



(11) **EP 3 464 117 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
30.06.2021 Bulletin 2021/26

(51) Int Cl.:
B65D 1/02 (2006.01) **B65D 83/38** (2006.01)
B65D 23/00 (2006.01)

(21) Application number: **17726470.2**

(86) International application number:
PCT/US2017/033487

(22) Date of filing: **19.05.2017**

(87) International publication number:
WO 2017/205199 (30.11.2017 Gazette 2017/48)

(54) **PLASTIC BOTTLE AND BASE CUP FOR A PRESSURIZED DISPENSING SYSTEM**

KUNSTSTOFFFLASCHE UND UNTERSETZER FÜR EIN UNTER DRUCK STEHENDES
AUSGABESYSTEM

BOUEILLE EN MATIÈRE PLASTIQUE ET COUPELLE DE BASE SERVANT À UN SYSTÈME DE
DISTRIBUTION SOUS PRESSION

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

- **CARLSON, David R.**
Cedarburg, WI 53012 (US)
- **MCGRATH, Daniel S.**
Gurnee, IL 60031 (US)
- **STENMARK, Niles**
Franklin, WI 53132 (US)

(30) Priority: **27.05.2016 US 201615166337**

(43) Date of publication of application:
10.04.2019 Bulletin 2019/15

(74) Representative: **Murgitroyd & Company**
Murgitroyd House
165-169 Scotland Street
Glasgow G5 8PL (GB)

(73) Proprietor: **S.C. Johnson & Son, Inc.**
Racine, WI 53403 (US)

(56) References cited:
JP-A- H05 147 656 US-A- 5 062 537
US-A1- 2011 049 167

(72) Inventors:
• **WOLAK, Christopher P.**
Racine, WI 53402 (US)

EP 3 464 117 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description**BACKGROUND****Field of the Invention**

[0001] Our invention generally relates to a pressurized dispensing system, such as a system that dispenses an aerosol product. More specifically, our invention relates to a dispensing system that includes a plastic bottle containing a product under pressure, with a base cup being attached to the plastic bottle to allow the system to stand upright.

Related Art

[0002] Pressurized dispensing systems, such as systems used to dispense aerosol products, have conventionally included metallic (e.g. steel or aluminum) containers for containing the product under pressure before it is dispensed from the system. Examples of products that are dispensed with such systems include air fresheners, fabric fresheners, insect repellants, paints, body sprays, hair sprays, shoe or footwear spray products, whipped cream, and processed cheese. Recently, there has been increased interest in using plastic bottles as an alternative to metallic containers in pressurized dispensing systems because plastic bottles have several potential advantages. For example, plastic bottles may be easier and cheaper to manufacture than metallic containers, and plastic bottles can be made in a wider variety of interesting shapes than metallic containers.

[0003] One of the biggest challenges in manufacturing plastic bottles for pressurized dispensing systems is providing the plastic bottle with enough structural integrity to be able to withstand the internal pressure required for full evacuation of the product. For example, an internal pressure required for compressed gas aerosols generally ranges from 310.3 kPa to 1379.0 kPa (45 PSIG to 200 PSIG) at 21.1 °C (70°F) whereas liquefied gas aerosols generally ranges from 117.2 kPa to 744.6 kPa (17 PSIG to 108 PSIG) at 21.1 °C (70°F). If the plastic aerosol bottle is not provided with enough structural integrity to withstand such pressurization through the life of the dispensing system, then there is a risk that the plastic aerosol bottle could rupture. In this regard, it is known that the pressure inside a plastic bottle can weaken the plastic structure over time, for example, by creating stress crazes and cracks in the plastic. Moreover, a pressurized dispensing system might be subject to an event that tests the structural integrity of its plastic bottle, for example, when the bottle is dropped, or when the bottle is left in a high temperature environment that heats the contents of the bottle to thereby increase the already high internal pressure. And the potential of a pressurized plastic bottle rupturing as a result of any of these events presents a clear safety risk to users of the dispensing system.

[0004] From a user functionality standpoint, the ability of a dispensing system to stand upright is very important. But, the use of a plastic bottle in a pressurized dispensing system presents a challenge with respect to making the system be able to stand upright. While the base of the plastic bottle could be molded in a flat shape that allows the bottle to stand upright, it has been found that imparting such a flat shape often creates problems. For example, contours that result from forming a vertically stable base in the bottle may be highly susceptible to stress crazing and cracking. Further, a contoured base may be prone to bursting if the plastic bottle is dropped, and the base may deform if the pressure inside the plastic bottle increases, e.g., in elevated temperature environments.

[0005] It has been found that a rounded base in a plastic bottle of a pressurized dispensing system is far less susceptible to stress crazing and cracking than contoured bases. Further, as compared to a contoured base, a rounded plastic base in a plastic bottle is less prone to bursting when dropped and less easily deformed in elevated temperatures when the bottle is filled with a product and pressurized. But, on the other hand, a rounded base does not provide a surface for making the plastic bottle stand upright. Thus, a secondary piece, or "base cup," can be attached to the rounded bottom of a plastic bottle, with the base cup providing a flat surface that allows the plastic bottle to stand upright.

[0006] While a base cup is conceptually an easy solution for making a plastic bottle with a rounded bottom stand upright, in practice attaching a base cup to a plastic bottle as part of a pressurized dispensing system is a tremendous challenge. The pressurized dispensing system will likely be exposed to handling and different environments before ever reaching the end consumer. And, during handling or in different environments, the pressurized dispensing system may encounter conditions that may weaken the attachment between the base cup and bottle, such as varying temperatures and impacts. If the attachment is weakened, the base cup might later become detached from the bottle when being used by the end consumer. It is critical that this does not happen—separation of the base cup and bottle will at least result in unsatisfied consumers, if not result in significant safety hazards for the consumers.

[0007] While there are several techniques that could conceivably be used to securely attach a base cup to a plastic bottle, there are problems with most of these techniques, particularly in the context of pressurized dispensing systems. For example, while welding techniques such as sonic, vibration, laser, and spin welding might be used to tightly attach a base cup to the bottle, the heat generated during the welding softens the material to a molten state, which in turn could lead to problematic stress risers when the bottle is subsequently filled with a product and pressurized. Additionally,

welding plastics requires similar plastic families to be used for both the base and base cup, which limits the resins that can be used. Another way that a base cup might be attached to the bottom of a plastic bottle is through some method of mechanical attachment, for example, the bottom of the bottle could be molded in a shape that locks to the base cup. However, such shaping of the bottom of the bottle may lead to the same types of problems that are found when the bottom of the bottle is made flat to make the bottle stand upright on its own.

[0008] As an alternative to welding and mechanical attachments, adhesives might be used to attach the base cup to the plastic bottles. And while there are many types of adhesives that might be considered, many of these adhesives are not suited for use in conjunction with a plastic bottle in a pressurized dispensing system. For example, UV cured glues shrink when cured, which would put additional stress points on the plastic bottle, thereby leading to stress crazing or stress cracking. As another example, solvent based structural adhesives, such as some epoxies, may not be suitable because these adhesives are generally difficult to cure and have poor impact resistance. JPH05147656A and US 5,062,537A disclose bottle-shaped containers including a base cup secured by an adhesive.

SUMMARY OF THE INVENTION

[0009] According to one aspect, our invention provides a container for a pressurized dispensing system according to claim 1.

[0010] According to another aspect, our invention provides a method of forming a pressurized dispensing system according to claim 8. The method includes heating a hot melt adhesive such that the hot melt adhesive is in a molten state, and depositing the molten melt adhesive in a recessed region in a top wall of a pedestal in a base cup. The method also includes pressing a center region of a rounded bottom of a plastic bottle against the molten hot melt adhesive such that the molten hot melt adhesive spreads out over the recessed region and the rest of the top wall of the pedestal, and cooling the molten hot melt adhesive to thereby attach the base cup to the plastic bottle.

[0011] According to yet another aspect, our invention provides an aerosol dispensing system according to claim 14..

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a side view of a plastic bottle for use in a pressurized dispensing system according to an embodiment of our invention.

FIG. 2 is an elevation view of the upper side of a base cup according to an embodiment of our invention.

FIG. 3 is a top view of the base cup shown in FIG. 2.

FIG. 4 is a cross-sectional view of a base cup shown in FIG. 2 as taken along line 4-4.

FIG. 5 is a bottom view of the base cup shown in FIG. 2.

FIG. 6 is an elevation view of the lower side base cup shown in FIG. 2.

FIG. 7 is a cross-sectional view of the base cup shown in FIG. 2 as taken along line 4-4, with an adhesive applied to the base cup.

FIG. 8 is a cross-sectional view of a base cup shown in FIG. 2 as taken along line 4-4, with the base cup being adhered to the bottom of a plastic bottle according to an embodiment of our invention.

FIG. 9 is a side view of a pressurized dispensing system according to an embodiment of our invention.

FIG. 10 is a cross-sectional view of the pressurized dispensing system shown in FIG. 9 as taken along line 10-10.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Our invention generally relates to pressurized dispensing systems. More specifically, our invention relates to a dispensing system that includes a plastic bottle containing a product under pressure, with a base cup being attached to the plastic bottle to allow the system to stand upright.

[0014] In the descriptions that follow, we will sometimes explain features of our invention in the specific context of an aerosol dispensing system. Those skilled in the art will readily appreciate, however, that our invention is not limited to use with aerosol products. Rather, the pressurized dispensing systems described herein could alternatively be used in conjunction with products other than aerosols. For example, the dispensing systems described herein might be used to dispense foam products such as shaving cream or soap, or used to dispense food products such as soda, whipped cream, or processed cheese.

[0015] Figure 1 is a side view of a plastic bottle 100 for use in a pressurized dispensing system according to an embodiment of our invention. The bottle 100 includes an upper end 102, a lower end 106, and a body section 104. At the upper end 102 is a neck region 108 having a crimping ring 110 surrounding an opening 112 of the bottle 100. The body section 104 extends downward from the neck region 108 to the lower end 106 of the bottle 100. At the lower end

106, the bottle 100 is provided with a rounded bottom 114. It should be noted that the shape, size, and proportions of the bottle 100 shown in Figure 1 are merely exemplary. Indeed, one of the advantages of using plastic to form the bottle 100 is that the plastic may be molded into a wide variety of shapes and sizes. In this regard, the bottle 100 may be formed using injection and/or blow molding techniques, which are well known in the art. In such techniques a plastic preform is first formed using injection molding; the plastic preform is subsequently heated and stretch blow molded into the final shape of the bottle 100.

[0016] A spray mechanism (not shown) including a valve structure may be provided to the upper end 102 of the bottle 100, with the spray mechanism being crimped onto the crimping ring 108. Such a spray mechanism includes a nozzle through which product from the bottle is dispensed, for example, as an aerosol mist. These types of spray mechanisms are well known in the art. And along these lines, it will be appreciated by those skilled in the art that the upper end 102 of the bottle 100 may have a different configuration than as shown in order to accommodate other types of spray mechanisms. For example, the bottle might be configured without the crimping ring 100, with the spray mechanism being crimped to the inside of the neck region 108 of the bottle 100 at a position adjacent to the opening 112.

[0017] The lower end 106 of the bottle 100 includes a rounded bottom 114. As used herein, the term "rounded" means that the bottom 114 is curved over the area at the lower end 106 of the bottle 100. That is, a "rounded" bottom includes shapes that could be described as spherical, elliptical, domed, etc. As generally discussed above, the rounded bottom 114 is advantageous compared to other shapes because the rounded bottom 114 is less susceptible to problematic stress crazing and cracking when the bottle is filled with a product and pressurized. For example, the rounded bottom 114 does not include contours that would be required to form a self-standing bottle. The round shape of the bottom 114 provides other advantages as well. For example, as the plastic is formed into the rounded shape during a blow molding process, stretch crystallinity is formed in the polymers making up the plastic. Further, the gate in an injection mold used to form a preform of the bottle may be provided at a position corresponding to the center of the rounded bottom 114, which leads to the center being the thickest section of the rounded bottom 114. By being the thickest section, the center will expand the least when the bottle is pressurized with a product, making the center of the rounded bottom 114 a good location for applying an adhesive to connect a base cup, as will be described in detail below.

[0018] The bottle 100 may be formed from a wide variety of plastics. Some examples of such plastics include branched or linear polyethylene terephthalate (PET), polycarbonate (PC), polyethylene naphthalate (PEN), polyethylene furanoate (PEF), polyolefins (PO) such as polyethylene (PE) and polypropylene (PP), and other polyesters, and blends thereof.

[0019] Figures 2-6 are views of a base cup 200 according to an embodiment of our invention. The base cup 200 is configured to be attached to the rounded bottom 114 of the bottle 100, as will describe in detail below. The base cup 200 includes a side wall 202 defining an outer perimeter of the base cup 200. At the bottom of the base cup 200, a bottom wall 204 extends inward from the cylindrical wall 202, with a plurality of apertures 206 being formed in the bottom wall 204. A pedestal 208 projects upwardly from the bottom wall 204 and within the space enclosed by the cylindrical side wall 202. More specifically, the pedestal 208 is formed with a cylindrical wall 210 that extends from the bottom wall 204 to a top wall 212. A recessed area 214 is formed in the top wall 212.

[0020] The base cup 200 may be an injection molded resin, thermoformed, or stretch blow molded. Examples of polymeric resins that could be used to form the base cup 200 include PET, PEN, PEF, polypropylenes, polyethylenes, polyesters, polycarbonates, nylons, poly(vinyl chloride) and polystyrenes. Some specific examples of commercially available resins that could be used to form the base cup 200 include FHR Polypropylene P5M6K-048 (a polypropylene copolymer) by Flint Hills Resources of Wichita, Kansas, PETROTHENE® NA206000 (a low density polyethylene) by LyondellBasell Industries of Northbrook, Illinois, and DURASTAR™ DS1910HF (a copolyester) by Eastman Chemical Company of Kingsport, Tennessee. Ultimately, those skilled in the art will recognize that the selection of the material for forming the base cup 200 will depend on several factors, including cost and appearance (e.g., a colored resin versus a clear resin). The selection of the material for forming the base cup 200 may also depend on characteristics of the surfaces of the base cup, as will be discussed in detail below.

[0021] Figures 7 and 8 show the application of an adhesive 300 to the pedestal 208 of the base cup 200 and the subsequent attachment of the bottle 100 to the base cup 200. This process starts with an adhesive 300 being deposited in the recessed area 214 of the pedestal 208. The adhesive 300 may be applied with a single deposit or multiple deposits in the recessed area 214. As will be discussed below, the adhesive 300 is a hot melt, meaning that it is heated to a liquid state and applied to the base cup 200 in that liquid state. The rounded bottom 114 of the bottle 100 is subsequently brought into contact with the adhesive 300, which causes the adhesive 300 to spread out over the recessed area 214 and the top wall 212 of the pedestal 208. The adhesive 300 is then allowed to cool, with the bottle 100 thereby becoming firmly attached to the base cup 200 by the adhesive 300. The apertures 206 in the bottom wall 204 of the base cup 200 increase the speed which the adhesive 300 cools by allowing air to flow to the inside of the base cup 100 where the bottle 200 is attached.

[0022] In the attachment process the adhesive 300 is applied to the base cup 200 first, as opposed to being applied to the bottle 100. The adhesive 300 may therefore cool slightly before it contacts the bottle 100. This is important because a temperature spike on points of the plastic of the bottle 100 where the adhesive 300 would be applied could potentially

soften the plastic and thereby weaken the bottle 100. That is, if the adhesive 300 was applied first the bottle 100, the area of the bottle 100 that contacts the adhesive might be susceptible to stress crazing and stress cracking when the bottle 100 is filled with a pressurized product. The slight cooling of the adhesive 300 while the adhesive is first applied to the base 200 reduces the risk of the adhesive 300 damaging the bottle 100.

[0023] By configuring the pedestal 208 with a recessed area 214, the base cup 200 can accommodate a small range of the sizes of the bottle 100, e.g., variances arising from manufacturing tolerances in molding the bottle 100. Further, the recessed area 214 is formed around the center of the rounded bottom 114 of the bottle 100. As discussed above, the bottle 100 may be formed in a process where a preform is injection molded, with injection gate corresponding to the center of the rounded bottom 114 in the bottle 100 ultimately formed in the process. Such a configuration results in a slight bulge being formed at the center of the rounded bottom 114. The recessed area 212 of the pedestal 208 can accommodate such a bulge at the center of the rounded bottom 114.

[0024] As shown in Figure 8, the adhesive 300 spreads out evenly over recessed area 214 and the top wall 212 of the pedestal 208 such that there is a layer of adhesive 300 between the pedestal 208 and the rounded bottom 114 of the bottle 100. That is, the adhesive 300 make it such that there is little, if any, contact between the pedestal 208 of the base cup 200 and the rounded bottom 114 of the bottle 100. That the layer of adhesive 300 separates the pedestal 208 and the rounded bottom 114 is highly advantageous because contact points between the pedestal 208 and rounded bottom 114 are in effect weak spots that increase the risk of the base cup 200 separating from the bottle 100, for example, during an impact; a strong bond is formed between the base cup 200 and the bottle 100 when the adhesive 300 is spread out over the entirety of the area between the pedestal 208 and the rounded bottom 114. Factors that can be adjusted to ensure that the adhesive 300 spreads out over the pedestal 208 will be discussed in detail below.

[0025] There are a wide variety of adhesives that could potentially be used to attach the base cup 200 to the bottle 100. But, as discussed above, some types of adhesives (such as UV cured glues and solvent based structural adhesives) have properties that are not suited for use in a pressurized dispensing system. Hot melt adhesives, however, do have several properties that facilitate the attachment of a base cup to a plastic bottle in a pressurized dispensing system. In particular, we have found that hot melt adhesives with a low surface energy work well to attach the base cup 200 to the bottle 100 in the process describe above. Such hot melt adhesives have elastic-like properties that impart impact resistance to the system. Further, such hot melt adhesives are flexible such that the base cup 200 can remain firmly attached to the bottle 100 even as the bottle 100 expands and contracts. Still further, a hot melt adhesive provides minimal stress when the adhesive is applied to the base cup 200 and bottle 100. That is, because these adhesives can be applied at a lower temperature, the adhesives are less likely to overheat the base cup 200 and bottle 100, and as such, the base cup 200 and/or bottle 100 can be made thinner without risking that they will melt during the attachment process. And the low melting temperature of the adhesive 300 means that the adhesive will more quickly cool to the final, adhered state. Hot melt adhesives also induce less stress on the bottle 100 than other types of adhesives from the standpoint that shrinkage of hot melt adhesives is negligible as the adhesives are cooled. A further property of hot melt adhesives that is beneficial is the green strength of such adhesives, green strength being the ability of an adhesive to hold before it is cured. Still further, hot melt adhesives can quickly set, with a 75 to 100 percent adhesive strength being achieved after only a few seconds of drying.

[0026] One of the significant properties of the hot melt adhesive 300 is its viscosity at the time it is applied to the base cup 200. As discussed above, the adhesive 300 spreads out over the recessed area 214 and the top wall 212 of the pedestal 208. If the viscosity of the adhesive 300 is too high, the adhesive 300 may not spread out over the area as intended. On the other hand, if the viscosity of the adhesive 300 is too low, the adhesive 300 may spread out too much and spill out over the edge of the top wall 212. In either case of the viscosity of the adhesive 300 being too high or too low, the result is insufficient adhesive 300 coverage of the surface area between the pedestal 208 and the rounded bottom 114 of the bottle 100. This means that there will be less adhesion between the base cup 200 and the bottle 100-the base cup 200 may in turn easily separate from the bottle 100 when it is pulled, peeled, or when it is dropped. Through experiments we found that a hot melt having a viscosity of 2.5 to 5.0 Pa.s (2500 to 5000 cps) at application temperature can effectively spread out over the pedestal 208 as described herein. With a viscosity in this range, the hot melt adhesive 300 spreads evenly around the recessed area 214 and the top wall 212, and an even bead of adhesive 300 is formed around the edge of the top wall 212 adjacent to the cylindrical wall 210.

[0027] The surface energy of the pedestal 208 is another factor that affects how the adhesive 300 will spread out on the pedestal 208. The material from which the surfaces of the pedestal 208 are constructed will have some inherent surface energy that may, or may not, facilitate the spreading of the adhesive 300-the adhesive 300 will more easily spread out on a surface that has a higher surface energy than a surface that has a lower surface energy. When the surfaces of the base cup 200 do not have a desired surface energy, the surfaces may be modified to increase spreading of the adhesive 300. For example, roughening the top wall 212 and the recessed area 214 creates crevices that allow the adhesive 300 to bite into and thereby more easily spread out over the surfaces. As will be appreciated by those skilled in the art, the surfaces of the top wall 212 and the recessed area 214 can be made rougher in a process of molding the base cup 200, or the surfaces could be made rougher after molding the base cup 200. Another example of a treatment

that could be applied to the surfaces of the top wall 212 and the recessed area 214 to increase spreading of the adhesive is corona treating. In such a process, a high voltage discharge is directed to the surfaces that are to be modified (*i.e.*, the surfaces of the top wall 212 and the recessed area 214). The result is that an increased chemical connection can be formed between the corona treated surfaces and the adhesive 300. We found that corona treatment significantly

increased spreading of the adhesive 300 when the base cup 200 is formed from low density polyethylene. **[0028]** Any modification of the properties of the surfaces of the pedestal 208 may be selected in combination with the viscosity of the adhesive 300. That is, the surfaces of the pedestal 208 may be modified to achieve a desired spreading of the adhesive 300 in a case where the adhesive 300 is set to have a particular viscosity at the time of its application. Alternatively, the viscosity of the adhesive 300 at the time of application can be increased or decreased to achieve a desired spreading given particular properties of the surface of the pedestal 208. In a specific example, we found that when an adhesive having a viscosity of 2.5 to 5.0 Pa.s (2500 to 5000 cps) was used, a corresponding VDI 45 finish on the surfaces of the recessed area 214 and top wall 212 resulted in the adhesive 300 being evenly spread over the surfaces so that a strong bond was formed between the base cup 200 and the bottle 100.

[0029] As to particular hot melt adhesives that can be used in our invention, we have found that solid based hot melt adhesives provide the best combination of properties for attaching the base cup 200 to the plastic bottle 100. Such adhesives are heated to the molten viscosity, with the higher the heating temperature the lower resulting viscosity of the adhesives. These adhesives are applied in the molten state, and when the adhesives are cooled to form a bond. Notably, there is minimal shrinkage of these types of adhesives as they are cooled-the density of applied adhesive is approximately the density of adhesive after cooling.

[0030] We specifically found that hot melt adhesives that are based on ethylene-vinyl acetate (EVA) or polyamides provide good bonding between the base cup 200 and the plastic bottle 100. Examples of such adhesives are sold under the tradenames HM-302D by Ellsworth Adhesives of Germantown, Wisconsin, and SCOTCH-WELD™ 3792 LM and 3789Q by 3M of Maplewood, Minnesota. We particularly found that adhesives that include an acrylic component provide the best bonding between the base cup 100 and plastic bottle in embodiments of our invention. An example of such an adhesive is comprised of EVA, an acrylic (which we believe to be poly(butyl acrylate) or poly(ethyl acrylate)), and polystyrene and is sold under the tradename HMS-792 by Ellsworth Adhesives. Without being bound by theory, we think that the combination of a hot melt component (*e.g.*, EVA) and an acrylic (*e.g.*, poly(butyl acrylate) or poly(ethyl acrylate)) provides bondings at the molecular level between the base cup 200 and the bottle 100, with the hot melt component providing a carrier for the acrylic that provides a van der Waals type bond.

[0031] The hot melt adhesives described herein are easy to work with. These adhesives are molten with a viscosity in the range of 2.5 to 5.0 Pa.s (2500 to 5000 cps) at temperatures around 107.2 - 204.4 °C (225-400 °F). Further, these hot melt adhesives have significant open times, *i.e.*, the maximum amount of time after the adhesive is applied that a bond can be formed with additional pressure being applied. In this regard, we found that an acrylic hot melt adhesive had open time around 75 seconds, while other hot melt adhesives had open times of about 40 to about 50 seconds. With such extended open times, the hot melt adhesives can be applied to multiple base cups in a production line before bottles are brought into contact with the adhesives, thereby providing flexibility in the manufacturing process.

[0032] In alternative examples that do not fall within the scope of the claims, other types of adhesives may be used to attach the base cup 200 to the bottle 100. For example, a pressure sensitive adhesive might be used, such as EVA blended with a styrene block copolymer. An adhesive of this type is sold as H7911-334B by Bostik of Paris, France. Another styrenic copolymer based adhesive that could be used is H20182 by Bostik. Those skilled in the art will recognize still other adhesives that would form a bond between the base cup 200 and the bottle 100 as described herein.

[0033] TABLE 1 shows tests that we conducted to determine the adhesive strength between a base cup bonded to a plastic bottle in terms of the pull off force required to separate the base cup and the bottle. In these tests the plastic bottle was molded from PET, and the base cup was molded from the materials as indicated. The base cup and bottle had the configurations described above. The bottle and the base cup were sized such that there was about 11.1 cm² (1.72 in²) of adhesive area between the pedestal of the base cup and the rounded bottom of the bottle. Note, the UV cured adhesive DEVCON® TRU-BOND™ PB 3500 by ITW Performance Polymers of Danvers, Massachusetts, was tested for comparison to the hot melt adhesives.

TABLE 1

Adhesive	Amount of Adhesive (g)	Base Cup Material	Pull Force (N)
EVA + Acrylic + Polystyrene (Ellsworth HMS 792)	0.95	Polypropylene Copolymer (Flint Hills P5M6K-048)	382.1 (85.90 lbf)
EVA + Acrylic + Polystyrene (Ellsworth HMS 792)	0.95	Low Density Polyethylene (PETROTHENE® NA206000)	427.5 (96.10 lbf)

(continued)

	Adhesive	Amount of Adhesive (g)	Base Cup Material	Pull Force (N)
5	EVA + Acrylic + Polystyrene (Ellsworth HMS 792)	0.95	Copolyester (DURASTAR™ DS1910HF)	676.1 (152.00 lbf)
	EVA + Acrylic + Polystyrene (Ellsworth HMS 792) Over-Heated	1.00	Polypropylene Copolymer (Flint Hills P5M6K-048)	476.0 (107.00 lbf)
10	EVA + Acrylic + Polystyrene (Ellsworth HMS 792) Over-Heated	1.00	Low Density Polyethylene (PETROTHENE® NA206000)	434.1 (97.60 lbf)
	EVA + Acrylic + Polystyrene (Ellsworth HMS 792) Over-Heated	1.00	Copolyester (DURASTAR™ DS1910HF)	778.4 (175.00 lbf)
15	EVA + Polystyrene (SCOTCH-WELD™ 3792)	0.90	Polypropylene Copolymer (Flint Hills P5M6K-048)	306.0 (68.80 lbf)
	EVA + Polystyrene (SCOTCH-WELD™ 3792)	0.90	Low Density Polyethylene (PETROTHENE® NA206000)	125.9 (28.30 lbf)
20	EVA + Polystyrene (SCOTCH-WELD™ 3792)	0.90	Copolyester (DURASTAR™ DS1910HF)	422.6 (95.00 lbf)
	Polyamide (SCOTCH-WELD™ 3789Q)	0.90	Polypropylene Copolymer (Flint Hills P5M6K-048)	246.9 (55.50 lbf)
25	Polyamide (SCOTCH-WELD™ 3789Q)	0.90	Low Density Polyethylene (PETROTHENE® NA206000)	183.3 (41.20 lbf)
	Polyamide (SCOTCH-WELD™ 3789Q)	0.90	Copolyester (DURASTAR™ DS1910HF)	416.8 (93.70 lbf)
30	EVA (Ellsworth HM-302-D)	0.90	Polypropylene Copolymer (Flint Hills P5M6K-048)	173.0 (38.90 lbf)
	EVA (Ellsworth HM-302-D)	0.90	Low Density Polyethylene (PETROTHENE® NA206000)	16.9 (3.80 lbf)
35	EVA (Ellsworth HM-302-D)	0.90	Copolyester (DURASTAR™ DS1910HF)	251.8 (56.60 lbf)
	UV Cured Adhesive (TRU-BOND™ PB 3500)	0.30	Polypropylene copolymer (Flint Hills P5M6K-048)	68.9 (15.50 lbf)
40	UV Cured Adhesive (TRU-BOND™ PB 3500)	0.30	Low Density Polyethylene (PETROTHENE® NA206000)	43.1 (9.70 lbf)
	UV Cured Adhesive (TRU-BOND™ PB 3500)	0.30	Copolyester (DURASTAR™ DS1910HF)	201.1 (45.20 lbf)

[0034] As can be seen from the data in TABLE 1, the hot melt adhesive containing EVA and an acrylic provided the strongest bond between the base cup and the bottle. It should also be noted that all of the hot melt adhesives provided at least comparable bonding to the UV cured adhesive. But, as discussed above, the hot melt adhesives are advantageous over UV cured adhesives in other ways. For example, hot melt adhesives do not shrink upon hardening, whereas UV cured adhesives do significantly shrink, which can harm the plastic structure of the bottle.

[0035] As generally discussed above, due to potential safety hazards, a pressurized dispensing system must be able to withstand impacts without failing. In this regard, U.S. Department of Transportation (DOT) regulations specifically require that a pressurized dispensing container must be able to withstand being dropped from a height of 1.8 m both onto the bottom of the container and when the container is angled at 45° relative to the ground. We applied DOT tests to the bottle and base cup combinations shown in TABLE 1. We found that the base cup and bottle bonded together with the hot melt adhesives did not generally become separated from the impact of the drop. We believe that the hot melt adhesives provide a flexible layer between the base cup and bottle that does not fatigue as a result of the impact, and this flexing likely contributed to the base cup remaining attached to the bottle in the drop tests.

[0036] The combination of the bottle 100 and the base cup 200 can form a container for a pressurized dispensing system, such as a system for dispensing an aerosol product. An example of this type of pressurized dispensing system 400 is shown in Figures 9 and 10. In the system 400, the rounded bottom 114 of the bottle 100 is adhered with a hot melt adhesive 300 to the pedestal 208 of the base cup 200. The base cup 200 allows the system 400 to stand upright on a flat surface despite the bottle 100 having a rounded bottom 114. As discussed above, the adhesive 300 creates a layer between the rounded bottom 114 and the pedestal 208. As such, the outer rim 216 is the only portion of the base cup 200 that contacts the bottle 100. Notably, in this embodiment the outer rim 216 is positioned adjacent to the body section 104 of the bottle 100 such that the rounded bottom 114 cannot be seen. In other embodiments, however, the outer rim 216 is positioned lower on the bottle 100 such that a portion of the rounded bottom 114 can be seen. At the top of the system 400 of the bottle is a spray mechanism 402, as discussed above. The pressurized product contained within the bottle 100 is dispensed through the spray mechanism 402 in this case as an aerosol mist. Although not shown, a cap may be provided over the spray mechanism 402. In sum, the bottle 100 and base cup 200 provide for a convenient and attractive.

[0037] In a specific embodiment of our invention, the system 400 is used to dispense an air freshening composition. Examples of formulations for the air freshening composition can be found in U.S. Patent Application No. 15/094,542.

[0038] Although this invention has been described in certain specific exemplary embodiments, many additional modifications and variations that fall within the scope of the claims would be apparent to those skilled in the art in light of this disclosure. It is, therefore, to be understood that this invention may be practiced otherwise than as specifically described. Thus, the exemplary embodiments of the invention should be considered in all respects to be illustrative and not restrictive, and the scope of the invention to be determined by the claims.

Industrial Applicability

[0039] The invention described herein can be used in the commercial production of a pressurized dispensing system. Such pressurized dispensing systems have a wide variety of uses, for example, in the market of aerosol products.

Claims

1. A container for a pressurized dispensing system, the container comprising:
 - a bottle (100) including an opening (112) at a top end (102) and a rounded bottom (114) at a bottom end (106), the bottle (100) being molded from a plastic material; and
 - a base cup (200) attached to the rounded bottom (114) of the bottle (100) with a hot melt adhesive (300), the base cup (200) including a pedestal (208) positioned adjacent to a center of the rounded bottom (114) of the bottle (100), and the base cup (200) having a bottom surface that allows the container to stand upright, **characterised in that** the hot melt adhesive (300) is spread over the entirety of an area between the pedestal (208) and the rounded bottom (114) of the bottle (100) so as to form a layer between the pedestal (208) and the rounded bottom (114) of the bottle (100) that prevents the rounded bottom (114) of the bottle (100) from contacting the pedestal (208).
2. The container according to claim 1, wherein the pedestal (208) includes a top wall (212), with a recessed area (214) being formed in the top wall (212), wherein the recess area (214) is positioned adjacent to the center of the rounded bottom (114) of the bottle (100), and wherein the adhesive (300) is spread over the recessed area (214) and the rest of the top wall (212).
3. The container according to claim 1, wherein the hot melt adhesive (300) includes an acrylic component.
4. The container according to claim 3, wherein the hot melt adhesive (300) includes ethylene-vinyl acetate and the acrylic component.
5. The container according to claim 1, wherein the bottle (100) is formed from polyethylene terephthalate.
6. The container according to claim 1, wherein the base cup (200) is formed from a resin selected from a group consisting of polyethylene terephthalate, polypropylene, and polyester.
7. The container according to claim 1, wherein a plurality of apertures (206) is provided in the bottom surface of the base cup (200).

8. A method of forming a pressurized dispensing system, the method comprising:

heating a hot melt adhesive (300) such that the hot melt adhesive (300) is in a molten state;
 depositing the molten hot melt adhesive (300) in a recessed region (214) in a top wall (212) of a pedestal (208)
 in a base cup (200);
 pressing a center region of a rounded bottom (114) of a plastic bottle (100) against the molten hot melt adhesive
 (300) such that the molten hot melt adhesive (300) spreads out over the recessed region (214) and the rest of
 the top wall (214) of the pedestal (208); and
 cooling the molten hot melt adhesive (300) to thereby attach the base cup (200) to the plastic bottle (100).

9. The method according to claim 8, wherein the molten hot melt adhesive (300) forms a layer between the rounded bottom (114) of the bottle (100) and the pedestal (208) of the base cup (200) such that the rounded bottom (114) of the bottle (100) does not contact the pedestal (208).

10. The method according to claim 8, wherein the hot melt adhesive (300) has a viscosity of 2.5 Pa.s (2,500 cps) to 5.0 Pa.s (5,000 cps) when it is deposited in the recessed region (214).

11. The method according to claim 8, wherein the hot melt adhesive (300) is heated to a temperature of 107.2 °C (225°F) to 204.4 °C (400°F) when it is applied to the recessed region (214).

12. The method according to claim 8, wherein the hot melt adhesive (300) includes an acrylic component.

13. The method according to claim 12, wherein the hot melt adhesive (300) includes ethylene-vinyl acetate and the acrylic component.

14. An aerosol dispensing system comprising:

a container according to any of claims 1 to 7, wherein the bottle (100) contains an aerosol product under pressure;
 and
 a spray mechanism (402) attached to the top end (102) of the bottle (100), the spray mechanism (402) including a nozzle through which the aerosol product can be discharged.

Patentansprüche

1. Ein Behälter für ein unter Druck stehendes Ausgabesystem, wobei der Behälter Folgendes beinhaltet:

eine Flasche (100), die eine Öffnung (112) an einem oberen Ende (102) und einen abgerundeten Boden (114) an einem Bodenende (106) umfasst, wobei die Flasche (100) aus einem Kunststoffmaterial geformt ist; und
 einen Basisbecher (200), der an dem abgerundeten Boden (114) der Flasche (100) mit einem Heißklebstoff (300) angebracht ist, wobei der Basisbecher (200) einen Sockel (208) umfasst, der angrenzend an eine Mitte des abgerundeten Bodens (114) der Flasche (100) positioniert ist, und der Basisbecher (200) eine Bodenfläche aufweist, die es dem Behälter erlaubt, aufrecht zu stehen,
dadurch gekennzeichnet, dass der Heißklebstoff (300) über die Gesamtheit eines Bereichs zwischen dem Sockel (208) und dem abgerundeten Boden (114) der Flasche (100) verteilt ist, um so eine Schicht zwischen dem Sockel (208) und dem abgerundeten Boden (114) der Flasche (100) zu bilden, die verhindert, dass der abgerundete Boden (114) der Flasche (100) den Sockel (208) berührt.

2. Behälter gemäß Anspruch 1, wobei der Sockel (208) eine obere Wand (212) umfasst, wobei in der oberen Wand (212) ein ausgesparter Bereich (214) gebildet ist,
 wobei der ausgesparte Bereich (214) angrenzend an die Mitte des abgerundeten Bodens (114) der Flasche (100) positioniert ist, und
 wobei der Klebstoff (300) über den ausgesparten Bereich (214) und den Rest der oberen Wand (212) verteilt ist.

3. Behälter gemäß Anspruch 1, wobei der Heißklebstoff (300) eine Acrylkomponente umfasst.

4. Behälter gemäß Anspruch 3, wobei der Heißklebstoff (300) Ethylvinylacetat und die Acrylkomponente umfasst.

EP 3 464 117 B1

5. Behälter gemäß Anspruch 1, wobei die Flasche (100) aus Polyethylenterephthalat gebildet ist.
6. Behälter gemäß Anspruch 1, wobei der Basisbecher (200) aus einem Harz gebildet ist, das aus der Gruppe ausgewählt ist, die aus Polyethylenterephthalat, Polypropylen und Polyester besteht.
7. Behälter gemäß Anspruch 1, wobei eine Vielzahl von Durchlässen (206) in der Bodenfläche des Basisbechers (200) bereitgestellt ist.
8. Ein Verfahren zum Bilden eines unter Druck stehenden Ausgabesystems, wobei das Verfahren Folgendes beinhaltet:
- Erhitzen eines Heißklebstoffs (300), sodass der Heißklebstoff (300) in einem geschmolzenen Zustand ist;
Ablagern des geschmolzenen Heißklebstoffs (300) in einer ausgesparten Region (214) in einer oberen Wand (212) eines Sockels (208) in einem Basisbecher (200);
Drücken einer mittleren Region eines abgerundeten Bodens (114) einer Kunststoffflasche (100) gegen den geschmolzenen Heißklebstoff (300), sodass sich der geschmolzene Heißklebstoff (300) über die ausgesparte Region (214) und den Rest der oberen Wand (214) des Sockels (208) verteilt; und
Abkühlen des geschmolzenen Heißklebstoffs (300), um dadurch den Basisbecher (200) an der Kunststoffflasche (100) anzubringen.
9. Verfahren gemäß Anspruch 8, wobei der geschmolzene Heißklebstoff (300) eine Schicht zwischen dem abgerundeten Boden (114) der Flasche (100) und dem Sockel (208) des Basisbechers (200) bildet, sodass der abgerundete Boden (114) der Flasche (100) den Sockel (208) nicht berührt.
10. Verfahren gemäß Anspruch 8, wobei der Heißklebstoff (300) eine Viskosität von 2,5 Pa.s (2500 cps) bis 5,0 Pa.s (5000 cps) aufweist, wenn er in der ausgesparten Region (214) abgelagert wird.
11. Verfahren gemäß Anspruch 8, wobei der Heißklebstoff (300) auf eine Temperatur von 107,2 °C (225 °F) bis 204,4 °C (400 °F) erhitzt wird, wenn er auf die ausgesparte Region (214) aufgetragen wird.
12. Verfahren gemäß Anspruch 8, wobei der Heißklebstoff (300) eine Acrylkomponente umfasst.
13. Verfahren gemäß Anspruch 12, wobei der Heißklebstoff (300) Ethylvinylacetat und die Acrylkomponente umfasst.
14. Ein Aerosolausgabesystem, das Folgendes beinhaltet:
- einen Behälter gemäß einem der Ansprüche 1 bis 7, wobei die Flasche (100) ein Aerosolprodukt unter Druck enthält; und
einen Sprühmechanismus (402), der an dem oberen Ende (102) der Flasche (100) angebracht ist, wobei der Sprühmechanismus (402) eine Düse umfasst, durch die das Aerosolprodukt freigesetzt werden kann.

Revendications

1. Un récipient pour un système de distribution sous pression, le récipient comprenant :
- une bouteille (100) incluant une ouverture (112) au niveau d'une extrémité de dessus (102) et un fond arrondi (114) au niveau d'une extrémité de fond (106), la bouteille (100) étant moulée à partir d'une matière plastique ; et une coupelle de base (200) fixée sur le fond arrondi (114) de la bouteille (100) avec un adhésif thermofusible (300), la coupelle de base (200) incluant un support (208) positionné de façon adjacente à un centre du fond arrondi (114) de la bouteille (100), et la coupelle de base (200) ayant une surface de fond qui permet au récipient de tenir debout,
- caractérisé en ce que** l'adhésif thermofusible (300) est réparti sur l'intégralité d'une zone entre le support (208) et le fond arrondi (114) de la bouteille (100) de façon à former une couche entre le support (208) et le fond arrondi (114) de la bouteille (100) qui empêche le fond arrondi (114) de la bouteille (100) d'être en contact avec le support (208).
2. Le récipient selon la revendication 1, dans lequel le support (208) inclut une paroi de dessus (212), avec une zone en renforcement (214) formée dans la paroi de dessus (212),

dans lequel la zone en renforcement (214) est positionnée de façon adjacente au centre du fond arrondi (114) de la bouteille (100), et
dans lequel l'adhésif (300) est réparti sur la zone en renforcement (214) et le reste de la paroi de dessus (212).

- 5 **3.** Le récipient selon la revendication 1, dans lequel l'adhésif thermofusible (300) inclut un composant acrylique.
- 4.** Le récipient selon la revendication 3, dans lequel l'adhésif thermofusible (300) inclut de l'éthylène-acétate de vinyle et le composant acrylique.
- 10 **5.** Le récipient selon la revendication 1, dans lequel la bouteille (100) est formée à partir de polytéréphtalate d'éthylène.
- 6.** Le récipient selon la revendication 1, dans lequel la coupelle de base (200) est formée à partir d'une résine sélectionnée dans un groupe constitué de polyéthylène téréphtalate, de polypropylène, et de polyester.
- 15 **7.** Le récipient selon la revendication 1, dans lequel une pluralité d'ouvertures (206) est fournie dans la surface de fond de la coupelle de base (200).
- 8.** Un procédé de formation d'un système de distribution sous pression, le procédé comprenant :
20 le fait de faire chauffer un adhésif thermofusible (300) de telle sorte que l'adhésif thermofusible (300) soit dans un état fondu ;
 le fait de déposer l'adhésif thermofusible fondu (300) dans une région en renforcement (214) dans une paroi de dessus (212) d'un support (208) dans une coupelle de base (200) ;
25 le fait de presser une région centrale d'un fond arrondi (114) d'une bouteille en plastique (100) contre l'adhésif thermofusible fondu (300) de telle sorte que l'adhésif thermofusible fondu (300) se répartisse sur la région en renforcement (214) et le reste de la paroi de dessus (214) du support (208) ; et
 le fait de refroidir l'adhésif thermofusible fondu (300) afin de fixer de ce fait la coupelle de base (200) sur la bouteille en plastique (100).
- 30 **9.** Le procédé selon la revendication 8, dans lequel l'adhésif thermofusible fondu (300) forme une couche entre le fond arrondi (114) de la bouteille (100) et le support (208) de la coupelle de base (200) de telle sorte que le fond arrondi (114) de la bouteille (100) ne soit pas en contact avec le support (208).
- 10.** Le procédé selon la revendication 8, dans lequel l'adhésif thermofusible (300) a une viscosité de 2,5 Pa.s (2 500 cps) à 5,0 Pa.s (5 000 cps) lorsqu'il est déposé dans la région en renforcement (214).
35
- 11.** Le procédé selon la revendication 8, dans lequel l'adhésif thermofusible (300) est chauffé jusqu'à une température de 107,2 °C (225 °F) à 204,4 °C (400 °F) lorsqu'il est appliqué sur la région en renforcement (214).
- 40 **12.** Le procédé selon la revendication 8, dans lequel l'adhésif thermofusible (300) inclut un composant acrylique.
- 13.** Le procédé selon la revendication 12, dans lequel l'adhésif thermofusible (300) inclut de l'éthylène-acétate de vinyle et le composant acrylique.
- 45 **14.** Un système de distribution d'aérosol comprenant :
 un récipient selon n'importe lesquelles des revendications 1 à 7, dans lequel la bouteille (100) contient un produit aérosol sous pression ; et
 un mécanisme de pulvérisation (402) fixé sur l'extrémité de dessus (102) de la bouteille (100), le mécanisme de pulvérisation (402) incluant une buse à travers laquelle le produit aérosol peut être émis.
50

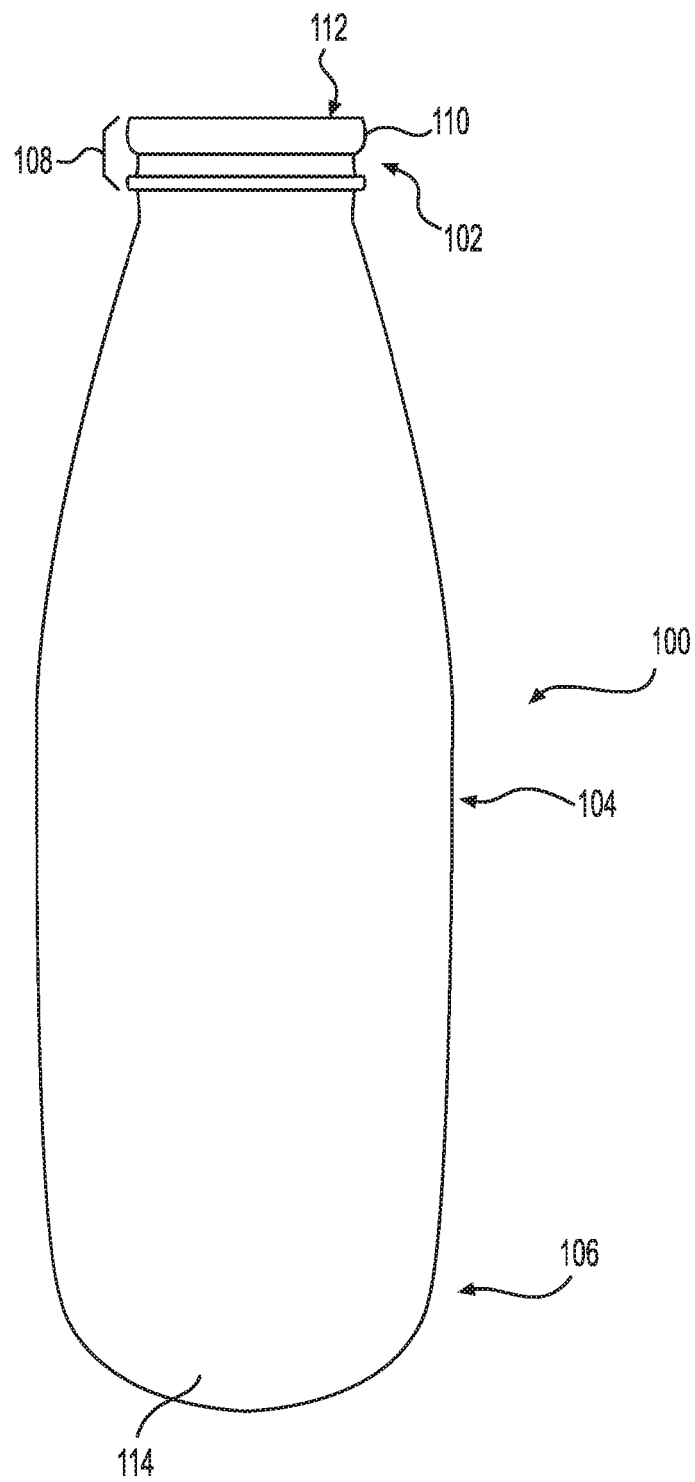


FIG. 1

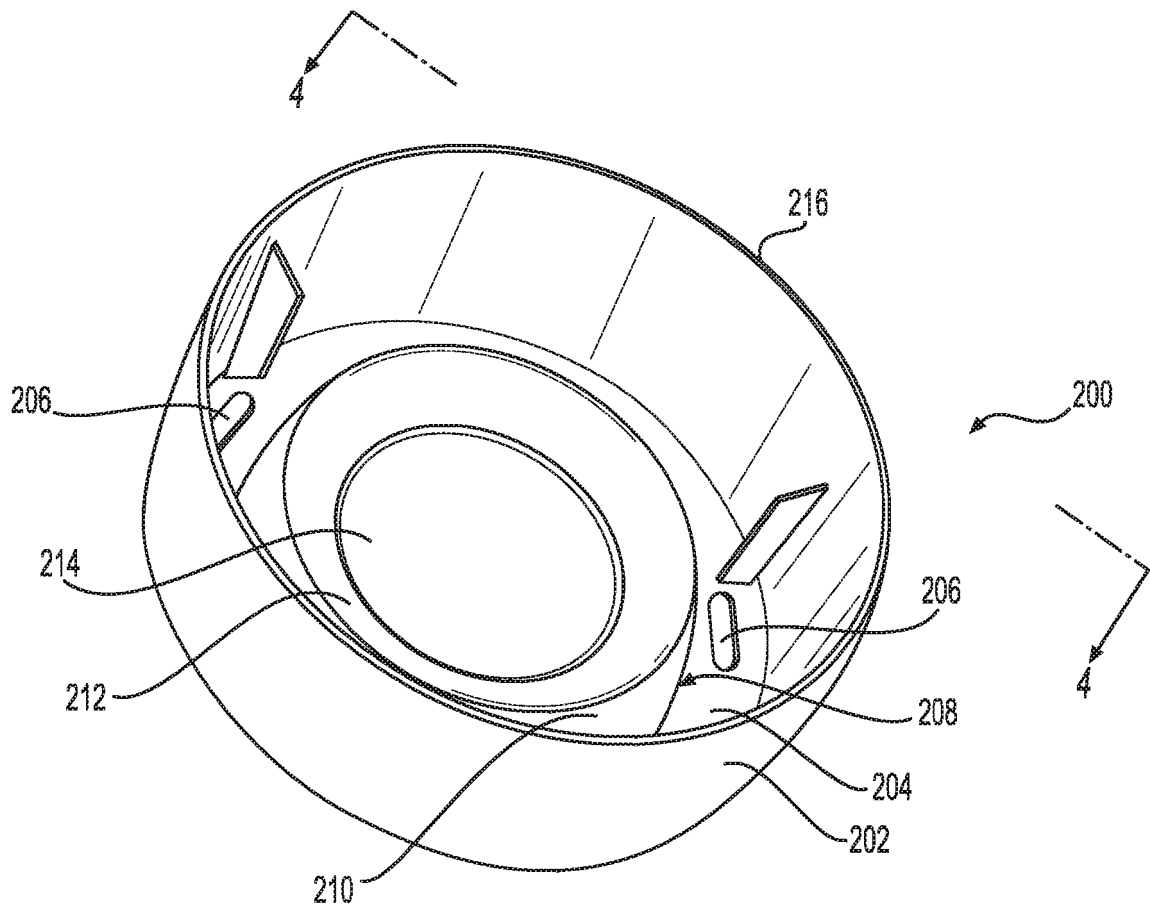


FIG. 2

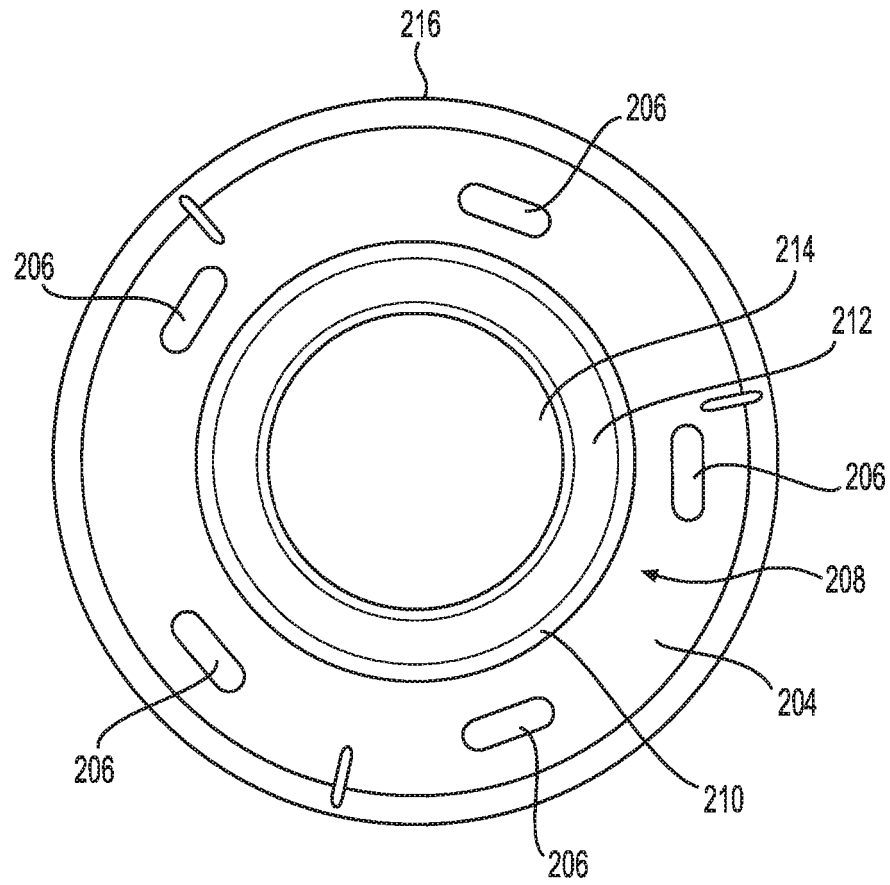


FIG. 3

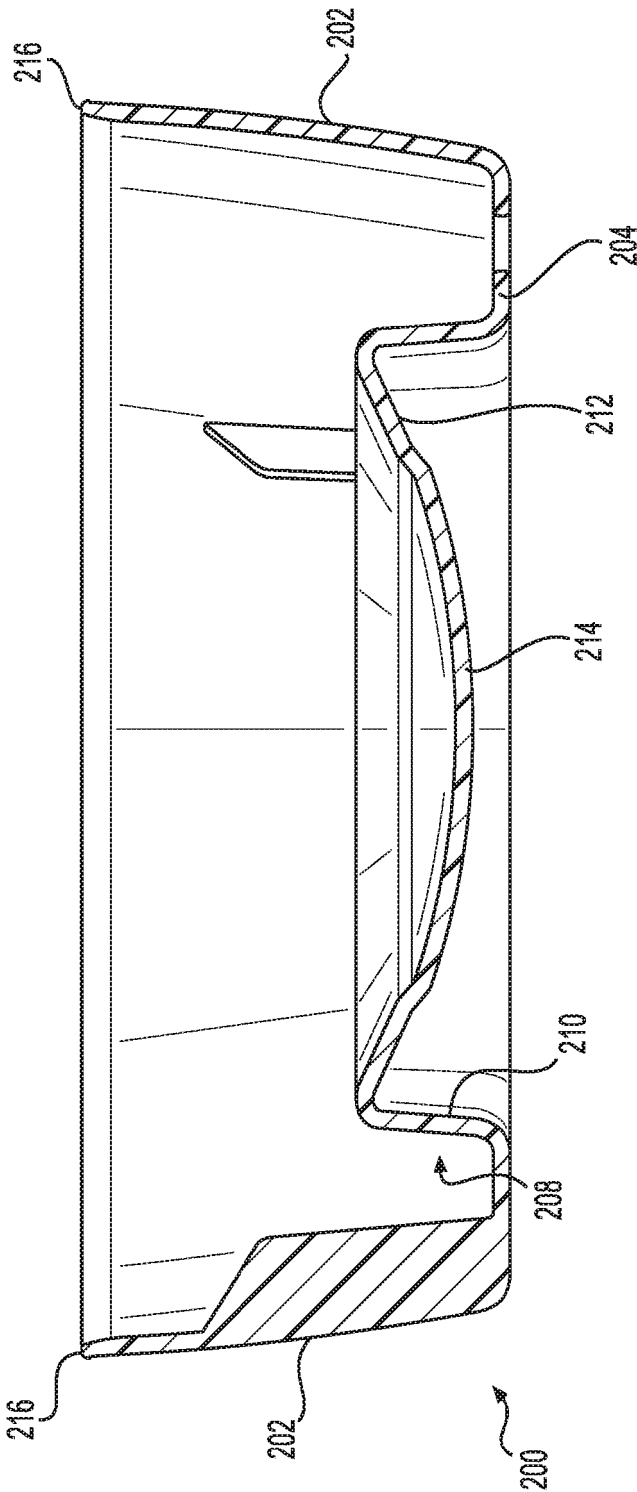


FIG. 4

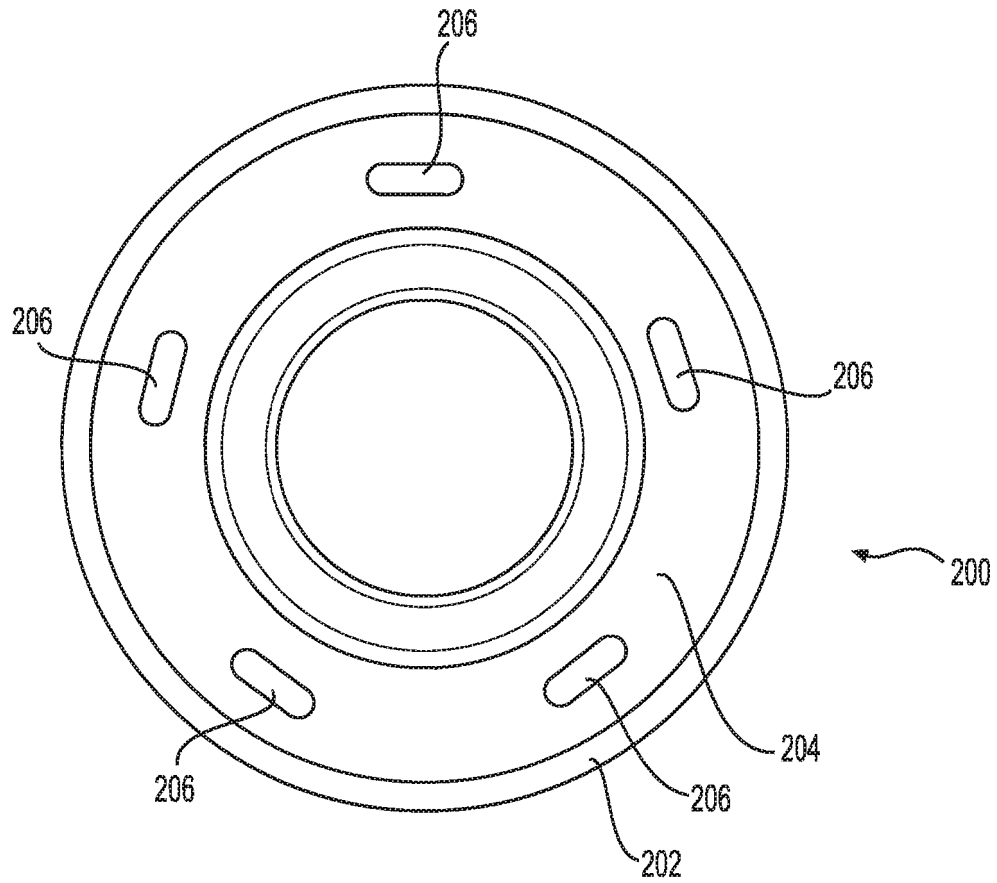


FIG. 5

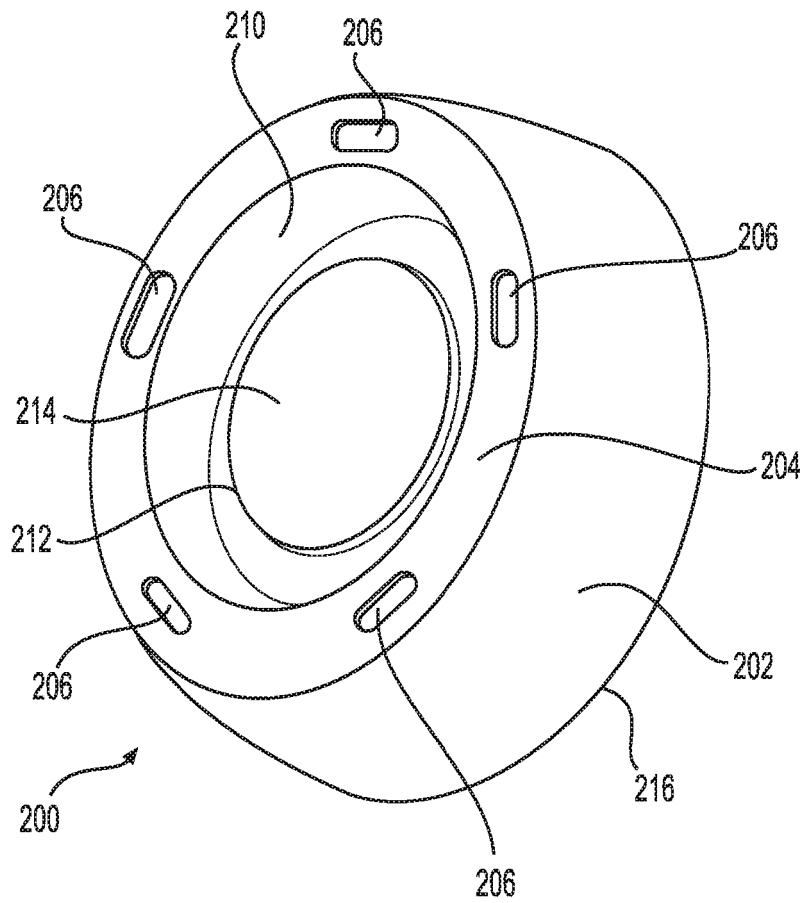


FIG. 6

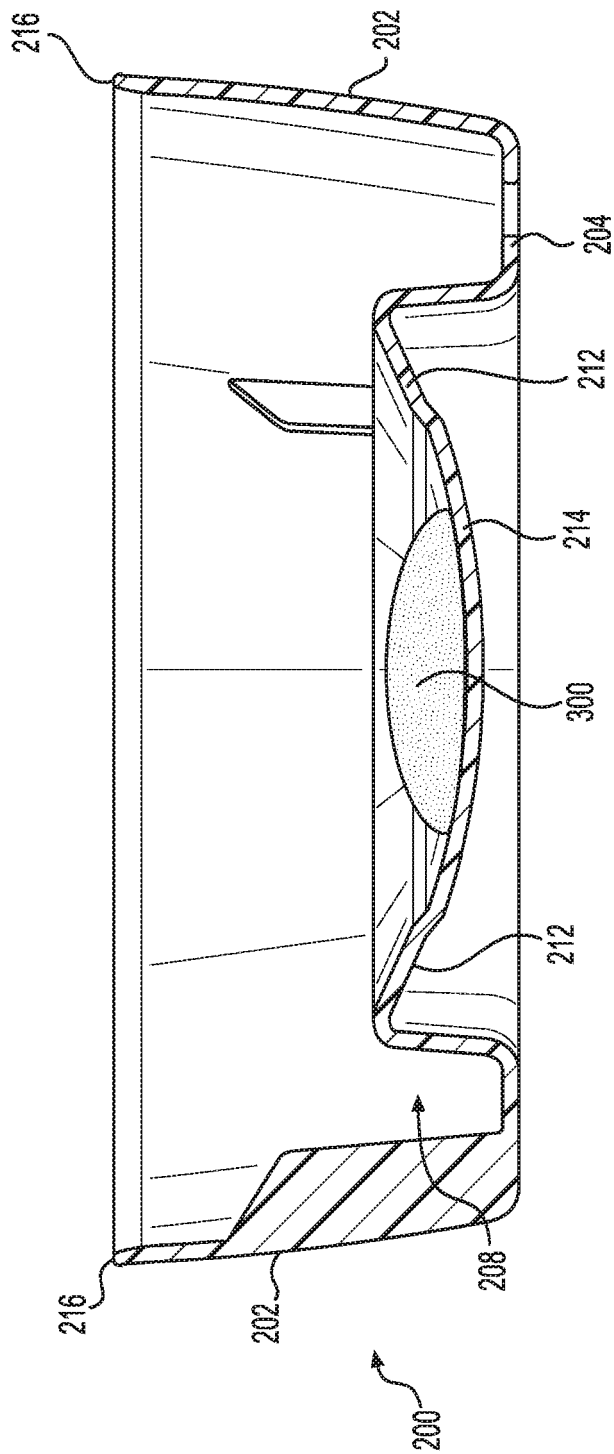


FIG. 7

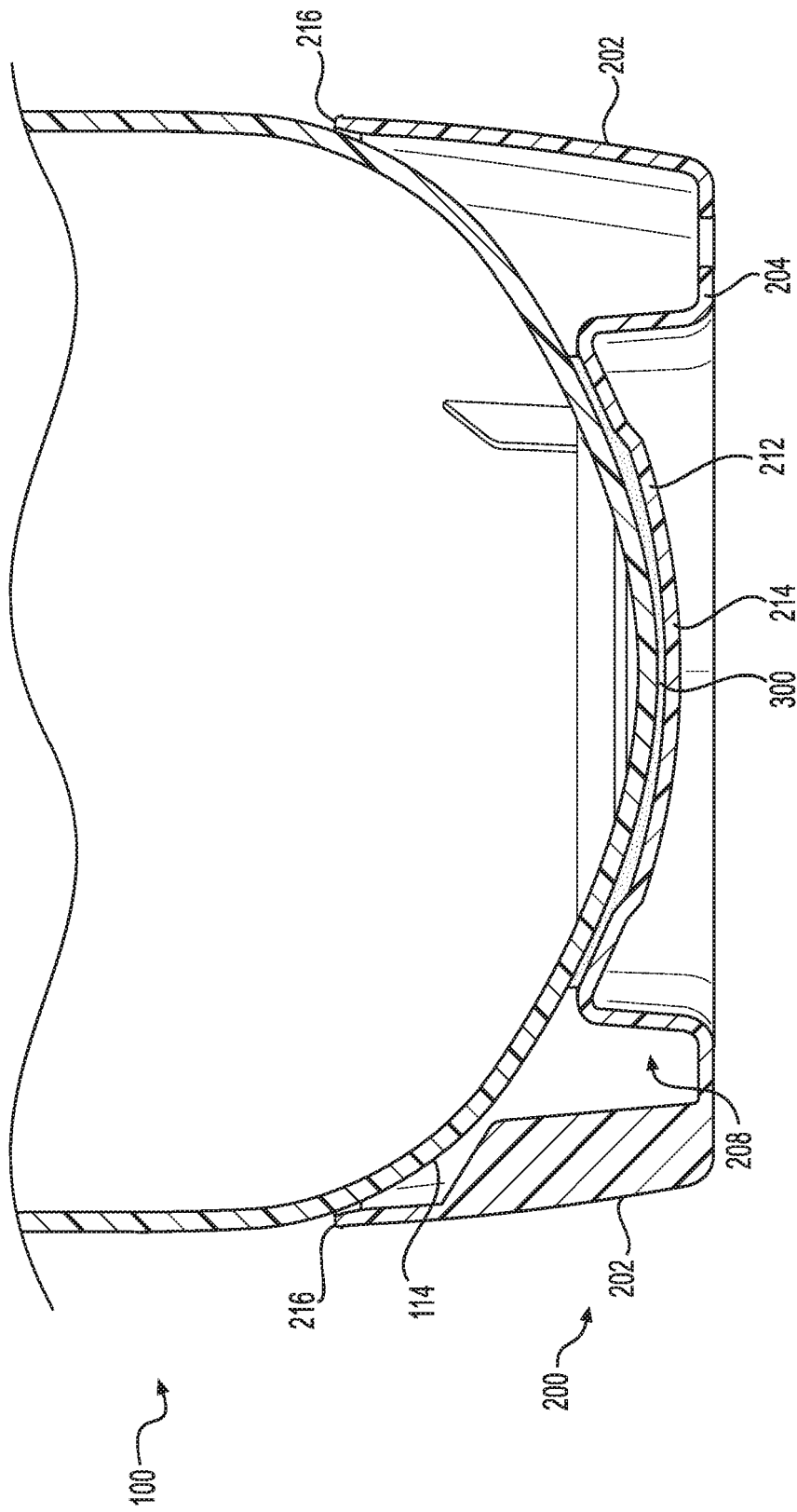


FIG. 8

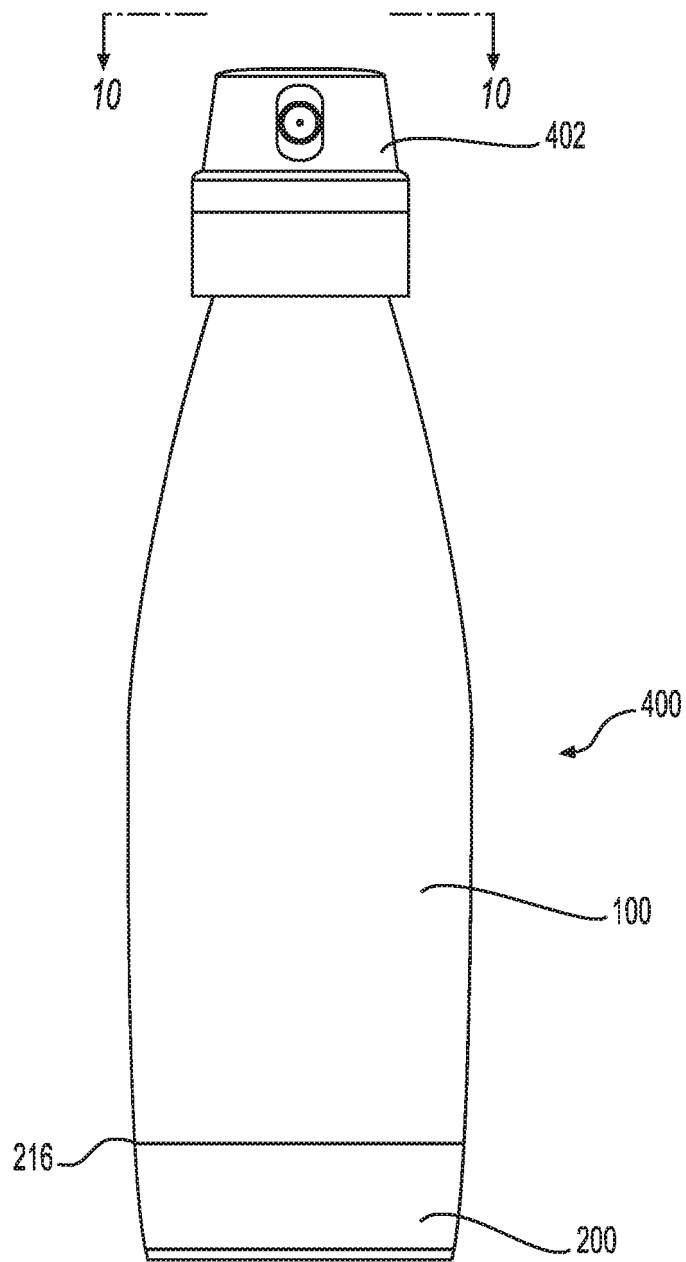


FIG. 9

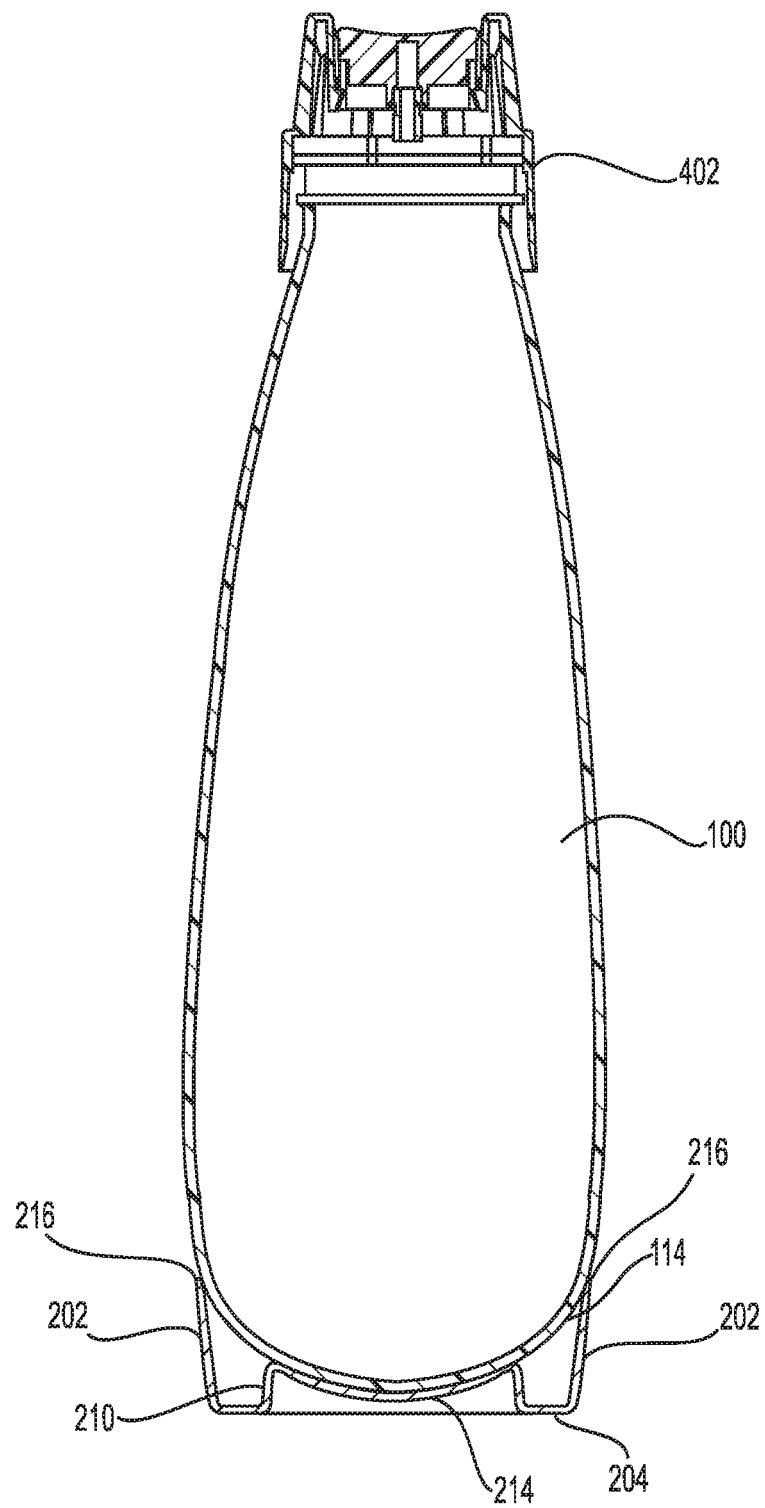


FIG. 10

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP H05147656 A [0008]
- US 5062537 A [0008]
- US 094542 [0037]