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(54) Title: A BLOW MOLDED CONTAINER

(57) Abstract: The present invention is directed to a container (101) comprising a retention mechanism (103) for attaching a closure (106) to an opening or neck (102) of the container with a portion of the container body comprising a physical geometry that creates more than one undercut (107).

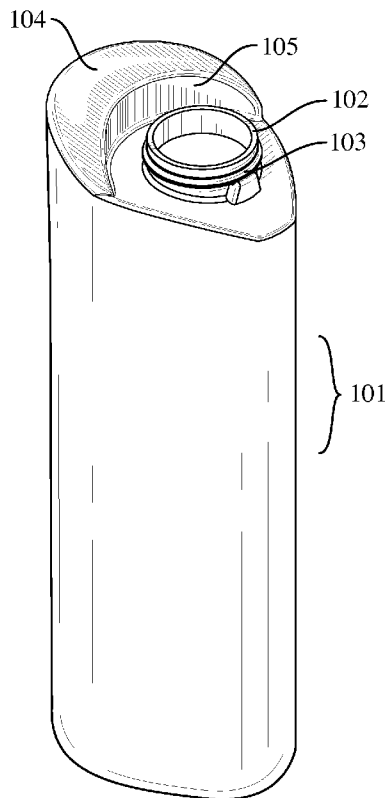


Fig. 1A

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(81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,

KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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A BLOW MOLDED CONTAINER

FIELD OF THE INVENTION

The present invention relates to a blow-molded container with a retention mechanism for
5 attaching a closure to an opening or neck of said container and a portion of said container
comprising a physical geometry that creates more than one undercut.

BACKGROUND OF THE INVENTION

A variety of packages, including dispensing packages or containers, have been developed
10 for household products, personal care products, and other products. Containers that have a
pleasing aesthetic look to consumers have a closure design that is fully integrated with the design
of the container. This conveys the message that the integration of the two components was well
thought of. This is important to make closure functioning intuitive to consumers. An example of
a well integrated container/closure system is one where the container's geometry wraps around
15 the closure to create shoulders. This geometry can also be referred to as a container with a
recessed neck. This recess geometry serves different purposes: overall integrated look to the
container and closure, stability to container in inverted orientation, and makes functioning of
closure more intuitive to consumers.

20 Blowing this container geometry with today's traditional blow molding technology, is not
possible, as the container would have undercuts in the concave portion of the shoulder. This is
because when the molding cavity tools are to be opened, the steel creating the concave part
becomes trapped. If one were to shape the top part using the blow pin head tool, one would then
encounter an undercut under the snap bead feature that is in proximity to the container's
25 shoulder. This is because one would not be able to pull the blow pin tooling which creates the
snap bead from underneath the formed bead feature.

When looking at containers in the market that use a recess geometry design, it has been
noticed that they usually have a straight shoulder vs. a concave design. The forming of that
30 recess does not require any inventive step as there is at least one direction in which the mold can
open with a straight-pull motion without yielding to any mold material becoming trapped within
the container's geometry. Yet, recess geometries that can be unmolded with a straight-pull in a

blow mold are highly restricted in design, limiting the integration of the closure with the blown container and therefore all the benefits stated above.

There are other containers currently in the market that have different shoulder geometries, but these containers use a different neck from what the present invention has found. These containers use a closure attachment mechanism, where the closure snaps onto the container from the inside of the dispensing orifice. A non-limiting example of a container made through the process described in the present invention can be referred to as having a snap-on closure mechanism, which snaps onto the outside of the container's neck. From the present invention discovery, the present design provides more reliability against leaking, as the outside part of the neck is calibrated, providing tighter tolerances, than the inside part of the container. The inside of the container is not highly calibrated, increasing the probability of poor engagement between container and closure, and thus leading to potential leaking. This is because the parts blown via the extrusion blow molding process usually have better controlled geometry on the outside of the part rather than the inside, as the material wall thickness can vary due to part aspect ratios translating into differing parison stretch ratios in both radial and axial directions. In addition, containers whose closures attach onto the container from the inside of the neck usually require trimming and reaming of the neck as secondary operations. An operation that cuts-away excess material is inherently not cost-effective and should be avoided. Furthermore, any cutting operation requires straight access to the part that shall be cut away restricting the available recess geometry and limiting the integration of the closure with the blown container and therefore all the benefits stated above. With a closure attachment mechanism where the closure seals from the inside of the neck and snaps onto the container from the outside of the neck, a traditional striker plate and blow pin tool design can be used, where the blow pin cuts the parison when it comes in contact with the striker plate, creating a calibrated neck and therefore eliminating the need for secondary operations such as trimming and reaming.

Currently, most closures complete the geometry of the container, thereby requiring the size of the closure to be proportional to the geometry of the container. In the present invention, the size of the closure is minimized thereby providing several benefits. One of the benefits is reducing the weight of the closure to the minimum amount of resin needed to enable the required closure functionality. This is a benefit for the environment as industry currently does not have a well established polypropylene recycling stream. By having a closure that has a reduced weight from the overall package, this allows a container to have improved recyclability. It also reduces

the overall costs of the closure including costs associated with resin, processing, tooling, injection mold (IM) press selection, and others. Another benefit of minimizing closure size is that the closure becomes a less focal point of the design making it more inductive to use the same closure for different container designs within one brand and even enable the use of the same
5 closure across different brands/shaped families. This drives optimization and efficiency and in return reduces further costs. This further enables the silhouette of the shape to be scaled proportionally without the use of additional features such as steps, larger radii or other geometric alterations and angles to accommodate the closure.

10 Another benefit for minimizing the closure size is that it can be integrated in the container shape. When the container is in its inverted orientation, an integrated design allows the use of the container top surface to add stability vs. requiring a larger closure. It also aids in creating differentiation between the forms (such as shampoo and conditioner), helping consumers identify the product that they are looking for. This drives scale in the container design and development
15 and therefore is an advantage. A further advantage is that having a recessed closure provides a higher level of protection from damage due to the recessed closure being protected by the recess geometry. Another benefit of having a recessed neck where the container wraps around the closure is that it enables using the same closure across different sizes while still having an integrated look between the container and the closure. A further benefit of the present invention
20 is the enablement of using the same closure across containers made by different molding technologies. Non-limiting examples of molding technologies include extrusion blow molding (EBM), injection blow molding (IBM), and injection stretch blow molding (ISBM). This drives scale and further reduces costs.

25 It is an objective of the present invention to describe a blown container, wherein said container contains a recess in the container's geometry. Such a recess allows integration of a closure with the container such that when the closure is coupled with the blown container, it is substantially flush to the apex of the outmost surface of that blown container.

30 SUMMARY OF THE INVENTION

The present invention is directed towards a blow molded container comprising a physical geometry that creates more than one undercut, preferably a recess, and a closure retention mechanism for attaching a closure to an opening or neck of said container.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A is an isometric view of a final container shape with a recessed neck and a snap bead closure attachment mechanism;

5 Figure 1B is an isometric view of a non-limiting example of a miniature closure;

Figure 1C is a container with a recessed neck and a miniature closure assembled and standing in an up-right and an upside-down orientations;

10 Figure 1D is a top view of a container illustrating the molding parting line and directions of mold action.

Figure 1E is a top view of a container with a recessed neck and a miniature closure assembled.

15

DETAILED DESCRIPTION OF THE INVENTION

For the purposes of the present invention, suitable recesses are those that permit a portion of the article to wrap around at least part of a closure, when said closure is coupled with said article. Such recess may allow the closure, when coupled to said article, to remain substantially flush to the apex of the outermost surface of said article. By “at least part of a closure” it is herein
20 intended that said portion extends around the perimeter of the closure to form an angle of at least 45° , preferably at least 60° , more preferable between 60° and 360° , taken from the centre of the closure and in the x-y plane, when said closure is coupled to said article.

The term “integrated” as used herein intends that: (i) at least part of said closure remains
25 substantially flush with at least one surface of the article, preferably the outer surface of said shoulder; and (ii) that at least one shoulder of said article wraps around at least part of said closure, preferably forming at least one concave surface. The advantage of such configuration being a consumer desirable silhouette.

30 The term “undercut” as used herein means a physical geometry that hinders article removal from a mold when said mold is opened in a linear direction which intersects at least a portion of said geometry.

The term “without damage” as used herein means that the article retains the end physical geometry generated at the end of the molding process.

5 The term “scale” as used herein refers to an economic benefit obtained by reducing the design and development time and resources, as well as capital investment obtained by direct reapplication without negative implications on consumer acceptance, design aesthetics, etc.

10 Blow molding is a well known manufacturing process for the fabrication of plastic articles such as containers, fuel tanks, handles etc. The blow molding process begins with melting plastic and forming it into a parison or preform. The parison is then clamped into a mold and a pressurized medium, usually air, is blown or pumped into it. The air pressure forces the plastic to match the peripheral geometry of the mold. Once the plastic has cooled and hardened the mold opens and the part is ejected.

15 There are three main types of blow molding platforms: extrusion blow molding (EBM), injection blow molding (IBM) and stretch blow molding (SBM). In some applications the combination of the abovementioned blow molding platforms may be more appropriate depending on the properties and complexity of the articles to be formed, such as injection stretch blow molding (ISBM).

20

Plastic resin materials for use in the present invention can be polyolefins such as polyethylene (PE) and polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), polylactic acid (PLA) or polyethylene terephthalate (PET).

25 As used herein and unless otherwise stated, “polyethylene” encompasses high density polyethylene (HDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), and ultra low density polyethylene (ULDPE). As used herein and unless otherwise stated, “polypropylene” encompasses homopolymer polypropylene, random copolymer polypropylene, and block copolymer polypropylene.

30

Therefore, there is a need for a new container design that has a recessed neck (102) and a closure retention mechanism (103). The container (101) can be made via any of the different blow molding processes previously described.

In an embodiment of the present invention, a container (101) comprises a closure retention mechanism (103) for attaching a closure (106) to an opening or neck (102) of a container (101) that can be selected from the non-limiting group consisting of snap bead, thread, bayonet, and mixtures thereof.

5

In an embodiment of the present invention, a container (101) also comprises a geometry shape that would traditionally be considered to create more than one undercut (107) and therefore removing the container from the mold after molding it would become challenging without temporarily or permanently altering or deforming the shape of the container. This is because the material of the mold used to create the shape of the container would become trapped within the container's geometry, not allowing for a straight pull opening action of the mold, as shown in Figure 1D.

10

In an embodiment of the present invention, a container (101) comprises a geometry where the interface (105) between the closure (106) and the container's geometry about the neck of the container can be selected from the non-limiting group consisting of concave, convex, linear, non-linear, or mixtures thereof. The specific shape of the interface geometry (105) can be defined to match the shape of the closure (106), allowing therefore the creation of an integrated look between the closure (106) and the container (101).

15

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In a further embodiment of the present invention, a container (101) comprises a non-linear geometry about a neck of the container and closure interface of the container. The curvature of the interface (105) allows having the container wrap around the closure (106) to enable a fully integrated desired design aesthetic. The portion of the container (101) that wraps around the closure (106) can be referred to as the container's shoulder (104).

25

In an embodiment of the present invention, a container (101) comprises a shoulder (104) geometry where the side of the shoulder wall having an interface (105) with the closure (106) has a positive draft angle of less than 10 degrees and in a further embodiment, there may be further reduction of the draft angle to less than 8 degrees and preferably even a further reduction of the draft angle to 5 degrees or less. This shoulder surface creates the interface (105) between the container (101) and the closure (106), once the closure (106) is assembled. Having a positive draft angle of less than 10 degrees is important for two main reasons:

30

- 1) Consumer acceptance - the smaller the draft angle, the smaller the space or gap (108) that will exist between the closure (106) and container (101) after the closure (106) is assembled. Large gaps are typically perceived by consumers as areas where water and product can accumulate, making the overall assembly be perceived as messy. In addition, a large gap can give consumers the perception that the closure and container are not fully integrated, making the overall package appear as a poor design. When such a gap (108) exceeds 7.4 mm distance from the shoulder surface (104) to the closure (106), the consumer also perceives an internal barrier for product flow.
- 2) Potential re-application of closure (106) across multiple container sizes – having a low draft angle on the container's vertical shoulder interface (105) wall enables using a closure (106) with a straight or low vertical draft angle. If the closure (106) has a low vertical draft angle, it can then be used not only with containers that have a shoulder (104) that cover this side of the closure, but also with containers that have a different shoulder design or even those that do not have a shoulder at all, where the closure's periphery is partially or fully exposed. Having the flexibility to use the same closure across different container designs creates scale, which typically reduces costs and logistic complexity.

In an embodiment of the present invention, a container (101) comprises a shoulder (104) geometry wherein the shape of the shoulder can be modified to mold containers of different volumetric sizes, while still being able to couple them with the same closure (106). Modifying the shape of the shoulder (104) to match with the same closure (106) creates scale which typically reduces costs, while allowing the overall assembly to maintain its fully integrated aesthetic look.

In a further embodiment of the present invention, a portion of a container body may have a physical geometry that creates at least one non-linear or more than one linear undercut. In an embodiment, a linear undercut may have a portion of the surface geometry such that the surface is within the same plane. In an embodiment of the present invention, a non-linear undercut can be defined by a portion of the surface geometry such that the surface exists in multiple planes.

In an embodiment of the present invention, a container (101) is made by a process selected from the non-limiting group consisting of extrusion blow molding (EBM), injection blow molding (IBM), injection stretch blow molding (ISBM) or mixtures thereof.

5 In an embodiment of the present invention, a container (101) comprises a shoulder (104) geometry that is integrated with a closure (106) and preferably the integration of this shoulder (104) geometry with this closure (106) completes a container silhouette.

10 In an embodiment of the present invention, a container (100) wherein the neck of the container may be at least partially encompassed by a portion of a container body.

In an embodiment of the present invention, a container (101) comprises a closure retention feature (103) wherein the container's retention feature (103) can be referred to as a "male component", as it protrudes from the container's outer neck finish, whilst the closure (106)
15 comprises the "female component", as it has a recessed area into which the container (101) will fit once assembled. In an embodiment of the present invention, a container (101)

In an embodiment of the present invention, a container (101) comprises a closure retention feature (103) wherein the container's retention feature (103) has a depth of less than
20 about 1.5mm from a tip of a bead to a base or outer diameter of a neck. Having this depth is important as it ensures that there will be enough engagement between the closure (106) and the container (101) to prevent the unintentional detachment of the closure from the container. In a different embodiment of the present invention, a container comprises a closure retention feature wherein the container's retention feature can be referred to as a "female component", as it has a
25 recession from the container's outer neck finish. The closure's retention feature can be referred to as a "male component", as it protrudes from the closure's finish and fits into the container once assembled. In an embodiment of the present invention, a container comprises a closure retention feature wherein the container's retention feature has a depth of less than about 1.5mm from an outer diameter of a neck to the base of the female retention feature. Having this depth is
30 important as it ensures that there will be enough engagement between the closure and the container to prevent the unintentional detachment of the closure from the container.

In a different embodiment of the present invention, a container (101) is comprised of a material selected from the non-limiting group consisting of polyolefins such as polyethylene (PE)

and polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), polylactic acid (PLA), polyethylene terephthalate (PET), or mixtures thereof. These are typical resins used in the manufacturing of blow molded containers. In one embodiment, the plastic resin material is the polyolefin high density polyethylene (HDPE). The plastic materials may be made from
5 petrochemical-sourced monomers or bio-sourced monomers.

In a further embodiment of the present invention, a container (101) comprises two standing surfaces (109) in container geometry. With this geometry, the molded article can be placed in multiple orientations, such as upright or inverted orientation. This geometry further
10 provides for a non-protruding closure (106) for the molded article.

In an embodiment of the present invention, a container (101) is removed from the molding cavity without permanently or temporarily deforming the molded container features. This is important because any type of deformation, being permanent or temporary, can lead to
15 affecting the feature's integrity.

In an embodiment of the present invention, a container (101) is comprised of a biodegradable polymer or mixture of biodegradable polymers.

In a further embodiment of the present invention, a container (101) is comprised of a
20 biodegradable polymer material selected from the non-limiting group consisting of polylactic acid (PLA), polyglycolic acid (PGA), polybutylene succinate (PBS), an aliphatic-aromatic copolyester based on terephthalic acid, an aromatic copolyester with a high terephthalic acid content, polyhydroxyalkanoate (PHA), thermoplastic starch (TPS), cellulose, or a mixture
25 thereof.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range
30 surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an

admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

5 While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

- 1) A container comprising:
 - a) a retention mechanism for attaching a closure to an opening or neck of a container;
 - b) a portion of a container body comprising a physical geometry that creates more than one undercut.
- 2) A container according to Claim 1 wherein the portion of the container comprises a geometry of the container about a neck of a container and a closure interface of the container which is selected from the group consisting of concave, convex, linear, non-linear, mixtures of linear and non-linear, or mixtures thereof.
- 3) A container according to Claim 2 wherein the portion of the container comprises a non-linear geometry about a neck of the container and a closure interface of the container.
- 4) A container according to Claim 1 wherein the container comprises a geometry wherein the vertical side of the shoulder that has an interface with a closure has a positive draft angle of less than 10 degrees.
- 5) A container according to Claim 1 wherein the neck of the container is at least partially encompassed by a portion of a container body.
- 6) A container according to Claim 1 wherein the shoulder geometry can be modified and molded to use a same closure across different volumetric sized containers.
- 7) A container according to Claim 1 wherein the container is made by a process selected from the group consisting of extrusion blow molding, injection blow molding, injection stretch blow molding and mixtures thereof.
- 8) A container according to Claim 1 wherein the shoulder geometry is integrated with a closure.

- 9) A container according to Claim 1 wherein the retention feature is a male component in an interface or attachment of a closure.
- 10) A container according to Claim 9 wherein the retention feature has a depth of less than about 1.5mm from a tip of the bead to a base or outer diameter of a neck.
- 11) A container according to Claim 1 wherein the retention feature is a female component in an interface or attachment of a closure.
- 12) A container according to Claim 11 wherein the retention feature has a depth of less than about 1.5mm from an outer diameter of the neck to the base of the female retention feature.
- 13) A container according to Claim 1 wherein the container is comprised of a material selected from the group consisting of polyolefins such as polyethylene (PE) and polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), polylactic acid (PLA), polyethylene terephthalate (PET), or mixtures thereof.
- 14) A container according to Claim 1 wherein the container comprises two standing surfaces in a container geometry.
- 15) A container according to Claim 1 wherein features of the container are not deformed temporarily or permanently during removal from the molding cavity.
- 16) A container, manufactured by the process described in Claim 7, which is composed of biodegradable polymers.
- 17) A container, manufactured by the process described in Claim 16, wherein the biodegradable polymer is selected from the group consisting of polylactic acid (PLA), polyglycolic acid (PGA), polybutylene succinate (PBS), an aliphatic-aromatic copolyester based on terephthalic acid, an aromatic copolyester with a high terephthalic acid content, polyhydroxyalkanoate (PHA), thermoplastic starch (TPS), cellulose, or a mixture thereof.

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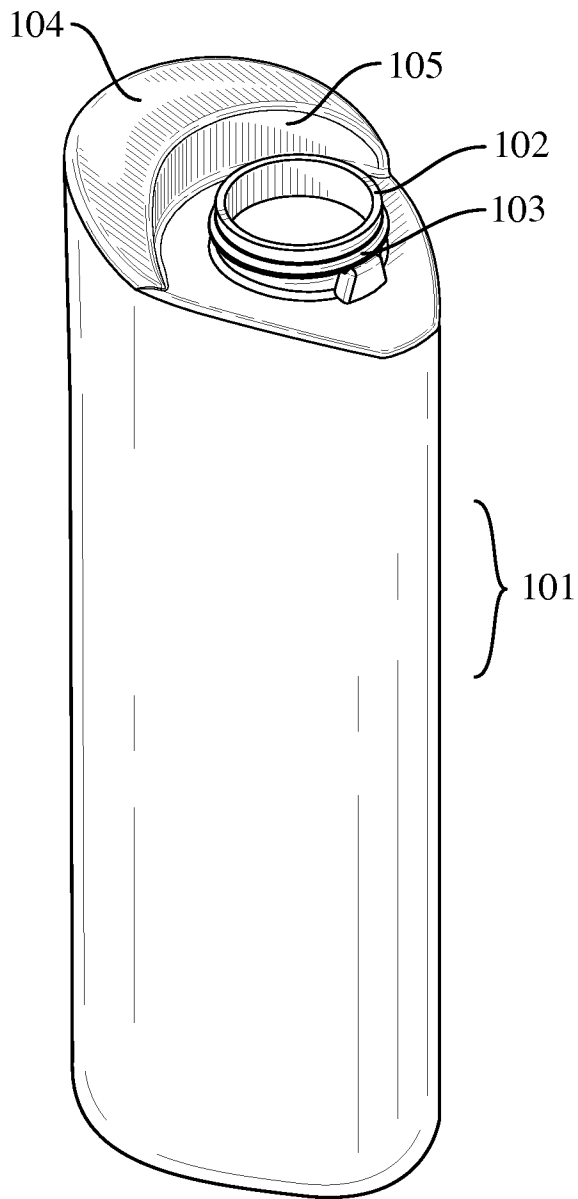


Fig. 1A

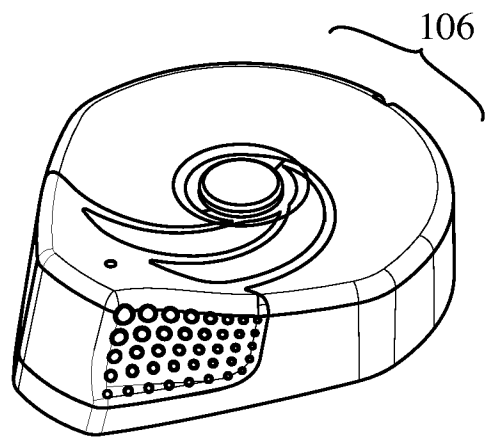


Fig. 1B

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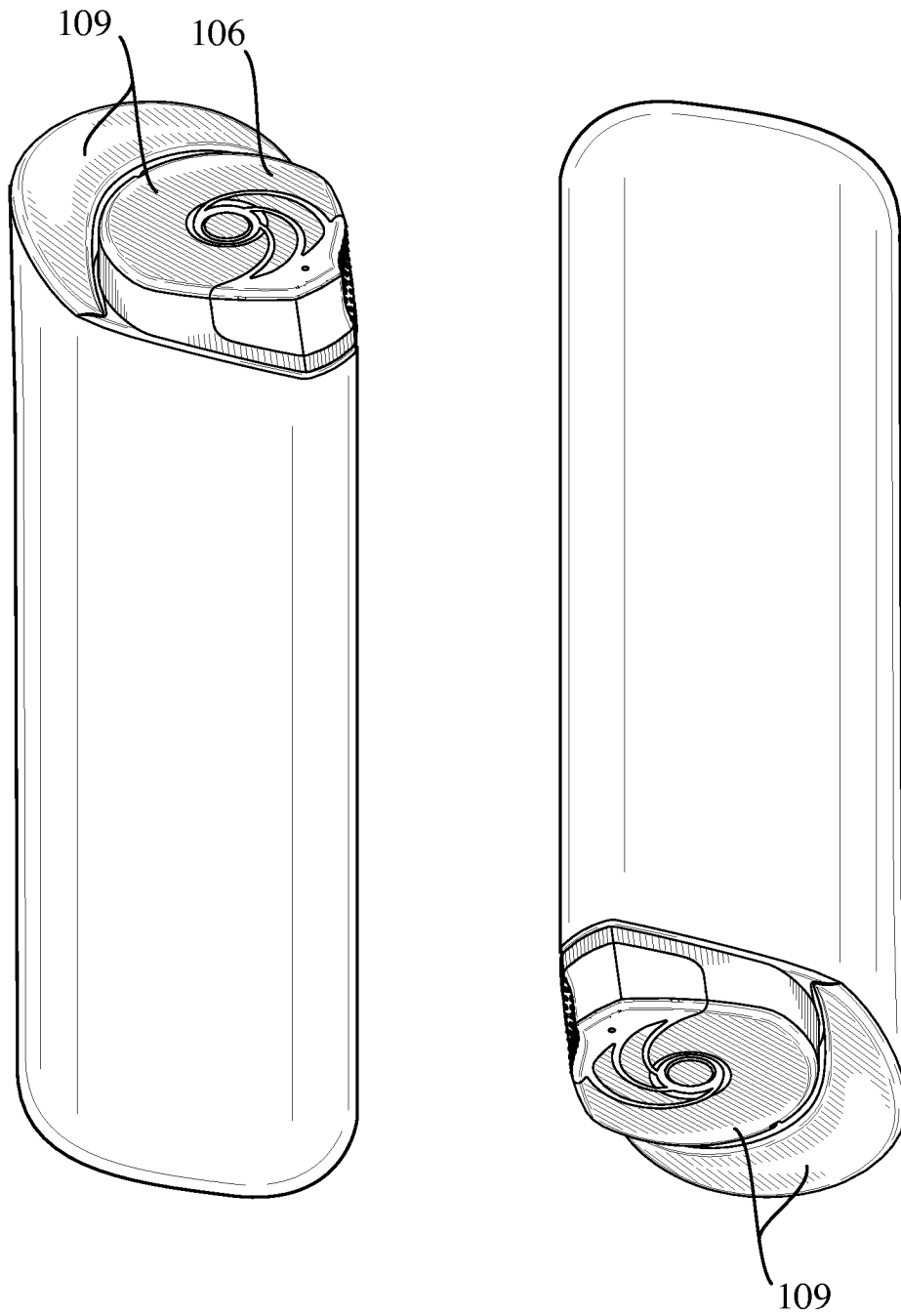


Fig. 1C

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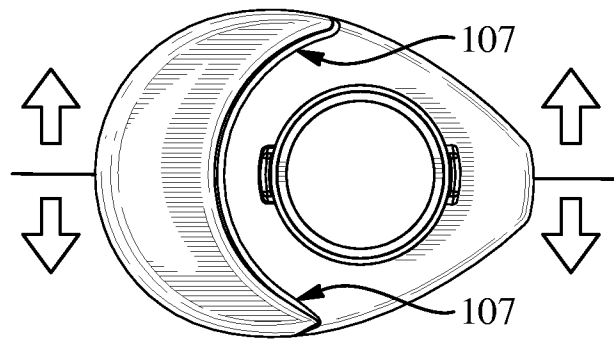


Fig. 1D

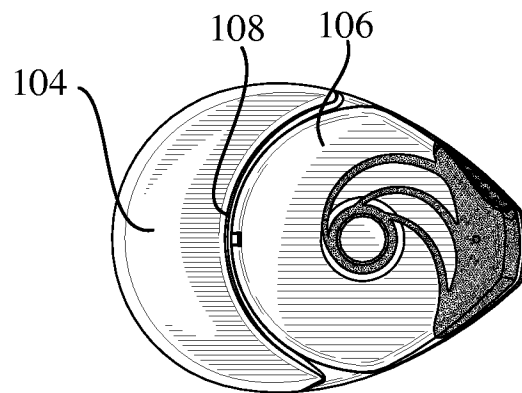


Fig. 1E

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/021238

A. CLASSIFICATION OF SUBJECT MATTER INV. B65D1/02 ADD.		
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) B65D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 290 094 B1 (ARNOLD JAY [US] ET AL) 18 September 2001 (2001-09-18) the whole document	1-15
X	----- EP 1 394 052 A1 (OREAL [FR]) 3 March 2004 (2004-03-03) the whole document & US 7 721 922 B2 (BALZEAU PASCAL [FR]) 25 May 2010 (2010-05-25)	1-15
X	----- US 6 041 975 A (FLAK FRANK [US]) 28 March 2000 (2000-03-28) the whole document	1-14
X	----- US 2010/308043 A1 (WIMMER THOMAS [DE]) 9 December 2010 (2010-12-09) paragraph [0019] - paragraph [0026]; figures ----- -/--	1-3,6,7, 9-13
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* 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 document 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 15 March 2012		Date of mailing of the international search report 23/03/2012
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Dederichs, August

INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 930 246 A1 (YOSHINO KOGYOSHO CO LTD [JP]) 11 June 2008 (2008-06-11) abstract; figures column 19 - column 32 -----	1,7,9-13
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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