(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 January 2024 (25.01.2024)

WIPO | PCT

(10) International Publication Number
WO 2024/019891 A1

(51) International Patent Classification:
B65D 47/26 (2006.01) *B65D 50/04* (2006.01)
B65D 47/28 (2006.01)

(21) International Application Number:
PCT/US2023/027138

(22) International Filing Date:
07 July 2023 (07.07.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
17/869,154 20 July 2022 (20.07.2022) US

(71) Applicant: **CLOSURE SYSTEMS INTERNATIONAL INC.** [US/US]; 7820 Innovation Blvd, Suite 100, Indianapolis, Indiana 46278 (US).

(72) Inventor: **KITTLESON, Alex E.**; 3010 Belfry Ln., Apt. 103, West Lafayette, Indiana 47906 (US).

(74) Agent: **GATZ, John C.**; Nixon Peabody LLP, 70 W. Madison St., Suite 5200, Chicago, Illinois 60602-4378 (US).

(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).

(54) Title: CHILD-RESISTANT CLOSURE AND PACKAGE

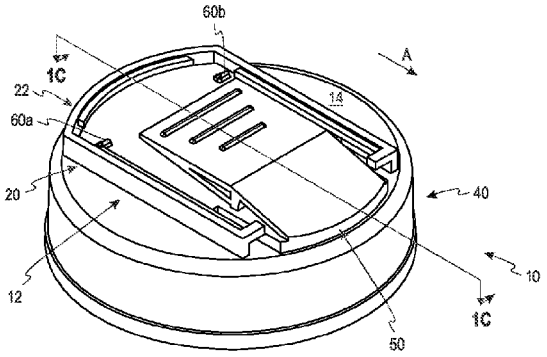

Fig. 1A

(57) Abstract: A child-resistant closure includes a polymeric top portion, a polymeric annular skirt portion depending from the top portion, and a cantilevered slidable lid. The top portion includes a slide portal with a retention wall, and forms an opening. The cantilevered slidable lid includes a first portion and a second portion. The first and second portions have respective first ends and second ends. The second end of the first portion forms a latch. The first end of the second portion is spaced from the first portion and forms a cantilever. The second portion extends generally upwardly and inwardly from the first portion into an interior of the closure. The cantilevered slidable lid is adapted to move by pressing on the first end of the second portion to release the latch and sliding the cantilevered slidable lid along the slide portal.

WO 2024/019891 A1

[Continued on next page]

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))*

Published:

— *with international search report (Art. 21(3))*

CHILD-RESISTANT CLOSURE AND PACKAGE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application No. 17/869,154 filed July 20, 2022, the contents of which is hereby incorporated by reference herein in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a closure that is configured to work with a container to form a package. More specifically, the present invention relates to a polymeric child-resistant closure.

BACKGROUND OF THE INVENTION

[0003] Polymeric closures have been used in many applications over the years in conjunction with containers. Some containers contain product or contents that are not intended for certain individuals, such as children. These contents may include products such as over-the-counter (OTC) medication, vitamins, prescriptions, etc. These containers are desirably child-resistant such that children are prevented or inhibited from gaining access to the products therein. These containers, however, may be difficult for other individuals to open and access the products contained therein. These other individuals may be those with reduced gripping strength, limited dexterity of their upper limbs (e.g., arms or hands), or other disabilities of their upper limbs that make such containers difficult to open.

[0004] It would be desirable to provide a child-resistant closure that overcomes these disadvantages of existing containers, while still performing desirable properties of a closure including securely positioning the closure on the container.

SUMMARY

[0005] According to one aspect of the present disclosure, a child-resistant closure includes a polymeric top portion, a polymeric annular skirt portion depending from the polymeric top portion, and a cantilevered slidable lid. The polymeric top portion has an exterior surface and an interior surface. The polymeric top portion includes a slide portal. The slide portal includes a retention wall. The polymeric top portion forms an opening. The cantilevered slidable lid includes a first portion and a second portion. The first portion has a

first end and a second end. The second end of the first portion forms a latch on an interior surface of the first portion. The second portion has a first end and a second end. The second end of the second portion is connected or attached to the second end of the first portion. The first end of the second portion is spaced from the first portion and forms a cantilever. The second portion extends generally upwardly and inwardly from the first portion into an interior of the closure. The cantilevered slidable lid is adapted to move by pressing on the first end of the second portion to release the latch and sliding the cantilevered slidable lid along the slide portal.

[0006] According to a further configuration of the above implementation, the first portion has at least one retention projection extending upwardly from an exterior surface of the first portion. The at least one retention projection in conjunction with the retention wall assists in preventing or inhibiting removal of the cantilevered slidable lid from the remainder of the closure. The at least one retention projection is a plurality of retention projections in one embodiment.

[0007] In a further aspect of the above implementation, the polymeric top portion further includes a depression or a latch-receiving opening. The depression or the latch-receiving opening being adapted to receive the latch when the closure is in a closed position.

[0008] In a further aspect of the above implementation, the closure further includes a tamper-evident feature. In one non-limiting example, the tamper-evident feature is connected to the first end of the second portion via a frangible connection.

[0009] In yet a further aspect of the above implementation, the second portion of the cantilevered slidable lid includes a plurality of gripping ridges extending from a top surface thereof to assist in sliding the cantilevered slidable lid along the slide portal.

[0010] According to a further configuration of the above implementation, the polymeric annular skirt portion includes an internal thread formation.

[0011] In a further aspect of the above implementation, the retention wall includes a pair of sidewalls bridging a top wall. The retention wall may further include a plurality of elongated rails to assist in sliding the cantilevered slidable lid along the slide portal.

[0012] According to another aspect of the present disclosure, a package includes a container and a closure. The container has a neck portion defining an opening. The neck portion has an exterior surface and an interior surface. The closure is configured for fitment to the neck portion of the container for closing the opening. The closure includes a polymeric top portion, a polymeric annular skirt portion depending from the polymeric top portion, and a cantilevered slidable lid. The polymeric top portion has an exterior surface and an interior

surface. The polymeric top portion includes a slide portal. The slide portal includes a retention wall. The polymeric top portion forms an opening. The cantilevered slidable lid includes a first portion and a second portion. The first portion has a first end and a second end. The second end of the first portion forms a latch on an interior surface of the first portion. The second portion has a first end and a second end. The second end of the second portion is connected or attached to the second end of the first portion. The first end of the second portion is spaced from the first portion and forms a cantilever. The second portion extends generally upwardly and inwardly from the first portion into an interior of the closure. The cantilevered slidable lid is adapted to move by pressing on the first end of the second portion to release the latch and sliding the cantilevered slidable lid along the slide portal.

[0013] According to a configuration of the above implementation, the first portion has at least one retention projection extending upwardly from an exterior surface of the first portion. The at least one retention projection in conjunction with the retention wall assists in preventing or inhibiting removal of the cantilevered slidable lid from the remainder of the closure.

[0014] According to another configuration of the above implementation, the polymeric top portion further includes a depression or a latch-receiving opening. The depression or the latch-receiving opening is adapted to receive the latch when the closure is in a closed position.

[0015] According to a further configuration of the above implementation, the closure further includes a tamper-evident feature. The tamper-evident feature is connected to the first end of the second portion via a frangible connection.

[0016] According to a further aspect of the present disclosure, a child-resistant closure includes a polymeric top portion, a polymeric annular skirt portion depending from the polymeric top portion, and a cantilevered rotationable lid. The polymeric top portion has an exterior surface and an interior surface. The polymeric top portion forms an opening. The cantilevered rotationable lid includes a first portion and a second portion. The first portion has a first end and a second end. The second end of the first portion forms a latch on an interior surface of the first portion. The second portion has a first end and a second end. The second end of the second portion is attached or connected to the second end of the first portion. The first end of the second portion is spaced from the first portion and forms a cantilever. The second portion extends generally upwardly and inwardly from the first portion into an interior of the closure. The cantilevered rotationable lid is adapted to rotate

by pressing on the first end of the second portion to release the latch and rotate the cantilevered rotationable lid.

[0017] According to a further configuration of the above implementation, the polymeric top portion includes at least one guiding member and an extension extending upwardly. The at least one guiding member assists in positioning the cantilevered rotationable lid.

[0018] In a further aspect of the above implementation, the polymeric top portion further includes a depression or a latch-receiving opening. The depression or the latch-receiving opening is adapted to receive the latch when the closure is in a closed position.

[0019] In a further aspect of the above implementation, the closure further includes a tamper-evident feature. The tamper-evident feature is connected to the first end of the second portion via a frangible connection.

[0020] According to yet another aspect of the present disclosure, a package includes a container and a closure. The container has a neck portion defining an opening. The neck portion has an exterior surface and an interior surface. The closure is configured for fitment to the neck portion of the container for closing the opening. The closure includes a polymeric top portion, a polymeric annular skirt portion depending from the polymeric top portion, and a cantilevered rotationable lid. The polymeric top portion has an exterior surface and an interior surface. The polymeric top portion forms an opening. The cantilevered rotationable lid includes a first portion and a second portion. The first portion has a first end and a second end. The second end of the first portion forms a latch on an interior surface of the first portion. The second portion has a first end and a second end. The second end of the second portion is attached or connected to the second end of the first portion. The first end of the second portion is spaced from the first portion and forms a cantilever. The second portion extends generally upwardly and inwardly from the first portion into an interior of the closure. The cantilevered rotationable lid is adapted to rotate by pressing on the first end of the second portion to release the latch and rotate the cantilevered rotationable lid.

[0021] In a further aspect of the above implementation, the polymeric top portion includes at least one guiding member and an extension extending upwardly to prevent or inhibit further rotation of the cantilevered rotationable lid. The at least one guiding member assists in positioning the cantilevered rotationable lid.

[0022] The above summary is not intended to represent each embodiment or every aspect of the present invention. Additional features and benefits of the present invention are apparent from the detailed description and figures set forth below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] Other advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

[0024] FIG. 1A is a top perspective view of a child-resistant closure in a closed position according to one embodiment.

[0025] FIG. 1B is a top perspective view of the child-resistant closure of FIG. 1A in an open position.

[0026] FIG. 1C is a cross-sectional view taken generally across line 1C-1C of the child-resistant closure of FIG. 1A.

[0027] FIG. 1D is a cross-sectional view of the child-resistant closure of FIG. 1A in the process of being opened.

[0028] FIG. 1E is another cross-sectional view of the child-resistant closure of FIG. 1A in the process of being opened.

[0029] FIG. 1F is a further cross-sectional view of the child-resistant closure of FIG. 1A after being fully opened.

[0030] FIG. 2 is a top perspective view of the child-resistant closure of FIG. 1A without a cantilevered slidable lid.

[0031] FIG. 3 is a top perspective view of a cantilevered slidable lid used in the child-resistant closure of FIG. 1A.

[0032] FIG. 4A is a top perspective view of a child-resistant closure in a closed position according to another embodiment.

[0033] FIG. 4B is a top perspective view of a child-resistant closure of FIG. 4B in an open position after removal of the tamper-evident feature.

[0034] FIG. 5 is a front view of a container according to one embodiment.

[0035] FIG. 6A is a side view of a package including the container of FIG. 5 and the child-resistant closure of FIG. 1A.

[0036] FIG. 6B is a top perspective view of the package of FIG. 6A.

[0037] FIG. 7A is a top perspective view of a child-resistant closure in a closed position according to a further embodiment.

[0038] FIG. 7B is a top perspective view of the child-resistant closure of FIG. 7A in an open position.

[0039] FIG. 7C is a cross-sectional view taken generally across line 7C-7C of the child-resistant closure of FIG. 7A.

[0040] FIG. 8 is a top perspective view of the child-resistant closure of FIG. 7A without a cantilevered slidable lid.

[0041] FIG. 9 is a top perspective view of a cantilevered slidable lid used in the child-resistant closure of FIG. 7A.

[0042] FIG. 10 is a top perspective view of a child-resistant closure of FIG. 7A in a closed position according to yet another embodiment.

[0043] FIG. 11A is a front view of a package including the container of FIG. 5 and the child-resistant closure of FIG. 7A.

[0044] FIG. 11B is a top perspective view of the package of FIG. 11A.

[0045] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION

[0046] Referring to FIGS. 1A-1F, a polymeric child-resistant closure 10 according to one embodiment is shown. The polymeric child-resistant closure 10 is a one-piece closure. The polymeric child-resistant closures of the present invention are advantageous because they allow users with limited dexterity or reduced gripping strength to open and access the products contained in the container using much less physical effort. It also is advantageous for users with other disabilities of the upper limbs (e.g., the hand and/or arm) to open and access the products contained in the container using much less physical effort. In one method, the child-resistant closures can be opened to access the product using a single hand. The child-resistant closures may be opened in one smooth and natural motion.

[0047] The polymeric child-resistant closure 10 is configured for fitment to a neck portion of a container for closing an opening of the container. The polymeric child-resistant closure 10 is configured to be used with a container 100 of FIG. 5 that forms a package 200 as shown in FIGS. 6A, 6B.

[0048] The polymeric child-resistant closure 10 of FIGS. 1A, 1B includes a polymeric top portion 12, a polymeric annular skirt portion 40, and a cantilevered slidable lid 50. The polymeric annular skirt portion 40 depends from the polymeric top portion 12. The polymeric annular skirt portion 40 is shown as having a generally smooth exterior surface.

This is advantageous if it is desirable for a user to not obtain a grip in an attempt to open the closure without using the slidable lid. It is contemplated, however, that the polymeric annular skirt portion may have a textured exterior surface.

[0049] The polymeric top portion 12 of the polymeric child-resistant closure 10 is best shown in FIG. 2 in the absence of the cantilevered slidable lid 50. The polymeric top portion 12 has an exterior surface 14 and an interior surface 16 (FIG. 1C). Referring back to FIG. 2, the polymeric top portion 12 further includes a slide portal 20 and a depression 26 formed in the exterior surface 14 of the polymeric top portion 12. The polymeric top portion 12 also forms an opening 30. The opening 30 is partially surrounded and located within the retention wall 22 in this embodiment.

[0050] The slide portal 20 includes a retention wall 22 that assists in moving and retaining the cantilevered slidable lid 50 therealong to open and close the polymeric child-resistant closure 10. More specifically, the retention wall 22 assists the user in more easily and consistently opening the polymeric child-resistant closure 10 and gaining access to the opening 30. The retention wall 22 is a structure that extends above the remainder of the polymeric child-resistant closure 10. The retention wall 22 has a pair of side walls 22a, 22b that is bridged by a front wall 22c. Each of the side walls 22a, 22b and front wall 22c includes a respective elongated rail 24a-24c that assists in sliding the cantilevered slidable lid 50 more easily and also to prevents or inhibits the cantilevered slidable lid 50 from being removed upwardly from the remainder of the polymeric child-resistant closure 10.

[0051] As will be discussed below, the depression 26 of FIG. 2 is sized to receive and contain a latch 52 of the cantilevered slidable lid 50 when the polymeric child-resistant closure 10 is in a closed position. The depression 26 is shown as being generally rectangular shaped in FIG. 2. The depression 26 slopes downwardly such that end 28b is at a greater depth D1 than end 28a. It is contemplated that the depression may be other shapes and sizes that function with receiving and containing the latch 52 of the cantilevered slidable lid 50. The shapes and sizes of the depression may be other polygonal (e.g., square) or non-polygonal shapes (e.g., oval). It is also contemplated that multiple latches and depressions may be used in another embodiment.

[0052] The depth D1 at the end 28b of the depression 26 can vary but in one embodiment is from about 0.03 to about 0.1 inches. In another embodiment, the depth D1 of the depression is from about 0.04 to about 0.08 inches.

[0053] It is contemplated that a latch-receiving opening may be used instead of a depression for receiving and containing a latch of the cantilevered slidable lid. The latch-

receiving opening would function in the same or similar manner as the depression, but would extend entirely through the polymeric top portion. The latch-receiving opening could be shaped the same as the depression or could take a different shape to correspond with a latch.

[0054] The opening 30 shown in FIG. 2 is generally rectangular in shape. It is contemplated that an opening formed in the polymeric top portion may be other shapes and sizes. The shapes and sizes of the opening may be other polygonal (e.g., square) or non-polygonal shapes (e.g., circular or oval). The size of the opening 30 can vary and may desirably be dependent on the product being dispensed. This allows for metered control of product release by corresponding the aperture size to the product size.

[0055] In one method, the slide portal 20 is integrally formed with the polymeric top portion 12. The slide portal, for example, may be molded with the polymeric top portion. In another embodiment, the slide portal may be formed separately and attached to the polymeric top portion.

[0056] The cantilevered slidable lid 50 of the polymeric child-resistant closure 10 is shown best in FIG. 3 according to one embodiment. The cantilevered slidable lid 50 is configured to slide into and along the slide portal 20 to open and close the polymeric child-resistant closure 10 so as to provide access to the contents of the container 100 of FIG. 5 in the package 200 of FIGS. 6A, 6B. The cantilevered slidable lid 50 in one method is formed separately from the remainder of the polymeric child-resistant closure 10.

[0057] The cantilevered slidable lid 50 includes a first portion 54 and a second portion 56 that are integrally connected or attached to each other. The first portion 54 has a first end 54a and a second end 54b. The first portion 54 has a plurality of retention projections 60a, 60b extending upwardly from an exterior surface 60 thereof. It is contemplated that the first portion of the cantilevered slidable lid 50 may include exactly one retention projection.

[0058] The first portion 54 also includes a plurality of cutouts 64a, 64b (FIG. 3). The cutouts save material and also assist in making it easier to bend at the hinge point. It is contemplated that the cutouts may not be formed in other embodiments.

[0059] The plurality of retention projections 60a, 60b in conjunction with the retention wall 22 assists in preventing or inhibiting removal of the cantilevered slidable lid 50 from the remainder of the polymeric child-resistant closure 10. This is shown best in FIGS. 1B, 1F with the plurality of retention projections 60a, 60b abutting and contacting respective portions of the retention wall 22. It is contemplated that the retention projections may be of

other shapes and sizes. Referring back to FIG. 3, the second end 54b of the first portion 54 forms the latch 52 on an interior surface 62 thereof.

[0060] The second portion 56 of the cantilevered slidable lid 50 has a first end 56a and a second end 56b. The second end 56b is connected or attached to the second end 54b of the first portion 54. As shown best in FIG. 1C, the first end 56a of the second portion 56 is spaced from the first portion 54 and forms a cantilever. The second portion 56 extends generally upwardly and inwardly from the first portion 54 into an interior of the polymeric child-resistant closure 10.

[0061] The second portion 56 of FIG. 3 includes a first segment 58a, a second segment 58b, a third segment 58c and a fourth segment 58d. In one embodiment, all of the segments 58a-58d are integrally connected or attached. As shown in FIG. 3, the second segment 58b is located closer to the first portion 54 than the first segment 58a. The third segment 58c is integrally connected to the first segment 58a near the fourth segment 58d. The third segment 58c extends upwardly and inwardly from the second end 56b of the second portion and then generally flattens out at the first segment 58a as shown best in FIG. 1C. The fourth segment 58d, which extends generally perpendicular, is connected to each of the other segments 58a-58c and also to the first portion 54.

[0062] The second portion 56 of the cantilevered slidable lid 50 further includes a plurality of gripping ridges 66 that extends from a top surface of the second portion 56 (specifically first segment 58a). The plurality of gripping ridges 66 assists in sliding the cantilevered slidable lid 50 along the slide portal 20 to open and close the polymeric child-resistant closure 10. The second portion 56 of the cantilevered slidable lid 50 is a generally rectangular shape. It is contemplated that the cantilevered slidable lid may be of other shapes and sizes.

[0063] For a user to move the polymeric child-resistant closure 10 from the closed position (FIG. 1A) to the open position (FIG. 1B) in the general direction of arrow A in FIG. 1A, a certain amount of force is needed to release the latch 52 of the cantilevered slidable lid 50 from the depression 26 formed in the polymeric top portion 12. The latch 52 is released by pressing downwardly (in the direction of arrow B in FIG. 1C) and then moving the cantilevered slidable lid 50 in the direction of arrow A in FIG. 1C. The movement is progressively shown in FIGS. 1D-1F until the cantilevered slidable lid 50 is in the fully open position (FIG. 1F). To close the polymeric child-resistant closure 10, the cantilevered slidable lid 50 is moved in the direction of arrow C (opposite of arrow A). This movement of the polymeric child-resistant closure 10 between the closed position (FIG. 1A) and the

open position (FIG. 1B) may be performed using a single hand and in a smooth and natural motion.

[0064] The polymeric child-resistant closure 10 may also include tamper-evident features. The tamper-evident features show visual identification to a user that the closure may have been opened and the product potentially been accessed. For example, the tamper-evident feature may be of a structure where the cantilevered slidable lid 50 cannot be moved without removing or breaking the tamper-evident feature.

[0065] One non-limiting example is shown in FIGS. 4A, 4B. FIGS. 4A, 4B show a polymeric child-resistant closure 70 that is identical to the polymeric child-resistant closure 10, except for the addition of the tamper-evident feature 80. The tamper-evident feature 80 is a walled structure that is connected to the first end 56a of the second portion 56 via a frangible connection 72. To move the cantilevered slidable lid 50 as described above, the tamper-evident feature 80 needs to be removed or broken. The tamper-evident feature is typically configured to prevent or inhibit the cantilevered slidable lid 50 from being pressed down or from being moved in general such that the latch 52 will not be released from the depression 26. It is contemplated that other tamper-evident features may be used in the polymeric child-resistant closure.

[0066] It is contemplated that the polymeric child-resistant closure may also include a liner located on an interior surface of the top wall portion. The liner is typically made of compressible polymeric material and provides sealing for the child-resistant closure. In one embodiment, the liner is a polymeric foam liner. In other embodiments, other sealing mechanisms can be used in conjunction with the polymeric child-resistant closures. For example, in one embodiment, an interior surface of the top portion may include a polymeric continuous plug seal and/or an outer seal. The polymeric continuous plug seal and/or the outer seal depend from the polymeric top portion and provide a sealing mechanism. It is contemplated that other sealing mechanisms may be used in the polymeric child-resistant closure.

[0067] An interior surface of the polymeric annular skirt portion may also include an internal thread formation in one embodiment. This is shown in FIG. 1C where the polymeric annular skirt portion 40 includes an internal thread formation 74 that is for mating engagement with an external thread formation of a finish of a container.

[0068] The internal thread formation may be a continuous helical thread in one embodiment. In another embodiment, the internal thread formation includes a first closure lead and a second closure lead, which are referred collectively as a double lead closure

thread. Each of the first and second closure leads may be continuous. The first and second helical closure leads may be helical. It is also contemplated that the internal thread formation of the closure may differ from a helical thread formation. It is also contemplated that other internal thread formations may be used in the closure.

[0069] In another embodiment, the interior surface of the polymeric annular skirt portion may include one or more anti-rotational features. Having either the closure or the container having anti-rotational features is advantageous when the product being stored in the container is not desirable for certain individuals (e.g., medicine for children). This embodiment can be also advantageous in that it greatly reduces the possibility of separating the child-resistant closure from the container. Thus, in this embodiment, the polymeric child-resistant closure assists in reducing environmental waste when the container is recycled in this embodiment.

[0070] The exterior surface of the polymeric annular skirt portion may also include a plurality of ridges. This may be employed if there is a desire for a user to obtain and grip the closure, or if a grip is desired in the manufacturing process for placing the closure onto the container. Since the polymeric child-resistant closure is typically designed not to allow the closure to be unthreaded from the container, the polymeric annular skirt portion is typically smooth. This makes it more difficult to get a better grip on the polymeric annular skirt portion when attempting to pull off or remove the closure with respect to the container.

[0071] The child-resistant closure may include an oxygen-scavenger material. This oxygen-scavenger material may be distributed within the closure or may be a separate layer. The oxygen-scavenger material may be any material that assists in removing oxygen within the container, while having little or no effect on the contents within the container.

[0072] Alternatively, or in addition to, the child-resistant closure may include an oxygen-barrier material. The oxygen-barrier material may be added as a separate layer or may be integrated within the closure itself. The oxygen-barrier materials assist in preventing or inhibiting oxygen from entering the container through the closure. These materials may include, but are not limited to, ethylene vinyl alcohol (EVOH). It is contemplated that other oxygen-barrier materials may be used in the closure.

[0073] A container is used with a polymeric child-resistant closure. A container has a neck portion defining an opening. The neck portion has an exterior surface and an interior surface. In one embodiment, the container has an external thread formation on the neck portion. It is contemplated in another embodiment that the container does not include an

external thread formation on the neck portion. In such an embodiment, the container may have anti-rotational features instead.

[0074] Referring to FIG. 5, a container 100 is shown that includes a neck portion 102 defining an opening 106. The neck portion 102 of the container 100 includes an external thread formation 110 in this embodiment. In one embodiment, the external thread formation is for mating engagement with an internal thread formation of the polymeric closure. In another embodiment, if a polymeric closure includes anti-rotational features, then there will not be a threaded engagement with an external thread formation of the container.

[0075] The external thread formation 110 is one continuous helical thread in this embodiment. In another embodiment, the external thread formation includes a first container lead and a second container lead, which are referred collectively as a double lead closure thread. Each of the first and second container leads may be continuous. The first and second helical container leads may be helical. It is contemplated that the first and second container leads may be discontinuous.

[0076] It is also contemplated that the external thread formation of the container may differ from a helical thread formation. It is also contemplated that other external thread formations may be used in the container. For example, the external thread formation may include a triple-threaded structure having first, second and third closure leads.

[0077] It is contemplated that other features may be included on the neck portion 102. Some non-limiting examples include retention lugs, A-collar for banded applications, and splines.

[0078] In one embodiment, a package comprises a container with an opening and a polymeric child-resistant closure. The polymeric child-resistant closure is configured for fitment to a neck portion of the container for closing the opening. The child-resistant closures are configured to be placed on a container or bottle that contain product. The product may be a liquid product, but typically is a solid product. In another embodiment, the product may be a combination of a liquid and solid product. Some products that may be especially desirable to use include dispensable tablets such as over-the-counter (OTC) medication, vitamins, prescriptions, etc. It is noted that the opening 30 of the polymeric child-resistant closure 10 may allow for metered dispersion of product by varying aperture size dependent upon product variation. The child-resistant closures can be color coordinated for product type to aid in visual identification of product being used before opening the container.

[0079] One non-limiting example of a closure and a container forming a package is shown in FIGS. 6A, 6B. FIG. 6A is a side perspective view of the package 200 including the polymeric child-resistant closure 10 of FIG. 1A and the container 100 of FIG. 5 in a closed position. FIG. 6B is a top perspective view of the package 200 including the polymeric child-resistant closure 10 of FIG. 1A and the container 100 of FIG. 5 in a closed position.

[0080] Referring to FIGS. 7A-7C, a polymeric child-resistant closure 210 according to another embodiment is shown. The polymeric child-resistant closure 210 is configured for fitment to a neck portion of a container. In one embodiment, the polymeric child-resistant closure 210 is configured to be used with the container 100 of FIG. 5, which is described above, that forms a package 300 as shown in FIGS. 11A, 11B.

[0081] The polymeric child-resistant closure 210 of FIGS. 7A, 7B includes a polymeric top portion 212, a polymeric annular skirt portion 240, and a cantilevered rotationable lid 250. The polymeric annular skirt portion 240 depends from the polymeric top portion 212. The polymeric annular skirt portion 240 is shown as having a generally smooth exterior surface. This is advantageous if it is desirable for a user to not obtain a grip in an attempt to open the closure without using the cantilevered rotationable lid. It is contemplated that the polymeric annular skirt portion may have a textured exterior surface. FIG. 7C shows the polymeric child-resistant closure 210 including an internal thread formation 274.

[0082] The polymeric top portion 212 of the polymeric child-resistant closure 210 is best shown in the absence of the cantilevered rotationable lid 250 in FIG. 8. The polymeric top portion 212 has an exterior surface 214 and an interior surface 216 (FIG. 7B). The polymeric top portion 212 further includes guiding members 220a, 220b, a depression 226, and a plurality of extensions or projections 224a, 224b formed in the exterior surface 214 of the polymeric top portion 212. The polymeric top portion 212 forms an opening 230. The opening 230, as shown best in FIG. 8, is generally located between the guiding members 220a, 220b.

[0083] The guiding members 220a, 220b assist in moving and retaining the cantilevered rotationable lid 250 therearound to open and close the polymeric child-resistant closure 210. More specifically, the guiding members 220a, 220b assist the user in more easily and consistently opening the polymeric child-resistant closure 210 so as to gain access to the opening 230. The guiding members 220a, 220b are in the general shape of the letter "L". The cantilevered rotationable lid 250 rotates into and through an area formed by the guiding members 220a, 220b as best shown in FIGS. 7A, 7B. The guiding members 220a,

220b also assist in preventing or inhibiting the cantilevered rotationable lid 250 from being removed upwardly from the remainder of the polymeric child-resistant closure 210 when in a closed position. It is contemplated that there may be more or less guiding members in the polymeric child-resistant closure.

[0084] As will be discussed below, the depression 226 is sized to receive and contain a latch 252 of the cantilevered rotationable lid 250 when the polymeric child-resistant closure 210 is in a closed position. The depression 226 is shown as being generally rectangular shaped in FIG. 8. The depression 226 slopes downwardly such that end 228b is at a greater depth D2 than end 228a. It is contemplated that the depression may be other shapes and sizes that function with receiving and containing the latch 252 of the cantilevered rotationable lid 250. These shapes and sizes of the depression may be other polygonal (e.g., square) or non-polygonal shapes (e.g., oval). It is also contemplated that multiple latches and depressions may be used in another embodiment.

[0085] The depth D2 at the end 228b of the depression 226 can vary but in one embodiment is from about 0.03 inches to about 0.1 inches. In another embodiment, the depth D2 of the depression is from about 0.04 to about 0.08 inches.

[0086] It is contemplated that a latch-receiving opening may be used instead of a depression for receiving and containing a latch of the cantilevered rotationable lid. The latch-receiving opening would function in the same or similar manner as the depression, but would extend entirely through the polymeric top portion. The latch-receiving opening could be shaped the same as the depression or could take a different shape to correspond with a latch.

[0087] The opening 230 shown in FIG. 8 is generally or roughly semi-circular in shape. It is contemplated that an opening formed in the polymeric top portion may be other shapes and sizes. The shapes and sizes of the opening may be other non-polygonal shapes (e.g., circular or oval) or polygonal shapes. The size of the opening 230 can vary and may desirably be dependent on the product being dispensed. This allows for metered control of product release by corresponding the aperture size to the product size.

[0088] In one method, the guiding members 220a, 220b are integrally formed with the polymeric top portion 212. The guiding members, for example, may be molded with the polymeric top portion. In another embodiment, the guiding members may be formed separately and attached to the polymeric top portion.

[0089] The cantilevered rotationable lid 250 of the polymeric child-resistant closure 210 is shown best in FIG. 9 according to one embodiment. The cantilevered rotationable lid 250 is configured to rotate to open and close the polymeric child-resistant closure 210, which

also provides access to the contents of the container 100 of FIG. 5 in the package 300 of FIGS. 11A, 11B. The cantilevered rotationable lid 250 in one method is formed separately from the remainder of the polymeric child-resistant closure 210.

[0090] The cantilevered rotationable lid 250 includes a first portion 254 and a second portion 256 that are integrally connected or attached. The first portion 254 has a first end 254a and a second end 254b. The first portion 254 has a generally semicircular portion with an extension therefrom that forms the latch 252. The extension 224b assists in preventing or inhibiting over rotation of the cantilevered rotationable lid 250. This is shown best in FIG. 7B.

[0091] The first portion 254 of the cantilevered rotationable lid 250 forms an aperture 268 (FIG. 9) that is configured to be received by the extension 224a to assist in rotating the cantilevered rotationable lid 250. Thus, the aperture 268 is sized and shaped to receive the extension 224a. To assist in keeping the cantilevered rotationable lid 250 in place, the extension 224a includes a screw 238 (see FIG. 8). It is contemplated that other mechanisms or fasteners may be used. The second end 254b of the first portion 254 forms the latch 252 on an interior surface 262 thereof.

[0092] The second portion 256 of the cantilevered rotationable lid 250 has a first end 256a and a second end 256b. The second end 256b is connected to the second end 254b of the first portion 254. As shown best in FIG. 7C, the first end 256a of the second portion 256 is spaced from the first portion 254 and forms a cantilever. The second portion 256 extends generally upwardly and inwardly from the first portion 254 into an interior of the polymeric child-resistant closure 210.

[0093] The second portion 256 of FIG. 9 includes a first segment 258a, a second segment 258b, a third segment 258c and a fourth segment 258d. In one embodiment, all of the segments 258a-258d are integrally connected or attached. As shown in FIG. 9, the second segment 258b is located closer to the first portion 254 than the first segment 258a. The third segment 258c is integrally connected to the first segment 258a near the fourth segment 258d. The third segment 258c extends upwardly and inwardly from the second end 256b of the second portion and then generally flattens out at the first segment 258a as shown best in FIG. 7C. The fourth segment 258d, which extends generally perpendicular, is connected to each of the other segments 258a-258c and also to the first portion 254.

[0094] The second portion 256 of the cantilevered rotationable lid 250 further includes a plurality of gripping ridges 266 that extends from a top surface of the second portion 256 (specifically first segment 258a). The plurality of gripping ridges 266 assists in

rotating the cantilevered rotationable lid 250 to both open and close the polymeric child-resistant closure 210. It is contemplated that the cantilevered rotationable lid may be of other shapes and sizes.

[0095] For a user to rotate the polymeric child-resistant closure 210 from the closed position (FIG. 7A) to the open position (FIG. 7B) in the general direction of arrow D in FIG. 7A, a certain amount of force is needed to release the latch 252 of the cantilevered rotationable lid 250 from the depression 226 formed on the polymeric top portion 212. The latch 252 is released by pressing downwardly (in the direction of arrow E in FIG. 7C) and then rotating the cantilevered rotationable lid 250 in the direction of arrow D in FIG. 7A. To close the polymeric child-resistant closure 210, the cantilevered rotationable lid 250 is moved in the direction of arrow F in FIG. 7B (opposite of arrow D). This rotational movement of the polymeric child-resistant closure 210 between the closed position (FIG. 7A) and the open position (FIG. 7B) may be performed using a single hand and in a smooth and natural motion.

[0096] The polymeric child-resistant closure 210 may also include tamper-evident features as discussed above. One non-limiting example is shown in FIG. 10. FIG. 10 shows a polymeric child-resistant closure 270 that is identical to the polymeric child-resistant closure 210, except for the addition of the tamper-evident feature 280. The tamper-evident feature 280 is a walled structure that is connected to the first end 256a of the second portion 256 via a frangible connection 272. To rotate the cantilevered rotationable lid 250 as described above, the tamper-evident feature 280 needs to be removed or broken. The tamper-evident feature is typically configured to prevent or inhibit the cantilevered rotationable lid 250 from being pressed down or being moved in general such that the latch 252 will not be released from the depression 226. It is contemplated that other tamper-evident features may be added to the polymeric child-resistant closure.

[0097] The child-resistant closures are typically made of polymeric material, such as olefin (e.g., polyethylene (PE), polypropylene (PP)), polyethylene terephthalate (PET) or blends thereof. One example of a polyethylene that may be used is high density polyethylene (HDPE). It is contemplated that the child-resistant closures may be made of other polymeric materials.

[0098] The child-resistant closures are typically formed by processes such as injection or compression molding.

[0099] The container 100 is typically made of polymeric material. One non-limiting example of a material to be used in forming a polymeric container is polyethylene terephthalate (PET), polypropylene (PP) or blends using the same. It is contemplated that the

container may be formed of other polymeric or copolymer materials. The container 100 is typically have an encapsulated oxygen-barrier layer or oxygen barrier material incorporated therein.

[00100] In another embodiment, the child-resistant closures may be made of non-polymeric materials such as metal. In such a configuration, the closure would need to be designed such that the slidable lid would be able to be properly positioned on the slide portal.

[00101] While the foregoing written description of the invention enables one of ordinary skill to make and use what is considered presently to be the best mode thereof, those of ordinary skill will understand and appreciate the existence of variations, combinations, and equivalents of the specific embodiment, method, and examples herein. The invention should therefore not be limited by the above described embodiment, method, and examples, but by all embodiments and methods within the scope and spirit of the invention.

CLAIMS

WHAT IS CLAIMED IS:

1. A child-resistant closure comprising:

a polymeric top portion having an exterior surface and an interior surface, the polymeric top portion including a slide portal, the slide portal including a retention wall, the polymeric top portion forming an opening;

a polymeric annular skirt portion depending from the polymeric top portion; and

a cantilevered slidable lid including a first portion and a second portion, the first portion having a first end and a second end, the second end of the first portion forming a latch on an interior surface of the first portion, the second portion having a first end and a second end, the second end of the second portion being connected or attached to the second end of the first portion, the first end of the second portion being spaced from the first portion and forming a cantilever, the second portion extending generally upwardly and inwardly from the first portion into an interior of the closure,

wherein the cantilevered slidable lid is adapted to move by pressing on the first end of the second portion to release the latch and sliding the cantilevered slidable lid along the slide portal.

2. The closure of claim 1, wherein the first portion has at least one retention projection extending upwardly from an exterior surface of the first portion, the at least one retention projection in conjunction with the retention wall assists in preventing or inhibiting removal of the cantilevered slidable lid from the remainder of the closure.

3. The closure of claim 2, wherein the at least one retention projection is a plurality of retention projections.

4. The closure of claim 1, wherein the polymeric top portion further includes a depression or a latch-receiving opening, the depression or the latch-receiving opening being adapted to receive the latch when the closure is in a closed position.

5. The closure of claim 1 further including a tamper-evident feature.

6. The closure of claim 5, wherein the tamper-evident feature is connected to the first end of the second portion via a frangible connection.

7. The closure of claim 1, wherein the second portion of the cantilevered slidable lid includes a plurality of gripping ridges extending from a top surface thereof to assist in sliding the cantilevered slidable lid along the slide portal.

8. The closure of claim 1, wherein the polymeric annular skirt portion includes an internal thread formation.

9. The closure of claim 1, wherein the retention wall includes a pair of sidewalls bridging a top wall.

10. The closure of claim 9, wherein the retention wall further includes a plurality of elongated rails to assist in sliding the cantilevered slidable lid along the slide portal.

11. A package comprising:

a container having a neck portion defining an opening, the neck portion having an exterior surface and an interior surface; and

a closure being configured for fitment to the neck portion of the container for closing the opening, the closure includes a polymeric top portion, a polymeric annular skirt portion depending from the polymeric top portion and a cantilevered slidable lid, the polymeric top portion having an exterior surface and an interior surface, the polymeric top portion including a slide portal, the slide portal including a retention wall, the polymeric top portion forming an opening, the cantilevered slidable lid including a first portion and a second portion, the first portion having a first end and a second end, the second end of the first portion forming a latch on an interior surface of the first portion, the second portion having a first end and a second end, the second end of the second portion being connected or attached to the second end of the first portion, the first end of the second portion being spaced from the first portion and forming a cantilever, the second portion extending generally upwardly and inwardly from the first portion into an interior of the closure,

wherein the cantilevered slidable lid is adapted to move by pressing on the first end of the second portion to release the latch and sliding the cantilevered slidable lid along the slide portal.

12. The package of claim 11, wherein the first portion has at least one retention projection extending upwardly from an exterior surface of the first portion, the at least one retention projection in conjunction with the retention wall assists in preventing or inhibiting removal of the cantilevered slidable lid from the remainder of the closure.

13. The package of claim 11, wherein the polymeric top portion further includes a depression or a latch-receiving opening, the depression or the latch-receiving opening being adapted to receive the latch when the closure is in a closed position.

14. The package of claim 11, wherein the closure further including a tamper-evident feature, the tamper-evident feature being connected to the first end of the second portion via a frangible connection.

15. A child-resistant closure comprising:

a polymeric top portion having an exterior surface and an interior surface, the polymeric top portion forming an opening;

a polymeric annular skirt portion depending from the polymeric top portion; and

a cantilevered rotationable lid including a first portion and a second portion, the first portion having a first end and a second end, the second end of the first portion forming a latch on an interior surface of the first portion, the second portion having a first end and a second end, the second end of the second portion being attached or connected to the second end of the first portion, the first end of the second portion being spaced from the first portion and forming a cantilever, the second portion extending generally upwardly and inwardly from the first portion into an interior of the closure,

wherein the cantilevered rotationable lid is adapted to rotate by pressing on the first end of the second portion to release the latch and rotate the cantilevered rotationable lid.

16. The closure of claim 15, wherein the polymeric top portion includes at least one guiding member and an extension extending upwardly, the at least one guiding member assists in positioning the cantilevered rotationable lid.

17. The closure of claim 15, wherein the polymeric top portion further includes a depression or a latch-receiving opening, the depression or the latch-receiving opening being adapted to receive the latch when the closure is in a closed position.

18. The closure of claim 15 further including a tamper-evident feature, the tamper-evident feature being connected to the first end of the second portion via a frangible connection.

19. A package comprising:

a container having a neck portion defining an opening, the neck portion having an exterior surface and an interior surface; and

a closure being configured for fitment to the neck portion of the container for closing the opening, the closure including a polymeric top portion, a polymeric annular skirt portion depending from the polymeric top portion, and a cantilevered rotationable lid, the polymeric top portion having an exterior surface and an interior surface, the polymeric top portion forming an opening, the cantilevered rotationable lid including a first portion and a second portion, the first portion having a first end and a second end, the second end of the first portion forming a latch on an interior surface of the first portion, the second portion having a first end and a second end, the second end of the second portion being attached or connected to the second end of the first portion, the first end of the second portion being spaced from the first portion and forming a cantilever, the second portion extending generally upwardly and inwardly from the first portion into an interior of the closure,

wherein the cantilevered rotationable lid is adapted to rotate by pressing on the first end of the second portion to release the latch and rotate the cantilevered rotationable lid.

20. The package of claim 19, wherein the polymeric top portion includes at least one guiding member and an extension extending upwardly to prevent or inhibit further rotation of the cantilevered rotationable lid, the at least one guiding member assisting in positioning the cantilevered rotationable lid.

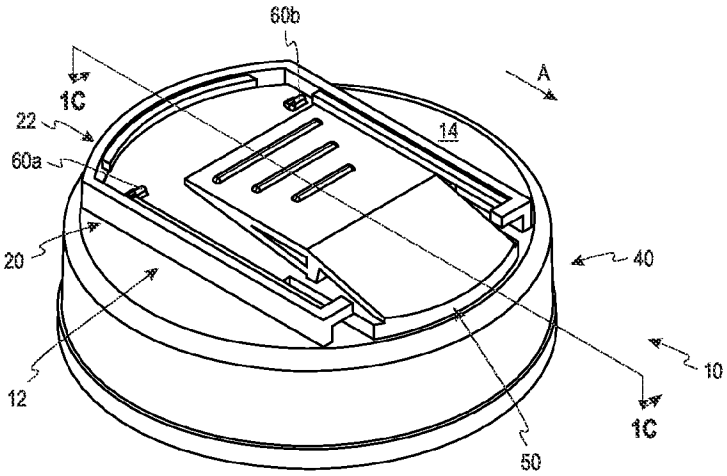

Fig. 1A

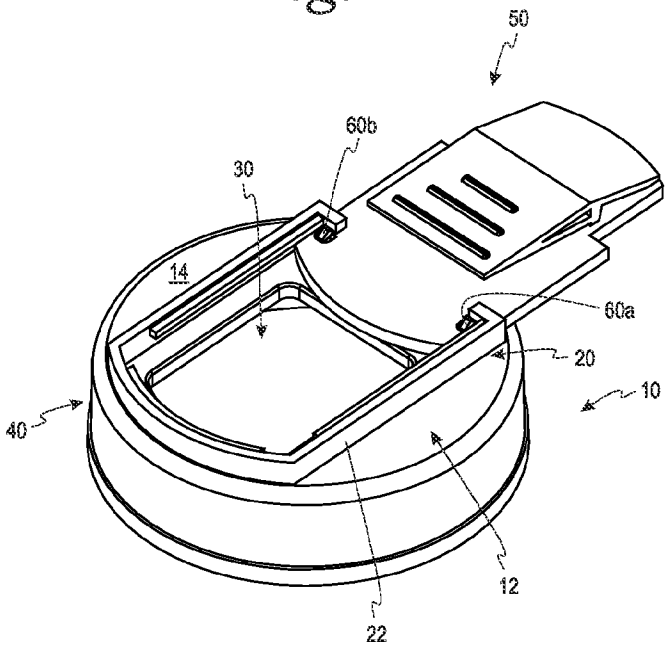

Fig. 1B

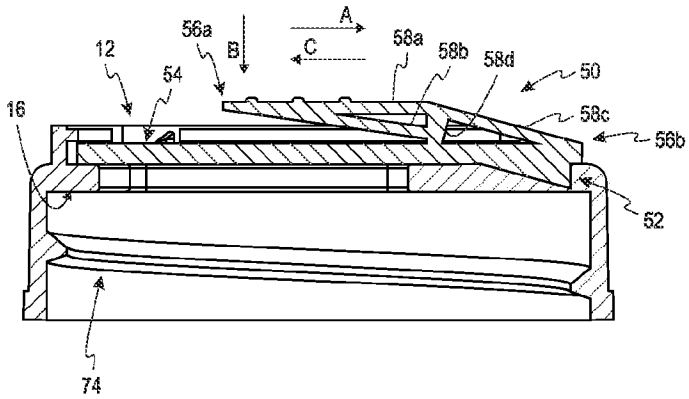
A
56a
B
C
58a
58b
58d
50
12
54
58c
16
56b
52
74

Fig. 1C

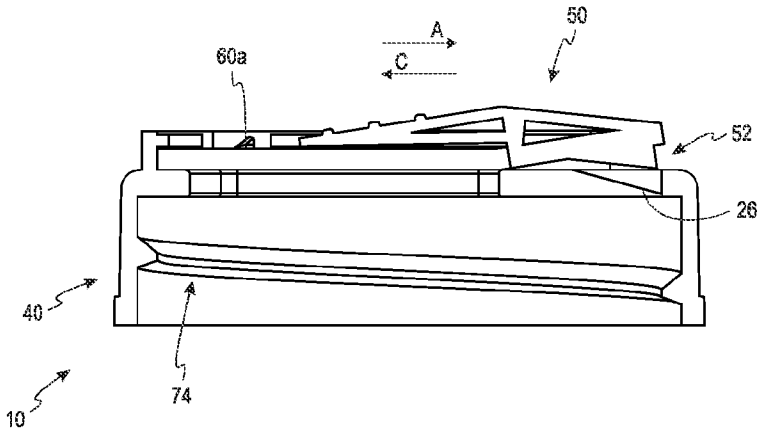
A
50
60a
C
52
26
40
74
10

Fig. 1D

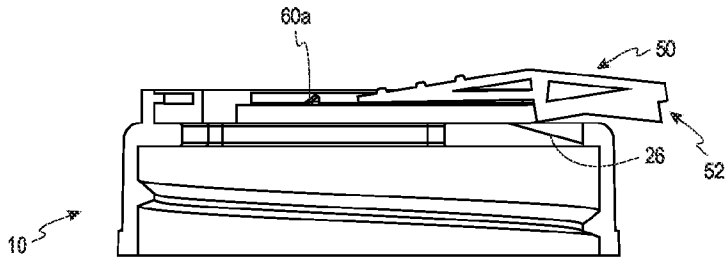

Fig. 1E

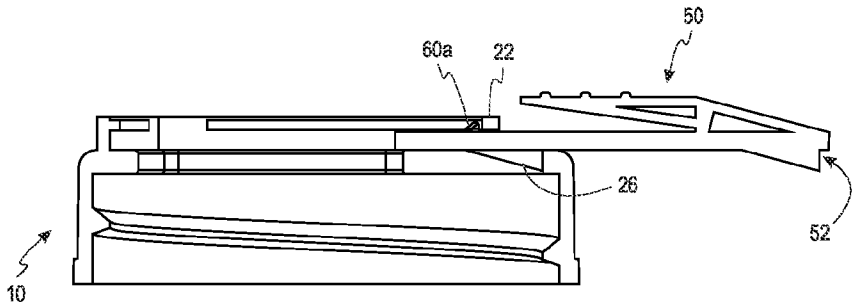

Fig. 1F

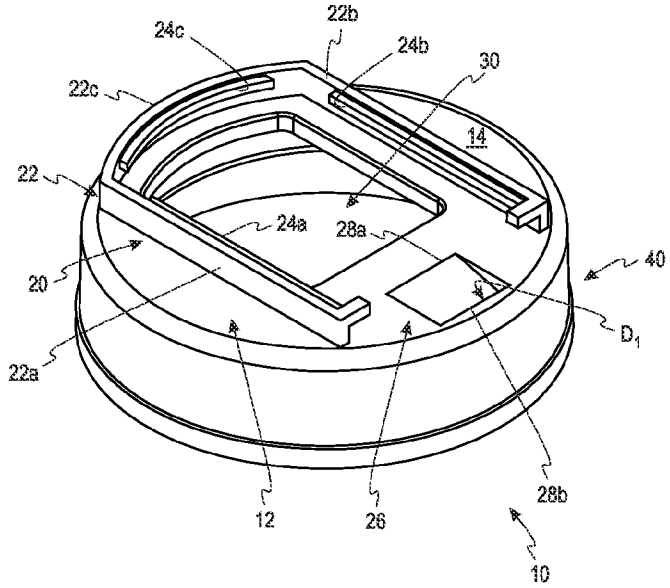
22b
24c
24b
30
22c
14
22
24a
28a
40
20
D_1
22a
12
26
28b
10

Fig. 2

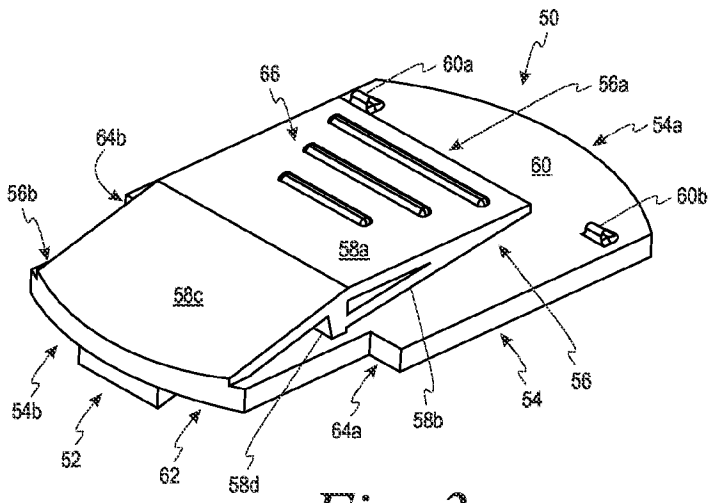
50
66
60a
56a
54a
64b
60
56b
60b
58a
58c
54b
52
62
58d
64a
58b
54
56

Fig. 3

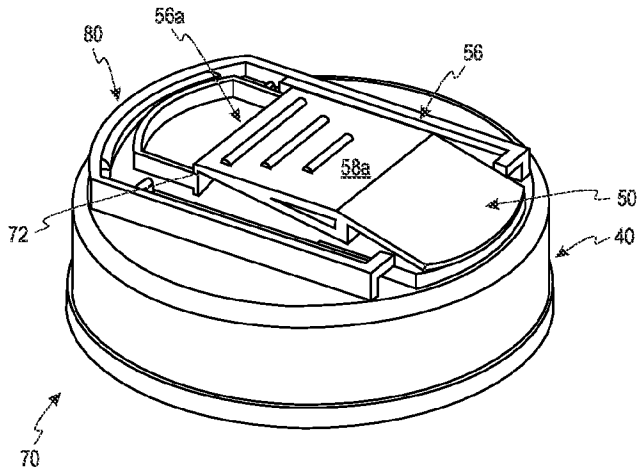

Fig. 4A

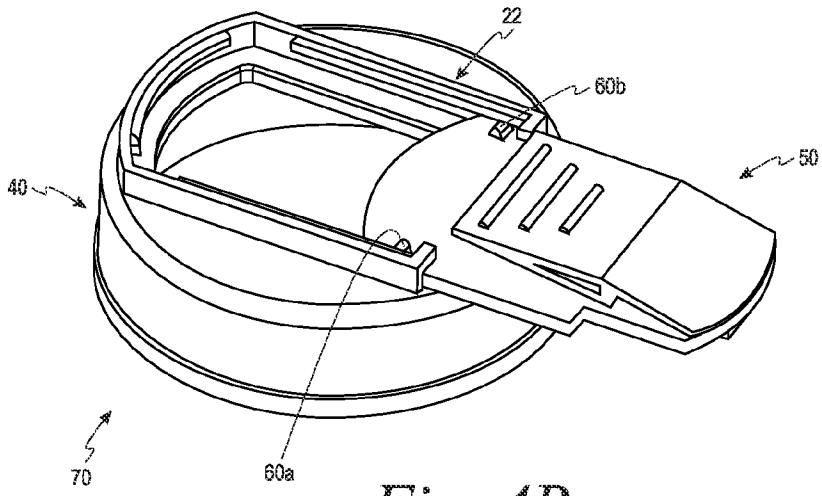

Fig. 4B

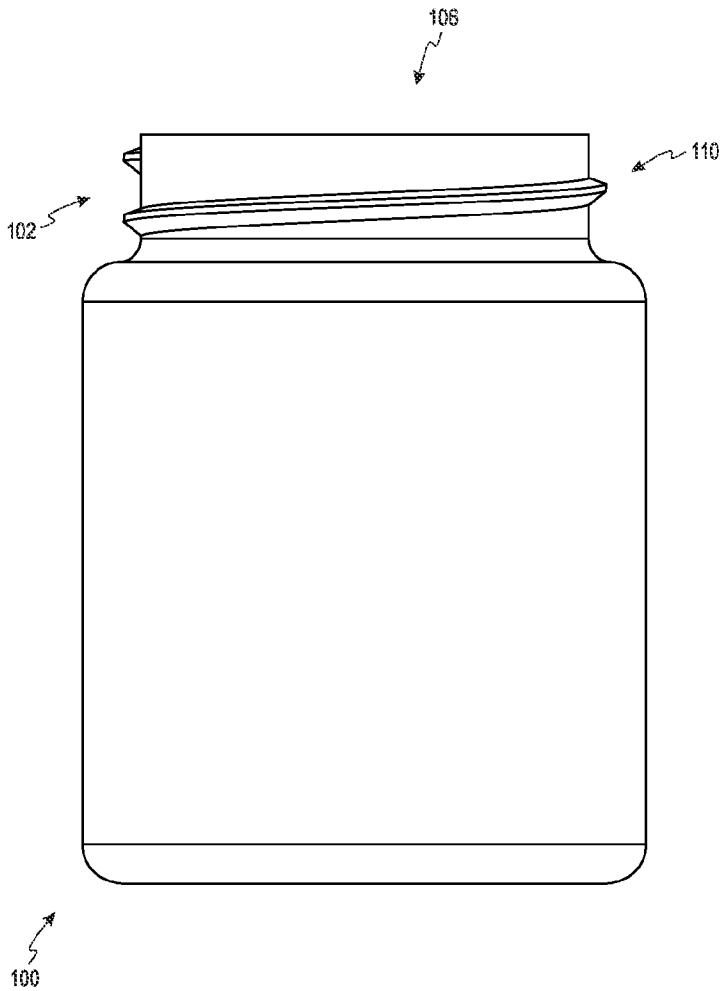

Fig. 5

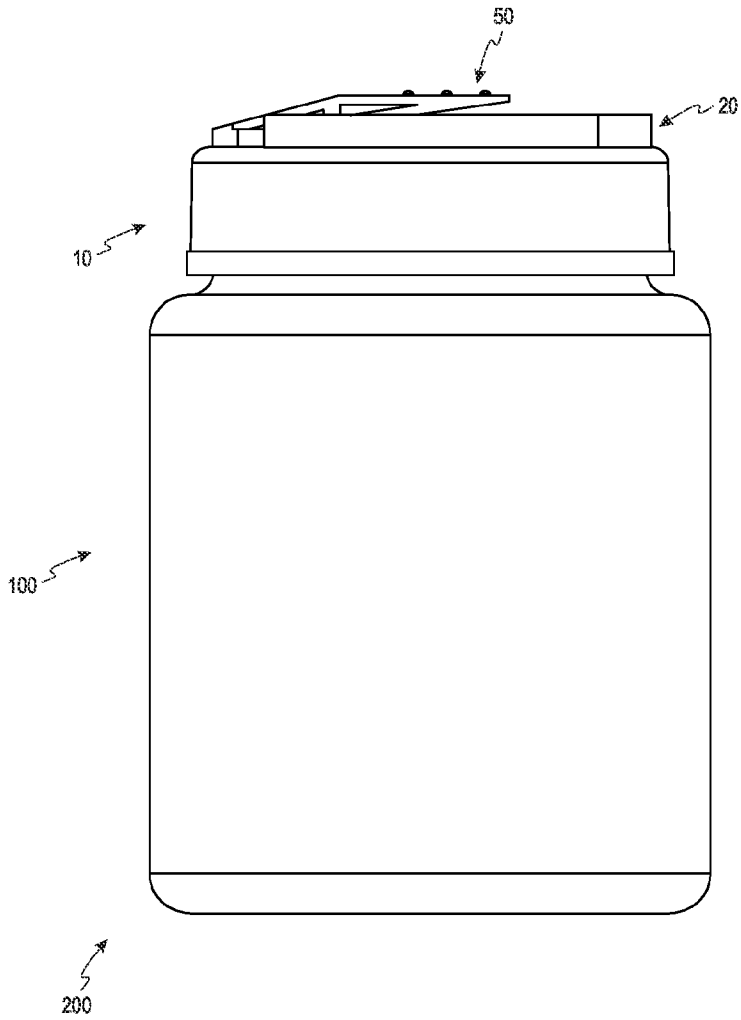

Fig. 6A

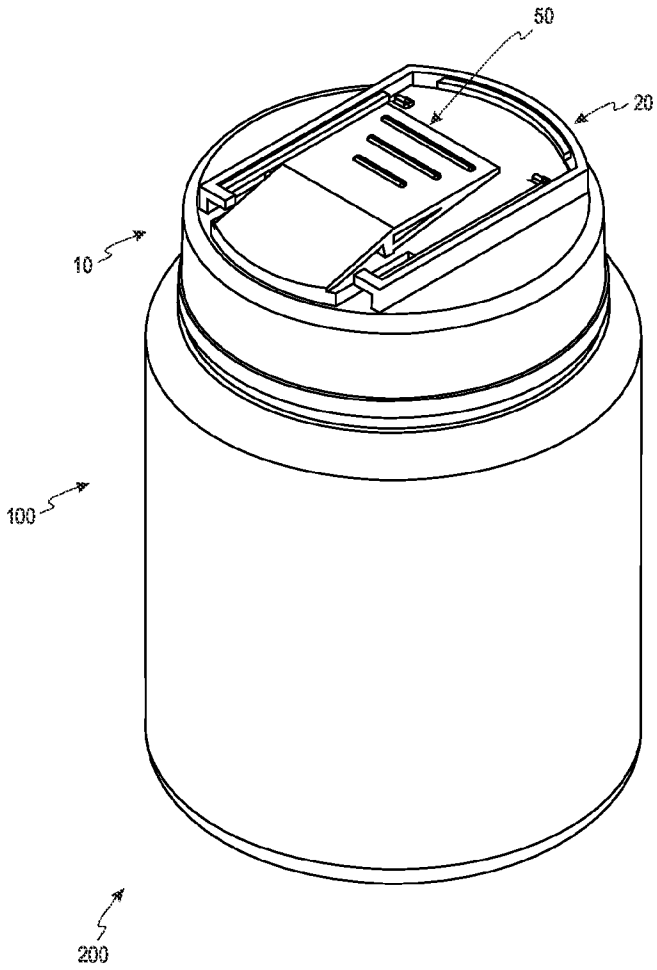

Fig. 6B

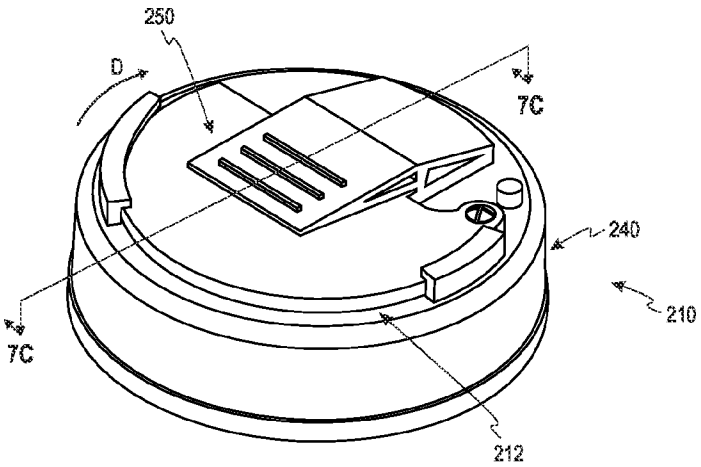
250
D
7C
240
210
7C
212

Fig. 7A

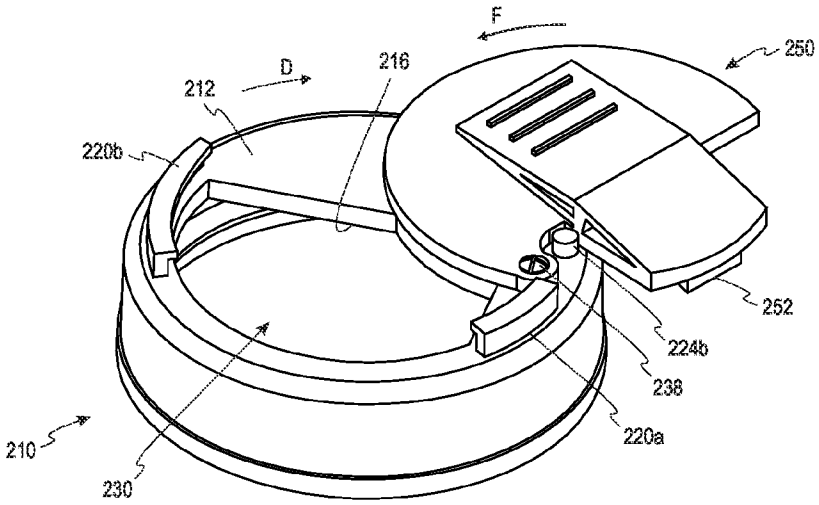
F
250
D
216
212
220b
252
224b
238
220a
210
230

Fig. 7B

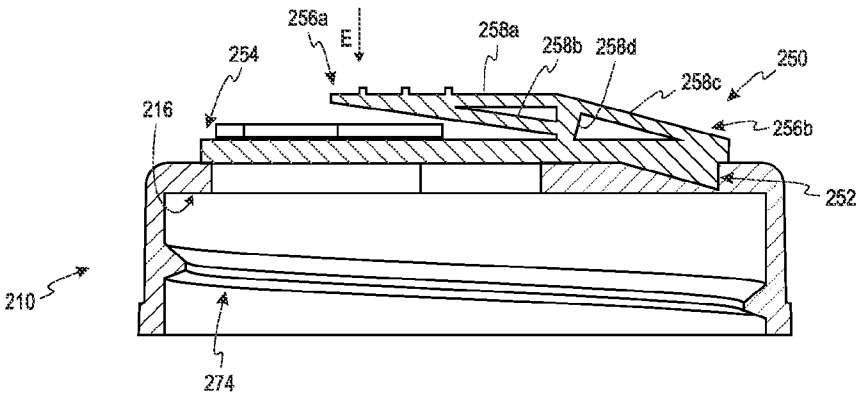

Fig. 7C

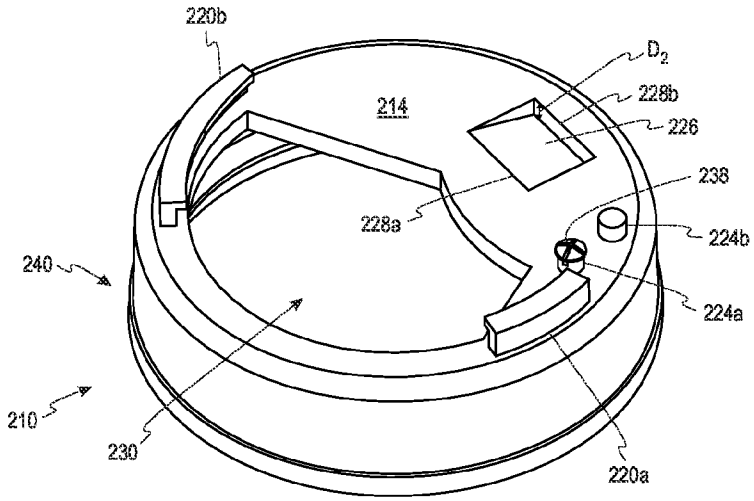
220b
D_2
214
228b
226
238
228a
224b
240
224a
210
230
220a

Fig. 8

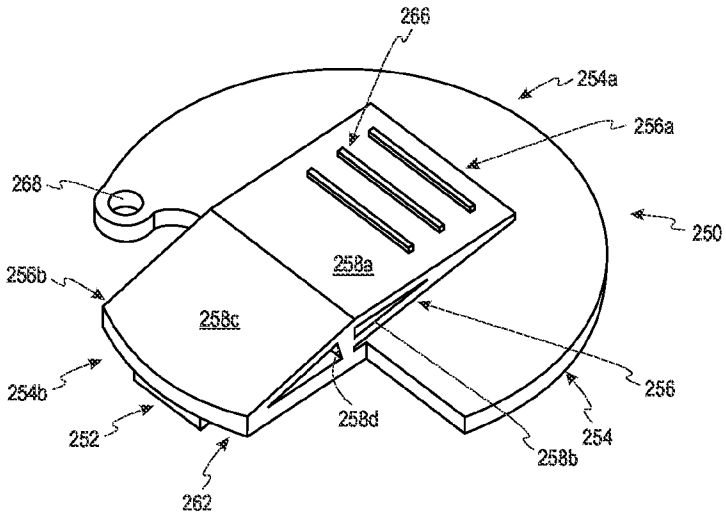
266
254a
256a
268
250
258a
256b
258c
256
254b
258d
254
252
258b
262

Fig. 9

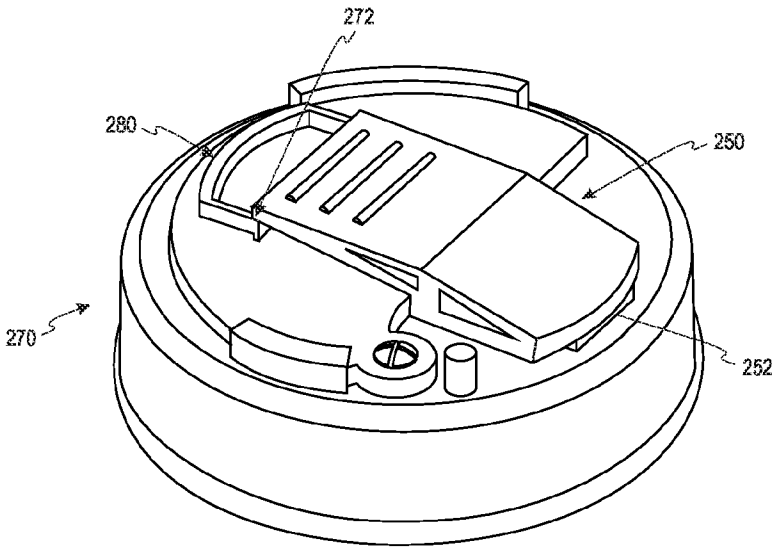

Fig. 10

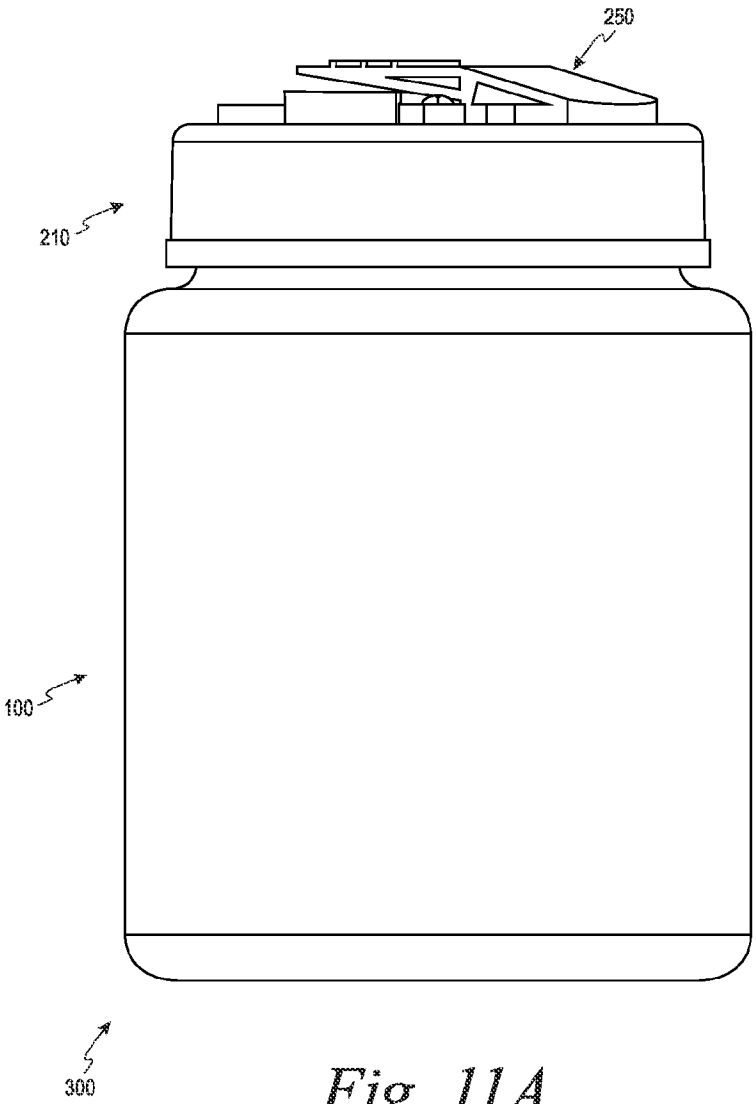

Fig. 11A

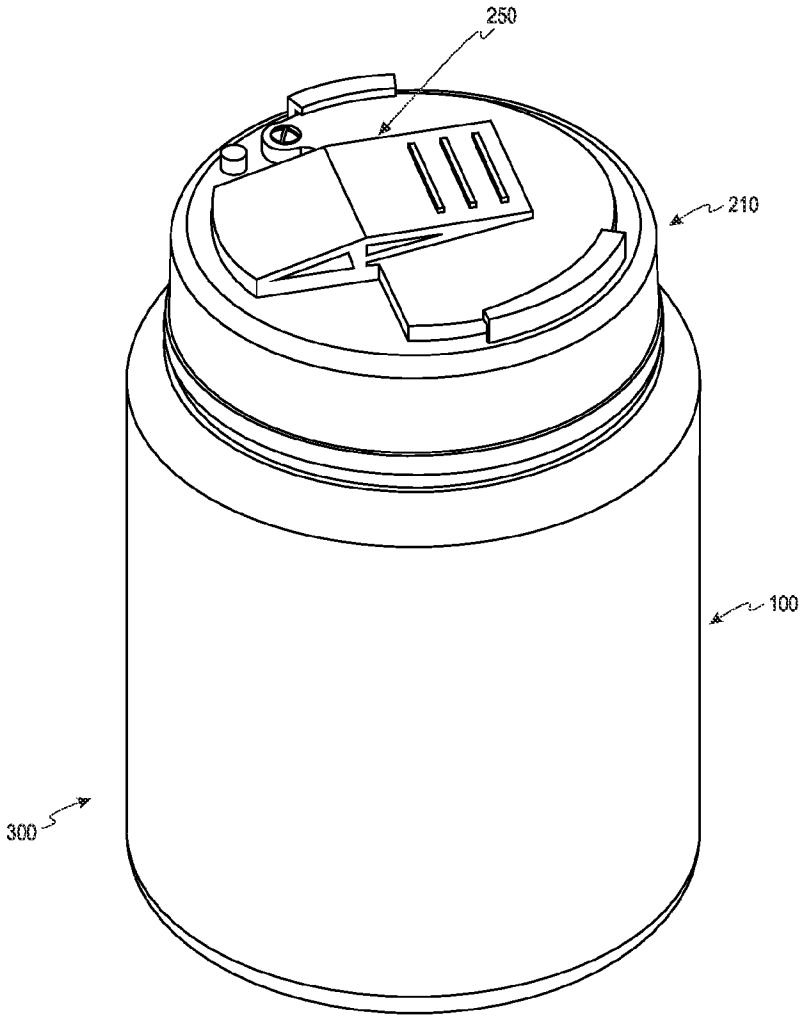

Fig. 11B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2023/027138

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D47/26 B65D47/28 B65D50/04
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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2020/006364 A1 (RB INNOVATIONS LLC [US]) 2 January 2020 (2020-01-02) page 41, line 12 - page 44, line 13; figures 19-23	1-20
A	US 9 365 333 B2 (BATZEL ZACHARY ROCKY [US]) 14 June 2016 (2016-06-14) figures	1
A	US 2013/320017 A1 (KIENTZLE VOLKER [US] ET AL) 5 December 2013 (2013-12-05) figures	1
A	DE 89 07 662 U1 (WEIDENHAMMER PACKUNGEN KG GMBH & CO) 25 October 1990 (1990-10-25) figures	1

-/--

[x] Further documents are listed in the continuation of Box C.

[x] 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 application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 September 2023	10/10/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Fournier, Jacques

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2023/027138

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 481 339 B1 (HSU WALTER W [TW]) 27 January 2009 (2009-01-27) figures	1
A	EP 0 339 939 A2 (METAL BOX CO SOUTH AFRICA [ZA]) 2 November 1989 (1989-11-02) figures	1
A	US 2 320 484 A (STRAUB WALTER F) 1 June 1943 (1943-06-01) figures	15-20
A	US 2006/278640 A1 (WATTS NANCY H [US]) 14 December 2006 (2006-12-14) figures	15-20
A	US 2020/270016 A1 (STENGEL JR GILBERT P [US] ET AL) 27 August 2020 (2020-08-27)	15-20
A	US 458 264 A (HASBROUCK) 25 August 1891 (1891-08-25) figures	15-20

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2023/027138

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2020006364 A1	02-01-2020	CA 3104689 A1	02-01-2020
		EP 3814244 A1	05-05-2021
		US 2021269201 A1	02-09-2021
		WO 2020006364 A1	02-01-2020
US 9365333 B2	14-06-2016	US 2015090686 A1	02-04-2015
		WO 2015048711 A1	02-04-2015
US 2013320017 A1	05-12-2013	NONE	
DE 8907662 U1	25-10-1990	NONE	
US 7481339 B1	27-01-2009	NONE	
EP 0339939 A2	02-11-1989	EP 0339939 A2	02-11-1989
		GB 2217695 A	01-11-1989
		ZA 891119 B	25-10-1989
US 2320484 A	01-06-1943	NONE	
US 2006278640 A1	14-12-2006	BR PI0609643 A2	20-04-2010
		JP 2008540257 A	20-11-2008
		KR 20070116995 A	11-12-2007
		US 2006278640 A1	14-12-2006
		WO 2006108102 A2	12-10-2006
US 2020270016 A1	27-08-2020	NONE	
US 458264 A	25-08-1891	NONE	