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(71) Applicant: **APPE BENELUX**
2960 Brecht (BE)

(72) Inventors:
- **Jansen, Cor**
  5121 AW Rijen (NL)
- **Van Brempt, Veerle**
  2930 Brasschaat (BE)
- **Dessaint, Alain**
  1910 Kampenhout (BE)

(74) Representative: **Matkowska, Franck**
Matkowska & Associés
9, rue Jacques Prévert
59650 Villeneuve d'Ascq (FR)

(54) Venting closure for a container and process for filling and sealing a container

(57) The venting closure (1A) is adapted for sealing a container, and in particular for avoiding pressures (vacuum pressures or overpressures) inside the container (C) that could deform the container. Said venting closure comprises a shell (10) defining a housing (102), a porous venting medium (104) positioned inside said housing (102) and a seal (103) positioned inside said housing (102), and said venting closure can be fitted onto a container (C) in at least two positions : a closing position, wherein air (A) coming from the outside of the container can enter into the container by passing necessarily through the said porous venting medium (104), or air coming from the inside of the container can escape outside the container by passing necessarily through the said porous venting medium (104), and a sealing position, wherein the seal (103) of the venting closure is hermetically sealing the container.

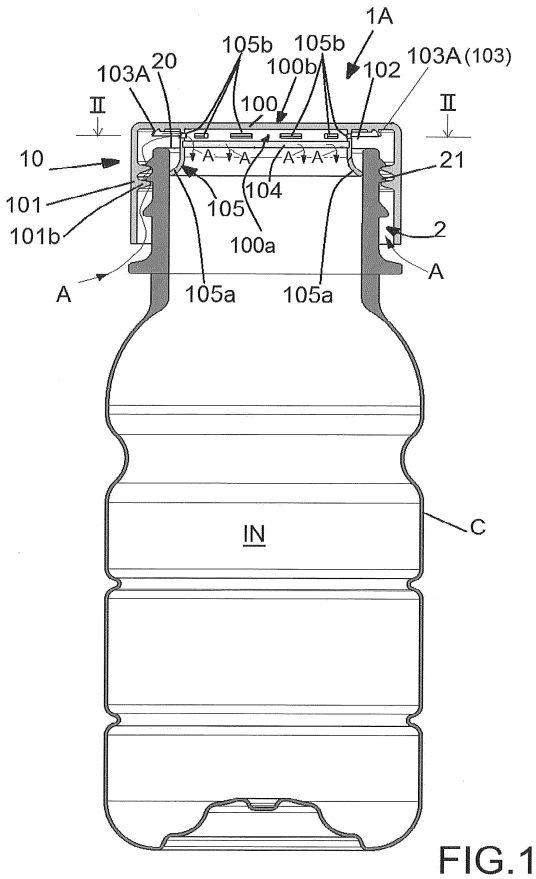

FIG.1

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Description

Technical field

[0001] The present invention relates to the sealing of containers in applications wherein vacuum can develop inside the containers and more particularly can mechanically deform the containers or wherein an overpressure can build up inside the containers and more particularly can mechanically deform the containers. The invention is more especially useful for hermetically sealing containers in hot-fill applications, or for hermetically sealing containers that have been sterilized, notably by carrying out a pasteurization process or a retort process. In this technical field, the invention relates to a novel venting closure that is suitable for sealing a container and avoiding pressures (vacuum pressures or overpressures) inside the container, and in particular pressures that could mechanically deform the container, and to a process for filling and sealing a container.

Prior art

[0002] In a hot-filling process, a container is filled with a commodity such as for example a liquid, while the commodity is at an elevated temperature. For example for liquids, such as juices, the temperature is typically between 68°C and 96°C, and is usually around 85°C. When packaged in this manner, the high temperature of the commodity also sterilizes the container at the time of filling. The container is not completely filled, but the filling is generally performed in such a way to keep a headspace with air inside the container.

[0003] After being hot-filled, the container is capped and allowed to reside at generally the filling temperature for a few minutes and is then actively cooled prior to transferring to labeling, packaging, and shipping operations.

[0004] When the product in the container is liquid or semi-liquid, this cooling reduces the volume of the product inside the container. This product shrinkage phenomenon results in the creation of a vacuum within the container. This vacuum is even more important when a headspace is existing.

[0005] Plastic containers and in particular PET (Polyethylene Terephthalate) containers are now widely used for storing various commodities, and in particular food products, liquids, etc... In particular, manufacturers and fillers, as well as consumers, have recognized that PET containers are lightweight, not expensive, can be manufactured in large quantities and can be recycled.

[0006] When a deformable container, like for example a plastic container, and more particularly a PET container, or like for example a cardboard container, is being hot filled, if the vacuum pressures generated inside the container is not controlled or otherwise accommodated, these vacuum pressures can result in unwanted severe deformations of the container, which leads to either an aesthetically unacceptable container or one that is unstable. Moreover, said vacuum pressures detrimentally increase the opening torque that is necessary for removing the closure cap and opening the container.

[0007] It has been proposed in the prior art to accommodate vacuum pressures in hot-fill plastic containers by incorporating deformable structures in the container wall and/or base

[0008] Plastic hot-fill containers incorporating such deformable structures are for example described in the following publications: U.S. Patents 5,005,716 ; 5,503,283 ; 6,595,380 ; 6,896,147 ; 6,942,116 ; and 7,017,763, and PCT application WO 2001/014759. In these publications, a deformable structure to at least partially compensating the volume reduction that occurs after capping and during cooling of a hot-filled product, is located in the base of the container. More particularly, in PCT application WO 2011/014759, the movable container base includes a central push-up portion and is designed to move up to accommodate internal vacuum pressures.

[0009] Plastic hot-fill containers are also described for example in the following publications: European patent application EP 1 947 016 and U.S. Patents 5,222,615 ; 5,762,221 ; 6,044,996 ; 6,662,961 ; 6,830,158. In these publications, a deformable portion, to at least partially compensating the volume reduction that occurs after capping and during cooling of a hot-filled product, is located in the shoulder part of the container.

[0010] Plastic hot-fill containers are also described for example in the following publications : U.S. Patents 5,092,475 ; 5,141,121 ; 5,178,289 ; 5,303,834 ; 5,704,504 ; 6,585,125 ; 6,698,606 ; 5,392,937 ; 5,407,086 ; 5,598,941 ; 5,971,184 ; 6,554,146 ; 6,796,450. In these publications, the deformable portions, to at least partially compensating the volume reduction that occurs after capping and during cooling of a hot-filled product, are located in the sidewall of the main body of the container, and are commonly referred as vacuum panels. In this case, the volume compensation can be advantageously increased.

[0011] The hot filling process is acceptable for commodities having a high acid content, but is not generally acceptable for non-high acid content commodities. For non-high acid commodities, pasteurization and retort are generally the preferred sterilization processes.

[0012] Pasteurization and retort are both processes for cooking or sterilizing the contents of a container after filling. Both processes include the heating of the contents of the container to a specified temperature, usually above approximately 70°C for a specified length of time (for example 20 - 60 minutes). Retort differs from pasteurization in that retort uses higher temperatures to sterilize the container and cook its contents. Retort also generally applies elevated air pressure externally to the container to counteract pressure inside the container.

[0013] In pasteurization and retort processes, if the container is hermetically closed during the heating phase, an overpressure can build up inside the container and can deform the container. Vacuum pressures can

also develop inside the plastic container during the cooling phase of the container, which can also result in unwanted deformations of the container.

[0014] One first solution to avoid the development of pressures (vacuum pressures or overpressure) inside a deformable container in hot-fill applications or in pasteurization and retort processes is to perform the sealing of the container in two sequential steps. In a first step, once the container is being filled with a hot product, a closure cap is for example positioned onto the container, but the container is not hermetically sealed, and air from the outside can freely enter inside the container, thereby avoiding the development of internal vacuum during the cooling phase of the product or air can freely escape outside the container, thereby avoiding the development of internal overpressures during the heating phase of the product. Once the product inside the container is sufficiently cold, the container is hermetically sealed by the closure cap.

[0015] In a second solution disclosed in US patent n° 7,748, 525, it has been proposed to use a closure cap that is designed in such a way to reduce the volume of the head space. In this solution, air from the outside can still freely enter inside the container during the cooling phase.

[0016] A major problem of these first and second solutions is that the air entering in the container during the cooling phase can transport contaminating agents, such as for example dust, bacteria and can detrimentally contaminate the product stored in the container.

[0017] To solve this problem, it is has been proposed, notably in PCT application WO 2009/117328, a closure cap having a gas permeable vent with an integral sealing means that is externally activable by a nonmechanical means, to effect hermetic sealing of the container after filling and cooling. More particularly, the gas permeable vent is a non-fusible porous matrix or membrane and comprises a porous fusible material that can hermetically close the non-fusible porous matrix when it is melted, for example by using an electromagnetic induction source. The sealing of the container is performed in two steps. In a first step, once the container is being filled with a hot product, the container is closed by the said closure cap. During the cooling phase, vacuum inside the container is relieved by air from the outside that enters inside the container though the non-fusible porous matrix or membrane acting as a filter. Once the product inside the container is sufficiently cold, the porous fusible material is activated, for example by means of an electromagnetic induction source, and is melted in such a way to hermetically seal the non-fusible porous matrix or membrane, thereby hermetically sealing the container.

[0018] This technical solution of a closure cap having heat-sealable gas permeable vent involves the manufacturing of a complex and costly closure cap and involves the use of a specific equipment for melting the porous fusible material. Moreover, the presence of the porous fusible material in the closure cap can be prejudicial for the recycling of the closure cap, especially if the porous fusible material comprises suitable energy absorbing material in the form of metallic particles that can be inductively heated for melting the porous fusible material.

Objective of the invention

[0019] An objective of the invention is to propose a novel technical solution for sealing a container in applications wherein pressures (vacuum pressures or overpressures) can develop inside the container and in particular can mechanically deform the container, which solution avoids the development of such internal pressures and also reduces the risk of contamination of the inside of the container, and which solution also avoids the use of a special equipment for heat-sealing a venting closure as disclosed in PCT application WO 2009/117328.

[0020] Another objective of the invention is to propose a venting closure that can be easily recycled.

Summary of the invention

[0021] To achieve these objectives, a first object of the invention is a venting closure as defined in claim 1.

[0022] Another object of the invention is the container and venting closure of claim 17

[0023] Another object of the invention is the process for filing and sealing a container as defined in claim 25.

Brief description of the drawings

[0024] The technical characteristics and advantages of the invention will appear more clearly on reading the following detailed description of several embodiments of the invention, which detailed description is made by way of non-exhaustive and non-limiting examples, and with reference to the appended drawings, as follows:

- Figure 1 is a longitudinal cross section view of a venting closure according to a first embodiment, fitted onto the neck finish of a container, in a first closing position wherein the development of internal vacuum inside the container is prevented.
- Figure 2 is a cross section of the venting closure in the plane II-II of figure 1.
- Figure 3 is a longitudinal cross section view of the neck finish and venting closure of figure 1, in a sealing position wherein the container is hermetically sealed.
- Figures 4, 6 and 8 are longitudinal cross section views of a venting closure according respectively to a second, third and fourth embodiments, fitted onto the neck finish of a container, in a first closing position wherein the development of internal vacuum inside the container is prevented.
- Figures 5, 7, and 9 are longitudinal cross section views of the neck finish and venting closure of respectively Figure 4, Figure 6, and Figure 8 in a seal-

ing position wherein the container is hermetically sealed.

Detailed description

[0025] Some preferred embodiments of the invention are discussed in detail below. While specific exemplary embodiments are discussed, it should be understood that this is done for illustration purpose only. A person skilled in the art will recognize that other container designs or container dimensions can be used without parting from the spirit and scope of the invention.

[0026] In reference to figure 1, a closure 1 A of the invention is fitted onto a standard neck finish 2 of a deformable container C comprising a top opening 20 (container mouth), like for example a bottle neck finish. This top opening 20 of the neck finish 2 is knowingly used for filling the container with a product and/or for pouring the product outside the container. In this particular embodiment, the closure 1 is a cap screwed on the container neck finish 2. In another variant, the closure 1 could be snapped on the container neck finish 2.

[0027] The material and the shape of the container C are not important. In particular the container can be made from any material that makes the container deformable at ambient temperature under an internal pressure (vacuum pressure or overpressure) generated inside the container C. In particular, the container C can be for example any plastic container or any cardboard container. More particularly, the container is not made of glass.

[0028] The container can be for example a bottle-shaped container, a flask, a jar, a tube, a bag, a pouch.

[0029] Within the scope of the invention, the deformable container C can be rigid, semi rigid or flexible. The container C may be either of a monolayer construction or a multilayer construction.

[0030] When the container C is made of plastic, suitable thermoplastic materials which may be used, as a layer or part of one or more layers in either monolayer or multilayer containers, include polyesters, and in particular polyethylene terephtalate (PET), polyolefins (including but not limited to polypropylene(PP) and polyethylene (PE)), polyetheresters, polyesteramides, polyurethanes, polyimides, polyureas, polyamideimides, polyamides, polyacrylates, polyphenyleneoxide, phenoxy resins, epoxy resins, polystyrene (PS), polyvinyl (including but not limited to polyvinyl chloride (PVC), polylactic acid (PLA), polyethylene-furanoate (PEF), homo or copolymers thereof, or combinations thereof.

[0031] The container C can be manufactured by using any method known in the art, including but not limited to injection moulding, injection blow moulding (IBM), injection stretch-blow moulding (ISBM), extrusion blow moulding, thermoforming, rotational moulding, folding.

[0032] The container can be a biaxial stretched plastic containers that is heat resistant, for example a heat-set ISBM container or a double blown ISBM container.

[0033] The closure 1 A comprises a non-porous shell 10, in the form of a cap, which is single piece, made from any material than makes the shell 10 substantially impermeable.

[0034] In certain embodiments, the material of the closure shell 10 can be for example any known thermoplastic material that can be moulded in a mould, and more particularly any known thermoplastic material that can be processed by injection or compression moulding. Preferably, the closure shell 10 can be made from a polyolefin, like for example polypropylene, polyethylene, polyethylene terephthalate, homo or copolymer, or combinations thereof. A good candidate for making the closure shell 10 is HDPE (High Density Polyethylene).

[0035] This shell 10 comprises a top wall 100 surrounded by a skirt 101. The top wall 100 comprises an outer face 100b and an inner face 100a that is intended in use to be oriented toward the inside (IN) of the container C. The skirt 101 extends transversally to the top wall 100, and defines a housing 102 with the inner face 100a of the top wall 100.

[0036] For example, but not necessarily, the top wall 100 can form a disc and the skirt 101 can be cylindrical.

[0037] In this particular example, the inner face 101 a of this skirt 101 comprises a screwing thread 101 b that can cooperate with a screwing thread 21 of the neck finish 2 for securing the closure 1A onto the neck finish 2.

[0038] The closure shell 10 also comprises a seal 103 positioned inside the housing 102, and adapted to hermetically seal the top opening 20 of the container neck 2 when the closure 1A is screwed on the container in the sealing position of figure 3.

[0039] More particularly, in this example, the seal 103 is a deformable and annular sealing lip 103A formed on the inner face 101 a of the top wall 100.

[0040] This deformable sealing lip is extending on the whole periphery of the top wall 100.

[0041] Pursuant to the invention, the closure 1A also comprises a porous venting medium 104 that is gas permeable. Said porous venting medium 104 is distinct from the seal 103.

[0042] Suitable materials for the porous venting medium 104 include any material that is gas-permeable, but which provides an effective barrier for isolating against migration of solids and liquids therethrough, including for example bacterial, viral, particulate, and other such material penetration.

[0043] Examples of porous venting medium 104 include, but are not limited to polymeric films or membranes, porous pads, papers, nonwovens, and combinations thereof.

[0044] In certain embodiments the porous venting medium 104 can be made from a polymer such as a polyolefin or fluorinated polyolefin. A list of suitable polyolefin includes, but is not limited to, polyethylenes polypropylenes, ethylene/propylene copolymers, polybutylenes, polymethylpentenes, copolymers thereof and combinations thereof. A particularly suitable fluorinated polyolefin is polytetrafluoroethylene (PTFE), in particular micropo-

rous PTFE or expanded porous PTFE (ePTFE).

[0045] In certain other embodiments the porous venting medium 104 can be made from ethylene copolymers including, but not limited to, ethylene/vinyl acetate copolymers, ethylene/vinyl alcohol copolymers and polyvinyl acetates as well as alloys, mixtures and combinations thereof.

[0046] The porosity of the porous venting medium 104 will depend of the size of the contaminants (dust, particles, bacteria, etc.) that have to be blocked by the porous venting medium 104 or trapped inside the porous venting medium 104.

[0047] The smaller the pore size is, the more reliable the barrier performance is. In certain embodiments the porous venting medium 104 can have for example a pore diameter range of 0.01μm to 350μm, with 0.05 μm to 2.0 μm preferred and 0.10μm to 0.20μm most preferred.

[0048] In certain embodiments, the porous venting medium 104 can be hydrophobic or hydrophilic;

[0049] More particularly, in reference to figure 1, this porous venting medium 104 is positioned inside the housing 102 defined by the shell 10, and is thereby protected by the shell 10 against deterioration.

[0050] In the particular example of figures 1 to 3, the porous venting media 104 is surrounded by the seal 103, and the seal 103 is positioned on the outer side of the porous venting media 104 both in the closing position of figure 1 and in the sealing position of figure 3.

[0051] More particularly, this porous venting medium 104 is an add-on porous venting medium, more particularly of small thickness. Add-on porous venting medium 104 of higher thickness can also be used.

[0052] More particularly, in this example, this add-on porous venting medium 104 is attached to the shell 10 by means of a supporting member 105.

[0053] In the variant of figure1, said supporting member 105 is part of the shell 10 and is more particularly formed from the inner face 10a of the top wall 100.

[0054] More particularly, said supporting member 105 forms a sealing lip 105a around the whole periphery of the porous venting medium 104.

[0055] More particularly, said supporting member 105 comprises air channels 105b (figures 1 and 2) for allowing air to pass through the supporting member 105 and positioned on the outer side of the venting medium 104, i.e. in this variant between the top wall 100 and the porous venting medium 104. These air channels 105b are preferably distributed on the whole periphery of the porous venting medium 104 (figure 2).

[0056] When the closure 1A is screwed onto the container C in the closing position of figure 1, the porous venting media 104 is positioned outside the container and is closing the top opening 20. Said top opening 20 of the container is not hermetically sealed, but air A coming from the outside of the container C can penetrate into the container C by passing through these air channels 105b and then necessarily at least through the said porous venting medium 104.

[0057] In this particular variant, when the closure 1A is screwed onto the container C in the closing position of figure 1, the sealing lip 105a, which is not permeable to gas, is in seal contact with the inner face of the container neck finish 2, and air coming from the outside of the container C is thus obliged to pass through these air channels 105B and then necessarily at least through the said porous venting medium 104 before entering into the container C.

[0058] In the closing position of figure 1, the porous medium 104 acts as a filter for the air coming from the outside of the container C and entering into the container C.

[0059] In the closing position of figure 1, air can also escape outside the container C by passing through the porous venting medium 104.

[0060] The closure 1 A can be used for sealing a deformable container in any application wherein vacuum can develop inside the container and more particularly can deform the container. The closure 1A is more especially useful for hermetically sealing containers in hot-fill applications, or for hermetically sealing containers that have been sterilized, notably by carrying out a pasteurization process or a retort process.

[0061] In a hot-filling process, the container C is first hot-filled with a product. In a pasteurization process or a retort process, the container C is first filled with a product and the product inside the container is subsequently heated.

[0062] Then, in a hot-filling process or in pasteurization process or in a retort process, the closure 1A is fitted onto the container C in the closing position of figure 1, and the container C and the product are cooled down. During this cooling phase, air A coming from the outside of the container C is passing necessarily through the porous venting medium 104 (figure 1) and is filtered by the porous venting medium 104 before entering inside the container into contact with the product stored inside the container. This incoming and filtered air advantageously avoids the development of vacuum pressures inside the container C while avoiding a contamination of the inside of the container and of the product.

[0063] Additionally, in a pasteurization process or a retort process, during the heating phase of the product, air can advantageously escape outside the container by passing through the porous venting medium 104, thereby avoiding the development of an overpressure inside the container.

[0064] Once, the container C and the product are sufficiently cold, the closure 1 is twisted further with a sufficient torque to be brought into the final sealing position of figure 3, wherein the seal 103 is in contact with the inner face of the container neck finish 2, is mechanically deformed and is hermetically sealing the top opening 20 of the container C.

[0065] Moreover, as the development of vacuum pressures inside the container has been avoided, the opening torque that is necessary to remove the closure 1 form

the container is advantageously less important, which renders the invention also useful for sealing containers that are not deformable by internal vacuum pressures.

[0066] Figures 4 and 5 show another variant of closure 1 B wherein the porous venting media 104 has the form of a ring 104B and is positioned inside the housing 102 of the closure shell 10 between the inner face 101 a of the skirt 101 and a retaining member 106. The seal 103 of the closure 1 B is a deformable and annular sealing lip 103B formed on the inner face 100a of the top wall 100. This annular sealing lip 103B is surrounded by the porous venting media 104.

[0067] In use, when the closure 1 B is in the closing position of Figure 4, the porous venting medium 104 is in a low position in contact with the container neck finish 2. The top opening 20 of the container is not hermetically sealed, but air A coming from the outside of the container C can penetrate into the container C by passing necessarily at least through the said porous venting medium 104. This incoming air A is thus filtered by the porous venting media and prevents the development of vacuum pressures inside the container C. When the closure is moved in the sealing position of Figure 5, in this particular case, by twisting sufficiently the closure onto the container neck finish 2, the porous venting medium 104 is pushed and move upwards in a upper position wherein it is no longer in contact with the neck finish 2, and the seal 103 is hermetically sealing the top opening 20 of the container.

[0068] Figures 6 and 7 show another variant of closure 1C wherein the closure comprises fastening means 101 c and is adapted to be snapped onto a container neck finish 2 in two positions (closing position of figure 6 before cooling and sealing position of figure 7 after cooling). In this variant, the porous venting medium 104 is a disc 104C that is separated from the closure shell 10. The porous venting medium 104 could also form a ring 104C

[0069] Figures 8 and 9 show another variant of closure 1 D wherein the closure is adapted to be snapped onto a container neck finish 2 in two positions (closing position of figure 8 before cooling and sealing position of figure 9 after cooling). In this variant, the porous venting medium 104 is a compressible pad or ring 104D or the like, that is attached to the inner face 100a of the top wall 100 of the closure shell 10. The seal 103 is a deformable sealing lips 103D that is a part of the container, and that is formed on the container, in particular on the upper wall of the neck finish 2. When the closure 1 D is moved in the sealing position of Figure 9, the porous venting medium 104 is being compressed.

[0070] As previously described for closure 1 A, closures 1 B, 1 C, and 1 D can be used for sealing a deformable container in any application wherein vacuum can develop inside the container and can deform the container and more especially for hermetically sealing containers in hot-fill applications, or for hermetically sealing containers that have been sterilized, notably by carrying out a pasteurization process or a retort process.

Claims

1. A venting closure (1A; 1 B; 1 C; 1 D) for sealing a container, said venting closure comprises a shell (10) defining a housing (102), a porous venting medium (104) positioned inside said housing (102) and a seal (103) distinct from the porous venting medium (104) and positioned inside said housing (102), and said venting closure can be fitted onto a container (C) in at least two positions : a closing position, wherein air (A) coming from the outside of the container can enter into the container by passing necessarily through the said porous venting medium (104), or air coming from the inside of the container can escape outside the container by passing necessarily through the said porous venting medium (104), and a sealing position, wherein the seal (103) is hermetically sealing the container.

2. The venting closure (1 A ; 1 B; 1 C; 1 D) of claim 1, wherein the porous venting medium (104) is surrounded by the seal (103).

3. The venting closure (1B) of claim 1, wherein the seal (103) is surrounded by the porous venting media (104).

4. The venting closure (1B) of claim 3, wherein the porous venting medium (104) forms a ring.

5. The venting closure of any one of the previous claims, wherein the porous venting medium (104) is attached to the closure shell (10).

6. The venting closure of claim 5, wherein the porous venting medium (104) is attached to the closure shell (10) by means of a supporting member (105) and wherein said supporting member (105) comprises one or several air channels (105b) for allowing air to pass through the supporting member (105) and positioned on the outer side of the porous venting medium (104), and a sealing lip (105a) around the whole periphery of the porous venting medium (104).

7. The venting closure of claim 6, wherein the supporting member (105) is an integral part of the closure shell (10).

8. The venting closure of any one of claims 1 to 7, wherein the porous venting medium (104) is not attached to the closure shell (10).

9. The venting closure of any one of the previous claims, wherein the seal (3) is a deformable sealing lip (103A ; 103B) that is an integral part of the closure shell (10).

10. The venting closure of any of any one of the previous

claims, wherein the shell (10) comprises a top wall (100) surrounded by a skirt (101).

11. The venting closure of claims 9 and 10 wherein the sealing lip (103A; 103B) is formed on the inner face (100a) of the top wall (100).

12. The venting closure of any of any one of the previous claims, wherein the shell (10) is a plastic cap, and preferably a plastic molded cap.

13. The venting closure of any one of the previous claims, wherein the shell (10) comprises a thread (101 b) in order to be screwed onto the neck finish (2) of a container in the said closing positon and in the said sealing position, or fastening means (101 c) in order to be snapped onto the neck finish (2) of a container in the said closing position and in the said sealing position.

14. The venting closure of any one of the previous claims, wherein the porous venting medium (104) has a pore diameter in the range of 0.01μm to 350μm.

15. The venting closure of any of the previous claims, wherein the porous venting medium (104) has a pore diameter in the range 0.05μm to 2.0 μm, and more preferably in the range 0.10μm to 0.20μm.

16. The venting closure of any of the previous claims, wherein the porous venting medium (104) comprise a microporous polymer.

17. A container (C) and a venting closure of any one of the previous claims.

18. The container and venting closure of claim 17, wherein the container can be deformed by internal pressures inside the container (C).

19. The container and venting closure of claim 17 or 18, wherein the container is made of plastic.

20. The container and venting closure of any one of claims 17 to 19, wherein the container is not made of glass.

21. The container and venting closure (1 D) of any one of claims 17 to 20, wherein the seal (103) is an integral part of the container.

22. The container and venting closure of claim of any of claims 17 to 21, wherein the porous venting medium (104) is not compressed by the shell both in the closing position and in the sealing position.

23. The container and venting closure of claim of any of claims 17 to 21, wherein the porous venting medium (104) is compressed by the shell in the sealing position.

24. The container and venting closure (1A ; 1 B; 1C ; 1 D) of any one of the claims 17 to 23, wherein at least in the closing position of the venting closure cap, and preferably also in the sealing position, the porous venting media (104) is positioned outside the container.

25. A process for filing and sealing a container, comprising the following sequential steps :

(i) hot-filling the container (C) with a hot product or filing the container (C) with a product and heating the product,
(ii) closing the container with a closure comprising a seal (103) and a porous venting medium (104) in such a way that air (A) coming from the outside of the container can enter into the container by passing necessarily at least through the said porous venting medium (104), or air coming from the inside of the container can escape outside the container by passing necessarily through the said porous venting medium (104),
(iii) cooling down the container and product,
(iv) once the container and product are sufficiently cold, moving the closure to a position wherein the seal (103) of the venting closure is hermetically sealing the container.

26. The process of claim 25 wherein the container and venting closure are the ones defined in any one of claims 17 to 24.

27. The process of any one of claims 25 to 26, wherein the container (C) is hot-filled during step (i) with a hot product at a temperature above 60°C, and preferably above 80°C.

28. The process of any one of claims 25 to 27, wherein the product is heated during step (i) for sterilizing or pasteurizing the product.

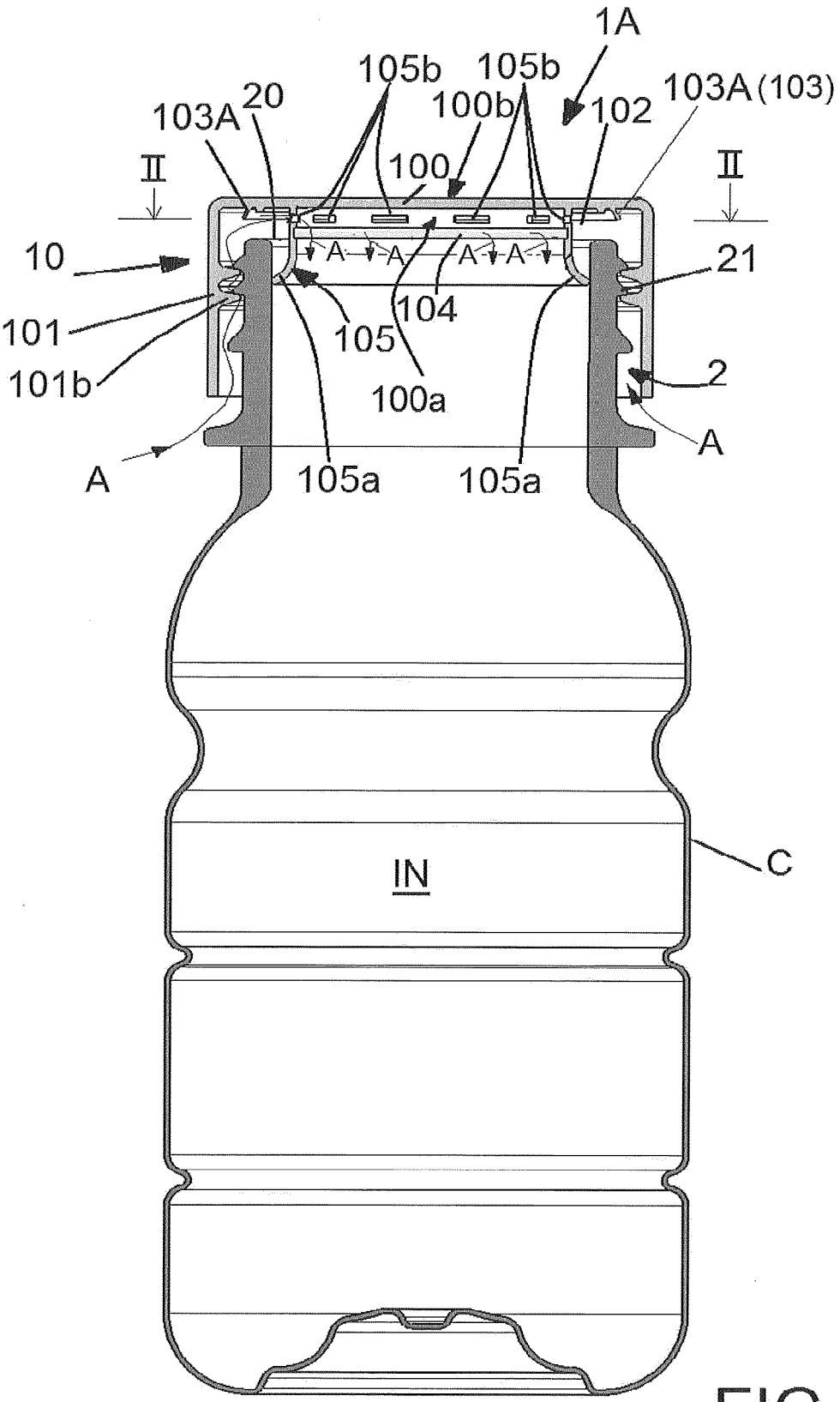
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FIG.1

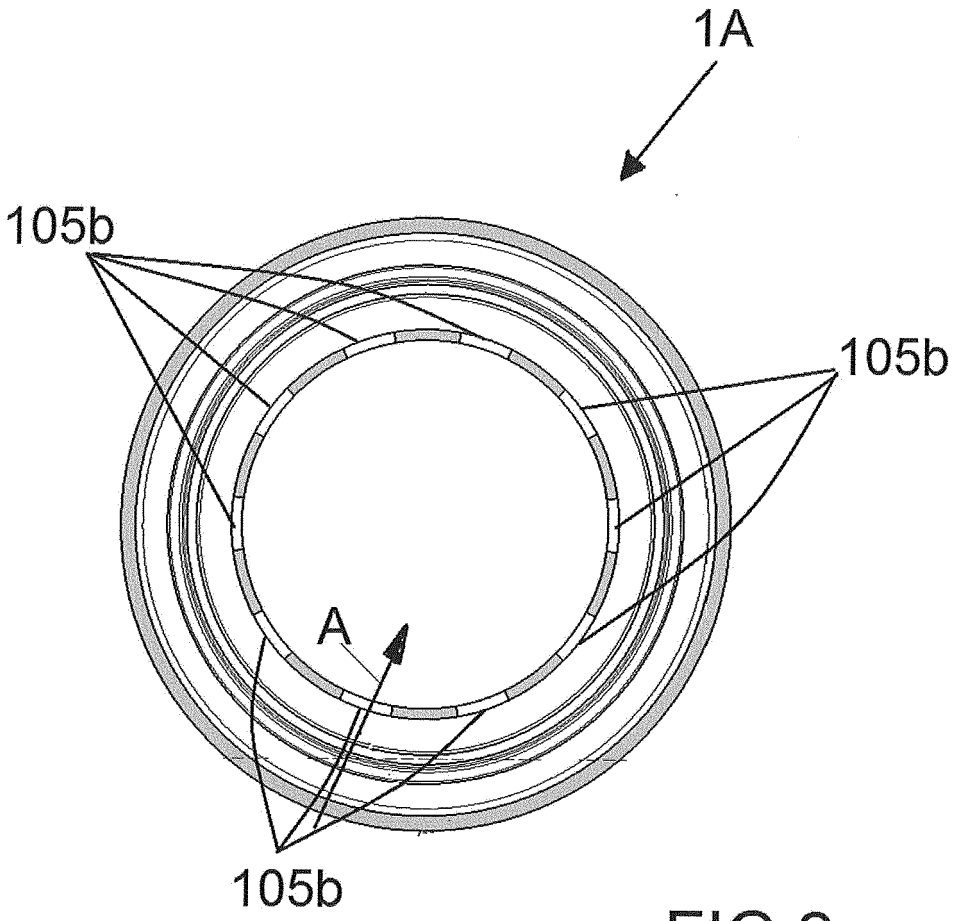

FIG.2

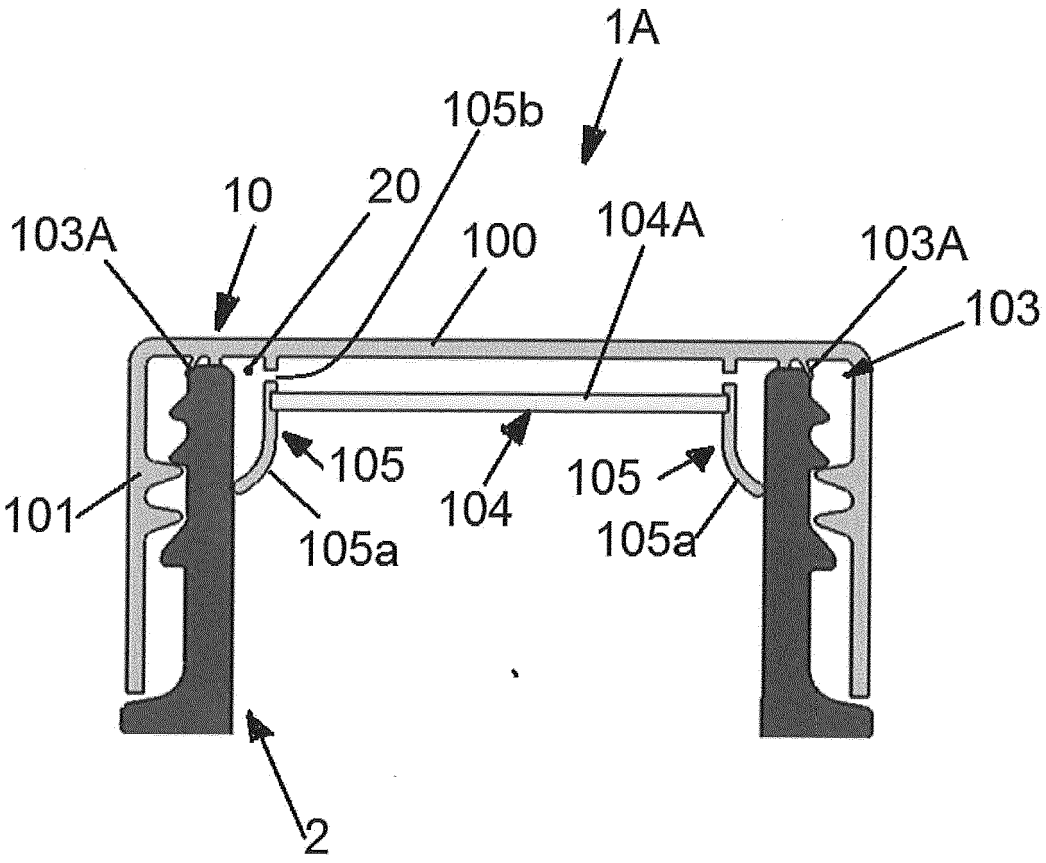

FIG.3

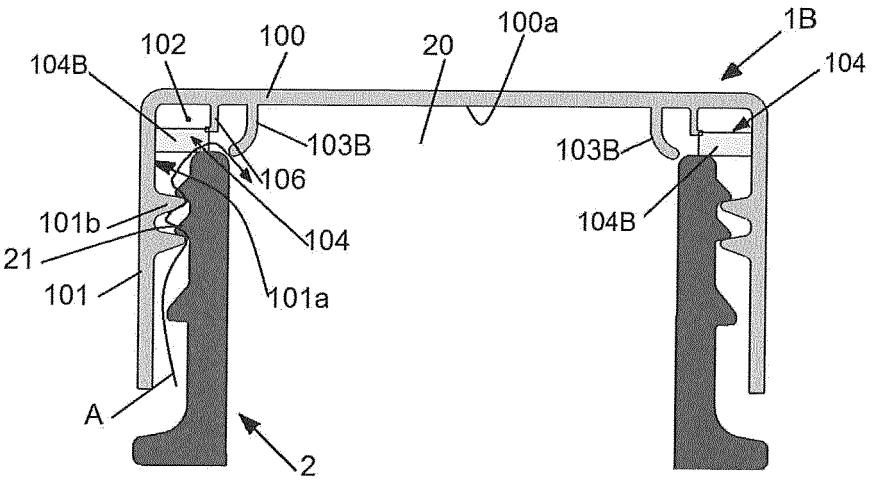
104B
102
100
20
100a
1B
104
103B
106
103B
101b
104
104B
21
101
101a
A
2

FIG.4

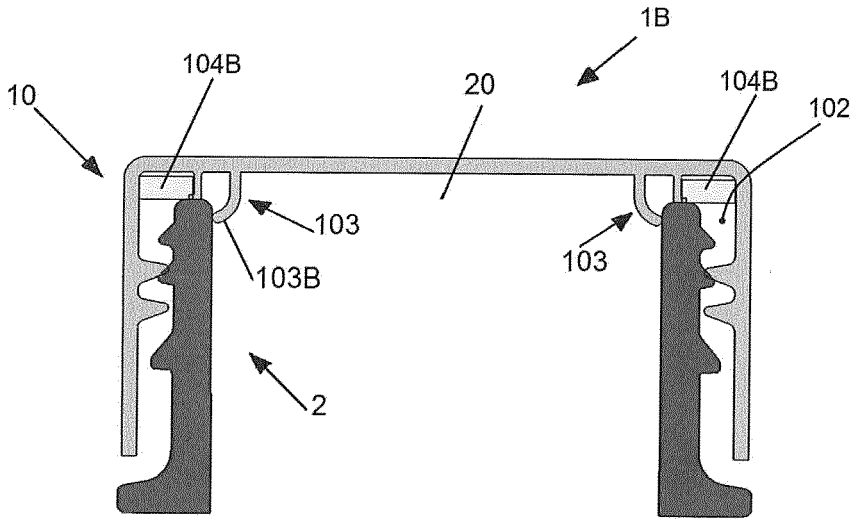
1B
104B
10
20
104B
102
103
103B
103
2

FIG.5

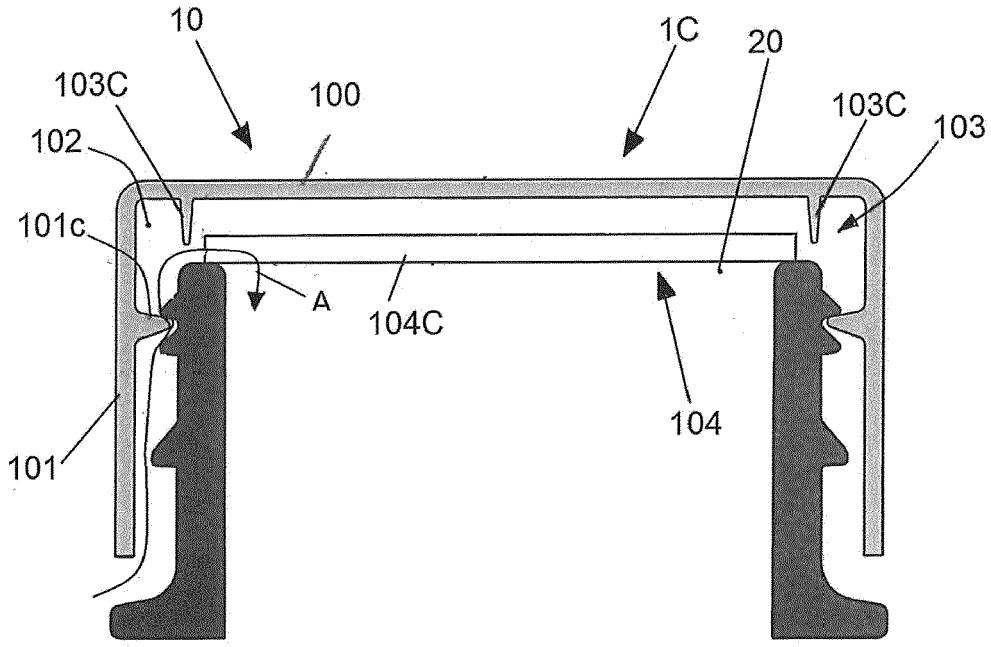
10
1C
20
103C
100
103C
103
102
101c
A
104C
104
101

FIG.6

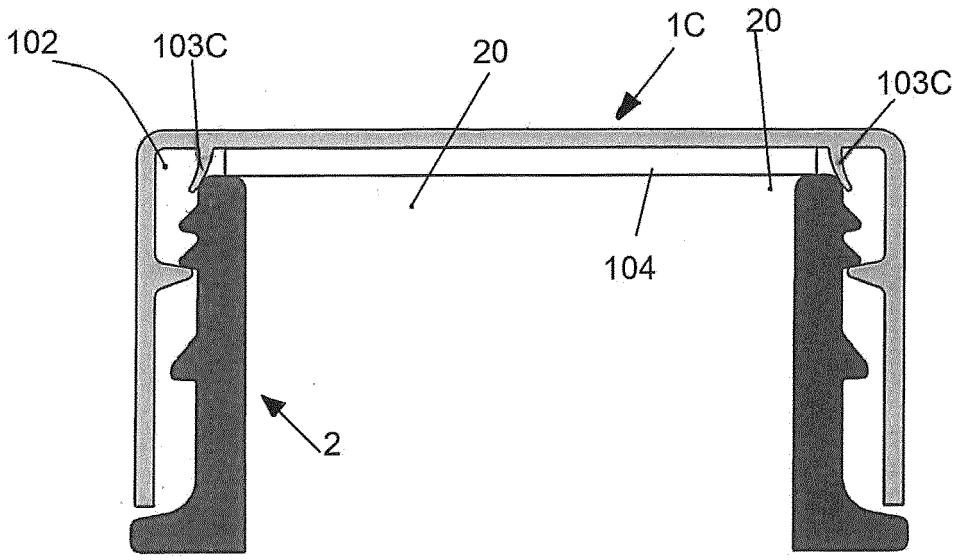
102
103C
20
1C
20
103C
104
2

FIG.7

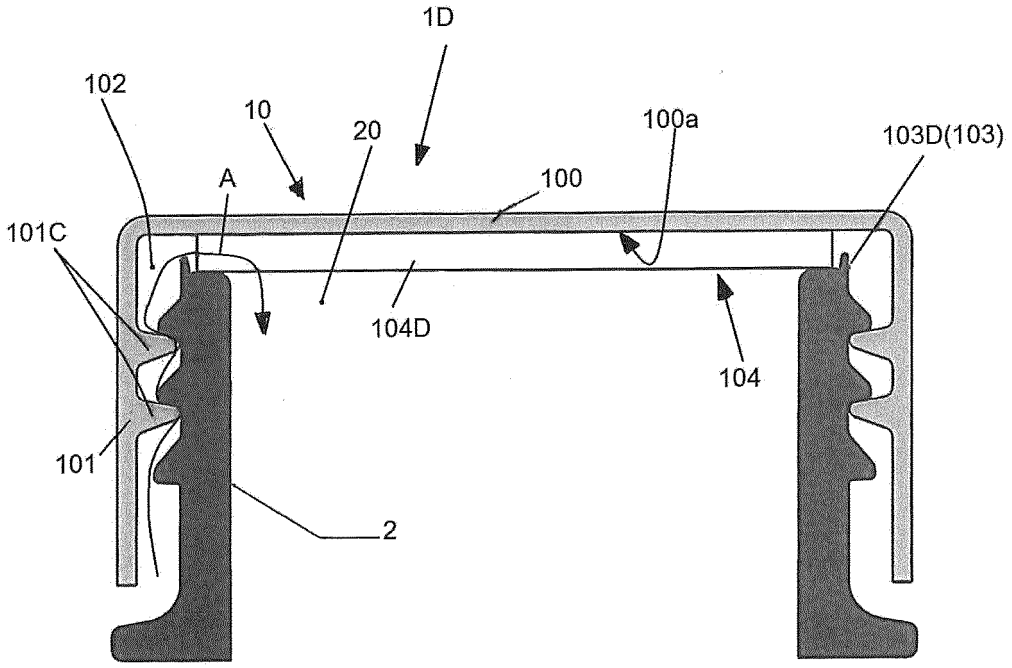
1D
102
10
20
100a
103D(103)
A
100
101C
104D
104
101
2

FIG.8

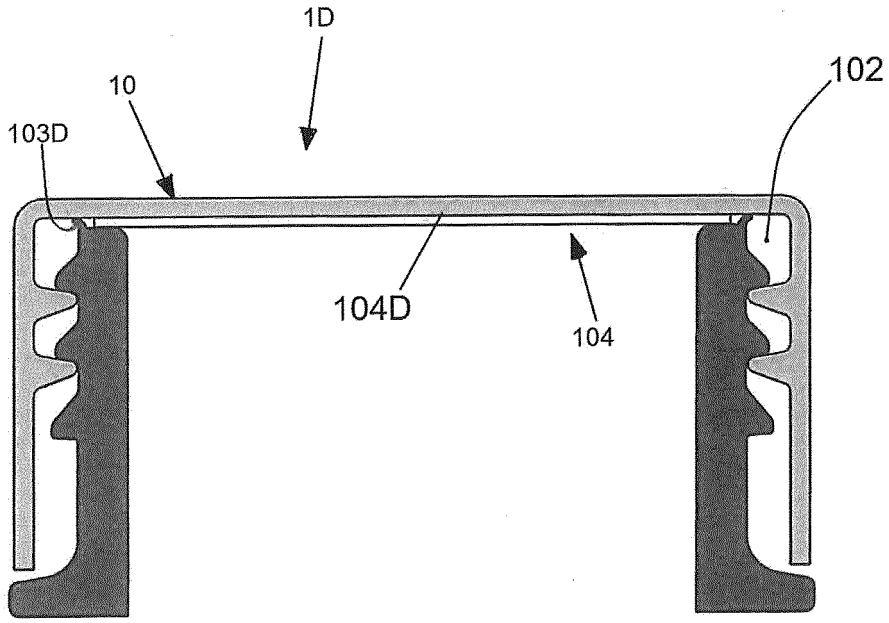
1D
10
102
103D
104D
104

FIG.9

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 0672

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 263 850 A (SCOTT DOUGLAS C) 2 August 1966 (1966-08-02) * claim 1; figures * -----	1,25	INV. B65D51/16

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	13 January 2015	Bridault, Alain

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13-01-2015

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