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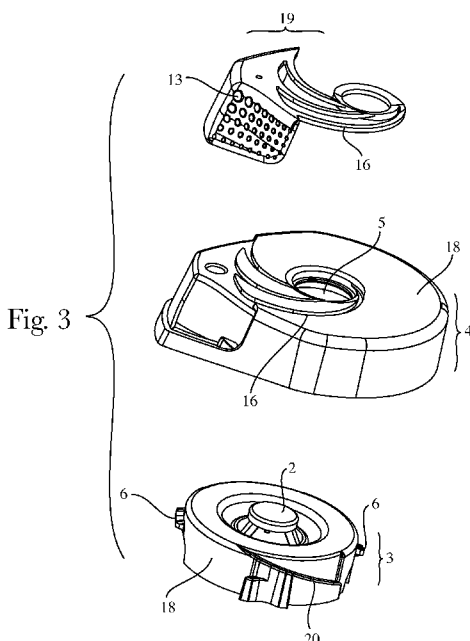
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(54) Title: A CLOSURE FOR A CONTAINER



(57) Abstract: A closure (1) comprises a first component (3) which assembles onto an outlet opening of a container (2), provides a seal and contains a snap component (7) and is threadingly engaged to a second component (4) of the closure. Said second component comprises a dispensing orifice (5) positioned directly adjacent to the open portion of the container outlet. The second component (4) will threadingly engage with the first component (3) when the second component (4) is moved relative to the first component to enable operation of the orifice (5). The first component (3) comprises one or more elements in a specific juxtaposition enabling a small height and a low profile for said element (s), which are in the plane or below the plane of the outlet of the container (2).

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A CLOSURE FOR A CONTAINER

FIELD OF THE INVENTION

The present invention relates to a closure for an outlet opening of a container comprising a first component which assembles onto an outlet opening and provides a seal for an outlet opening, said first component is threadingly engaged to a second component of said closure; which will engage with the first component when the second component is moved relative to the first component to enable operation of the orifice. In particular, the present invention relates to a first component comprising one or more elements being in a specific juxtaposition enabling a small height and low profile/ a narrow profile for one or more of the elements wherein a seal and the mechanical features supporting the operation of the closure are in the plane or below the plane of the outlet of the container.

BACKGROUND OF THE INVENTION

A variety of packages, including dispensing packages or containers, have been developed for household products, personal care products, and other products. Currently, there are several closure designs on store shelves. They all vary from Disc/pivot top, push to open, flip top, push and pull, twist to open, as well as a variety of others. A current disadvantage of all these closures is that they don't take into consideration the ease of use, audible/tactile signals, intuitiveness, and ergonomic features that delights the consumer. In the present invention, designs being developed take into consideration consumer insight. All closures represent one handed operation that demonstrates obviousness in open and close position with integrated locking feature. Also, the present invention will enable upright and inverted use of the package. Each closure is holistically designed to deliver intuitive operation; obviousness of being open or closed; ergonomic to operate; and providing all of the sensory (audible, tactile and visual) cues for operation. Further, the present invention expands on consumer insights that drive to efficiency per usage experience.

Currently, most closures complete the geometry of the container, thereby requiring the size of the closure to be proportional to the geometry of the container. In one embodiment of the present invention, the size of the closure is minimized thereby providing several benefits. One of the benefits is reducing the weight of the closure to the minimum amount of resin needed to enable the required closure functionality. This is a benefit for the environment as industry currently does not have a well established polypropylene recycling stream. By having a closure that has a reduced weight from the overall package, this allows a container to have improved recyclability. It also reduces the overall costs of the closure including costs associated with resin, processing, tooling, injection mold (IM) press selection, and others. Another benefit of minimizing closure size is that the closure becomes a less focal point of the design making it

more inductive to use the same closure for different container designs within one brand and even enable the use of the same closure across different brands/shaped families. This drives optimization and efficiency and in return reduces further costs. This further enables the silhouette of the shape to be scaled proportionally without the use of additional features such as container shoulders and angles to accommodate the closure.

Another benefit for minimizing the closure size is that it can be integrated in the container shape. When the container is in its inverted orientation, an integrated design allows the use of the container top surface to add stability vs. requiring a larger closure. This drives scale in the container design and development and therefore is an advantage. It also aids in creating differentiation between the forms (such as shampoo and conditioner), helping consumers identify the product that they are looking for.

SUMMARY OF THE INVENTION

The present invention is directed to a closure for an outlet opening of a container comprising a first component which assembles onto an outlet opening and provides a seal for an outlet opening said first component is threadingly engaged to a second component of said closure; a second component comprising a dispensing orifice of said second component, said second component, threadingly engaged with said first component; a dispensing orifice positioned directly adjacent to the open portion of the container body; wherein the second component will engage with the first component when the second component is moved relative to the first component to enable operation of the orifice and wherein the first component comprises one or more elements/one or more mechanical features being in a specific juxtaposition enabling a small height/ low profile/ a narrow profile for one or more (the majority of) of the mechanical features/elements of the first component wherein the seal and the mechanical features supporting the operation of the closure are in the plane or below the plane of the outlet of the container.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A is an isometric view of a closure with an arrow depicting a direction to open.

Figure 1B is an isometric view of a closure with an arrow depicting a direction to open.

Figure 2 is an exploded view of a closure – with an underside view.

Figure 3 is an exploded view of a closure.

Figure 4A is an isometric view of a first component of a closure.

Figure 4B is an isometric view of a first component of a closure.

Figure 4C is an isometric view of a first component of a closure.

Figure 4D is an isometric view of a first component of a closure.

Figure 5 is an isometric view of a closure integrated within two shoulders of a container.

Figure 6A is an isometric view of a second component of a closure.

Figure 6B is an isometric view of a second component of a closure.

Figure 6C is an isometric view of a second component of a closure.

Figure 7A is a cross section view of closure and container of Figure 8.

Figure 7B is a cross section view of closure and container of a modified Figure 8.

Figure 8 is an isometric view of a closure integrated with a shoulder of a container.

DETAILED DESCRIPTION OF THE INVENTION

According to the present invention a closure (1) for an outlet opening of a container comprises a first component which assembles onto an outlet opening and provides a seal for an outlet opening said first component is threadingly engaged to a second component of the closure. The first component connects the second component with the container. It enables the sealing mechanism for the container and first component and sealing between the first and second component. Non-limiting examples of a sealing mechanism include a plug seal, a telescoping seal, a membrane seal, a crab claw seal, a silicone membrane seal, spin or ultrasonic welding, glue adhesive and mixtures thereof. In an embodiment of the present invention, the sealing mechanism for the container and first component is a plug seal (9) and the sealing between the first and second component is a telescoping seal (8). A telescoping seal (8) may enable dynamic sealing between the first and second component. The telescoping seal maintains the seal as the user operates/actuates the closure.

The first component can comprise a male/female thread mechanism to enable closure operation and female ramps (20) to provide stability to the second component comprising male ribs (21) during closure operation. In a further embodiment, a thread mechanism may comprise mechanical female/male thread, designed in a helical path, to enable vertical movement of the second component relative to the first component.

Also, the first component (3) comprises an anti-rotating female feature (22) to prevent free movement of the closure as well as the counter part for an audible mechanism (23). An anti-rotating feature can prevent the first component from spinning freely relative to a container neck opening. There is also a second anti-rotating feature which is female mechanism (14) in one embodiment, and may be male mechanism (15) in another embodiment, between the first and second component such as an interlocking joint feature which may be a mechanical interlocking joint. An audible mechanism may communicate to the user when the closure is either closed or open. In a further embodiment of the present invention, the first component may comprise a snap ring(s) (24) which enables the first component to be securely attached to the neck of the container.

In an embodiment of the present invention, a second component comprises a dispensing orifice wherein the second component is, threadingly engaged with the first component. The second component may comprise features that contribute to the user interface. Such component comprises the color/shape

differentiation as well as the tactile features (13) and ergonomic intuitive design components. It also has the counter part mechanisms for the audible, telescoping seal, dispensing orifice, female/male thread mechanism, ramps/tracks stability features and anti rotating features.

In an embodiment in the present invention, a dispensing orifice (5) positioned directly adjacent to the open portion of the container body wherein the second component will engage with the first component when the second component is moved relative to the first component to enable operation of the orifice and wherein the first component comprises one or more elements/one or more mechanical features being in a specific juxtaposition enabling a small height/ low profile/ a narrow profile for one or more (the majority of) of the mechanical features/elements of the first component wherein a seal and the mechanical features supporting the operation of the closure are in the plane or below the plane of the outlet of the container (26). Most of the features within the first component are located at or below the plane of the container opening outlet (25). This enables the features to be placed at locations that are typically considered dead space. This allows for a design that has significantly less height than typical closures and as a result significant weight reduction of the overall closure is achieved. This will not only enable significant manufacturing cost reduction but, will also enable sustainability improvement by developing a closure that can be manufactured in half or less time (due to less energy consumption) and less part weight than average closures.

In an embodiment of the present invention, wherein the first component comprises one or more elements or one or more mechanical features being in a specific juxtaposition enabling a small height/ low profile/ a narrow profile regardless of the diameter of the container opening.

In an embodiment of the present invention, the height or distance of the specific juxtaposition may stay constant regardless of the size of the diameter of container opening. For example, the low profile needed for a small container opening may stay constant for a larger container opening.

In an embodiment of the present invention, the first component (3) may comprise one or more sealing regions, such as a plug seal (9) and telescoping seal (8) located on the top of the neck or extending beyond the top plane of the neck or top plane/surface of the neck and inside the neck of the container or it is located within the height of the neck or below the neck of the container enabling a small height or low profile or a narrow profile or same plane for mechanical features/elements of the first component.

In a further embodiment of the present invention, the first component (3) may comprise one or more elements located at or below a plane defined by a top region/area of a neck outlet of the container enabling a small height or low profile or a narrow profile or same plane for all of the mechanical features/elements of the first component.

In an embodiment of the present invention, a closure (1) for an outlet opening of a container is provided comprising a first component (3) which assembles onto an outlet opening (26) and provides a seal for an outlet opening said first component is threadingly engaged to a second component (4) of said closure; a second component (4) comprising a dispensing orifice (5) of the second component (4), the

second component (4) , threadingly engaged with the first component (3); a dispensing orifice (5) positioned directly adjacent to the open portion of the container body; wherein the second component (4) will engage with the first component (3) when the second component is moved relative to the first component (3) to enable operation of the orifice and wherein a full assembly of the first component (3) and the second component (4) comprises at least one material, and in a further embodiment, at least two materials.

In one embodiment of the present invention, in order to allow a user to reveal the dispensing orifice (5) of a package, a closure (1) may be designed with various different types of movements. A closure (1) may move by rotational movement along an axis, diagonal movement, and horizontal movement, vertical movement, a twist movement, elevate movement, slide movement, and mixtures thereof to reveal a dispensing orifice.

To achieve the above directional movement, in an embodiment of the present invention, the following mechanical features may be designed in the closure; female/male thread interface, a flow channel that may have a telescoping mechanism, a cylindrical, an elliptical, a square, or triangular shape; pivot points, swivel hinge type mechanisms and mixtures thereof.

In one embodiment of the present invention, the first component (3) comprises a male thread (6) to engage with said second component (4) and the second component (4) comprises female thread (7) which is a counterpart feature component of the closure. In a further embodiment of the present invention, the first component (3) comprises a female component to engage with said second component (4) and the second component (4) comprises male component which is a counterpart feature component of the closure. In a further component the first component may comprise a combination of female and male component and the second component may comprise a combination of female and male components as well.

The female (7) and male (6) threads allows the two components to stay together as one component. The female (7) and male threads (6) also enable the closure movement from a lower position to an elevated position. This allows the user to reveal the dispensing orifice (5) and hence dispense a fluid.

In an embodiment of the present invention, the second component (4) is moved in a concentric movement, linear movement, axial movement, radial movement, co-radial movement, eccentric movement, spiral movement and mixtures around the first component (3).

The dispensing orifice (5) may be revealed in different ways. For example; in a rotate/twist to open closure (1), the dispensing orifice (5) is opened via a female/male thread interaction where the first component (3) rotates/spins within it's axis of rotation, concentrically to the second component (4).

In a further embodiment of the present invention, the closure is integrated with a body of a container (Figure 7 and Figure 8). By having a closure as small as functionally possible; it may provide a centered or an offset of the closure to one side and have the container shoulder flush to the closure top

surface. It also provides full integration of the closure within the shoulders (10) of a container (1), and in a further embodiment within the shoulders (10) of a container (1).

In an embodiment of the present invention, the closure (1) is integrated with a body of a container, as shown in Figures 5 and 8, wherein geometry of the closure acts in completing the silhouette of the body of the container. In a further embodiment, in an inverted orientation a recessed closure allows the use of a container shoulder to add stability vs. requiring a full size closure on top of a container.

In a further embodiment of the present invention, closure geometry provides a surface for optimal leverage to operate a closure. A closure (1) is operated by a single hand of a user or by two hands of a user. A closure may have features with enhanced ergonomics such as handles, levers, alternative materials, textures, specific shaped contours, and combinations thereof. These features are strategically positioned to enable ease of use with either wet or dry hands. For example, in an embodiment of the present invention, in a twist/rotate to open closure (1) that uses female/male threads, the further away the lever or point of opening is from the axis of rotation, the easier the opening of the closure will be for the same area of applied pressure. In other words, in such an embodiment, the further the distance from the axis of rotation is, the less force will be required by the consumer to open the closure for a specific torque. The closure design could either have an enhanced shroud design for ease of use or ergonomically incorporated levers (11) or an ergonomically incorporated lever (29).

In an embodiment of the present invention, a closure (1) may comprise a mechanism that suspends one component relative to the other component to ensure a closure remains closed or open. As part of a twist/rotate motion to open a closure, the first and/or second component may have bumps or protrusions (12) in either a female thread (7) or a male thread (6) that will prevent a closure to close while opened or to open while closed. When the male thread (6) passes over the protrusions (12) or bump, the closure will lock in place and thus not allowing the second component (4) to open or close by itself.

In a further embodiment of the invention, a closure comprises a first component (3) which comprises an orienting mechanism which enables a specific orientation of the first component (3) relative to an outlet opening of a container. In this embodiment, a closure has either a male mechanism or female mechanism (22), which act as an orienting mechanism, that interacts with the male mechanism (30) or female mechanism (22) of a container to prevent free rotation and enable closure orientation for proper closure operation.

In an embodiment of the present invention, a closure (1) comprises a first component (3) comprising an orienting mechanism which enables a specific orientation of the second component (4) relative to the first component (3). This embodiment comprises a design that takes advantage of a first component female tracks and creates a female/male mechanism configuration with the second component to align and prevent further rotation between the first component (3) and a second component (4). In this embodiment, the female mechanism (14) and male mechanism (15) is designed in an interlocking joint

which may allow for a more robust and stable engagement between the first component (3) and the second component (4).

In an embodiment of the present invention, a closure (1) rotates around an axis between an open and a close position.

In a twist/rotate to open closure a second component (4) is rotated around an axis to move the second component (4) relative to a first component (3) between a lower and elevated position, allowing a user to reveal the dispensing orifice (5) of the second component (4).

In a further embodiment of the present invention, a closure (1) comprises tactile features (13) and/or visual features (16) that provide a user with direction on how to operate the closure. The closure (1) will incorporate tactile features (13) and visual features (16) that will cue or communicate to a user to know where to press/push/hold and which direction the force needs to be applied.

In an embodiment of the present invention, a closure comprises an audible sound mechanism. In an embodiment, a closure may have a cantilever feature (17) or a similar mechanical feature that will generate a sound as the user manipulates a closure from an open to a closed position and/or closed to open position. This will communicate to a user when a closure is fully opened and when a closure is fully closed.

In a further embodiment of the present invention, the first component (3) may comprise anchor ribs (27) to provide stability of the second component (4) relative to the first component.

By having anchor ribs (27) in either the first component (3) or second component (4), the integrity of the assembly increases and therefore the more stable the assembly will be. This is because the anchor ribs (27) may limit the side-to-side movement (wobble) of the second component (4) relative to the first component (3).

In a further embodiment of the present invention, the first component (3) may comprise anchor ribs (27) to keep first component (3) and second component (4) intact upon removal of the closure.

By having anchor ribs (27) in either the first component (3) or the second component (4), the integrity of the assembly increases and therefore the more robust the engagement of the assembly will be. This is because the anchor ribs (27) are limiting the side-to-side movement (wobble) of the second component and consequently they increase the retention force of the second component (4) relative to the first component (3). The anchor ribs (27) increase the engagement of the retention feature that enables the second component (4) to stay together with the first component (3). In a further embodiment of the present invention, wherein the first component (3) or the second component (4) may comprises multi stage opening bumps for metered dosing. By having a multistage opening closure, a consumer will be capable of opening the closure at different heights and therefore control the size of the dispensing orifice opening. This will enable the consumers to dispense a preferred amount from the container, which is

different from existing closures were a consumer has limited control over the amount that they dispense from their containers. The present invention will enable the consumer to always dose the same exact amount every single time.

By having a multistage opening closure the consumer will be capable of opening the closure at different heights and therefore control the size of the dispensing orifice opening. This will enable the consumers to dispense their preferred amount from the container. Different from today were they have limited control over the amount that they dispense from their containers. The present invention will enable the consumer to always dose the same exact amount every single time.

In a further embodiment of the present invention, a closure is comprised of a sustainable material. The closure may be manufactured completely with sustainable materials or either the first component (3) or second component (4) only. This may allow for a more recyclable closure. Some of the materials that could be used are: PCR, HDPE, LDPE, Bamboo, renewable resins include PLA (polylactic acid), PHA (polyhydroxyalkanoate), and bio-polyolefins (bio-PE, bio-PP, bio-PET), where starting materials are plants or biomass instead of oil; recycled and recyclable resins include PP PCR (post consumer regrind) and PIR (post industrial regrind), which are resins diverted from trash to be reprocessed and/or reused instead; Natural fillers include minerals (e.g. CaCO₃), wood, pulp, paper, bamboo, grass, kenaf, bulrush, and other natural plants that have been crushed, cut, broken, or pulverized for inclusion in plastics; renewable resins include PLA (polylactic acid), PHA (polyhydroxyalkanoate), and bio-polyolefins (bio-PE, bio-PP, bio-PET), where starting materials are plants or biomass instead of oil; recycled and recyclable resins include PP PCR (post consumer regrind) and PIR (post industrial regrind), which are resins diverted from trash to be reprocessed and/or reused instead; some recycled miscellaneous materials can be used as fillers, including waste currency. (e.g. U.S. dollar bills).

In a further embodiment of the present invention, a container made by the present invention wherein the container is comprised of a biodegradable polymer material selected from the group consisting of polyglycolic acid (PGA), polybutylene succinate (PBS), an aliphatic-aromatic copolyester based on terephthalic acid, an aromatic copolyester with a high terephthalic acid content, thermoplastic starch (TPS), cellulose, or a mixture thereof.

The sustainable materials may include biopolymers made from non-petroleum sources, biodegradable polymers, recycled resins and mixtures thereof. Some of the potential

biopolymers that could be used for this application are: bamboo, paper, and grass. A non-petroleum source may be selected from the group consisting of bio-derived polyethylene, bio derived polypropylene, bio derived polyesters and mixtures thereof. Some or all of the sustainable material may contain colorants, antistatics, UV inhibitors, or other small quantity additives to change the appearance or performance.

In an embodiment of the present invention, a closure may comprise at least two materials. A closure may be molded with a hard material (18) (such as a polypropylene (PP) like resin) and a soft material (19). In a further embodiment of the presents invention such hard materials may be hard resins such as Polyolefin resins, such as Polyethylene PE and polypropylene PP; Acrylates, such as Poly methyl acrylate, PMA; Carbonates such as Polycarbonate PC; Carbonates, such as Polycarbonate PC; Methacrylates, such as poly methyl methacrylate PMMA; Amides such as Nylon 6 ; Acetal ; Copolymers, such as Acrylonitrile butadiene styrene – ABS; Chlorinated Polymers, such as Poly vinyl chloride PVC; Styrenics, such as Polystyrene PS; Esters, such as polyethylene terephthalate PET; Modified Esters such as PETG; Polyformaldehyde such as Delrin; Methacrylates, such as poly methyl methacrylate PMMA; Amides, such as Nylon 6 ; Acetal ; Copolymers such as Acrylonitrile butadiene styrene – ABS; Chlorinated Polymers, such as Poly vinyl chloride PVC; Styrenics, such as Polystyrene PS; Esters, such as polyethylene terephthalate PET; Modified Esters, such as PETG; and Polyformaldehyde, such as Delrin.

In a further embodiment, a closure may be molded with a soft material (19). Such soft material (19) may include soft injection moldable resins; Thermoplastic elastomers; TPE including styrenic (SEBS and SBS) based and olefin (TPO PP Elastomer) based; Thermoplastic eurothanes TPU; Melt Processable Rubber MPR; Thermoplastic Vulcanizate TPV; and Poly vinyl chloride PVC and mixtures thereof. In an embodiment of the present invention, the soft like material may delight the consumer with a soft touch feel while opening and closing the closure.

In a further embodiment of the present invention, soft resins that are not injection molded may be used, such as silicone; and urethane rubbers.

In a further embodiment of the present invention, a closure may comprise materials which may improve functional performance (sealing, ergonomics, stability on storage surfaces, visual aid for user, container durability, customized the tactile and audible signals to the user and mixtures thereof). A TPE or silicone like material will enable for a more robust seal between the

dispensing orifice (5) and a spud (2) design. In the present application, the softer material (19) will tend to conform to the shape of the spud (2) design, allowing for a better seal vs. PP to PP components.

The closure may also incorporate dissimilar materials between the first component (3) and the second component (4) to lower the coefficient of friction between both components. Materials combinations that may be used are PP/PP, HDPE/PP, LDPE/PP, Acetel/PP, Bamboo/PP and mixtures thereof.

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

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

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

CLAIMS

What is claimed is:

1. A closure for an outlet opening of a container comprising:
 - a. a first component which assembles onto an outlet opening and provides a seal for an outlet opening said first component is threadingly engaged to a second component of said closure;
 - b. a second component comprising a dispensing orifice of said second component, said second component, threadingly engaged with said first component;
 - c. a dispensing orifice positioned directly adjacent to the open portion of the container body;
wherein the second component will engage with the first component when the second component is moved relative to the first component to enable operation of the orifice and wherein the first component comprises one or more elements being in a specific juxtaposition enabling a small height and a low profile for one or more of the elements of the first component and the second component wherein a seal and elements supporting the operation of the closure are in the plane or below the plane of the outlet of the container.
2. A closure according to Claim 1 wherein the closure will move in a method selected from the group consisting of twist, elevate, slide, diagonal, horizontal, rotational and mixtures thereof to define a dispensing orifice.
3. A closure according to Claim 1 wherein the closure comprises at least two materials.
4. A closure according to Claim 1 wherein the dispensing orifice is formed by the orientation of the first component to the second component or the orientation of the second component to the first component.
5. A closure according to Claim 1 wherein the first component comprises a female/male feature to engage with said second component and the second component comprises a female/male counterpart feature component of the closure.

6. A closure according to Claim 1 wherein the second component comprises a female/male feature to engage with said first component and the first component comprises a female/male counterpart feature component of the closure.
7. A closure according to Claim 1 wherein the second component is moved in concentric movement around the first component.
8. A closure according to Claim 1 wherein the closure is integrated with a body of a container.
9. A closure according to Claim 8 wherein the closure is integrated with a body of a container wherein geometry of the closure functions in completing the silhouette of the body of the container.
10. A closure according to Claim 1 wherein the closure is operated by a single hand of a user or two hands of a user.
11. A closure according to Claim 1 wherein the closure and a container connected to the closure are held by a single hand of a user and closure is operated by a single digit of the single hand.
12. A closure according to Claim 1 wherein the closure comprises a mechanism that suspends one component relative to the other component to ensure a closure remains closed or open.
13. A closure according to Claim 1 wherein the first component comprises an orienting mechanism which enables a specific orientation of closure components relative to the outlet opening of the container where the assembly possesses an orienting or an alignment assembly.
14. A closure according to Claim 1 wherein the first component comprises an orienting mechanism which enables a specific orientation of the other closure components relative to the first component.

15. A closure according to Claim 1 wherein the closure comprises tactile features.
16. A closure according to Claim 1 wherein the closure comprises visual features.
17. A closure according to Claim 16, wherein the closure comprises the visual features which provide the user with direction on how to operate the closure.
18. A closure according to Claim 15, wherein the closure comprises the tactile features which provide the user with direction and a function on how to operate the closure.
19. A closure according to Claim 1 wherein the closure comprises an audible sound mechanism.
20. A closure according to Claim 1 wherein the closure is comprised of a sustainable material.
21. A closure according to Claim 1 wherein the first component comprises an anchor rib(s).
22. A closure according to Claim 20 wherein the sustainable material is selected from the group consisting of biopolymers made from non-petroleum sources, biodegradable polymers, recycled resins and mixtures thereof.
23. A closure according to Claim 22 wherein the non-petroleum source is selected from the group consisting of bio-derived polyethylene, bio derived polypropylene, bio derived polyesters and mixtures thereof.
24. A closure according to Claim 3 wherein the closure comprises materials that improve functional performance selected from the group consisting of sealing, ergonomics, stability on storage surfaces, visual aids for user, container durability, customization of tactile and audible signals to the user and mixtures thereof.
25. A closure according to claim 24 wherein the closure comprises material selected from the group consisting of polyolefin resins, polyethylene PE, polypropylene PP; Acrylates,

poly methyl acrylate, PMA; carbonates, polycarbonate PC; carbonates, polycarbonate PC; methacrylates, poly methyl methacrylate PMMA; amides, Nylon 6, acetal, copolymers, acrylonitrile butadiene styrene, ABS; chlorinated polymers, poly vinyl chloride PVC; styrenics, polystyrene PS; Esters, polyethylene terephthalate PET; modified esters, PETG, polyformaldehyde Delrin; methacrylates, poly methyl methacrylate PMMA; amides, Nylon 6, acetal, copolymers Acrylonitrile butadiene styrene – ABS, chlorinated polymers, poly vinyl chloride PVC; styrenics, such as polystyrene PS, esters, polyethylene terephthalate PET, modified esters, such as PETG, and polyformaldehyde, delrin and mixtures thereof.

26. A closure according to Claim 24 wherein the closure comprises a soft material selected from the group consisting of thermoplastic elastomers; TPE, styrenic (SEBS and SBS) based and olefin (TPO PP Elastomer) based, thermoplastic urethanes TPU, melt processable rubber MPR, thermoplastic vulcanizate TPV, and poly vinyl chloride PVC and mixtures thereof.
27. A closure according to Claim 1 wherein the closure geometry provides a surface for optimal leverage to operate the closure.

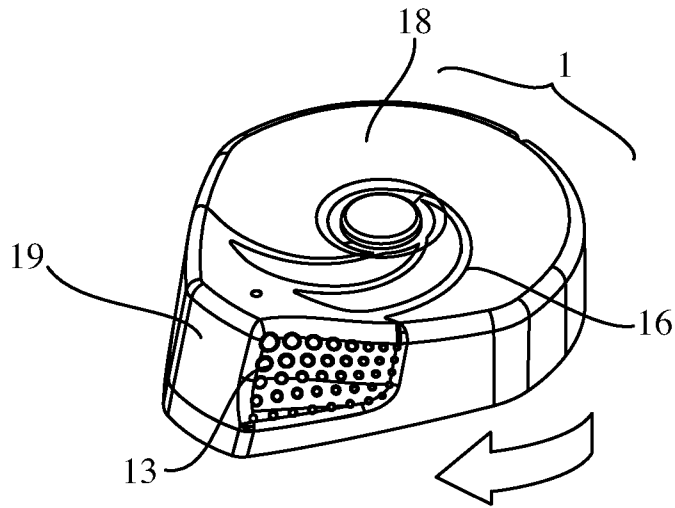


Fig. 1A

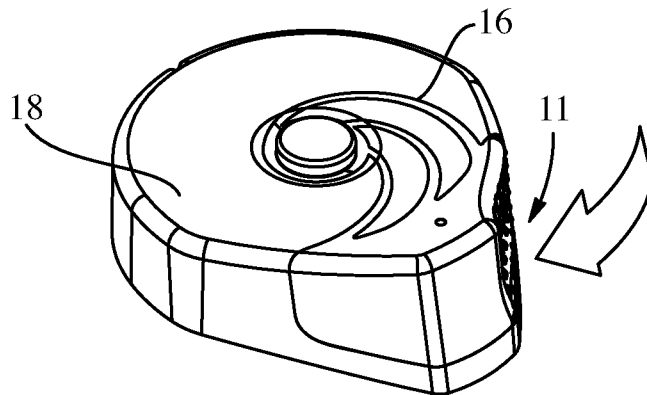
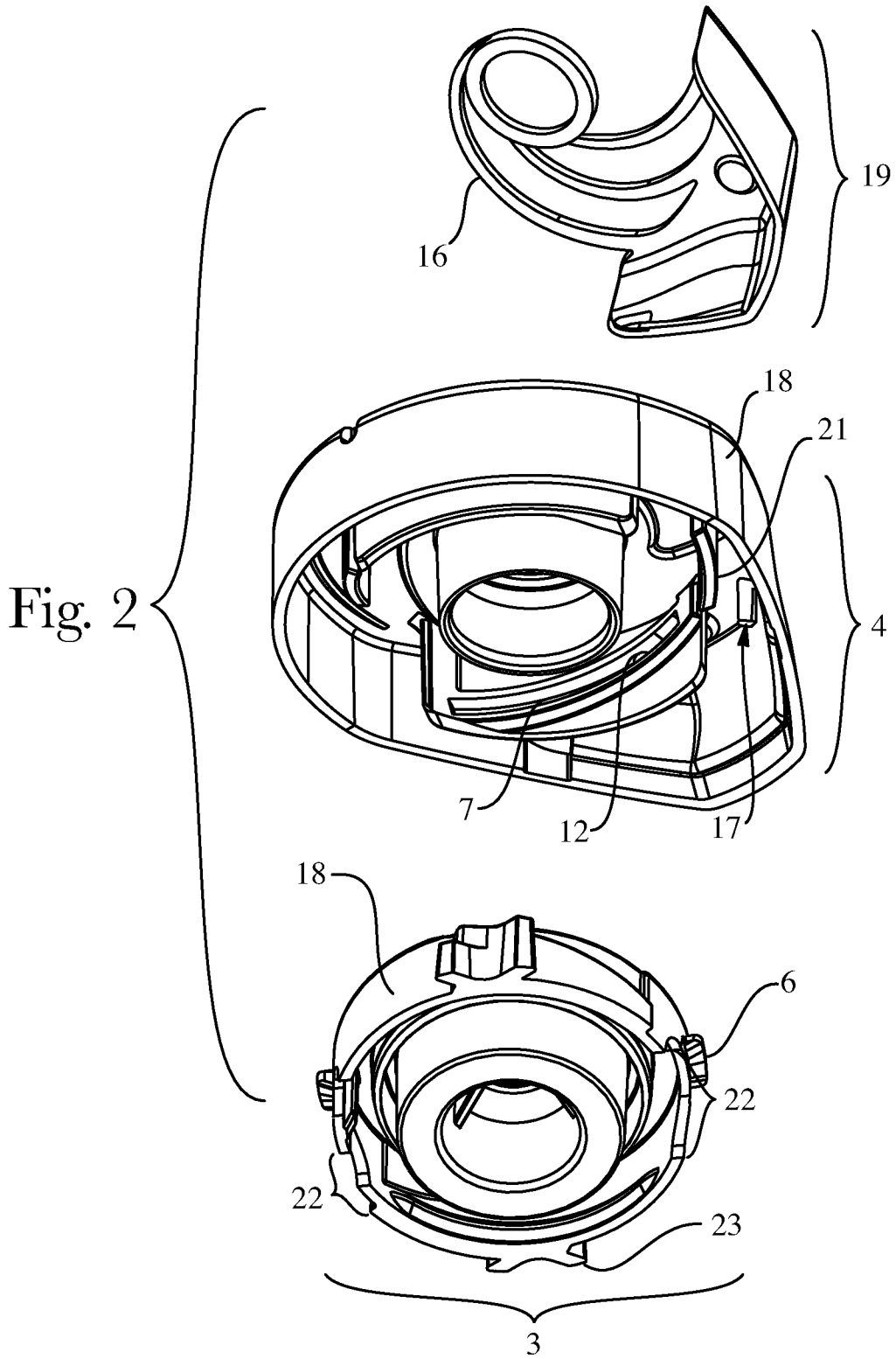
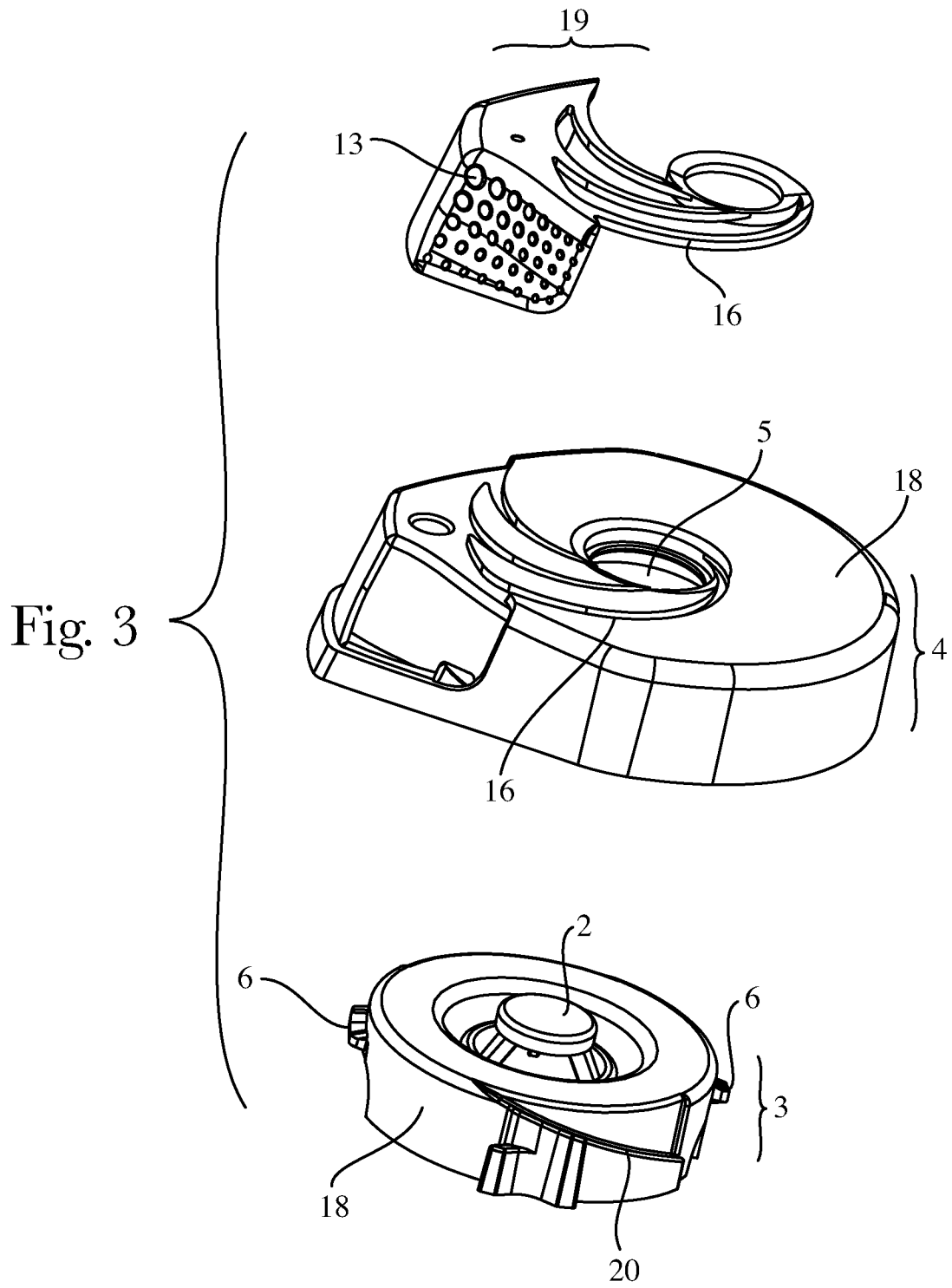


Fig. 1B



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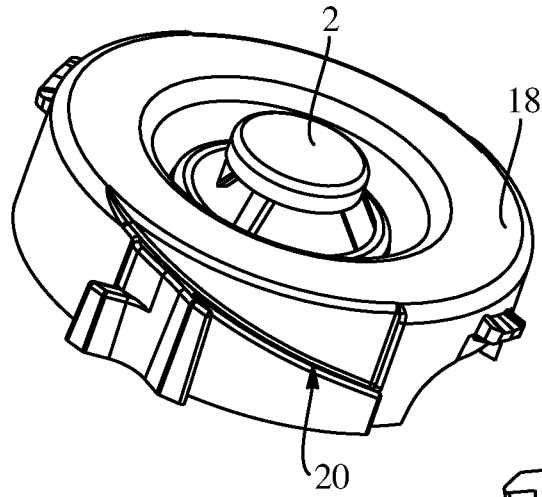


Fig. 4A

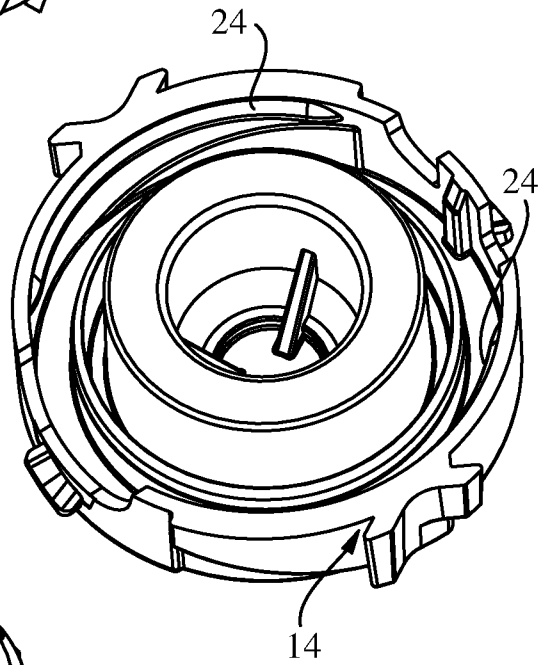


Fig. 4B

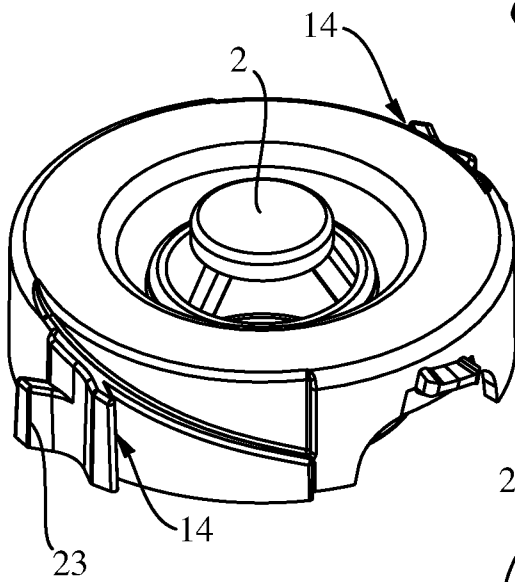


Fig. 4C

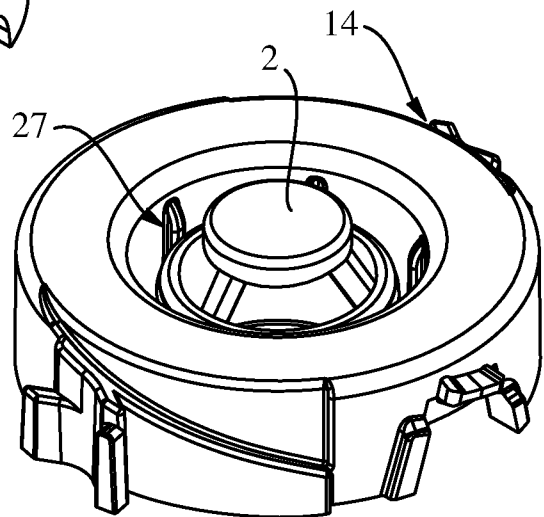


Fig. 4D

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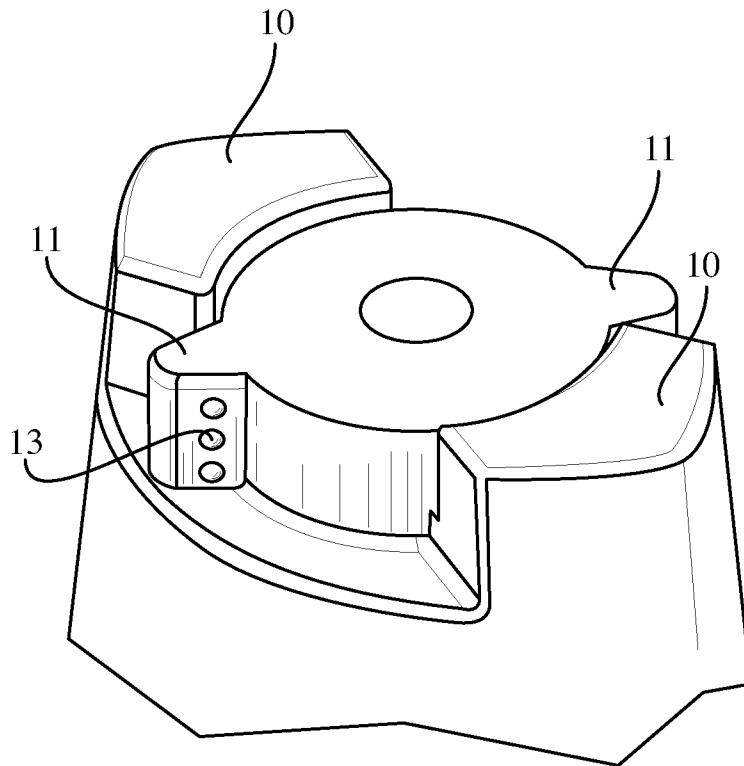


Fig. 5

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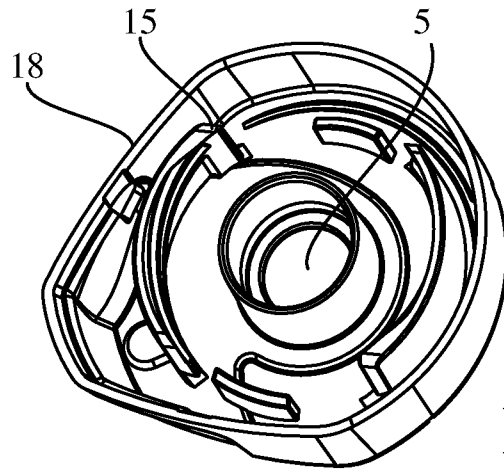


Fig. 6A

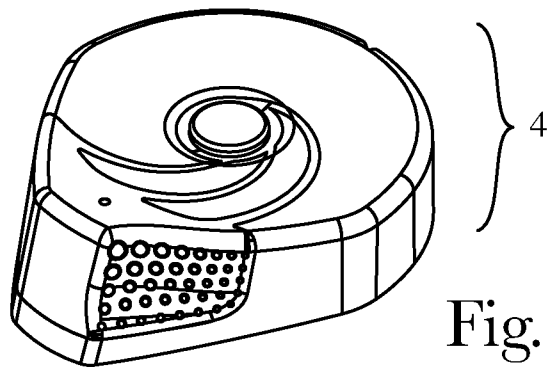


Fig. 6B

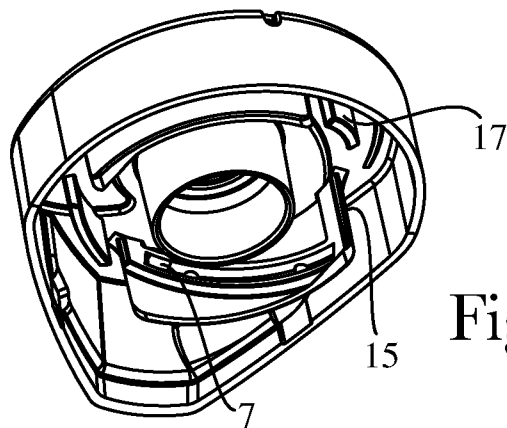


Fig. 6C

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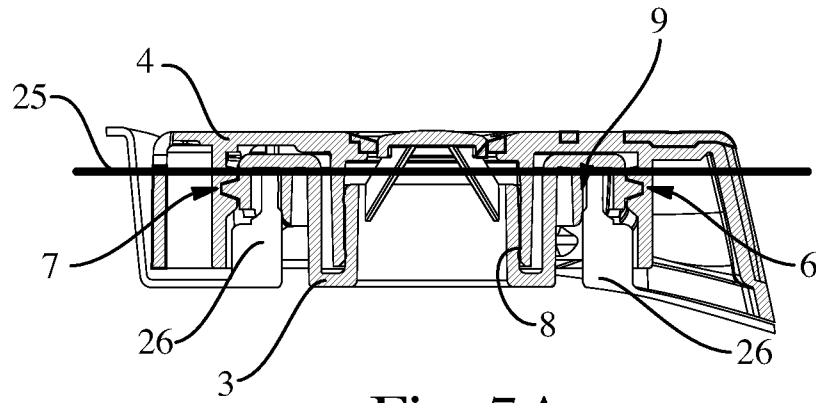


Fig. 7A

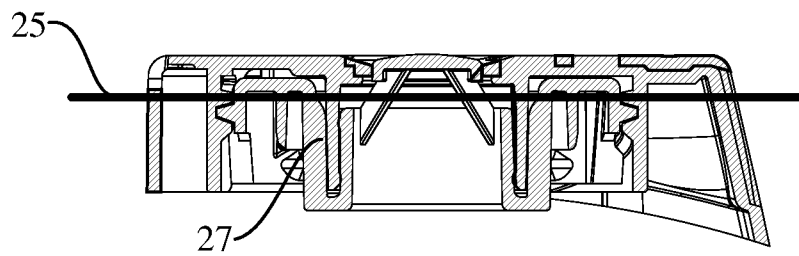


Fig. 7B

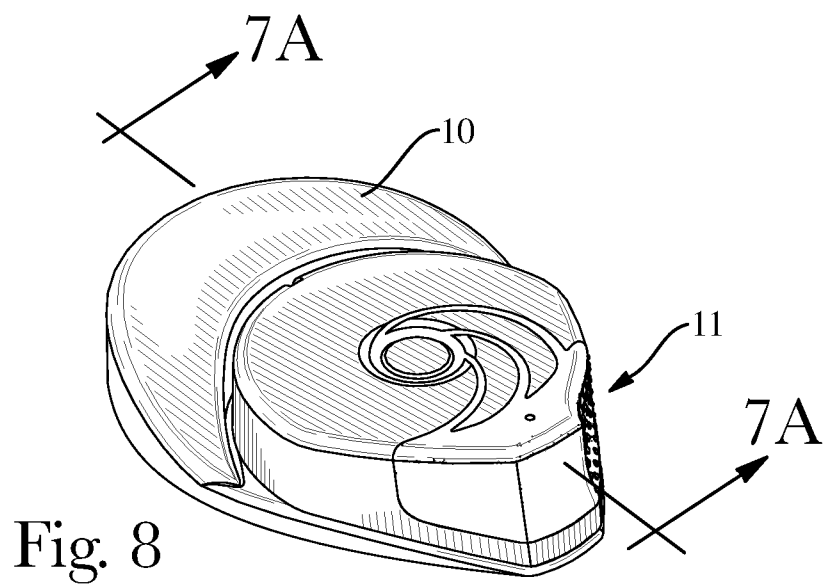


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/021265

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D47/24
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	the whole document	20, 22-24,26
X	----- US 5 850 950 A (HOFMANN RICHARD W [US]) 22 December 1998 (1998-12-22)	1,2, 4-16,21, 27
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	the whole document ----- -/--	



Further documents are listed in the continuation of Box C.



See patent family annex.

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 "&" document member of the same patent family

Date of the actual completion of the international search

14 March 2012

Date of mailing of the international search report

22/03/2012

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 Fax: (+31-70) 340-3016

Authorized officer

Dederichs, August

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/021265

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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