



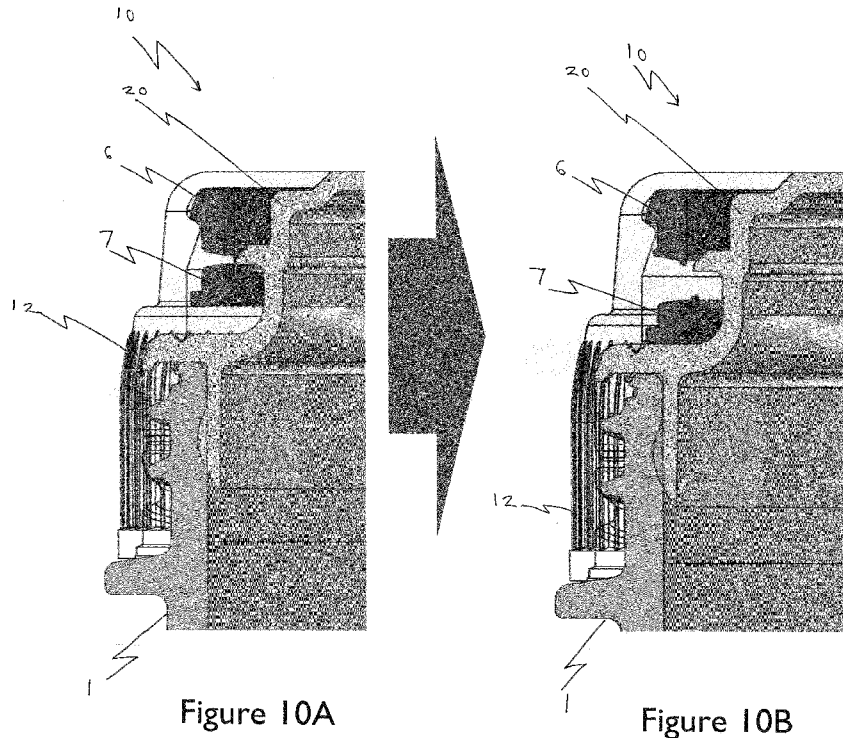
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(54) Title: TAMPER-EVIDENT CLOSURE



(57) Abstract: A tamper-evident closure (10) is provided and comprises a body (12) and a separate plug member (20). The body has a sidewall including screw thread formations for screwing the closure onto a screw threaded container neck and the plug member is locatable on the neck to seal it. The closure comprises a tamper-evident member (5) at least part of which is movable from a first position to a second position when the closure is unscrewed from the neck for the first time and, in use, when the body is unscrewed the body moves axially with respect to the plug member to cause the tamper-evident member to move from the first to the second position.

WO 2016/193183 A1

TAMPER-EVIDENT CLOSURE

The present invention relates generally to a closure and particularly, although not exclusively, to a container closure including one or more tamper-indicating features.

5

There is a widespread requirement within the field of closures for mechanisms which can be used to indicate to a consumer if a closure is unopened. One very common system uses a drop band which is frangibly connected to the open end of a closure and which drops onto and remains on a container neck if the closure is removed.

10

The present invention seeks to provide improvements over known tamper-indicating closures.

The present invention provides a tamper-evident closure comprising a body and a
15 separate plug member, the body having a sidewall including screw thread formations for screwing the closure onto a screw threaded container neck and the plug member being locatable on the neck to seal it, the closure comprising a tamper-evident member at least part of which is movable from a first position to a second position when the closure is unscrewed from the neck for the first time, in use when the body
20 is unscrewed the body moves axially with respect to the plug member to cause the tamper-evident member to move from the first to the second position.

The tamper-evident member may be non-frangibly associated with the body or the plug member.

25

The closure may comprise a tamper-evident drop band irreversibly moved from a first position to a second position to indicate if the closure has been opened, the closure comprising retention means for non-frangibly holding the band in the first position in an initial closed position, and as the closure is moved towards an open position the
5 band is released from the retention means and moves to the second position.

The tamper-evident member may comprise two or more parts frangibly connected together which are separated when the body is unscrewed.

10 The tamper-evident member may comprise a tamper-evident band, for example a tamper-evident drop band.

The body may cause the band to be released from the plug as it moves away from an initial closed position.

15

The band may be generally annular.

The band may be of a unitary structure, for example a one-piece moulding.

20 The band may comprise one or more flaps for non-frangibly engaging the plug retention means.

The plug retention means may comprise an annular bead.

25 The band may be located in the interior of the closure.

The retention means may help to prevent the band from returning to the first position.

The body may include a window in which or through which the band is visible in the
5 first position and out of which the band falls as it moves to the second position.

The present invention also provides a tamper-evident closure comprising a one-piece
body and a separate plug member, the body having a sidewall including screw thread
formations for screwing the closure onto a screw threaded container neck and the
10 plug member being locatable on the neck to seal it, the closure comprising a tamper-
evident member, the member comprising two parts frangibly connected together, one
of the tamper-evident member parts is retained by the body and the other part is
retained by the plug member, in use when the body is unscrewed for the first time the
body moves axially with respect to the plug member to cause the tamper-evident parts
15 to be separated.

The present invention also provides a tamper-evident plastics flat cap comprising a
body and a tamper-evident member provided internally of the body for indicating if the
cap has been removed from a container neck.

20

The body may include a surface formation for engaging the plug member as the body is
unscrewed to lift the plug member off the neck.

The formation may be axially spaced from the plug member in the initially closed position so that lifting of the plug member is delayed until after the body has moved axially with respect thereto so as to cause separation of the dispensing member parts.

- 5 The plug member may comprise retention means for retaining it on the container neck.

The plug member retention means may be overcome by the body surface formation to lift the dispensing member off the neck.

10

The tamper-evident member may comprise two rings frangibly connected together.

After first opening one of the tamper-evident member parts may remain in the body and the other may drop onto the plug member.

15

The body may comprise a top plate. The top plate may be generally circular and the sidewall may be generally cylindrical and depend from the periphery of the top plate.

The top plate may be generally flat, for example generally disc-shape.

20

In one embodiment there are important interactions between:

I. a bead on a plug and a bead on a lower part of a tamper-evident double ring, which causes the ring to break if the lid is opened or if the base is removed;

25

2. a bead/clip on a plug which holds it onto a container neck (until a bead on the base lifts it off); and

3. a bead on the base and part (e.g. an edge) of the plug, which cause the plug to be
5 lifted off the neck after the tamper-evident ring has been broken due to interaction I.

In some embodiments the member is the only tamper-indicating feature; in other embodiments further features may be provided.

10 Closures of the present invention may be formed from any suitable material, such as a plastics material (for example PP or PE). The closure may be formed by moulding, for example by injection or compression moulding.

The present invention also provides a closure as described herein in combination with
15 a container.

A further aspect provides a neck or neck finish for a container, the finish having a height in the range 7mm to 11mm when measured from a transfer bead. The finish may have a height in the range 8 to 10mm, for example in the range 8mm to 9mm. In
20 some embodiments the finish has a height of approximately 8.41mm.

A further aspect provides a neck or neck finish for a tamper-evident closure, the neck finish being formed with an absence of a tamper-evident bead. The neck finish may be formed in combination with a closure having a base and be part of a system that can

still detect an attempt to remove the base and provide an indication that the base has been removed.

The neck finish of aspects and embodiments of the present invention may be a 29/25
5 finish.

Finishes of the present invention may include engagement means for enabling connection to a closure, for example they may include an external and/or internal screw thread formation, snap bead or the like.

10

A further aspect provides a container having a neck or neck finish as described herein.

The present invention also provides for a closure as described herein in combination with a neck, neck finish or container as described herein.

15

The container, neck or neck finish of the present invention may be formed from any suitable material, including plastics material (e.g. PET, PP or PE) or glass.

Different aspects and embodiments of the invention may be used separately or
20 together.

Further particular and preferred aspects of the present invention are set out in the accompanying independent and dependent claims. Features of the dependent claims may be combined with the features of the independent claims as appropriate, and in
25 combination other than those explicitly set out in the claims.

The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

5 Figure 1 is a side view of a closure formed according to the present invention;

Figure 2 is a section of the closure of Figure 1 taken along line A-A;

Figure 3 is a magnified view of the closure of Figure 2;

10

Figures 4 to 9 are a sequence of drawings showing a closure of the type shown in Figures 1 to 3 being opened and reclosed;

Figures 10A and 10B show a magnified view of the closure of Figures 4 and 9; and

15

Figures 11 to 14 show perspective, side, plan and perspective views of a container neck finish for use with the closure of Figures 1 to 10.

The example embodiments are described in sufficient detail to enable those of
20 ordinary skill in the art to embody and implement the systems and processes herein described. It is important to understand that embodiments can be provided in many alternate forms and should not be construed as limited to the examples set forth herein.

Accordingly, while embodiment can be modified in various ways and take on various alternative forms, specific embodiments thereof are shown in the drawings and described in detail below as examples. There is no intent to limit to the particular forms disclosed. On the contrary, all modifications, equivalents, and alternatives falling
5 within the scope of the appended claims should be included. Elements of the example embodiments are consistently denoted by the same reference numerals throughout the drawings and detailed description where appropriate.

Unless otherwise defined, all terms (including technical and scientific terms) used
10 herein are to be interpreted as is customary in the art. It will be further understood that terms in common usage should also be interpreted as is customary in the relevant art and not in an idealised or overly formal sense unless expressly so defined herein.

Referring now to the drawings, wherein like reference numbers are used to designate
15 like elements throughout the various views, several embodiments of the present invention are further described. The figures are not necessarily drawn to scale, and in some instances the drawings may have been exaggerated or simplified for illustrative purposes only. One of ordinary skill in the art will appreciate the many possible applications and variations of the present invention based on the following examples of
20 possible embodiments of the present invention.

Figures 1 to 3 show a closure generally indicated 10 connected to a container neck 1.

The closure 10 comprises a body 12, a plug member 20 and a tamper-evident member
25 5.

The body 12 comprises a top plate 13 from which depends an upper sidewall 14.

The top plate 13 is annular and includes a central hole 13a.

- 5 The sidewall 14 is generally cylindrical and includes an internal annular bead 15 which projects radially inwards at a point axially displaced from the top plate.

A generally cylindrical lower sidewall 16 continues from the upper sidewall 14. The side wall 16 terminates with an annular shoulder 16c which extends radially inwards
10 and merges into the upper sidewall 14.

The interior of the side wall 16 comprises internal screw thread formations 16a for engaging corresponding external screw thread formations 2 on the container neck located above a transfer bead 4. The interior of the side wall 16 further comprises an
15 annular retention bead 16b positioned axially above the screw thread 16a.

The plug 20 comprises a lower portion 50, a central portion 51 and an upper portion 52.

- 20 The lower portion 50 comprises a ledge 21 with an annular seal 56 depending therefrom. In use, the seal 56 enters the bore of the container neck such that it seals against its inner surface.

The ledge 21 comprises a plurality of radially outwardly extending retention spokes 60
25 at its periphery. The spokes 60 abut against the shoulder 16c. It will be noted that the

spokes 60 are spaced from the bead 16b and that they terminate with a “claw” 61 that allows them to grip onto the rim 3 of the container neck 1 which comprises a peripheral bead 3a.

- 5 The central section 51 includes an annular sidewall 52 and a flange 41 which projects radially outward from the side of the wall 52.

The upper portion 52 comprises a sidewall 53 closed at one end by a top cover 54. The top cover extends into the top plate hole 13a.

10

The tamper-evident member 5 takes the form of a separate element having an upper ring 6 and a lower ring 7 connected together by frangible connections 8.

- 15 The tamper-evident member 5 fits into the sidewall 14 of the body 12, radially outward of the plug 20.

The upper ring 6 includes an upper projection 6a which projects radially outwardly and engages under the sidewall bead 15.

- 20 The lower ring 7 includes a flange 7a which projects radially inwardly and in the initially closed position of the closure shown in Figures 1 to 3 is located under the plug flange 41.

- 25 As described below the body cannot be unscrewed without breaking the frangible connections 8 and separating the rings 6, 7.

Referring now to Figures 4 to 9 the closure is shown being opened for the first time and then reclosed.

- 5 Figures 4A and 4B show the closure 10 in the fully closed position, as described in relation to Figures 1 to 3.

The closure is opened by unscrewing the body 12 from the neck 1.

- 10 As the body is initially unscrewed it begins to move axially upwards, whilst the plug 20 remains in position. As a result the member 5 moves upwards until the ring flange 7a contacts the plug flange 41, as shown in Figures 5A and 5B

- 15 Further unscrewing causes the rings 6, 7 to separate because the ring 6 is retained by the bead 15 and the ring 7 cannot pass over the flange 41. The ring 7 then drops and falls onto the plug ledge 21 as shown in Figures 6A and 6B.

- 20 The body is unscrewed further until the sidewall retention bead 16b contacts the spokes 60, as shown in Figures 7A and 7B. Further unscrewing causes the body to lift the plug, as shown in Figures 8A and 8B. The closure 10 can now be removed.

When the closure 10 is replaced and screwed back onto the neck 1 the rings 6, 7 remain separated, as shown in Figures 9A and 9B.

In this embodiment the body is non-opaque (for example translucent or transparent). This means that the separated rings are clearly visible. In other embodiments part of the body is non-opaque, or there is an opening/window formed in the body so that the at least one of the rings is visible/not visible in the initially unopened position and/or
5 the reclosed position.

In this embodiment, therefore, the present invention provides an internal tamper-evident band for a flatcap, activated by unscrewing of the body from the neck. The closure moves from the appearance shown in Figure 10A to the appearance shown in
10 Figure 10B.

In this embodiment the closure is formed without a tamper-evident drop band at the free end of the sidewall. This means that there is no requirement for a bead on the neck which would otherwise be required to engage under a drop band and cause it to
15 be broken away from the sidewall. As a result a neck finish 101, for example, of the type shown in Figures 11 to 14 is possible. This allows for weight reduction of the bottle neck and the closure and avoids issues of unwanted band breakage when the closure is applied to the neck.

20 The neck finish 101 includes a transfer bead 104.

The finish 101 is the part of the container that holds a cap or closure in use, and surrounds the opening 103 in the container. It is so named because, in early hand glass manufacturing, it was the last part of the glass container to be made, hence the term
25 "finish"

The exterior of the finish 101 includes a single start screw thread 105. In this embodiment this is a continuous spiral projecting ridge on the finish intended to mesh with the thread of a screw-type closure. Other screw thread formations, including
5 multi-start threads, are possible.

The transfer bead 104 is a continuous horizontal ridge near the bottom of the finish used in transferring of a container from one part of a manufacturing operation to another.
10

The neck finish rim 106 includes an undercut 107.

Although illustrative embodiments of the invention have been disclosed in detail herein, with reference to the accompanying drawings, it is understood that the
15 invention is not limited to the precise embodiments shown and that various changes and modifications can be effected therein by one skilled in the art without departing from the scope of the invention.

20

CLAIMS

1. A tamper-evident closure comprising a body and a separate plug member,
the body having a sidewall including screw thread formations for screwing the closure
5 onto a screw threaded container neck and the plug member being locatable on the
neck to seal it,
the closure comprising a tamper-evident member at least part of which is movable
from a first position to a second position when the closure is unscrewed from the
neck for the first time,
10 in use when the body is unscrewed the body moves axially with respect to the plug
member to cause the tamper-evident member to move from the first to the second
position.
2. A closure as claimed in claim 1, in which the tamper-evident member is non-
15 frangibly associated with the body or the plug member.
3. A closure as claimed in claim 2, in which the closure comprises a tamper-
evident drop band irreversibly moved from a first position to a second position to
indicate if the closure has been opened, the closure comprising retention means for
20 non-frangibly holding the band in the first position in an initial closed position, and as
the closure is moved towards an open position the band is released from the retention
means and moves to the second position.

4. A closure as claimed in claim 1, in which the tamper-evident member comprises two or more parts frangibly connected together which are separated when the body is unscrewed.
- 5 5. A closure as claimed in any preceding claim, in which the body causes the band to be released from the plug as it moves away from an initial closed position.
6. A closure as claimed in any preceding claim, in which the band is generally annular.
- 10
7. A closure as claimed in any preceding claim, in which the band is a unitary structure.
8. A closure as claimed in any preceding claim, in which the band comprises one
15 or more flaps for non-frangibly engaging the plug retention means.
9. A closure as claimed in any preceding claim, in which the retention means comprise an annular bead.
- 20 10. A closure as claimed in any preceding claim, in which the band is located in the interior of the closure.
11. A closure as claimed in any preceding claim, in which the retention means help to prevent the band from returning to the first position.

12. A closure as claimed in any preceding claim, in which the lid includes a window in which or through which the band is visible in the first position and out of which the band falls as it moves to the second position.

5 13. A tamper-evident closure comprising a one-piece body and a separate plug member,
the body having a sidewall including screw thread formations for screwing the closure onto a screw threaded container neck and the plug member being locatable on the neck to seal it,
10 the closure comprising a tamper-evident member, the member comprising two parts frangibly connected together, one of the tamper-evident member parts is retained by the body and the other part is retained by the plug member,
in use when the body is unscrewed for the first time the body moves axially with respect to the plug member to cause the tamper-evident parts to be separated.

15

14. A tamper-evident plastics flat cap comprising a body and a tamper-evident member provided internally of the body for indicating if the cap has been removed from a container neck.

20 15. A closure as claimed in any preceding claim, in which the lid includes a surface formation for engaging the plug member as the body is unscrewed to lift the plug member off the neck.

16. A closure as claimed in claim 15, in which the formation is axially spaced from
25 the plug member in the initially closed position so that lifting of the plug member is

delayed until after the body has moved axially with respect thereto so as to cause separation of the dispensing member parts.

17. A closure as claimed in any preceding claim, in which the plug member
5 comprises retention means for retaining it on the container neck.

18. A closure as claimed in claim 17 when dependent on claim 15 or claim 16, in
which the plug member retention means is overcome by the body surface formation to
lift the dispensing member off the neck.

10

19. A closure as claimed in any preceding claim, in which the tamper-evident
member comprises two rings frangibly connected together.

20. A closure as claimed in any preceding claim, in which after first opening one of
15 the tamper-evident member parts remains in the body and the other drops onto the
plug member.

21. A closure as claimed in any preceding claim, in which the body comprises a top
plate.

20

22. A closure as claimed in claim 13, in which the top plate is generally flat.

23. A closure as claimed in claim 21 or claim 22, in which the top plate includes a
hole through which at least part of the plug extends in the fully closed position.

25

24. A closure substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

25. A closure as claimed in any preceding claim in combination with a container.

5

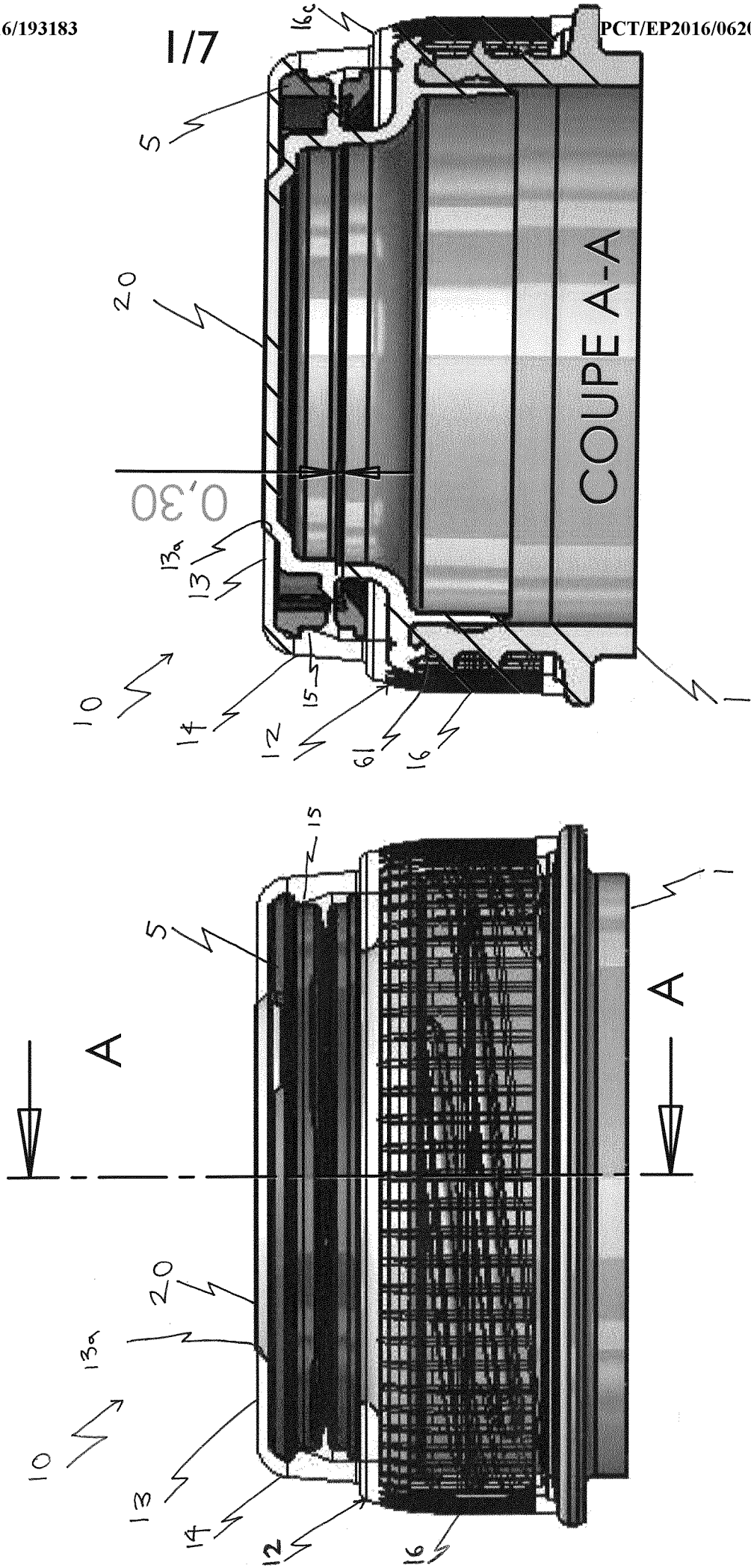


Figure 1

Figure 2

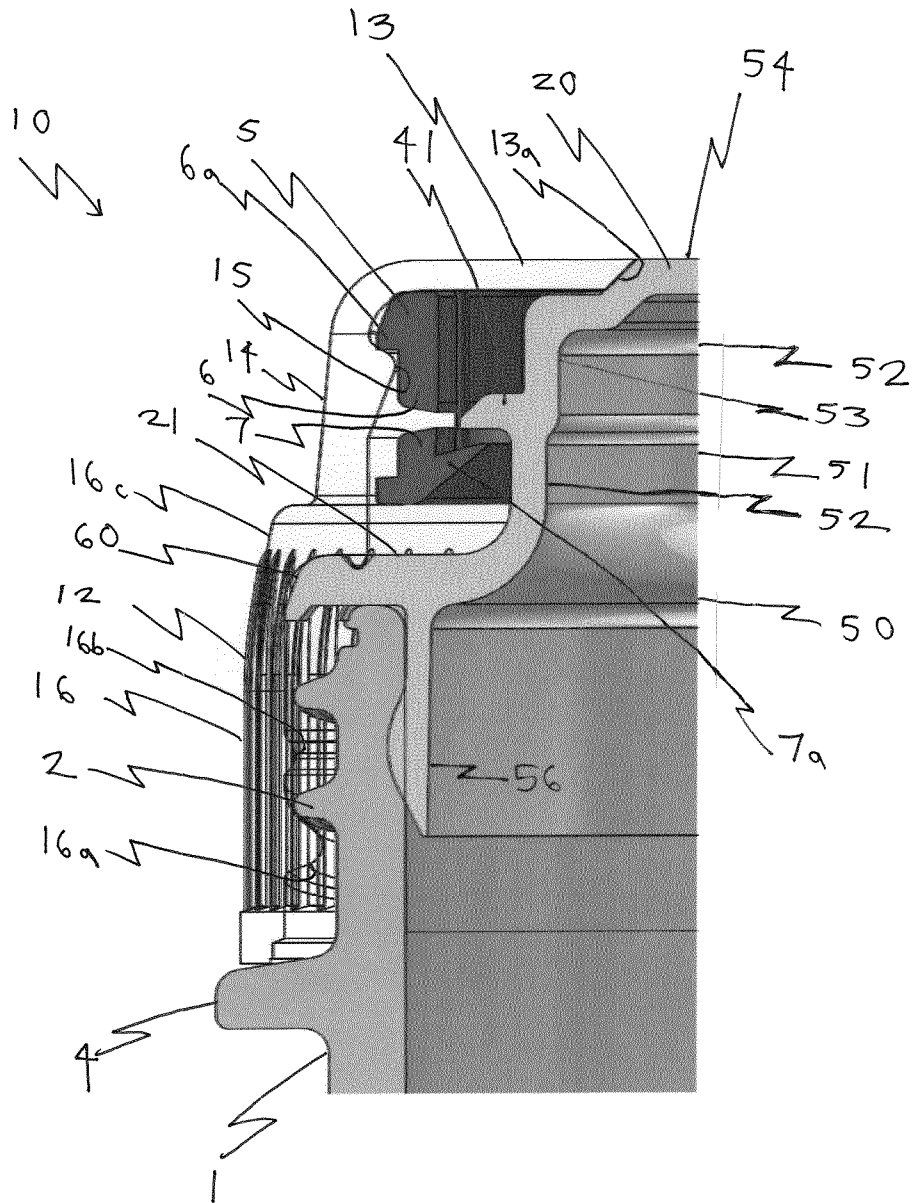


Figure 3

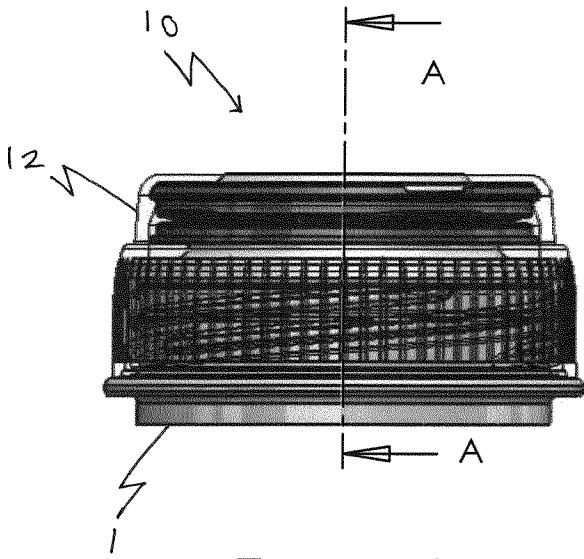


Figure 4A

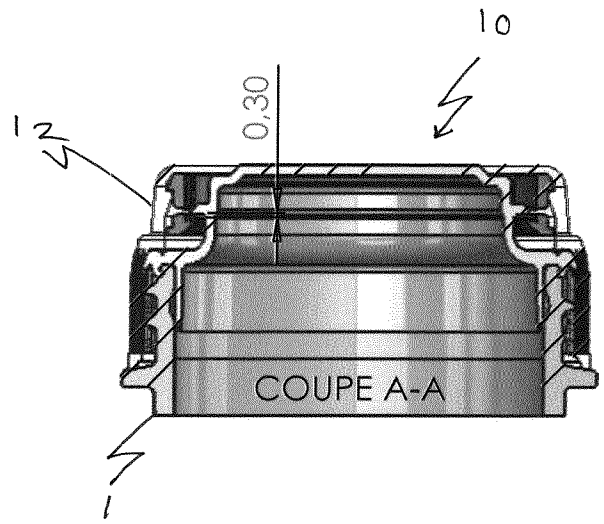


Figure 4B

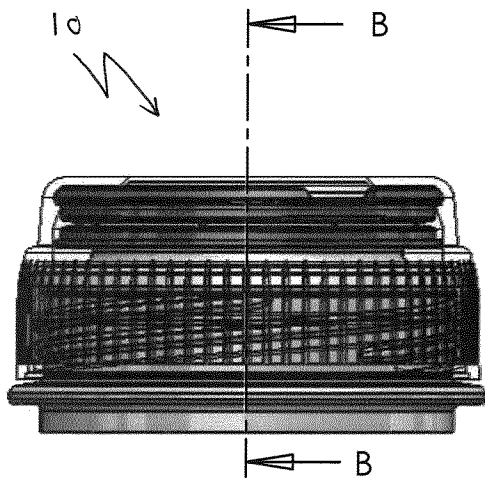


Figure 5A

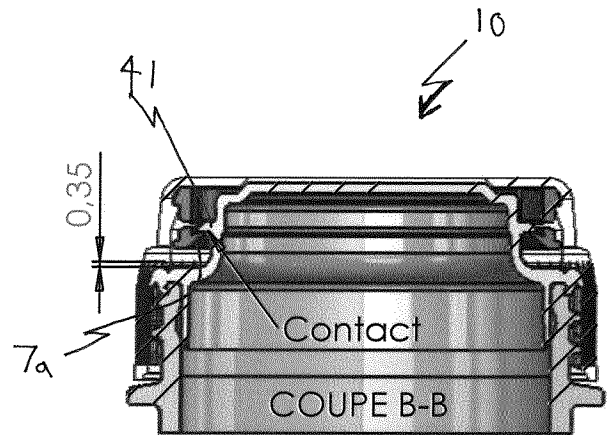


Figure 5B

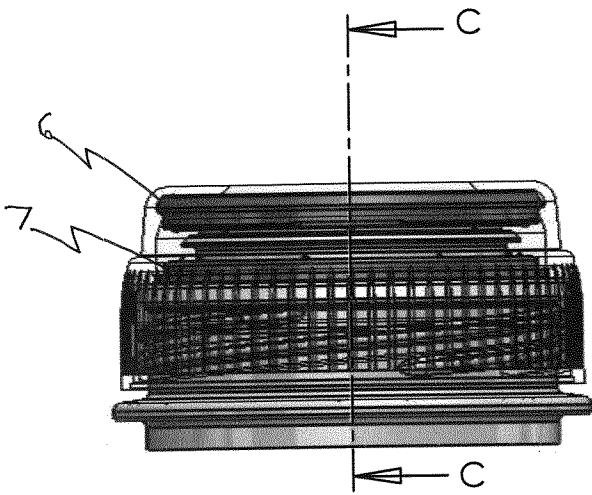


Figure 6A

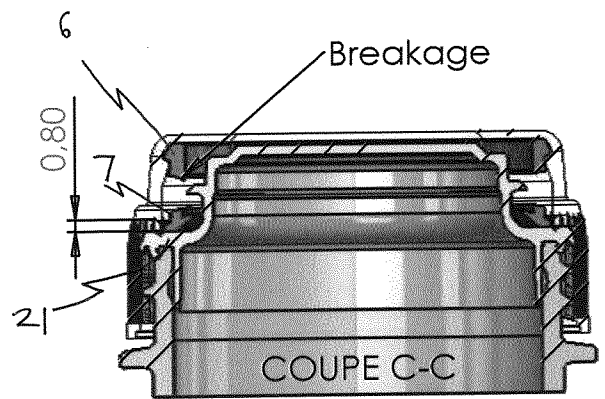


Figure 6B

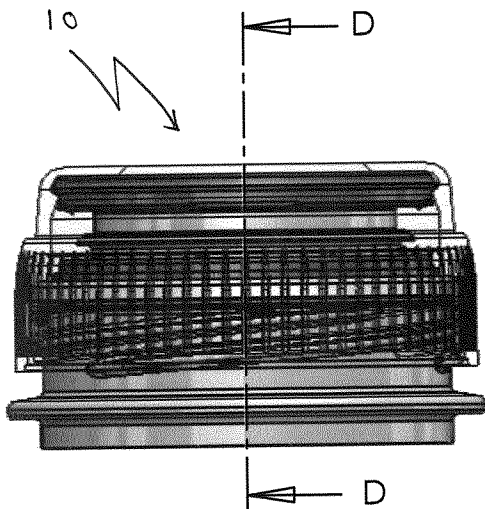


Figure 7A

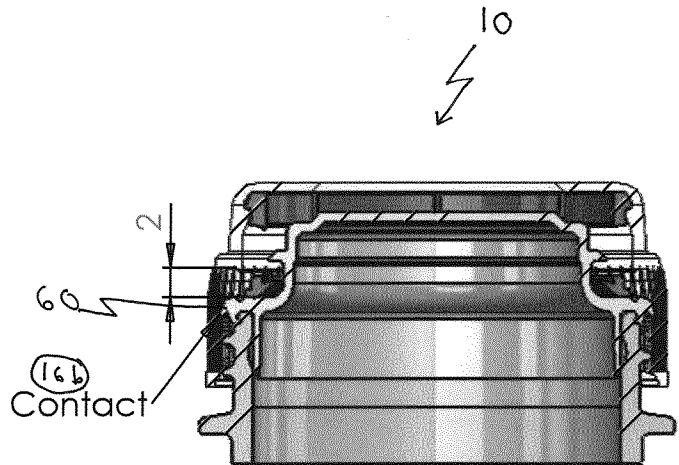


Figure 7B

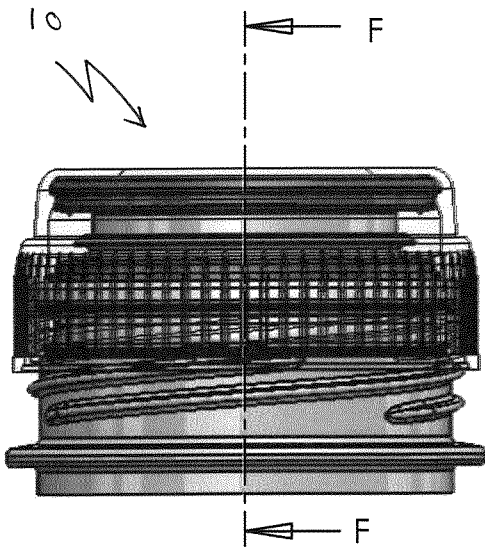


Figure 8A

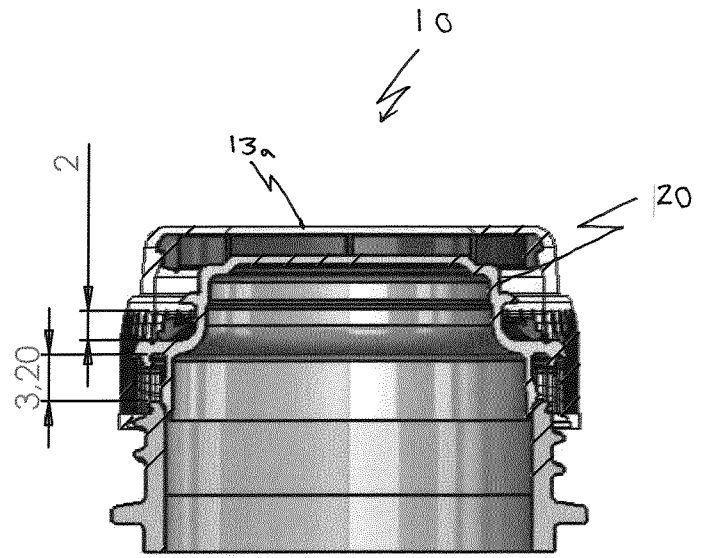


Figure 8B

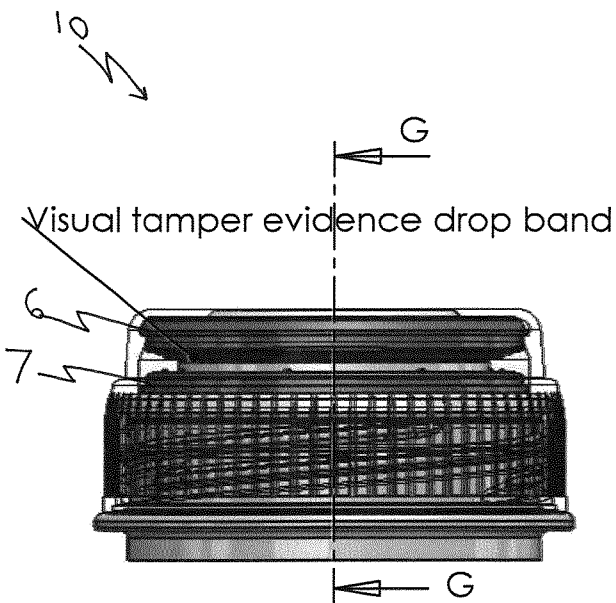


Figure 9A

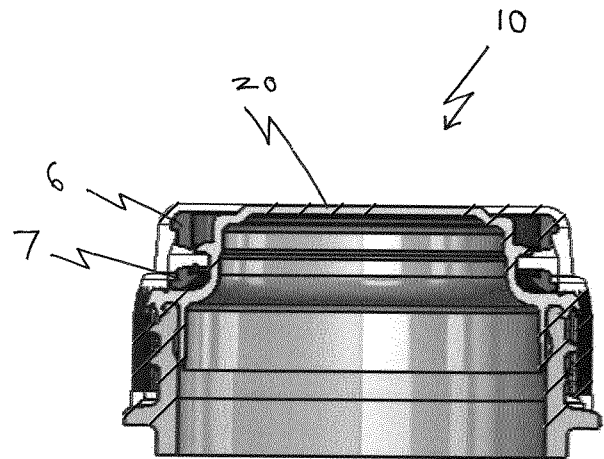


Figure 9B

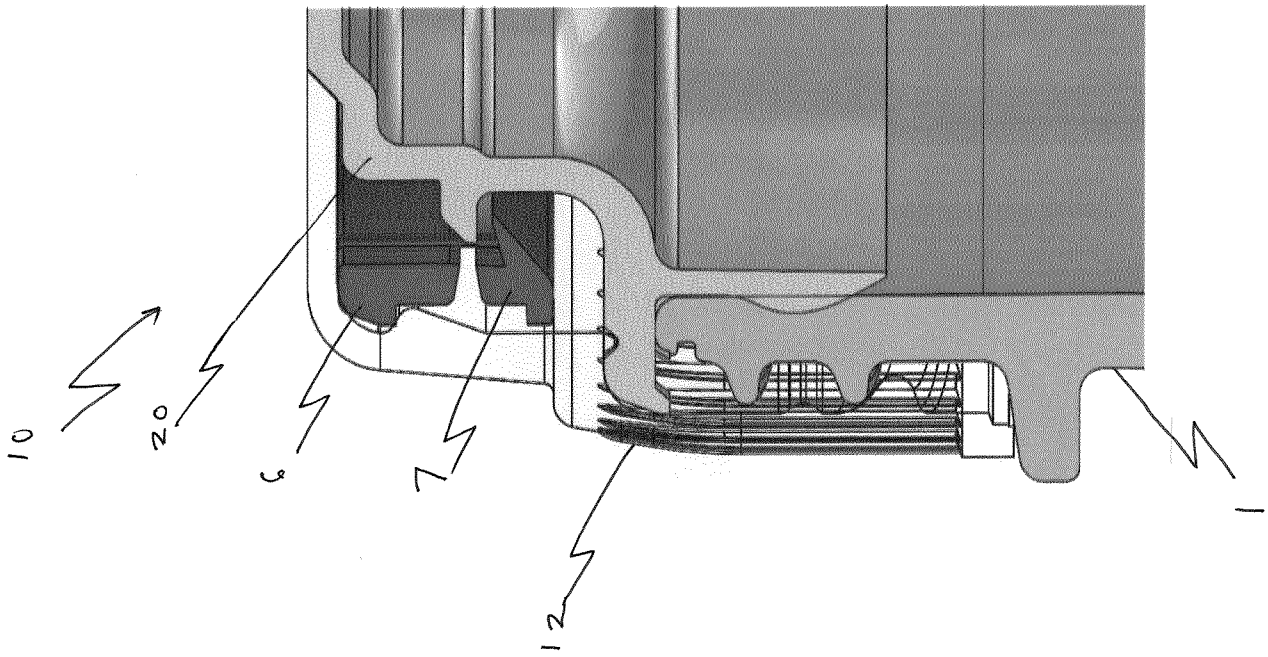


Figure 10A

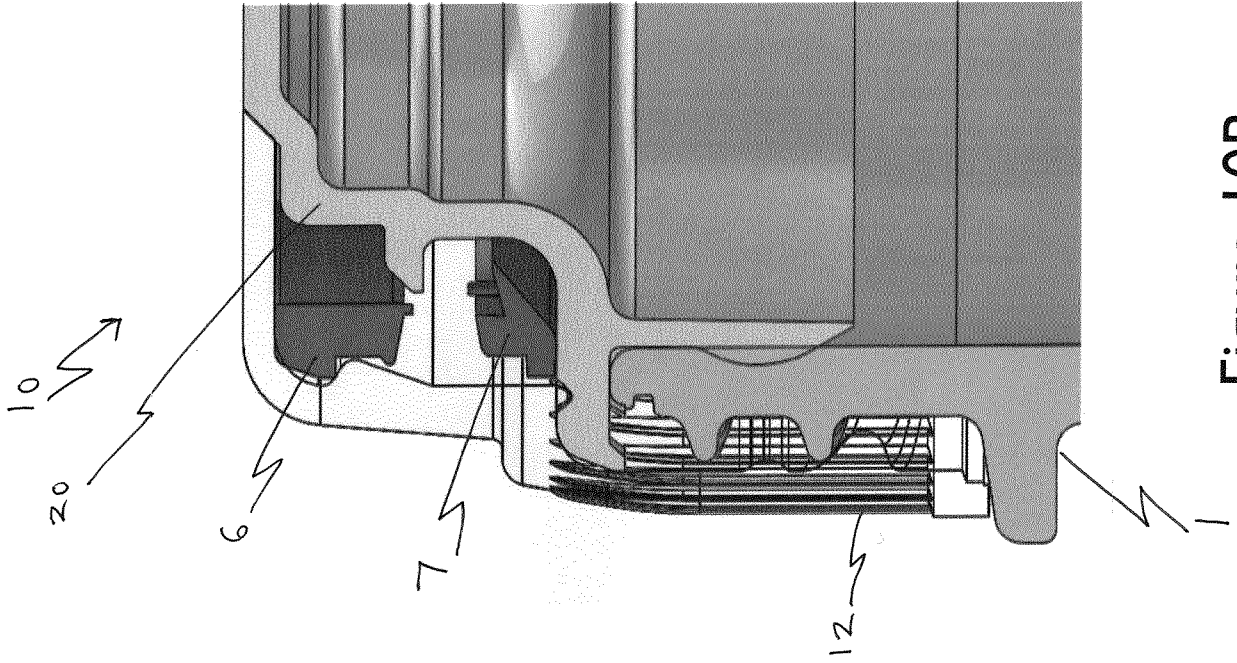


Figure 10B

Figure 11

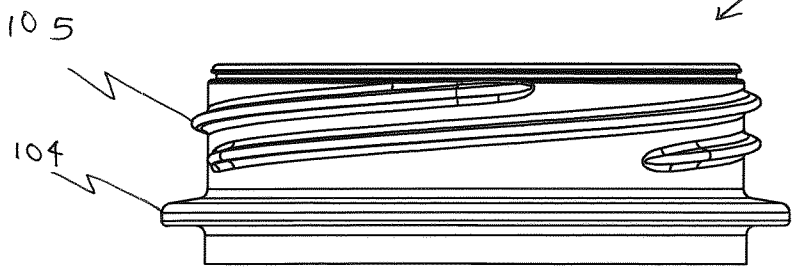
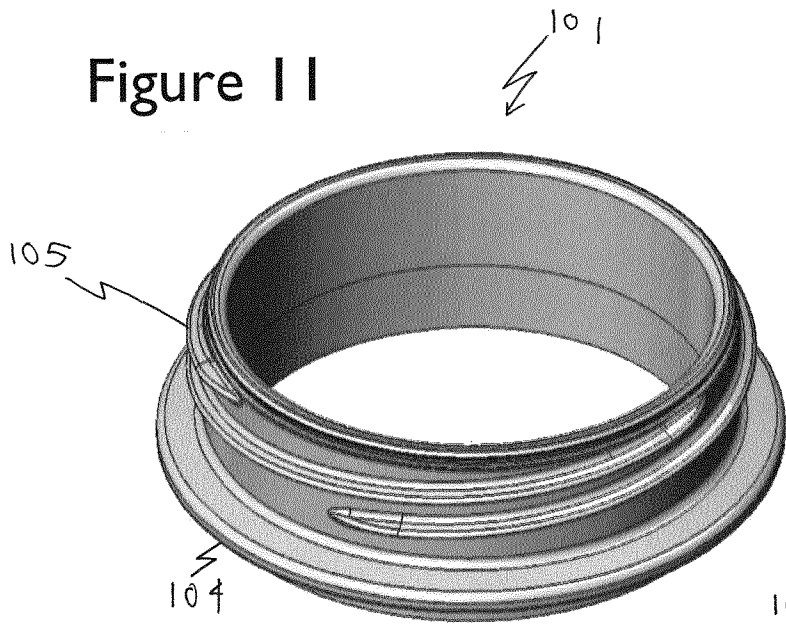


Figure 12

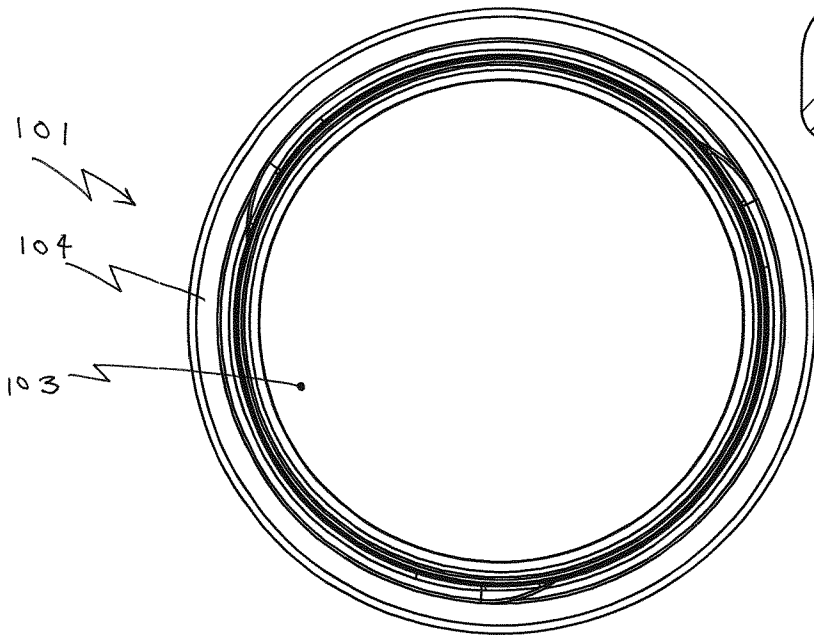


Figure 13

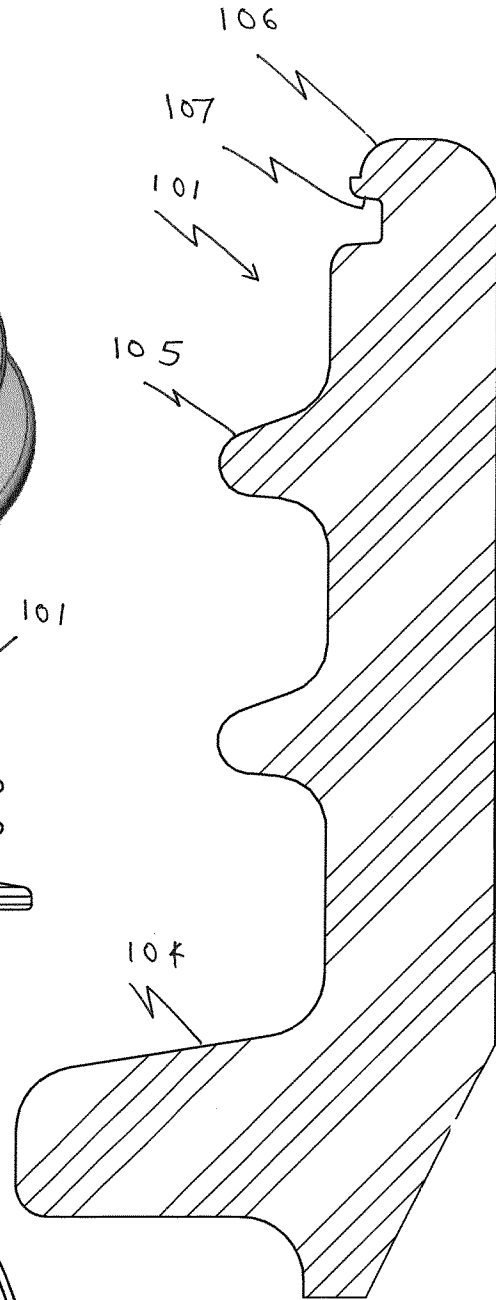


Figure 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2016/062096

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: 24
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/062096

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D41/34 B65D55/02
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
B65D
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|---|---|
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X A | WO 2009/022892 A1 (PRIDA MEDELLIN GONZALO [US]; MEDELLIN ALARCON DIEGO [MX]) 19 February 2009 (2009-02-19) figures 5,7a-7c | 1,2,4, 14,17, 21,22,25 3,5-13, 15,16, 18-20,23 |
| A | ----- WO 2015/049066 A1 (OBRIST CLOSURES SWITZERLAND GMBH) 9 April 2015 (2015-04-09) figure 9 | 1-23,25 |
| X,P | ----- WO 2015/121177 A1 (OBRIST CLOSURES SWITZERLAND [CH]) 20 August 2015 (2015-08-20) page 7, lines 10,18 - line 19 page 1, line 18 ----- | 1-23,25 |

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

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|--|---|
| Date of the actual completion of the international search 10 August 2016 | Date of mailing of the international search report 22/08/2016 |
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| Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016 | Authorized officer Sunde11, 011i |
|--|--|

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/062096

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|-------------------------|-----------------------------|
| WO 2009022892 | A1 | 19-02-2009 | NONE |
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| WO 2015049066 | A1 | 09-04-2015 | CN 105705426 A 22-06-2016 |
| | | | EP 3052400 A1 10-08-2016 |
| | | | WO 2015049066 A1 09-04-2015 |
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| WO 2015121177 | A1 | 20-08-2015 | NONE |
| ----- | | | |

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 24

Claim 24 was not searched, because it contravenes Rule 6.2(a) PCT.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.