

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization

International Bureau



(10) International Publication Number

WO 2014/170284 A1

(43) International Publication Date
23 October 2014 (23.10.2014)

(51) International Patent Classification:
B65D 41/34 (2006.01)

(21) International Application Number:
PCT/EP2014/057549

(22) International Filing Date:
14 April 2014 (14.04.2014)

(25) Filing Language:
English

(26) Publication Language:
English

(30) Priority Data:
1307027.1 18 April 2013 (18.04.2013) GB

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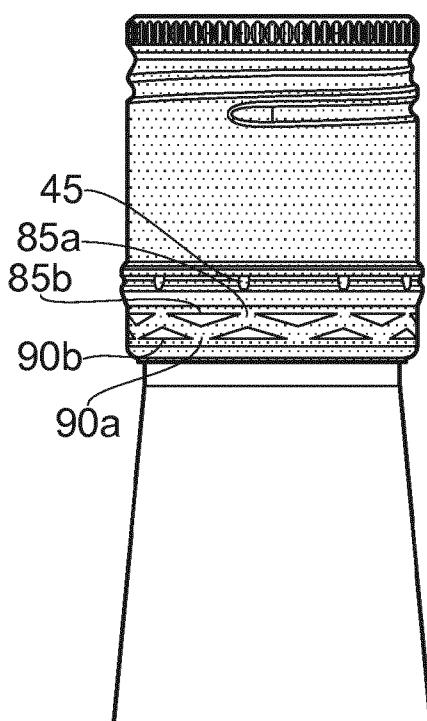
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,

[Continued on next page]

(54) Title: TAMPER EVIDENT CLOSURE



(57) Abstract: A tamper-evident closure (10, 110) for a container, the closure (10, 110) comprising a shell having a break line (40, 140) along which it is separable, in which the shell further comprises a distortable portion (70, 170), which is distorted upon first opening, the distortable portion (70, 170) being spaced from and separate to the break line (40, 140).

FIG. 2B



EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, **Published:**
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, — *with international search report (Art. 21(3))*
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

TAMPER EVIDENT CLOSURE

Field of the Invention

The present invention relates generally to a tamper-evident closure and
5 particularly to a closure with two or more parts which separate in an opening
event and then indicates the closure has been opened at least once.

Background of the Invention

In many cases it is desirable for a closure to provide visible evidence that it has
10 been opened at least once. Many different systems have been proposed for
tamper-evidence. One of the most common systems is to ensure that upon first
opening the closure separates into two or more parts which are not re-formed
upon closing.

15 One of the main considerations when designing a tamper-evident closure is the
prevention of overcoming the tamper-evidence by reforming the closure parts.
This is particularly important for products which are subject to counterfeiting,
such as in the wines and spirits industry.

20 It is known, for example, to provide a closure with a generally plain crown and a
tubular skirt with a line of weakening which divides the closure into an upper top
cap and a lower tamper-evident break band. Upon first opening of the closure
the cap and the band are physically separated and upon re-application of the top
cap the band remains broken away from the cap. However, it has been found

that counterfeiters can re-form such closures by connecting the cap back to the break band using, for example, nail varnish. Such a re-formed cap may be indistinguishable from an untampered closure.

5 The present invention seeks to address the problems with known tamper-evident closures.

Summary of the Invention

According to a first aspect there is provided a tamper-evident closure for a
10 container, the closure comprising a shell having a break line along which it is
separable, in which the shell further comprises a distortable portion which is
distorted upon first opening, the distortable portion being spaced from and
separate to the break line.

15 According to a further aspect there is provided a tamper-evident closure for a
container, the closure comprising a shell having a break line along which it is
separable, the shell comprising a line of weakness along which it is separated
upon first opening of the closure, the shell further comprising a deformable
region which is distinct from the break line and is inevitably deformed by axial
20 stretching of the shell during first opening, the closure comprising means for
limiting the extent of the axial stretching of the deformable region.

According to another aspect there is provided a tamper-evident closure for a
container, the closure including a body having two or more parts which are

separated upon first opening along a line of weakness, the opening event causes one or more parts of the body to be distorted, the distortion occurs in a region of the body discrete from the line of weakness.

5 According to a further aspect there is provided a closure for a container, the closure comprising: an outer shell separable into a first shell portion and a second shell portion, the first shell portion and/or the second shell portion comprising a distortable portion; and an inner part in engagement with the first shell portion, wherein in an opening event, the first shell portion is movable relative to the inner 10 part from an unactivated first position to an activated second position in which there is a predetermined axial movement of the first shell part with respect to the inner part, the opening event causing deformation of the distortable portion, the distortion being limited by the predetermined axial movement of the first shell part with respect to the inner part, the first shell portion and the inner part being 15 arranged to become irreversibly locked in the activated second position so that the first shell portion and the inner part cannot be moved back to the unactivated first position.

20 The tamper-evidence of the present invention therefore does not rely entirely upon separation of closure shell, but also deformation/distortion of a different part/region so that it is more clear an opening event has occurred and so that returning the closure to its original, unopened state is rendered considerably more difficult.

The distortion may be produced by various methods including stretching, twisting pulling, squashing and tearing. The distortion may affect the integrity of the part and/or its properties including shape, thickness, colour and markings.

- 5 The or each body part may be distorted before, during or after breakage and/or separation of the shell. In other words, the distortion may be completed prior to, as part of, or following physical separation.

- 10 The distortion may be caused by axial separation of two or more parts (which may, for example be shell sections) for example as the parts are pulled away from each other during opening by having one of the parts captive on a container and the other part moveable.

- 15 The distorted part may be adapted to remain on the container in use. Alternatively, the distorted part may be adapted to be removable with undistorted part/s remaining on the container.

The body may include one or more lines of weakness.

- 20 The body may comprise a top cap with a tamper evident band at its free end. For example, the body may comprise a shell with a top plate and a depending side wall, with the tamper evident band formed at the free end of the side wall. The free end of such a side wall may be secured to a container neck for example

by a tuck-in and/or a tuck-under to secure that part of the body to a container neck.

5 In embodiments where a tamper-evident band is provided it may be the tamper-evident band which is distorted. Alternatively, or additionally, the top cap of such an arrangement may be distorted.

10 The distortable region may include a notch line or the like along which distortion occurs in use. The notch line may involve a partial or complete cut through the material of the body. In such cases the arrangement of the distortion line must be such that distortion occurs prior to separation of the parts. This could be done, for example, by selecting an appropriate strength for frangible bridges holding the parts together at a line of weakness.

15 The body may be formed from any suitable material, for example metal and/or plastics material. In some embodiments the closure is of the form of a roll-on pilfer-proof type which is typically formed from aluminium.

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

20

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 combination other than those explicitly set out in the claims.

According to a further aspect of the present invention there is provided a container in combination with a closure as described herein.

5 **Brief Description of the Drawings**

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

10 **Figure 1** is a side view of a closure formed according to an embodiment of the present invention shown in a sealed, unopened position;

Figures 2A to 2D show the opening sequence of the closure of **Figure 1**;

15 **Figure 3** is a side view of a closure formed according to an alternative embodiment and shown in an unopened condition;

Figures 3A to 3D show the opening sequence of the closure of **Figure 3**;

Figure 4 is a section of the closure of **Figure 3**; and

20 **Figures 4A to 4D** show the opening sequence in sectional form of the closure of **Figure 4** i.e. corresponding to **Figures 3A to 3D** respectively.

Description

Referring first to **Figure 1** there is shown a tamper-evident closure generally indicated 10 attached to a container (in this embodiment a bottle) neck 15.

The closure 10 comprises a generally circular top plate 20 having a generally cylindrical side wall 25 depending from its periphery.

The side wall 25 includes a knurled zone 30 adjacent the top plate 20. Adjacent the knurled zone 30 a screw thread profile 35 is provided and corresponds to screw thread formations formed on the neck 15; the profile 35 is formed by 10 rolling the side wall 25 on to the neck 15.

Towards the open end of the side wall 25 a line of weakness 40 is formed by a plurality of frangible bridges 45. On one side the line 40 defines a tamper-evident band 50 the free end of which is turned under a bead (not shown) on the 15 neck 15 at a tuck under 52. At the other side of the line 40 a top cap 55 is defined.

Referring now to **Figures 2A to 2D** the closure 10 is shown during opening.

20 The top cap 55 is turned and the screw thread profile 35 begins to rise up the screw thread formations 36 on the neck (see Figure 3). The band 50 is prevented from lifting by the tuck under 52.

The band 50 has a distortion zone 70 formed within it. More specifically, the frangible bridges 45 are not directly connected to the distortion zone 70 but rather a solid intermediate band 80 connects the bridges 45 to the distortion zone 70.

5

As shown best in Figure 2B, the distortion zone 70 comprises a hidden notch line with alternating upper and lower slots 85b, 90b which are defined by respective alternating upper and lower fixed points 85a, 90a, with the upper fixed points 85a connected to the solid band 80 and the lower fixed points 90a connected to 10 the tuck under 52.

Upon opening, the distortion band 70 is pulled and stretched into a zig-zag shape shown in Figure 2B. The bridges 45 then break and the top cap 55 is removed and the distorted band 50 drops down, as shown in Figure 2C. The band 50 15 remains on the glass finish. Upon re-application of the top cap 55 the zig-zag distorted area 70 remains as visual evidence the closure has been opened at least once, as shown in Figure 2D, with a gap G between the top cap 55 and the drop band 50 and the distorted band itself.

20 Referring now to **Figures 3 and 4** there is shown a closure 110 formed according to an alternative embodiment.

The closure 110 is quite similar to the closure 10, with a top cap 155 and drop band 50 part forming an outer shell (in this embodiment formed from metal).

The band 50 is longer and includes an insulating bead 154 below the break line 140 and above the distortion zone 170.

The insulating bead is rolled into the shell so as to be spaced from an undercut 5 117 formed on the neck finish 115. The finish 115 also includes a step 118 below the undercut 117.

Referring now also to **Figures 3A to 3D** and **4A to 4D**, when the closure 110 is first opened the tuck under 152 prevents any axial movement of the band. The 10 band 150 is stretched against the tuck under 152 until the insulating bead 154 engages the undercut 117. Accordingly, the notched distortion zone 170 is stretched to the position shown in Figures 3B and 4B.

Continued turning of the top cap 155 now causes the main bridges 145 to break. 15 The top cap 155 can now be screwed off and the band 150 drops down, as shown in Figures 3C and 4C, until the bead 154 rests on the step 118.

When the top cap 155 is replaced there is a gap G between the cap 155 and the band 150, as shown on Figure 3D and 4D.

20

In other embodiments (not shown) a further gap generating mechanism may be included, for example as described in WO2005/049443.

Although illustrative embodiments of the invention have been disclosed in detail herein, with reference to the accompanying drawings, it is understood that the 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 as defined by the appended claims and their equivalents.

5

CLAIMS

1. A tamper-evident closure for a container, the closure comprising a shell having a break line along which it is separable, in which the shell further 5 comprises a distortable portion which is distorted upon first opening, the distortable portion being spaced from and separate to the break line.

2. A tamper-evident closure for a container, the closure comprising a shell having a break line along which it is separable, the shell comprising a line of 10 weakness along which it is separated upon first opening of the closure, the shell further comprising a deformable region which is distinct from the break line and is inevitably deformed by axial stretching of the shell during first opening, the closure comprising means for limiting the extent of the axial stretching of the deformable region.

15

3. A tamper-evident closure as claimed in claim 2, in which the means for limiting the extent of axial stretching comprise an insulating bead on the shell.

4. A tamper-evident closure as claimed in any of claims 1 to 3, in 20 which means for a gap is generated at the break line following first opening.

5. A tamper-evident closure as claimed in claim 4, in which the gap is present between two shell sections.

6. A tamper-evident closure for a container, the closure including a body having two or more parts which are separated upon first opening along a line of weakness, the opening event causes one or more parts of the body to be distorted, the distortion occurs in a region of the body discrete from the line of
5 weakness.

7. A tamper-evident closure as claimed in claim 6, in which the or each body part is distorted during opening and prior to separation of the parts.

10 8. A tamper-evident closure as claimed in claim 6 or claim 7, in which the distortion is caused by axial separation of the parts.

9. A tamper-evident closure as claimed in any of claims 6 to 8, in which the body includes one or more lines of weakness defining the parts.

15

10. A tamper-evident closure as claimed in any of claims 6 to 9, in which the parts are connected to each other by frangible bridges.

20 11. A tamper-evident closure as claimed in any of claims 6 to 10, in which the body comprises a top cap with a tamper-evident band at its free end.

12. A tamper-evident closure as claimed in claim 11, in which part of the tamper-evident band is distorted.

13. A tamper-evident closure as claimed in any of claims 6 to 12, in which the body comprises a shell with a top plate and a sidewall.

5 **14.** A tamper-evident closure as claimed in claim 13, in which the free end of the sidewall is, in use, tucked under a container neck bead.

15. A tamper-evident closure as claimed in any of claims 6 to 14, in which part of the top cap is distorted.

10 **16.** A tamper-evident closure as claimed in any of claims 1 to 15, in which the body is formed from metal.

15 **17.** A tamper-evident closure as claimed in any of claims 1 to 15, in which the body is formed from a plastics material.

18. A tamper-evident closure as claimed in any of claims 1 to 17, in which a distorted part remains on the container in use.

20 **19.** A closure for a container, the closure comprising:
an outer shell separable into a first shell portion and a second shell portion, the first shell portion and/or the second shell portion comprising a distortable portion; and

an inner part in engagement with the first shell portion, wherein in an opening event, the first shell portion is movable relative to the inner part from an

unactivated first position to an activated second position in which there is a predetermined axial movement of the first shell part with respect to the inner part, the opening event causing deformation of the distortable portion, the distortion being limited by the predetermined axial movement of the first shell part with respect to the inner part, the first shell portion and the inner part being arranged to become irreversibly locked in the activated second position so that the first shell portion and the inner part cannot be moved back to the unactivated first position.

10 **20.** A closure according to claim 19, wherein the inner part includes an extension which extends beyond the first outer part towards the second outer part portion in the activated second position.

15 **21.** A closure according to claim 20, wherein the distorted part at least partially obscures a portion of the extension.

22. A closure according to any of claims 19 to 21, wherein a distorted part remains on the first shell section in use.

20 **23.** A closure according to any of claims 19 to 22, wherein a distorted part remains on the second shell section in use.

24. A closure according to any of claims 19 to 23, wherein the outer shell includes one or more lines of weakness defining the first and second shell parts.

5 **25.** A closure according to any of claims 19 to 24, wherein the first and second shell parts are connected to each other by frangible bridges.

26. A closure as claimed in any of claims 19 to 25, in which the outer shell is formed from metal.

10

27. A closure as claimed in any of claims 19 to 26, in which the inner part is formed from a plastics material.

15 **28.** A closure as claimed in any of claims 19 to 27, wherein the second shell portion is adapted to be connected to said container and the first shell portion comprises a cap.

29. A closure as claimed in claim 28, wherein the second shell portion is permanently fixed in position on said container.

20

30. A closure as claimed in to any of claims 19 to 29, wherein the inner part is adapted to engage an in-bore fitment associated with said container.

31. A closure as claimed in any of claims 19 to 30, wherein the first shell portion and the inner part are locked in the activated second position by a ratchet arrangement.

5 **32.** A closure as claimed in any of claims 1 to 31, in which the distortable region includes a notch line along which distortion occurs in use.

33. A closure as claimed in any of claims 1 to 32, in which the closure is of the roll on pilfer proof type.

10

34. A wine or spirits bottle closure comprising a closure as claimed in any of claims 1 to 33.

15 **35.** A container in combination with a closure as claimed in any of claims 1 to 3.

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

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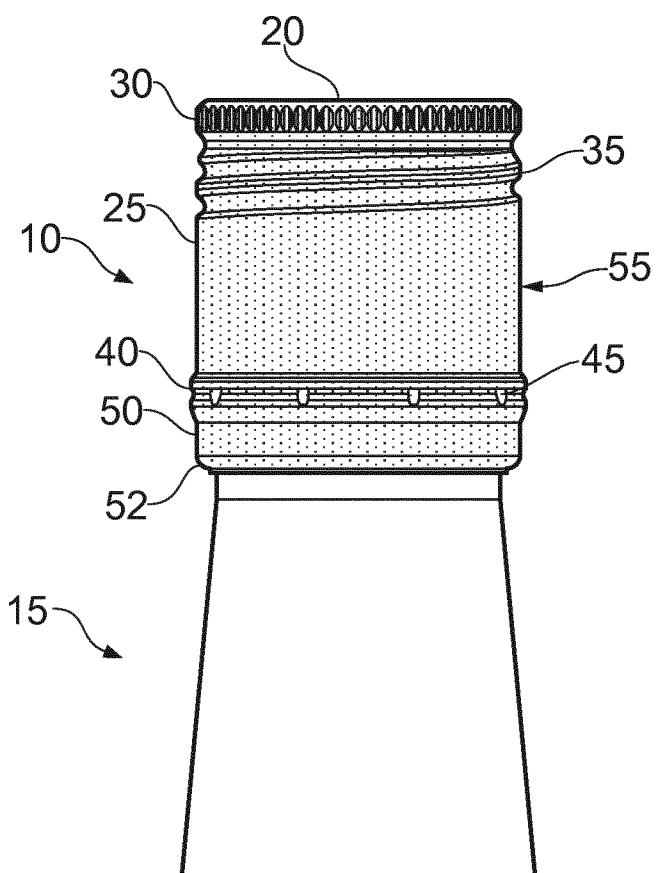


FIG. 1

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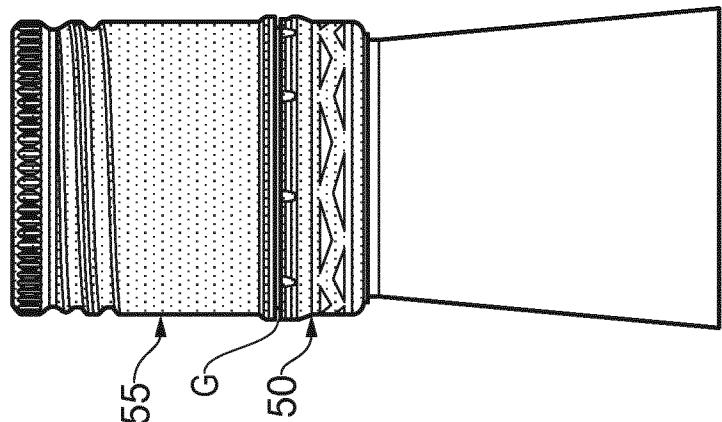


FIG. 2A

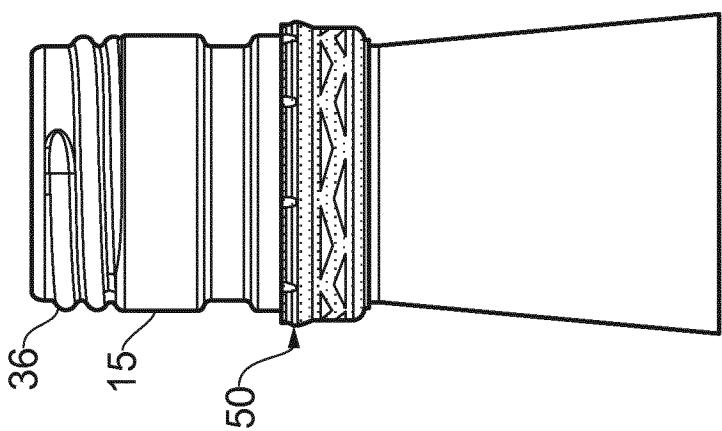


FIG. 2B

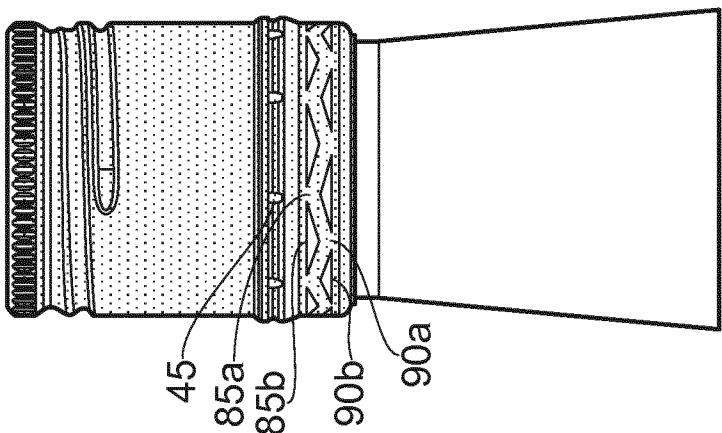


FIG. 2C

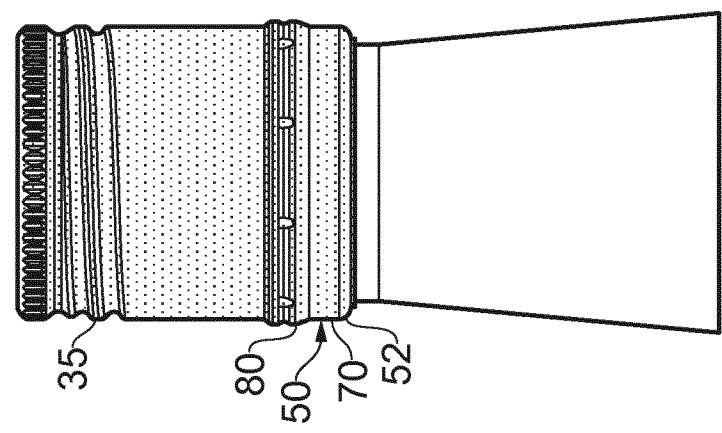


FIG. 2D

3/4

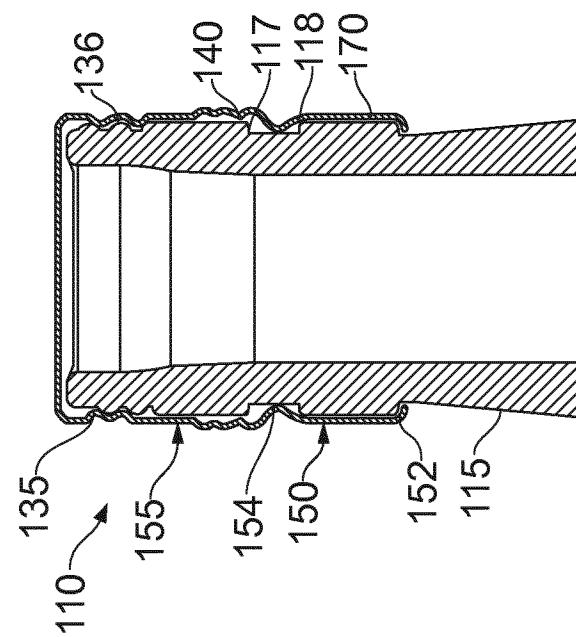


FIG. 4

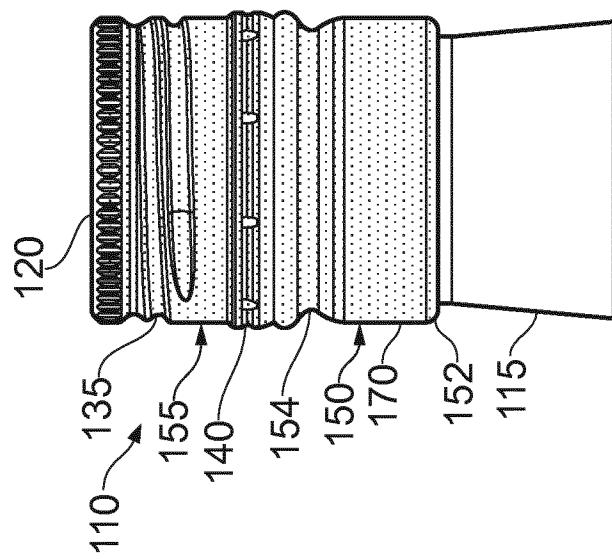


FIG. 3

4/4

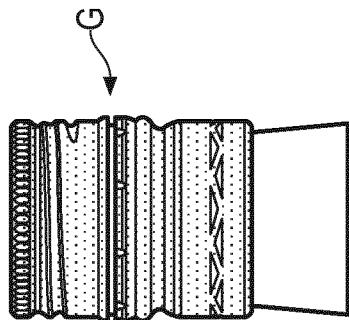


FIG. 3A

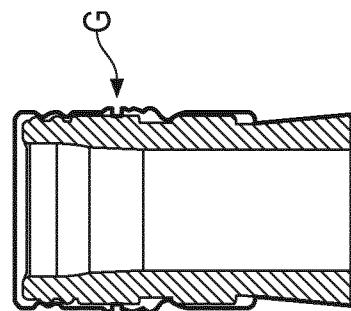


FIG. 3B

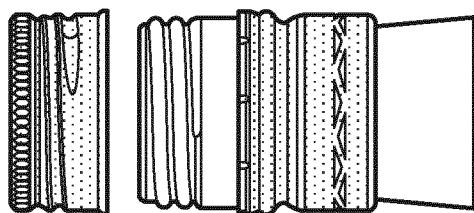


FIG. 3C

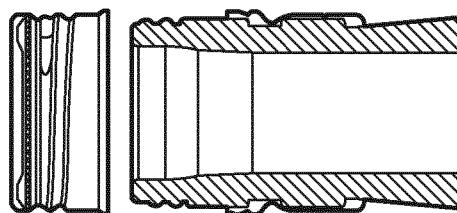


FIG. 3D

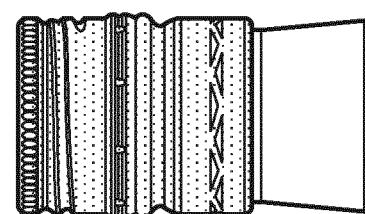


FIG. 4A

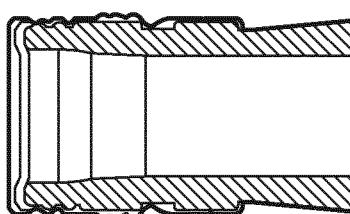


FIG. 4B

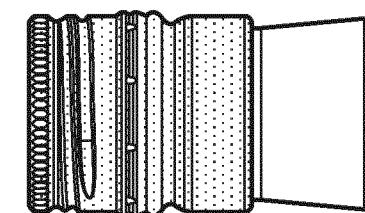


FIG. 4C

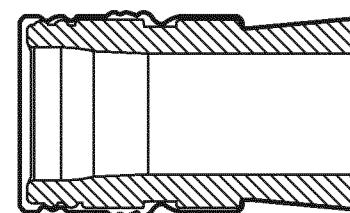


FIG. 4D

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/057549

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D41/34
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	WO 2011/064489 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]; ANTIER GREGORY [FR]; FLAMAND FABI) 3 June 2011 (2011-06-03) page 8, line 15 - page 9, line 22; figures 1,2,5-8 ----- WO 94/14674 A1 (ZAPATA INDUSTRIES) 7 July 1994 (1994-07-07) page 3, line 12 - page 5, line 10 page 6, line 5 - line 6; figures ----- US 4 611 723 A (MEGOWEN WILLIAM [US]) 16 September 1986 (1986-09-16) column 3, line 38 - column 4, line 7; figures ----- -/-	1,2, 4-18,32, 34,35 1,2, 4-18,34, 35 1,2,6, 15,16, 19,32,33
A		

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

Date of the actual completion of the international search	Date of mailing of the international search report
22 May 2014	02/06/2014
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 Newell, Philip

INTERNATIONAL SEARCH REPORT

International application No PCT/EP2014/057549

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 078 689 A (U.G.CLOSURES & PLASTICS) 13 January 1982 (1982-01-13) the whole document -----	1-3,6, 19,33
1		

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2014/057549

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.: 36 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 36

Rule 6.2(a)

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/057549

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
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