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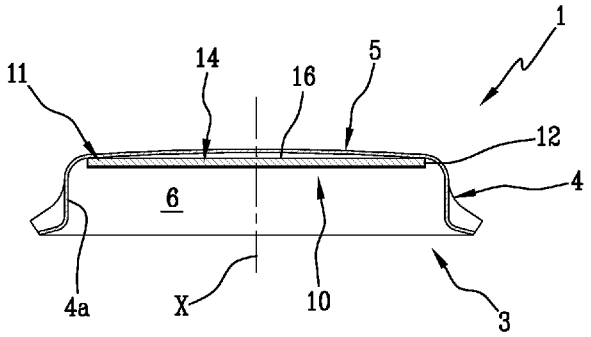
(54) Title: CAP FOR A CONTAINER AND RELATED METHOD FOR MAKING IT

Fig.1



(57) Abstract: A cap (1) for a container (2) and related method for making it, wherein the cap (1) comprises: a cup-shaped body (3) made of metal material, having a skirt (4) which extends around an axis (X) and a transversal wall (5) positioned transversally to the axis (X), said cup-shaped body (3) on the inside defining a cavity (6) interposed between an inner surface (4a) of the skirt (4) and an inner surface (5a) of the transversal wall (5); a gasket (10) housed in the cavity (6) and engaged with at least the inner surface (5a) of the transversal wall (5), said gasket (10) having a peripheral portion (11) configured to couple in a fluidtight way to a mouth (2a) of the container (2); the gasket (10) is made with a natural fibre-based material comprising at least 30% cellulose by weight, said gasket (10) having a modulus of compression of between 0.5 and 50 Mpa.

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Cap for a container and related method for making it.

This invention relates to a cap provided with an inner sealing gasket and intended to be used for closing containers such as bottles, jars, pots or the like.

In more detail, the cap according to this invention may be of any type and material, coupled to the neck of the container by means of suitable connecting systems.

Such systems may be of different types, such as for example the type using pressure and plastic deformation of the perimetric edge of the cap itself, snap-on by means of suitable cap inner undercuts which act on the neck of the container, or of the screw type which has suitable threads made both on the cap and on the mouth of the container.

The invention also relates to a method for making a cap for a container.

As is known, current environmental protection regulations increasingly focus on the reduction of some materials, in particular plastic materials.

In this context, the production of materials without plastic is becoming increasingly widespread and is moving towards 100% recyclable materials such as aluminium and steel.

In fact, aluminium and steel caps are widely used in many contexts given the malleability of the material which makes it easy to work together with good structural strength.

However, the caps, irrespective of their shape and size as well as the system for connection to and disengagement from the neck of the container, still have, although at a minimum, components made of plastic material.

In fact, it should be noticed that in order to ensure a fluidtight seal between the inner surface of the cap and the edge of the container, a gasket inserted inside the cap is always required. That gasket, usually disk- or ring-shaped, has a circular peripheral portion suitable for being interposed and crushed between the cap and the edge of the neck of the container, thereby preventing ways for fluid to pass through.

The gaskets are mainly made of plastic material which has optimum structural features in order to define a correct fluidtight seal between the cap and the container.

In fact, the plastic materials allow the obtainment using moulding processes of disk-shaped gaskets, with compact dimensions and at the same time deformable in the condition of stable constraint of the cap on the neck.

However, as specified above, the plastic component is difficult to recycle and for example in the case of a metal crown cap, is burned in the furnace during the process for recycling the metal. In this way, circular use of the resources is prevented, in particular of non-renewable resources such as plastic obtained from fossil hydrocarbons.

Therefore, the aim of the invention is to improve caps for containers, notably eliminating the presence of plastic but at the same time guaranteeing the fluidtight seal of the caps on the respective containers.

A further aim is to supply a method for making a cap provided with a gasket which is easily obtainable and workable using prior art forming techniques.

According to a first aspect of the invention, a cap for a container is provided, comprising: a cup-shaped body having a skirt which extends around an axis and a transversal wall positioned transversally to the axis. The cup-shaped body on the inside defines a cavity interposed between an inner surface of the skirt and an inner surface of the transversal wall. Housed inside the cavity is a gasket made with a natural fibre-based material and engaged with at least the inner surface of the transversal wall. That material comprises at least 30% cellulose by weight. The gasket preferably has a modulus of compression of between 0.5 and 50 Mpa.

Preferably, the natural fibre-based material comprises at least 70% cellulose by weight, advantageously at least 80% cellulose by weight.

Moreover, the gasket has a hardness of between 50 and 90 SHORE A.

Preferably, the cup-shaped body is also made with a natural fibre-based material comprising at least 30% cellulose by weight. Even more preferably, the natural fibre-based material of the cup-shaped body has an average density greater than or equal to 0.8 g/cm3.

According to a further aspect of this invention a method for making a cap for a container is provided, comprising the steps of: preparing a cup-shaped body having a skirt which extends around an axis and a transversal wall positioned transversally to the axis; preparing a gasket inside a cavity of the cup-shaped body interposed between an inner surface of the skirt and an inner surface of the transversal wall. The gasket is engaged with the inner surface of the transversal wall. Wherein the step of preparing the gasket comprises the step of making the gasket with a natural fibre-based material, such as in particular cellulose.

According to a further aspect of the invention, the step of making the gasket is performed before the step of inserting the gasket in the cavity. For example, by moulding the cellulose in the form of an aqueous suspension and discharging the excess water by means of porosity in the mould.

Advantageously, the gasket is made by moulding starting from a flat sheet of natural fibre-based material to define an annular peripheral portion having a concave surface defining a containment groove for the edge of a mouth of the container.

According to a further aspect of the invention, the step of making the gasket is performed at the same time as the step of engaging the gasket with the inner surface.

In this case, the gasket is made by moulding a cellulose-based material which is a powder or a fluff or an airlaid directly on the inner surface of the transversal wall.

The invention can be better understood and implemented with reference to the accompanying drawings, which illustrate several example, non-limiting embodiments of it, in which:

- Figure 1 is a side view and in cross-section of a cap for a container according to a first embodiment of this invention;
- Figure 2 is a bottom plan view of the cap for a container according to a further embodiment of the invention;
- Figure 3 is a cross-section along the line A-A of Figure 2;
- Figure 4 is an exploded view and in cross-section along the line A-A of Figure 2;
- Figures 5a - 5c are respectively side views and in cross section of the cap for a container according to further embodiments of this invention;
- Figure 6 is a side view and partly in cross-section of the cap of Figure 5b and coupled to a respective container; and
- Figures 7a and 7b are schematic views of respective steps of forming of a detail of the cap according to this invention.

With reference to the accompanying figures, the numeral 1 denotes in its entirety a cap for a container 2 according to this invention.

In particular, the invention relates to a cap 1 comprising a cup-shaped body 3 shaped depending on the type of container 2 which may be for example a bottle for liquid products, a jar typically used for foodstuffs, or another type of container.

To allow a better understanding of the invention, by way of example and therefore without limiting the invention, the accompanying figures show a cup-shaped body 3 of the crown type or the screw type.

However, as specified above, the cup-shaped body 3 may be of any other type, such as for example the “twist off” type typically used for jars.

In particular, the cup-shaped body 3 has a skirt 4 which extends around an axis “X” and a transversal wall 5 positioned transversally to the axis “X”.

The skirt 4, which extends annularly and is concentric with the above-mentioned axis “X” also has an inner surface 4a configured to be directed towards a mouth 2a (partly and schematically illustrated in Figure 6) of the container 2.

The transversal wall 5 is substantially flat, lying in a plane extending

perpendicularly to the above-mentioned axis “X”. The skirt 4 is circumferentially engaged with the outer periphery of the transversal wall 5. In this situation, the cup-shaped body 3 is made in a single body in which the transversal wall 5 and the skirt 4 are coupled without interruption.

Moreover, the transversal wall 5 has an inner surface 5a configured to be directed towards the mouth 2a of the container 2.

The cup-shaped body 3 on the inside defines a cavity 6 interposed between the inner surface 4a of the skirt 4 and the inner surface 5a of the transversal wall 5.

The cavity 6 is suitable for containing the end portion of the mouth 2a in which a respective circular edge 2b is defined (Figure 6).

In accordance with the embodiment illustrated in Figures 1 to 4, which shows a crown cap 1, the skirt 4 has an undulating profile, defining an annular portion 7 in a ring configured to be plastically deformed on the mouth 2a of the container 2.

Alternatively, Figures 5b, 5c and 6 show a screw cap, in which the skirt 4 has a thread 8 made at least on the inner surface 4a of the skirt 4 itself. The thread 8 is advantageously configured to screw the cup-shaped body 3 onto the mouth 2a of the container 2, the outside of which is also provided with a thread 9.

The cup-shaped body 3 in the embodiment in Figures 1 to 4 is usually made of metal material. In contrast, in the screw cap embodiment in Figures 5b, 5c and 6 it is usually made of plastic or metal material.

However, the cup-shaped body 3 may be made of any material.

For example, the cup-shaped body 3 may be made of metal material, preferably but not limited to aluminium or steel.

Additionally, there is a further embodiment in which the cup-shaped body 3 is made of a natural fibre-based material comprising at least 30% cellulose by weight.

In particular, the material of the cup-shaped body 3 may preferably have a

quantity of cellulose greater than or equal to 80% by weight.

That material may also comprise additives such as dyes, adhesives, lubricants, substances intended to increase the density of the material comprising cellulose after the latter has been pressed, substances intended to improve particular properties of the cup-shaped body, for example properties of a barrier to light or to gases. The additives may be present in a quantity less than or equal to 10% by weight.

The natural fibre-based material of the cup-shaped body 3 may also comprise a limited quantity of synthetic polymeric material, for example less than or equal to 10% by weight.

In this context, the cup-shaped body 3 is formed starting from a material containing cellulose, in the dry form (powder or granules), or in the pasty form, or even in the form of a solid film or in the form of a fluff. If the material used to form the cap is in the pasty form, it may be obtained by adding water or another liquid to a dry starting material. The material containing cellulose is inserted into a mould comprising a male mould-part and a female mould-part to obtain a high degree of compaction of the material comprising cellulose. In particular, it is possible to obtain a cup-shaped body 3 having an average density which is greater than or equal to 0.8 g/cm3.

In one embodiment, the average density of the cup-shaped body 3 may be greater than or equal to 1 g/cm3.

It is also possible to obtain an average density of the cup-shaped body 3 greater than or equal to 1.1 g/cm3.

Irrespective of the structure and of the material of the cup-shaped body 3, the cap 1 also comprises a gasket 10 housed in the cavity 6 and engaged with at least the inner surface 5a of the transversal wall 5.

In particular, the gasket 10 comprises a peripheral portion 11 configured to couple in a fluidtight way to the above-mentioned mouth 2a of the container 2 (Figure 6).

It should be noticed that the peripheral portion 11 is positioned coupled to

the inner surface 5a of the wall 5 but near the skirt 4. In this situation, an outer circular edge 12 of the gasket 10 can be near or abut against the inner surface 4a of the skirt 4.

The peripheral portion 11 has an annular surface 13 configured to be in contact with the edge 2b of the mouth 2a (Figure 6).

The accompanying figures show, by way of example only, an annular surface 13 having a concave profile and defining a groove for containing the above-mentioned edge 2b of the mouth 2a.

However, as illustrated in the embodiment of Figures 1 and 5b, the groove could be absent and the peripheral portion 11 could be delimited by a surface having a non-concave geometry, for example flat. In other words, in this situation the gasket 10 is a completely flat disk.

In accordance with what is illustrated in Figure 1 to 4, the gasket 10 has a disk-shaped body 14, positioned centrally relative to the peripheral portion 11 which is defined by a circular and perimetric zone of the disk-shaped body 14.

In other words, the disk-shaped body 14 and the peripheral portion 11 are made in a single body and are respectively concentric relative to the axis “X”. The disk-shaped body 14, easier to see in Figure 2, on the inside also covers the central zone of the inner surface 5a which in this situation is not visible.

In accordance with the embodiment of Figure 5b, the gasket 10 can also be defined by only the peripheral portion 11 and therefore extends in an annular fashion. In this case, the inner part of the gasket 10 has a hole made in it and a central zone of the inner surface 5a of the wall 5 is visible.

Advantageously, the gasket is made with material having a density of between 0.4 and 1.2 g/cm^3.

In accordance with a main aspect of this invention, the gasket 10 is made with a natural fibre-based material.

Preferably, that natural fibre-based material has specific mechanical features which make the gasket 10 soft and sufficiently elastic.

In particular, the natural fibre-based material comprising at least 30% cellulose by weight.

Advantageously, the natural fibre-based material comprises at least 70% cellulose by weight. Even more preferably, the natural fibre-based material comprises at least 80% cellulose by weight.

The gasket as a whole has a hardness of between 50 and 90 SHORE A and a modulus of compression of between 0.5 and 50 Mpa. For that purpose, natural fibre-based materials are preferred in which at least 50-70% of the fibres have a length of between 0.2 and 3.0 mm and width of between 0.015 and 0.045 mm

In particular, the method for measuring the modulus of compression involves the use of a dynamometer and of a sample having a thickness of between 0.8 and 2 mm. Moreover, a 55 mm diameter presser is used and the approach speed of the crosspiece is set equal to 1.3 mm/min. The modulus of compression is advantageously calculated in the linear stretch of the curve contained within the first 0.4 mm of deformation of the sample.

In accordance with a preferred, non-limiting embodiment of this invention, the natural fibre-based material is at least partly cellulose-based. Preferably, the material is composed entirely of cellulose.

In fact the cellulose-based material has features suitable for use as a gasket 10 for the cap 1 according to this invention.

The gasket may also comprise components, for example water-soluble polymers in combination with hydrophobic polymers. For example, polyvinyl alcohol (PVOH, PVA, vinyl alcohol) may be used as a water-soluble polymer combined with hydrophobicity inducing agents such as alkyl ketene dimer (AKD), alkenyl succinic anhydride (ASA), Rosin.

In this case, the hydrophobic components may be integrated inside the cellulose material or as a surface layer. The water-soluble component is in this case applied in a layer to be protected by the above-mentioned hydrophobic polymers. Advantageously, the water-soluble component has the function of a barrier to oxygen and at the same time during recycling is

easily stripped from the rest of the cellulose material given the fact that it dissolves in water.

Alternatively, the hydrophobicity inducing agents may also be present without the above-mentioned water-soluble polymers.

The gasket 10 made in this way can also be coupled to a barrier layer 15 directed towards the mouth 2a of the container 2 and therefore away from the cup-shaped body 3.

In detail, the barrier layer 15 is positioned at least at the peripheral portion 11 to also cover the annular surface 13 of the embodiment of Figure 2 to 4. Advantageously, it should be noticed that the barrier layer 15 is in contact with the edge 2b of the container2 for the purpose of making the gasket 10 impermeable to any liquids contained in the container 2.

The layer 15 may also be used as a barrier to other elements such as for example gases and aromas. For that purpose use may be made of various polymers or a different layer of cellulose, for example nano-cellulose, may be used as a barrier to gases. Advantageously, there may be two or more barrier layers 15, which are superposed on each other, depending on the specific needs and the product contained in the container 2.

For example, there may be a layer 15 of nano-cellulose as a barrier to oxygen and a layer 15 of synthetic component as a barrier to liquids.

In accordance with the embodiment illustrated in the accompanying figures, the barrier layer 15 covers the entire surface of the gasket 10 directed towards the mouth 2a. Therefore, the layer 15 covers not just the peripheral portion 11, but also the disk-shaped body 14.

There may be other layers, in the form of film or in the form of additive or coating which is distributed on the gasket 10 and which are suitable for making the gasket 10 itself impermeable.

The cap 1 also comprises an adhesive layer 16 interposed between a contact surface 10a of the gasket 10 on the opposite side to the barrier layer 15 and the inner surface 5a of the transversal wall 5.

The adhesive layer 16 allows the gasket 10 to be constrained in a sealed

fashion inside the cavity 6.

That adhesive layer 16 may be in the form of a sticking resin, distributed on the inner surface 5a and/or on the gasket 10. Alternatively, the layer 16 may be in the form of film interposed between the body 3 and the gasket 10.

Additionally or alternatively to the above, the gasket 10 remains constrained by mechanical interlocking inside the cavity 6 of the cup-shaped body 3.

In this case, the peripheral portion 11 of the gasket 10 is engaged by mechanical interlocking with the inner surface 4a of the skirt 4. Advantageously, there may be undercuts made directly on the inner surface 4a of the skirt 4 and suitable for retaining in position the peripheral portion 11 of the gasket 10 inside the cavity 6.

The cap 1 described above is obtained by means of a method for making it which is also the subject matter of this invention.

The method comprises the steps of preparing a cup-shaped body 3 having a skirt 4 which extends around an axis “X” and a transversal wall 5 positioned transversally to the axis X.

In detail, that step of preparing the cup-shaped body 3 is performed depending on the material and the particular shape of the body itself. For example, in the case of crown caps made of metal material, the body 3 is made by forming starting from a flat sheet of metal material, preferably steel or aluminium. In this situation, the step of preparing the cup-shaped body 3 comprises the sub-step of plastically deforming by forming the sheet of metal material to define the above-mentioned skirt 4 and the transversal wall 5 which are described above in mainly structural terms.

Alternatively, in the case of caps made of plastic material or of cellulose, the body 3 may be made as indicated above by moulding using male and female mould portions.

The method also comprises the step of preparing a gasket 10 inside a cavity 6 of the cup-shaped body 3 interposed between an inner surface 4a

of the skirt 4 and an inner surface 5a of the transversal wall 5.

Advantageously, the step of preparing a gasket 10 comprises the step of making the gasket 10 with a natural fibre-based material.

According to a first embodiment illustrated in Figures 7a and 7b by way of example, the step of making the gasket 10 is performed by moulding starting from a flat sheet 17 of natural fibre-based material. The flat sheet 17 is fed between a first and a second die 18a, 18b of a mould 19. Those dies 18a, 18b define respective surfaces having shapes suitable for giving the configuration of the peripheral portion 11 and if necessary of the disk-shaped body 14. In more detail, the first and second dies 18a, 18b are moved towards each other in order to perform a compression action on the flat sheet 17 (Figure 7b). That compression allows the annular surface 13 of the peripheral portion 11 to be formed and the disk-shaped body 14 to extend flat.

Moreover, in this step the flat sheet 17 is punched to obtain only the gasket 10 from the flat sheet 17. In this case, the first die 18a is provided with an annular blade 20 positioned on the perimeter for cutting off a piece of the sheet 17. It should be noticed that, during punching, the blade 20 is positioned on the outside of the second die 18b in order to obtain complete separation of the gasket from the sheet 17.

It should also be specified that, if the gasket 10 is made in the form of only the peripheral portion 11 (therefore is provided with a central hole), there is a blade inside the two dies 18a, 18b in such a way as to define, in the punching, the annular configuration of the gasket 10.

In addition, before the moulding of the flat sheet 17, there is a step of coupling a barrier layer 15 to the flat sheet 17. Advantageously, the moulding step is performed on the flat sheet 17 which is already provided with the above-mentioned water-repellent layer.

The gasket obtained in this way is then inserted in the cavity 6 of the cup-shaped body 3 and engaged with at least the inner surface 5a of the transversal wall 5.

In this case, the step of making the gasket 10 is therefore performed before the step of preparing the gasket in the cavity 6.

Alternatively, the step of making the gasket 10 may be performed at the same time as the step of engaging the gasket 10 with the inner surface 5a.

In this case, the gasket is made by moulding the natural fibre-based material such as cellulose which is a powder or a fluff or an airlaid directly on the inner surface 5a of the transversal wall 5.

In other words, in this situation the moulding step is performed by depositing the cellulose-based material and pressing by means of a suitable mould against the inner surface 5a.

That pressing action forms the gasket 10 and retains it directly engaged inside the cavity 6.

The pressing action may already be sufficient to define stable sticking of the natural fibre-based material on the inner surface 5a. Alternatively, the inner surface 5a of the wall 5 and if necessary the inner surface 4a of the skirt 4 may be pre-treated with suitable additives for improving sticking of the natural fibre-based material.

In a further alternative, independently of the moulding action before or at the same time as the step of engaging the gasket 10, there may be a further step of interposing an adhesive layer between the gasket 10 and the inner surface 5a of the transversal wall 5.

That step of interposing the adhesive layer is therefore performed before the step of engaging the gasket 10 inside the cavity 6.

Moreover, the adhesive layer may be interposed by means of a spraying of resin or another sticking substance on the inner surface 5a and/or on the preformed gasket 10.

Alternatively, the adhesive layer may be in the form of a film which is secured to the inner surface 5a and/or on the gasket 10.

Advantageously, the adhesive layer guarantees stable securing of the gasket 10 to the cup-shaped body 3.

Moreover, in accordance with a further embodiment, the step of engaging

the gasket 10 with the inner surface 5a is performed by means of mechanical constraint. In this case, once the gasket 10 has been made it is deformed to secure it to suitable undercuts made on the inner surface 4a of the skirt 4.

That mechanical engagement has the advantage of not using any adhesive components, but still retains the gasket 10 inside the cavity 6.

The natural fibre-based material such as cellulose therefore allows significant versatility in the processes for forming the cap 1. That versatility is given by the possibility of obtaining the gasket 10 by moulding before coupling it inside the cavity 6. Alternatively, moulding of the natural fibre-based material may take place directly inside the cup-shaped body 6.

Moreover, the natural fibre-based material is particularly formable by means of prior art forming techniques such as moulding.

Moreover, the cap 1 provided with the gasket 10 made of natural fibre-based material is capable of notably reducing the presence of synthetic substances such as in particular the plastic of the gasket, which in the various types of caps cannot be recycled.

Additionally, if the cup-shaped body 3 is also made of cellulose, the entire cap 1 may be entirely natural-fibre based.

In this context, the natural fibre-based material, such as in particular cellulose, is widely available in nature and therefore is easy to find. Moreover, natural fibre-based materials are easily degradable and recyclable. In the specific case of cellulose it should also be noticed that it is collectable together with paper and is therefore recyclable even where it contains a predetermined percentage of other materials, including plastics, if however they can be well separated from the cellulose in the recycling plants.

In this context, it should be noticed that the gasket 10 made of cellulose-based material has mechanical behaviours similar to plastic materials and therefore can be deformable in order to define the fluidtight seal on the respective container 2. For this reason, use of the cellulose-based material

is capable of effectively substituting prior art caps, of any type and material, which are provided with plastic gaskets.

CLAIMS

1. Cap for a container comprising:

a cup-shaped body (3) having a skirt (4) which extends around an axis (X) and a transversal wall (5) positioned transversally to the axis (X), said cup-shaped body (3) on the inside defining a cavity (6) interposed between an inner surface (4a) of the skirt (4) and an inner surface (5a) of the transversal wall (5);

a gasket (10) housed in the cavity (6) and engaged with at least the inner surface (5a) of the transversal wall (5), said gasket (10) having a peripheral portion (11) configured to couple in a fluidtight way to a mouth (2a) of the container (2);

wherein the gasket (10) is made with a natural fibre-based material comprising at least 30% cellulose by weight, said gasket (10) having a modulus of compression of between 0.5 and 50 Mpa.

2. Cap according to the preceding claim, wherein said natural fibre-based material comprises at least 70% cellulose by weight, preferably at least 80% cellulose by weight.

3. Cap according to any one of the preceding claims, wherein said gasket (10) has a hardness of between 50 and 90 SHORE A.

4. Cap according to any one of the preceding claims, wherein it also comprises an adhesive layer interposed between a contact surface (10a) of the gasket (10) on the opposite side to the mouth (2a) of the container (2) and the inner surface (5a) of the transversal wall (5).

5. Cap according to any one of the preceding claims, wherein said gasket (10) also comprises at least one barrier layer (15), positioned at said peripheral portion (11) and directed towards the mouth (2a) of the container (2).

6. Cap according to any one of the preceding claims, wherein the gasket

(10) has an annular shape and extends in a planar fashion.

7. Cap according to any one of claims 1 to 5, wherein the gasket (10) has a disk-shaped body (14), said peripheral portion (11) being defined by a circular and perimetric zone of the disk-shaped body (14).

8. Cap according to any one of the preceding claims, wherein said peripheral portion (11) comprises an annular surface (13) for contact with an edge (2b) of the mouth (2a) of the container (2).

9. Cap according to the preceding claim, wherein said peripheral portion (11) of the gasket (10) is constrained by mechanical interlocking to the inner surface (4a) of the skirt (4).

10. Cap according to claim 1 wherein the natural fibre-based material comprises at least one hydrophobic component.

11. Cap according to claim 1 wherein the natural fibre-based material comprises at least one water-soluble component combined with at least one hydrophobic component.

12. Cap according to claim 10 or 11, wherein the hydrophobic component is integrated inside the natural fibre-based material and/or applied as a layer, and wherein the water-soluble component is applied in a layer to be protected by said hydrophobic component.

13. Cap according to any one of the preceding claims, wherein said cup-shaped body (3) is made with a natural fibre-based material comprising at least 30% cellulose by weight.

14. Cap according to the preceding claim, wherein said natural fibre-based material of the cup-shaped body (3) has an average density greater than or equal to 0.8 g/cm3.

15. Cap according to claim 13 or 14, wherein said natural fibre-based

material of the cup-shaped body (3) contains up to 10% synthetic polymers and/or up to 10% additives.

16. Cap according to any one of claims 1 to 12, wherein the cup-shaped body (3) is made of metal material.

17. Cap according to any one of the preceding claims, wherein the skirt (4) has an undulating profile defining an annular portion (7) in a ring configured to be plastically deformed on the mouth (2a) of the container (2).

18. Cap according to any one of the preceding claims, wherein the skirt (4) has a thread (8) made on the inner surface (4a) of the skirt (4) itself, said thread (8) being configured to screw the cup-shaped body (3) onto the mouth (2a) of the container (2).

19. Method for making a cap for a container, comprising the steps of:
- preparing a cup-shaped body (3) having a skirt (4) which extends around an axis (X) and a transversal wall (5) positioned transversally to the axis (X);
- preparing a gasket (10) inside a cavity (6) of the cup-shaped body interposed between an inner surface (4a) of the skirt (4) and an inner surface (5a) of the transversal wall (5);
- engaging said gasket (10) at least with the inner surface (5a) of the transversal wall (5);
wherein said step of preparing a gasket (10) comprises the step of making the gasket (10) with a natural fibre-based material comprising at least 30% cellulose by weight, said gasket (10) having a modulus of compression of between 0.5 and 50 Mpa.

20. Method according to the preceding claim, wherein said step of making the gasket (10) is performed by moulding starting from a flat sheet (17) of natural fibre-based material to define an annular peripheral portion (11)

having an annular surface (13) for contact with the edge of a mouth (2a) of the container (2).

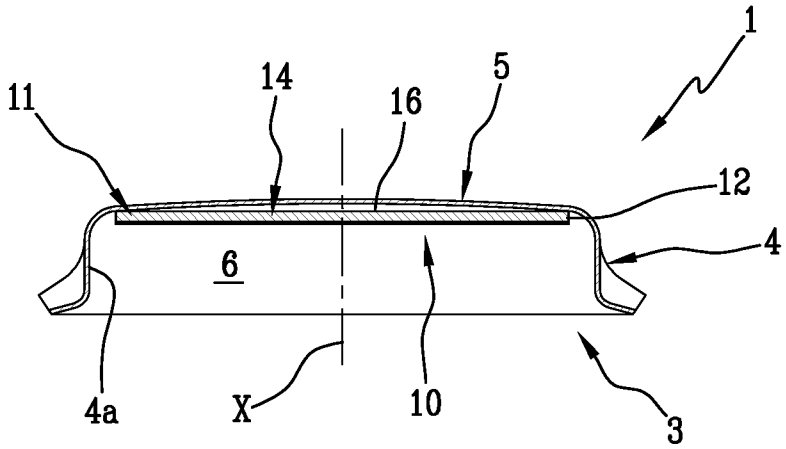
21. Method according to one of the preceding claims, wherein it also comprises, before moulding of the flat sheet (17), a step of coupling a barrier layer (15) to said flat sheet (17); said barrier layer (15) being configured to be positioned towards the mouth (2a) of the container (2).

22. Method according to claim 19, wherein said step of making the gasket (10) comprises the sub-step of moulding a natural fibre-based material which is a powder or a fluff or an airlaid directly on the inner surface (5a) of the transversal wall (5).

23. Method according to any one of claims 19 to 22, wherein it also comprises the step of interposing an adhesive layer between the gasket (10) and the inner surface (5a) of the transversal wall (10) in order to secure the gasket (10) to said transversal wall (5).

24. Method according to any one of claims 19 to 23, wherein said cup-shaped body (3) is prepared using a natural fibre-based material comprising at least 30% cellulose by weight.

Fig.1



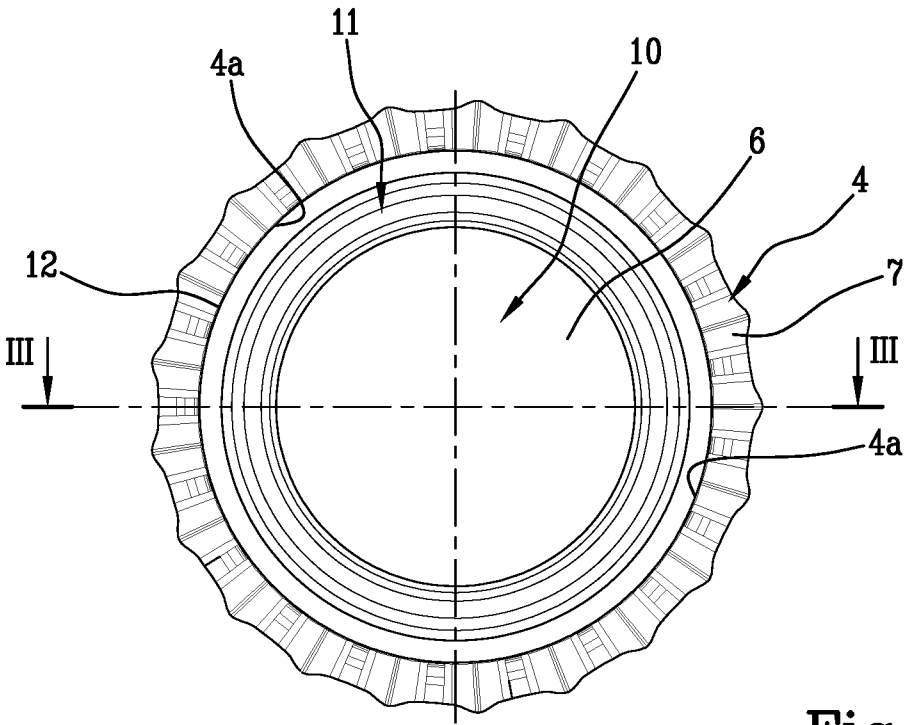
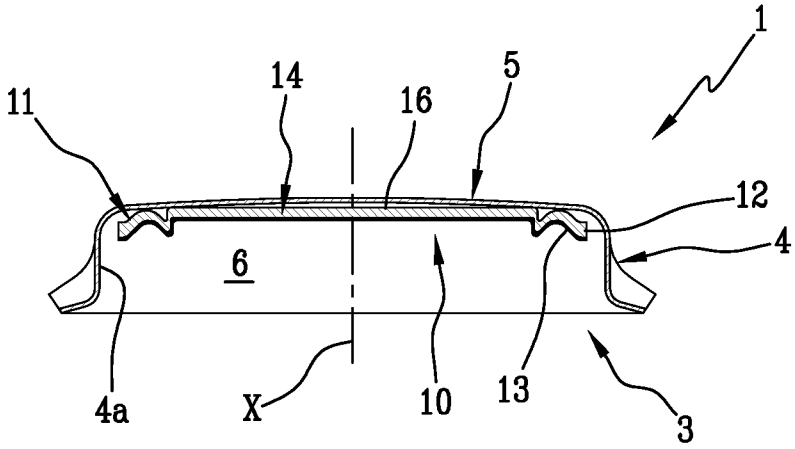


Fig.2

Fig.3



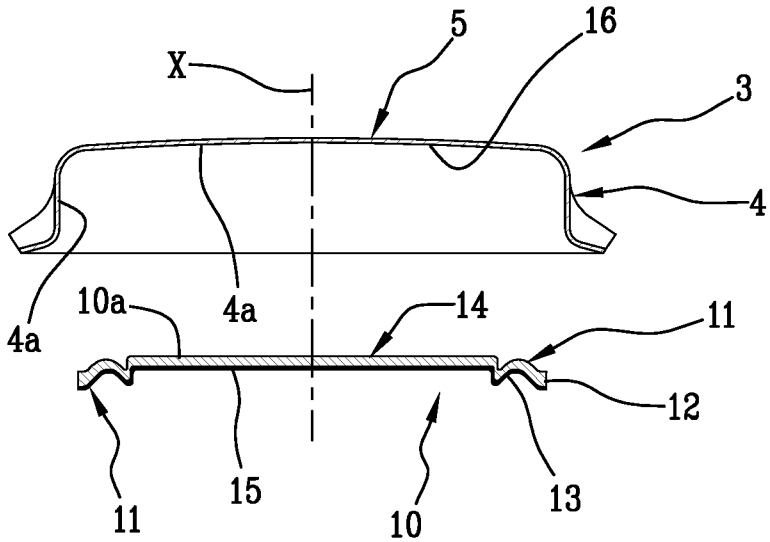
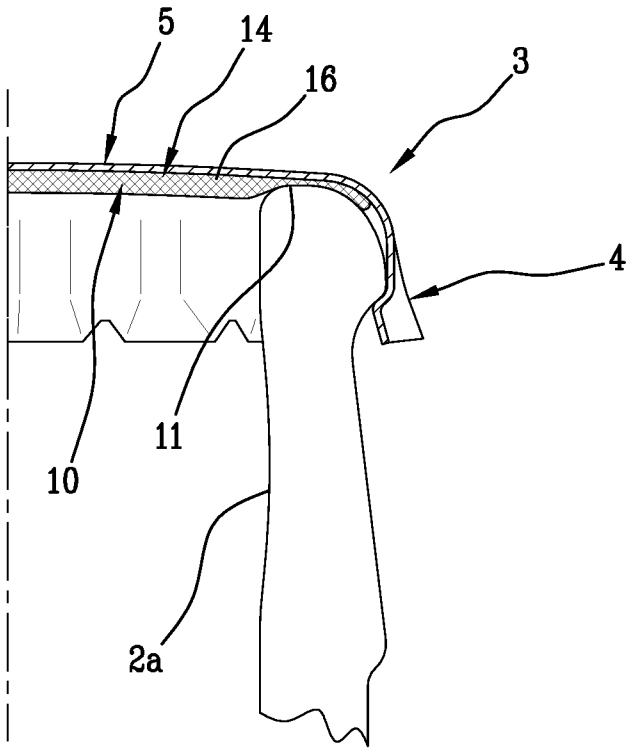


Fig.4

Fig.5A



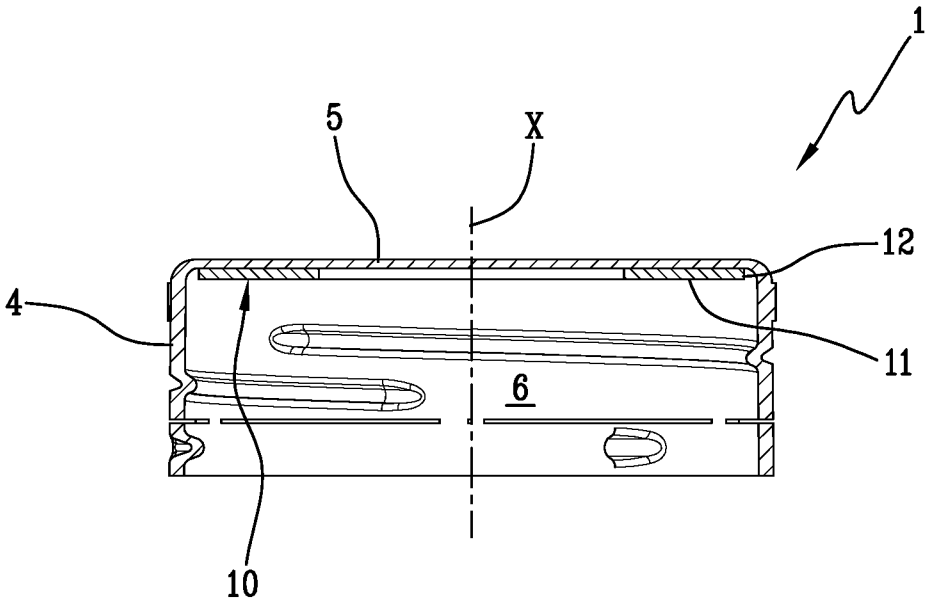
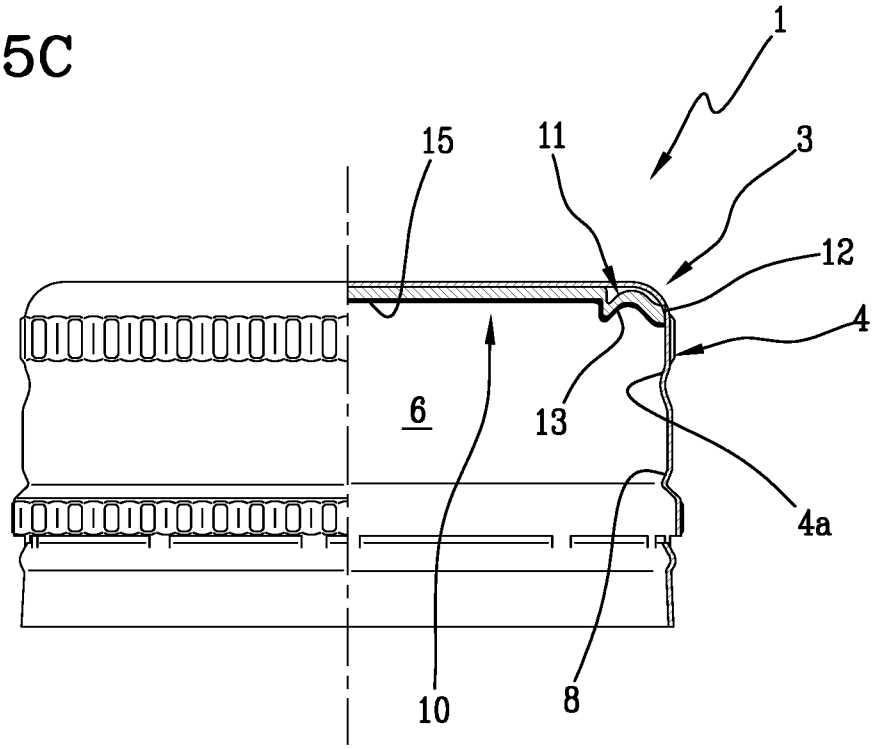


Fig.5B

Fig.5C



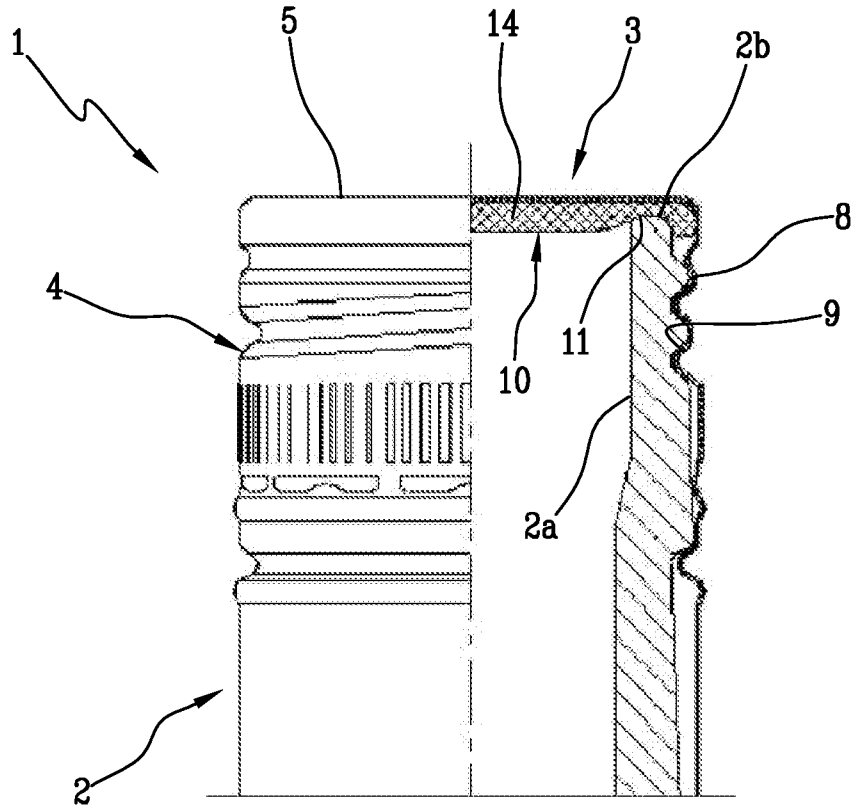
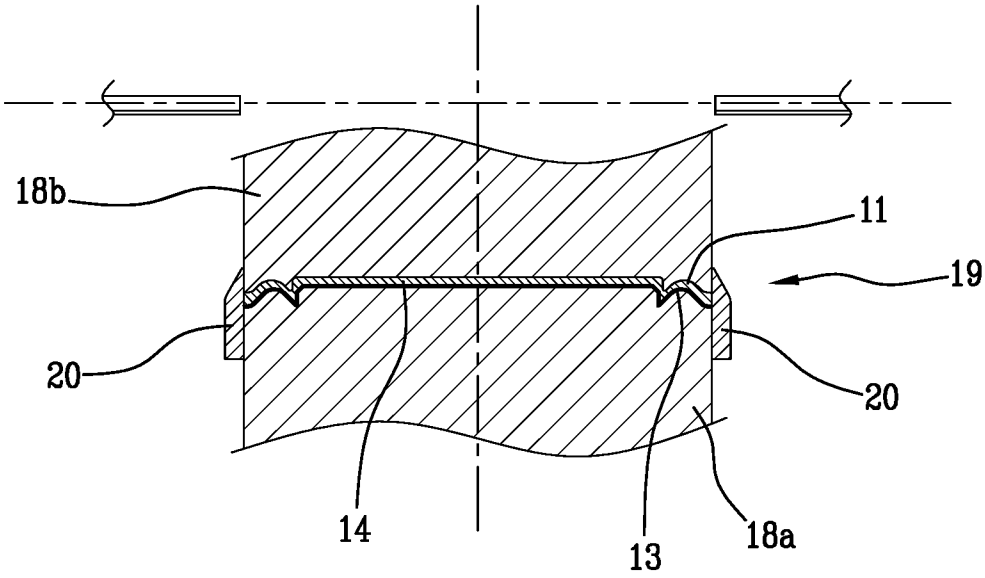


Fig.6

Fig.7A



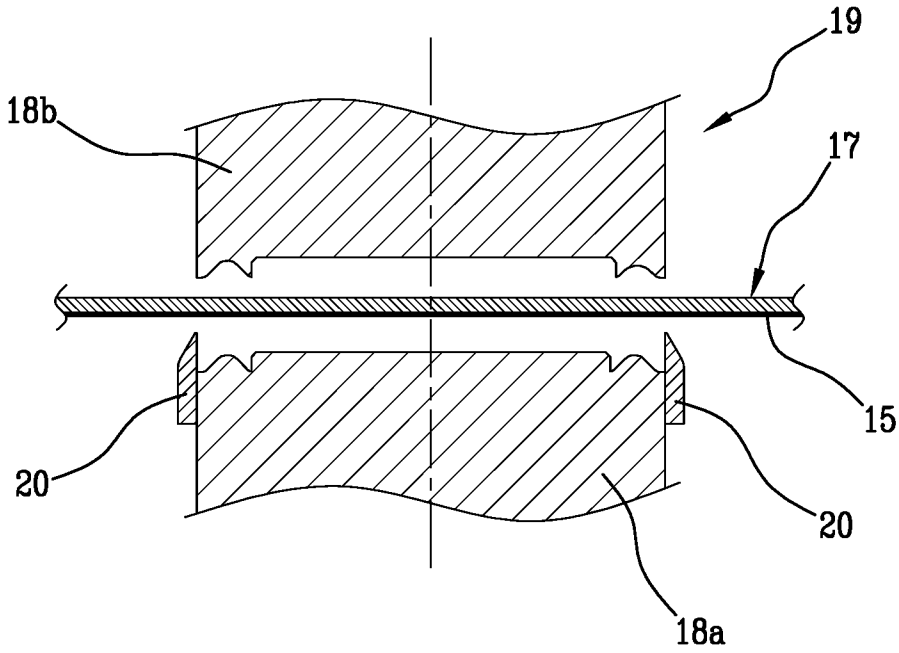


Fig.7B

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2023/051600

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D41/04 B65D41/12
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 Y A	US 2 404 741 A (FRIEDRICH OTTENSTEIN) 23 July 1946 (1946-07-23) figures 1-3 column 2, line 3 - line 8	1-8, 16-23 9 10-15,24
X	GB 481 034 A (CROWN CORK & SEAL CO) 4 March 1938 (1938-03-04) figures 1-3 claim 1	1-4
Y	US 1 806 425 A (TALIAFERRO THOMAS L) 19 May 1931 (1931-05-19) figure 3	9
A	US 1 956 481 A (WARTH ALBIN H) 24 April 1934 (1934-04-24) figures 1, 2 claim 1	1-24

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[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 May 2023	15/05/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sacepe, Nicolas

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2023/051600

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 220 907 A (HUNDT DONALD D ET AL) 30 November 1965 (1965-11-30) column 2, line 46 - line 66; figures 1, 2	1-24

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2023/051600

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		GB 429396 A	29-05-1935
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