other "skinny" or "slim" cans, the upper lip (e.g., upper lip 204 of Fig. 4) of the can can be placed in contact with the second flange 320. This can reduce egress of fluid such as liquids or pressurized gases.

Second threaded portion 322 is arranged opposite dome 310 from first threaded portion 312. Second threaded portion 322 is configured to mate with an adjacent component such as cap 106 (Fig. 1). When such adjacent component is attached to second threaded portion 322, no fluid egress is possible from a can housed within dome 310. The adjacent component closes off fluid path 324, and all other potential routes of egress are closed off by some combination of first threaded portion 312, first interior wall 314, first flange 316, second interior wall 318, and/or

second flange 320.

In sum, the effervescence present in a carbonated beverage, for example, can be maintained while fluid path 324 is closed off, by attaching a cap to second threaded portion 322. Unlike a typical aluminum can, however, it is possible to re-open and re-close fluid path 324 to alternately access or contain a beverage housed therein.

Fig. 7 is a perspective view of a container housing 400 having a base 402, a dome 404, and a cap 406. As depicted by the shading in Fig. 7, each of these components has a different color than the others. In embodiments, various patterns, colors, and even ornamental structural features can be added to base 402, dome 404, and/or cap 406 to distinguish container housing 400 from others in its vicinity. In use, container housing 400 could be transported in a cooler along with several others. Upon reopening the cooler, each container housing 400 can be distinguished from the others using these features, colors, or patterns, even if the contents of the cooler have shifted. Thus, container housing 400 can provide a benefit in health and safety, by preventing or reducing, for example, cross-contamination between users. Color, shape, ornamental features, or other distinguishing features can also be added to identify containers housing alcoholic substances, for example.

Figs. 8–10 are end views of a dome 500, a cap 600, and a base 700, respectively. Dome 500, cap 600, and base 700 are configured to interlock with one another to house a container, such as can 200 previously described with respect to Fig. 4, in a hermetically sealed system.

Fig. 8 shows dome 500, including a first taper 502, a flange 504, a second taper 506, a mouth 508, an insulating layer 510, a plurality of outer grooves 512, and threads 514. In the embodiment shown in Fig. 5, dome 500 is configured for use with a single can size. As such, first taper 502 extends to flange 504, which is positioned to interface with an adjacent can when dome 500 is connected to base 700. Second taper 506 extends to mouth 508, which provides egress for fluid when cap 600 is not attached to dome 500.

Insulating layer 510 is positioned in dome 510 and fills a part of the interior of the dome 510 structure, in embodiments. Insulating layer 510 can have a high specific heat in embodiments. In some embodiments, insulating layer 510 can have a relatively low rate of heat transfer. In some embodiments, insulating layer 510 can provide shielding against various types of heat transfer, such as conductive (e.g., insulating layer 510 can include a vacuum layer), radiative (e.g., insulating layer 510 can include a reflective layer) or convective (e.g., insulating layer 510 can be a solid layer). Various embodiments can include one or more such layers, or in some

embodiments dome 500 can be made entirely from a thermally insulating and/or high specific heat material, such as an insulating gel.

Outer grooves 512 can provide grip to apply torque to the dome 500, for example to attach or detach dome 500 from base 700, or to attach or detach cap 600 from dome 500.

Threads 514 provide an attachment mechanism between dome 500 and base 700. Although it is not depicted in the view shown in Fig. 8, additional threads can be present at mouth 508 in embodiments (similar to threads 322 previously described with respect to Fig. 6). In other embodiments, various alternative attachment mechanisms can be used at either the interface between dome 500 and cap 600, or the interface between dome 500 and base 700.

Fig. 9 depicts cap 600, according to one embodiment. Cap 600 is defined by a corrugated edge 602 at its radially outer extremity. A threaded inner edge 604 extends along its radially inner extremity, between a lip 606 and a wall 608. As previously described, lip 606 and wall 608 can close off fluid egress from the container holder made by combining cap 600 with dome 500 and base 700. Threaded inner edge 604 can be used to mechanically couple cap 600 with dome 500, in embodiments. In embodiments, lip 606 can form a seal with a part of dome 500 when engaged, or a seal can be formed at threaded inner edge 604.

Fig. 10 depicts a cross-sectional view of base 700, which includes an outer wall 702, an insulating sleeve 704, an inner wall 706, and a bottom 708. Outer wall 702, as previously described, can be textured, colored, patterned, or otherwise modified to distinguish one base 700 from others or to provide grip, in embodiments. As shown in Fig. 10, base 700 has a scalloped outer edge 702. Insulating sleeve 704 can extend through base 700, and can be made from a material having a high specific heat, or a desired thermal conductivity rate, in embodiments. Insulating sleeve 704 can be freezable in embodiments, such that base 700 can be pre-chilled prior to use with a beverage can.

Inner wall 706 and bottom 708 combine to define an inner cavity within base 700 that is substantially the same size or slightly larger than a standard can size. As previously described, various standard can sizes are known, which can vary between countries. In embodiments, inner wall 706 and bottom 708 can be contoured to match the shape of standard cans as well. For example, as depicted in Fig. 4, some standard cans include tapers, lips, or other features.

Fig. 11 depicts an insert 800, according to an embodiment. Insert 800 is shaped substantially like a standard-sized aluminum can, such as those described above. In contrast to these aluminum cans, however, insert 800 is a reusable container (i.e., insert 800 does not have a frangible

opening) that can be filled, washed out, and re-filled with any desired beverage. For example, insert 800 can be filled with ice cubes and a soft drink. Once so filled, insert 800 can be inserted into a container holder system such as those described with respect to the previous figures, and sealed to prevent egress of fluids such as a beverage or the effervescence contained therein. Because insert 800 is shaped the same as a standard aluminum can, it can be used interchangeably in the same cavity defined by the container holders of the previously-described systems.

Fig. 12 is a cross-sectional view of an embodiment of a dome 904. Dome 904 includes features that prevent leakage of carbonation from a can (not shown) held by dome 904 as described above with respect to other embodiments.

Dome 904 includes a groove G that can hold an elastic or deformable material that provides a seal with the can. The depth of groove G can vary based on the type of deformable material used. For example, in one embodiment groove G can have a depth of between about 3.0 mm and about 6.0 mm. A standard-sized can has a height such that the top lip (e.g., upper lip 206 of Figure 4) extends into groove G and causes deformation of the deformable material therein. This deformation causes a hermetic seal that prevents or reduces egress of liquid or effervescence.

Figs. 13 and 14 are cross-sectional perspective views showing a can 200 as previously described with respect to Fig. 4, housed within a base 102, dome 104, and cap 106 as previously described with respect to Figure 1. Fig. 13 further shows gap G′ filled by deformable material M′. As shown in Fig. 13, upper lip 206 of can 200 deforms deformable material M′ to form a hermetic seal.

Figs. 13 and 14 further show in more detail first threaded seal 108a and second threaded seal 108b previously described with respect to Figure 1. In embodiments, threaded seals 108a and 108b can provide a hermetic seal, as previously described. In alternative embodiments, such as the ones shown in Figs. 13 and 14, first threaded seal 108a can be used to force upper lip 206 into gap G′ to form the hermetic seal at that location. Similarly, cap 106 can be tightened onto dome 104 using second threaded seal 108b to either provide a hermetic seal directly, or to force dome 104 into cap 106 at a deformable portion of cap 106 that provides a seal, or both.

Fig. 15 is a cross-sectional view of a base 102, dome 104, and cap 106, and further depicts can 200 and a base spacer 1000. Base spacer 1000 can be positioned underneath a smaller can to ensure desired engagement between upper lip 206 and deformable material M′. For example, in one embodiment base 102 is deep enough to accommodate a standard 12-oz. can or 20-oz. bottle,

and base spacer 1000 can be placed within base 102 to ensure a snug fit to deformable material M′ for a standard-sized 8-oz. can. Other base spacers, including shaped spacers (e.g., spacer 906 described above) can be employed for a variety of different sizes and shaped containers to be housed within base 102, in various embodiments.

Base spacer 1000 can be made of a relatively incompressible material such as a plastic, in embodiments. In embodiments, base spacer 1000 could be made of a material having a heat capacity greater than that of the remainder of base 102. In one embodiment, base spacer 1000 can have a heat capacity greater than or equal to 0.5 Joules per gram-°C. For example, base spacer 1000 could be made of stainless steel, having a heat capacity of about 0.5 Joules per gram–°C, or aluminum, having a heat capacity of about 0.9 Joules per gram–°C. Similarly, base 102 can include a layer of a material having the same or a similar material, and/or could include an insulation layer, such as a foamed polymer, a vacuum layer, or another form of insulation.

Fig. 16 is a perspective view of a dome 1104, according to an alternative embodiment, in which interior structures are shown in phantom view. According to the embodiment shown in Fig. 16, lower threaded interface 1108a connects to a base (not shown) that is sized for a bottle, rather than a can as shown in the embodiments above. Likewise, dome 1104 has a generally concave rather than convex shape, approximating that of a bottle top.

Unlike a can with an upper lip, bottles often include an outer flange below a conical or frustoconical portion that ends at a lip. For some bottles, the conical or frustoconical portion can be threaded to receive a bottle cap. For other bottles, a smooth lip can be used where, for example, a metal pop-off cap is attached. Deformable material M″ is positioned such that it would engage with the upper lip, whether the bottle is conical, frustoconical, threaded, or smooth. Deformable material M″, like deformable material M′ described above, can be any material that has appropriate rheological properties, flowability, and/or elasticity to form a hermetic seal at the lip of the bottle to prevent egress of liquid or effervescence.

## EMBODIMENTS AND ALTERNATIVES

As described above, various devices can prevent egress of effervescence from a container. The devices above include a base, a dome removably coupled to the base at a first interface, the dome defining an annular gap, a cap removably coupled to the dome at a second interface, the second interface positioned opposite the gap from the first interface, and an annular portion arranged in the gap, the annular portion made of a deformable material. The base, the dome, and the cap define an interior cavity configured to hold the container such that the upper lip of the container

at least partially fills the gap by deforming the deformable material to form a hermetic seal.

The interior cavity of some devices can be the same as a standard sized container, such as a standard sized bottle or can. Additionally or alternatively, some devices can include a spacer sized to fill a portion of the interior cavity, to modify the interior cavity to be the shape of a standard sized container. Additionally or alternatively, the spacer can modify the interior cavity from a first, larger standard sized container shape to a smaller standard sized container shape. In any of these embodiments, the interior cavity can also include a fluid path to the cap from the standard sized container cavity.

The standard sized container can be a standard 12-ounce can having a height of 123 mm (4.83 inches), and the upper lip has a diameter of 54 mm (2.13 inches), or an industry standard bottle having a height of about 225 mm (8.86 inches).

The deformable material can be neoprene rubber or any other suitable material that forms a hermetic seal to prevent egress of effervescence or liquids. The cap can, additionally or alternatively, include a deformable pad arranged to engage with the dome when the cap is coupled to the dome at the second interface. The deformable pad and the annular portion can be made of a common deformable material with one another, in some embodiments, or different materials or thicknesses in other embodiments..

The base can include a thermal insulation layer. Additionally or alternatively, the spacer used in some embodiments as described above can also include a thermally insulating material or a material having a high heat capacity.

For example, the base can include a layer having a heat capacity greater than 0.5 Joules/gram–°C. That material could be stainless steel, for example, or aluminum. To thermally insulate, the base of some embodiments can include a vacuum-sealed layer. The thermal insulation layer could also be a foamed polymer layer.

The first and second interfaces could be threaded interfaces, or clamped interfaces, or other types of fasteners that provide some pressure between the top of a standardized can held in the interior cavity and the deformable material in the gap of the dome.

While embodiments are amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

Various embodiments of systems, devices and methods have been described herein. These embodiments are given only by way of example and are not intended to limit the scope of the invention. It should be appreciated, moreover, that the various features of the embodiments that have been described may be combined in various ways to produce numerous additional embodiments. Moreover, while various materials, dimensions, shapes, configurations and locations, etc. have been described for use with disclosed embodiments, others besides those disclosed may be utilized without exceeding the scope of the invention.

Persons of ordinary skill in the relevant arts will recognize that the invention may comprise fewer features than illustrated in any individual embodiment described above. The embodiments described herein are not meant to be an exhaustive presentation of the ways in which the various features of the invention may be combined. Accordingly, the embodiments are not mutually exclusive combinations of features; rather, the invention can comprise a combination of different individual features selected from different individual embodiments, as understood by persons of ordinary skill in the art. Moreover, elements described with respect to one embodiment can be implemented in other embodiments even when not described in such embodiments unless otherwise noted. Although a dependent claim may refer in the claims to a specific combination with one or more other claims, other embodiments can also include a combination of the dependent claim with the subject matter of each other dependent claim or a combination of one or more features with other dependent or independent claims. Such combinations are proposed herein unless it is stated that a specific combination is not intended. Furthermore, it is intended also to include features of a claim in any other independent claim even if this claim is not directly made dependent to the independent claim.

Any incorporation by reference of documents above is limited such that no subject matter is incorporated that is contrary to the explicit disclosure herein. Any incorporation by reference of documents above is further limited such that no claims included in the documents are

incorporated by reference herein. Any incorporation by reference of documents above is yet further limited such that any definitions provided in the documents are not incorporated by reference herein unless expressly included herein.

For purposes of interpreting the claims for the present invention, it is expressly intended that the provisions of Section 112, sixth paragraph of 35 U.S.C. are not to be invoked unless the specific terms "means for" or "step for" are recited in a claim.

## PRIORITY REFERENCE

U.S. Provisional Patent Application No. 62/181,502 (filed 18 June 2015)

## CLAIMS

1. A device for preventing egress of effervescence from a container, the device comprising:

a base;

a dome removably coupled to the base at a first interface, the dome defining an annular gap;

a cap removably coupled to the dome at a second interface, the second interface positioned opposite the gap from the first interface; and

an annular portion arranged in the gap, the annular portion made of a deformable material,

wherein the base, the dome, and the cap define an interior cavity configured to hold the container such that the upper lip of the container at least partially fills the gap by deforming the deformable material to form a hermetic seal.

2. The device of claim 1, and further comprising a spacer sized to fill a portion of the interior cavity.

3. The device of claim 1, wherein the interior cavity is in the shape of a standard sized container.

4. The device of claim 3, wherein the standard sized container is a standard 12-ounce can having a height of 123 mm (4.83 inches), and the upper lip has a diameter of 54 mm (2.13 inches).

5. The device of claim 3, wherein the standard sized container is an industry standard bottle having a height of about 225 mm (8.86 inches).

6. The device of claim 1, wherein the deformable material is neoprene rubber.

7. The device of claim 1, wherein the cap includes a deformable pad arranged to engage with the dome when the cap is coupled to the dome at the second interface.

8. The device of claim 7, wherein the deformable pad and the annular portion are made of a

common deformable material with one another.

9. The device of claim 7, wherein the deformable pad is made of a material selected from the group consisting of ethylene propylene diene monomer rubber, silicone, or neoprene.

10. The device of claim 2, wherein the spacer comprises an incompressible material.

11. The device of claim 1, wherein the base comprises a thermal insulation layer.

12. The device of claim 1, wherein the base comprises a layer having a heat capacity greater than 0.5 Joules/gram–°C.

13. The device of claim 12, wherein the layer comprises stainless steel.

14. The device of claim 11, wherein the thermal insulation layer comprises a vacuum-sealed layer.

15. The device of claim 11, wherein the thermal insulation layer comprises a foamed polymer layer.

16. The device of claim 10, wherein the spacer is made of a material having a heat capacity greater than 0.5 Joules/gram–°C.

17. The device of claim 16, wherein the spacer comprises stainless steel.

18. The device of claim 16, wherein the spacer comprises aluminum.

19. The device of claim 1, wherein the first interface is a threaded interface.

20. The device of claim 1, wherein the second interface is a threaded interface.

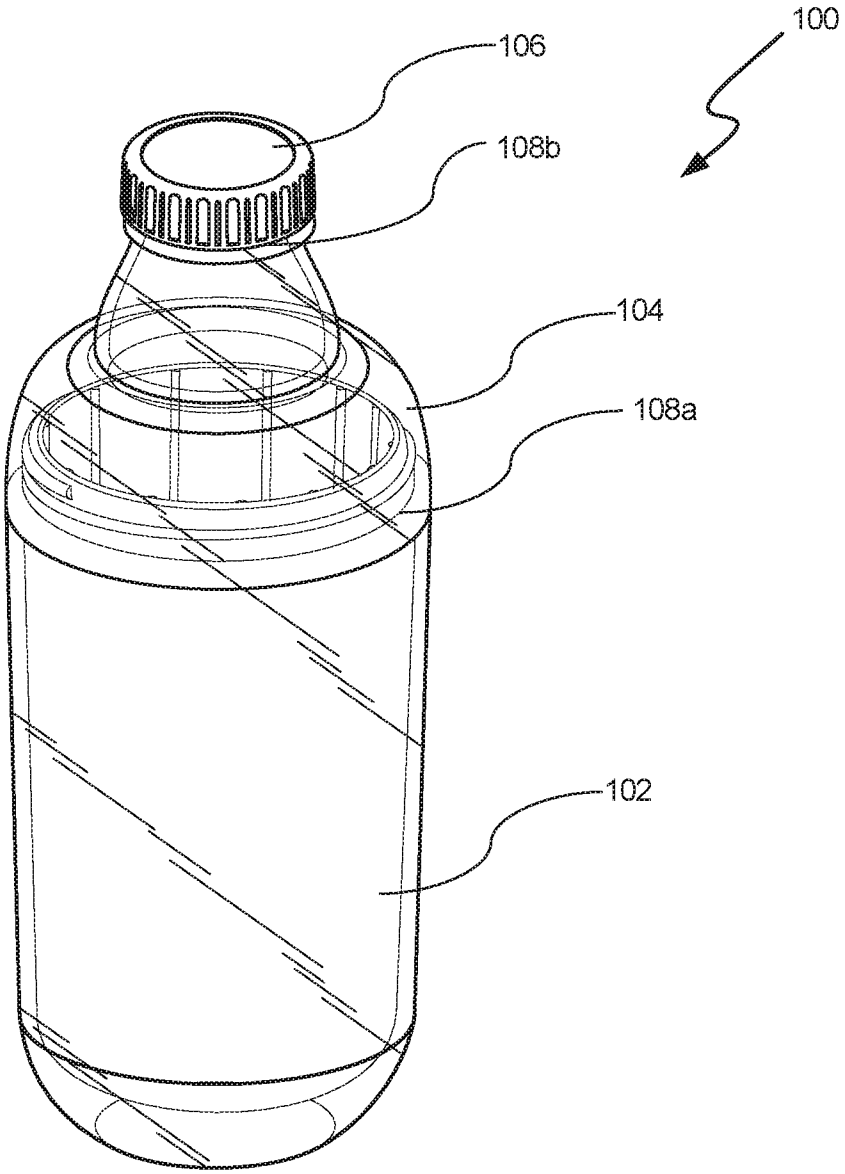


Fig. 1

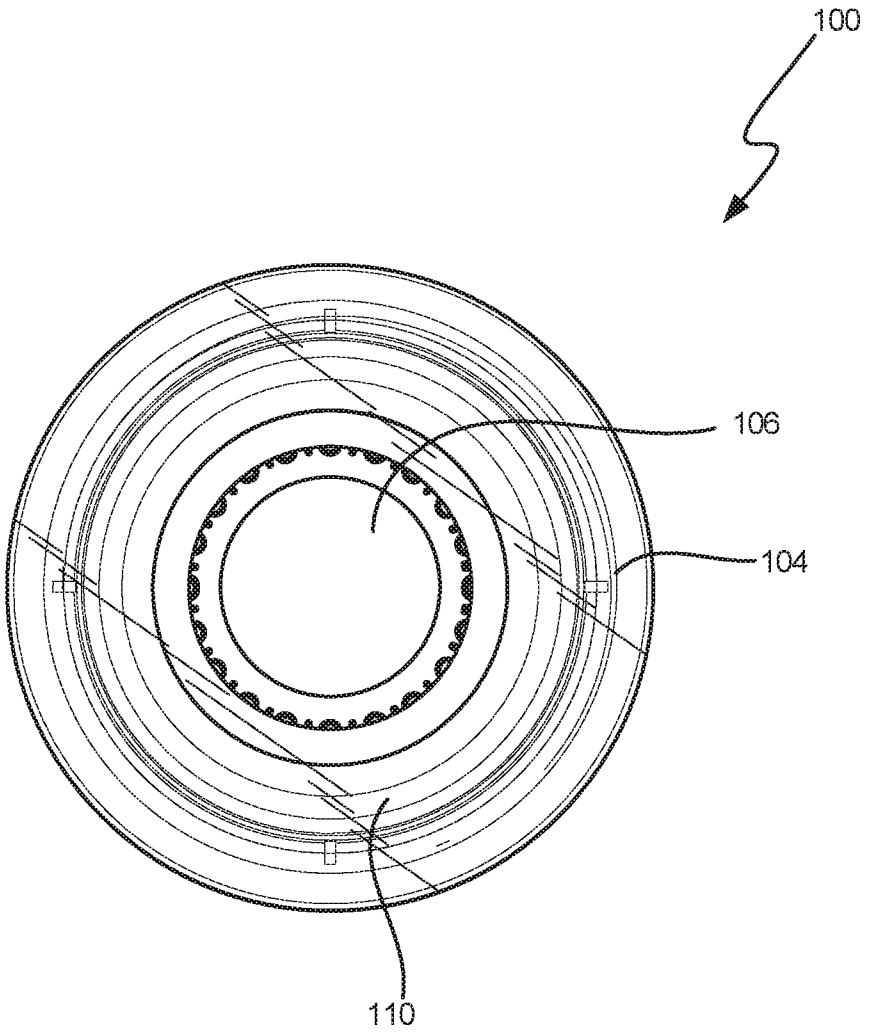


Fig. 2

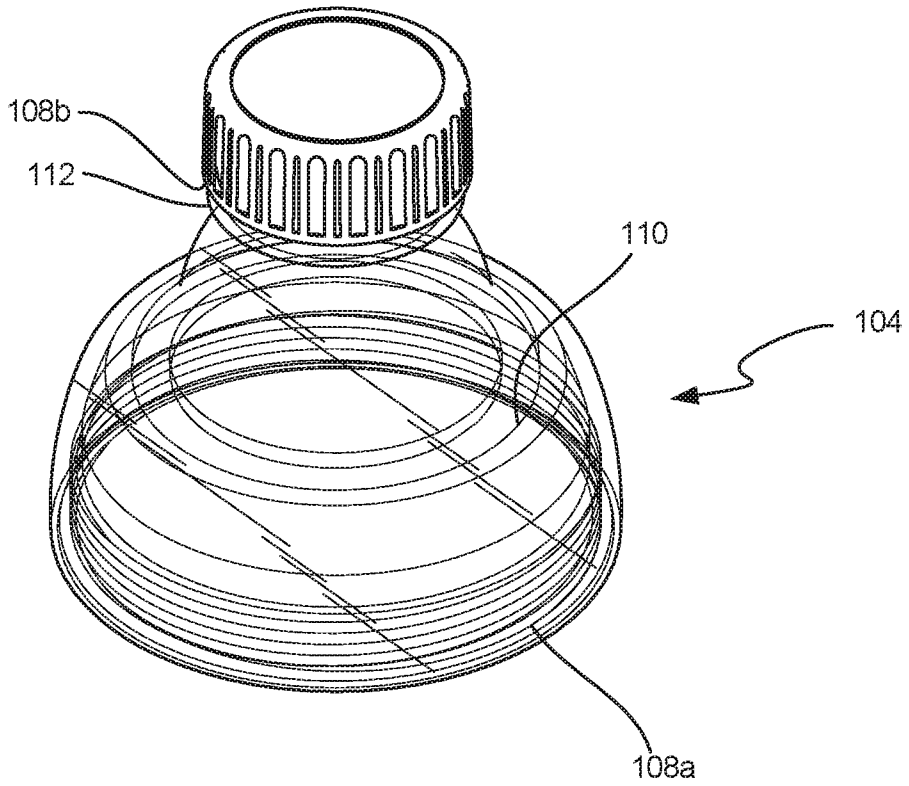


Fig. 3

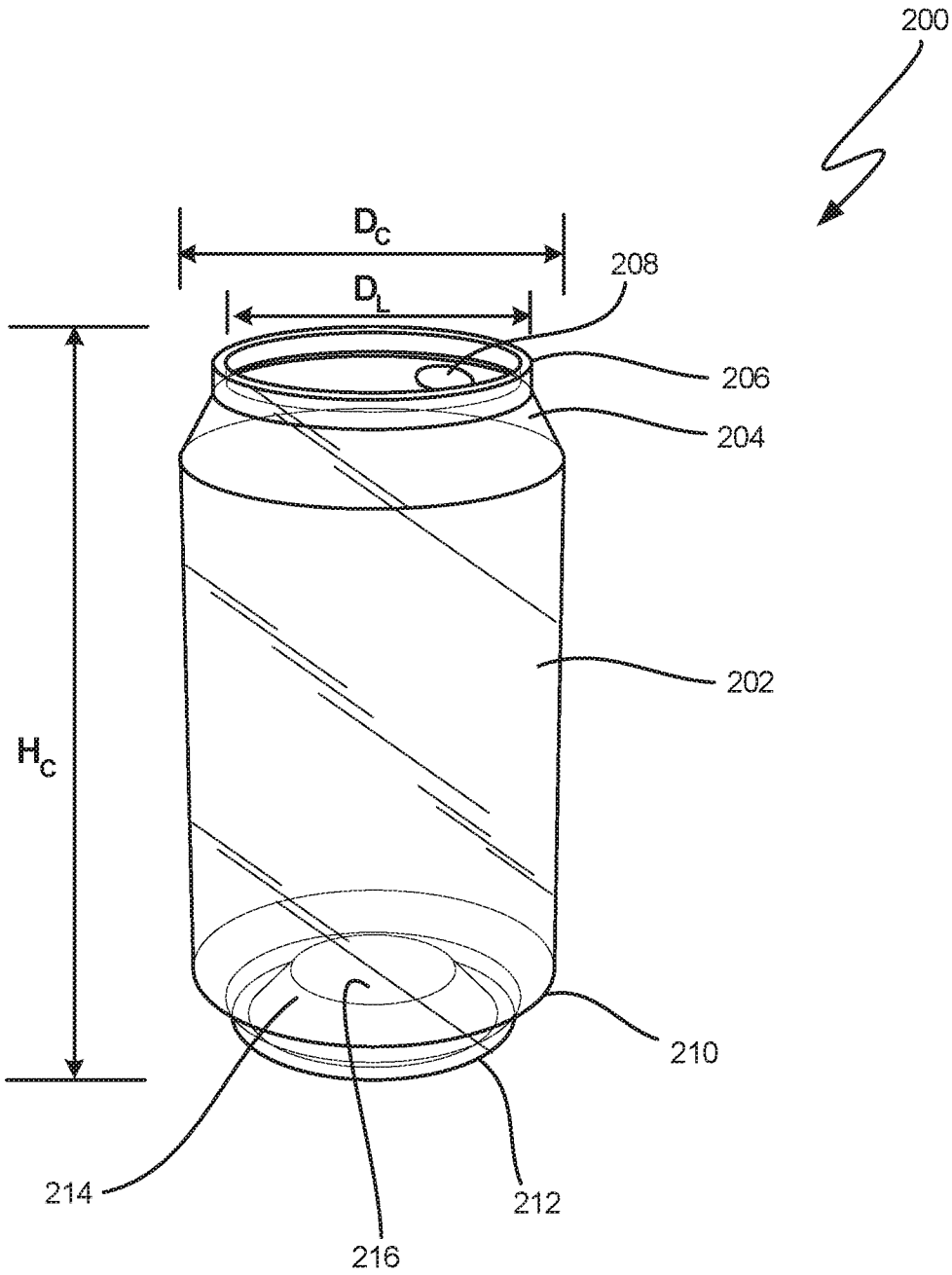


**Fig. 4**
(PRIOR ART)

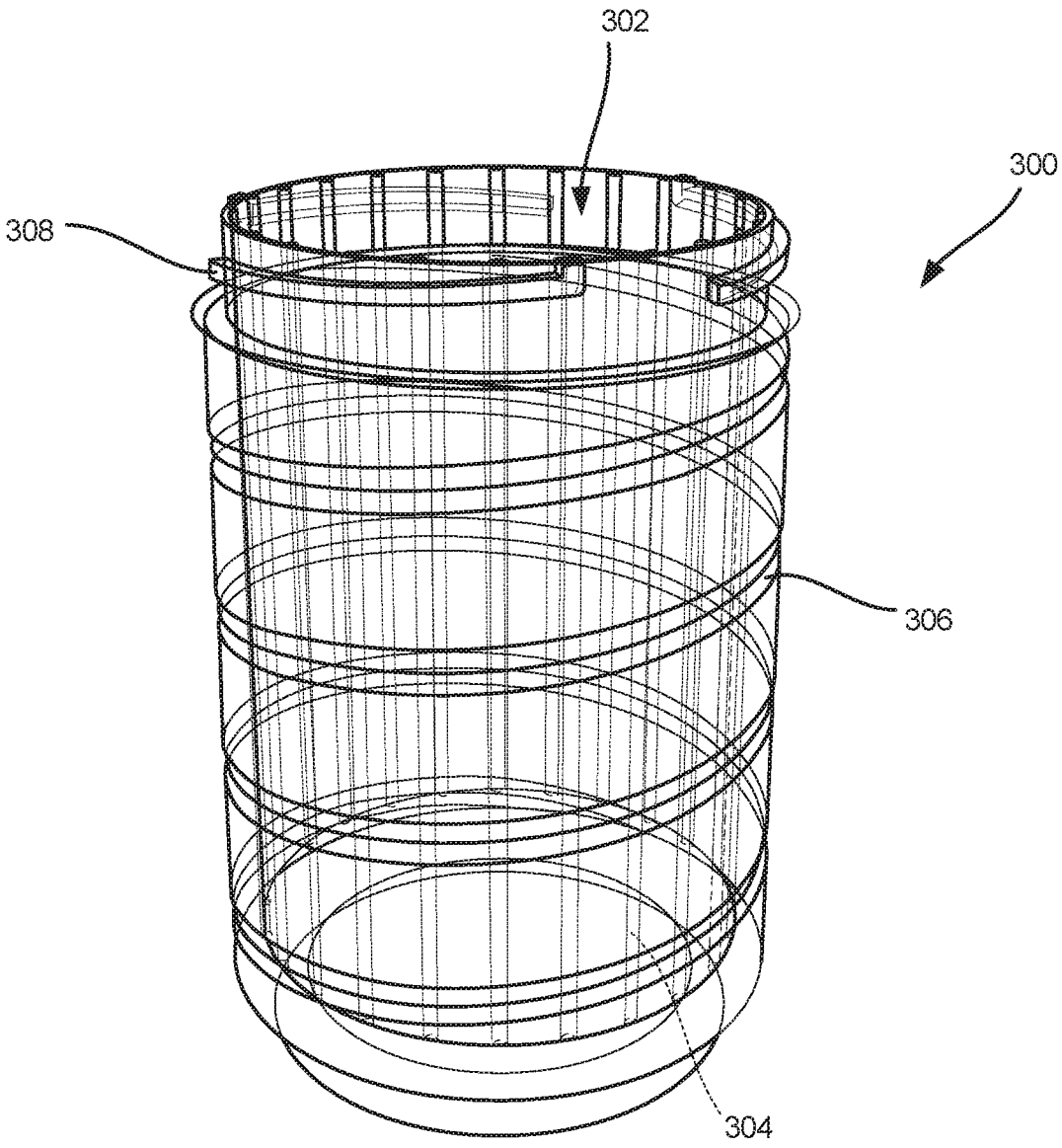


Fig. 5

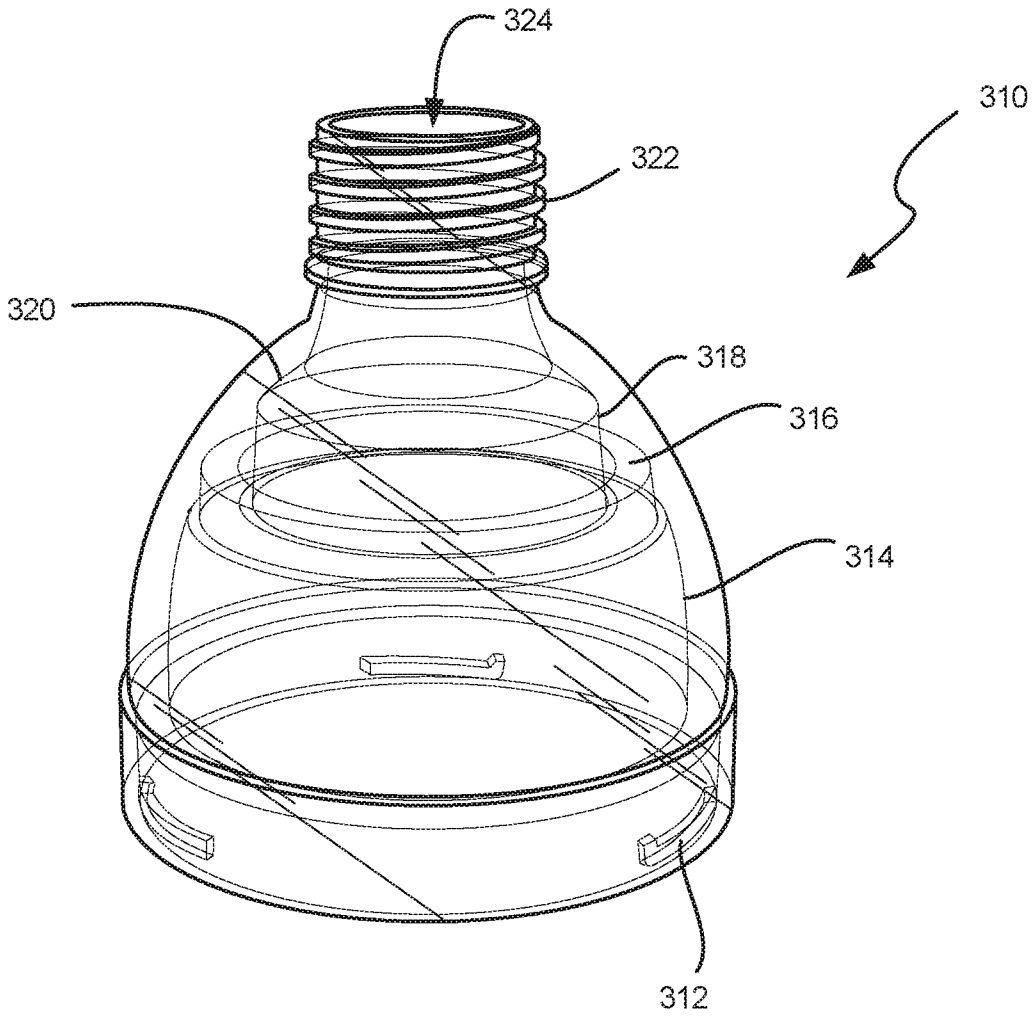


Fig. 6

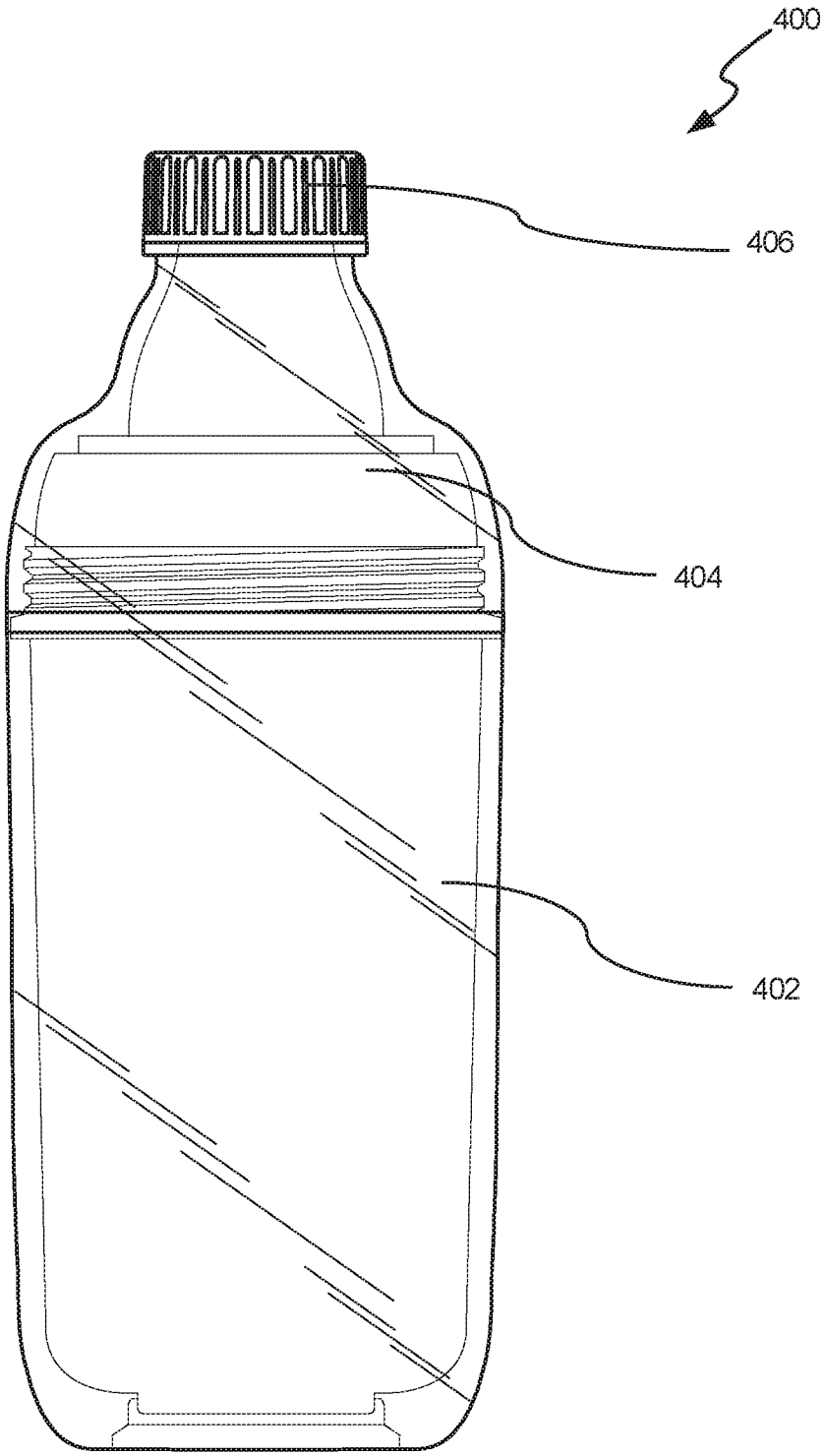


Fig. 7

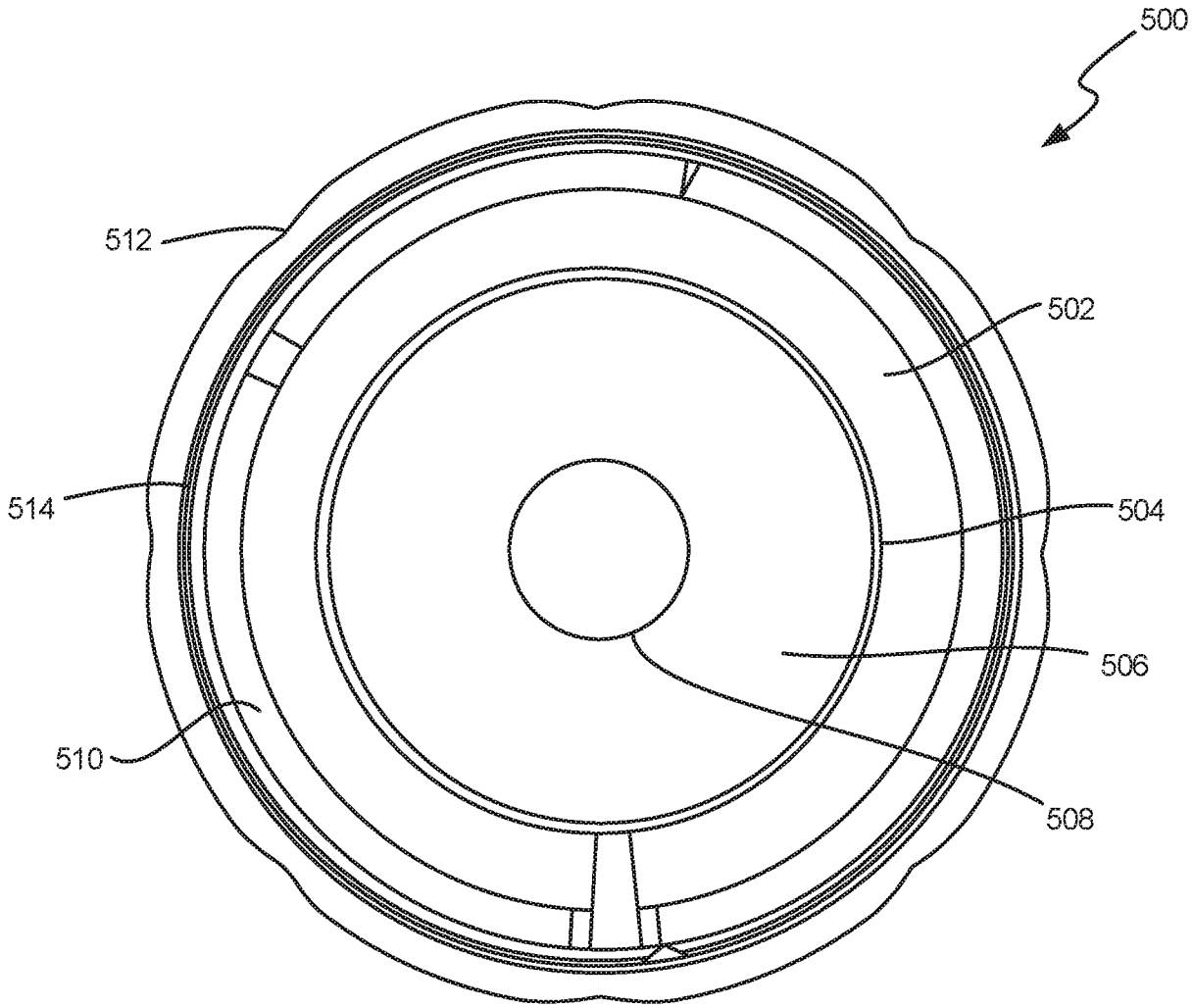


Fig. 8

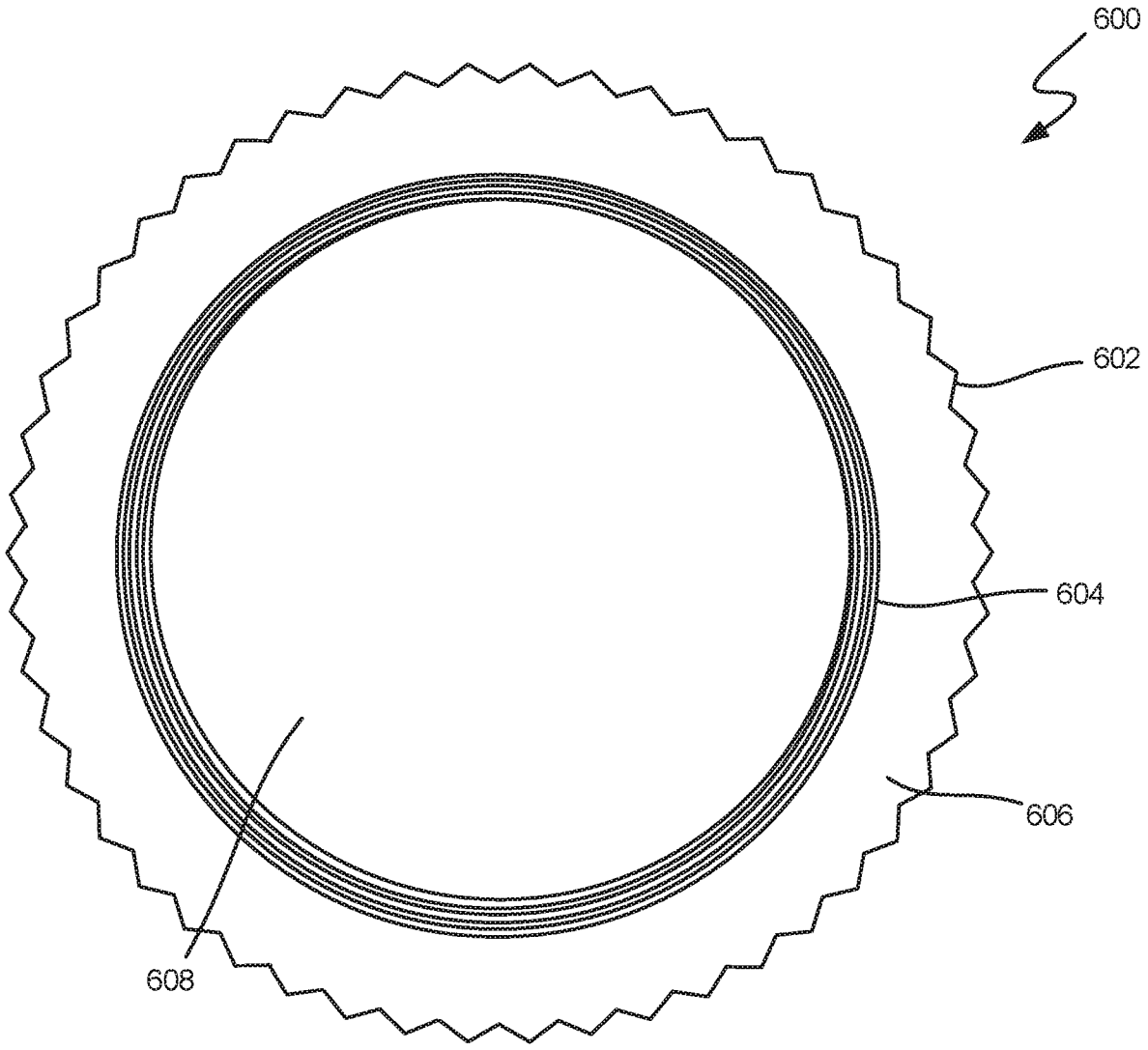


Fig. 9

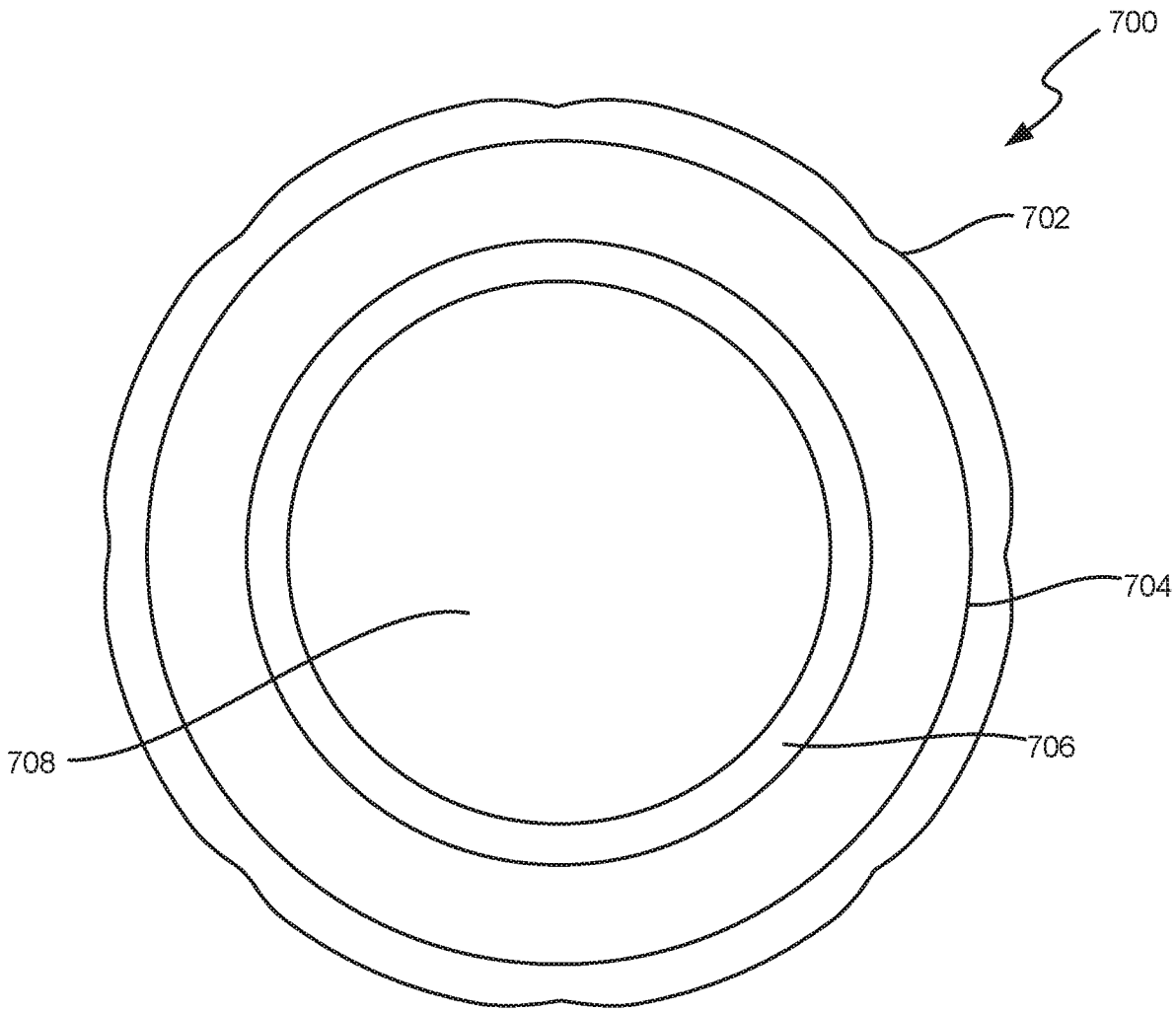


Fig. 10

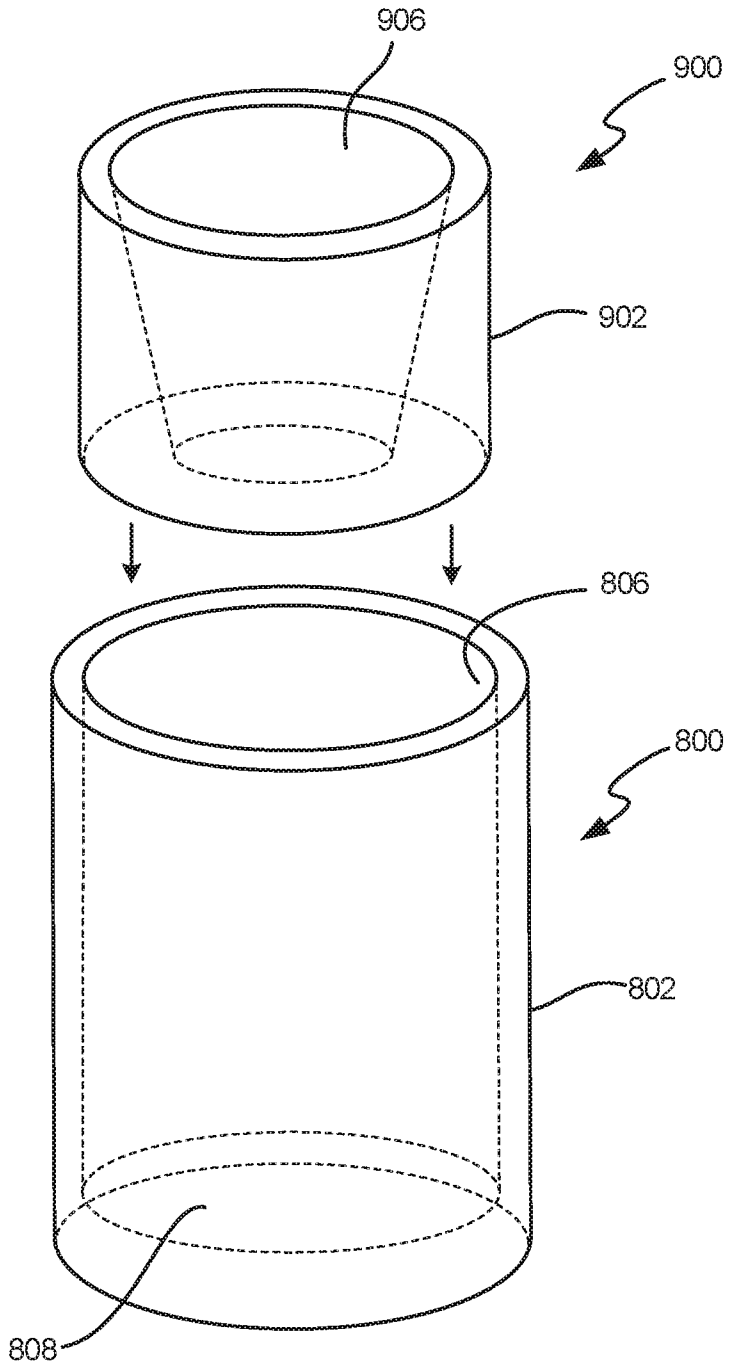


Fig. 11

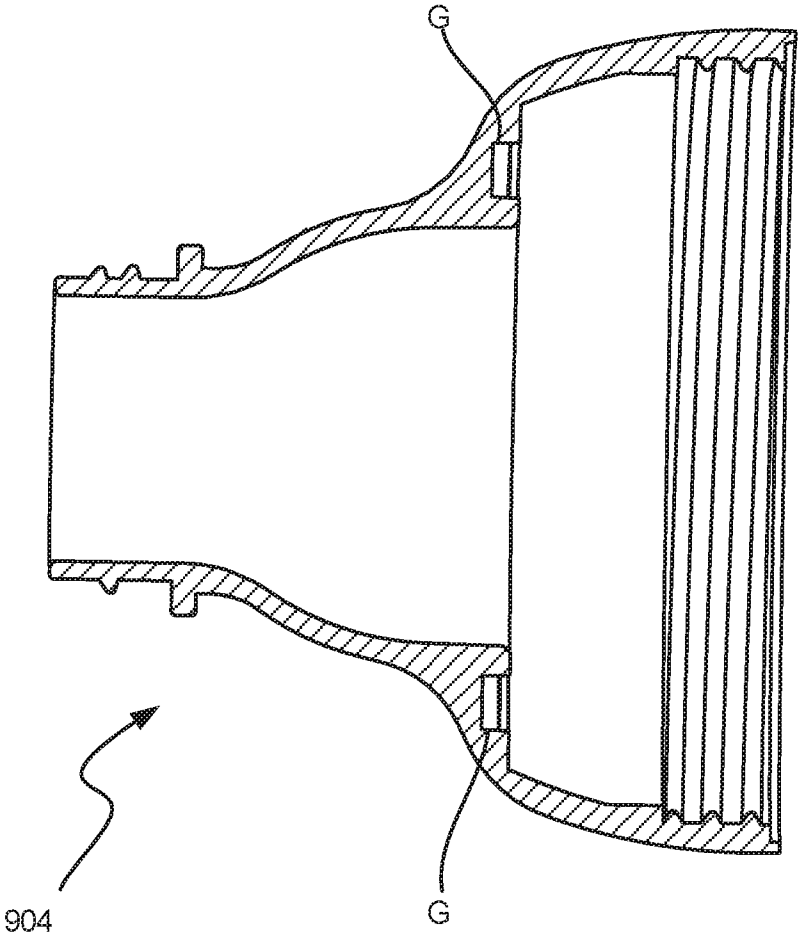


Fig. 12

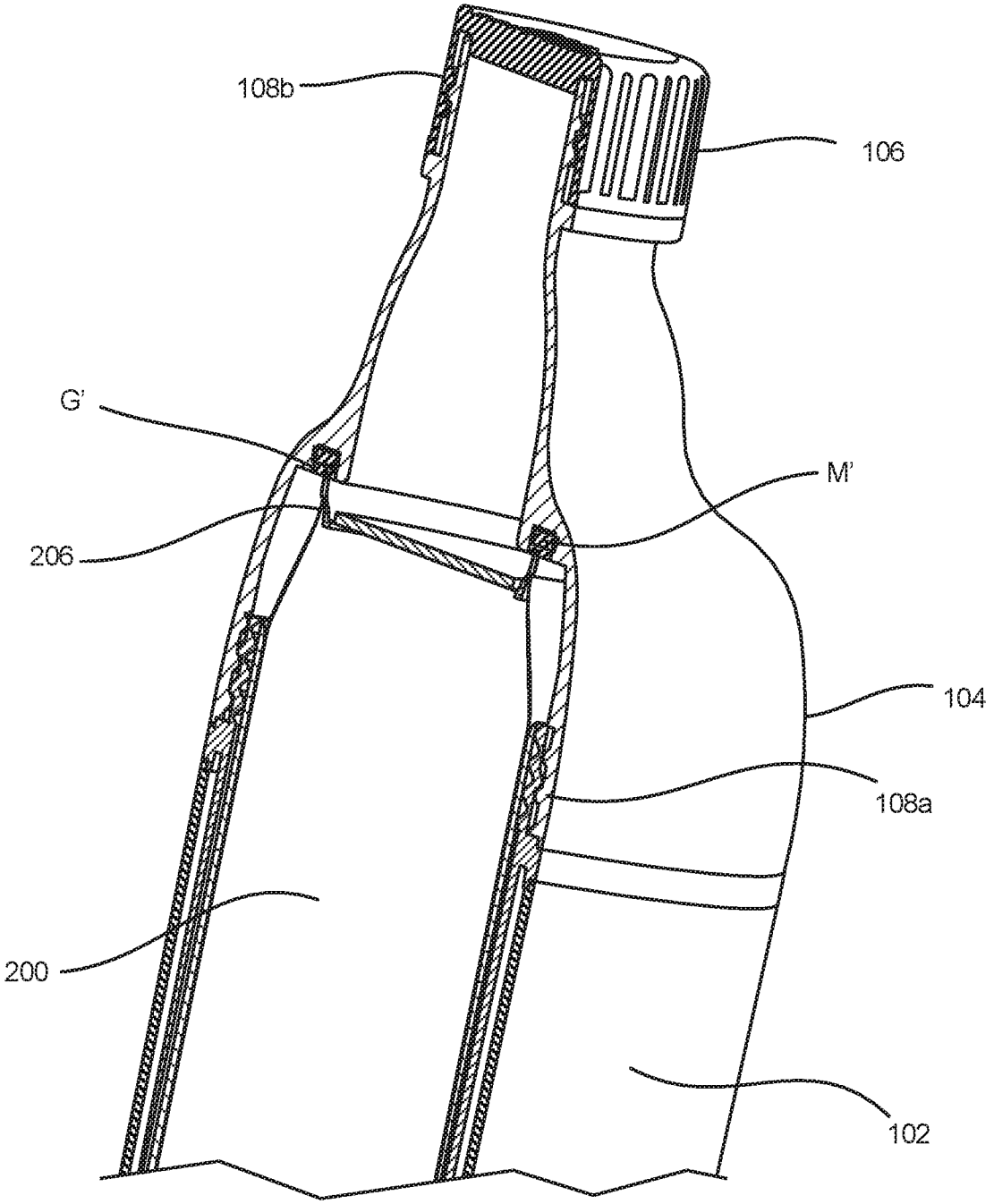


Fig. 13

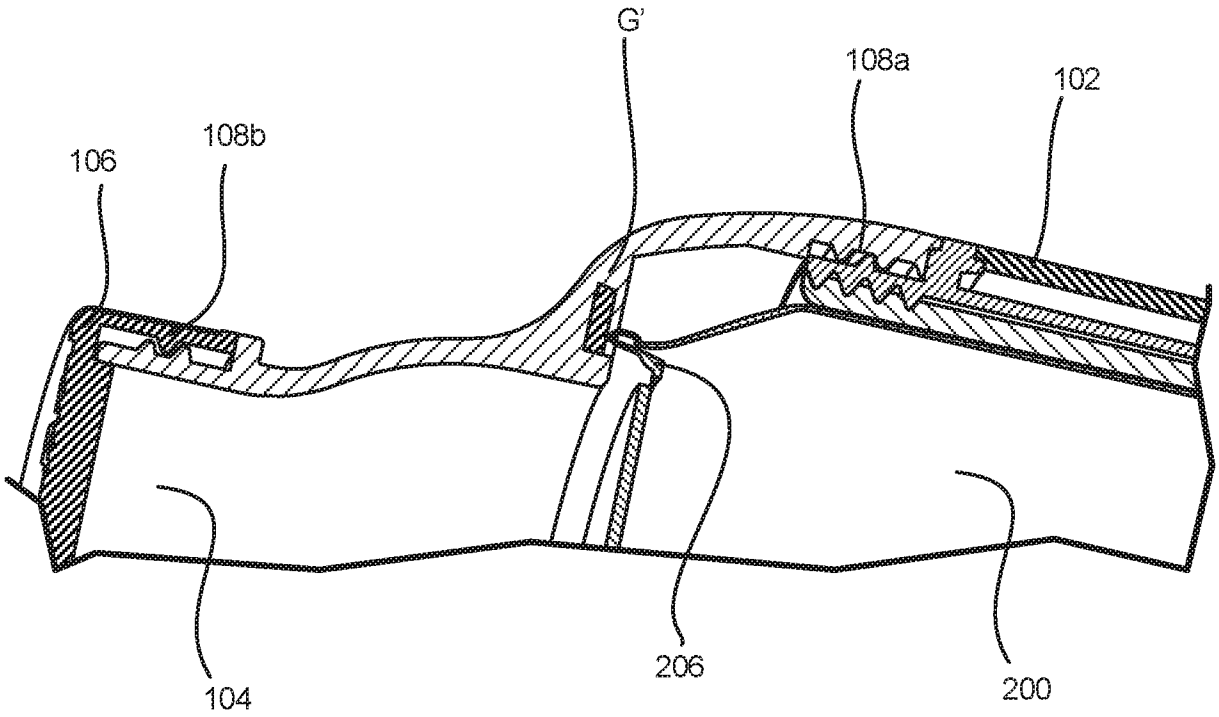


Fig. 14

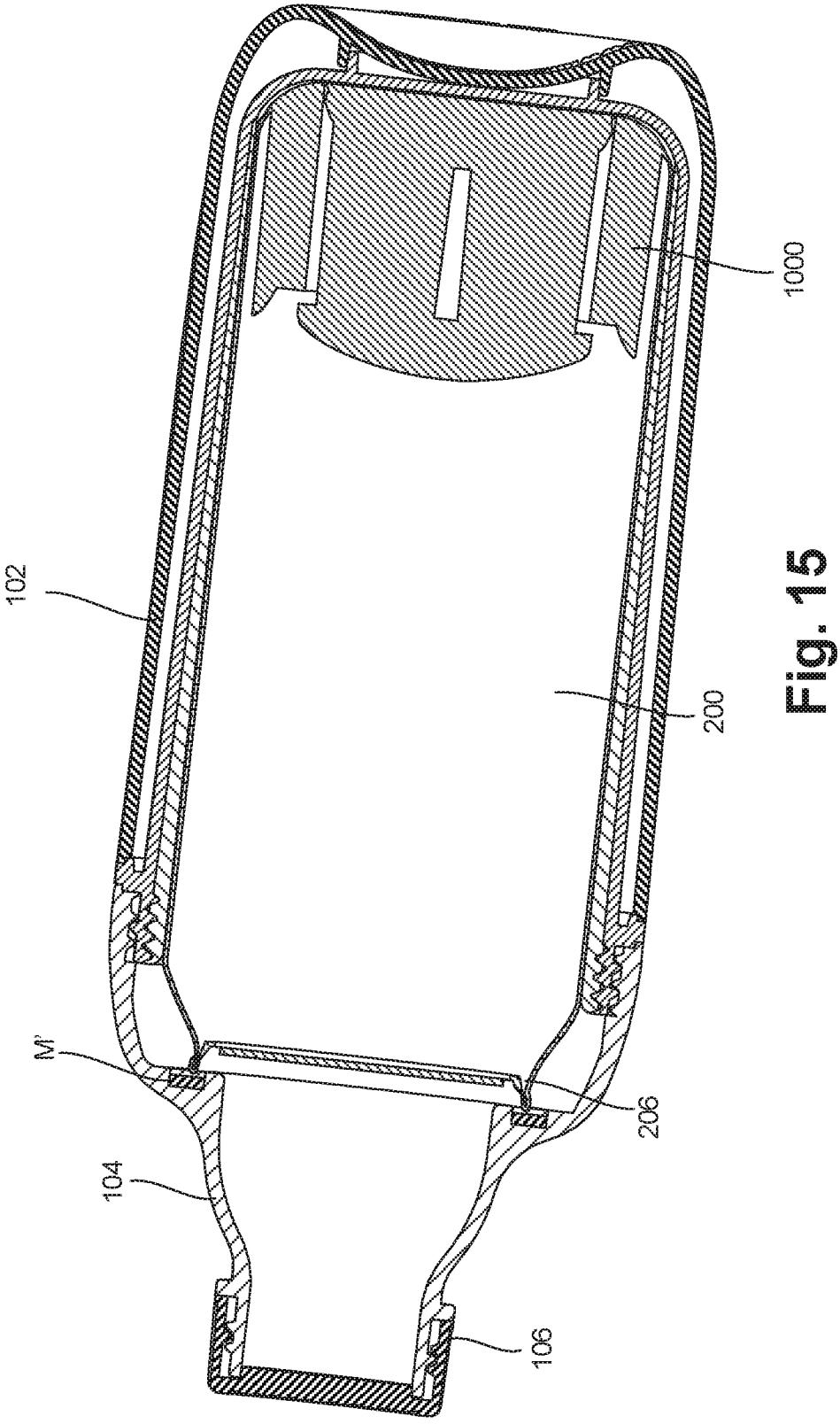


Fig. 15

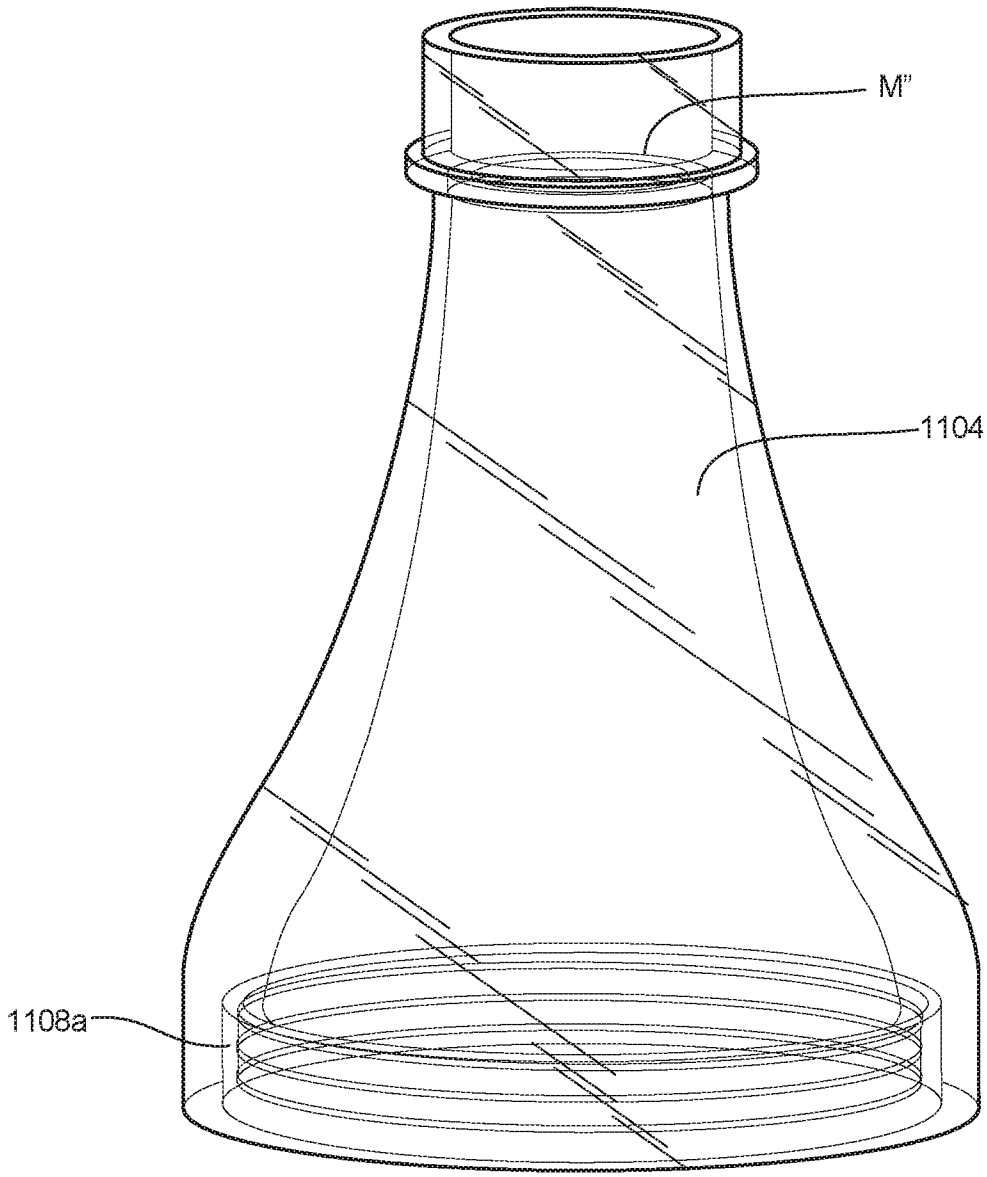


Fig. 16

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 16/37840

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B65D 25/00, B65D 41/16, B65D 41/18, B65D 41/18, B65D 47/14, B65D 55/16 (2016.01)
CPC - B65D 25/00, A47G 23/0266, B65D 2251/0018, B65D 2251/0071, B65D 25/48, B65D 2517/0041
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): B65D25/00 (2016.01)
CPC: B65D25/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8): B65D41/16, B65D41/18, B65D41/18, B65D47/14, B65D55/16, B65D81/38 (2016.01). CPC: A47G23/0266, B65D2251/0018, B65D2251/0071, B65D25/48, B65D2517/0041, B65D2517/0049, B65D2543/00092, B65D2543/00296, B65D2543/00518

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase. Google (Web, Patent, Scholar). Search Terms: 202, 3D, Around, Attachable, Beer, Beverage, Bottle, Bottleneck, Bottom, Camouflage, Can, Carbonation, Case, Casing, Cavity, Chamber, Conceal, Container, Converter, Detachable, Double, Drinking, Enclosure, Funnel, Gasket, Hidden, Holder, Housing, Inner, Insulate, Jacket

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 6,311,865 B1 (LAURENT) 06 November 2001 (06.11.2001) Figs. 1-6; col 3 ln 45-51, col 5 ln 66 - col 6 ln 7, 53-55, col 8 ln 55-58. | 1, 3-4, 11-12, 19-20 |
| Y | | 2, 5-7, 9-10, 13-16 |
| A | | 8, 17-18 |
| Y | US 6,824,002 B1 (HADLAND) 30 November 2004 (30.11.2004) Figs. 1-3; col 5 ln 44-65, 60-65; col 7 ln 19-24, col 8 ln 34-37, col 10 ln 14-19, 33-36 | 2, 10, 16 |
| A | | 17-18 |
| Y | US 2,808,167 A (POLAZZOLO) 01 October 1957 (01.10.1957) Figs. 1-4; col 2 ln 5-41 | 5 |
| Y | US 7,784,759 B2 (FARRELL) 31 August 2010 (31.08.2010) Figs. 1-7; col 4 ln 62 - col 5 ln 27 | 6, 15 |
| Y | US 3,278,064 A (ARTHUR) 11 October 1966 (11.10.1966) Figs. 1-2; col 2 ln 9-17 | 7, 9 |
| Y | US 6,626,326 B2 (MURAKAMI) 30 September 2003 (30.09.2003) Fig. 3; col 3 ln 51 - col 4 ln 11 | 13-14 |
| Y | "PROPERTIES OF PAPER" (PAPERONWEB.COM) 08 February 2014 (08.02.2014) [online] retrieved from <URL: https://web.archive.org/web/20140208093613/ http://paperonweb.com/paperpro.htm> pg 16 | 16 |
| A | | 17-18 |
| A | US 5,947,324 A (PALINCHAK) 07 September 1999 (07.09.1999) Figs. 1-3; col 2 ln 46-62 | 1-20 |
| X/P | "LOLO LIDS CONVERT ZBEER KOOZIES" (DUDE) 30 May 2016 (30.05.2016) [online] retrieved from <URL: http://www.dudeiwantthat.com/gear/food-drink/lolo-lids-covert-beer-koozies.asp> | 1-20 |

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 25 August 2016 | 28 SEP 2016 |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-8300 | Authorized officer:<br>Lee W. Young<br>PCT Helpdesk: 571-272-4300<br>PCT OSP: 571-272-7774 |