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(54) **CAPSULE WITH A SEALING ELEMENT AND METHOD FOR PRODUCING SAID CAPSULE**

(57) The present invention refers to a capsule (1) adapted for containing an edible substance in sealed manner relative to oxygen and to be used in a beverage preparation device (10), whereby said capsule (1) presents a container part (2) and a sealing element (4) of annular shape provided as a loose piece, so that can be displaced along the side wall (22) and in the proximity of the upstream oriented surface of the rim region (24)

of said container part (2), whereby said sealing element (4) is adapted so that can be pressed against said upstream-oriented surface of said rim region (24) when said capsule (1) is inside a product preparation device (10) in a position of readiness for preparing the product.

The present invention further refers to a process of manufacturing a capsule (1) according to the present invention.

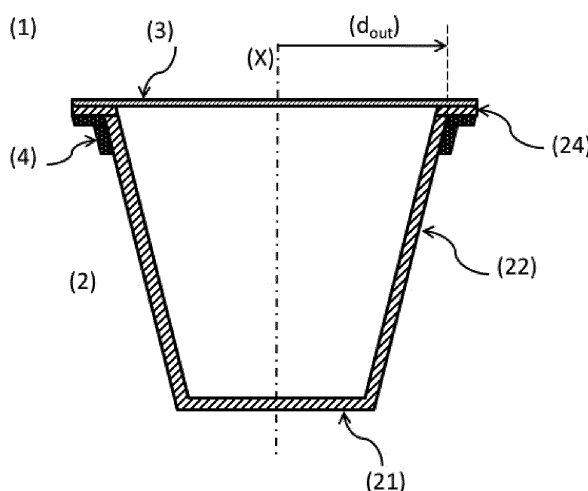


FIGURE 3

Description

Field of the invention

[0001] The present invention refers to the field of capsules for preparing edible products, in particular aromatic beverages such as for example espresso type coffee and similar.

[0002] The present invention further refers to a process for manufacturing capsules of the type of the present invention.

Background of the invention

[0003] The prior art includes different solutions of capsules of the type of the invention, adapted for preparing edible products.

[0004] Said capsules typically present an envelope that provides an oxygen barrier and confines an individual portion of edible substance, such as for example roasted ground coffee beans. Moreover, said capsules typically present a wall adapted for entry of an upstream pressurized flow, and a downstream wall adapted for exit of a resulting beverage

[0005] The document CH 605293 discloses a capsule of the type of the present invention presenting a container part configured in frusto-conic shape that provides an opening and a rim region that develops in the perimeter of said opening, and a lid part that can be united with a rim region of the container part.

[0006] One of the problems that have been addressed in this type of capsules is that of sealing of said rim region when submitted to the pressurized flow inside of a respective brewing device.

[0007] The documents EP 1654966 B1, EP 1816934 B1 and EP 1839543 B1 disclose solutions for a better sealing of the rim region of a capsule by sealing means.

[0008] The document EP 2012994 B1 discloses a solution whereby the sealing means are injection moulded over the external surface of the container part of capsule.

[0009] The documents EP 1849715 B1, EP 2029457 B1 disclose solutions for providing a better connection of the sealing element to the container part of capsule.

[0010] The document EP 2289820 B1 refers the possibility of the sealing means being provided as an integral piece or a piece separate from the container part of capsule, and further, in the previous case, as a piece mounted in releasable manner or as a piece attached to the rim region, for example by means of a welding technique or of an adhesive. This document neither discloses nor advances any suggestion on how to provide a simple retention of sealing means on the capsule.

[0011] There is therefore the need for a solution of retention of sealing means in the container part of capsule, of simple construction and adapted so that can be actuated in effective and reliable manner when necessary.

General description of the invention

[0012] The objective of the present invention is to provide a capsule for preparing edible products, such as espresso coffee and similar beverages, said capsule comprising a container part and a lid part and providing a more effective sealing disposition of the rim region, ensuring a fluid-tight arrangement of this particular region when impinged by a pressurized fluid flow, with a simpler construction and less use of materials and energy, in particular by means of a simpler and more reliable retention of the sealing means on the container part of capsule.

[0013] The capsule is adapted so that can be operated by a beverage preparation apparatus, in particular confined inside of a product preparation device, such as an extraction device, by means of closure of confining parts of extraction device and so that can be crossed by a pressurized liquid flow along a prevailing flow direction.

[0014] The objective above is solved according to the present invention by means of a capsule according to claim 1, whereby preferred embodiments are described in the dependent claims.

[0015] In particular, the present invention discloses a capsule that presents sealing means provided as a single and separate piece presenting a first portion and a second portion of general ring-like shape, whereby the first portion is configured to sit on the upstream-oriented side of the rim region of container part, and the second portion extends in a collar-like design upstream from the first portion and is adapted so that can be retained under pressurized fitting on the sidewall of the of the container part in the vicinity of the rim region, such that provides retention of the first portion in direct contact with the rim region.

[0016] The first portion is thereby adapted so that can be impinged by one of the capsule confining parts of said product preparation device being thereby pushed relative to the side wall of container part and pressed upon the rim region thereof when the capsule is inside of a respective product preparation device and the latter is at a product preparation position.

[0017] In particular, said capsule is adapted for preparing beverages such as for example aromatic beverages including espresso coffee and similar, by means of a pressurized flow that flows through a portion of edible substance collected inside of said capsule.

[0018] The container part of said capsule is provided in a material that provides oxygen barrier, such as known in prior art, including in aluminium or aluminium alloy, and in plastic or in a plastic composite.

[0019] The capsule disclosed by the present invention is particularly adapted for containing an individual portion of aromatic edible substance, such as for example roasted ground coffee, tea, or similar, and presents capsule walls disposed in direct opposition and adapted for injection of a pressurized fluid flow upstream, and discharge of resulting aromatic beverage downstream.

[0020] A related objective of the present invention is to provide a process for manufacturing of capsules, in

particular of a capsule according to the present invention.

[0021] The objective above is solved according to the present invention by means of a manufacturing process according to claim 13.

Description of the figures

[0022] The present invention shall hereinafter be explained in greater detail based upon preferred embodiments and the attached Figures.

[0023] The Figures show, in simplified schematic representations:

Figure 1: side cut-view of a capsule (1) of the type of the present invention, according to prior art;

Figure 2: side cut-view of a capsule (1) of the type of the present invention, according to prior art, inside of a product preparation device (10);

Figure 3: side cut-view of a capsule (1) according to the present invention;

Figure 4: bottom view of a capsule (1) according to the present invention;

Figure 5: top view of an embodiment of a sealing element (4) according to the present invention;

Figure 6: side cut-view of an embodiment of a sealing element (4) according to the present invention;

Figure 7: side-cut view of a first embodiment of a sealing element (4) according to the present invention;

Figure 8: side-cut view of a second embodiment of a sealing element (4) according to the present invention;

Figure 9: side cut-view of a first moment of a manufacturing process of capsule (1) according to the invention;

Figure 10: side cut-view of a second moment of a manufacturing process of capsule (1) according to the invention;

Figure 11: side-cut view of a first moment of a beverage preparation process with a capsule (1) according to the invention;

Figure 12: side-cut view of a second moment of a beverage preparation process with a capsule

(1) according to the invention.

Description of preferred embodiments of the invention

[0024] It is known in the prior art to configure capsules (1) for preparing edible products such as espresso coffee and other aromatic beverages, so that can be operated in fluid tight manner, including by means of impingement with a pressurized fluid flow, inside of product preparation devices (10), such as espresso coffee brewing devices.

[0025] A capsule (1) of the type of the present invention (see **Figure 1**) comprises a container part (2), configured for example in generally frusto-conic shape, presenting a base wall (21) upstream, and a sidewall (22) that defines an opening (23) downstream, and further presenting a rim region (24) that extends sideways along the perimeter of said opening (23). The capsule (1) further comprises a lid part (3) configured as membrane or folio-like element, and adapted so that can be united with the downstream-oriented surface of said rim region (24).

[0026] It is further known in the prior art to provide a sealing element (4) configured in annular shape and provided in the upstream-oriented face of said rim region (24) so that can be compressed by an upstream confining part (11) of said product preparation device (10) when in a position of readiness to operate (see **Figure 2**).

[0027] Said sealing element (4) is typically provided next to the upstream-oriented surface of said rim region (24). According to prior art, said sealing element (4) can be provided in the same material as said container part (2), or in a different material.

[0028] As represented in **Figures 3 and 4**, the capsule (1) according to the present invention presents a sealing element (4) of annular shape provided as a separate piece, and comprising a first sealing portion (41) next to the rim region (24) and a second sealing portion (42) extending at an angle in respect of the first portion (41) and adapted so that can be retained by means of a pressurized fitting on the sidewall (22) in the vicinity of the rim region (24) and thereby also retain the first sealing portion (41) in position, that is in extensive surface contact with the upstream-oriented surface of the rim region (24).

[0029] The capsule (1), in particular the container part (2), does not present any retention means for retaining the sealing element (4) in position, such as any external variation of the geometric shape thereof or other.

[0030] The first sealing portion (41) is adapted so that can be pressed, by an upstream confining part (11) of said product preparation device (10), against said upstream-oriented surface of said rim region (24) when said capsule (1) is inside of a product preparation device (10) in a position of readiness for preparing the product, for example an aromatic beverage such as espresso coffee.

[0031] The second sealing portion (42) is adapted so that can provide for retention by means of pressurized fitting on the region of sidewall (22) in the vicinity of the

rim region (24) such that the first sealing portion (41) is retained in contact herewith.

[0032] The sealing element (4), and at least the second sealing portion (42) can be provided in a synthetic material and with a characteristic free internal dimension smaller than the characteristic outside dimension of the region of sidewall (22) in the vicinity of the rim region (24), such that the sealing element (4) is retained by means of inwards elastic tension.

[0033] **Figures 5 and 6** show an embodiment of a sealing element (4) in a capsule (1) according to the present invention.

[0034] The sealing element (4) presents a first sealing portion (41) of ring-like shape and adapted so that can be pressed directly against the upstream-oriented surface of said rim region (24), and a second sealing portion (42) extending in a collar-like arrangement upstream from an inner perimeter region of said first sealing portion (41), thereby forming a transition angle (α 1) with respect to said first sealing portion (41), whereby said transition angle (α 1) is comprised between 2° and 10° , preferentially between 4° and 8° , relative to a direction parallel to the central symmetry axis (X).

[0035] **Figures 7 and 8** show two different embodiments of the sealing element (4) in a capsule (1) according to the invention, whereby these embodiments basically differ in the shape of the cross-section, as seen sideways, of the second sealing portion (42).

[0036] In fact, a first embodiment presents a second sealing portion (42) with a constant wall thickness (21).

[0037] It has been experimentally determined as very advantageous when the free edge of the second sealing portion (42) is tampered relative to the region of transition to the first sealing portion (41).

[0038] Therefore, in the case of the second embodiment, the second sealing portion (42) presents two parts each with a different wall thickness (t_{21} , t_{22}).

[0039] The sealing element (4) is applied to the container part (2) factory-side such that the sealing element (4) is already in position when the capsule (1) is inserted into the product preparation device (10), such as an extraction device in a beverage preparation apparatus.

[0040] The sealing element (4) is generally designed so that can be inserted along the sidewall (22), with the second sealing portion (42) oriented upstream to the base wall (21) of the container part (2), and sit with the first sealing portion (41) upon the upstream-oriented surface of said rim region (24).

[0041] In particular, as depicted in **Figures 9 to 10**, in a first moment of the process of assembling the sealing element (4) factory-side to the container part (2), the sealing element (4) can be placed on a tubular part such that sits on the edges thereof by the first sealing portion (41).

[0042] Then, in a second moment, the container part (2) can be inserted through the opening of the sealing element (4) and pressed hereupon, such that the first sealing portion (41) sits tightly upon the rim region (24) and the second sealing portion (42) is fitted under pres-

sure on the region of the sidewall (22) next to the rim region (24), thereby reliably retaining the sealing element (4) in position.

Claims

1. Capsule for preparing an edible product, adapted so that can confine gas-sealed a portion of edible substance and be confined liquid-sealed inside a product preparation device (10) such that can be crossed by a pressurized fluid in a prevailing flow direction and besides enclosed in a liquid-sealed manner, said capsule (1) comprising:

- a container part (2) configured in a generally frusto-conic shape rotationally symmetric in respect of a central symmetry axis (X), presenting a base wall (21) arranged upstream and a sidewall (22) that defines an opening (23) arranged downstream, and further presenting a rim region (24) that develops sideways along the perimeter of said opening (23),
- a lid part (3) configured as a membrane or folio-like element, and adapted so that can be united with said rim region (24) on a downstream-side in respect of the prevailing flow direction, and
- a sealing element (4) provided as a separate and piece adapted so that can be pressed against the upstream-oriented surface of rim region (24) when said capsule (1) is in operative condition inside of said product preparation device (10),

said capsule (1) being **characterized**

in that said sealing element (4) presents first and second sealing portions (41, 42) whereby the first (41) is adapted so that can be pressed upon the upstream-oriented surface of said rim region (24), so that can provide fluid sealing along thereof, and whereby the second (42) is adapted so that can be retained under pressurized fitting against the exterior side of said sidewall (22) next to the rim region (24), so that can keep the first region (41) in contact with said rim region (24) and provide additional fluid sealing extension along the vicinity region of the sidewall (22).

2. Capsule according to claim 1, **characterized**

in that said sealing element (4) presents a first and second sealing portions (41, 42) in a materially continuous design that configures an angled surface oriented to the transition region between sidewall (22) and rim region (24), said angled surface presenting a transition shape and a transition angle that is similar to the transition shape and transition angle between sidewall

(22) and rim region (24) such that the sealing element (4) can sit directly on the transition region between sidewall (22) and rim region (24), and

in that said sealing element (4) presents a first sealing portion (41) that sits with all of its downstream-oriented surface upon at least most of, preferentially all, the upstream-oriented side of the rim region (24), and a second sealing portion (42) that is adapted so that exerts pressure upon the outside surface of sidewall (22), at least in the vicinity region of said rim region (24) .

3. Capsule according to claim 2, **characterized**

in that said sealing element (4) presents a first sealing portion (41) of ring-like shape and adapted so that can be pressed directly against the upstream-oriented surface of said rim region (24), and a second sealing portion (42) extending in a collar-like arrangement upstream from an inner perimeter region of said first sealing portion (41), thereby forming a transition angle (alpha 1) with respect to said first sealing portion (41), whereby said transition angle (alpha 1) is comprised between 2° and 10°, preferentially between 4° and 8°, relative to a direction parallel to the central symmetry axis (X).

4. Capsule according to claims 1 to 3, **characterized**

in that said sealing element (4) is adapted such that said second portion (42) exerts an inwards-oriented tension upon said sidewall (22), in respect of said reference axis (X), whereby said inwards-oriented tension is generated by at least one of: the elastic properties of the material and the relative smaller characteristic diameter of at least part of said second sealing portion (42) in relation to the characteristic outside diameter of the sidewall (22) in the vicinity of the rim region (24).

5. Capsule according to any of previous claims 1 to 4, **characterized**

in that said first sealing portion (41) presents a region with first wall thickness (t_1) that extends over at least most of, preferentially the entire, extension of first sealing portion (41) such that covers at least most, preferentially the entire rim region (24), and whereby said first wall thickness (t_1) is at least similar, preferentially bigger than the wall thickness (t_2) of the second sealing portion (42), and

in that said second sealing portion (42) presents at least two regions of different wall thickness (t_{21} , t_{22}), whereby a first region of bigger wall thickness (t_{21}) includes the transition to the first sealing portion (41) and a second region of smaller wall thickness (t_{22}) includes the free edge of said second sealing portion (42) such

that a bigger elastic tension inward can be exerted upon the sidewall (22) by the first region of bigger wall thickness (t_{21}).

6. Capsule according to any of previous claims 1 to 5, **characterized**

in that in a condition of sealing element (4) not arranged on the container part (2), said first and second sealing portions (41, 42) define a transition region with a first inner diameter (d_1) that is similar to, preferentially smaller by a previously defined margin tolerance than, the outside diameter (d_{out}) of the transition region between outside surface of sidewall (22) and rim region (24), whereby the first inner diameter (d_1) is comprised between 27 and 30 mm, preferentially between 28 and 29 mm.

7. Capsule according to any of previous claims 1 to 6, **characterized**

in that said sealing portion (4) has a second sealing portion (42) presenting a first wall region with a first wall thickness (t_{21}) that is similar to, or at least 70% of, the wall thickness (t_1) of the first sealing portion (41), whereby the wall thickness (t_1) of the first sealing portion (41) is comprised between 0,5 and 1 mm, preferentially between 0,6 and 0,9 mm, and

in that said sealing portion (4) has a total height comprised between 2 mm and 5 mm, preferentially between 3 mm and 4 mm.

8. Capsule according to any of previous claims 1 to 7, **characterized**

in that said sealing portion (4) has a second sealing portion (42) presenting a second wall thickness (t_{22}) associated with the free edge thereof, whereby it is preferred when said first and second wall thickness (t_{21} , t_{22}) are reconciled by means of tampered angling the exterior surface of the part with said second sealing wall thickness (t_{22}) by an angle comprised between 10° and 20°, preferentially between 13 and 17° relative to the exterior surface of said first sealing wall thickness (t_{21}).

9. Capsule according to any of previous claims 1 to 8, **characterized**

in that said second sealing portion (42) presents a free edge that is tampered, in terms of a reduction of the first wall thickness (t_{21}) next to the wall thickness (t_1) of the first sealing portion (41), and

in that said second sealing portion (42) presents a free edge that is only tampered in a region thereof that does configure the transition to the first sealing portion (41) .

10. Capsule according to any one of previous claims, **characterized in that** said first and second sealing portions (41, 42) are provided as a single piece and present at least one of: a different average wall thickness and a different shape of side-cut section. 5
11. Capsule according to any one of previous claims, **characterized in that** said first sealing portion (41) presents a wall thickness (t_1) comprised between 0,3 and 1,2 mm, preferentially between 0,5 and 1,00 mm, more preferentially between 0,6 and 0,9 mm. 10
12. Capsule according to any one of previous claims, **characterized in that** said sealing element (4) is provided in a material that provides a stable and substantially rigid contact surface, and 20
in that said sealing element (4) is provided in a different material, or in a similar material of different composition, then said container part (2), preferentially in a plastic material. 25
13. Process for manufacturing a capsule for preparing beverages, in particular a capsule (1), whereby said process successively comprises the steps: 30
- producing a plurality of sealing elements (4) with an annular shape and comprising a first portion (41) and a second portion (42) as a collar in respect of the first portion (41), 30
 - providing said sealing elements (4) to receptacles (20) of generally tubular shape such that they are arranged on a rim portion thereof, 35
 - providing container parts (2), to the interior of said receptacles (20) such that they are pressed against said sealing elements (4);
 - filling said container parts (2) with an edible substance, such as for example roasted and ground coffee; 40
 - providing lid parts (3) so that seal the container parts (2). 45
14. Process according to claim 13, characterized **characterized in that** said production of sealing elements (4) includes the steps of: 50
- injection moulding of a plurality of sealing elements (4) in a strip-like material support such that the second sealing portion (42) projects therefrom; 50
 - cutting-out from the strip-like material support along the shape of first sealing portion (41) thereby obtaining individual sealing elements (4) separated from the excessive material support. 55
15. Process according to claim 13 or 14, characterized **characterized in that** said step of injection moulding simultaneously provides the second sealing portion (42) of said sealing element (41).

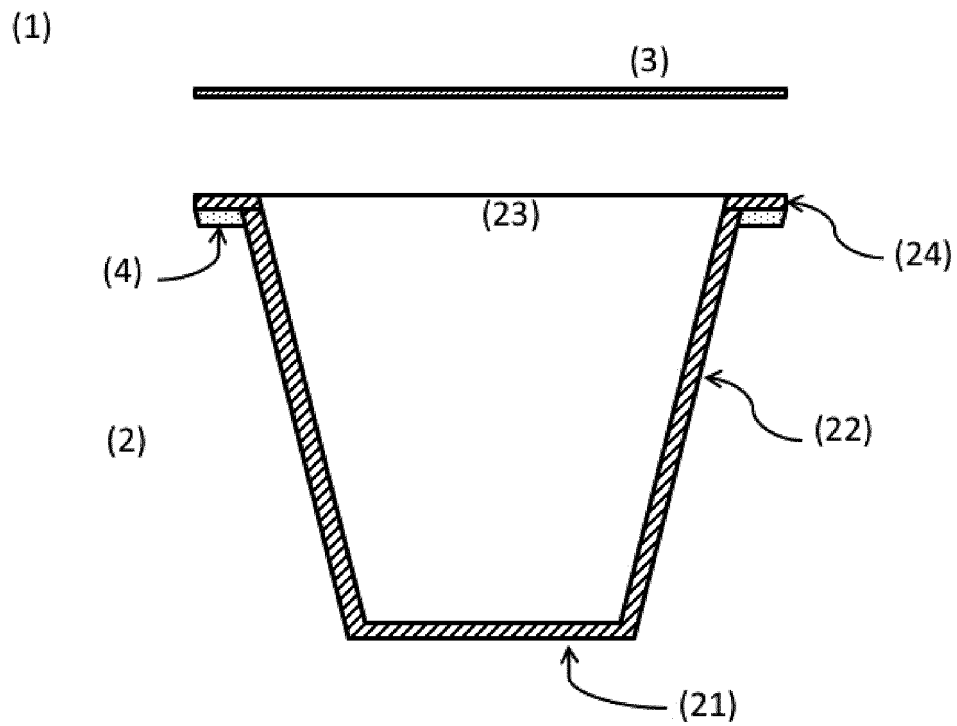


FIGURE 1

PRIOR ART

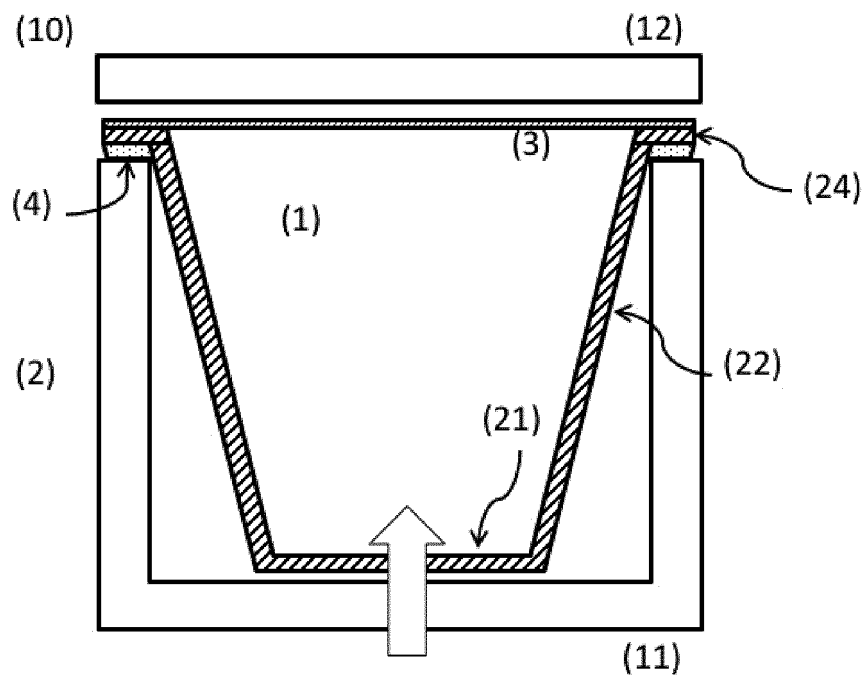


FIGURE 2

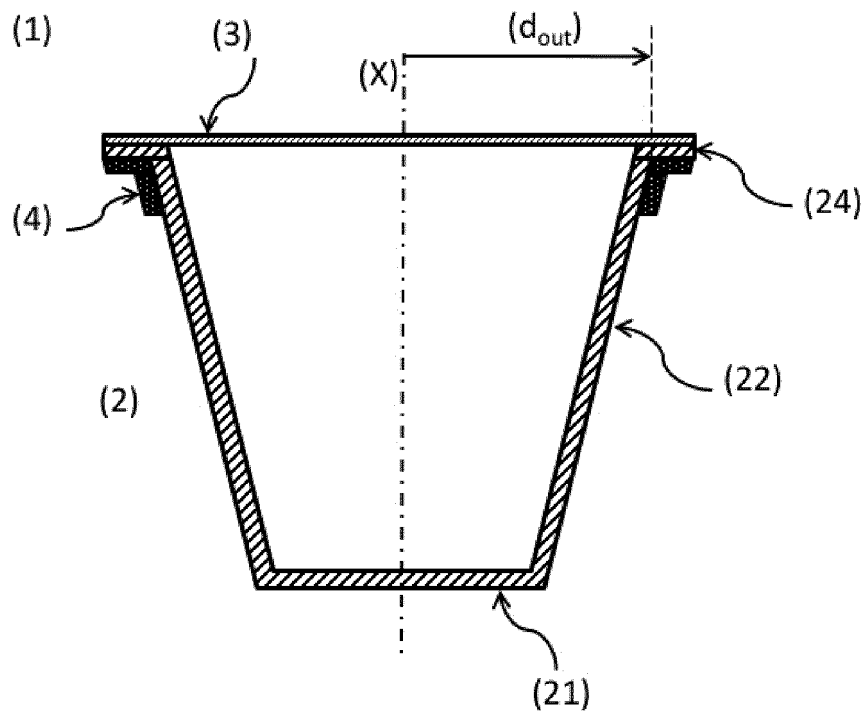


FIGURE 3

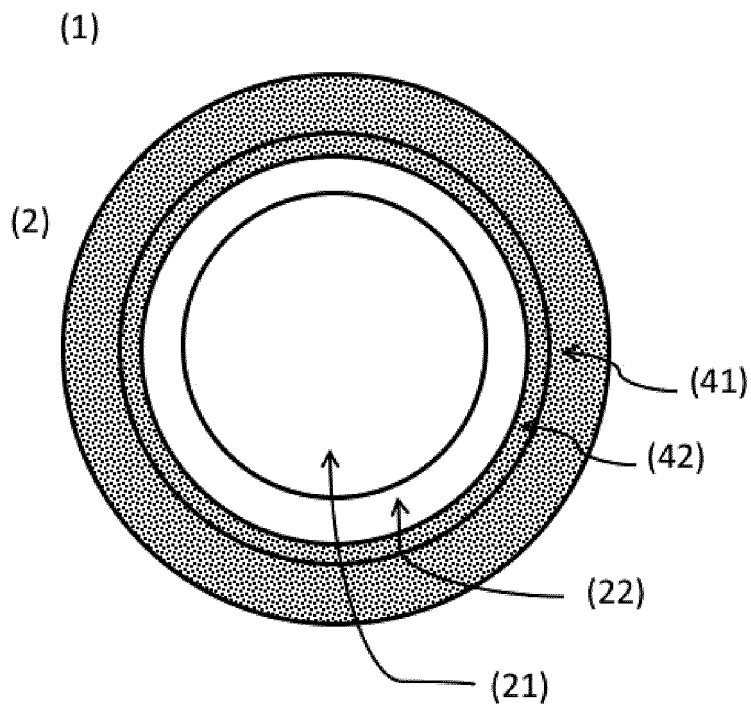


FIGURE 4

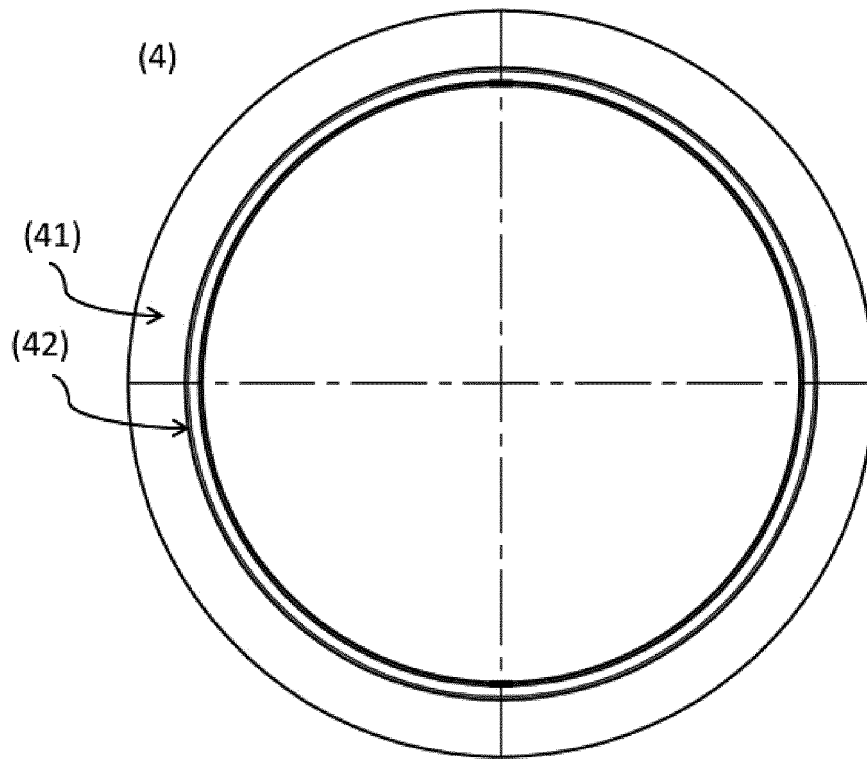


FIGURE 5

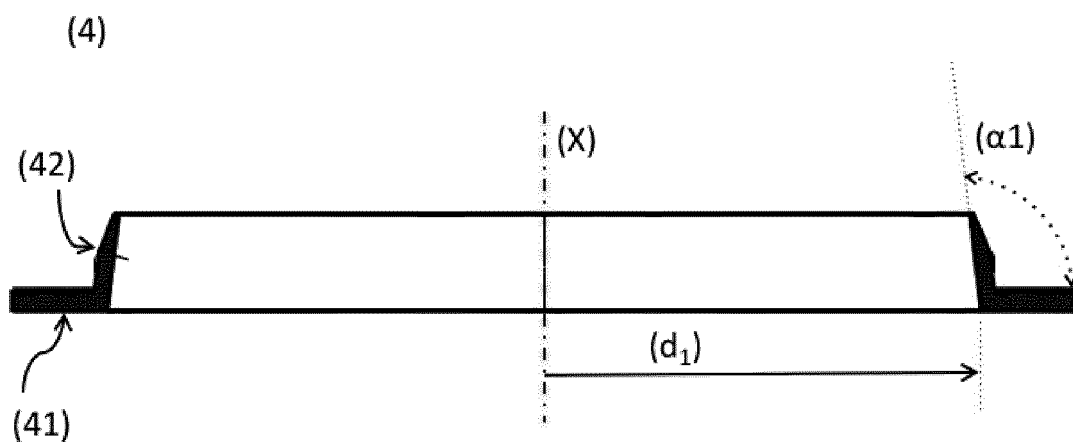


FIGURE 6

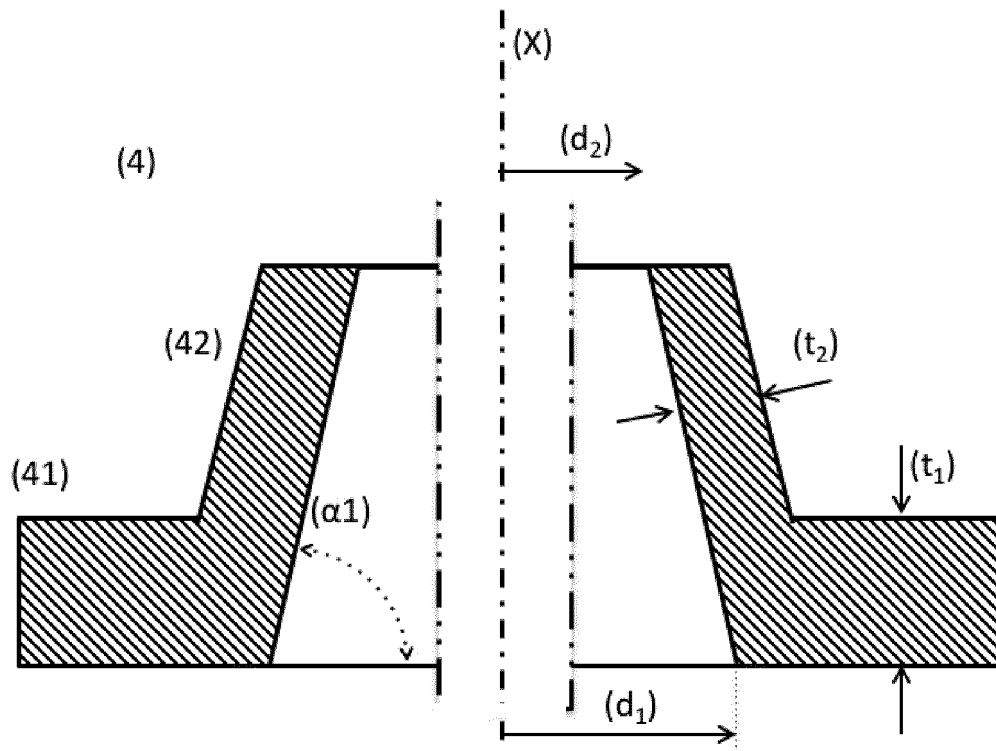


FIGURE 7

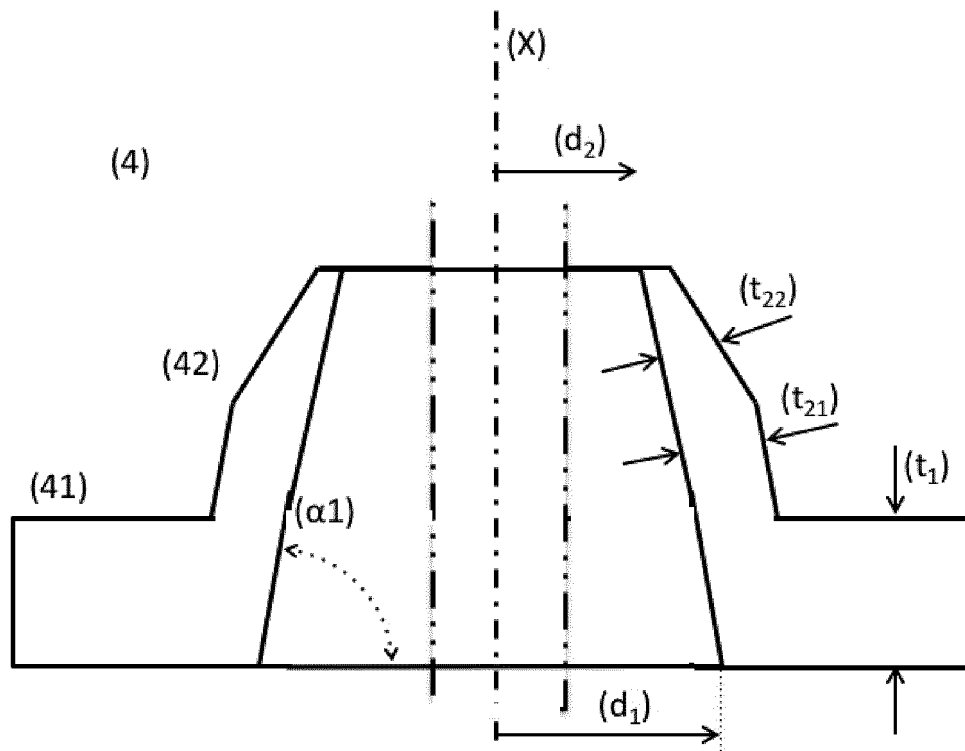


FIGURE 8

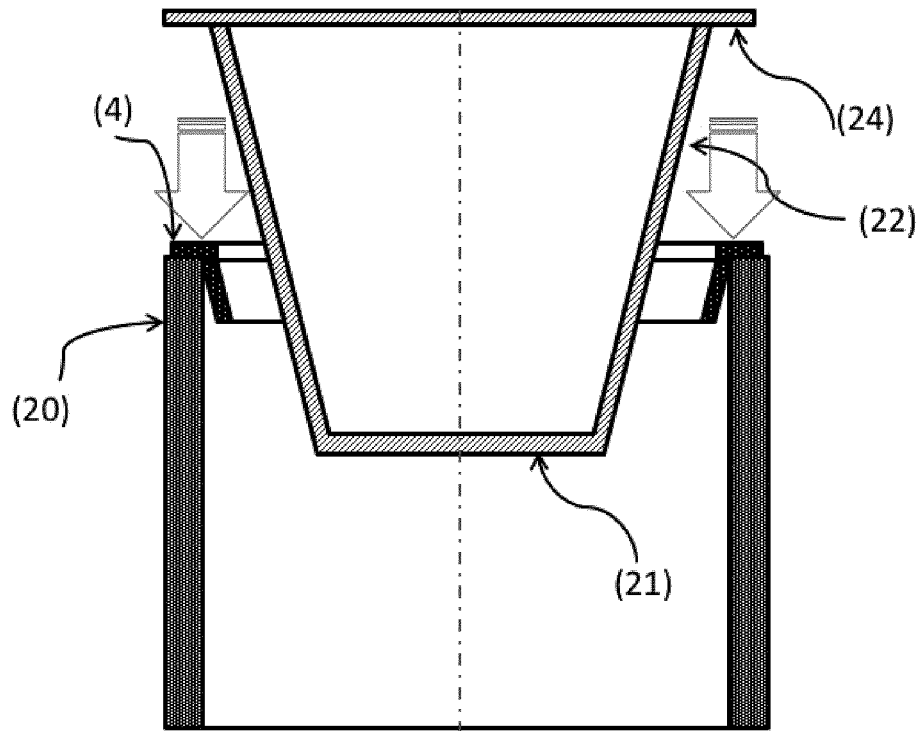


FIGURE 9

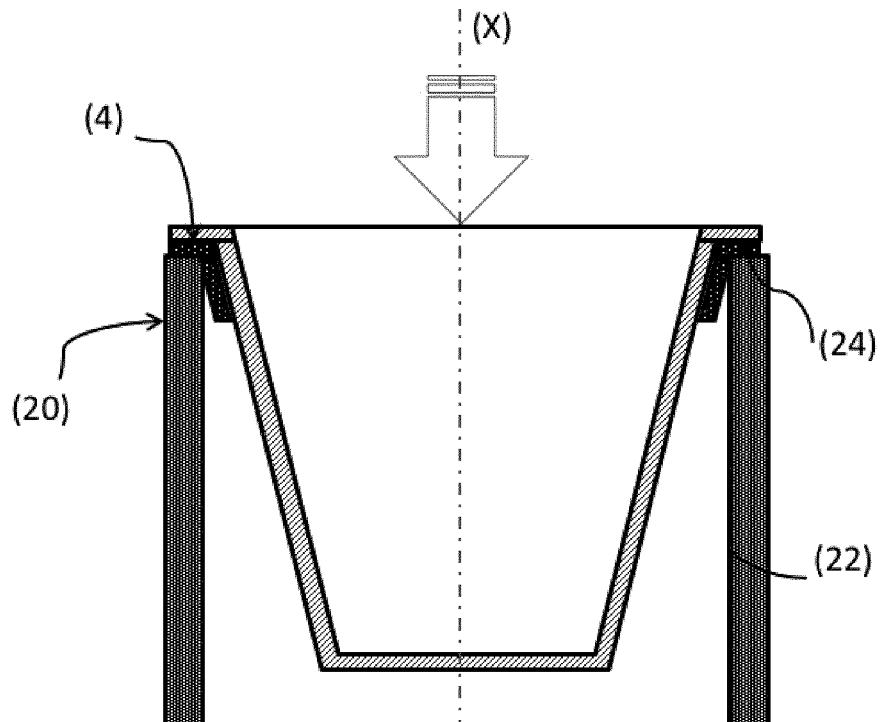


FIGURE 10

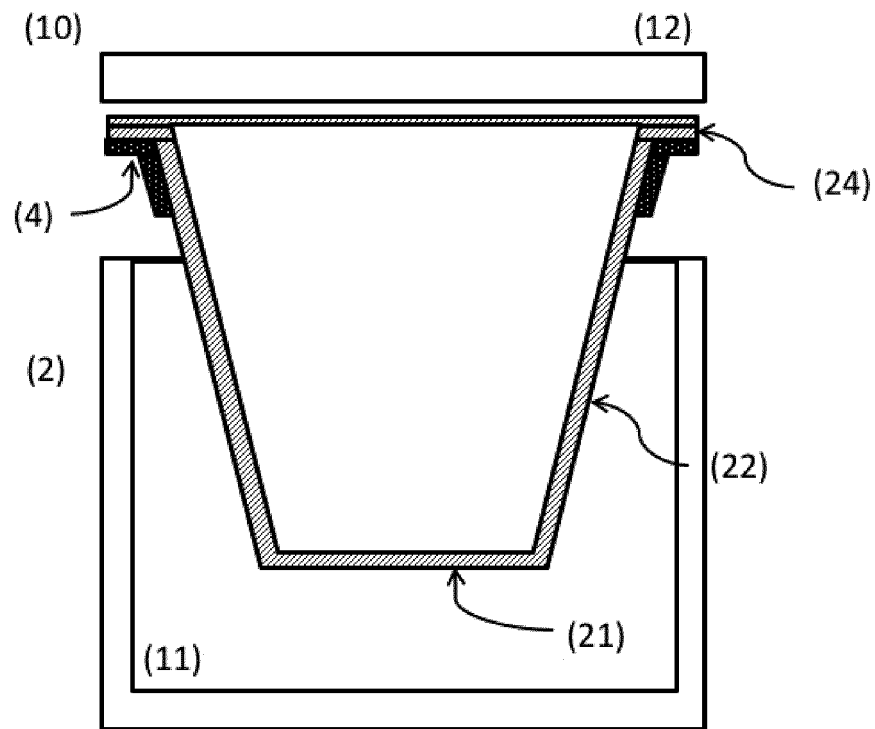


FIGURE 11

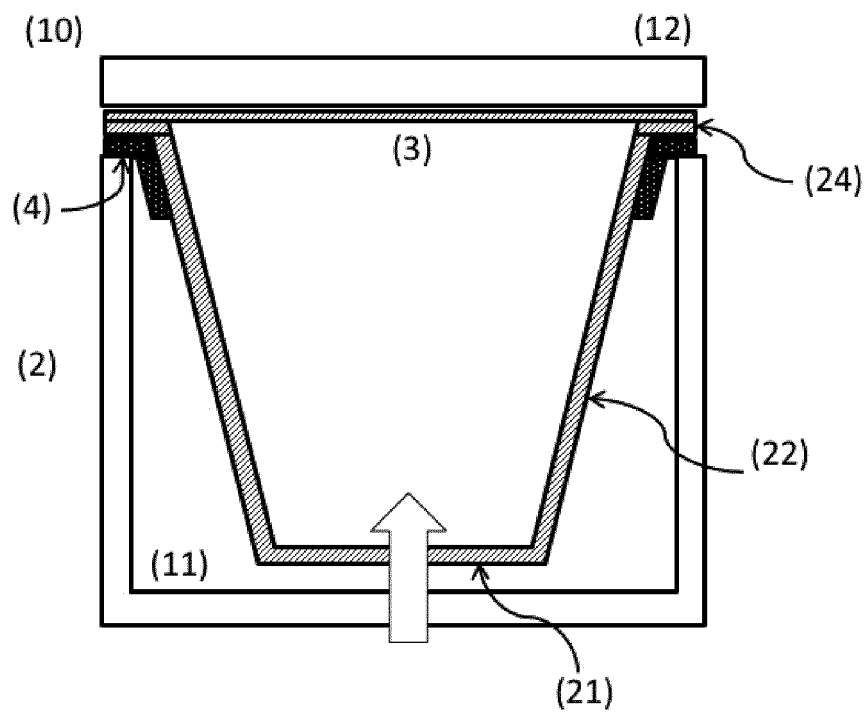


FIGURE 12

INTERNATIONAL SEARCH REPORT

International application No

PCT/PT2020/050053

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D85/804
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	EP 1 849 715 A1 (NESTEC SA [CH]) 31 October 2007 (2007-10-31) cited in the application claims 1-12; figure 7 -----	1-15
X	WO 2018/211147 A1 (K FEE SYSTEM GMBH [DE]) 22 November 2018 (2018-11-22) claims 1-19; figure 1 -----	1-15
X	EP 3 575 241 A1 (GALVAO & NORONHA LDA [PT]) 4 December 2019 (2019-12-04) claims 1-14; figures 2-4 -----	1-15
X	WO 2019/081363 A1 (NESTEC SA [CH]) 2 May 2019 (2019-05-02) figures 15,17 -----	1-15
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

11 May 2021

Date of mailing of the international search report

26/05/2021

Name and mailing address of the ISA/

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Brochado Garganta, M

INTERNATIONAL SEARCH REPORT

International application No

PCT/PT2020/050053

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2010/128844 A1 (SARA LEE DE NV [NL]; KAMERBEEK RALF [NL] ET AL.) 11 November 2010 (2010-11-11) figure 10 -----	1-15

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/PT2020/050053

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