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(72) Inventors:
• **CARVALHO, Agostinho Miguel Quitério Garcia**
2400-842 Leiria (PT)
• **CARAMELO, Daniel Freire Falcão Teles**
1700-141 Lisboa (PT)
• **JOSUÉ, Sónia Raquel Da Silva Gomes**
2410-128 Leiria (PT)

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(74) Representative: **Couto, Cláudia**
Clarke, Modet Portugal
Av. Casal Ribeiro, 50 - 3^o Dto.
1000-093 Lisboa (PT)

(71) Applicant: **WEADD, LDA**
2430-028 Marinha Grande (PT)

(54) **CAPSULE FOR PREPARATION OF BEVERAGES**

(57) The present invention relates to a capsule (1) for a soluble edible product comprising a closed container (2), which contains a hollow interior containing an individual dose of a soluble edible product, the container (2) being delimited by a side wall (21), a water inlet cover element (22) and an edible product outlet cover element

(23), wherein said water inlet cover element (22) comprises a recess (3), which comprises a through hole (4), wherein the surface of the recess (3) facing the interior of the container (2) is coated, at least partially, by a microfilm (5) that covers said through hole (4).

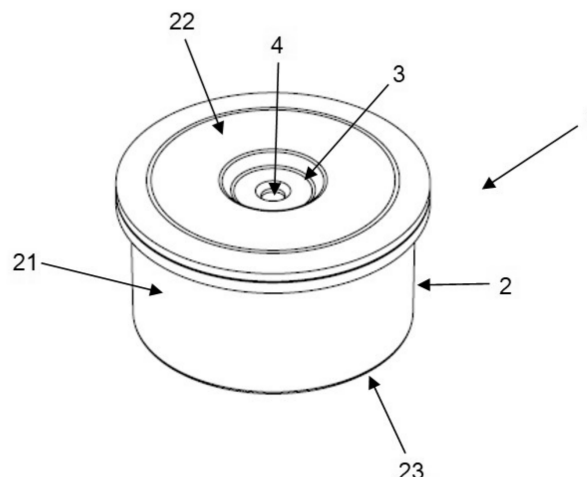


FIG. 1

Description

FIELD OF INVENTION

[0001] The present invention relates to the field of single-use capsules for preparing soluble edible products, such as espresso coffee, tea or other solubles.

BACKGROUND OF THE INVENTION

[0002] The state of the art includes several solutions relating to single-use capsules for preparing edible products, such as espresso coffee, tea and other solubles.

[0003] Capsules consist of small containers that contain the edible product, used in compatible machines and that allow the quick preparation of the edible product. In general, the capsule comprises two elements: a base cup and a lid. The base cup has a bottom that is either fully closed or pre-perforated, in either case being perforated by the punches of the edible product machine where the capsule is placed. The cup's mouth of the capsules has a peripheral flap that then serves as a surface for gluing the lid, which generally consists of a plastic lid, aluminium foil, filter paper or micro-perforated plastic.

[0004] The capsules used in edible product machines, after being placed in the machine, are perforated on both sides by a mechanized system of punches, wherein some are perforated when closing the lid of the machine compartment where the capsule is placed and others are perforated by a punching mechanism that is incorporated into the machine and is driven by an electrical system, which ensures the water's pumping and heating.

[0005] There are also capsule coffee machines that work with the aid of a lever that opens an extraction group made up of a container where the capsule is housed after it's insertion into the machine and a sealing lid that breaks or opens the capsule and introduces hot water to it. Once filled and under the effect of high pressure, the capsule opens and releases the water mixture that passes through the edible substance to the outside of the machine. At the end, the capsule is expelled by repeating the opening movement of the lever.

[0006] In the state of the art, there are different types of capsules made up of numerous shapes and materials (paper, plastic and metal - aluminium), whereby they obtain different compositions that influence their performance in preserving the edible product. The use of various types of materials in the production of capsules, in addition to making capsule production more expensive, creates problems with the collection, separation and selection of waste products, especially when the capsules are collected for recycling, which is why, sometimes, it is more customary to place it in the common trash. Many currently existing capsules are not recyclable or are difficult to recycle. Currently, aluminium is the best material for the production of capsules, as it ensures more effective maintenance of the properties of edible products and also has the advantage of being "infinitely

recyclable", being quickly put into a new cycle of production, and it is a very light material. However, this material presents rigidity and resistance characteristics very different from those of plastic, which may bring some disadvantages in terms of its plastic deformation, when applied to the part of the lid that is subjected to opening by the machine.

[0007] Currently existing coffee capsules have accustomed consumers to drinking coffee quickly, hygienically and with high quality, however, the material that makes up the capsule: plastic or metal, combined with the organic matter of the coffee inside, makes the recycling process very complex and difficult to implement. One of the main concerns of coffee brands today is the development and presentation of solutions that reduce the ecological footprint caused by the consumption of capsules.

[0008] There are coffee capsules on the market that present great difficulty in being recycled, both because they use two aggregated materials: plastic and aluminium, and because of the way the lid and container are welded together, making access to the organic matter contained inside practically impossible. Currently, there are already some solutions in the state of the art that meet a more eco-responsible and sustainable approach, using recyclable materials and limiting the amount of material used in the manufacture of capsules.

[0009] Another difficulty that currently also exists in edible product capsules resides in the fact that they present very demanding mechanical performance for coffee machines, as their opening depends on the rupture of a plastic "door" at one of the tops of the cylinder through the application of a force that, over continued use, damages the sealing behaviour required to the machine's extraction groups.

[0010] Document PT 109815B discloses a capsule that has a configuration that optimizes the positioning and perforation of the capsule, through its circular lid-type constructive element, which is adapted to provide a flow inlet passageway into the interior of the constructive element in the form of a container type. The passageway has a region of weakened material that is adapted so that it ruptures under a certain flow pressure. It is also mentioned the existence of a projection element that exerts a lever-type mechanical force on the region of weakened material. In this case, the circular cap-type constructive element that undergoes the perforation is made of plastic material.

[0011] In turn, the document PT 107043B presents a capsule comprising a part of the lid that can present at least one facilitated rupture formation to the entry of water. The lid has at least one break formation facilitated to the entry of an infusion water into the container. The container, the lid, the base and the piercing element are made of plastic while the protective element is an aluminium plate. The perforation of the capsule lid is not of a mechanical type, but only of a hydraulic type.

[0012] Finally, the document PT 2139791 discloses a single-use retention capsule of an aromatic essence to

produce an infusion comprising a container with a cover and a perforated base covered externally with a protective element, and a perforating element present on the inner face of the said protection element, which acts by the fluid pressure created inside the capsule container, allowing the infusion to exit. The flat cover has at least one groove to facilitate the infusion water inside the container. It is also mentioned that the container, the cover, the base and the piercing element are made of plastic, being that only the protection element is an aluminium plate. In this case, the cover perforation is hydraulic.

[0013] The solutions disclosed in the state of the art are mainly aimed at optimizing capsules to obtain a more efficient and precise opening by the machine, since an incorrect opening can negatively influence the obtaining of an ideal infusion, as well as causing detachment of materials, which contaminate the infusion, as well as the unwanted exit of edible product from the capsule.

[0014] However, none of the state of the art solutions address the problem of capsules presenting a very demanding mechanical performance for coffee machines, which throughout their continued use damages the sealing behaviour required To the machine's extraction groups.

[0015] Therefore, there is a need in the art for capsules for soluble edible product machines, with characteristics that allow correct rupture and passage of water and consequent extraction of edible product, also providing an effective opening when used in the compatible machine, without requiring a very demanding mechanical performance for coffee machines, allowing them to have superior durability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Following is a detailed description of the invention with reference to the attached drawings, wherein:

Fig. 1 represents the perspective view of the capsule (1) wherein the water inlet cover element (22) comprises a recess (3), which in turn comprises a through hole (4).

Fig. 2 shows the perspective view of the capsule (1) wherein the soluble edible product outlet cover element (23) comprises through openings (6).

Fig. 3 represents the view of the water inlet cover element (22), which comprises a recess (3) and this comprises a through hole (4).

Fig. 4 shows the view of the edible product outlet cover element (23) of the capsule (1) which comprises through openings (6).

Fig. 5 shows the sectional view of the capsule (1) wherein the side wall (21), the water inlet cover element (22) and the edible product outlet cover

element (23) define the inner surface (7) of the container (2) and wherein the through hole (4) of the water inlet cover element (22) is covered by a microfilm (5).

Fig. 6 represents the perspective sectional view of the capsule (1).

Fig. 7 represents the exploded sectional view of an embodiment of the capsule (1) which comprises an external structure (8) made of porous material that is laminated with the microfilm (5) of a biopolymer.

Fig. 8 shows the exploded sectional view of the embodiment of the capsule (1) wherein the closed container (2), delimited by a side wall (21), a water inlet cover element (22) and a edible product outlet cover element (23), comprises a porous material laminated with a biopolymer microfilm (5).

SUMMARY OF THE INVENTION

[0017] The present invention relates to a capsule (1) for a soluble edible product comprising a closed container (2), which contains a hollow interior (24) containing an individual dose of a soluble edible product, the container (2) being delimited by a side wall (21), a water inlet cover element (22) and an edible product outlet cover element (23), wherein the side wall (21), the water inlet cover element (22) and the edible product outlet cover element (23) define an inner surface (7) of the container (2), wherein said water inlet cover element (22) comprises a recess (3), which comprises a through hole (4), wherein a surface (31) of the recess (3) facing the interior (24) of the container (2) is coated, at least partially, by a microfilm (5) that covers said through hole (4).

[0018] In one aspect of the present invention, the inner surface (7) of the container is partially or completely coated with a microfilm (5).

[0019] In another aspect, the capsule (1) comprises a material selected from the group comprising plastic, aluminium, polymeric material, cellulosic material or composites and combinations thereof.

[0020] In a further aspect of the invention, the capsule (1) comprises a porous material.

[0021] In another aspect, said porous material is a cellulosic material.

[0022] In a further aspect, the cellulosic material is cellulosic pulp, for example paper pulp.

[0023] In another aspect of the invention, the microfilm (5) is selected from the group comprising poly(lactic acid) (PLA), polyhydroxybutyrate (PHB) and polyhydroxybutyrate-co-polyhydroxyhexanoate (PHBHx).

[0024] In another further aspect, the edible product outlet cover element (23) comprises through openings (6).

[0025] In one aspect, the through openings (6) are coated with said microfilm (5).

[0026] In a further aspect, the side wall (21) is heat-welded or ultrasonically welded to the water inlet cover element (22).

[0027] The capsule (1) of the present invention is suitable for preparing soluble edible products in soluble edible product machines.

[0028] In one aspect of the invention, the capsule (1) is suitable for preparing espresso coffee, tea or other soluble edible products.

DETAILED DESCRIPTION OF THE INVENTION

[0029] The capsule (1) of the present invention is designed for use in soluble edible product machines, such as espresso coffee, tea or other soluble products, wherein the opening of the capsule is made in its water inlet cover element (22), whether it is located at the top or bottom of the capsule (1).

[0030] The aim of the present invention is to provide a single-use capsule for espresso coffee, tea or other soluble coffee machines, adaptable to any machine on the market, wherein the opening for water to enter the capsule results from the interaction of water pressure (around 15 bar) that the machine exerts on a microfilm (5) present in the water inlet cover element (22), allowing it to break for the passage of water and, consequently, the extraction of edible product. This breakage of the microfilm (5) present in the water inlet cover element (22) is also achieved due to the presence of a second material surrounding the microfilm (5), which will support and serve as counterpressure to the deformation of the microfilm when the water pressure is exerted. This second material can be any one selected from plastic, metal, cellulosic material, polymeric material or composites and combinations thereof.

[0031] For this purpose, the present invention provides a capsule (1) for a soluble edible product comprising a closed container (2), which contains a hollow interior (24) containing an individual dose of a soluble edible product, the container (2) being delimited by a side wall (21), a water inlet cover element (22) and an edible product outlet cover element (23), wherein the side wall (21), the water inlet cover element (22) and the edible product outlet cover element (23) define an inner surface (7) of the container (2), wherein said water inlet cover element (22) comprises a recess (3), which comprises a through hole (4), wherein the surface (31) of the recess (3) facing the interior (24) of the container (2) is coated, at least partially, by a microfilm (5) that covers said through hole (4).

[0032] Within the scope of the present invention, the terms "water inlet cover element" and "edible product outlet cover element" should be understood as being elements that close the side wall at the top and bottom, in any order, that is, the "water inlet cover element" can close the side wall at the top or bottom and the "edible product outlet cover element" can close the side wall at the top or bottom. These two covering elements and the

side wall thus define a hollow internal cavity of the container, which is essential to the container so that it can contain an individual dose of an edible product.

[0033] According to the present invention, "inner surface of the recess" is understood to mean the face of the recess that lies on the inner surface of the container together with the inner faces of the side wall and the water inlet and outlet cover elements of edible product.

[0034] Within the scope of the present invention, "microfilm" is understood to be a film of a biopolymer whose thickness is comprised in the range of 1-200 μm and the biopolymer can be selected from the group comprising poly(lactic acid) (PLA), polyhydroxybutyrate (PHB) and polyhydroxybutyrate-co-polyhydroxyhexanoate (PHBHx).

[0035] According to the present invention, "recess" is understood to mean an element that is recessed relative to the outer face of the water inlet cover element, as shown in Fig. 5.

[0036] Within the scope of the present invention, "porous material" is understood to be any material that contains pores (empty or hollow), which are filled with a fluid (liquid or gas). Examples of porous materials include: plasterboard, untreated wood, cement and bricks, paper, cardboard, etc.

[0037] Within the context of the present description, the term "comprising" should be understood as "including, among others". As such, said term should not be interpreted as "consisting only of".

[0038] Note that any X value presented in the course of this description should be interpreted as an approximate value of the true X value, since such an approximation to the true value would be reasonably expected by the person skilled in the art due to experimental and/or measurement conditions that introduce deviations from the true value. Therefore, for example, reference to "80%" means a value of "about 80%".

[0039] Unless otherwise stated, the value ranges presented in this description are intended to provide a simplified, technically accepted way to indicate each individual value within the respective range. By way of example, the expression "15% to 25%" or "between 15% and 25%" means any value within this range, for example 15%; 16%; 17%; 18%; 19%; 20%; 21%; 22%; 23%; 24%; 25%; or others, for example including a decimal place.

[0040] In an embodiment of the present invention, said surface (31) of the recess (3) facing the interior (24) of the container (2) is coated, at least partially, by a microfilm (5) that covers said through hole (4). The function of the microfilm (5) is to create a barrier between the soluble edible product contained inside the capsule (1) and the air from the outside environment, allowing the soluble edible product to be preserved, maintaining its quality and validity for more than 12 months. The microfilm (5) comprises a biopolymer film whose thickness is in the range of 1-200 μm . The biopolymer can be selected from the group comprising poly(lactic acid) (PLA), polyhydroxybutyrate (PHB) and polyhydroxybutyrate-co-polyhy-

droxyhexanoate (PHBHx).

[0041] In another embodiment of the present invention, the union of the side wall (21) with the water inlet cover element (22) is carried out by fitting and is subsequently thermo-welded or ultrasonically welded, any other method that allows easy opening of the capsule (1) of the invention can also be used.

[0042] In another embodiment of the present invention, the edible product outlet cover element (23) comprises through openings (6) that are coated, at least partially, by a microfilm (5), which covers said through openings (6) by the inner side of said container (2). This microfilm (5) is broken by the pressure of the water that is injected by the machine through the recess (3), in the water inlet cover element (22) of the capsule (1), and which causes the soluble edible product to come out by means of said through openings (6).

[0043] As previously mentioned, capsules of edible products, such as coffee capsules, have the advantage of allowing the consumer to drink the edible drink quickly, hygienically and with high quality, however, the material that constitutes the capsules that currently exist: plastic or metal, combined with the organic matter of the edible product inside, make the recycling process very complex and difficult to carry out. The development of solutions that reduce the ecological footprint caused by the consumption of capsules is one of the main concerns of edible product brands. In this sense, it is also the aim of the present invention to create sustainable edible product capsules, presenting a technical solution in terms of the materials that are used.

[0044] Thus, in another embodiment of the present invention, the capsule (1) of the invention comprises 100% compostable materials, wherein the material of the container (2), which is delimited by a side wall (21), a water inlet cover element (22) and an edible product outlet cover element (23), comprises a cellulosic pulp, for example paper pulp, laminated with a microfilm of a biopolymer. After use, these materials can be placed in unsorted waste or organic waste. Other sustainable cellulosic materials may be applied to the capsule (1) of the present invention, namely: paper, cardboard, cardboard, among others, or mixtures thereof.

[0045] In this embodiment of the capsule (1) of the present invention, the cellulosic paste constitutes an external structure (8) whose functions are to provide support, structure and protect the microfilm (5). This external structure (8) is internally laminated with a biopolymer microfilm, the microfilm (5), whose main function is to prevent contact of the edible product with air, both through the through hole (4), on the water inlet cover element (22), or the through openings (6), on the edible product outlet cover element (23), or through the cellulosic pulp itself, as it is a porous material.

[0046] Thus, with the new geometry of the water inlet cover element (22) and its opening mechanism, it is possible to ensure a correct functional performance of edible product extraction without the need for very de-

manding mechanical opening performance for coffee machines. coffee. In turn, the use of ecological, more sustainable and 100% compostable materials makes it possible to reduce the negative impact that plastics and aluminium currently have on consumers and the environment.

[0047] The new geometry of the water inlet cover element (22) of the capsule (1) is adaptable to any type of edible product capsule machine, since the capsule opening is carried out in the water inlet cover element (22) and this can be located in the upper or lower part of the capsule (1) and, therefore, the capsule (1) of the present invention can be used in edible product machines that open the capsule in the upper or lower part.

[0048] The geometry and weight of the capsule (1) of the present invention are compatible with the operation of edible product filling lines.

EXAMPLE

[0049] With reference to Fig. 1 to 8, the soluble edible product capsule (1) comprises a closed, hollow container (2) that contains an individual dose of a soluble edible product, which is delimited by a side wall (21), a water inlet cover element (22) and a edible product outlet cover element (23).

[0050] When in use, the capsule is placed in the capsule compartment of the soluble edible product preparation machine, for example, espresso machine. The capsule (1) is kept in said compartment and the opening element of the machine is activated, which will impact the recess area (3), but will not pierce the capsule (1) due to its geometry. The concentration of machine water pressure in the recess area (3) of the capsule (1) will cause the microfilm (5) located in the through hole (4) to rupture and thus allow water to enter the inside of the capsule (1).

[0051] The water is then mixed with the coffee powder present inside the capsule (1). The accumulation of pressure inside the capsule and, subsequently, the greater pressure on the microfilm (5) present in the through openings (6), generates the extraction of coffee. The microfilm (5) is ruptured and the coffee is released into the espresso receiving container. The resistance of the microfilm (5) until it ruptures, associated with the diameter of the holes in the through openings (6), will determine the coffee extraction time.

[0052] It is to be noted that although the present invention has been described with reference to its preferred embodiments, many modifications and alternatives can be made by one skilled in the art without departing from the scope of the invention, which is defined by the claims.

Claims

1. A capsule (1) for a soluble edible product comprising a closed container (2), which contains a hollow inter-

- ior (24) containing an individual dose of a soluble edible product, the container (2) being delimited by a side wall (21), a water inlet cover element (22) and an edible product outlet cover element (23), wherein the side wall (21), the water inlet cover element (22) and the edible product outlet cover element (23) define an inner surface (7) of the container (2), **characterized in that** said water inlet cover element (22) comprises a recess (3), which comprises a through hole (4), wherein a surface (31) of the recess (3) facing the interior (24) of the container (2) is coated, at least partially, by a microfilm (5) that covers said through hole (4).
2. The capsule (1) for a soluble edible product, according to claim 1, **characterized in that** the inner surface (7) of the container is partially or totally coated with a microfilm (5).
3. The capsule (1) for a soluble edible product, according to claims 1 and 2, **characterized in that** it comprises a material selected from the group comprising plastic, aluminium, polymeric material, cellulosic material or composites and combinations thereof.
4. The capsule (1) for a soluble edible product, according to claim 3, **characterized in that** it is made of porous material.
5. The capsule (1) for a soluble edible product, according to claim 4, **characterized in that** said porous material is cellulosic material.
6. The capsule (1) for a soluble edible product, according to claim 5, **characterized in that** the cellulosic material is paper pulp.
7. The capsule (1) for a soluble edible product, according to any one of claims 1 to 6, **characterized in that** the microfilm (5) is selected from the group comprising poly(lactic acid) (PLA), polyhydroxybutyrate (PHB) and polyhydroxybutyrate-co-polyhydroxyhexanoate (PHBHx).
8. The capsule (1) for a soluble edible product, according to any one of claims 1 to 7, **characterized in that** the edible product outlet cover element (23) comprises through openings (6).
9. The capsule (1) for a soluble edible product, according to claim 8, **characterized in that** the through openings (6) are coated with said microfilm (5).
10. The capsule (1) for a soluble edible product, according to any one of claims 1 to 9, **characterized in that** the side wall (21) is thermo-welded or ultrasonically welded to the water inlet cover element (22).
11. Use of the capsule (1) as claimed in claims 1 to 10, **characterized in that** it is for the preparation of soluble edible products in soluble edible product machines.
12. Use of the capsule (1), according to the previous claim, **characterized in that** it is for the preparation of espresso coffee, tea or other soluble edible products.

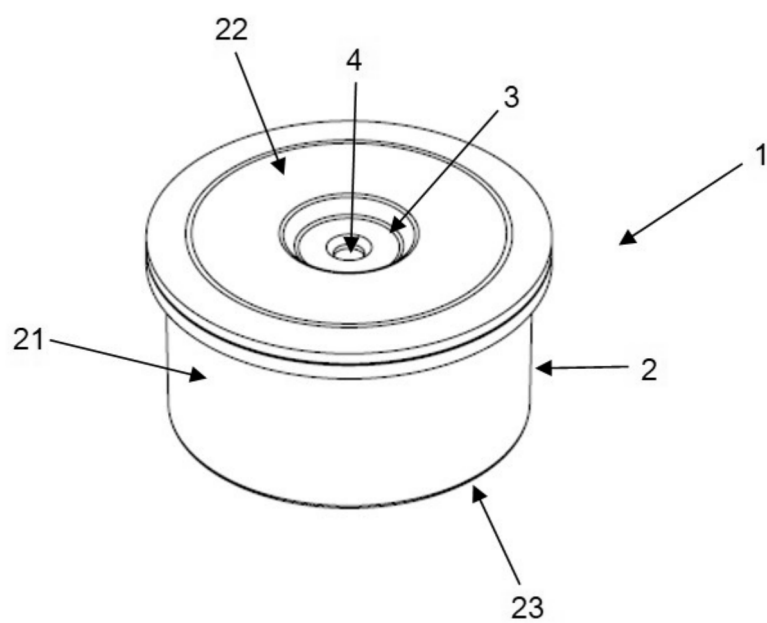


FIG. 1

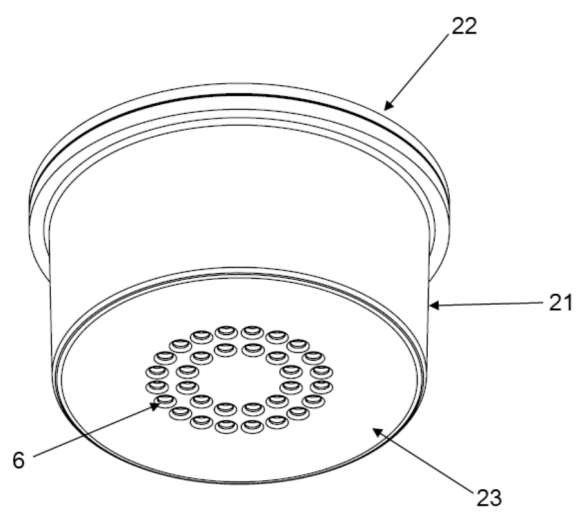


FIG. 2

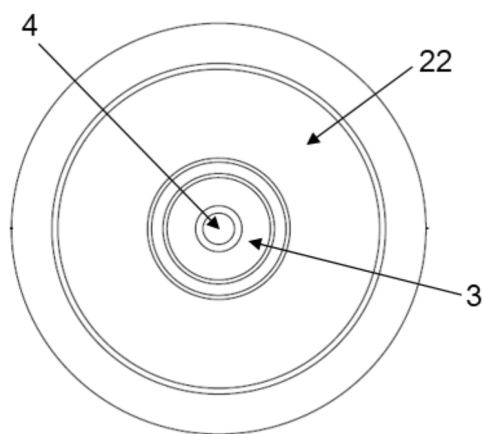


FIG. 3

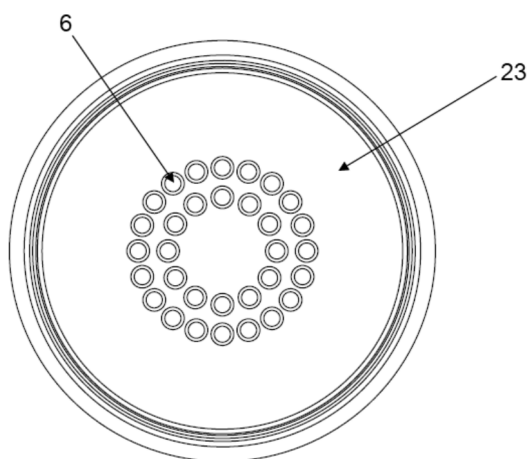


FIG. 4

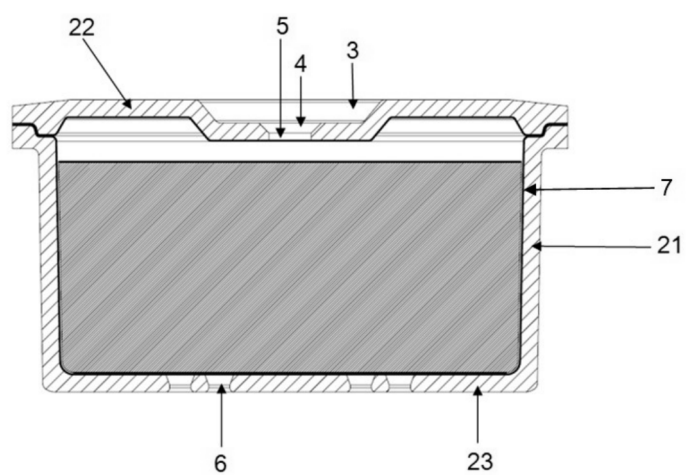


FIG. 5

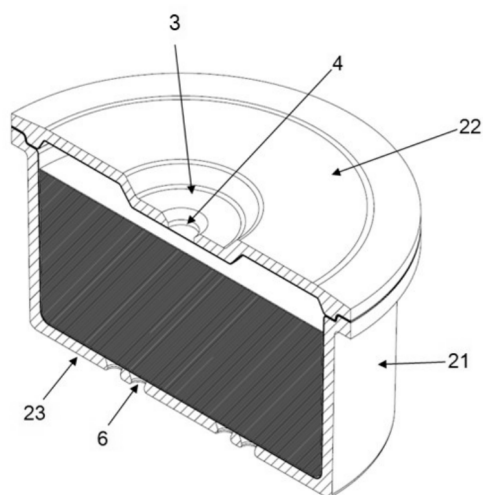


FIG. 6

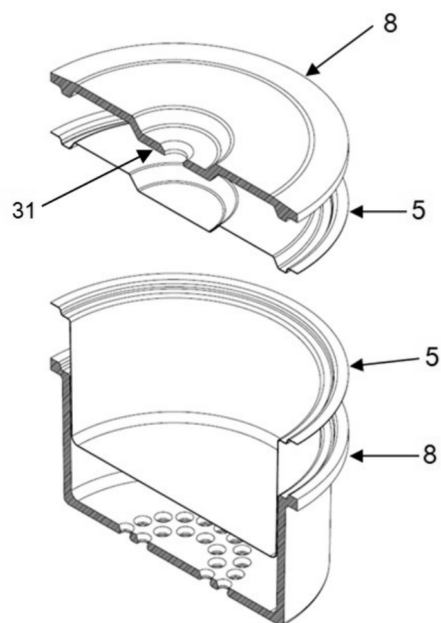


FIG. 7

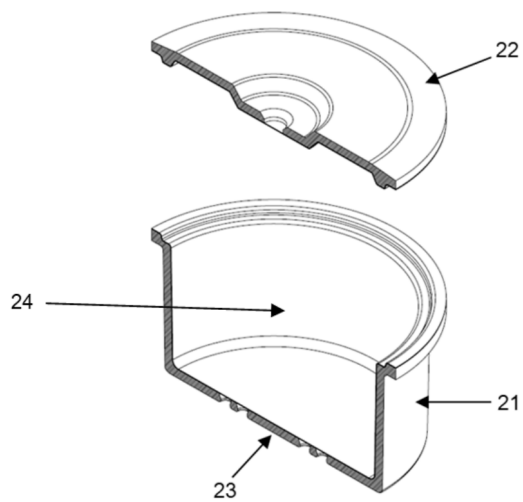


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- PT 109815 B [0010]
- PT 107043 B [0011]
- PT 2139791 [0012]