



(51) International Patent Classification:

B65D 1/02 (2006.01) B65D 41/17 (2006.01)
B65D 41/04 (2006.01) B65D 47/08 (2006.01)

(21) International Application Number:

PCT/EP2024/057139

(22) International Filing Date:

18 March 2024 (18.03.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/454,389 24 March 2023 (24.03.2023) US
23172437.8 09 May 2023 (09.05.2023) EP

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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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))
- in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE

(54) Title: CLOSURE

(57) Abstract: A container comprising a closure, e.g., a bottle in combination with the closure. The closure includes an upper wall defining an opening and a cylindrical snap on pipe depending from the upper wall. The pipe includes threads designed to mate with threads on a neck of the bottle. The threads on the pipe and threads on the neck of the bottle pass over each other when the closure is snapped onto the bottle during manufacture. The pipe includes a resistance recess and a guidance recess. The resistance recess and the guidance recess accommodate a forcing element on a neck of the bottle and permit unscrewing of the closure. The walls of the resistance recess are preferably symmetrical. The bottle neck contains a transfer ring to facilitate injection mold manufacturing.



CLOSURE

Background of the Invention

5 Numerous personal care products are sold in plastic bottles. Examples of such products are body washes and shampoos. While dispensing of a body wash or hair care product from a bottle is convenient for the consumer, plastic bottles generally are disposed of after one use and sometimes undesirably find their way into landfills. Although plastic bottles are sometimes recycled, both transportation to the recycling facility and recycling
10 itself utilize energy. Accordingly, it would be preferable if the packaging were re-used instead of discarded after a single use.

 While some present commercial bottles could theoretically be re-used by consumers, the ease of doing so generally leaves something to be desired. For instance, it
15 may be difficult for a consumer to remove the closure sufficiently to facilitate access to the body of the bottle. This creates a considerable impediment to the goal of minimization of plastic usage and disposal. Therefore, there has been a need for a bottle having a closure which can readily be removed by the consumer. Moreover, it is important that the consumer be able easily to again secure the closure to the bottle once she has refilled the
20 container.

 Easy consumer access to the interior of the bottle is certainly desirable, but the bottle cannot be designed such that the closure will separate from the bottle too readily. Otherwise, product will be released from the container at inopportune times, such as
25 during transportation. Especially is this true for containers delivered via e-commerce since individually shipped containers cannot readily be packaged as securely as mass-shipped products. Also, the goal of a readily separable closure must be balanced with a competing goal, namely ease of placing the closure on the bottle during manufacture and attendant minimization of production costs.

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Various closure/bottle arrangements are described in the patent literature.

Jackel US Patent No. 8,365,933 discloses a closure system including a snap-on closure which can be pressed upon a spout wherein two interacting elements are shifted
5 by or over one another due to their flexibility. The closure can only be removed with difficulty in the strictly axial/vertical direction by exerting a certain force, but can be removed by a rotational motion which is said to be significantly easier to perform than the axial removal motion. The closure includes a recess in a cylindrical snap-on pipe which engages with a forcing element on the container shoulder. The sides of the recess are
10 designed so that the gradient at one point on one side is smaller than the gradient at the same point on the other side.

WO 2022/029017 A1 discloses a closure including an upper wall defining an opening and a cylindrical snap on pipe depending from the upper wall. The pipe includes
15 threads designed to mate with external threads on a neck of the bottle. The threads on the pipe and threads on the neck of the bottle pass over each other when the closure is snapped onto the bottle during manufacture. The pipe includes a resistance recess and a guidance recess. The resistance recess and the guidance recess accommodate a forcing element on a shoulder of the bottle and permit unscrewing of the closure. The walls of the
20 resistance recess are preferably symmetrical.

The cylindrical snap-on pipe thread may maintain its position below the container neck thread as the closure is rotated at least until the forcing element reaches a position beneath the second guidance recess wall. That is, the threads maintain their relative axial
25 positions until the forcing element reaches a position below at least the second guidance recess wall, at which point one or more interruptions in the threads permit them to pass each other and to release the closure from the bottle.

Contiero EP 1 982 770 is directed to a closing system comprising a container with
30 a neck and a closing body (closure). The closing body wall includes at least one protrusion that, when a tongue is seated in a seating portion, arranges circumferentially adjacent to a first circumferential stopping projection protruding from the bottle neck. Stopping

projections and the tongue are sized and arranged so that an interference configuration is attained by relative rotation between the bottle neck and the closing body.

5 Scott et al. US Patent No. 9,850,040 discloses a container including a circumferential flange extending radially outwardly from the neck, the flange including a plurality of spaced flange tabs. A neck engaging member, which can be a cap, includes a raised snap bead, a notch and a raised stop member, which cooperate with the flange tabs to create a snap fit engagement between the neck and the neck engaging member. See also, EP2921232.

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Surin US Patent No. 10,722,911 is directed to a unit for dispensing a fluid product, including a reservoir, a system for dispensing the product, and a device for fixing the dispensing system in the reservoir, the fixing device consisting of a single part having securing means on the neck of the reservoir, actuated by an axial translational movement, and disconnection means with respect to the neck of the reservoir actuated by a rotational movement.

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The neck of the '911 reservoir includes at least one radial projection and has an annular edge around the upper opening. The fixing device comprises a skirt having an annular ring engaging with the annular edge of the neck for the snap fitting of the fixing device on the neck of the reservoir, wherein the skirt also has at least one ramp engaging with the radial projection to unscrew the fixing device with respect to the neck of the reservoir.

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25 WO2022/167540 discloses a latch element and a support ring. See., e.g., Fig. 7.

Suffa US 2004/0245204 discloses a sealing cap for a bottle neck having a snap on projection and an alignment projection.

30 Miota et al. US Patent No. 7958703 discloses a closure which includes a plurality of axially extending collar segments (70), each of which has an engagement end. An engagement face (74) on at least one of the closure collar segments is present to engage

the front face (48) of a container flange segment to establish a positive orientation of the closure at a predetermined position of rotation. The closure further includes a closure displacing structure (132) located at the engagement end of one of the collar segments and having a surface slanted relative to the axis of rotation of the closure to engage the flange segment front face (48) at an angle at the axially outward end of the cap and thereby displace the closure axially outwardly relative to the container as the closure is rotated.

The container includes at least one circumferentially oriented flange segment (44) that extends less than 360 degrees and has a starting end defined by a front face and a termination end defined by a back face. A gap (60) is defined by the front face of one of the flange segments and the back face of one of the flange segments.

Additional references related to some of the above include EP3753635,

The WO 2022/029017 solution above works well for extrusion blow molded bottles, but there is a need for further improvements for use with injection blow molded bottles or injection stretch blow molded bottles.

20 Summary of the Invention

The present invention is directed to an improved bottle with a snap-on/twist off closure, particularly suitable for use with injection blow molded bottles, such as those made from polyethylene terephthalate. The closure can be readily and conveniently snapped onto the bottle during manufacture, yet easily twisted off by consumers. It is very durable, as can be seen in the standard industry drop test. The invention is also directed to a bottle adapted for use with the closure, especially an injection molded PET bottle or an injection stretch blow molded bottle.

The bottle of the invention comprises a reservoir, one or more walls forming a bottle neck, a forcing element projecting outwardly from at least one of the walls of the bottle neck, and preferably a shoulder above the reservoir and below the bottle neck. The

forcing element is preferably spaced from the shoulder. The wall or walls of the bottle neck include an annular transfer ring, the one or more forcing elements extending outwardly beyond the transfer ring and the one or more forcing elements being disposed above the transfer ring.

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The closure used in the invention preferably includes a cover and a base. The base comprises an upper wall defining an opening, and a cylindrical snap-on pipe depending from the upper wall and extending vertically/axially to a bottom pipe end. The cylindrical snap-on pipe includes threads or other fasteners, preferably on an inner wall, designed to mate with threads or other fasteners, preferably external, on a neck of the bottle. The closure base is snap fit onto the bottle neck whereby the thread(s) of the cylindrical snap-on pipe passes over and temporarily locks beneath the thread(s) of the container neck. Although the threads may be arranged either so that they are internal to the snap-on pipe and external to the neck of the bottle, or external to the snap-on pipe and internal to the neck of the container, the invention will be described using the internal snap on pipe thread/external bottle neck thread embodiment.

The closure cylindrical snap-on pipe includes at its bottom end at least one resistance recess and at least one guidance recess. The resistance and guidance recesses play roles in the unscrewing of the closure whereby it can be easily removed for refilling. The resistance recess includes opposing first and second walls defined by the cylindrical snap-on pipe. Preferably the gradients of the walls are essentially the same at each point lying at the same axial vertical height. That is, preferably the first and second resistance recess walls are essentially symmetrical. Alternatively, the resistance recess walls have gradients wherein the gradient of one of the walls is smaller at least at one point than the gradient on the other wall at a point lying at the same axial/vertical height.

Use of symmetric first and second resistance walls is advantageous in that they are more easily manufactured than walls having varying angles.

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When the closure is closed, a forcing element from the container is at least partially accommodated within the resistance recess. In the embodiment with symmetric resistance

recess walls, threads on the snap on pipe and mating threads on the bottle neck are disposed at an angle (or angles) which facilitates rotating the closure in the opening direction from the closed position and inhibits turning the closure in the opposite direction from the closed position. In the embodiment with an asymmetric recess, the resistance

5 recess wall with the higher gradient contacts a forcing element wall with a steep gradient, which resists turning of the closure in one (non-opening/screwing closed/closure securing) direction, usually the clockwise direction. This feature may also be used in combination with the thread angles to resist rotation from the closed position.

10 In both embodiments, when the closure is turned in the opposite, or opening/unscrewing/closure removal direction, contact between the opposite wall of the resistance recess and the forcing element forces the closure slightly upwardly. In the case of the asymmetric resistance recess, such opposite wall will have a gentler gradient compared to the wall encountered in the closing direction. Likewise, the forcing element

15 wall which contacts the resistance recess wall in the opening direction may have a gentler gradient than the opposite forcing element wall. In the case of the symmetric resistance recess walls, the gradients of each resistance recess wall will be the same and the gradients of the forward and rear forcing element walls may be the same.

20 During this initial rotation, the thread(s) on the cylindrical snap-on pipe maintain its/their position below the thread(s) of the container neck as the closure travels axially upwardly relative to the container neck. The presence of the bottle neck thread above the snap-on pipe thread keeps the closure associated with the bottle at this point and prevents its premature removal. The axial motion results from the fact that the threads are angled;

25 the net result of the angled rotational movement is axial movement.

Upon further turning of the closure in the counterclockwise or unscrewing/opening direction, after encountering the trailing end of the resistance recess, the forcing element on the bottle encounters the bottom rim of the snap-on pipe and then enters the guidance

30 recess. By "encounters" it is meant that the forcing element will at least be adjacent to, if not touching, the mentioned component. During rotation of the closure in the unscrewing/opening direction, the guidance recess first extends upwardly from the bottom

end to permit lowering of the cylindrical snap-on pipe relative to the container neck while the mating threads on the closure cylindrical snap-on pipe and container neck contact each other but maintain their positions with the bottle thread above the snap on pipe thread. Thereafter, with the cylindrical snap-on pipe and neck threads still in engagement,
5 as the closure is rotated further in the unscrewing/opening/closure removal direction, the guidance recess includes a gradual downward gradient toward the bottom end of the cylindrical snap-on pipe.

The downward gradient of the guidance recess, and relative upward motion of the
10 closure consistent with the gradients of the matching threads on the container neck and skirt, provides guidance and offers minimal resistance to turning of the closure in the unscrewing/opening direction. The consumer can continue turning the closure with minimal resistance whereby to eventually remove the closure. The presence of the guidance recess also facilitates the reverse process wherein the consumer rotates the
15 closure in the closing, usually clockwise, direction after having refilled the bottle. It is believed that without the guidance recess the bottom of the snap-on pipe would inhibit engagement of the threads upon screwing-on of the closure. In the closure opening direction, eventually, the closure is unscrewed to a point where there is an interruption in one or both of the threads, which permits the threads to pass each other and releases the
20 closure from the bottle.

The forcing element does not need to touch the guidance recess walls; the guidance recess provides space for movement of the forcing element as the closure rotates consistent with the angle of the bottle neck and snap-on pipe threads.
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The closure may include a closing element which contacts and/or covers the top wall of the closure base to seal the closure opening, but which can be removed from the opening to dispense the product. Preferably the closing element remains associated with the closure base when removed to dispense the product, e.g., as the result of a hinge or
30 other attachment.

The bottom rim of the snap-on pipe extending between the resistance recess and the guidance recess is preferably at least 2mm and is up to 5mm, especially from 2 to 4 mm, in length whereby to maximize durability of the closure, including promoting a good, comfortably tight, fit of the closure on the bottle over a prolonged period of use. The upwardly extending wall of the guidance recess (in the closure opening direction) preferably has a gradient within the range of 90 and 150 degrees, especially 90 to 135 degrees, to a horizontal line drawn through the bottom rim and then the guidance recess has a downwardly extending wall at a less severe gradient of within the range of 0 to 10 degrees, especially 4 to 10 degrees relative to a horizontal line drawn through the intersection of the downwardly extending guidance recess wall and the pipe bottom.

The invention permits secure placement of a closure on the bottle neck during manufacture yet easy removal of the closure from, and re-application of the closure to, the bottle by the consumer, thereby encouraging removal of the closure to refill the container. The closure is durable, e.g., is resistant to wear and tear. The symmetric embodiment of the resistance recess walls is easier to manufacture than the prior asymmetric version. Placement of the forcing element on the neck of the bottle and above the transfer ring facilitates use of the invention in bottles which are made by injection blow molding, particularly PET bottles. Preferably, the forcing element extends outwardly beyond the transfer ring, and preferably the one or more forcing elements are disposed above the transfer ring.

It will be apparent that changes such as the directions of screwing/unscrewing and the locations of the threads may require adjustments in the locations and shape of the resistance and guidance recesses.

As will be seen, features of the invention include one or more of the following:

- A closure comprising
- a. an upper wall defining an opening;
 - b. a cylindrical snap-on pipe depending from the upper wall and extending axially to a bottom end;

- c. the cylindrical snap-on pipe including at least one resistance recess at the bottom end thereof;
- d. a cylindrical snap-on pipe further including at least one thread;
- e. a cylindrical snap-on pipe defining opposing first and second walls of a resistance recess;
- 5 f. the bottom end of a cylindrical snap-on pipe being shaped to include a guidance recess consistent with lowering the cylindrical snap-on pipe thread relative to a container neck;
- g. a closure being configured such that a guidance recess includes a first guidance recess wall with an upward gradient and a second guidance recess wall having a downward gradient whereby in a closure opening direction of rotation the first guidance recess wall permits the cylindrical snap-on pipe axially to be lowered toward the container neck having a forcing element and the second wall being consistent with the closure cylindrical snap-on pipe being raised relative to the container; and the thread on the snap-on pipe maintains its axial position relative to a thread on a bottle neck to which the closure is being applied when the forcing element contacts one of said resistance recess walls at least until the forcing element reaches a position beneath the second guidance recess wall and/or
- 10 a closure including a closing cover for closing the opening, the closing cover being hingedly attached to a closure base of the closure;
- a closure wherein in the direction of rotation to unscrew the closure, after encountering the resistance recess the forcing element is accommodated within the guidance recess and is beneath the first guidance recess wall and then the second guidance recess wall;
- 15 a closure wherein when the forcing element reaches a position below the first guidance recess wall the cylindrical snap-on pipe thread and the container thread maintain their relative axial positions with the container thread above the snap on pipe thread;
- a closure wherein the first and second resistance recess walls have gradients, and wherein the gradients of the first and second resistance recess walls are essentially the same at any point lying at the same axial height;
- 20
- 25
- 30

- a closure wherein the distance between the resistance recess and the guidance recess in the unscrewing direction is at least 2mm;
- a closure wherein the distance between the resistance recess and the guidance recess in the unscrewing direction is from 2mm up to 5mm;
- 5 a closure wherein the distance between the resistance recess and the guidance recess in the unscrewing direction is from 2mm up to 4mm;
- a closure wherein the first guidance recess wall has a gradient of from 90 to 150 degrees;
- a closure wherein the first guidance recess wall has a gradient of from 90 to 135 degrees;
- a closure wherein the second guidance recess wall has a gradient of from 0 to 10;
- 10 a container comprising a combined closure and bottle, which includes a closure and a bottle having a shoulder and one or more walls forming a bottle neck and including at least one forcing element;
- a container with a closure including an upper wall defining an opening;
- a container with a closure including a cylindrical snap-on pipe depending from the upper wall and extending axially to a bottom end,
- 15 a container with a closure including the cylindrical snap-on pipe including at least one resistance recess therein extending to the bottom end;
- a container with a closure including the cylindrical snap-on pipe further including one or more threads;
- 20 a container with a closure including the cylindrical snap-on pipe defining opposing first and second walls of the resistance recess;
- a container with a closure including the bottom end of the cylindrical snap-on pipe being shaped to include a guidance recess consistent with lowering and raising the cylindrical snap-on pipe threads relative to the bottle neck;
- 25 a bottle including a forcing element projecting outwardly from a wall of the bottle neck; the forcing element being spaced from the bottle shoulder; the bottle neck having one or more threads; the at least one bottle forcing element on the bottle being adapted to be at least partly received within the resistance recess of the closure cylindrical snap-on pipe;
- 30 the guidance recess includes a first wall with an upward gradient and a second wall having a downward gradient whereby in a closure opening direction of rotation the first guidance recess wall permits the cylindrical snap-on pipe axially to be lowered toward the forcing

- element on the bottle and the second guidance recess wall being consistent with the closure cylindrical snap-on pipe being raised relative to the closing element;
the snap-on pipe thread and the bottle neck thread maintaining their relative axial positions with the bottle neck thread above the snap on pipe thread when the forcing
- 5 element contacts the resistance recess wall at least until the forcing element reaches a position beneath the second guidance recess wall;
- a container comprising an interruption in one or more of the snap on pipe thread and the bottle thread and wherein after a forcing element reaches a position below the second guidance recess wall the cylindrical snap-on pipe thread passes the bottle
- 10 thread through the one or more interruptions thereby releasing the closure from the bottle;
- a container wherein the first and second resistance recess walls have gradients wherein the gradient of each of the resistance recess walls are essentially the same at each point lying at the same axial height;
- 15 a container wherein the snap-on thread is on an inner wall thereof;
- a container wherein the snap-on thread is on an inner wall thereof and the bottle neck thread is external to the bottle neck;
- a container wherein the wall or walls of the bottle neck includes an annular transfer ring;
- a container wherein the forcing element extending outwardly beyond the transfer ring;
- 20 a container wherein the one or more forcing elements are disposed above the transfer ring;
- a container comprising a bottle, the bottle including a shoulder and one or more walls forming a bottle neck and including at least one forcing element;
- a container having a forcing element projecting outwardly from at least one of the
- 25 walls of the bottle neck;
- a container having a forcing element spaced from the shoulder;
- a container wherein the wall or walls of the bottle neck include an annular transfer ring;
- a container having a forcing element extending outwardly beyond a transfer ring;
- 30 a container having one or more forcing elements disposed above the transfer ring;
- A container wherein the transfer ring is spaced from and above the shoulder.

For a more complete understanding of the above and other features and advantages of the invention, reference should be made to the following detailed description of preferred embodiments and to the accompanying drawings.

5

Brief Descriptions of the Drawings

Fig. 1 is a side elevational view of the bottle and closure of the invention with the closure in cross section.

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Fig. 2 is a front elevational view of a bottle of the invention and showing the closure base above it in cross section with the closing cover removed.

Fig. 3 is a perspective view from above of the bottle and closure according to the invention with the closure removed and the closure cover in the open position.

15

Fig. 4 is a bottom plan view of the closure of Fig. 3.

Fig. 5 is a side elevation of the package of the invention with the closure partly rotated in the unscrewing/opening/closure removal direction with portions of the closure broken away to reveal the cylindrical snap-on pipe and with a portion of the snap on pipe on the left removed to show a portion of the bottle neck.

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Fig. 6 is a partial cross section of the closure with portions of the closure broken away and with the closure removed from the bottle.

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Fig 7 is a side elevational view of the closure with portions broken away in the fully closed position on the bottle.

Fig. 8 is a side elevational view of an upper portion of the container with portions of the closure broken away and with the closure in the process of being opened with the forcing element within the guidance recess, for the embodiment wherein the resistance

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recess has asymmetrical walls and with a portion of the snap on pipe on the left removed to show a portion of the bottle neck.

Fig. 9 is a partial cross section of the closure with portions broken away with the
5 closure removed from the bottle, for the embodiment wherein the resistance recess has asymmetrical walls.

Fig. 10 is a side elevational view of the closure with portions broken away in the
10 fully closed position on the bottle for the embodiment wherein the resistance recess has asymmetrical walls.

Fig. 11 is a cross section through the closure with the cover attached, for the
embodiment wherein the resistance recess walls are asymmetric.

15 Detailed Description of the Invention

As seen in Figs. 1-3, bottle 20 includes reservoir 21, shoulder 27, and neck 32. Neck 32 extends upwardly from its base 18 to a circular ridge 51 surrounding a mouth 53. Neck 32 includes the base 18, transfer ring 59, forcing element 50, thread 60, the ridge
20 51 and mouth 53. Transfer ring 59 is spaced vertically from the base 18, which intersects with shoulder 27. Ridge 51 can be utilized for holding the preform plastic prior to injection blow molding. Forcing elements play a role in securing the closure to the bottle and opening the closure, as will be explained below, and also serve to prevent rotation during manufacture of the bottle, to ensure precise placement of the closure on the bottle.
25 Transfer ring 59 will provide a support on which the preform can sit when the body of the preform is inserted into the mold during injection blow molding.

Closure 22 sits on bottle 20 (e.g., Figs. 1 and 2). Closure 22 includes closure base
24 connected to closing cover 26 by hinge 28, although other possible arrangements will
30 be apparent to one of ordinary skill in the art. Closure base 24 includes generally cylindrical snap-on pipe 30, best seen in Figs. 1 and 2, depending downwardly from upper wall 25. Cylindrical snap-on pipe 30 is positioned to engage neck 32 of bottle 20. The

inner wall of cylindrical snap-on pipe 30 includes one or more internal threads 34, which protrude inwardly.

Closure base 24 includes a dispensing opening 36 (Fig. 3) centrally disposed
5 within upper wall 25. Although opening 36 is illustrated and described as being centrally disposed, it may be off-center if desired. Structure may be provided above and/or below opening 36 to assist with pouring or sealing, such as ring 38. When closure base 24 is positioned on bottle 20, opening 36 is in communication with the interior of bottle 20 through the interior of snap-on pipe 30 and exterior closure base wall 23. Closing cover 26
10 includes plug 40 to assist in sealing the closure and ultimately the bottle.

Neck 32 of bottle 20 includes external threaded protrusion 60.

As best seen in Figs. 5-7, cylindrical snap-on pipe 30 includes resistance recess
15 42 extending upwardly from bottom end or rim 43. Rim 43 typically extends perpendicularly to the downwardly extending axis of the pipe. A second resistance recess 42a may be present 180° removed from resistance recess 42, as seen in Fig. 11. Fig. 11 illustrates an asymmetric resistance recess (walls with different gradients) but is otherwise equally applicable to the symmetric resistance recess 42 seen in Fig. 5.

20 Resistance recess 42 of Figs. 5-7 includes two walls 44, 46 formed in cylindrical snap-on pipe 30. As will be discussed below, in one embodiment, that of e.g., Figs. 5-7, the walls of the resistance recess are symmetrical. In another, seen particularly in Figs. 8-11, the walls are asymmetrical. In the latter embodiment, the shape of walls 44c, 46c will
25 depend upon the direction which it is desired to have the closure rotate in order to release it from the bottle so that it can be removed.

Typically, closures are unscrewed/opened/removed by turning counterclockwise, so for the purpose of the present description counterclockwise unscrewing/opening will be
30 assumed. However, it will be apparent that a different direction could be used if desired and the shapes of walls 44c, 46c, and the location of guidance recess 70 will be adjusted accordingly.

As best seen in Fig. 7, when the closure is in the closed position, resistance recess 42 receives at least part of forcing element 50, which is the protrusion extending outwardly from bottle neck 32. The bottle may have one or more forcing elements, such as the two
5 shown at 180 degrees positions in Fig. 2.

In accordance with one of the embodiments, the trailing resistance recess wall during unscrewing/opening rotation, illustrated as 44c in the embodiment shown in Fig. 9, includes at its lower end 45c a gradient which is more gradual than that of the opposite
10 (leading) recess wall 46c; the gradient at the lower end of resistance recess wall 46c is more severe or steep. In this asymmetric resistance recess walls embodiment as well as the below described symmetric recess wall embodiment, the forcing element (50c for the asymmetric version in Fig. 10) also may include at least two oblique side walls 54c, 52c of different gradients as seen in Fig. 10. Or they may be the same, as illustrated in Fig. 7.
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In accordance with the preferred embodiment, as illustrated e.g., in Figs. 6, 7, the walls of the resistance recess can also be symmetrical or essentially symmetrical. As mentioned above, resistance recess 42 includes leading wall 46 and trailing wall 44. These walls are symmetrical, mirror images of each other so that the gradients of the walls
20 are the same at each point lying at the same axial vertical height. Similarly, walls 54 and 52 of forcing element 50 (Fig. 1, 7) are illustrated as symmetrical or essentially symmetrical, although if desired these may be asymmetric even where the resistance recess walls are symmetric.

The symmetric recess wall embodiment (Fig. 6) operates in the same way as the asymmetric recess wall embodiment, except that neither recess wall 44 nor 46 includes a steep gradient which prevents rotation of the closure. Rather, this embodiment relies primarily on the angles of the threads on the snap-on pipe and the bottle neck to prevent or substantially impede rotation of the closure in the closing direction from the position
30 shown in Fig.7.

Describing the closure opening operation in more detail, for the asymmetric embodiment shown in Figs. 8-10, starting from the initially closed position shown in figure 10, if the closure is rotated in the clockwise direction as the consumer turns it, a steep gradient of forcing element side wall 52c faces a steep gradient on resistance recess wall 46c and prevents rotation. On the other hand, upon rotation of the closure in the counterclockwise direction from the initially closed position, side wall 54c of the forcing element faces resistance recess wall 44c which has a gentler gradient at least in its lower half, e.g., at 45c, proximate its base. Side wall 54c may also have a gentler gradient if desired as illustrated in Fig. 10. The effect of this contact between the forcing element and wall 44c having the gentler gradient is that, instead of prevention of rotation, which occurs with the steeper gradients, the forcing element 50c forces the walls of the resistance recess and the depending cylindrical snap-on pipe 30 slightly upwardly. Rotation of the closure in the opening direction results in an axial upwardly movement of the closure also from the angles of the bottle neck and snap-on pipe threads.

For the symmetric embodiment of Fig. 7, upon rotation of the closure in the counterclockwise direction from the initially closed position, side wall 54 of the forcing element 50 faces resistance recess wall 44. The gradients of the walls of the forcing element and the trailing resistance recess wall are such that the forcing element 50 forces the wall 44 of the resistance recess and the depending cylindrical snap-on pipe 30 slightly upwardly. Again, here, continued rotation in the opening direction carries with it an axially upward component resulting from the angles of the bottle neck and snap-on pipe threads.

For both the symmetric and asymmetric resistance recess wall embodiments, there may desirably be a relationship between the gradients of the resistance recess walls and the walls of the forcing elements. The smaller, gentler gradient at 45c (Fig. 9) of the trailing asymmetric resistance recess wall 44c, and the gradient of symmetric wall 44 (Figs. 6, 7) are similar or identical to the gradients of corresponding side walls 54c, 54 of the forcing elements of the bottle, which face resistance recess walls 44c, 44 during unscrewing/opening.

The gradient of wall of 44c at section 45c is preferably within the range of between 10 degrees more and 10 degrees less than that of wall 54c (Fig. 10). The gradient of wall 44, at least where it will contact forcing element 50, is within the range of between 10

degrees more and 10 degrees less than that of wall 54. Thus, if wall 54c is 45 degrees, wall 44c at section 45c is within the range of from 35 degrees to 55 degrees. If wall 54 is 45 degrees, the gradient of wall 44 where it will contact wall 54 is within the range of from 35 degrees to 55 degrees. Each of walls 44c and 44 and 54, 54c is within the range of
5 between 30 and 85 degrees.

The gradient of wall 44c at section 45c, and the gradient of wall 44 at the point at which it contacts the forcing element, are measured relative to a horizontal line drawn through rim section 56, which extends along the bottom of the snap on pipe between the trailing end of the resistance recess and the first (in the closure opening direction),
10 upwardly extending wall of the guidance recess. The gradients of walls 54c, 54 are measured at the point at which they first contact walls 44c, 44 respectively upon rotation and are measured with respect to a horizontal line intersecting the point of contact with walls 44c, 44, the line being parallel to, or coincident with, bottom rim section 56.

Further counterclockwise rotation of closure 22 during removal of the closure by
15 the consumer will result in forcing element 50c or 50 clearing resistance recess wall 44c or 44, and the top 58 of the forcing element contacting section 56 of bottom rim 43 of the cylindrical snap-on pipe. Upon still further unscrewing/opening, counterclockwise, rotation of closure 22, top 58 of forcing element 50c or 50 encounters guidance recess 70, seen e.g., in Figs. 5, 7, and 8. Fig. 8 shows forcing element 50c beneath the guidance recess
20 after the snap on pipe has been turned past rim section 56 in the opening position.

Guidance recess 70 includes an upwardly extending wall 72 at a gradient within the range of 90 and 150 degrees, preferably within the range of 90 and 135 degrees, to a horizontal line drawn through section 56 of the bottom rim, and then a downwardly
25 extending wall 74 at a less severe gradient of within the range of 0 to 10 degrees, especially 4 to 10 degrees, relative to a horizontal line drawn through the intersection 75 of wall 74 (Fig. 5) and pipe bottom 43. Top wall 58 of forcing elements 50c and 50 preferably do not touch the first and second guidance walls during rotation. Rather, the guidance recess permits free rotation of snap-on pipe 30 consistent with the pitch of the
30 bottle neck and snap-on pipe threads during which forcing element 50c or 50 is accommodated within the space of the guidance recess.

The distance between resistance recess 42c or 42 and the guidance recess 70 is measured along bottom rim section 56 from the point at which wall 44c or 44 merges with snap-on pipe bottom end or rim 43 to the point at which guidance recess wall 70 begins to ascend at the beginning of wall 72. The distance between the resistance recess and the
5 guidance recess in the unscrewing/opening direction is preferably at least 3mm. The distance is typically from 2mm up to 5mm, especially from 2mm to 4mm.

The presence of the guidance recess in addition to the resistance recess also
10 facilitates rotation of the closure in the opposite, closing, direction, which is generally clockwise. When the closure is rotated in the clockwise, closing direction, at point 75 (Fig. 5), forcing element 50c or 50 will be beneath gradually upwardly sloping wall 74 of guidance recess 70, then beneath the steeper, downward slope of wall 72, then will contact rim 43 at section 56 and finally will be disposed between resistance recess walls
15 44c or 44 and 46c or 46 in the closed position, as seen in Figs. 7 and 10.

In operation, typically the bottle will be made using injection blow molding. The presence of transfer ring 59 facilitates manufacture of the bottle, especially by supporting the preform in the mold for the injection blow molding. During assembly of the package,
20 closure 22 is snap fit onto neck 32 (e.g., Fig. 2) of bottle 20 by pressing of closure 22 axially downwardly (or bottle 20 being pressed axially upwardly, or both). Since the bottle body and the closure are made of a flexible material and/or because the presence of one or more recesses in the snap-on pipe permits the cylindrical snap-on pipe 30 to expand resiliently radially, the internal thread 34 on the cylindrical snap-on pipe passes over the
25 external thread 60 on the container neck and the closure snaps onto the neck. Forcing elements 50c, 50, will be received within their respective resistance recesses. Thus, the closure is securely attached to the container and a substantial amount of effort would be needed for the consumer or other external force to separate them using a strictly vertical or upward axial motion. Alternatively, closure 22 may initially be applied onto container 20
30 by being rotated on, to engage the threads.

In normal use, the product is dispensed with cover 26 removed from opening 36. Cover 26 is then closed so that plug 40 seals the opening when the product is not in use.

When the bottle is substantially empty of the shampoo, body wash, lotion or other
5 product originally contained within, the consumer removes closure 22 from the package to facilitate refilling and reusing it. To initiate removal of the closure, the consumer rotates it, typically in the counterclockwise direction, starting from the position shown in Fig. 7 or Fig. 10 wherein forcing element 50c or 50 is at least partly accommodated within resistance recess 42c or 42. Forcing element 50c or 50 forces closure 22 slightly upwardly upon
10 closure rotation as described above. Cylindrical snap-on pipe thread 34 maintains its position below container neck thread 60 as the closure is rotated at least until the forcing element reaches a position beneath the guidance recess wall 72, preferably until the forcing element reaches a position beyond the position beneath the second guidance recess wall. That is, the threads maintain their relative axial positions until the forcing
15 element reaches such positions, at which point one or more interruptions in the threads permit them to pass each other and to release the closure from the bottle. During rotation, the angle of the bottle neck and snap-on pipe threads results in an axial upward component to movement of the closure.

20 Returning more specifically to the interaction between the forcing element and the snap on pipe, after passing the resistance recess, forcing element 50c or 50 next encounters section 56 of bottom rim 43 of the cylindrical snap-on pipe and then further rotation of the closure/snap-on pipe brings the forcing element below upwardly extending wall 72 of guidance recess 70. Wall 72 permits the cylindrical snap-on pipe axially to
25 lower itself toward the container neck and accommodates the forcing element so that it does not interfere with rotation of the snap-on pipe. Cylindrical snap-on pipe thread 34 remains below bottle thread 60 whereby the closure is still retained on the bottle and the consumer can continue to use a normal rotation to unscrew the closure from the container
30 neck.

Fig. 8 shows forcing element 50c within recess 70. In the alternative (symmetric resistance recess walls) embodiment, forcing element 50 would likewise be

accommodated within recess 70. Preferably forcing elements 50c, 50 do not touch first and second guidance recess walls but are accommodated within the recess as the snap-on pipe/closure rotates. Alternatively, this unscrewing rotation may optionally be further facilitated by forcing element top 58 to contact downwardly extending wall 74 of guidance recess 70. Optional contact by the top 58 with downwardly extending wall 74 may raise the closure cylindrical snap-on pipe to support the normal unscrewing action of the closure, whereby the closure is easily removed. The pitch of the snap on pipe and bottle neck threads is similar to the gradient of wall 74, namely 0 to 10 degrees, especially 4 to 10 degrees. Typically, the threads will be at an angle within 10% of that of guidance recess wall 74.

At some point in the opening rotation, preferably after the forcing element is beyond a location beneath the second guidance recess wall, interruptions in one or both of the snap on pipe threads and bottle neck threads will permit the snap on pipe thread to pass the bottle neck thread whereby the closure is released from the bottle. Typically this will happen further into rotation in the opening direction than the position shown for forcing element 50 in Fig. 5, e.g. forcing element 50 will be closer to, preferably beyond, point 75. Removal is also facilitated by the flexible material of which the closure is made.

With the closure removed, the consumer then can refill the bottle with the shampoo or other product. She then applies the closure back onto the bottle either by snapping the closure downwardly over the bottle neck in an axial direction similar to that used in manufacture, or she screws the closure back on to the bottle neck. If she chooses the latter, the clockwise-moving rim 43 of pipe 30 optionally contacts top 58 of the forcing element (50c or 50). When it reaches point 75 (Fig. 5), it is preferably below gradually ascending wall 74 which permits lowering of the pipe relative to the bottle neck consistent with the normal screwing downwardly of a closure. At this point, the threads have engaged.

The forward (in the closing direction) and/or top wall of the forcing element is then preferably below wall 72 of guidance recess 70 which accommodates raising of pipe 30 relative to bottle neck 32 and the top 58 of forcing element 50c or 50 then optionally contacts section 56 of rim 43. Upon further rotation of the snap-on pipe, the forcing

element reaches resistance recess wall 44c or 44, and pipe 30 moves downwardly as forcing element 50c or 50 is accommodated within recess 42c or 42. As the consumer rotates the closure closed, internal thread 34 of pipe 30 maintains its position below external thread 60 on bottle neck 32, thereby keeping the closure attached to the bottle.

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In the asymmetric option, as shown e.g., in Fig. 10, when forcing element wall 52c encounters steep wall 46c of resistance recess 42c the closure cannot be rotated any further. In the symmetric option, as shown in Fig. 7, the angle of the threads tends to prevent further rotating once forcing element wall 52 encounters leading resistance recess wall 46. If further protection against rotation in the closing direction is desired when the forcing element 50 reaches this point, additional stopping mechanisms may be provided such as a tooth on the closure which engages a ratchet on the bottle neck or shoulder.

10

While the thread(s), snap on bead(s) and other protuberance(s) are generally illustrated herein as being internal to the snap-on pipe and external to the bottle neck, if desired this can be reversed so that the protuberance(s) will be external to the snap-on pipe and internal to the bottle neck.

15

As used herein "thread(s)" encompasses traditional bottle neck-type threads, snap bead(s) and other protuberance(s) and connectors which function similarly to threads. Preferably, snap bead(s) will be used for the "thread(s)" of the snap-on pipe and more traditional bottle neck thread(s) will be used for the bottle neck.

20

When it is said herein that the gradient of each of the resistance recess walls at each axial height is essentially the same or that the walls are essentially symmetrical, it is meant that at each axial height the angle of the wall with respect to the snap on pipe rim is within 10% of the angle at the same axial height of the opposite resistance recess wall, albeit as a mirror image. Preferably the angle of the wall is within 5% of the angle of the opposite recess wall, most especially

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within 1%, more preferably within 0.5% and still preferably the angles are the same, albeit mirror images, at each axial height. Said differently, the angles of the essentially symmetrical opposing walls at the same axial height are essentially the same, albeit rotated 180 degrees.

5

The exact height and shape of the resistance recess may be influenced by the material of which the closure, especially the snap-on pipe, is made and so may be adjusted after plastic components are tested.

10

The closure 22 can be placed on the container neck securely and economically by strictly vertical/axial placement on the bottle during manufacture, whereas by providing the consumer with the ability readily to rotate the closure for removal and to re-apply it to the bottle, refilling of the container is promoted. Closure 22 may also be applied onto the container during manufacture by being rotated to engage the threads.

15

References to upward or downward motion herein assume that container 20 is resting on its base (not shown) at its end opposite the closure. That does not negate the possibility that the container may be used as a tottle, e.g., rested on its head, i.e., on the closure, in use.

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When used in connection with a range herein, the word "to" should be interpreted to include the values at both ends of the range.

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The closure may be made from polypropylene or polyethylene or similar polymeric materials, and the bottle is preferably molded from polyethylene terephthalate, i.e., PET or other suitable polymer using injection molding. If desired, the bottle may also be made from polypropylene or polyethylene. The closure is designed to be durable, resisting normal wear and tear by opening and closing the closure and even by dropping.

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The invention may be used for personal care products, which include products for application to the skin, the scalp or the mouth, such as shampoo, body wash, skin lotions,

petroleum jelly, etc. The container of the invention may also be useful for household products such as laundry detergent and for foods such as mayonnaise.

It should be understood, of course, that the specific forms of the invention herein illustrated and described are intended to be representative only as certain changes may
5 be made therein without departing from the clear teachings of the disclosure. Accordingly, reference should be made to the following appended claims in determining the full scope of the invention.

Claims:

1. A container comprising a combined closure (22) and bottle (20), which includes a closure and a bottle having a shoulder (27) and one or more walls forming a bottle neck (32) and including at least one forcing element (50),
 - I. the closure (22) including
 - a) an upper wall (25) defining an opening (36);
 - b) a cylindrical snap-on pipe (30) depending from the upper wall and extending axially to a bottom end (43),
 - c) the cylindrical snap-on pipe including at least one resistance recess (42) therein extending to the bottom end;
 - d) the cylindrical snap-on pipe further including one or more threads (34);
 - e) the cylindrical snap-on pipe defining opposing first and second walls of the resistance recess (42);
 - f) and
the bottom end of the cylindrical snap-on pipe being shaped to include a guidance recess (70) consistent with lowering and raising the cylindrical snap-on pipe threads relative to the bottle neck (32),
 - II. the bottle (20) including a forcing element (50) projecting outwardly from a wall of the bottle neck, the forcing element being spaced from the shoulder (27),
the bottle neck having one or more threads (60),
the at least one bottle forcing element being adapted to be at least partly received within the resistance recess (42) of the closure cylindrical snap-on pipe (30), wherein the guidance recess includes a first wall (72) with an upward gradient and a second wall (74) having a downward gradient whereby in a closure opening direction of rotation the first guidance recess wall permits the cylindrical snap-on pipe (30) axially to be lowered toward the forcing element (50) and the second guidance recess wall being consistent with the closure cylindrical snap-on pipe being raised relative to

the forcing element (50), the snap-on pipe thread and the bottle neck thread maintaining their relative axial positions with the bottle neck thread above the snap on pipe thread when the forcing element contacts the resistance recess wall at least until the forcing element reaches a position beneath the second guidance recess wall,

wherein the wall or walls of the bottle neck includes an annular transfer ring (59) and wherein the forcing element (50) extending outwardly beyond the transfer ring (59), wherein the one or more forcing elements are disposed above the transfer ring.

2. The container according to claim 1 further comprising an interruption in one or more of the snap on pipe thread and the bottle thread and wherein after the forcing element (50) reaches a position below the second guidance recess wall (74) the cylindrical snap-on pipe thread (34) passes the bottle thread (60) through the one or more interruptions thereby releasing the closure from the bottle (20).
3. The container according to claim 1 or 2, wherein the first and second resistance recess walls have gradients wherein the gradient of each of the resistance recess walls are essentially the same at each point lying at the same axial height.
4. The container according to any one of the preceding claims, wherein the one or more forcing elements are disposed above the transfer ring.
5. The container according to any one of the preceding claims, wherein the closure further includes a closing cover (26) for closing the opening, the closing cover being hingedly attached to a closure base (24) of the closure.
6. The container according to any one of the preceding claims, wherein in the direction of rotation to unscrew the closure, after encountering the resistance recess (42) the forcing element is accommodated within the guidance recess (70) and is beneath the first guidance recess wall (72) and then the second guidance recess wall (74).

7. The container according to any one of the preceding claims, wherein the distance between the resistance recess (42) and the guidance recess (70) in the unscrewing direction of the closure is at least 2mm.
8. The container according to any one of the preceding claims, wherein the first guidance recess wall (72) has a gradient of from 90 to 150 degrees.
9. The container according to claim 8, wherein the first guidance recess wall has a gradient of from 90 to 135 degrees.
10. The container according to any one of the preceding claims, wherein the second guidance recess wall (74) has a gradient of from 0 to 10 degrees.
11. The container according to any one of the preceding claims, wherein the transfer ring (59) is spaced from and above the shoulder (27).
12. The container according to any one of the preceding claims, wherein the distance between the resistance recess (42) and the guidance recess (70) in the unscrewing direction of the closure is from 2 mm up to 5 mm.
13. The container according to any one of the preceding claims, wherein the distance between the resistance recess (42) and the guidance recess (70) in the unscrewing direction of the closure is from 2mm up to 4mm.

Fig. 1

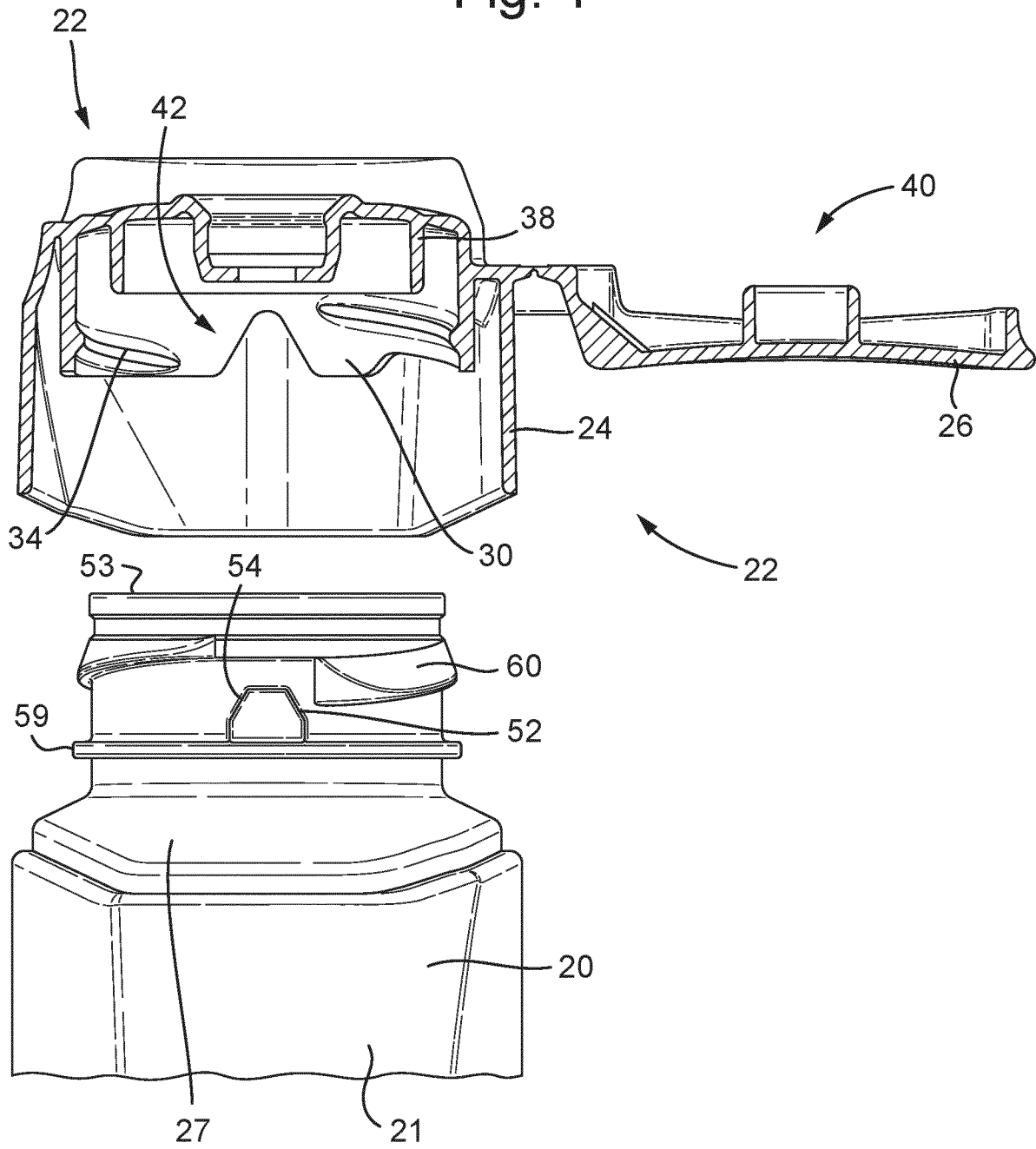


Fig. 2

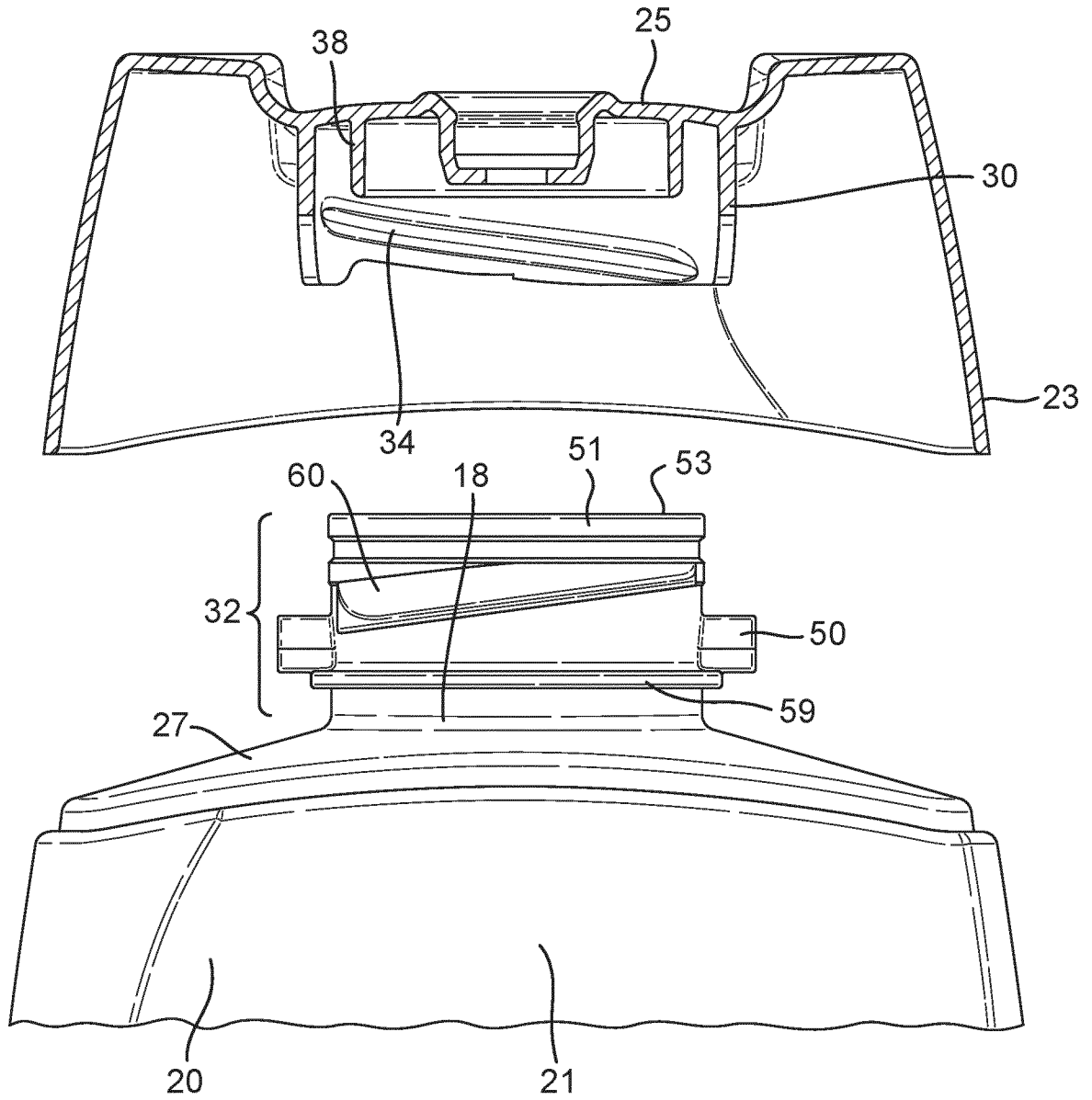


Fig. 3

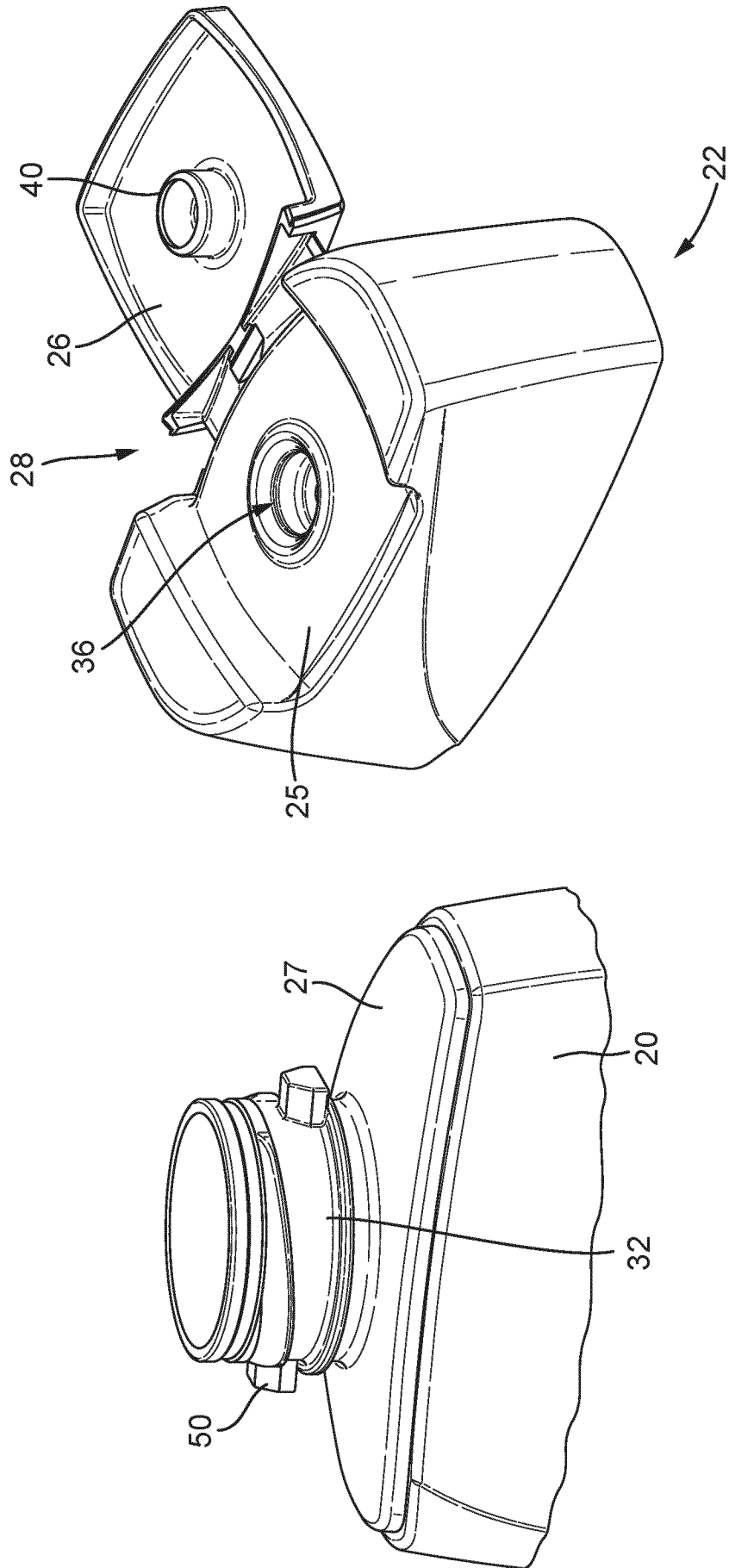


Fig. 4

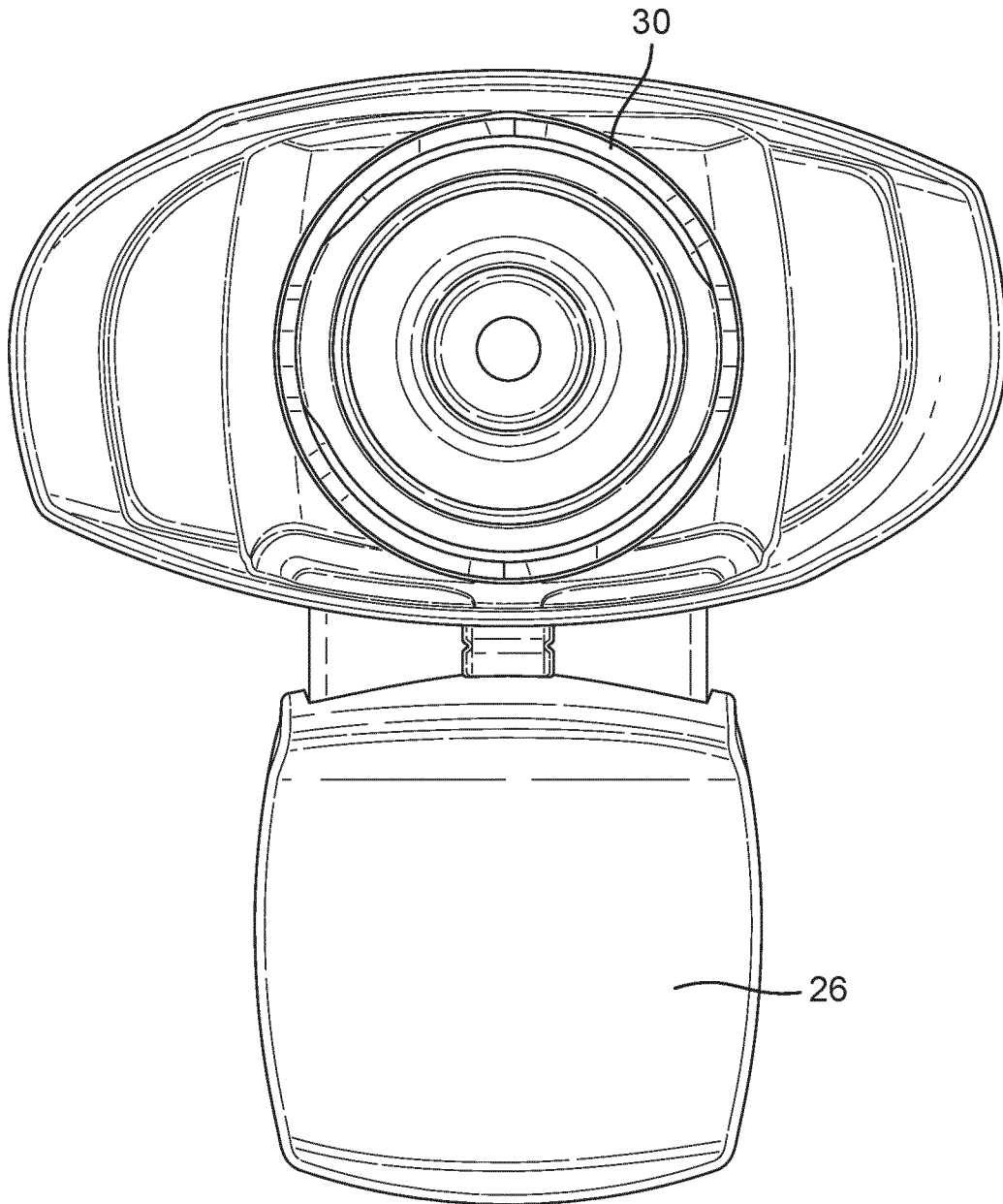


Fig. 5

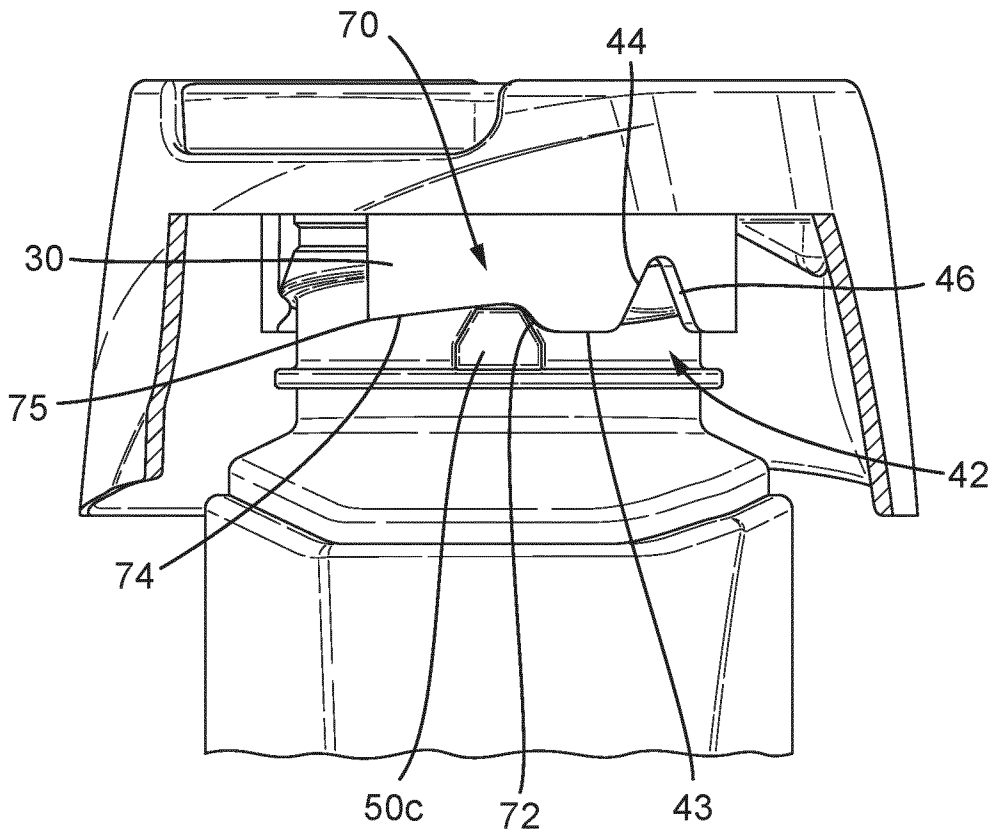


Fig. 6

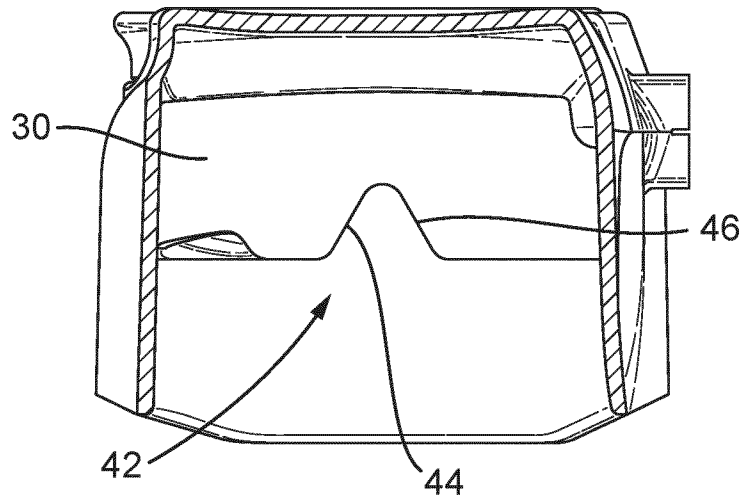


Fig. 7

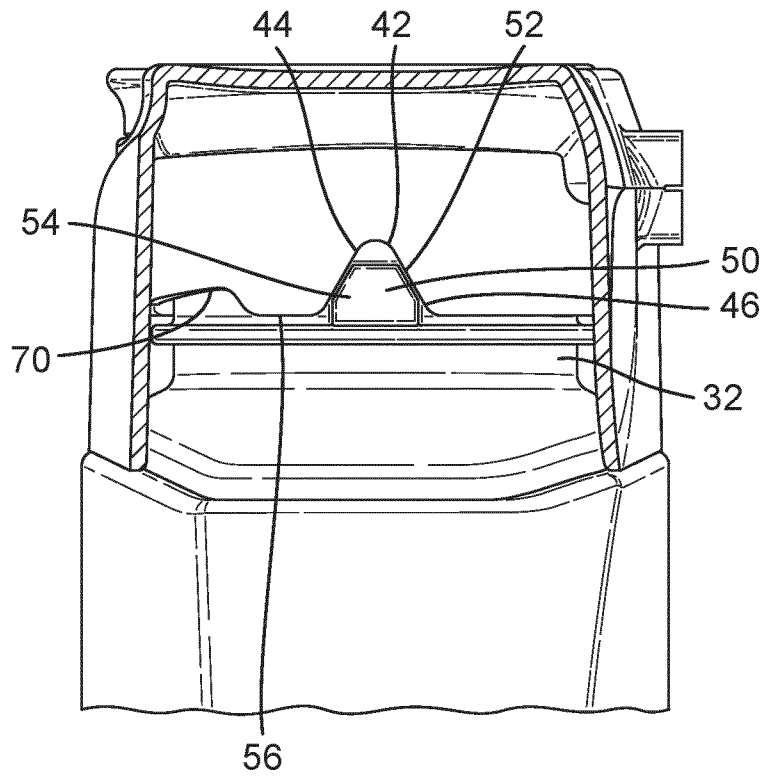


Fig. 8

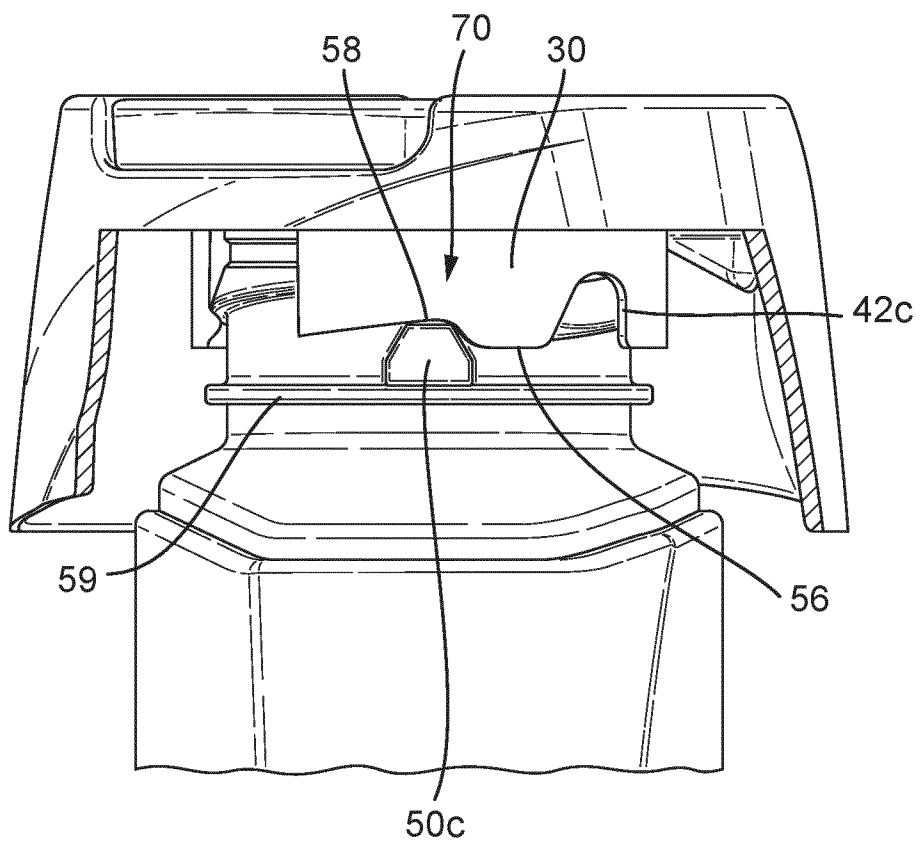


Fig. 9

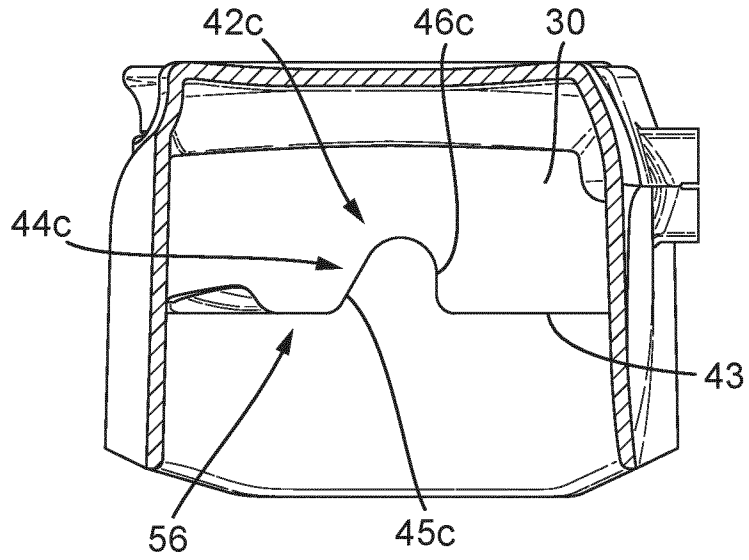


Fig. 10

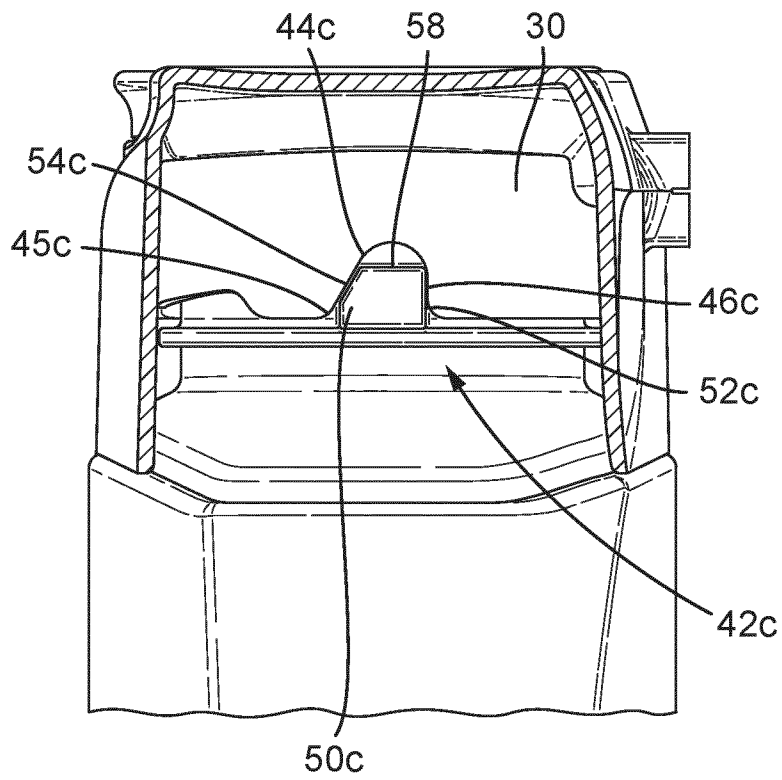
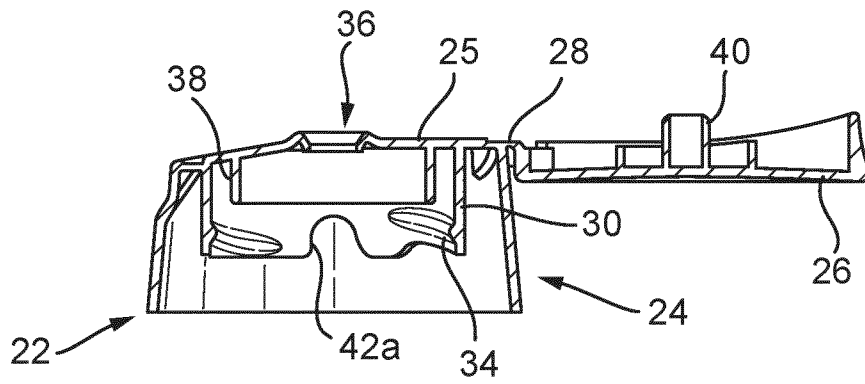


Fig. 11



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/057139

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B65D1/02 B65D41/04 B65D41/17 B65D47/08
 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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 2022/204224 A1 (HILTSEER BALINT [NL] ET AL) 30 June 2022 (2022-06-30) paragraphs [0135] - [0148]; figures 47-52 -----	1 - 13
A	US 2002/166834 A1 (BRANSON MARK K [US] ET AL) 14 November 2002 (2002-11-14) paragraphs [0016] - [0027]; figures -----	1 - 13
A	CN 204 713 667 U (WELL MAX BEAUTY LAB CO LTD) 21 October 2015 (2015-10-21) paragraph [0025]; figures -----	1 - 13
	- / - -	

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 13 May 2024	Date of mailing of the international search report 20/06/2024
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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 Fournier, Jacques
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/057139

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	FR 2 553 382 A1 (OREAL [FR]) 19 April 1985 (1985-04-19) figures -----	1 - 13

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Information on patent family members

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