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(54) **Beverage bottle with a re-sealable closure having a cap and a collar**

(57) The present invention relates to a beverage bottle having a re-sealable closure (10). The beverage bottle comprises a mouth. The mouth comprises an outwardly oriented bulge. The closure comprising a cap comprising a disc (16) adapted to cover the opening of the mouth. The cap further comprises a corrugated circumferential skirt (18). The skirt has a plurality of resilient axial slots (20). The closure further comprises a collar (12) comprising an upper section, a lower section and an intermediate section. The intermediate section defines an inwardly ori-

ented protrusion (32). The sections define an inner space accommodating the cap and allowing the cap to be axially movable. The closure defines a closed state in which the inwardly oriented protrusion compresses the skirt inwardly for interlocking with the outwardly oriented bulge. The closure further defines an open state in which the inwardly oriented protrusion is located adjacent the disc such that the skirt assumes an uncompressed state.

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Description

[0001] The present invention relates to a beverage bottle having a re-sealable closure and a method of applying and interlocking a re-sealable closure for a beverage bottle.

Background of the invention

[0002] Metallic caps, generally known as crown corks, have been frequently used for sealing glass beverage bottles ever since their introduction in the late 19th century. Crown corks comprise a metallic cap having parts arranged for engagement with the external periphery of a neck or wall of the beverage bottle. Generally, crown corks are applied onto standard glass bottles having an outwardly oriented bulge near the mouth of the bottle. The crown cork is clamped securely onto the bulge in order to withstand and seal the pressure within the bottle. The generally known crown corks are made of thin metal sheet and have the advantage of being easy to manufacture, require a very small amount of material and they are easy to apply onto the mouth of the beverage bottle. Crown corks are also tamper evident, since once the crown cork is removed, it cannot easily be re-applied onto the bottle. The original crown corks are described in US 468,226 and US 468,258.

[0003] The drawbacks with the original crown cork is the fact that a tool, a so called bottle opener is required in order to bend the crown cork away from the mouth of the bottle. In case no bottle opener is available, the user may have to resort to ad-hoc solutions to open the bottle which may then break or become damaged. There is thus a need for a beverage bottle having a re-sealable closure and a method of applying and interlocking a re-sealable closure onto a beverage bottle.

[0004] The above problem has been frequently investigated in the prior art and a vast amount of documents describe various solutions for achieving the above need. A common approach is to use a closure comprising a cap of flexible material which is held tightly in place on the mouth of the beverage bottle by a collar surrounding the cap. To open the closure, the collar is pulled off the bottle by hand, where after the cap is released. The above idea is known as the pull collar concept. The prior art includes numerous publications from several decades.

[0005] The pull collar concept may be defined as a closure comprising a cap encircled by a collar. The cap has a skirt for encircling and engaging a flange on the neck of a bottle for retaining the closure to the bottle, and the collar is slidable along the axis of the cap from a first position, in which it allows the cap to be mounted on the bottle, to a second position in which the collar forces the skirt to engage the flange. In variations of the pull collar concept the skirt may engage an upper or a lower flange on the bottle neck. As regards the skirt, it is understood that it may be constituted by a single piece or may comprise multiple axially directed tabs.

[0006] The simplest closure disclosing the general pull collar concept is known from US 3,151,758, published in 1964, in which a collar is axially moveable on a cap to selectively deform a skirt to force an edge thereof to engage the flange of a bottle neck. A further simple closure is known from DE 30 09 568, published in 1981, in which a collar is axially moveable in relation to a cap having tabs for engaging the flange of a bottle neck. A further closure is known from US 3,905,502, published in 1975, and includes snap-fit locking structures to limit movement of the collar.

[0007] Historically, the earliest patent publications found is US 835,366, published in 1906, which patent publication discloses a bottle stopper having a cap with depending fingers, the fingers being forced into engagement with a flange of a bottle by the collar. A later patent publication, US 1,441,742, published in 1923, uses a ring instead of a collar, the ring forcing jaws into engagement with a flange of a bottle. The collar theme is once more found in US 1,545,227, published in 1925, wherein a collar is retained on a cap and is moveable from a first position to a second position to selectively force tabs into engagement with a bottle neck flange.

[0008] A more cap-like closure is known from US 1,758,696, published in 1930, in which a collar is axially moveable from a first "open" position, to a second "locked" position. A simple implementation is shown in GB 44 66 12, published in 1936, in which a collar is mountable on the cap to force the sides of the skirt to engage the flange on the bottle neck. Similar closures are also known from US 2,659,511, published in 1953, and US 2,814,405, published in 1954.

[0009] A closure comprising several components is disclosed in US 2,576,580, published in 1951, wherein a collar is axially moveable in relation to a cap structure for selectively causing the legs to engage the flange of a bottle neck. As regards the application of closures to bottles or containers, further variants include features related to the collar or outer cap being initially attached to the cap in an "open" position, allowing the closure to be easily applied to the container before the attachment is broken, when the collar is forced into the "locked position", see for the closure disclosed by US 5,085,332, published in 1992.

[0010] EP 1 121 300 discloses a bottle security device comprising an outer cap and an inner cap and a mechanism for preventing the inner cap from being removed from the outer cap. EP 747 293 discloses a vial and a crimp top seal. A collar may be mounted on the crimp top seal to further increase the contact between the crimp top seal and the neck of the vial along contact lines. EP 655 042 discloses a two-piece all plastic seal having an inner cap and an outer cap, the inner cap having a slit skirt.

[0011] EP 2 051 912 discloses a bottle closure for high pressure liquids, the closure comprising a first part for engaging the neck of the bottles, and a second part moveable from a locked to an open position for selectively

influencing the first part. The second part further includes a lower section 48 for further engaging the bottle neck. EP 1 186 546 discloses a device for closing bottles, in which device a sleeve is axially moveable to force tabs into engagement with the flange of a bottle neck. EP 696 994 discloses a bottle cap in which a collar is moved axially upwards as the cap is pressed down, the collar thus causing the tabs to engage the flange of the bottle neck.

[0012] WO 2011/022756 discloses a closure which comprises an outer cap and an inner cap having tabs, the outer tab having cams allowing the outer cap to be moved axially in relation to the inner cap by application of an axial force, or by turning the outer cap. The outer cap further includes a frangible component for further engaging the bottle neck.

[0013] EP 2 344 397 discloses a closure for a bottle, the closure having an inner part having tabs for engaging the bottle neck and an outer part axially moveable with respect to the inner part for selectively forcing the tabs of the inner part to engage a flange on the bottle neck. The parts further include raised portions for preventing rotating of the parts in relation to each other. EP 1 632 439 discloses a cap having an outer cap comprising a sleeve and tabs for engaging a flange on a bottle neck to retain a stopper in the opening of the bottle.

[0014] A further example of a cap with a slit skirt is shown in US 1,447,082, published in 1923, which discloses a cap described to be shaped substantially as a contemporary crimped cap.

[0015] Further examples of caps with slit skirts are known from US 5,960,972, published in 1999. An outer part having a bottom edge for engaging a lower edge of an inner cap is found in US 2003/0168456, published in 2003, wherein a partly tapered outer cap has a bottom edge for engaging the lower edge of an inner cap having tabs.

[0016] WO 2011/039400A1, published in 2011, discloses a cap having a skirt with an inner projection, the outer surface of the skirt having a corresponding external depression. The reasoning behind this feature, according to the patent publication, is that the amount of material needed for the manufacture of the cap is reduced. US 5,615,788, published in 1997, discloses a pull collar styled closure having a paper seal provided on the top, i.e. connected to both the collar and the cap, see the figure below. The paper seal is perforated.

[0017] Further prior art include AU 2003 203053, AU 2003 289760, US 2010/012615, US 2011/024383 and WO 2010/040186.

[0018] It has been recently discovered by the applicant that many of the above solutions are not capable of withstanding and sealing the pressure within the beverage bottle when the beverage bottle is filled by carbonated beverage. This is in part caused by the fact that glass bottles, as opposed to plastic bottles, exhibit a significant manufacturing tolerance, i.e. the outer periphery of the bulge of the mouth of the bottle may vary significantly

between different bottles. It is thus an object of the present invention to provide a re-sealable closure which may seal bottles having different outer peripheries of the bulge of the mouth.

[0019] It is an advantage of the present invention that the closure may be applied by a simple downwardly oriented pressure force, i.e. no clamping action is required. The opening may consequently be performed by a simple upwardly oriented force without the use of a bottle opener.

Summary of the invention

[0020] The above object, the above advantages and the above feature together with numerous other objects, advantages and features which will be evident from the below detailed description of the present invention are according to a first aspect of the present invention obtained by a beverage bottle having a re-sealable closure, the beverage bottle comprising a body, a cylindrical neck connected to the body and a mouth connected to the neck opposite the body and defining an opening, the mouth comprising an outwardly oriented bulge at a first axial distance from the opening, the bulge defining a first outer periphery at the first axial distance, the closure comprising:

a cap comprising a disc defining a second periphery, the disc being adapted to cover the opening of the mouth, the cap further comprises a circumferential skirt extending a second axial distance from the second periphery of the disc, the second axial distance being larger than the first axial distance, the skirt being corrugated and defining a third periphery constituting an inner periphery and a fourth periphery constituting an outer periphery, the skirt having a plurality of axial slots and being resilient in a radial direction between an uncompressed state in which the third periphery is equal to or larger than the first periphery of the outwardly oriented bulge of the mouth and the fourth periphery being larger than the second periphery of the disc, and, a compressed state in which the third periphery is smaller than the first periphery of the outwardly oriented bulge of the mouth while the fourth periphery of the skirt is equal to or larger than the second periphery of the disc, and a collar comprising an upper section, a lower section and an intermediate section, the sections defining an inner space accommodating the cap and allowing the cap to be axially movable within the inner space, the upper section defining an inner surface for contacting the disc opposite the skirt, the lower section circumferentially enclosing the skirt opposite the disc, the intermediate section being substantially cylindrical and interconnecting the upper section and the lower section and defining an inwardly oriented surface and an outwardly oriented surface, the outwardly oriented surface of the intermediate section

defining a groove and the inwardly oriented surface of the intermediate section defining an inwardly oriented protrusion corresponding to the groove of the outwardly oriented surface,

the closure defining:

a closed state in which the upper section of the collar bears against the disc, the lower section of the collar being axially spaced apart from the skirt and the inwardly oriented protrusion of the inwardly oriented surface compressing the skirt inwardly into the compressed state for interlocking with the outwardly oriented bulge of the mouth, and

an open state in which the upper section of the collar being spaced apart from the disc, the lower section of the collar bearing against the skirt and the inwardly oriented protrusion being located adjacent the second periphery of the disc such that the skirt assumes the uncompressed state.

[0021] The beverage bottle is a standard bottle having a body intended to accommodate the beverage, typically in an amount of between 25cl and 1 litre, and a neck leading to the mouth and the opening of the bottle. The outwardly oriented bulge is typically rounded and defines a circumference larger than the neck and defines a "saddle" between the bulge and the neck. The first outer periphery is understood to be the largest periphery of the bulge and is located at an axial distance from the opening. The neck may optionally define further bulges below the bulge closest to the opening, which bulges may be used for other purposes such as fastening a tamper evident ring.

[0022] The cap covers the opening and seals the opening in relation to the outside environment. The circumferential skirt extends the second axial distance from the opening to a location below the first periphery such that the skirt may interlock with the outwardly oriented bulge at the "saddle" between the outwardly oriented bulge and the neck. The corrugation of the skirt typically extends in an axial direction and the third periphery corresponds to the innermost periphery, i.e. the innermost extreme points of the corrugation, and the fourth periphery corresponds to the outermost periphery, i.e. the outermost extreme points of the corrugation. The number of corrugations is typically between 10 and 40, such as 20. The number of axial slots typically coincides with the number of corrugations. The width of each slot should be sufficient for allowing the skirt to be bent between the uncompressed state and the compressed state without plastically or permanently deforming the skirt. In the uncompressed state the skirt is capable of being pressed over the bulge. In some embodiments, the skirt thereby flexes in an outwardly direction, i.e. the uncompressed state may imply some outwardly oriented flexing of the skirt. In other embodiments, the "neutral" state of the skirt is having a larger inner periphery than the outwardly oriented

ed bulge. When the cap is applied onto the mouth of the bottle without the collar, the cap is easily removable by hand and not capable of withstanding the pressure of a carbonated beverage. In the uncompressed state, the outer periphery of the skirt should be larger than the periphery of the disc.

[0023] The cap is accommodated in the inner space of the collar. When the collar is applied onto the mouth of the beverage bottle, the disc of the cap will cover the opening of the mouth and the skirt of the cap will enclose the third periphery of the outwardly oriented bulge of the mouth in the uncompressed state. The collar may thereafter be pushed downwardly towards the bottle. The inner surface of the upper section is defining a circumference which is smaller than the disc such that when pressure is applied onto the upper section, thereby limiting the distance which the collar may travel in the downwardly direction, thereby preventing the collar from slipping off the cap. When the collar is moved downwardly, the inwardly oriented protrusion compresses the skirt to the compressed state in which the skirt interlocks with the bulge. In this way a minor variation in the second periphery of the bulge will not affect the capability of the cap to seal the opening. The level of compression is thereby adjusted by the distance which the collar is moved. The inwardly oriented protrusion should define a periphery being larger than the second periphery of the disc in order to be able to encircle the cap, but smaller than the fourth periphery of the skirt in order to be able to compress the skirt such that the skirt interlocks with the bulge. When the closure is in the closed state, i.e. when the protrusion of the collar compresses the skirt, the friction between the protrusion and the skirt is sufficient to keep the skirt in the closed state. The groove and protrusion are corresponding which is understood to mean that they are of substantially identical geometrical configuration. As will be elaborated further below, such identical geometrical configuration has the advantage of being very simple to manufacture, e.g. by using a material sheet of uniform thickness and establishing a dent in the material.

[0024] When the closure is about to be opened, the user may grip around the circumferential groove and lift the collar upwards, i.e. away from the bottle. The protrusion will then move upwardly and rest around the disc and the skirt will reassume its uncompressed state. The user may then remove the closure from the mouth of the bottle. When the closure is in the open state, i.e. when the skirt is in the uncompressed state, the lower section of the collar bears against the skirt from below in order to lift the cap off the mouth of the beverage container. In this way the cap is contained within the inner space. The lower section may thus define a periphery being larger than the second periphery of the disc, but smaller than the fourth periphery in the uncompressed state such that the collar fits over the mouth of the beverage bottle.

[0025] According to a further embodiment of the first aspect, the groove constitutes a circumferential groove and the protrusion constitutes a circumferential protrusion.

sion corresponding to the circumferential groove. By using a circumferential groove and corresponding protrusion it may be assured that the protrusion is capable of compressing the complete skirt while at the same time providing a suitable gripping surface for the user.

[0026] According to a further embodiment of the first aspect, the circumferential groove constitutes a rolled groove. A circumferential groove may advantageously be made by rolling.

[0027] According to a further embodiment of the first aspect, the groove constitutes one or more detents. Detents may be used as an alternative to the circumferential groove. The detents may be flexible in order to adjust the level of compression. The detents are preferably punched out of the intermediate section and form a taper away from the upper section.

[0028] According to a further embodiment of the first aspect, the one or more detents define a fifth periphery being smaller than the second periphery of the disk, the collar being capable of assuming an initial state, in which the fifth periphery is bearing against the disc. In this way it may be ensured that the cap is pressed by a sufficiently high sealing pressure force against the opening of the beverage container before the detents flex outwardly in order to pass the disc and cause the skirt to interlock with the bulge. The detents may have a lower end which is slightly tapered towards the upper section in order to be able to pass the disc.

[0029] According to a further embodiment of the first aspect, the cap is made of metal. Metal is preferred in order to achieve a sufficiently strong corrugation which is not deformed or at least not critically deformed during closing of the seal.

[0030] According to a further embodiment of the first aspect, the collar is made of metal. Metal is preferred in order to obtain a minimum of creeping.

[0031] According to a further embodiment of the first aspect, the inwardly oriented surface and the outwardly oriented surface are tapered in a direction towards the disc. A taper towards the disc or upper section will make the closure easier to apply and will allow for an even larger tolerance of the first periphery of the bulge.

[0032] According to a further embodiment of the first aspect, the taper is between 1 and 10 degrees, preferably between 2 and 7 degrees, more preferably between 3 and 5 degrees, such as 4 degrees. 4 degrees will allow a difference in the first periphery of 1.75 mm.

[0033] According to a further embodiment of the first aspect, without the collar, the cap is exhibiting the mouth to a pressure of about 0.1-1 bar, such as 0.5 bar, and, with the collar, the cap is exhibiting the mouth to a pressure of between 5 and 10 bar, such as 8 bar. The pressure of the skirt against the mouth in the closed position is sufficient to keep the closure sealed to the pressurised beverage bottle. When the collar is lifted to the open position, the pressure within the bottle will typically escape.

[0034] According to a further embodiment of the first aspect, the bottle is made of glass. Glass is a rigid ma-

terial which is recyclable and thereby environmentally friendly. Glass is also very rigid and capable of holding pressurised beverages.

[0035] According to a further embodiment of the first aspect, when in the closed state, the friction force between the cap and said collar amounts to between 5 and 50N, preferably 10-40N, more preferably between 20 and 30N, such as 25N. The friction force between the collar and the cap should be sufficient to avoid the collar from being lifted accidentally when the bottle is handled, and sufficiently small for allowing elderly people to open the closure without too much effort.

[0036] According to a further embodiment of the first aspect, the upper section comprises an annular ring or a disc. The upper section may preferably be constituted by an annular ring or disc in order to establish the inner surface which is able to contact the disc and an outer surface which is capable of showing a commercial message such as a brand name.

[0037] The above object, the above advantages and the above feature together with numerous other objects, advantages and features which will be evident from the below detailed description of the present invention, are according to a second aspect of the present invention obtained by a method of applying and interlocking a re-sealable closure for a beverage bottle, the beverage bottle comprising a body, a cylindrical neck connected to the body and a mouth connected to the neck opposite the body and defining an opening, the mouth comprising an outwardly oriented bulge at a first axial distance from the opening, the bulge defining a first outer periphery at the first axial distance, the closure comprising:

a cap comprising a disc defining a second periphery, the disc being adapted to cover the opening of the mouth, the cap further comprises a circumferential skirt extending a second axial distance from the second periphery of the disc, the second axial distance being larger than the first axial distance, the skirt being corrugated and defining a third periphery constituting an inner periphery and a fourth periphery constituting an outer periphery, the skirt having a plurality of axial slots and being resilient in a radial direction between an uncompressed state in which the third periphery is equal to or larger than the first periphery of the outwardly oriented bulge of the mouth and the fourth periphery being larger than the second periphery of the disc, and, a compressed state in which the third periphery is smaller than the first periphery of the outwardly oriented bulge of the mouth while the fourth periphery of the skirt is equal to or larger than the second periphery of the disc, and a collar comprising an upper section, a lower section and an intermediate section, the sections defining an inner space accommodating the cap and allowing the cap to be axially movable within the inner space, the upper section defining an inner surface for contacting the disc opposite the skirt, the lower section

circumferentially enclosing the skirt opposite the disc, the intermediate section being substantially cylindrical and interconnecting the upper section and the lower section and defining an inwardly oriented surface and an outwardly oriented surface, the outwardly oriented surface of the intermediate section defining a groove and the inwardly oriented surface of the intermediate section defining an inwardly oriented protrusion corresponding to the groove of the outwardly oriented surface, the method comprising the steps of:

providing the beverage bottle and the re-sealable closure, the closure being in an open state in which the upper section of the collar is spaced apart from the disc, the lower section of the collar bearing against the skirt and the inwardly oriented protrusion being located adjacent the second periphery of the disc such that the skirt assumes the uncompressed state,

applying the closure onto the beverage bottle such that the opening is covered by the disc and the bulge is covered by the skirt, and

closing the closure by axially moving the collar relative to the cap, thereby compressing the skirt inwardly into the compressed state by means of the inwardly oriented protrusion of the inwardly oriented surface, interlocking the skirt with the outwardly oriented bulge of the mouth, causing the upper section of the collar to move towards the disc and causing the lower section of the collar to be axially spaced apart from the skirt.

[0038] The above method according to the second aspect may be used to manufacture the beverage bottle according to the first aspect.

[0039] The above object, the above advantages and the above feature together with numerous other objects, advantages and features which will be evident from the below detailed description of the present invention are according to a third aspect of the present invention obtained by a method of applying and interlocking a re-sealable closure for a beverage bottle, the beverage bottle comprising a body, a cylindrical neck connected to the body and a mouth connected to the neck opposite the body and defining an opening, the mouth comprising an outwardly oriented bulge at a first axial distance from the opening, the bulge defining a first outer periphery at the first axial distance, the closure comprising:

a cap comprising a disc defining a second periphery, the disc being adapted to cover the opening of the mouth, the cap further comprises a circumferential skirt extending a second axial distance from the second periphery of the disc, the second axial distance being larger than the first axial distance, the skirt being corrugated and defining a third periphery constituting an inner periphery and an fourth periphery

constituting an outer periphery, the skirt having a plurality of axial slots and being resilient in a radial direction between an uncompressed state in which the third periphery is equal to or larger than the first periphery of the outwardly oriented bulge of the mouth and the fourth periphery being larger than the second periphery of the disc, and, a compressed state in which the third periphery is smaller than the first periphery of the outwardly oriented bulge of the mouth while the fourth periphery of the skirt is equal to or larger than the second periphery of the disc, and a collar comprising an upper section, a lower section and an intermediate section, the sections defining an inner space accommodating the cap and allowing the cap to be axially movable within the inner space, the upper section defining an inner surface for contacting the disc opposite the skirt, the lower section circumferentially enclosing the skirt opposite the disc, the intermediate section being substantially cylindrical and interconnecting the upper section and the lower section and defining an inwardly oriented surface and an outwardly oriented surface, the method comprising the steps of:

providing the beverage bottle and the re-sealable closure, the closure being in an open state in which the upper section of the collar being spaced apart from the disc, the lower section of the collar bearing against the skirt and the inwardly oriented protrusion being located adjacent the second periphery of the disc such that the skirt assumes the uncompressed state, applying the closure onto the beverage bottle such that the opening is covered by the disc and the bulge is covered by the skirt, closing the closure by axially moving the collar relative to the cap, causing the upper section of the collar to move towards the disc and causing the lower section of the collar to be axially spaced apart from the skirt, and rolling the collar thereby defining a groove in the outwardly oriented surface of the intermediate section and simultaneously defining a protrusion in the inwardly oriented surface of the intermediate section corresponding to the groove of the outwardly oriented surface, thereby compressing the skirt inwardly into the compressed state by means of the inwardly oriented protrusion of the inwardly oriented surface and interlocking the skirt with the outwardly oriented bulge of the mouth.

[0040] The above method according to the third aspect may be used as an alternative mode to manufacture the beverage bottle according to the first aspect. According to the third aspect and differently from the second aspect, the collar is rolled after the closure has been applied. In this way the inwardly oriented protrusion may be formed

to optimally fit each bottle thereby overcoming any differences between the first peripheries of the outwardly oriented bulges of different bottles.

Brief description of the drawings

[0041]

Fig. 1 is a perspective view of a first embodiment of a closure having a cap and a skirt with a rolled groove.

Fig. 2 is a perspective cut out view of a first embodiment of a closure having a cap and a skirt with a rolled groove.

Fig. 3 is a perspective view of a first embodiment of a closure applied onto a bottle in an open state and in a closed state.

Fig. 4 is a perspective cut out view of a first embodiment of a closure applied onto a bottle.

Fig. 5 is a perspective view of a second embodiment of a closure having a cap and a skirt with detents.

Fig. 6 is a perspective view of a third embodiment of a closure having a cap and a skirt with a rolled groove and detents.

Detailed description of the drawings

[0042] Fig. 1 shows a perspective view of a closure 10 according to the present invention. The closure comprise a collar 12 and a cap 14. The cap 14 comprise a disc 16 and a skirt 18. The skirt 18 is corrugated and has a number of slots 20, such as between ten and forty slots, or preferably twenty to twenty five slots. The number of slots coincides with the number of corrugations. The slots 20 are located at the outer periphery of the skirt 18. The corrugations of the skirt define an inner periphery and an outer periphery. The present skirt is divided into an upper skirt part 22 adjacent the disc 16 and a lower skirt part 24 and only the lower skirt part 24 is corrugated. The skirt is resilient between a compressed state and an uncompressed state.

[0043] The collar 12 defines an upper section 26, an intermediate section 28 and a lower section 30, which together are adapted to form an inner space to enclose the cap 14 while still allowing the cap 14 to move axially within the collar 12. The upper section 26 defines a periphery which is smaller than the periphery of the disc 16 such that the disc 16 cannot pass through the upper section 26. The intermediate section 28 is generally cylindrical and has an inner periphery larger than the outer periphery of the skirt when in uncompressed state, but comprises a rolled groove 32 which defines a periphery which is smaller than the outer periphery of the skirt 18 when in uncompressed state, but larger than the outer periphery of the disc 16 such that the rolled groove 32 may compress and uncompress the skirt 28 when the collar is moved axially towards and away, respectively, in relation to the skirt 16. The collar further comprise a lower

section 30 which defines a periphery which is smaller than the outer periphery of the skirt 18 when in uncompressed state but larger than the bulge of the beverage bottle (not shown) such that the collar 12 fits outside the mouth of the beverage bottle (not shown), but the cap 14 may be removed together with the collar 12.

[0044] Fig. 2 shows a perspective cut out view of the closure 10 according to the present invention. The cap 14 is made of a thin metal sheet.

[0045] Fig. 3A shows the closure 10 applied in an open state onto an outwardly oriented bulge 34 of a beverage bottle neck 36. The upper section 26 of the collar is separated from the disc 16 of the cap 14.

[0046] Fig. 3B shows the closure 10 applied in an closed state onto the outwardly oriented bulge 34 of the beverage bottle neck 36. By pressing the upper section 28 of the collar 12 firmly downwards against the disc, the disc 16 is pressed against the opening of the bottle neck 36, the skirt 18 of the cap 14 is covering the bulge 34 of the bottle 36 and the rolled groove is pressed against the skirt thereby causing the skirt to assume the compressed state thereby interlocking with the bulge 34 in the "saddle" established between the bulge 34 and the bottle neck 36. The friction between the collar 12 and the cap 14 keeps the collar 14 in place.

[0047] Fig. 4A shows the first step in applying the closure 10 onto the bottle neck 36. The left side of the figure shows the inner periphery of the corrugated skirt 18, whereas the right side shows the outer periphery of the corrugated skirt 18. In the first step, the cap, being in its uncompressed state, is applied loosely onto the bulge 34. In the present embodiment, the bottle neck 36 defines a second bulge 40 and a saddle 38 between the first and second bulge 34, 40. The skirt 18 covers the outer periphery of the bulge 34 and ends adjacent the saddle 38. The intermediate section 28 of the collar 18 is slightly tapered towards the upper section 26 and may or may not define the groove 32 as indicated by the dashed line 42.

[0048] Fig. 4B shows the second step in applying the closure 10 onto the bottle neck 36. The lower section 30 has just passed the corrugated and resilient skirt 18 and thus locks the cap 18 within the inner space established by the upper section 26, intermediate section 28 and lower section 30. The rolled groove 32, if present, is located adjacent the periphery of the disc 16. The present state is known as the open state since the complete closure 10 including collar 14 and cap 12 is only loosely attached to the bulge 32 and may be easily removed from the bulge 34 by hand.

[0049] Fig. 4C shows the third step in applying the closure 10 onto the bottle neck 36. In case the rolled groove 32 is not made before applying the closure 10 onto the bulge 34, it may be established in the third step by rolling the collar 14 as indicated by the arrows. The rolled groove 32 compresses the skirt 18 such that the skirt 18 interlocks the bulge 34 at the saddle 38. The closure may be removed by lifting the collar 12.

[0050] Fig. 5 shows a closure 10' having a collar 12' according to an alternative embodiment. The collar 12' defines detents 32' replacing the rolled groove of the previous embodiment. The detents 32' are currently six but in principle any number of detents may be used. The detents 32' are punched out of the intermediate section 28 either before or after applying the closure 10' onto the bottle, in a similar way as described above in connection with the previous embodiment. The detents 32' are fastened adjacent the upper section 26 and establishes an inwardly oriented flexible tap oriented towards the lower section 30. The lowermost part 44 of the detents 32' are bent slightly outwards, such that in the first step the lowermost part 44 may rest against the upward oriented face of the disc 16 until a sufficient amount of pressure has been generated to bend the detents 32' outwardly allowing the collar to pass. In this way, it may be ensured that sufficient pressure is applied onto the enclosure for proper sealing. When in a closed state, the detents 32' fulfil the function of the rolled groove and compress the skirt 18 to interlock with the bulge.

[0051] Fig. 6 shows a further alternative embodiment, in which the detents 32' and the rolled groove 32 are combined.

[0052] Although the present invention has been described above with reference to specific embodiments, it is contemplated that various modifications may be deduced by a person having ordinary skill in the art.

List of parts:

[0053]

- 10. Closure
- 12. Collar
- 14. Cap
- 16. Disc
- 18. Skirt
- 20. Slots
- 22. Lower skirt
- 24. Upper skirt
- 26. Upper section
- 28. Intermediate section
- 30. Lower section
- 32. Circumferential groove / Detent
- 34. Bulge

- 36. Bottle neck
- 38. Saddle
- 40. 2nd bulge
- 42. Dashed line
- 44. Lowermost part

Claims

1. A beverage bottle having a re-sealable closure, said beverage bottle comprising a body, a cylindrical neck connected to said body and a mouth connected to said neck opposite said body and defining an opening, said mouth comprising an outwardly oriented bulge at a first axial distance from said opening, said bulge defining a first outer periphery at said first axial distance, said closure comprising:

a cap comprising a disc defining a second periphery, said disc being adapted to cover said opening of said mouth, said cap further comprises a circumferential skirt extending a second axial distance from said second periphery of said disc, said second axial distance being larger than said first axial distance, said skirt being corrugated and defining a third periphery constituting an inner periphery and a fourth periphery constituting an outer periphery, said skirt having a plurality of axial slots and being resilient in a radial direction between an uncompressed state in which said third periphery is equal to or larger than said first periphery of said outwardly oriented bulge of said mouth and said fourth periphery being larger than said second periphery of said disc, and, a compressed state in which said third periphery is smaller than said first periphery of said outwardly oriented bulge of said mouth while said fourth periphery of said skirt is equal to or larger than said second periphery of said disc, and

a collar comprising an upper section, a lower section and an intermediate section, said sections defining an inner space accommodating said cap and allowing said cap to be axially movable within said inner space, said upper section defining an inner surface for contacting said disc opposite said skirt, said lower section circumferentially enclosing said skirt opposite said disc, said intermediate section being substantially cylindrical and interconnecting said Upper section and said lower section and defining an inwardly oriented surface and an outwardly oriented surface, said outwardly oriented surface of said intermediate section defining a groove and said

inwardly oriented surface of said intermediate section defining an inwardly oriented protrusion corresponding to said groove of said outwardly oriented surface,

said closure defining:

a closed state in which said upper section of said collar bears against said disc, said lower section of said collar being axially spaced apart from said skirt and said inwardly oriented protrusion of said inwardly oriented surface compressing said skirt inwardly into said compressed state for interlocking with said outwardly oriented bulge of said mouth, and

an open state in which said upper section of said collar is spaced apart from said disc, said lower section of said collar bearing against said skirt and said inwardly oriented protrusion being located adjacent said second periphery of said disc such that said skirt assumes said uncompressed state.

2. The beverage bottle according to claim 1, wherein said groove constitutes a circumferential groove and said protrusion constitutes a circumferential protrusion corresponding to said circumferential groove. 25
3. The beverage bottle according to claim 2, wherein said circumferential groove constitutes a rolled groove. 30
4. The beverage bottle according to claim 1, wherein said groove constitutes one or more detents. 35
5. The beverage bottle according to claim 4, wherein said one or more detents define a fifth periphery being smaller than said second periphery of said disc, said collar being capable of assuming an initial state in which said fifth periphery is bearing against said disc. 40
6. The beverage bottle according to any of the preceding claims, wherein said cap is made of metal. 45
7. The beverage bottle according to any of the preceding claims, wherein said collar is made of metal.
8. The beverage bottle according to any of the preceding claims, wherein said inwardly oriented surface and said outwardly oriented surface are tapered in a direction towards said disc. 50
9. The beverage bottle according to claim 8, wherein said taper is between 1 and 10 degrees, preferably between 2 and 7 degrees, more preferably between 3 and 5 degrees, such as 4 degrees. 55

10. The beverage bottle according to any of the preceding claims, wherein, without said collar, said cap is exhibiting said mouth to a pressure of about 0,1-1 bar, such as 0,5 bar, and, with said collar, said cap is exhibiting said mouth to a pressure of between 5 and 10 bar, such as 8 bar.

11. The beverage bottle according to any of the preceding claims, wherein said bottle is made of glass.

12. The beverage bottle according to any of the preceding claims, wherein, when in said closed state, the friction force between said cap and said collar amounts to between 5 and 50N, preferably 10 and 40N, more preferably between 20 and 30N, such as 25N.

13. The beverage bottle according to any of the preceding claims, wherein said upper section comprises an annular ring or a disc.

14. A method of applying and interlocking a re-sealable closure for a beverage bottle, said beverage bottle comprising a body, a cylindrical neck connected to said body and a mouth connected to said neck opposite said body and defining an opening, said mouth comprising an outwardly oriented bulge at a first axial distance from said opening, said bulge defining a first outer periphery at said first axial distance, said closure comprising:

a cap comprising a disc defining a second periphery, said disc being adapted to cover said opening of said mouth, said cap further comprises a circumferential skirt extending a second axial distance from said second periphery of said disc, said second axial distance being larger than said first axial distance, said skirt being corrugated and defining a third periphery constituting an inner periphery and a fourth periphery constituting an outer periphery, said skirt having a plurality of axial slots and being resilient in a radial direction between an uncompressed state in which said third periphery is equal to or larger than said first periphery of said outwardly oriented bulge of said mouth and said fourth periphery being larger than said second periphery of said disc, and, a compressed state in which said third periphery is smaller than said first periphery of said outwardly oriented bulge of said mouth while said fourth periphery of said skirt is equal to or larger than said second periphery of said disc, and

a collar comprising an upper section, a lower section and an intermediate section, said sections defining an inner space accommodating said cap and allowing said cap to be axially movable within said inner space, said upper section

defining an inner surface for contacting said disc opposite said skirt, said lower section circumferentially enclosing said skirt opposite said disc, said intermediate section being substantially cylindrical and interconnecting said upper section and said lower section and defining an inwardly oriented surface and an outwardly oriented surface, said outwardly oriented surface of said intermediate section defining a groove and said inwardly oriented surface of said intermediate section defining an inwardly oriented protrusion corresponding to said groove of said outwardly oriented surface, said method comprising the steps of:

providing said beverage bottle and said re-sealable closure, said closure being in an open state in which said upper section of said collar is spaced apart from said disc, said lower section of said collar bearing against said skirt and said inwardly oriented protrusion being located adjacent said second periphery of said disc such that said skirt assumes said uncompressed state, applying said closure onto said beverage bottle such that said opening is covered by said disc and said bulge is covered by said skirt, and closing said closure by axially moving said collar relative to said cap, thereby compressing said skirt inwardly into said compressed state by means of said inwardly oriented protrusion of said inwardly oriented surface, interlocking said skirt with said outwardly oriented bulge of said mouth, causing said upper section of said collar to move towards said disc and causing said lower section of said collar to be axially spaced apart from said skirt.

15. A method of applying and interlocking a re-sealable closure for a beverage bottle, said beverage bottle comprising a body, a cylindrical neck connected to said body and a mouth connected to said neck opposite said body and defining an opening, said mouth comprising an outwardly oriented bulge at a first axial distance from said opening, said bulge defining a first outer periphery at said first axial distance, said closure comprising:

a cap comprising a disc defining a second periphery, said disc being adapted to cover said opening of said mouth, said cap further comprises a circumferential skirt extending a second axial distance from said second periphery of said disc, said second axial distance being larger than said first axial distance, said skirt being corrugated and defining a third periphery constitut-

ing an inner periphery and an fourth periphery constituting an outer periphery, said skirt having a plurality of axial slots and being resilient in a radial direction between an uncompressed state in which said third periphery is equal to or larger than said first periphery of said outwardly oriented bulge of said mouth and said fourth periphery being larger than said second periphery of said disc, and, a compressed state in which said third periphery is smaller than said first periphery of said outwardly oriented bulge of said mouth while said fourth periphery of said skirt is equal to or larger than said second periphery of said disc, and

a collar comprising an upper section, a lower section and an intermediate section, said sections defining an inner space accommodating said cap and allowing said cap to be axially movable within said inner space, said upper section defining an inner surface for contacting said disc opposite said skirt, said lower section circumferentially enclosing said skirt opposite said disc, said intermediate section being substantially cylindrical and interconnecting said upper section and said lower section and defining an inwardly oriented surface and an outwardly oriented surface, said method comprising the steps of:

providing said beverage bottle and said re-sealable closure, said closure being in an open state in which said upper section of said collar being spaced apart from said disc, said lower section of said collar bearing against said skirt and said inwardly oriented protrusion being located adjacent said second periphery of said disc such that said skirt assumes said uncompressed state, applying said closure onto said beverage bottle such that said opening is covered by said disc and said bulge is covered by said skirt, closing said closure by axially moving said collar relative to said cap, causing said upper section of said collar to move towards said disc and causing said lower section of said collar to be axially spaced apart from said skirt, and rolling said collar thereby defining a groove in said outwardly oriented surface of said intermediate section and simultaneously defining a protrusion in said inwardly oriented surface of said intermediate section corresponding to said groove of said outwardly oriented surface, thereby compressing said skirt inwardly into said compressed state by means of said inwardly oriented protrusion of said inwardly oriented surface and inter-

locking said skirt with said outwardly oriented bulge of said mouth.

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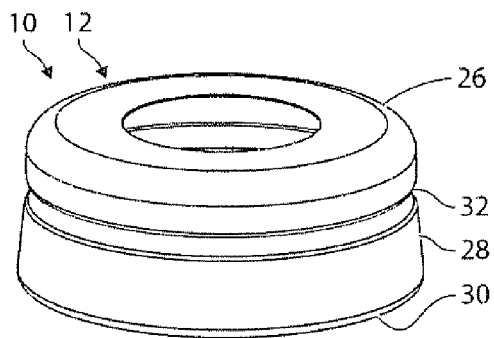


FIG. 1A

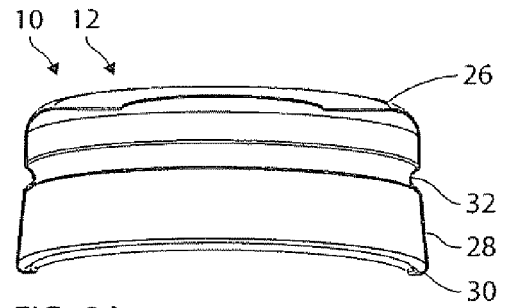


FIG. 2A

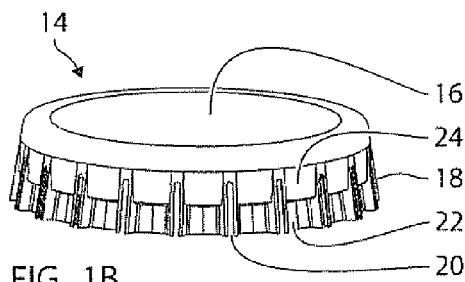


FIG. 1B

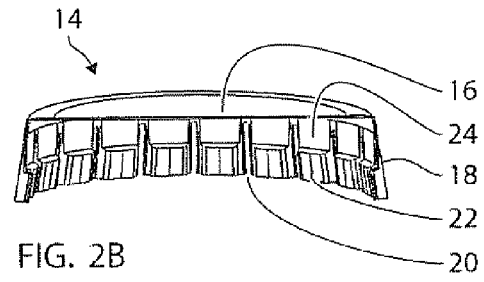


FIG. 2B

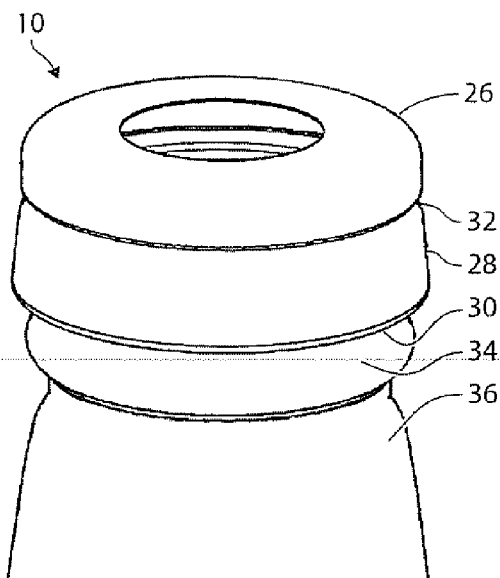


FIG. 3A

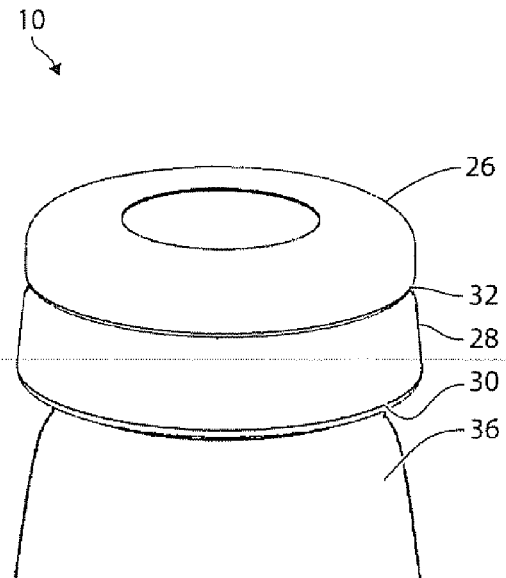


FIG. 3B

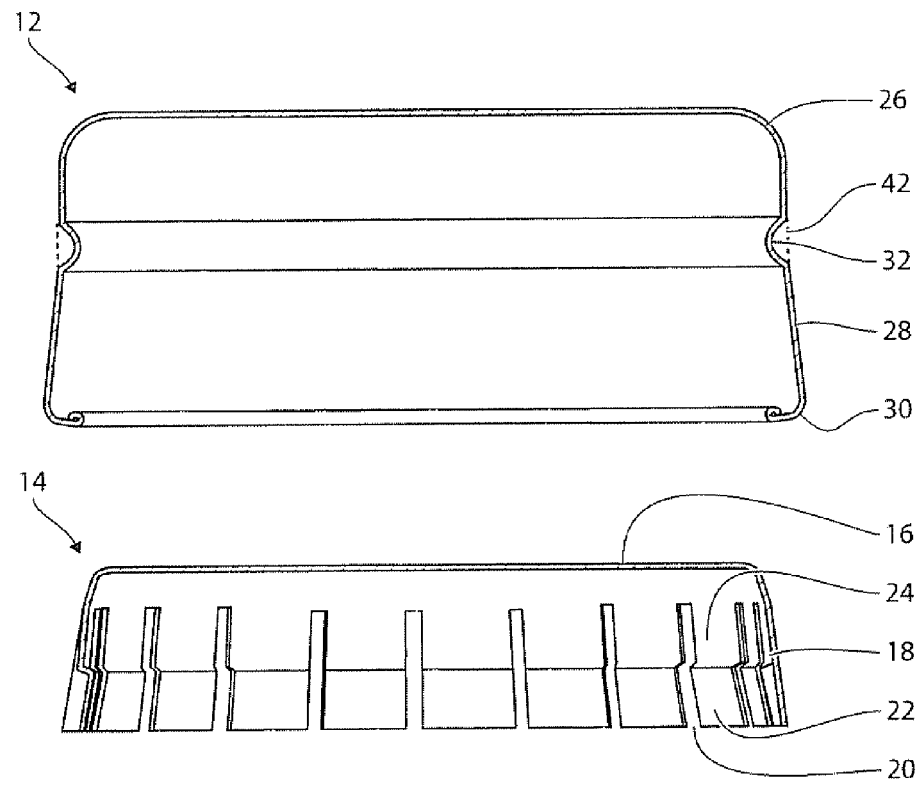
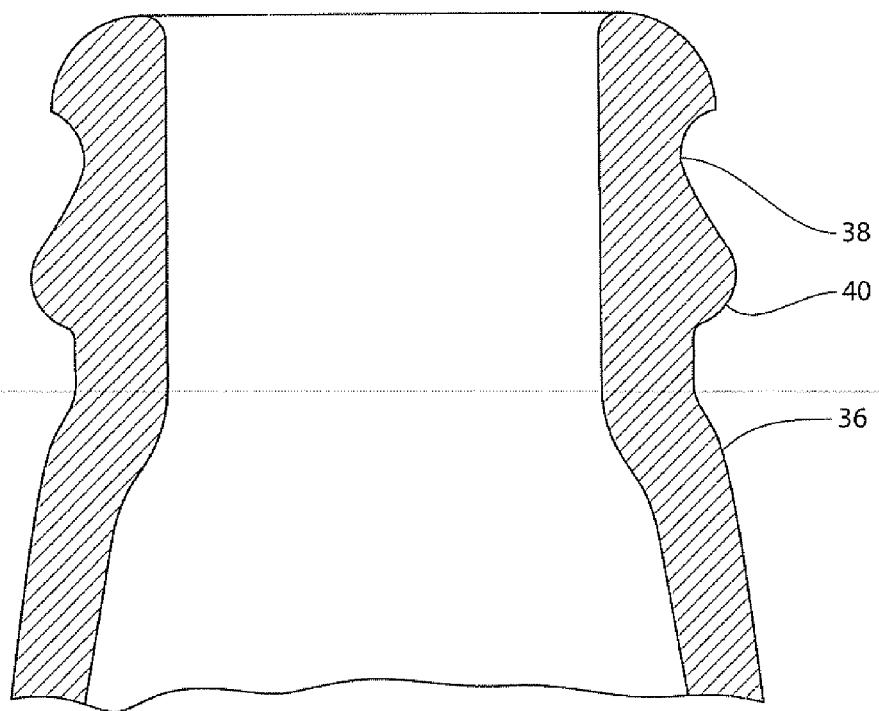
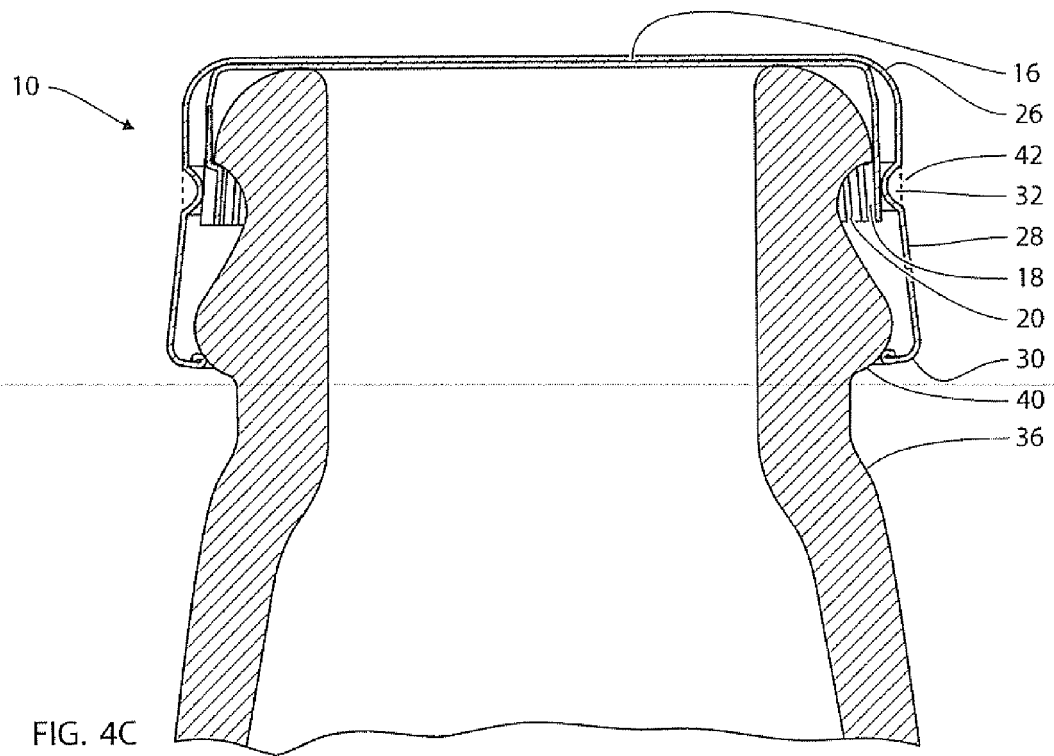
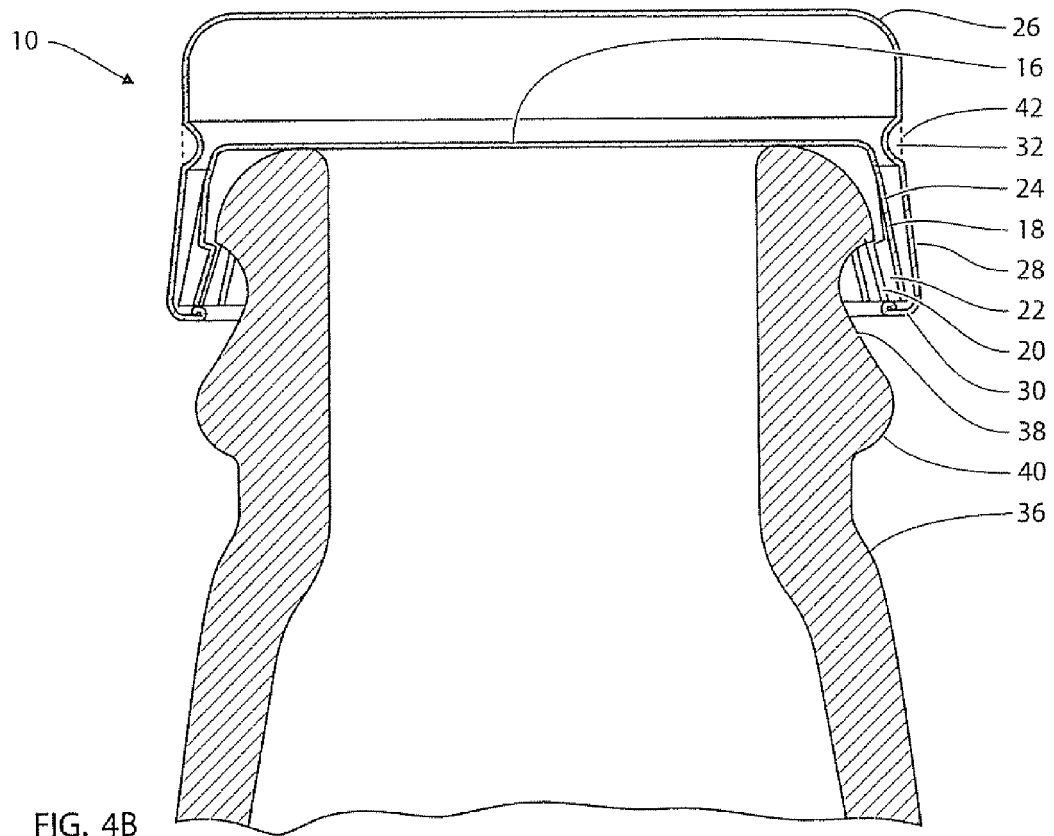


FIG. 4A





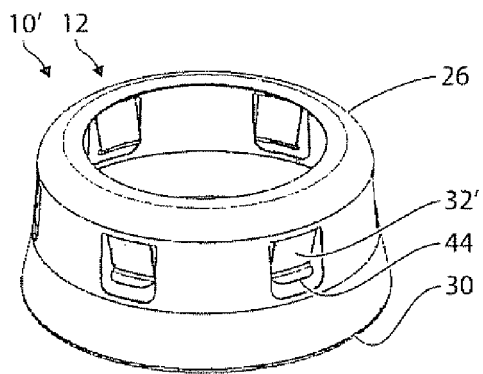


FIG. 5A

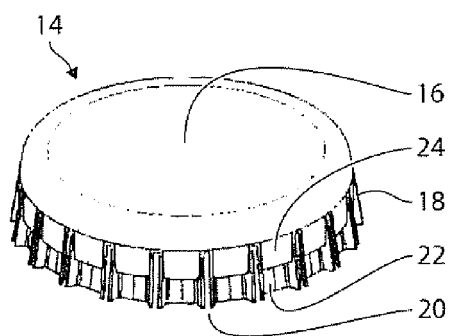


FIG. 5B

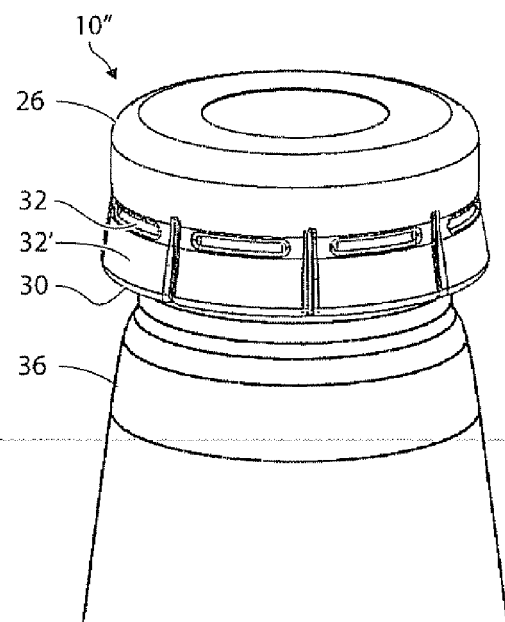


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 8427

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* abstract; claims; figures *	1-11, 13-15	
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A	----- DE 42 36 052 A1 (ZIMMERMANN JOHANN DIPL ING [DE]; SCHOEL BIRGIT [DE]; STELLMACH ALFRED) 28 April 1994 (1994-04-28) * column 2, line 48 - column 3, line 66; figures *	1	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B65D
Place of search		Date of completion of the search	Examiner
The Hague		9 February 2012	Dederichs, August
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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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