(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 282 772 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
13.11.2024 Bulletin 2024/46

(21) Application number: **22175732.1**

(22) Date of filing: **27.05.2022**

(51) International Patent Classification (IPC):
B65D 47/08 *(2006.01)* ***B65D 51/22*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65D 51/228; B65D 47/0838

(54) PROCESS FOR PRODUCING A CLOSURE ASSEMBLY AND CLOSURE ASSEMBLY SO OBTAINED

VERFAHREN ZUR HERSTELLUNG EINER VERSCHLUSSANORDNUNG UND SO HERGESTELLTE VERSCHLUSSANORDNUNG

PROCÉDÉ DE PRODUCTION D'UN ENSEMBLE DE FERMETURE ET ENSEMBLE DE FERMETURE AINSI OBTENU

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

(43) Date of publication of application:
29.11.2023 Bulletin 2023/48

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WO-A2-98/19918 **GB-A- 2 435 467**

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a closure assembly for a container, in particular a container filled or fillable with a food product, even more particular a container filled or fillable with a solid food product. It should be appreciable that, although preferably conceived for closing food containers, the closure assembly of the present invention can suitably be used also for animal feed, cosmetic, pharmaceutical, chemical, and agrochemical product containers.

BACKGROUND ART

[0002] As known, many solid or pourable food products, such as coffee, tea, or instant preparations, such as instant milk, soluble barley, instant chocolate, infant formula, flour, sugar, and nutritional supplements, such as protein or dietary supplements, or also fruit juice, milk, wine, tomato sauce, etc., are sold in container items, such as composite packages, bottles, jars, cans and the like.

[0003] Because many of these items are stored, shipped, and ultimately dispensed from the same container, the container should be robust enough to withstand the conditions to which it can be exposed. Additionally, the container should be user friendly for the ultimate consumer. Containers formed of plastic and/or metal are often used to store and sell various granular products, particularly in the industrial food and pharmaceutical sectors. Some containers may include a lid or closure such that the container can be repeatedly opened and closed. One problem often associated with such containers is leakage of the product from the container. Such leakage typically occurs in the area around the closure. Moreover, if a lid or closure does not provide an adequate seal, contaminants can more readily be introduced into the product stored in the container, resulting in spoilage or other deleterious effects. As such, while some containers include resealable lids which a user can open and close to access product contained within the container, many of these lids do not provide a sufficiently secure seal.

[0004] In order to overcome such inconveniences, it has been proposed to tether the lid to the ring member by means of a connection element. Even though such closure assemblies work satisfyingly well, a desire is felt in the sector to further improve such closure assemblies. In this regard, means for hermetically sealing a container in conjunction with the reclosable lid or overcap are also known. One example of a hermetic seal for a container is the provision of a flexible membrane thermosealed to the rim of the container, with the membrane being removable to provide access to the contents of the container.

[0005] For example, US 4,171,084 shows a closure for a container having an outer ring with a central opening that is closed by a laminate sheet. The ring includes an upper circular portion and vertically positioned skirt portion. The two portions surround the top and outside edge of the rim of the container. The laminate sheet is secured between the bottom surface of the upper ring portion and the upper edge of the container rim. The laminate is sealed to both the ring and container rim by induction heating. Opening the container by removal of the ring causes a separation of the laminate from the rim of the container.

[0006] US 4,359,169 shows a closure for a container having a membrane sealed between the underside surface of the outer peripheral edge of the closure and the top surface of the rim of the container. The closure includes a pivotable inner member surrounded by an outer ring member. The pivotable member includes a rim having a downwardly projecting flange that is sealed to the membrane. As the pivotable member is lifted, the membrane tears adjacent the flange and a central portion of the membrane is carried by the member.

[0007] US 3,892,351 and US 3,973,719 show a container with a membrane thermoseal attached to the upper surface of the container rim. An overcap is provided on an underside surface with a pattern of heat deformable ribs that engage the edge of the membrane in the area of the container rim. An RF source is used to heat a conductive portion of the membrane to create a seal with the rim while simultaneously heating the ribs. The heated ribs conform to the surface of the membrane. GB 2435467A discloses a closure assembly according to the preamble of independent claim 1.

[0008] However, all these closures are quite complex and, accordingly, also expensive. Moreover, different elements of the same closure are made of different materials, so that the overall closure results to be not convenient from the point of view of environmental sustainability and disposal.

[0009] Therefore, it is an object of the present invention to provide a closure that overcomes the technical drawbacks of the prior art.

[0010] A further object of the invention is to provide a closure that is cheaper than those that are currently on the market, as well as more environmentally sustainable and easily recyclable.

SUMMARY OF THE INVENTION

[0011] This and other objects are achieved through a closure assembly as defined in the claims, as well as a process for producing the same.

[0012] As it will be apparent from the following detailed description, the closure assembly of the invention allows to satisfactorily preserve the container's content, at the same time giving the consumer an easy opening and an easy handling.

[0013] Moreover, the process for producing the closure has resulted in a very rapid and efficient sequence of a only few steps, thus making the overall production very

convenient under both the economical and environmental points of view.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The characteristics and advantages of the invention will be clear from the description of a preferred but non-exclusive embodiment of the invention, illustrated by working examples provided for illustrative and non-limiting purposes, as well as the accompanying figures, wherein:

Figure 1 shows an embodiment of a lid, in a top view (Fig. 1A), in a top perspective view (Fig. 1B), in a lateral view (Fig. 1C), in a bottom perspective view (Fig. 1D), and in a bottom view (Fig. 1E);
Figure 2 shows an embodiment of a closure assembly, in a top view (Fig. 2A), in a top perspective view (Fig. 2B), in a lateral view (Fig. 2C), in a bottom perspective view (Fig. 2D), and in a bottom view (Fig. 2E);
Figure 3 shows an embodiment of a closure assembly hinged to a lid, when the lid is in an open position, in a bottom view (Fig. 3A), in a bottom perspective view (Fig. 3B), in a lateral view (Fig. 3C), in a top perspective view (Fig. 3D), and in a top view (Fig. 3E);
Figure 4 shows an embodiment of a closure assembly hinged to a lid, when the lid is in an open position, in a top perspective view (Fig. 4A), along with an enlarged view of the hook-shaped opening tab (Fig. 4A'); and an embodiment of a closure assembly hinged to a lid, when the lid is in a closed position, in a top perspective view (Fig. 4B), along with an enlarged back view of the recess housing the opening tab (Fig. 4B').

DETAILED DESCRIPTION OF THE INVENTION

[0015] The present invention relates to an improved closure assembly comprising:

- a collar having an outer surface, an inner surface, and a flat annular protrusion extending laterally inward from said inner surface and defining the area of a central opening, and
- a flexible membrane having a peripheral surface area,

wherein the flat annular protrusion overlaps and embeds the peripheral surface area of the flexible membrane, the latter extending beyond the area of the central opening, thus closing the same.

[0016] Reference now will be made in detail to the embodiments of the present disclosure. It will be apparent to those skilled in the art that various modifications and variations can be made to the teachings of the present disclosure without departing from the scope of the appended claims. For instance, features illustrated or described as part of one embodiment, can be used with another embodiment to yield a still further embodiment.

[0017] For the sake of clarity, not all reference numerals are necessarily present in each drawing Figure. In addition, positional terms such as "upper," "lower," "side," "top," "bottom," "vertical," "horizontal," etc. refer to the closure assembly when in the orientation shown in the drawings. It is clear that the closure assembly can assume different orientations when in use.

[0018] With reference to Fig. 2, an embodiment of a closure assembly 10 of the present invention is shown, in a top view (Fig. 2A), in a top perspective view (Fig. 2B), in a lateral view (Fig. 2C), in a bottom perspective view (Fig. 2D), and in a bottom view (Fig. 2E).

[0019] The closure assembly 10 is intended for use in closing a container, not shown. The closure assembly 10 includes a collar 12 having a central opening 14. A lid 16, such as the one shown in Fig. 1, can releasably engage collar 12, so that lid 16 covers central opening 14. In Fig. 3 and Fig. 4, the lid 16 is pivotally attached to collar 12, so that lid 16 can pivot between an open position, where a bottom surface 18 of the lid 16 is disengaged from collar 12, and a closed position, where the bottom surface 18 of lid 16 engages collar 12 and lid 16 covers central opening 14. Lid 16 is seen in an open position in Fig. 3. In certain embodiments, lid 16 and collar 12 are pivotally connected via hinge structure, such as "flip-top" closure type or via living hinge 13. In other embodiments, lid 16 and collar 12 are two separate pieces, as shown in Fig. 1 and Fig. 2, and lid 16 can be press fit onto collar 12 by the user to engage collar 12 with lid 16 and place lid 16 in a closed position.

[0020] In some embodiments, the shape of collar 12 and lid 16 is complementary to the shape of container. For instance, when the container is cylindrical, having a generally circular cross-section, collar 12 and lid 16 can have a generally circular shape. However, collar 12 and lid 16 can be manufactured in a variety of shapes and sizes, including round, elliptical, oval, square, rectangular, hexagonal, etc. In preferred embodiments, the shape of collar 12 and lid 16 is complementary to the shape of container, said shape being elliptical or essentially elliptical, as exemplary shown in the top and bottom views provided in the Figures.

[0021] For each of these shapes, lid 16 can be pivotally attached to collar 12 (such as by a living hinge 13), or lid 16 and collar 12 can be two separate pieces, lid 16 being press fit onto collar 12 to engage lid 16 with collar 12 and place the lid 16 in a closed position. In other embodiments, the shape of the upper end of the container can be complementary to the shape of the collar 12 and the lid 16, and the remainder of the container can have a different shape.

[0022] Collar 12 is configured to engage and connect to a container. The container typically has an open upper end. Closure assembly 10 can be configured such that when collar 12 is connected to container, the bottom side

of the closure assembly 10 facing and fitting the open upper end of the container, the central opening 14 is concentric with said open upper end. As such, when lid 16 is engaged with collar 12 in the closed position, lid 16 can cover both the central opening 14 in collar 12 and said open upper end in the container.

[0023] In preferred embodiments, the lid 16 engages the collar 12 in the closed position, by simply exerting a pressure on the lid 16.

[0024] In some other embodiments, the closure assembly 10 can further include a collar latch element. In embodiments not shown in Figures, the collar latch element can be located on an outer surface 27 of collar 12. In some embodiments, collar latch element is a latch that can be pivotally attached to collar 12 via mechanical fasteners commonly known in the art, such as bolts or pins. In some embodiments, collar latch element is pivotally attached to collar 12 via a living hinge 13, so that collar 12 and collar latch element can be manufactured as one integral piece. In these alternative embodiments, the lid latch element can be located on an outer surface 28 of lid 16. Collar latch element is configured to engage lid latch element to secure lid 16 to collar 12 in a closed position. In other embodiments, lid latch element is a latch that can be pivotally attached to lid via mechanical fasteners, such as bolts or pins. In some embodiments, lid latch element is pivotally attached to lid via a living hinge 13, to secure lid 16 to collar 12 in a closed position.

[0025] Referring again to Fig. 2, a flexible membrane 30 is partially embedded into the flat annular protrusion 34 of the collar 12. In fact, said flexible membrane 30 can serve as both a protective barrier preventing contaminants from reaching the product during shipping and as a tamper evident mechanism indicating that a consumer should not buy or use the product, if flexible membrane 30 has been tampered with or removed. Therefore, advantageously, the closure assembly of the present invention also satisfies the needs of providing an aesthetically appealing container closure, while having tamper evident sealing mechanisms and being easy to use.

[0026] In particular, said flexible membrane 30 is partially embedded into the flat annular protrusion 34 of the collar 12, and is openable by a consumer prior to the first use of the product. "Partially embedded" means that the flat annular protrusion 34 overlaps and embeds the peripheral surface area of the flexible membrane 30, the latter extending beyond the area of the central opening 14, thus closing the same. Accordingly, with reference to the Figures, the flexible membrane 30 and the central opening 14 coincide, and, as further disclosed below with respect to the process of production, said peripheral surface area is no longer visible once the closure assembly is formed.

[0027] Moreover, once the flexible membrane 30 is positioned and tightened by the flat annular protrusion 34, the central surface area of the flexible membrane 30 matches the central opening 14 in collar 12, closing the same. With reference to the embodiment of Fig. 2, the flat annular protrusion 34 of the collar 12 overlaps and embeds the peripheral surface area of the flexible membrane 30, insofar as the latter extends beyond the area of the central opening 14 up to the dots 15, included. As illustratively depicted in the form of a dashed line in Fig. 4A', the flexible membrane 30 extends between the dots 15 and the opening tab 22. The dots 15 are punctual depressions preferably provided on the flat annular protrusion 34 of the collar 12, and deriving from a preferred embodiment of the production process of the closure assembly 10, as will be further detailed below.

[0028] Flexible membrane 30 can then be removed by a consumer by cutting or pulling the flexible membrane 30 up through central opening 14 in collar 12, thereby giving the consumer access to the contents of container. Preferably, an opening tab can be provided in order to facilitate the removal by the consumer. Said opening tab can be positioned on the flat annular protrusion 34 or on the flexible membrane 30. In Fig. 4A and Fig. 4A', it is depicted a preferred embodiment of said opening tab 22, which is hook-shaped to be easily handled by the consumer. In said preferred embodiment, the opening tab 22 is located on the flat annular protrusion 34, projecting upwards therefrom. This embodiment advantageously reduces the time associated with assembling closure 10 during manufacture because opening tab 22 does not have to be connected to collar 12 via a secondary operation (whether manually or through automation). The opening tab 22 projecting from the flat annular protrusion 34, is also advantageously oriented so as to follow cutlines (dotted lines in Fig. 4a') running between the dots 15 and the inner surface 26 of collar 12. Once the opening tab 22 is pulled up and along the cutlines, a strip is torn out around the flexible membrane 30, thus allowing the total removal of the latter and access to the content of container.

[0029] In Fig. 4B and Fig. 4B', it is depicted a preferred embodiment of the lid 16, wherein a recess 17 is present on the bottom surface 18 of said lid 16, with the aim to house the opening tab 22 of the collar 12, when the closure assembly 10 and the lid 16 are in the closed position. The lid 16 has a bottom surface 18 and a lower perimeter 32. The collar 12 includes a flat annular protrusion 34. When lid 16 is in a closed position and engages collar 12, lower perimeter 32 can be in mating contact with flat annular protrusion 34. Preferably, the collar 12 has a peripheral rim having a higher diameter than the collar diameter, thus defining an intermediate lid mating surface. Alternatively, the lid and the collar can be threaded and closed by screwing, if both are of round shape.

[0030] In Fig. 2, flat annular protrusion 34 extends laterally inward generally from the inner surface 26 of collar 12, thus defining the area of the central opening 14, as well as the exposed area of the flexible membrane 30. It will be readily apparent that, when lid 16 is in the closed position, flat annular protrusion 34 of collar 12 faces the lower perimeter 32 of the lid 16, and the bottom surface 18 faces the flexible membrane 30.

[0031] Preferably, the flexible membrane 30, the collar 12 and the lid 16 are made of the same or different thermoplastic materials.

[0032] In preferred embodiments, the flexible membrane 30, the collar 12 and the lid 16 are made of the same thermoplastic material, so as to improve the recyclability of the whole closure assembly, as well as to reduce the overall production costs.

[0033] More preferably, said thermoplastic material is selected from acrylic (PMMA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), thermoplastic elastomer (TPE), and mixtures thereof.

[0034] Preferably, said thermoplastic material is polyethylene (PE), polypropylene (PP), or polyethylene terephthalate (PET).

[0035] Preferably, the thickeness of the flat annular protrusion 34 is 5 to 30 times the thickness of the flexible membrane 30, preferably 10 to 20 times. These ratios allow the peripheral surface area of the flexible membrane 30 to be excellently embedded into the flat annular protrusion 34, thus improving the tamper evident sealing properties of the closure assembly 10.

[0036] In preferred embodiments, the thickness of the flexible membrane 30 is 20-150 μm, more preferably 40-100 μm, even more preferably 50-80 μm.

[0037] In preferred embodiments, the thickeness of the flat annular protrusion 34 is 0,5-2,0 mm, preferably about 1,0 mm.

[0038] In another aspect, the present invention concerns a process for producing the closure assembly above described.

[0039] Particularly, the process for producing the closure assembly, comprises the following steps:

i) providing an injection moulding apparatus equipped with a mould having an integrated vacuum system, a manipulator and a flexible membrane storage,

ii) with the mould open, making the manipulator take the flexible membrane from the storage and position the same within the mould, wherein the vacuum system is active, so that the flexible membrane maintains the given position also once the manipulator releases the same,

iii) closing the mould and starting the injection of thermoplastic material,

iv) once the injection is completed, cooling and releasing the closure assembly so moulded. The mould can be a single-cavity mould or a multi-cavity mould, where a single-cavity mould produces a single closure assembly per cycle, while a multi-cavity mould produces more than one closure assembly per cycle.

[0040] In preferred embodiments, the mould is a multi-cavity mould having 4-16 cavities, more preferably 6-10 cavities. The number of cavities depends on the size of the closure assembly to be produced: the larger the size, the lower the number of cavities, unless increasing the size of overall mould and injection moulding apparatus.

[0041] It is understood that, when the mould is a multi-cavity mould, the manipulator positions a number of flexible membranes corresponding the the number of cavities.

[0042] In preferred embodiments, the mould is provided with punctual protrusions in correspondence of the peripheral surface area of the flexible membrane, assuring the correct positioning and tightening of said flexible membrane in step iii), when the mould closes and the thermoplastic material is injected. Indeed, said punctual protrusions, once the mould closes, fix the peripheral area of the flexible membrane in the position given by the manipulator until the thermoplastic material embeds the same. The presence of said punctual protrusions in the mould results in visible punctual depressions, i.e. dots 15, in the flat annular protrusion 34 of the finished collar 12, as shown in Figg. 2-4.

[0043] Preferably, during the picking and positioning step ii), the flexible membranes are charged with static electricity so that, once placed within the mould cavities, they perfectly adhere to the latter, in addition to the tightening effect given by the vacuum system: this allows reducing to a minimum the risks of movement of the flexible membrane during the injection of the thermoplastic material into the mould.

[0044] Once the flexible membrane is positioned into the mould, the injection cycle starts, the mould closes and the cavities are filled with melted thermoplastic material, thus embedding the peripheral area of the flexible membrane.

[0045] At the end of the injection cycle, the cooling cycle starts. The material inside the mould is cooled, the mould opens and the so-obtained closure assembly is released. Advantageously, the single injection-moulded closure assembly having a flexible membrane in-moulded therein, can be made of a single thermoplastic material or of at least two types of mixed thermoplastic material or thermoplastic material that are moulded together.

[0046] In a further embodiment, the closure assembly is hinged to a lid, so that the mould is designed to produce a single injection-moulded closure assembly having a flexible membrane in-moulded therein and hinged to a lid.

[0047] It should be appreciated that the process of the present invention allows the closure assembly to be injection-moulded while partially embedding a flexible membrane, to give a single piece ready to use and easily disposable and recyclable.

[0048] In addition, this process advantageously enables very high printing quality to be maintained or obtained, and particular high resolution graphic effects and images to be reproduced on the flexible membranes, before the same are positioned in the mould. Therefore, also words and/or graphic elements (such as opening instructions) can be printed on the flexible membranes, thus further exploiting the flexible membrane surface for

communicating additional information or for aesthetic purposes.

[0049] In this manner, from the mould, the closure assembly can be extracted that no longer needs additional processing before being coupled with the container.

[0050] Preferably, the temperature of the mould during the injection is of 180-250°C.

[0051] Injection of step iii) can be performed at high pressure and at 220°C for PP and 180°C for PE to enable the thermoplastic material to flow inside the mould.

[0052] The closure assembly, as such or hinged to a lid, as above disclosed, leads to a significant energy saving inasmuch as it uses a single step, rather than at least two distinct steps necessary for producing the collar and then thermosealing the membrane. It is thus financially advantageous in addition to increasing production speed.

[0053] The closure assembly is further producible at low cost using standard machinery and procedures, ensuring the tightness and recyclability of the whole closure, thus overcoming the drawbacks of the aforementioned US documents.

[0054] Further, by the bi-injection system, it is possible to make the closure assembly (with or without lid hinged) in two or more colours, or even in two or more distinct plastics, even though in a single piece.

[0055] The closure assembly, at least in the configuration depicted in Figures, provides significant advantages also in logistical terms both in the steps of handling and storage, as being easily stackable.

[0056] In a further aspect, the present invention concerns a closure assembly obtainable by the process of production as above disclosed. In particular, the present invention also concerns a closure assembly (10) comprising:

- a collar (12) having an outer surface (27), an inner surface (26), and a flat annular protrusion (34) extending laterally inward from said inner surface (26) and defining the area of a central opening (14), and
- a flexible membrane (30) having a peripheral surface area,

wherein the flat annular protrusion (34) overlaps and embeds the peripheral surface area of the flexible membrane (30), the latter extending beyond the area of the central opening (14), thus closing the same,
and obtainable by the single-moulding process comprising:

i) providing an injection moulding apparatus equipped with a mould having an integrated vacuum system, a manipulator and a flexible membrane storage,
ii) with the mould open, making the manipulator take the flexible membrane from the storage and position the same within the mould, wherein the vacuum system is active, so that the flexible membrane maintains the given position also once the manipulator releases the same,
iii) closing the mould and starting the injection of thermoplastic material,
iv) once the injection is completed, cooling and releasing the closure assembly so moulded. It should be appreciable that, although preferably conceived for closing food containers, the closure assembly of the present invention can suitably be used also for animal feed, cosmetic, pharmaceutical, chemical, and agrochemical product containers, i.e. any time a product should be better sealed and stored for long periods of time. Thus, in an additional aspect, the present invention also concerns to container sealed by the closure assembly 10 as above described, said container being a container for storing food, animal feed, cosmetic, pharmaceutical, chemical, or agrochemical products

[0057] Moreover, advantageously, the closure assembly of the present invention also satisfies the needs of providing an aesthetically appealing container closure, while having tamper evident sealing mechanisms and being easy to use.

[0058] It should be understood that all the aspects identified as preferred and advantageous for the closure assembly are to be deemed to be similarly preferred and advantageous for the process of production, and vice versa, as well as for the container sealed by the same. Also all the possible combinations of the preferred aspects of the closure assembly, of the productive processes thereof as indicated above, as well as of the container sealed by the same, are moreover to be deemed to be disclosed and thus similarly preferred.

Claims

1. A closure assembly (10) comprising:

- a collar (12) having an outer surface (27), an inner surface (26), and a flat annular protrusion (34) extending laterally inward from said inner surface (26) and defining the area of a central opening (14), and
- a flexible membrane (30) having a peripheral surface area,

wherein the flat annular protrusion (34) overlaps the peripheral surface area of the flexible membrane (30), the latter extending beyond the area of the central opening (14), thus closing the same, **characterized in that** the flat annular protrusion (34) embeds said peripheral surface area of the flexible membrane (30).

2. The closure assembly (10) of claim 1, wherein an

opening tab (22) projects upwards from the flat annular protrusion (34), and is oriented so as to follow cutlines running along the inner surface (26) of collar (12), so as to allow the complete removal of the flexible membrane (30).

3. The closure assembly (10) of claim 1 or 2, wherein a lid (16) is pivotally attached to collar (12), preferably via living hinge (13).

4. The closure assembly (10) of any one of claims 1-3, being made of thermoplastic material selected from acrylic (PMMA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), thermoplastic elastomer (TPE), and mixtures thereof.

5. The closure assembly (10) of claim 4, being made of thermoplastic material selected from polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET).

6. The closure assembly (10) of any one of claims 1-5, wherein the collar (12) and the flexible membrane (30) are made of the same thermoplastic material.

7. The closure assembly (10) of any one of claims 1-5, wherein the thickeness of the flat annular protrusion (34) is 5 to 30 times the thickness of the flexible membrane (30), preferably 10 to 20 times.

8. The closure assembly (10) of any one of claims 1-7, wherein the thickness of the flexible membrane (30) is of 20-150 μm, preferably 40-100 μm, more preferably 50-80 μm.

9. The closure assembly (10) of any one of claims 1-8, wherein the thickeness of the flat annular protrusion (34) is 0,5-2,0 mm, preferably about 1,0 mm.

10. A process for producing the closure assembly (10) of any one of claims 1-8, the process comprising the following steps:

i) providing an injection moulding apparatus equipped with a mould having an integrated vacuum system, a manipulator and a flexible membrane storage,
ii) with the mould open, making the manipulator take the flexible membrane from the storage and position the same within the mould, wherein the vacuum system is active, so that the flexible membrane maintains the given position also once the manipulator releases the same,
iii) closing the mould and starting the injection of thermoplastic material,
iv) once the injection is completed, cooling and releasing the closure assembly so moulded.

11. The process of claim 10, wherein the mould is a multi-cavity mould having 4-16 cavities, preferably a 6-10 cavities.

12. The process of claim 10 or 11, wherein the mould is provided with punctual protrusions in correspondence of the peripheral surface area of the flexible membrane, assuring the correct positioning and tightening of said flexible membrane in step iii), when the mould closes and the thermoplastic material is injected.

13. The process of any one of claims 10-12, wherein, during the picking and positioning step ii), the flexible membrane is charged with static electricity so that, once placed within the mould, it perfectly adheres to the latter.

14. A container sealed by the closure assembly (10) of any one of claims 1-9, said container being a container for storing food, animal feed, cosmetic, pharmaceutical, chemical, or agrochemical products.

Patentansprüche

1. Verschlussanordnung (10), umfassend:

- einen Hals (12), der eine äußere Oberfläche (27), eine innere Oberfläche (26) und einen flachen ringförmigen Vorsprung (34), der sich seitlich von der inneren Oberfläche (26) nach innen erstreckt und den Bereich einer zentralen Öffnung (14) definiert, aufweist, und
- eine flexible Membran (30), die einen Umfangsoberflächenbereich aufweist,

wobei der flache ringförmige Vorsprung (34) den Umfangsoberflächenbereich der flexiblen Membran (30) überlappt, wobei Letztere sich über den Bereich der zentralen Öffnung (14) hinaus erstreckt, wodurch diese geschlossen wird, **dadurch gekennzeichnet, dass** der flache ringförmige Vorsprung (34) den Umfangsoberflächenbereich der flexiblen Membran (30) einbettet.

2. Verschlussanordnung (10) nach Anspruch 1, wobei eine Öffnungslasche (22) nach oben von dem flachen ringförmigen Vorsprung (34) vorsteht und so ausgerichtet ist, dass sie Schnittlinien folgt, die entlang der inneren Oberfläche (26) des Halses (12) verlaufen, um das vollständige Entfernen der flexiblen Membran (30) zu ermöglichen.

3. Verschlussanordnung (10) nach Anspruch 1 oder 2, wobei ein Deckel (16) schwenkbar an dem Hals (12) angebracht ist, vorzugsweise über ein Filmscharnier (13).

4. Verschlussanordnung (10) nach einem der Ansprüche 1-3, aus thermoplastischem Material gefertigt, das aus Acryl (PMMA), Polyethylen (PE), Polypropylen (PP), Polystyrol (PS), Polyethylenterephthalat (PET), thermoplastischem Elastomer (TPE) und Mischungen davon ausgewählt ist.

5. Verschlussanordnung (10) nach Anspruch 4, aus thermoplastischem Material gefertigt, das aus Polyethylen (PE), Polypropylen (PP) und Polyethylenterephthalat (PET) ausgewählt ist.

6. Verschlussanordnung (10) gemäß einem der Ansprüche 1-5, wobei der Hals (12) und die flexible Membran (30) aus dem gleichen thermoplastischen Material gefertigt sind.

7. Verschlussanordnung (10) nach einem der Ansprüche 1-5, wobei die Dicke des flachen ringförmigen Vorsprungs (34) das 5- bis 30-Fache, vorzugsweise das 10- bis 20-Fache der Dicke der flexiblen Membran (30) beträgt.

8. Verschlussanordnung (10) nach einem der Ansprüche 1-7, wobei die Dicke der flexiblen Membran (30) 20-150 μm, vorzugsweise 40-100 μm, besonders bevorzugt 50-80 μm beträgt.

9. Verschlussanordnung (10) nach einem der Ansprüche 1-8, wobei die Dicke des flachen ringförmigen Vorsprungs (34) 0,5 bis 2,0 mm, vorzugsweise etwa 1,0 mm beträgt.

10. Verfahren zum Herstellen der Verschlussanordnung (10) nach einem der Ansprüche 1-8, wobei das Verfahren die folgenden Schritte umfasst:

    i) Bereitstellen einer Spritzgussvorrichtung, die mit einer Form mit integriertem Vakuumsystem, einem Manipulator und einem flexiblen Membranlager ausgestattet ist,
    ii) bei geöffneter Form, Bewirken, dass der Manipulator die flexible Membran aus dem Lager entnimmt und diese innerhalb der Form positioniert, wobei das Vakuumsystem aktiv ist, so dass die flexible Membran auch dann die vorgegebene Position beibehält, wenn der Manipulator sie freigibt,
    iii) Schließen der Form und Beginnen des Einspritzens des thermoplastischen Materials,
    iv) nach Abschluss des Einspritzens, Abkühlen und Freigeben der so geformten Verschlussanordnung.

11. Verfahren nach Anspruch 10, wobei die Form eine Mehrfachform mit 4-16 Kavitäten, vorzugsweise 6-10 Kavitäten ist.

12. Verfahren nach Anspruch 10 oder 11, wobei die Form mit punktförmigen Vorsprüngen entsprechend dem Umfangsoberflächenbereich der flexiblen Membran versehen ist, wodurch die korrekte Positionierung und Straffung der flexiblen Membran in Schritt iii) sichergestellt wird, wenn die Form geschlossen wird und das thermoplastische Material eingespritzt wird.

13. Verfahren nach einem der Ansprüche 10-12, wobei während des Aufnahme- und Positionierungsschritts ii) die flexible Membran mit statischer Elektrizität aufgeladen wird, so dass sie, sobald sie in der Form platziert ist, perfekt an dieser haftet.

14. Behälter, der durch die Verschlussanordnung (10) nach einem der Ansprüche 1-9 abgedichtet ist, wobei der Behälter ein Behälter zum Lagern von Lebensmitteln, Tierfuttermitteln, kosmetischen, pharmazeutischen, chemischen oder agrochemischen Produkten ist.

Revendications

1. Ensemble de fermeture (10) comprenant :

    - un collier (12) comportant une surface extérieure (27), une surface intérieure (26) et une saillie annulaire plate (34) s'étendant latéralement vers l'intérieur à partir de ladite surface intérieure (26) et définissant la zone d'une ouverture centrale (14), et
    - une membrane flexible (30) comportant une zone de surface périphérique,

    dans lequel la saillie annulaire plate (34) chevauche la zone de surface périphérique de la membrane flexible (30), cette dernière s'étendant au-delà de la zone de l'ouverture centrale (14), fermant ainsi celle-ci, **caractérisé en ce que** la saillie annulaire plate (34) intègre ladite zone de surface périphérique de la membrane flexible (30).

2. Ensemble de fermeture (10) selon la revendication 1, dans lequel une languette d'ouverture (22) fait saillie vers le haut à partir de la saillie annulaire plate (34), et est orientée de manière à suivre des lignes de coupe s'étendant le long de la surface intérieure (26) du collier (12), de manière à permettre le retrait complet de la membrane flexible (30).

3. Ensemble de fermeture (10) selon la revendication 1 ou 2, dans lequel un couvercle (16) est fixé de manière pivotante au collier (12), de préférence via une charnière vivante (13).

4. Ensemble de fermeture (10) selon l'une quelconque

des revendications 1 à 3, étant constitué d'un matériau thermoplastique choisi parmi l'acrylique (PMMA), le polyéthylène (PE), le polypropylène (PP), le polystyrène (PS), le polyéthylène téréphtalate (PET), l'élastomère thermoplastique (TPE) et leurs mélanges.

5. Ensemble de fermeture (10) selon la revendication 4, étant constitué d'un matériau thermoplastique choisi parmi le polyéthylène (PE), le polypropylène (PP) et le polyéthylène téréphtalate (PET).

6. Ensemble de fermeture (10) selon l'une quelconque des revendications 1 à 5, dans lequel le collier (12) et la membrane flexible (30) sont constitués du même matériau thermoplastique.

7. Ensemble de fermeture (10) selon l'une quelconque des revendications 1 à 5, dans lequel l'épaisseur de la saillie annulaire plate (34) est de 5 à 30 fois l'épaisseur de la membrane flexible (30), de préférence de 10 à 20 fois.

8. Ensemble de fermeture (10) selon l'une quelconque des revendications 1 à 7, dans lequel l'épaisseur de la membrane flexible (30) est de 20 à 150 μm, de préférence de 40 à 100 μm, plus préférablement de 50 à 80 μm.

9. Ensemble de fermeture (10) selon l'une quelconque des revendications 1 à 8, dans lequel l'épaisseur de la saillie annulaire plate (34) est de 0,5 à 2,0 mm, de préférence d'environ 1,0 mm.

10. Procédé de production de l'ensemble de fermeture (10) selon l'une quelconque des revendications 1 à 8, le procédé comprenant les étapes suivantes :

i) la fourniture d'un appareil de moulage par injection équipé d'un moule doté d'un système de vide intégré, d'un manipulateur et d'un stockage à membrane flexible,
ii) avec le moule ouvert, le fait d'amener le manipulateur à prendre la membrane flexible depuis le stockage et à la positionner à l'intérieur du moule, dans lequel le système de vide est actif, de sorte que la membrane flexible conserve la position donnée même une fois que le manipulateur la libère,
iii) la fermeture du moule et le démarrage de l'injection de matériau thermoplastique,
iv) une fois l'injection terminée, le refroidissement et la libération de l'ensemble de fermeture ainsi moulé.

11. Procédé selon la revendication 10, dans lequel le moule est un moule à cavités multiples comportant 4 à 16 cavités, de préférence 6 à 10 cavités.

12. Procédé selon la revendication 10 ou 11, dans lequel le moule est pourvu de protubérances ponctuelles en correspondance avec la zone de surface périphérique de la membrane flexible, assurant le positionnement et le serrage corrects de ladite membrane flexible à l'étape iii), lorsque le moule se ferme et que le matériau thermoplastique est injecté.

13. Procédé selon l'une quelconque des revendications 10 à 12, dans lequel, lors de l'étape de prélèvement et de positionnement ii), la membrane flexible est chargée en électricité statique de sorte que, une fois placée à l'intérieur du moule, elle adhère parfaitement à ce dernier.

14. Récipient scellé par l'ensemble de fermeture (10) selon l'une quelconque des revendications 1 à 9, ledit récipient étant un récipient destiné au stockage d'aliments, aliments pour animaux, produits cosmétiques, pharmaceutiques, chimiques ou agrochimiques.

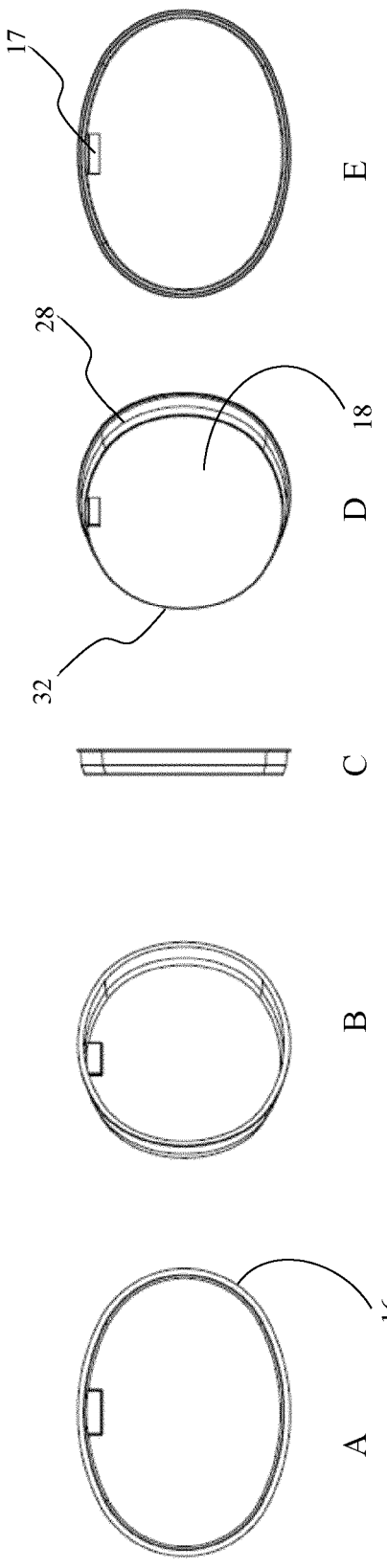


Fig. 1

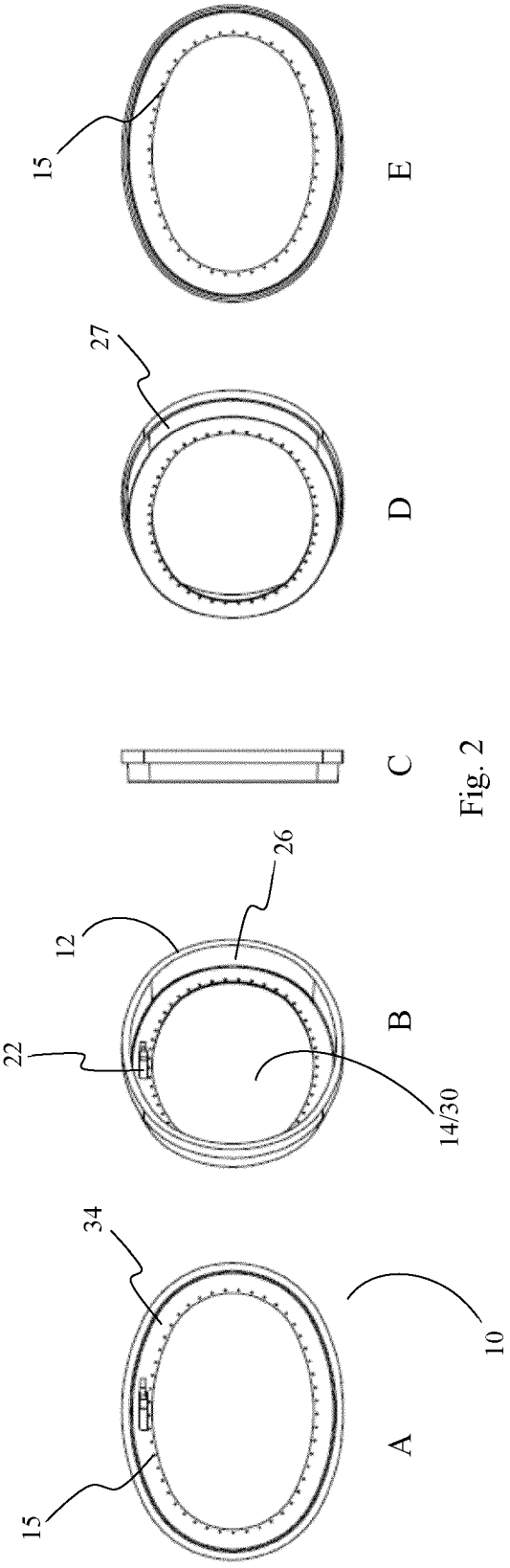


Fig. 2

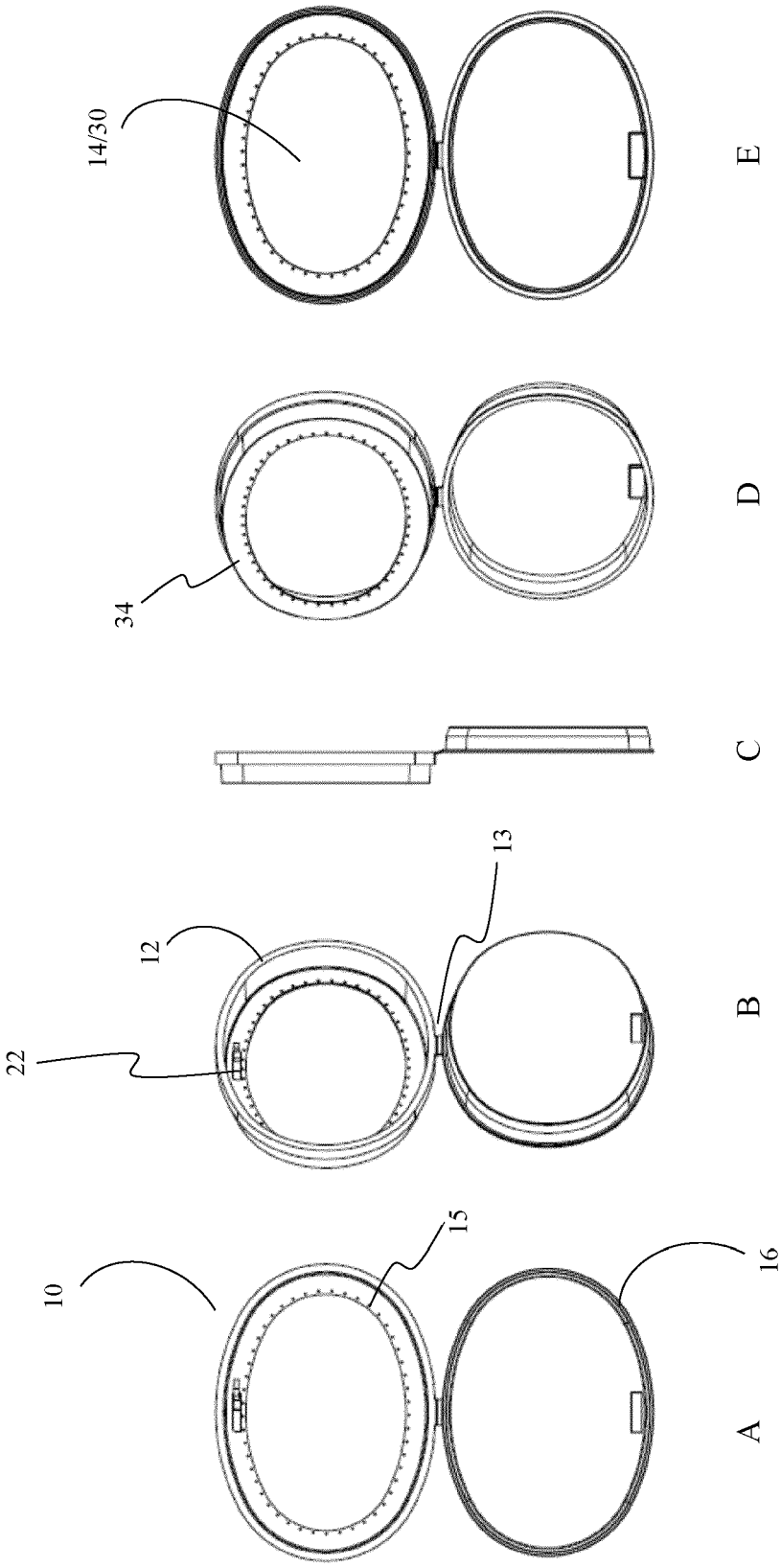


Fig. 3

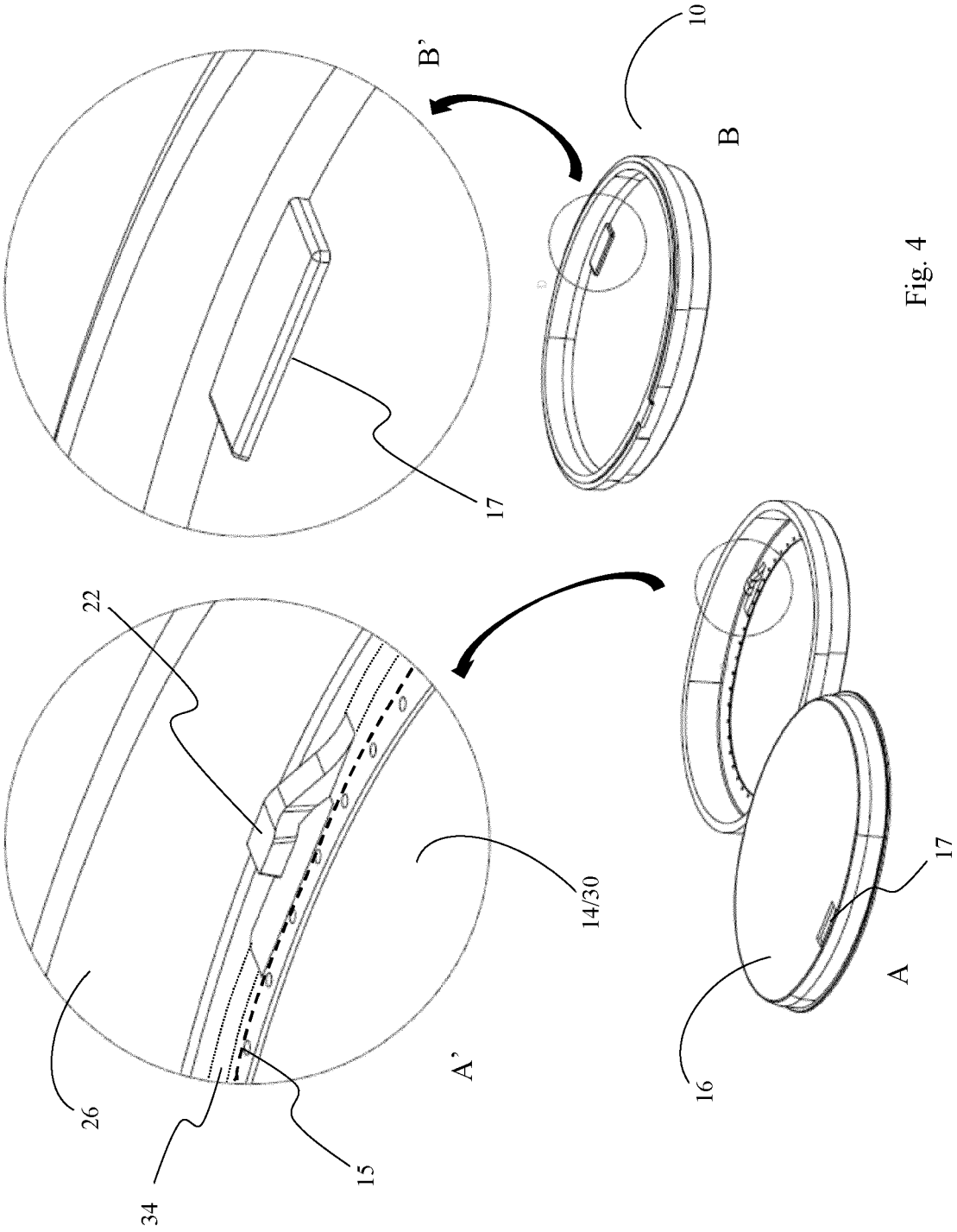


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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