

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
13 March 2008 (13.03.2008)

PCT

(10) International Publication Number  
**WO 2008/029368 A2**

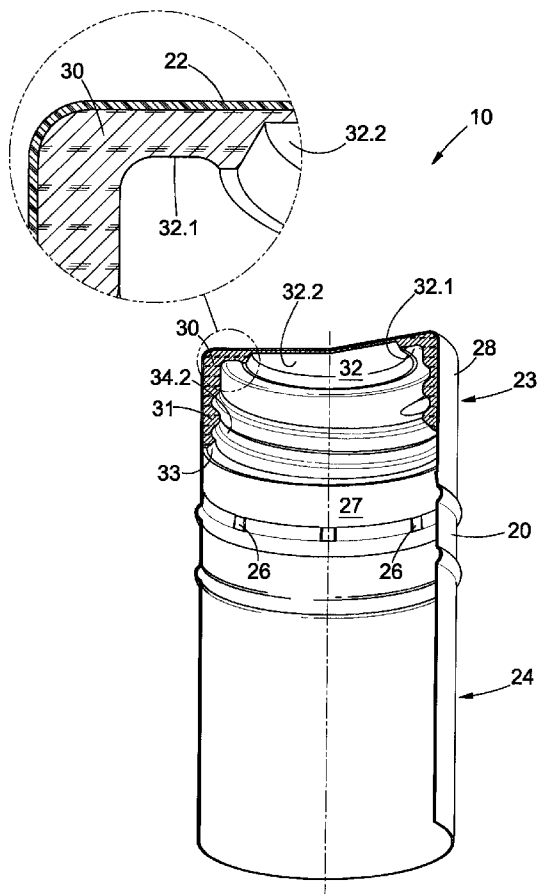
- (51) **International Patent Classification:**  
*B29C 43/18* (2006.01)      *B65D 41/62* (2006.01)
- (21) **International Application Number:**  
PCT/IB2007/053589
- (22) **International Filing Date:**  
6 September 2007 (06.09.2007)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
2006/07528      8 September 2006 (08.09.2006)      ZA
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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) **Title:** CLOSURE ARRANGEMENT AND METHOD OF MANUFACTURING THE SAME



(57) **Abstract:** This invention relates to a closure arrangement for closing a container, and more particularly to a closure arrangement for closing a bottle with a threaded neck finish. The invention also relates to a method of manufacturing such closure. The method includes the steps of providing an outer sleeve configured to fit around the neck of the bottle, and forming a blank of polymeric material into an inner sleeve by way of a moulding process, wherein an outer surface of the inner sleeve is forced to abut an inner surface of the outer sleeve while the inner sleeve is being formed.

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FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,  
PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— *without international search report and to be republished  
upon receipt of that report*

## **CLOSURE ARRANGEMENT AND METHOD OF MANUFACTURING THE SAME**

### **FIELD OF THE INVENTION**

This invention relates to a closure for closing a container, and more particularly, but not exclusively, to a closure for closing a bottle with a threaded neck finish. The invention also relates to a method of manufacturing such closure.

### **BACKGROUND TO THE INVENTION**

Containers, and in particular bottles, are typically closed and sealed using two alternative closure arrangements, being threaded closure arrangements such as screwed caps, and internal interference fit arrangements such as corks or other stopper-arrangements.

Internal interference fit arrangements are especially popular in the wine industry, and usually comprise a solid cylindrical body, made of cork or any suitable synthetic material, that is inserted into the aperture of the bottle. The cylindrical body is at least partially resilient, and is configured to have an outer diameter in excess of the inner diameter of the opening of the bottle, thus resulting in an interference fit between the body and the bottle when installed. The neck of the bottle is subsequently covered with an aluminium sleeve for aesthetical purposes, and also to provide a smooth printing area onto which the name of the wine-estate can, inter alia, be printed.

Due to advances in sealing technology, there is presently a move away from internal interference fit type closures towards threaded closure arrangements. However, it would be advantageous if the outer appearance of the sealed bottles remained

substantially the same. It would for instance be important from a printing point of view that the outer sleeve remains smooth, and does not become threaded, as is the case in many threaded cap arrangements.

A number of threaded closure arrangements have been proposed for this purpose. A common requirement is that these threaded closure arrangements should be able to fit onto standard thread finishes. This requirement results in a number of design constraints insofar as the dimensions and configuration of the threaded closure is concerned.

Suitable threaded closure arrangements known in industry, such as the closure disclosed in South African Patent No. 2002/5353 in the name of Pechiney, are complex to manufacture, and typically comprise the separate manufacturing of an inner and an outer liner, which liners are then secured to one another thereafter. It is believed that it is possible to simplify this method so as to render the process simpler and more cost-effective.

The threaded closure arrangements known in industry is furthermore configured to form a seal on an annular sealing face, defined by an upper lip of the bottle. It would be beneficial if a seal were to be formed over a larger area so as to enhance the integrity of the seal so formed.

#### **OBJECT OF THE INVENTION**

It is accordingly an object of the invention to provide a closure arrangement, and a method of manufacturing the same, which will at least partially alleviate the abovementioned disadvantages, and/or which will provide a useful alternative to existing closure arrangements and methods of manufacturing the same.

## SUMMARY OF THE INVENTION

According to the invention there is provided a method of manufacturing a closure arrangement, suitable for closing and sealing the opening of a bottle with a threaded neck finish, the method including the steps of:

- providing an outer sleeve configured to fit around the neck of the bottle;
- forming a blank of polymeric material into an inner sleeve by way of a moulding process, wherein an outer surface of the inner sleeve is forced to abut an inner surface of the outer sleeve while the inner sleeve is being formed.

There is provided for the blank of polymeric material to be provided inside the outer sleeve, and for the moulding process to be a compression moulding process. The moulding process may alternatively be an injection moulding process.

The method includes the step of forming a bond between the inner sleeve and the outer sleeve when the inner sleeve is forced to abut the outer sleeve.

The outer sleeve may include an internal coating suitable for aiding in forming the bond between the inner sleeve and the outer sleeve.

The method may also include the step of forming an internal thread in an inner surface of the inner sleeve after the inner sleeve has been formed and bonded to the outer sleeve. The internal thread may be dimensioned and configured to for an interference fit with the thread finish on the neck of the bottle.

Alternatively, the method may provide for the inner surface of the inner sleeve to remain substantially smooth, with no internal thread being formed, the inner diameter of the inner sleeve being smaller than the outer diameter of the thread finish on the neck of the bottle.

The outer sleeve may be made from metal, and may be substantially closed by way of a top section at one end so as to form a cap. Alternatively, the outer sleeve may also be made of a polymeric material.

The method may include the further step of locating a top liner element inside the outer sleeve prior to locating the blank of polymeric material inside the outer sleeve, in order for the liner element to be sandwiched between the top section of the outer sleeve and an end of the inner sleeve when the inner sleeve is formed.

The top liner may be substantially disc-shaped.

The inner sleeve may be made from a polymeric material, and is more particularly made from polyethylene. Preferably, the inner sleeve may be formed to be substantially closed at one end by way of an integrally formed top section. Alternatively, the inner sleeve may be formed to include an inwardly protruding lip formation extending from an end of the inner sleeve.

According to a further aspect of the invention there is provided a closure arrangement, suitable for closing and sealing the opening of a bottle with a threaded neck finish, the closure arrangement including:

an outer sleeve configured to surround the neck of the bottle; and

an inner sleeve secured to an inner wall of the outer sleeve;

the inner sleeve being dimensioned, in use, to form an interference fit with the threaded neck finish of the bottle.

The inner sleeve may include an internal thread configured and dimensioned to form an interference fit with the thread provided on the bottle, in order for a sealing interface, in use, to be formed between the internal thread on the inner sleeve and the thread provided on the bottle.

Alternatively, the inner sleeve may be substantially smooth, with the inner diameter of the inner sleeve being smaller than the outer diameter of the thread provided on the bottle in order for the inner sleeve to be able to form an interference fit with the thread provided on the bottle when forced onto the neck of the bottle.

The outer sleeve may be made from metal, and may be substantially closed at one end so as to form a cap. Alternatively the outer sleeve may be made from a polymeric material.

The inner sleeve may be made from polymeric material, and is more particularly made from polyethylene. Preferably, the inner sleeve may be substantially closed at one end by way of an integrally formed top section. Alternatively, the inner sleeve may include an inwardly protruding lip formation extending from an end of the inner sleeve.

A disc-shaped liner may be located between the end of the outer sleeve and the end of the inner sleeve.

Preferably the closure arrangement is manufactured by the method described hereinbefore.

According to a further aspect of the invention there is provided a method of installing a closure arrangement as described hereinbefore onto a bottle with a threaded neck finish, the method including the steps of:

- providing a closure arrangement of the type described hereinbefore;  
and
- installing the closure arrangement on the neck of the bottle so as to form a sealing interface between the threaded neck finish and the inner surface of the inner sleeve of the closure arrangement.

The method may also include the step of exerting a force in the direction of the bottle on the closure arrangement while rotating the closure arrangement, so as to cause the thread provided on the neck of the bottle to form an internal thread in the inner sleeve of the closure arrangement when a closure arrangement without internal thread is utilized.

According to a further aspect of the invention there is provided a sealed bottle including a bottle with a threaded neck finish, and a closure arrangement of the type as described hereinbefore installed onto the neck of the bottle.

The sealed bottle includes a sealing interface between the thread provided on the neck of the bottle and an inner sleeve of the closure arrangement.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**



Preferred embodiments of the invention are described by way of non-limiting examples, and with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional perspective view of a first embodiment of a closure arrangement in accordance with the invention;

Figure 2 is a cross-sectional side view of the closure arrangement of figure 1 showing the dimensions of the closure arrangement in more detail;

Figure 3 is a cross-sectional perspective view of a second embodiment of a closure arrangement in accordance with the invention;

Figure 4 is a cross-sectional side view of the closure arrangement of figure 3 showing the dimensions of the closure arrangement in more detail;

Figure 5 is a cross-sectional side view of the neck of a bottle on which a closure arrangement in accordance with the invention is to be installed; and

Figure 6 is a cross-sectional side view of a sealed bottle.

#### **DETAIL DESCRIPTION OF THE INVENTION**

Referring to the drawings, in which like numerals indicate like features, non-limiting examples of closure arrangements in accordance with the invention are indicated by reference numeral 10. A first embodiment of a closure arrangement 10 is shown in figure 1, and a second embodiment in figure 3. In both embodiments, the closure

arrangement 10 includes an outer sleeve 20 and an inner sleeve 30 that is secured to the outer sleeve 20. The closure arrangement 10 is configured to be installed on a bottle 40, having a threaded neck 42 as shown in figure 5.

The outer sleeve 20 is made from metal, such as for instance aluminium. The outer sleeve 20 comprises tubular sidewalls 21, and is closed by way of a disc-shaped end wall 22 at one end, so as to form a cap arrangement. The disc-shaped end wall 22 may have at least some perforations (not shown) therethrough. The outer sleeve 20 may further have an upper section 23 and a lower section 24. The upper section 23 houses the inner sleeve 30 as described in more detail hereinbelow, and is connected to the lower section 24 or skirt by way of a plurality of bridge members 26. The upper section 23 can be removed from the lower section 24 by breaking the bridge members 26, typically by rotating the upper section 23 relative to the lower section 24. In use, the lower section 24 of the outer sleeve 20 is locked onto the neck (not shown) of the bottle by a secondary rolling action. When the upper section 23 is subsequently removed from the neck, the bridge members 26 will break, thus leaving the lower section 24 on the neck of the bottle. The outer sleeve 20 furthermore includes an inner surface 27 to which the inner sleeve 30 is secured, and an outer surface 28, which is suitable for being printed on due to its smooth surface finish. The inner surface includes a coating (not shown) of a composition selected to adhere to the inner sleeve 30.

The inner sleeve 30 is made from a suitable polymeric material, such as polyethylene (OR LLDPE). The material selection of the inner sleeve 30 is influenced by the required degree of oxygen permeability rate, in order for the rate of oxygen ingress to be adjustable to the requirement specified by an end user.

The inner sleeve 30, once formed as described hereinbelow, comprises tubular sidewalls 31, and may also include an upper end wall 32 of various configurations. In the described embodiments, the upper end wall 32 includes an annular lip section 32.1 that extends from the end of the tubular sidewall 31, and a disc-shaped liner section 32.2 extending from the lip section, the lip section 32.1, liner section 32.2 and tubular sidewall 31 being integrally formed. The lip section 32.1 is thicker than the liner section 32.2, and is provided for forming a seal with an upper lip 44 of the neck 41 of the bottle 40 on which the closure arrangement is to be applied. The liner section 32.2 forms a barrier against oxygen ingress from the environment. It will be appreciated that an external liner element (not shown) may be provided between the inner sleeve 30 and the outer sleeve 20, thus negating the need of a liner section 32.2. Alternatively, lining may be provided by a combination of the liner section 32.2 of the inner sleeve, and an external liner (not shown).

The opposing end 33 of the inner sleeve is of tapered configuration, which aids in the process of installing the closure arrangement 10 on the neck 41 of the bottle 40.

The surface finish of the inner surface 34 of the inner sleeve 30 may vary, and two embodiments are shown in figures 1 and 3 respectively. In figure 1 the inner sleeve 30 includes an internal thread 34.2 that has been formed in the inner surface of the sidewall 31 in a process described in more detail below. The thread 34.2 is formed slightly oversized relative to the complementary thread 42 provided on the neck 41 of the bottle 40, so as to result in an interference fit between the thread 34.2 on the closure arrangement 10 and the thread 42 on the bottle 40, thus forming a seal along the full length of the threaded section.

In the embodiment of figure 3, the inner surface 34.1 of the inner sleeve 30 is smooth, and does not include any threads. In this embodiment an inner diameter of

the tubular sidewall 31 is smaller than an outer diameter of the thread 42 provide on the neck 41 of the bottle 40, so as to result in an interference fit between the inner sleeve 30 and the thread 42 on the bottle. This interference fit results in an internal thread being formed in the inner sleeve when the closure arrangement is installed as described hereinbelow.

It will be appreciated that the inner surface 34 of the inner sleeve 30 may also have a surface finish in-between a threaded and a smooth finish. For example, a partial guiding thread may be provided in the inner surface to aid in the process of forming a thread when the closure arrangement is installed.

The specific dimensions of particular embodiments of the closure arrangement in accordance with the invention are shown in figures 2 and 4.

The closure arrangement 10, installed on a neck 41 of a bottle 40, is shown in figure 6.

The closure arrangement 10 is formed by providing the outer sleeve 20 as described hereinbefore, and then forming the inner sleeve 30 by way of a compression moulding process inside the outer sleeve 20. A suitably sized blank of polymeric material is located inside the outer sleeve, and is subsequently formed into the inner sleeve by inserting a suitable die into the outer sleeve. Upon application of the required force, the blank of polymeric material is formed into a tubular sleeve or cap, whilst the outer surfaces of the inner sleeve 30 is simultaneously forced to abut the inner surfaces of the outer sleeve 20, thus causing the inner sleeve to adhere to the outer sleeve, and more particularly to an inner coating of the outer sleeve. No additional adhesives or adhesive aids are required to secure the inner sleeve to the outer sleeve, and the bonding step is furthermore part of the step of forming the inner

sleeve and does not have to be done separately after the inner sleeve has been formed.

In order to form the closure arrangement of figures 1 and 2, the method also includes the step of forming an internal thread in the inner sleeve 30 whilst the die is removed from the closure arrangement. This is for example achieved by utilizing a collapsing die, as is known in the art.

The closure arrangement 10 is installed on the neck 41 of the bottle 40 using standard capping equipment, such as for example an Andre Zalkin-type magnetic torque head having suitable clamping jaws to grip the closure arrangement during application. The magnetic torque head is set to rotate and descend onto the neck of the bottle at a predetermined speed to ensure proper application of the closure arrangement. In the case of the closure arrangement shown in figures 3 and 4, the inner surface of the inner sleeve 30 will be compressed, and the thread on the neck of the bottle will form a thread in the inner sleeve 30 of the closure arrangement 10 as it is rotated about the threaded neck of the bottle. Once installed as shown in figure 6, the closure arrangement will form a first sealing interface 50 along the length of the threaded section, as well as a second sealing interface 51 between the lip section 32.1 of the inner sleeve 30 and the upper lip 44 of the bottle 40.

The inventor believes that this invention will resolve a number of problems associated with prior art. First, the method of manufacturing the closure arrangement is simpler than known prior art methods because the inner sleeve is formed and bonded to the outer sleeve in one step, instead of two separate steps as is known in the art. The interference fit configuration between the inner sleeve of the closure arrangement and the threads on the neck of the bottle furthermore provides an additional sealing interface that enhances the integrity of the seal formed when the

closure arrangement is installed on the bottle. The closure arrangement is also adapted to be installed on a standard bottle with a standard thread configuration.

A further benefit introduced by this invention is the ability to adjust the oxygen permeability of the closure arrangement as a whole. The material of which the inner sleeve is made can be selected in accordance with the required oxygen permeability, so that the ingress of oxygen can be regulated as per the particular application in which the bottle is to be used. It is foreseen that the invention can be applied across a wide range of products stored in glass bottled, including, but not limited to, wine, fruit-juice, spirits, liquor, carbonated soft drinks, isotonic beverages and iced tea.

It will be appreciated that the above examples are only some embodiments of the invention, and that there may be many variations without departing from the spirit and the scope of the invention. For example, the inner sleeve may be formed by way of an injection moulding process instead of a compression moulding process, in which case the blank of polymeric material will not be located inside the outer sleeve prior to the commencement of the moulding process, but will be used as raw material for the injection moulding process. Also, the outer sleeve does not have to be made of metal, and can also be made of a suitable polymeric material. An injection moulding process will in particular be utilized when the outer sleeve is made of polymeric material.

**CLAIMS:**

1. A method of manufacturing a closure arrangement, suitable for closing and sealing the opening of a bottle with a threaded neck finish, the method including the steps of:
  - providing an outer sleeve configured to fit around the neck of the bottle;
  - forming a blank of polymeric material into an inner sleeve by way of a moulding process, wherein an outer surface of the inner sleeve is forced to abut an inner surface of the outer sleeve while the inner sleeve is being formed.
2. The method of claim 1 wherein the blank of polymeric material is positioned inside the outer sleeve prior to moulding.
3. The method of claim 1 or claim 2 wherein the moulding process is a compression moulding process.
4. The method of claim 1 or claim 2 wherein the moulding process is an injection moulding process.
5. The method of any one of the preceding claims including the step of forming a bond between the inner sleeve and the outer sleeve when the inner sleeve is forced to abut the outer sleeve.
6. The method of claim 5 wherein the outer sleeve includes an internal coating suitable for aiding in forming the bond between the inner sleeve and the outer sleeve.

7. The method of claim 5 including the step of forming an internal thread in an inner surface of the inner sleeve after the inner sleeve has been formed and bonded to the outer sleeve.
8. The method of claim 7 wherein the internal thread is dimensioned and configured to form an interference fit with the thread finish on the neck of the bottle.
9. The method of claim 5 wherein there is provided for the inner surface of the inner sleeve to remain substantially smooth with no internal thread being formed, the inner diameter of the inner sleeve being smaller than the outer diameter of the thread finish on the neck of the bottle.
10. The method of any one of the preceding claims wherein the outer sleeve is made of metal, and is substantially closed by way of a top section at one end thereof so as to form a cap.
11. The method of any one of claims 1 to 9 wherein the outer sleeve is made of a polymeric material.
12. The method of any one of the preceding claims including the step of locating a top liner element inside the outer sleeve prior to locating the blank of polymeric material inside the outer sleeve, in order for the liner element to be sandwiched between the top section of the outer sleeve and an end of the inner sleeve when the inner sleeve is formed.
13. The method of claim 12 wherein the top liner is substantially disc-shaped.



14. The method of any one of the preceding claims wherein the inner sleeve is made of a polymeric material.
15. The method of any one of the preceding claims wherein the inner sleeve is formed to be substantially closed at one end by way of an integrally formed top section.
16. The method of any one of claims 1 to 14 wherein the inner sleeve is formed to include an inwardly protruding lip formation extending from an end of the inner sleeve.
17. A closure arrangement, suitable for closing and sealing the opening of a bottle with a threaded neck finish, the closure arrangement including:
  - an outer sleeve configured to surround the neck of the bottle; and
  - an inner sleeve secured to an inner wall of the outer sleeve;
  - the inner sleeve dimensioned in use to form an interference fit with the threaded neck finish of the bottle.
18. The closure arrangement of claim 17 wherein the inner sleeve includes an internal thread configured and dimensioned to form an interference fit with the thread provided on the bottle, in order for a sealing interface in use to be formed between the internal thread on the inner sleeve and the thread provided on the bottle.
19. The closure arrangement of claim 17 wherein the inner sleeve is substantially smooth, with the inner diameter of the inner sleeve being smaller than the outer diameter of the thread provided on the bottle, in order for the inner

sleeve to form an interference fit with the thread provided on the bottle when forced onto the neck of the bottle.

20. The closure arrangement of any one of claims 17 to 19 wherein the outer sleeve is made of metal, and is substantially closed at one end so as to form a cap.
21. The closure arrangement of any one of claims 17 to 20 wherein the inner sleeve is made of polymeric material.
22. The closure arrangement of any one of claims 17 to 21 wherein the inner sleeve is substantially closed at one end by way of an integrally formed top section.
23. The closure arrangement of any one of claims 17 to 21 wherein the inner sleeve includes an inwardly protruding lip formation extending from an end of the inner sleeve.
24. The closure arrangement of any one of claims 17 to 23 wherein a disc-shaped liner is located between the end of the outer sleeve and the end of the inner sleeve.
25. The closure arrangement of any one of claims 17 to 24 manufactured by a method as claimed in any one of claims 1 to 16.
26. A method of installing a closure arrangement as described hereinbefore onto a bottle with a threaded neck finish, the method including the steps of:

- providing a closure arrangement as claimed in any one of claims 17 to 25; and
- installing the closure arrangement on the neck of the bottle so as to form a sealing interface between the threaded neck finish and the inner surface of the inner sleeve of the closure arrangement.

27. The method of claim 26 including the step of exerting a force in the direction of the bottle on the closure arrangement while rotating the closure arrangement, so as to cause the thread provided on the neck of the bottle to form an internal thread in the inner sleeve of the closure arrangement when a closure arrangement without internal thread is utilized.

28. A sealed bottle including a bottle with a threaded neck finish, and a closure arrangement as claimed in any one of claims 17 to 25 installed on the neck of the bottle.

29. The sealed bottle of claim 28 including a sealing interface between the thread provided on the neck of the bottle and an inner sleeve of the closure arrangement.

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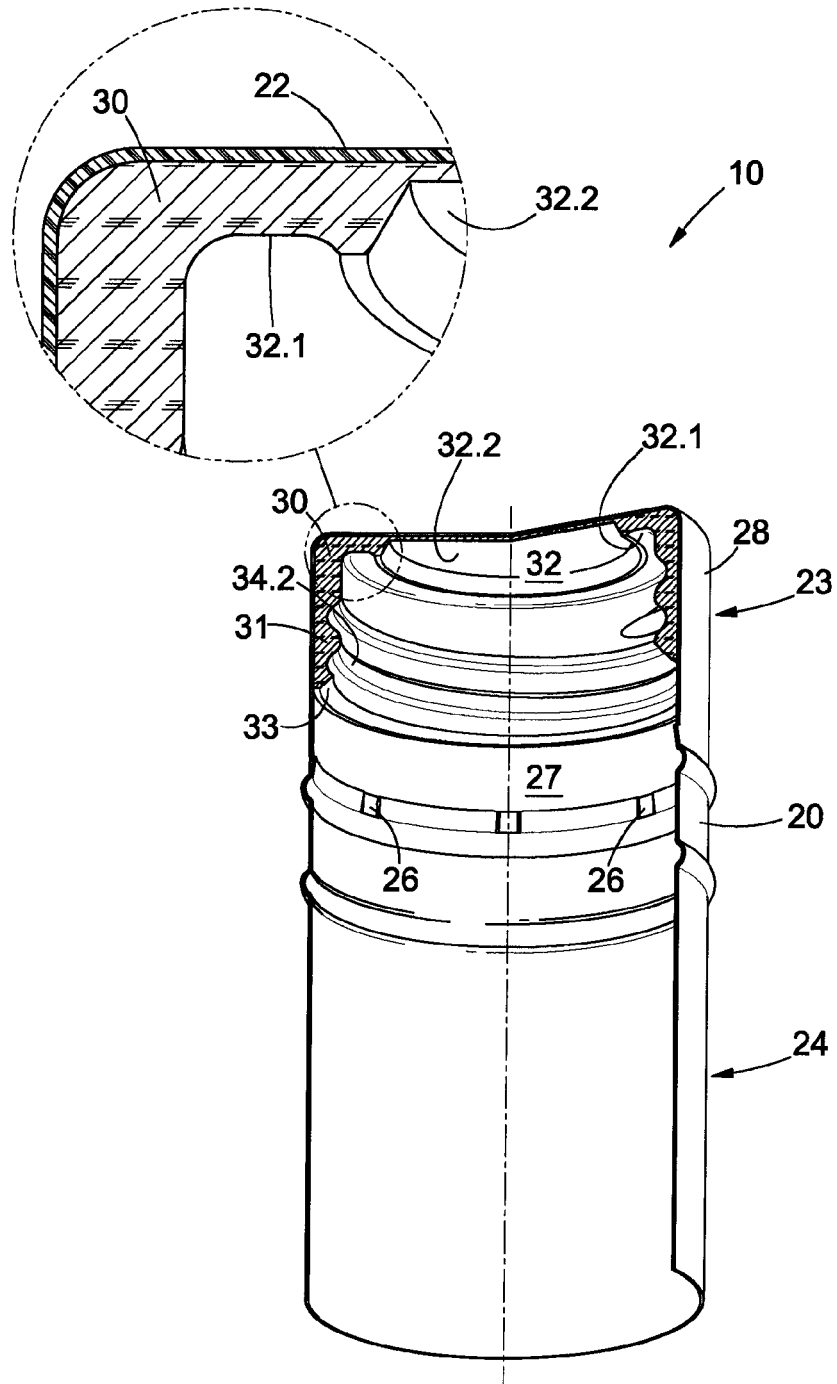


FIGURE 1



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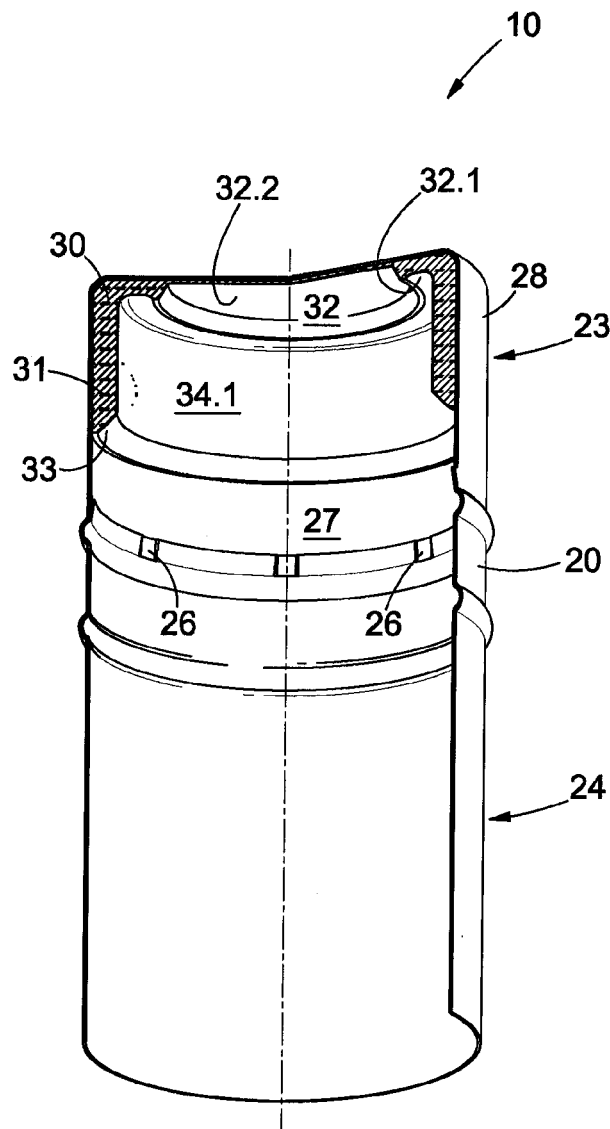


FIGURE 3

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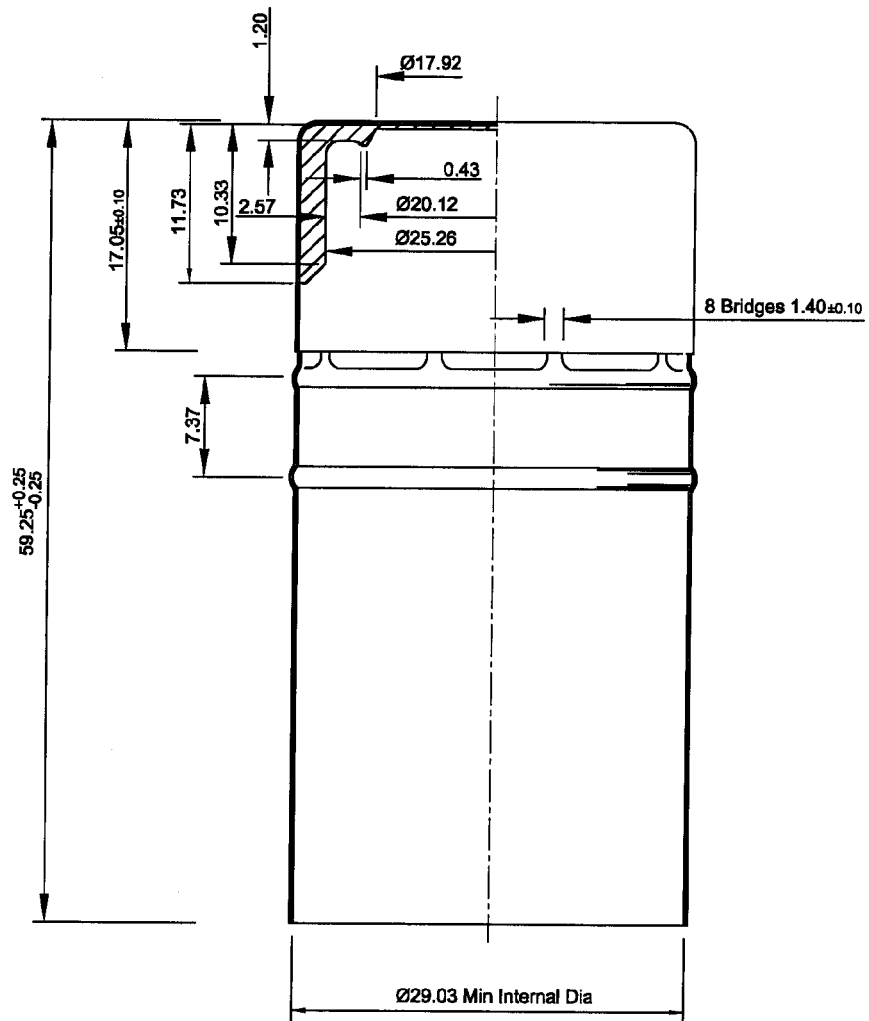


FIGURE 4

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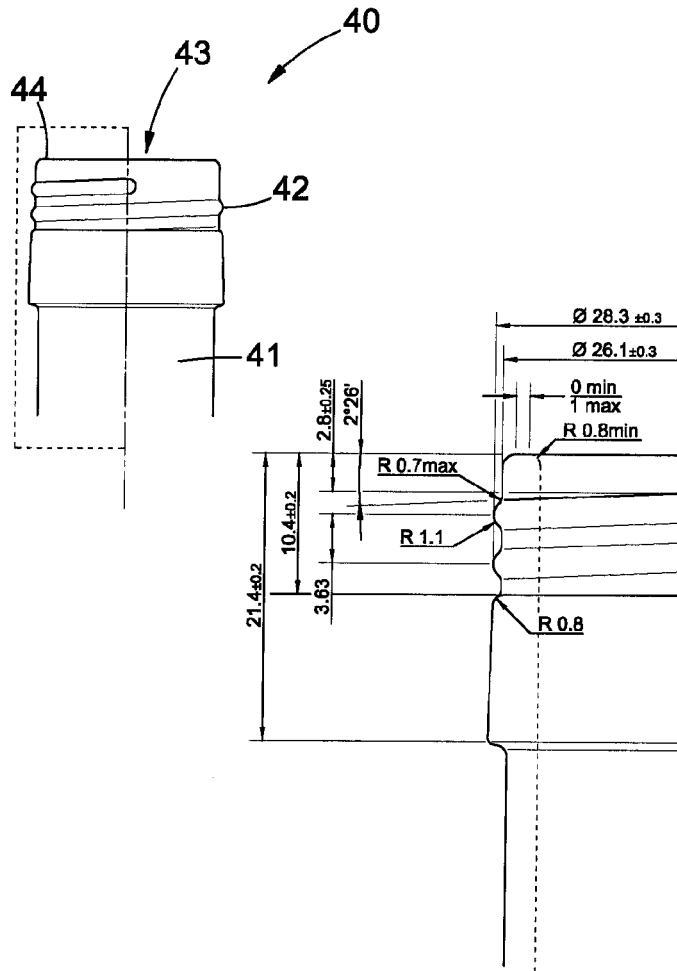


FIGURE 5



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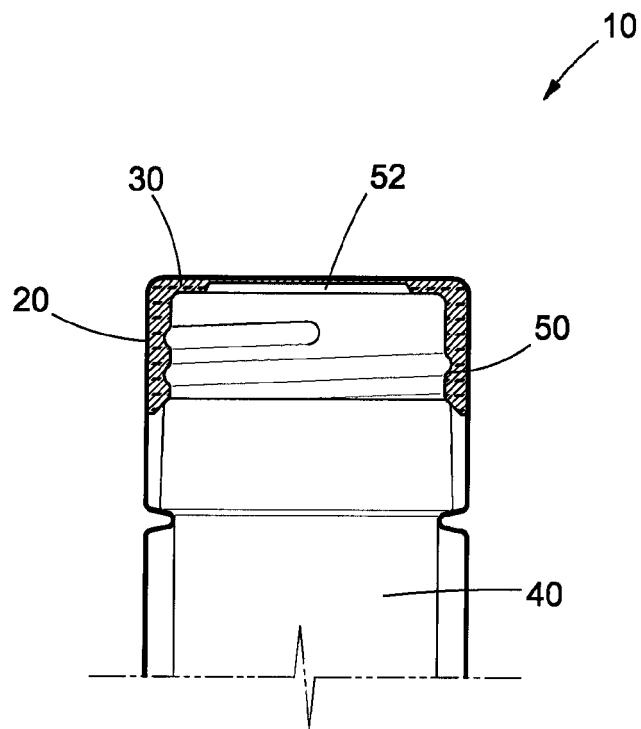


FIGURE 6