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

(11) EP 2 514 683 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.10.2012 Bulletin 2012/43

(51) Int Cl.:
B65D 43/02 *(2006.01)*

(21) Application number: **12164972.7**

(22) Date of filing: **20.04.2012**

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

(30) Priority: **21.04.2011 SE 1150357**

(71) Applicant: **Arlövs Plastgjuteri Försäljnings AB**
243 35 Höör (SE)

(72) Inventor: **Danielsson, Arne**
243 32 HÖÖR (SE)

(74) Representative: **Milanov, Nina Vendela Maria**
Awapatent AB
P.O. Box 5117
200 71 Malmö (SE)

(54) Plastic container structure

(57) The present invention relates to a plastic container structure (1) comprising a lid (2), a gasket (3), and a container (4). The lid (2) is configured to be attached to the container (4) to close it by movement of the lid (2) relative to the container (4) along an engagement direction (D). The container (4) has an opening defined by a circumferential flange (5) having a circumferential seat (6) for receiving the gasket (3). Also, the lid (2) has a circumferential wall (7) configured to surround the circumferential flange (5) of the container (4). The seat (6) is provided on the outside of the flange (5) of the container (4) opposite the circumferential wall (7) of the lid (2) and the seat (6) and the circumferential wall (7) of the lid (2) are configured such that the gasket (3) is compressed between the circumferential wall (7) of the lid (2) and the seat (6) of the container (4). The circumferential flange (5) of the container and/or the wall (7) of the lid (2) are convex in a plane substantially perpendicular to the engagement direction (D).

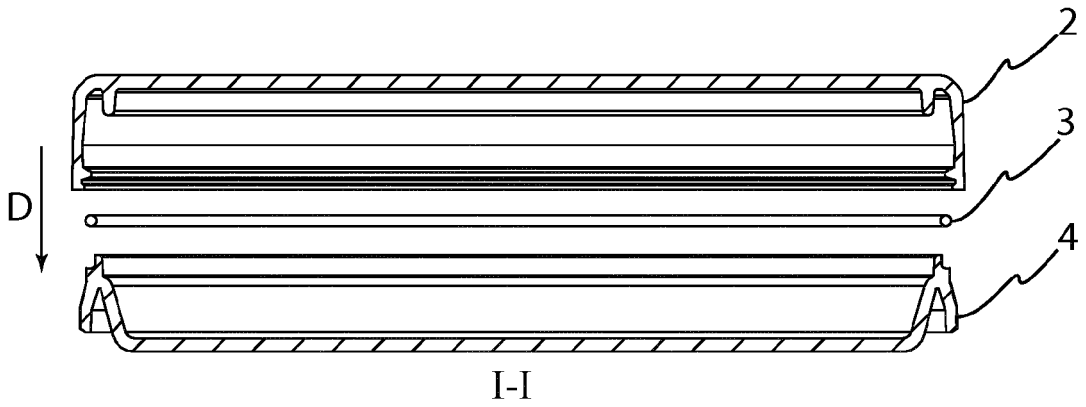

Fig. 3

EP 2 514 683 A1

Description

Technical field

[0001] The present invention relates to a waterproof plastic box suitable for injection molding. More specifically, the present invention relates to a joint design for a waterproof joint between plastic parts, in particular a waterproof plastic box suitable for containing electronics.

Background

[0002] Plastic containers with removable lids are well known in the art and may be used for storage and protection of for example objects or cooked food. Plastic containers typically are not airtight and hence are not suitable for protection of sensitive electronic equipment. Another problem of known plastic containers are that they have to be designed in such a way that they can be injection molded. Therefore, a plastic container which may be manufactured by injection molding and which is airtight would be beneficial. A further problem is how to design a plastic container that can be manufactured with an inexpensive mold with high tolerances, little wear on the mold and with short injection and cooling times for each molded container. Yet another problem is that plastics typically creep over time, which leads to deformation of the plastic parts and eventually leads to air leaks of the container produced using said plastic parts.

Summary

[0003] Hence, an object of the invention is to provide a plastic container which is airtight, which can be manufactured by injection molding in an inexpensive mold and which is not prone to leaking over time.

[0004] These and other objects and advantages, which will be obvious from the following description of the present invention, are achieved by a plastic container structure according to the independent claim.

[0005] According to an aspect of the invention a plastic container structure is provided comprising a container, a gasket and a lid. The lid is configured to be attached to the container to close it by movement of the lid relative to the container along an engagement direction. The container has an opening defined by a circumferential flange having a circumferential seat for receiving the gasket. Also, the lid has a circumferential wall configured to surround the circumferential flange of the container. The seat is provided on the outside of the flange of the container opposite the circumferential wall of the lid and the seat and the circumferential wall of the lid are configured such that the gasket is compressed between the circumferential wall of the lid and the seat of the container. The circumferential flange of the container and/or the wall of the lid are convex in a plane substantially perpendicular to the engagement direction

[0006] An advantage of the plastic container structure is that the gasket is compressed inwards by the circumferential wall of the lid, which in turn leads to the gasket being compressed in a direction substantially different from the direction in which the lid is moved onto the container. This results in that the gasket will not act to force the lid off the container, since the compressed gasket does not act to push the lid back off the container, but rather to try to expand the circumferential measure of the circumferential wall of the lid. Here, a further advantage is that the circumferential wall distributes forces from the compressed gasket over a large area along the gasket, thus reducing stress in the material of the wall of the lid, which in turn prevents creep and deformation of the lid. Altogether, this enables airtight sealing along and between the container and the lid. The design of the container structure makes it possible to manufacture the structure in inexpensive molds without sliders. Also, the convexity brings an advantage in that the flange of the container and the circumferential wall surrounding the flange are both made more stable against deformation due to compression forces from the gasket acting on the flange and the wall. Especially, it should be noted that the wall portion immediately surrounding the gasket forms a convex ring surrounding the gasket, which ring receives and distributes stress from forces from the gasket such that material creep in other parts of the lid is prevented. The convex shape results in that any movement of the wall outwards requires circumferential extension of the circumferential wall. If one or more wall portions would have been straight, the wall would initially be able to move slightly outwards without tensioning the wall but rather tensioning the material connecting the wall portion and the rest of the lid. The same physical rules and reasoning applies for the circumferential flange of the container for which any movement inwards will cause compressive forces in the flange, due to its convex shape.

[0007] According to an embodiment, the lid is further provided with support means, said support means being configured to contact the flange of the container from the inside of the container such that movement of the flange of the container due to forces from compression of the gasket is prevented. This brings an advantage in that the circumferential flange of the container will be stabilized such that material stress will be reduced in other parts of the container, effectively preventing unnecessary stress and creep of the container.

[0008] The support means may comprise a ridge extending at a distance from and parallel to the circumferential wall of the lid. This brings an advantage in that it provides support along the full length of the circumferential flange of the container whilst at the same time being easy to manufacture in a mold without the complexity of extra slides or cores.

[0009] The support means of the lid may be convex in a plane substantially perpendicular to the engagement direction. The convexity brings an advantage in that the support means is made more stable against deformation due to compression forces from the gasket acting on the

flange.

[0010] According to an embodiment, the circumferential wall of the lid extends a distance past the gasket substantially along said engagement direction. Also, an end portion of the circumferential wall of the lid is provided with engagement means for interlocking engagement with corresponding interlocking means of the container. The engagement and the interlocking means are configured to prevent the lid from moving away from the container along the engagement direction. This brings an advantage in that the lid will be firmly secured to the container independently of the gasket seal.

[0011] The engagement means may comprise a protrusion extending along the circumferential wall of the lid on the inner side of the lid. This brings an advantage in that the interlocking engagement is provided for around the whole circumference of the lid. A further advantage is that the protrusion is easily provided for in the mold without any need for extra slides or cores, since the lid design allows the wall of the lid to spring outwards during extraction/release from the associated mold core, such that the protrusion slides out of its cavity in the mold core where after the lid may be ejected/released from the mold core.

[0012] Further, the interlocking means of the container may comprise a flange extending from the circumferential flange of the container substantially along said engagement direction. This brings an advantage in that the interlocking means provides a locking surface all around the circumference of the container, such that the engagement means of the lid may grip the container around the whole circumference of the container.

[0013] Also, the flange of the interlocking means of the container may be outwardly slanted away from the circumferential flange of the container. This brings a further advantage in that the flange is suitable to injection molding, since no extra slides or cores are needed to shape the outwardly slanted flange. Further, the outside surface of the flange provides a slanted surface along which the engagement means of the lid slides during engagement of the lid to the container, which in turn promotes relaxation of the gasket during engagement/disengagement of the lid, since the circumferential wall of the lid is moved outwards.

[0014] The gasket may be an O-ring. This brings an advantage in that O-rings have a continuous cross section, thus require less attention when mounting on the container. Further, O-rings are inexpensive and are readily available, which in turn provides for easy future service and replacement.

Brief description of drawings

[0015] Embodiments of the present invention will in the following be described with reference to the appended drawings, in which:

Fig. 1 shows an exploded view of a container structure according to an embodiment of the invention;

Fig. 2a-c shows a front view, a top view, and a side view of the container structure also shown in Fig. 1;

Fig. 3 shows an exploded cross-sectional view of cross-section B-B of the container structure also shown in Figs 1 and 2a-c;

Fig. 4 shows a non-exploded cross-sectional view of cross-section B-B of the container structure also shown in Figs 1 and 2a-c; and

Fig. 5 shows an enlarged portion of the cross-section of Fig. 4 without cross-hatching for improved clarity.

Detailed description

[0016] As shown in Figs 1-5, a plastic container structure 1 according to an embodiment of the invention comprises a lid 2, a gasket 3, and a container 4. The lid 2 is configured to be attached to the container 4 to close it by movement of the lid 2 relative to the container 4 along an engagement direction D. The container 4 has an opening defined by a circumferential flange 5 having a circumferential seat 6 for receiving the gasket 3. Also, the lid 2 has a circumferential wall 7 configured to surround the circumferential flange 5 of the container 4. The seat 6 is provided on the outside of the flange 5 of the container 4 opposite the circumferential wall 7 of the lid 2 and the seat 6 and the circumferential wall 7 of the lid 2 are configured such that the gasket 3 is compressed between the circumferential wall 7 of the lid 2 and the seat 6 of the container 4.

[0017] The plastic material of choice of the container 4 and the lid 2 is a thermoplastic material suitable for injection molding. Particularly suitable materials are PMMA, PA, CA, PETG, and PC.

[0018] Suitable materials for the gasket 3 are elastomers commonly used for making gaskets, such as rubber, PU, TPE, and silicon rubber. In the embodiment shown in Figs 1-5, the gasket 3 is an O-ring, but it could as well have other forms and it may also be molded directly onto the container 4.

[0019] When assembling and closing the container structure 1, the gasket 3 is first placed around the container 4 in the seat 6 provided on the outside of the flange 5 of the container 4. Thereafter, the lid 2 is aligned with the container 4 and pushed onto the container 4, e.g. by pressing. The box assembly is not easily openable due to the specific configuration of container and lid which is discussed further below. Hence, the closed box is secure and reliable as regards remaining closed and airtight. Depending on the specific design of the lid 2 and the container 4, the direction of engagement D in which the lid 2 has to be moved relative to the container 4 may vary. For example, the direction of engagement D may be perpendicular to the top surface of the lid 2 and the surface of the bottom of the container, i.e. the direction of engagement D essentially coincides with the direction of the flange 5. The gasket 3 is compressed between the circumferential wall 7 of the lid 2 and the seat 6 of the

flange 5 of the container 4. This results in that the gasket 3 will not act to force the lid 2 off the container 4, since the compressed gasket 3 does not act to push the lid 2 back off the container 4, but rather to try to expand the circumferential measure of the circumferential wall 7 of the lid 2. Hence, once the lid 2 is engaged with the container 4 to close and seal the container 4, there is little to no built in stress acting to move the lid 2 off the container 4.

[0020] According to an embodiment, the lid 2 is further provided with support means 8, said support means 8 being configured to contact the flange 5 of the container from the inside of the container 4 such that movement of the flange 5 of the container 4 due to forces from compression of the gasket 3 is prevented. This brings an advantage in that the circumferential flange 5 of the container 4 will be stabilized such that material stress will be reduced in the container 4, effectively preventing unnecessary stress and creep of the container 4. Hence, the gasket 3 is mainly compressed by forces from the support means 8 and the circumferential wall 7 of the container 4.

[0021] According to an embodiment, as shown in Figs 1-5, the support means 8 comprises a ridge extending at a distance from and parallel to the circumferential wall 7 of the lid 2.

[0022] This brings an advantage in that the support means 8 provides support along the full length of the circumferential flange 5 of the container 4 whilst at the same time being easy to manufacture in a mold without the complexity of extra slides or cores.

[0023] According to an embodiment, the circumferential flange 5 of the container 4 is convex, which is to be construed as that the flange 5 is outwardly convex in a plane substantially perpendicular to the engagement direction D, as shown in Fig. 2b. The flange 5 may have a convex shape wholly or in part. The wall 7 of the lid 2 may also be convex, i.e. the wall 7 is outwardly convex in a plane substantially perpendicular to the engagement direction D. "Outwardly convex" is to be construed as the flange 5 and/or the wall 7 having a convex shape as seen from the outside of the box, i.e. that the flange 5 and/or wall 7 bends outwards in a direction from the centre of the box/container/lid. "In a plane" means that the flange 5 or wall 7 may be convex in two directions, i.e. in both directions contained within that plane. This brings an advantage in that the flange 5 of the container 4 and the circumferential wall 7 surrounding the flange 5 are both made more stable against deformation due to compression forces from the gasket 3 acting on the flange 5 and the wall 7 respectively. Especially, it should be noted that the portion of the wall 7 immediately surrounding the gasket 3 forms a convex ring of material surrounding the gasket 3, which ring of material receives and distributes stress caused by forces from the gasket 3 such that material creep in other parts of the lid 2 is prevented. The convex shape results in that any movement of the wall 7 outwards requires circumferential extension of the wall 7, effectively providing good compression of the gasket 3 along the whole length of the gasket 3 and not only in corners of the container structure 1. If one or more wall portions would have been straight, those wall portions would initially be able to move slightly outwards without tensioning the wall 7 but rather tensioning material connecting the wall 7 to the rest of the lid 2.

[0024] The same reasoning applies for the circumferential flange 5 of the container 4 for which any movement inwards will cause compressive forces in the flange 5, due to its convex shape.

[0025] Also, the same reasoning regarding convexity holds for the support means 8 according to the embodiment shown in Figs 1-5 comprising a ridge extending at a distance from and parallel to the circumferential wall 7 of the lid 2. The support means 8 may have a convex shape wholly or in part, i.e. the support means 8 is outwardly convex in a plane substantially perpendicular to the engagement direction D. "Outwardly convex" is to be construed as the support means 8 having a convex shape as seen from the outside of the box, i.e. that the support means 8 bends outwards in a direction from the centre of the lid. "In a plane" means that the support means 8 may be convex in two directions, i.e. in both directions contained within that plane.

[0026] According to an embodiment, the circumferential wall 7 of the lid 2 extends a distance past the gasket 3 substantially along said engagement direction D. Also, an end portion of the circumferential wall 7 of the lid is provided with engagement means 9 for interlocking engagement with corresponding interlocking means 10 of the container 4. The engagement 9 and the interlocking means 10 are configured to prevent the lid 2 from moving away from the container 4 along the engagement direction D.

[0027] This brings an advantage in that the lid 2 will be firmly secured to the container 4 and that deformation of the engagement means 9 and the interlocking means 10 will not substantially affect the sealing function of the gasket 3. Since the wall 7 extends substantially along said engagement direction, a compact container structure 1 is achieved. Further, moldability is maintained.

[0028] According to an embodiment, the engagement means 9 comprises a protrusion extending along the circumferential wall 7 of the lid 2 on the inner side of the lid 2. The protrusion extends inwardly in a plane substantially perpendicular to the engagement direction D. "Inwardly" is to be construed as the protrusion extending inwards as seen from the outside of the box, i.e. that the protrusion extends inwards in a direction towards the centre of the box/container/lid.

[0029] The interlocking means 10 comprises a flange extending from the circumferential flange 5 of the container 4 substantially along the engagement direction D. This is to be construed as said second type of flange being a kind of extension of the first flange 5 in said direction. Further, the flange of the interlocking means 10 of the container 4 is outwardly slanted away from the circumferential flange 5 of the container 4.

[0030] Further, the locking engagement may be accomplished by other methods such as gluing, welding, screwing, bolting, riveting, and shrinking, in addition to the above discussed use of a protrusion and/or flange.

[0031] The invention has been described above with reference to some embodiments. However, it is obvious to the person skilled in the art that additional embodiments are possible within the scope of the invention.

Claims

1. A plastic container structure (1) comprising a container (4), a gasket (3), and a lid (2) configured to be attached to said container (4) to close it by movement of the lid (2) relative to the container (4) along an engagement direction (D),
wherein the container (4) has an opening defined by a circumferential flange (5) having a circumferential seat (6) for receiving the gasket (3),
wherein the lid (2) has a circumferential wall (7) configured to surround the circumferential flange (5) of the container (4), wherein the seat (6) is provided on the outside of the flange (5) of the container (4) opposite the circumferential wall (7) of the lid (2), and wherein the seat (6) and the circumferential wall (7) of the lid (2) are configured such that the gasket (3) is compressed between the circumferential wall (7) of the lid (2) and the seat (6) of the container (4),
characterised in that the circumferential flange (5) of the container and/or the wall (7) of the lid (2) are convex in a plane substantially perpendicular to the engagement direction (D).

2. The plastic container structure (1) according to claim 1, wherein the lid (2) is further provided with support means (8), said support means (8) being configured to contact the flange (5) of the container (4) from the inside of the container (4) such that movement of the flange (5) of the container (4) due to forces from compression of the gasket (3) is prevented.

3. The plastic container structure (1) according to claim 2, wherein said support means (8) comprises a ridge extending at a distance from and parallel to the circumferential wall (7) of the lid (2).

4. The plastic container structure (1) according to claim 2 or 3, wherein the support means (8) are convex in a plane substantially perpendicular to the engagement direction (D).

5. The plastic container structure (1) according to any one of the preceding claims, wherein the circumferential wall (7) of the lid (2) extends a distance past the gasket (3) substantially along said engagement direction (D), and wherein an end portion of the circumferential wall (7) of the lid (2) is provided with engagement means (9) for interlocking engagement with corresponding interlocking means (10) of the container (4), said engagement (9) and interlocking (10) means being configured to prevent the lid (2) from moving away from the container (4) along the engagement direction (D).

6. The plastic container structure (1) according to claim 5, wherein said engagement means (9) comprises a protrusion extending along the circumferential wall (7) of the lid (2) on the inner side of the lid (2).

7. The plastic container structure (1) according to any one of claims 5-6, wherein said interlocking means (10) of the container comprises a flange extending from the circumferential flange (5) of the container (4) substantially along said engagement direction (D).

8. The plastic container structure (1) according to claim 7, wherein said flange of the interlocking means (10) of the container (4) is outwardly slanted away from the circumferential flange (5) of the container (4).

9. The plastic container structure (1) according to any one of the preceding claims, wherein the gasket (3) is an O-ring.

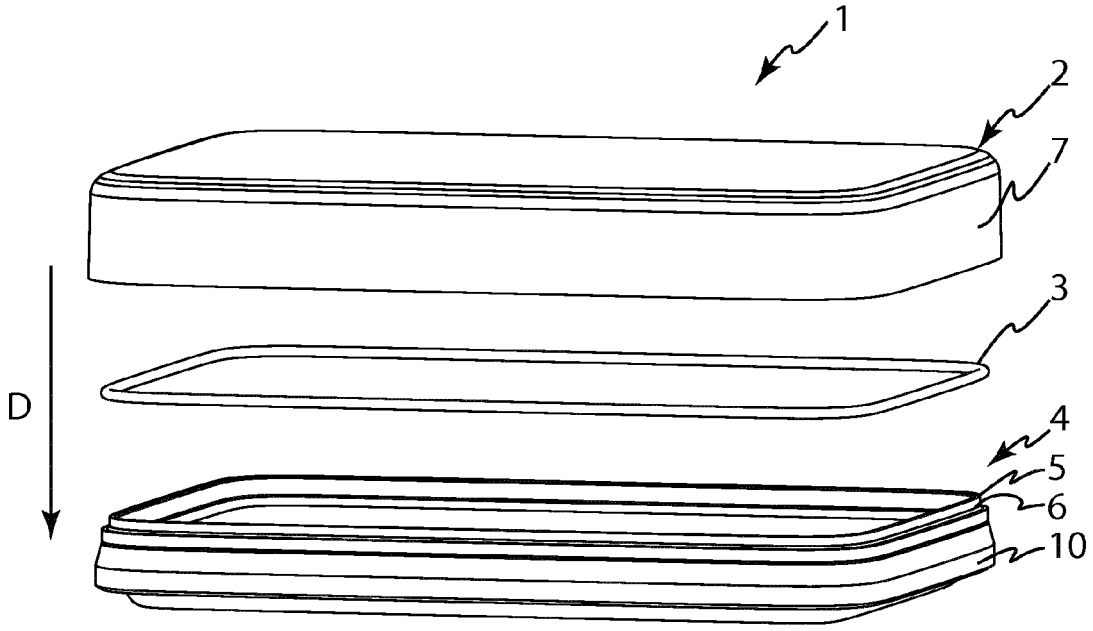

Fig. 1

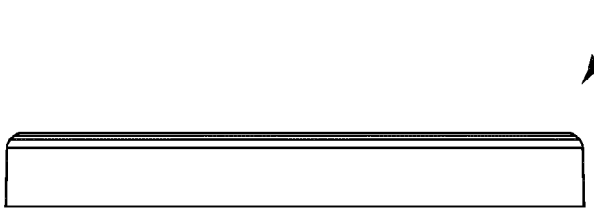

Fig. 2a

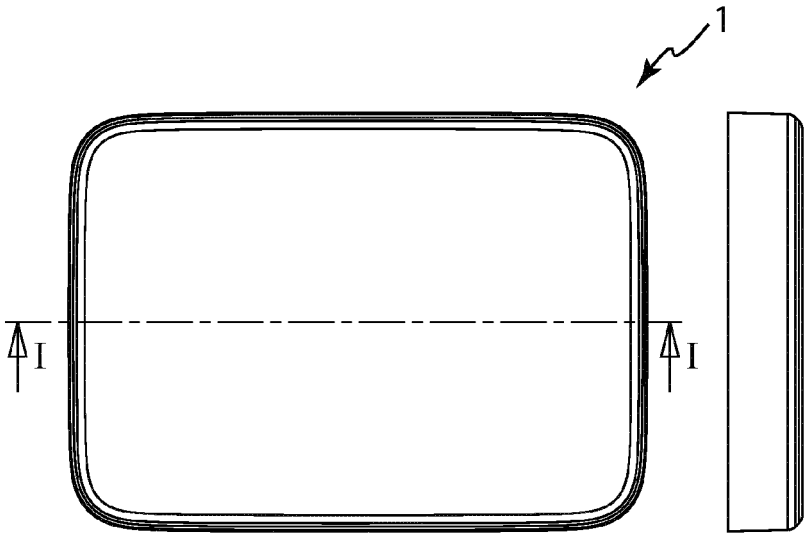

Fig. 2b

Fig. 2c

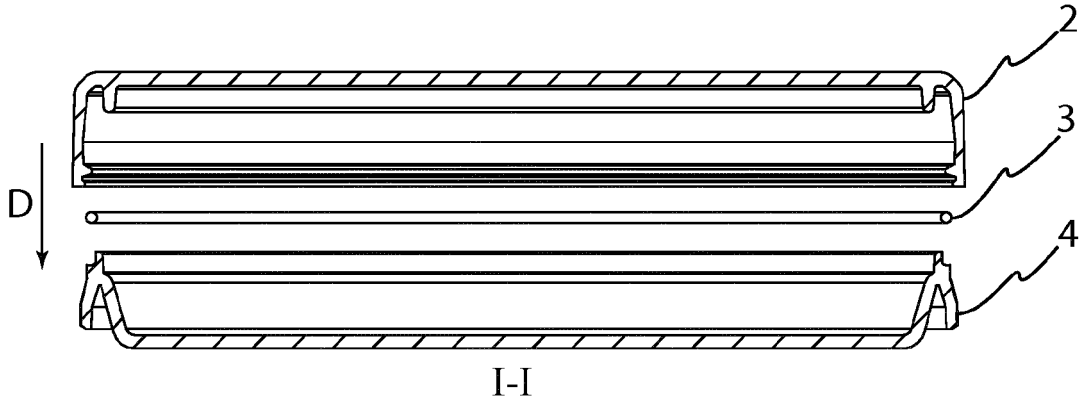

Fig. 3

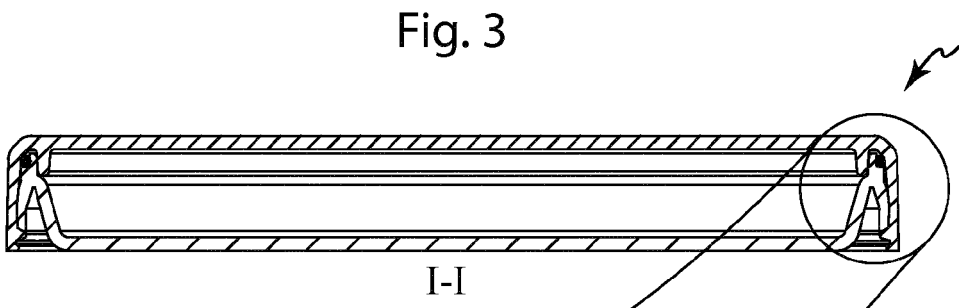

Fig. 4

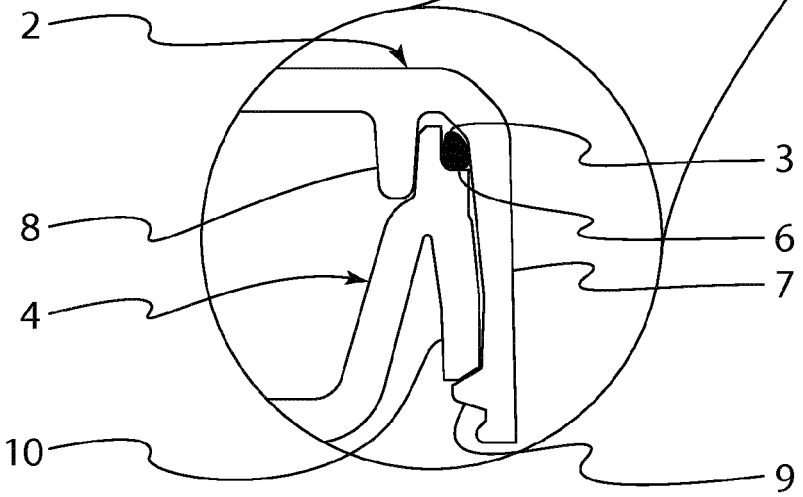

Fig. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 16 4972

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 163 576 A (GALER HERBERT W [US]) 17 November 1992 (1992-11-17) * figure 2 * -----	1-9	INV. B65D43/02
X	EP 0 950 614 A1 (GEORGES DAVID ETS [FR]) 20 October 1999 (1999-10-20) * paragraphs [0006], [0007], [0025]; figures 2,3 * -----	1-9	
A	GB 409 785 A (BARRINGER WALLIS & MANNERS LTD; ROBERT MANNERS) 10 May 1934 (1934-05-10) * page 3, line 73 - line 86; figures * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 May 2012	Zanghi, Amedeo

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

3

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 16 4972

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-05-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5163576 A	17-11-1992	NONE	
EP 0950614 A1	20-10-1999	EP 0950614 A1	20-10-1999
		FR 2777543 A1	22-10-1999
GB 409785 A	10-05-1934	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82