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# (54) CAPSULE FOR INFUSING A BEVERAGE

(57) The capsule for infusing a beverage comprises a structure in the form of a bowl (1) which includes a base (6), a lateral wall (9) and a mouth which is closed by a cover (3). A first objective of the invention is to reduce the amount of plastic material employed in the manufacture of the capsule; a second objective of the invention is to reduce the complexity of its manufacture; and a third objective of the invention is to achieve the opening of the capsule by means of the breaking of a laminar membrane (5) solely by means of an increase in the pressure of the liquid mixture within the capsule without physical contact of an additional element in order to break said laminar membrane (5) which separates a lower chamber from an upper chamber. All of the above enables an emulsion of the foodstuff (for example, coffee) with the formation of a long-lasting rich, abundant cream.

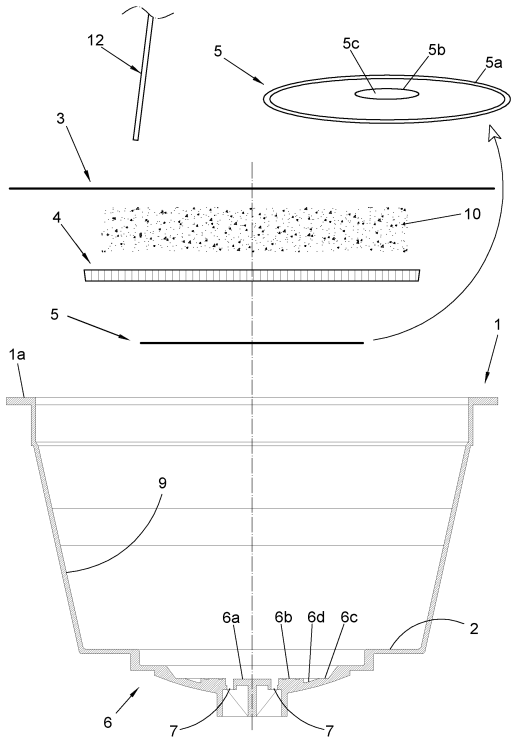


FIG. 1

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## Description

### Object of the invention

**[0001]** The capsule for infusing a beverage is configured to be inserted into a machine prepared to inject water into a cup structure, flooding the interior space of said cup structure, in order to finally obtain a liquid mixture formed by the infusion and the water; wherein said liquid mixture will come out through a lower outlet mouth. Starting from this premise, a first objective of the invention is to reduce the amount of plastic material used in the manufacture of the capsule; a second objective of the invention is to reduce the complexity of its manufacture; and a third objective of the invention is to achieve an opening of the capsule by means of the breaking of a laminar membrane solely by means of an increase in the pressure of the liquid mixture inside the capsule without physical contact of an additional element in order to break said laminar membrane. All of the above enables an emulsion of the food substance (for example, coffee) with the formation of a long-lasting rich, abundant cream.

### Technical problem to be resolved and background of the invention

**[0002]** At present, beverage preparation capsules are known wherein, after mixing a liquid with a food product such as teas and coffee, said mixture is filtered inside the capsule through a filtering surface.

**[0003]** Capsules for producing beverages are also known which comprise a filter with a filtering surface in the interior space thereof, through which the mixture passes before being extracted to the outside through a lower mouth of the capsule.

**[0004]** Due to the pressure reached inside the food beverage preparation capsule when a liquid is injected therein, the filter tends to destabilise and move internally due to the stresses to which said filter is subjected, which causes abnormal operation inside the capsule.

**[0005]** Another problem that occurs in known capsules is the formation of a crater in the volume of the food product housed inside the capsule when the liquid is injected into the capsule, such that the formation of said crater creates a channel through which part of the liquid is evacuated directly to the outlet mouth of the capsule with a poor mixture of the tea or coffee; the formation of said crater can even cause part of the food product to not be soaked by the liquid injected into the capsule.

**[0006]** Moreover, inside the capsules there is an upper chamber which contains the food product and a lower chamber which may or may not house a filter, such that in some cases both chambers are initially isolated from each other by means of a laminar membrane. In this situation, when water is introduced into the upper chamber, it soaks the food product and at the same time the pressure increases progressively, reaching a moment when the membrane breaks and then the liquid mixture of water and food product reaches the lower chamber, which communicates with an outlet hole through which the mixture is extracted for consumption thereof.

**[0007]** In most cases, the membrane is broken by means of physical contact between the membrane and a sharp element, such as in the patent with Spanish publication number ES 2260626 (EP 02000943), wherein with the increase in pressure inside the upper chamber of the capsule, the membrane moves and comes into contact with the sharp element.

**[0008]** In contrast, in the invention patent with publication No. ES 2555631, the laminar membrane breaks due to the increase in pressure inside the upper chamber of the capsule without requiring a sharp element that penetrates the laminar membrane. To do so, the laminar membrane includes specific incisions or notches which constitute weakened areas, and it is through where the membrane finally breaks when the pressure increases sufficiently.

**[0009]** The invention patent with Spanish publication number ES 2359284 T3 with priority of the European patent EP 07104813, refers to a capsule of ingredients for beverages which comprises a cup structure including an upper chamber and a lower chamber which are separated by a filter, such that when the pressure increases inside the upper chamber wherein the food substance is located, the liquid mixture (beverage) of water and the food substance passes into the lower chamber through a perimeter gap which is released as a consequence of the increase in pressure in the upper chamber, such that said perimeter gap is delimited between an internal side face of the cup structure and a perimeter part of the filter adjacent to said internal side face. The filter includes direct capillary holes which communicate directly between the upper chamber and the lower chamber.

**[0010]** The invention patent with application number in Spain P 201930359 relates to a capsule for infusing a beverage which is owned by the same holder as the invention at hand. It comprises a laminar membrane which separates an upper chamber and a lower chamber inside a capsule structure; wherein said laminar membrane includes a circumferential pre-slit facing an annular valley of a filter located inside the lower chamber of the capsule, such that when the pressure inside the upper chamber increases, the laminar membrane breaks along said circumferential pre-slit, the beverage moving from the upper chamber to the lower one travelling through two mazes of the filter, in order for the beverage to finally come out through an outlet mouth for the consumption thereof.

### Description of the invention

**[0011]** For the purpose of achieving the objectives and avoiding the drawbacks mentioned in the preceding sections, the invention proposes a capsule for infusing a beverage comprising a cup structure which includes a base, a lateral wall and a mouth which is closed by means of a cover; wherein said base includes a central area with

at least one outlet hole for the beverage.

**[0012]** The capsule of the invention further comprises a laminar membrane which separates a lower chamber from an upper chamber which is configured to house a food substance; wherein said laminar membrane includes a circumferential pre-slit; and wherein the upper chamber is delimited between a part of the lateral wall, the cover and the laminar membrane, while the lower chamber is delimited between the base and the laminar membrane.

**[0013]** The base of the cup structure comprises a first annular plateau which surrounds the central area, and a second annular plateau which surrounds a channel located around the first annular plateau; wherein said channel constitutes a valley which separates the first annular plateau and the second annular plateau; and wherein the circumferential pre-slit of the laminar membrane is facing the channel.

**[0014]** The laminar membrane is attached to a first surface of the first annular plateau of the base by means of a first welded attachment, which corresponds to a first internal part by way of a central disc of the laminar membrane; wherein an annular portion of said first internal part is welded to the first surface of the first annular plateau of the cup structure.

**[0015]** The laminar membrane is attached to a second surface of the second annular plateau of the base by means of a second continuous welded attachment which corresponds to a second end part of the laminar membrane welded to the second surface of the second annular plateau of the cup structure.

**[0016]** The lower chamber comprises the channel and a central cavity delimited between the central area of the base and a central part of the laminar membrane; wherein said channel and the central cavity communicate with each other through a maze located in the first annular plateau; and wherein the outlet hole communicates with said central cavity.

**[0017]** In one embodiment of the invention, the maze comprises a grooved structure located on the first structure of the first annular plateau of the base of the cup structure; wherein said grooved structure interrupts the continuity of said first surface on which the laminar membrane is attached by means of the first welded attachment.

**[0018]** Next, to help better understand this specification and as an integral part thereof, a series of figures is attached in which the object of the invention is depicted in an illustrative and non-limiting manner.

## Brief description of the figures

**[0019]**

**Figure 1** shows an exploded perspective view of the capsule for infusing a beverage, object of the invention. It basically comprises a cup structure, a laminar membrane located inside the cup structure, and a concentric maze located on the base itself of the structure in the form of a cup.

**Figure 2** shows a cross-sectional view of the cup structure and the laminar membrane welded to a part of the base of said cup structure.

**Figure 3** shows a plan view of the cup structure.

**Figures 4 and 5** show plan views of the laminar membrane.

## Description of an exemplary embodiment of the invention

**[0020]** Considering the numbering adopted in the figures, the capsule for infusing a beverage comprises a cup structure 1 with a perimeter step 2, a cover 3, a filter paper 4 which is optional, and a laminar membrane 5.

**[0021]** The cover 3 is attached by means of sealing on an upper perimeter rim 1a which delimits a mouth of the cup structure 1.

**[0022]** The cup structure 1 includes a base 6 located below the perimeter step 2; wherein said base 6 comprises a central area 6a, a first annular plateau 6b which surrounds the central area 6a and a second annular plateau 6c which surrounds a channel 6d located around the first annular plateau 6b; wherein said channel 6d constitutes a valley which separates the first annular plateau 6b and the second annular plateau 6c.

**[0023]** The central area 6a of the base 6 of the cup structure 1 includes in the entire contour of the perimeter thereof holes 7 to give the beverage an outlet.

**[0024]** The laminar membrane 5 is attached to a first surface of the first annular plateau 6b of the base 6 by means of a first welded attachment, which corresponds to a first internal part 5c by way of a central disc of the laminar membrane 5; wherein an annular portion of said first internal part 5c is welded to the first surface of the first annular plateau 6b of the cup structure.

**[0025]** The laminar membrane 5 is attached to a second surface of the second annular plateau 6c of the base 6 by means of a second continuous welded attachment which corresponds to a second end part 5a of the laminar membrane 5 welded to the second surface of the second annular plateau 6c of the cup structure 1.

**[0026]** In one embodiment of the invention, the filter paper 4 which is welded to a part of one face, the internal one of a lateral wall 9 of the cup structure 1 is joined to a laminar membrane face 5.

**[0027]** The laminar membrane 5 together with the filter paper 4 separate a lower chamber and an upper chamber; wherein the upper chamber is configured to house a food substance 10 which will be in contact with the laminar membrane 5 or with the filter paper 4 when this latter element 4 is incorporated.

**[0028]** In contrast, the lower chamber comprises at first the channel 6d and a central cavity 11 delimited between

the central area 6a of the base 6 and a central part of the laminar membrane 5, such that said channel 6d and the central cavity 11 communicate with each other through a maze 8 located in the first annular plateau 6b. The outlet holes 7 communicate with said central cavity 11.

**[0029]** In one embodiment of the invention, said maze 8 comprises a grooved structure located on the first structure of the first annular plateau 6b, such that said grooved structure interrupts the continuity of said first surface on which the laminar membrane 5 is welded.

**[0030]** The laminar membrane 5 includes a continuous circumferential pre-slit 5b which has a diameter greater than the dimension of the contour of the first annular plateau 6b and smaller than the dimension of the contour of the second annular plateau 6c of the base 6 of the cup structure; wherein said continuous circumferential pre-slit 5b is facing the channel 6d which separates both annular plateaus 6b, 6c.

**[0031]** Moreover, the continuous circumferential pre-slit 5b delimits the surface area of the first internal part 5c of the laminar membrane 5; wherein said continuous circumferential pre-slit 5b is located in a part delimited between the two welded attachments; and wherein the continuous circumferential pre-slit 5b separates the first internal part 5c of a part 5d of the laminar membrane 5 which includes the second end part 5a.

**[0032]** The lower chamber of the capsule constitutes a discharge and filtration chamber, wherein the water mixed with the food substance 10 flows through the spaces and clearance of the maze 8, the water with the food substance 10 being filtered and homogenised as it travels from the channel 6d, then passing through the maze 8 in order to finally reach the central cavity 11 which communicates with the outside through the outlet holes 7 through which the liquid mixture (beverage) of water with the food substance 10 will flow out.

**[0033]** After introducing the capsule of the invention into a machine for infusing a beverage, and operating said machine, one end of a cannula 12 of the machine pierces the cover 3 of the capsule and is inserted into a hollow space existing in the upper part of the capsule, above the food substance 10 housed in the upper chamber; all this in order to flood said upper chamber with water in a liquid state.

**[0034]** Thus, the food substance 10 occupies a filling space which is complemented with the hollow space wherein the end of the cannula 12 opens, such that the upper chamber comprises the hollow space and the space occupied by the food substance 10.

**[0035]** The cannula 12 introduces hot water into the upper chamber of the capsule, flooding the interior space of said upper chamber; wherein during this operation the hot water is mixed with the food substance 10. As the hot water is being introduced, the pressure inside the upper chamber of the capsule progressively increases.

**[0036]** When the pressure inside the upper chamber of the capsule reaches a certain value, the controlled breaking of the laminar membrane 5 begins in an area of the continuous circumferential pre-slit 5b thereof, and then along the entire closed path of the continuous circumferential pre-slit 5b; whereby communicating the upper chamber and the lower chamber.

**[0037]** It should be pointed out that the laminar membrane 5 breaks progressively along the entire path of the continuous circumferential pre-slit 5b, with a continuous annular opening being generated around the first annular plateau 6b. So, with the increase in pressure inside the capsule, the laminar membrane 5 initially breaks at the weakest point of the continuous circumferential pre-slit 5b (laser marked) and then the breaking is progressively completed along the entire path of said continuous circumferential pre-slit 5b.

**[0038]** In this situation, once the laminar membrane 5 breaks, the mixture of water and food substance 10 reaches the channel 6d; from wherein the mixture will travel through the maze 8 until it reaches the central cavity 11 and finally the outlet holes 7 through which the mixture of water and food substance 10 will flow out.

**[0039]** As a consequence of the foregoing, the outlet of the liquid beverage through the lower part of the capsule during the beverage extraction process occurs in a gradual manner, without the water hammer effect, which results in a smooth extraction without gushing out or splashing.

**[0040]** Furthermore, a main advantage of the invention is the fact that by means of the continuous circumferential pre-slit 5b of the laminar membrane 5, the shape of the breaking of said laminar membrane 5 is completely controlled as it has a contour with a path closed solely by the increase in pressure of the injected water fluid; whereby the laminar membrane 5 is prevented from generating irregular opening areas, from which parts of the material of said laminar membrane 5 may become detached, or deficient liquid fluid passage areas.

**[0041]** It should be pointed out that after the laminar membrane 5 breaks, it remains attached to the first annular plateau 6b and also to the second annular plateau 6c.

**[0042]** The laminar membrane 5 comprises a first aluminium layer and a second polyester layer; wherein the first layer is the one which is welded to the corresponding areas of the base 6.

**[0043]** It should be noted that the double welding in order to attach the laminar membrane 5 forms contour conditions which prevent any movement other than the deformation of the laminar membrane 5 itself.

**[0044]** The laminar membrane 5 is deformed with the pressure exerted by the liquid fluid inside the upper chamber, said laminar membrane 5 being able to be divided into two separate parts, without participating in physical contact with other elements of the capsule through the break area.

**[0045]** In the final manufacturing process of the laminar membrane 5, a section of the second polyester layer is removed (evaporated) by means of a laser; wherein said section corresponds to the continuous circumferential

pre-slit 5b wherein only the aluminium material of the first layer remains.

**[0046]** Removing the polyester material from a specific area reduces the mechanical capabilities of the laminar membrane 5 in a precise manner which is designed to break along the area etched with the laser.

**[0047]** Under the pressure of the liquid fluid, the adaptation of the laminar membrane 5 on the base 6 of the cup structure 1 causes sectors with different deformations to be differentiated, such that in this situation the laminar membrane 5 is subjected to stress in the entirety of the extension thereof, where, having reached the moment of maximum deformation and stress, the laminar membrane 5 will break at the weakest part thereof, which is precisely the area wherein the continuous circumferential pre-slit 5b has been previously made, where only the aluminium material of the first layer remains.

**[0048]** Thus, at the point of maximum deformation and stress of the laminar membrane 5, the breaking thereof occurs in coincidence with the weakened portion of the continuous circumferential pre-slit 5b, such that the weakened properties of the aluminium material of the first layer produce a controlled break at a specific pressure of the liquid fluid inside the upper chamber without mechanical contact.

**[0049]** Analysing the type of break of the laminar membrane, under the theory for the strength of materials and structures, the elongation prior to the laminar membrane 5 breaking causes a tensile stress therein. This stress increases proportionally with the deformation, until the maximum tensile strength of the first aluminium layer is reached (in the area of the continuous circumferential pre-slit 5b with laser) and causes the laminar membrane 5 to break; always without mechanical contact with other elements or coupling in the break area.

**[0050]** In order to always have the same opening of the capsule, in a controlled and delimited manner, the continuous circumferential pre-slit 5b has been designed in the laminar membrane 5.

**[0051]** It should be noted that in order to carry out the opening of the capsule, the continuous circumferential pre-slit 5b does not have a beginning or an end. In contrast, other conventional linear slits have a final segment which is susceptible and sensitive to the concentration of stresses, the appearance of uncontrolled cracks possible due to the deformation of the laminar membrane including said linear slits.

**[0052]** The continuous circumferential pre-slit 5b is a geometry without a beginning or an end, wherein, once the laminar membrane 5 starts to break, it extends through the area weakened by the laser, producing the total breaking of the first aluminium layer into two sections. This effect includes a self-conclusive effect, without the possibility of the weakened areas of the aluminium layer being in contact with other parts of the capsule before breaking.

**[0053]** The aluminium layer is designed to break without mechanical contact or coupling with other areas of the capsule, but by only participating in the deformation and tensile stress due exclusively to the pressure generated by the liquid fluid inside the upper chamber of the cup structure 1.

**[0054]** In order to facilitate the controlled breaking operation, the base 6 of the cup structure 1 includes a channel 6d by way of an annular valley around the first annular plateau 6b on the first surface of which the first interior part 5c of the laminar membrane 5 is welded; wherein said channel 6d is facing an annular portion 13 of the laminar membrane 5 wherein the continuous circumferential pre-slit 5b is located.

**[0055]** The channel 6d limits and defines the span over which the elongation (stretching) of the first aluminium layer will be carried out; wherein the continuous circumferential pre-slit 5b of the laminar membrane 5 is facing said span of the channel 6d.

**[0056]** The channel 6d is the empty space over which the first aluminium layer of the laminar membrane 5 is deformed to the breaking point thereof along the continuous circumferential pre-slit 5b of said laminar membrane 5.

**[0057]** Once the laminar membrane 5 has been broken in a controlled manner along the continuous circumferential pre-slit 5b thereof, the first interior part 5c and the complementary part 5d of said laminar membrane 5 are physically separated, such that the adjacent portions of both parts 5c, 5d bend towards the interior space of the channel 6d until they make contact with side faces and a base of said channel 6d.

**[0058]** Once the laminar membrane 5 breaks, the geometry of the channel 6d, in the direction of the escape of the liquid beverage, maintains passage cross sections at the limits of the channel 6d open through the clearance of the maze 8 located in the first annular plateau 6b of the base 6 of the cup structure.

**[0059]** One of the problems associated with the manageability of capsules for the infusion of beverages is the initial impact of the front of the liquid flow when leaving the capsule, caused by the high pressure at which the infused beverage is formed.

**[0060]** In order to prevent said effect of the initial impact of the front of the liquid flow at the outlet of the capsule, the characteristic base 6 has been designed to first expand the beverage, and then concentrate, reduce and soften the speed and/or pressure thereof, and centralise the extraction of the beverage through the outlet holes 7.

**[0061]** The channel 6d of the base 6 of the cup structure 1 distributes the liquid beverage along the entire annular path thereof, homogenising the flow of the liquid beverage before proceeding to the next step which corresponds to the passage of the beverage through the maze 8 until it reaches the central cavity 11.

**[0062]** Finally, the passage cross section of the outlet holes 7 concentrates the liquid beverage again, once it has lost speed and pressure in order to form the only outlet of the capsule through said outlet holes 7.

**[0063]** With this described arrangement, when the cap-

sule of the invention is to be used, water is introduced with the cannula 12 into the upper chamber, flooding all of it and soaking the food substance 10 that is located inside said upper chamber, such that as more water is introduced, the pressure therein progressively increases; reaching a moment when the laminar membrane 5 starts to break along a point of the continuous circumferential pre-slit 5b thereof.

**[0064]** In this situation, the laminar membrane 5 is progressively and slowly torn until the entire path of said continuous circumferential pre-slit 5b is completed.

**[0065]** From the moment when the laminar membrane 5 starts to break, the mixture of water with the food substance 10 reaches the channel 6d; then the liquid mixture will travel through the maze 8 concentrating until it reaches the central cavity 11 and from here the liquid mixture will run through the outlet holes 7 located in the centre of the base 6 of the cup structure 1.

## Claims

1. **A capsule for infusing a beverage,** comprising:

   - a cup structure (1) which includes a base (6), a lateral wall (9) and a mouth which is closed by means of a cover (3); wherein said base (6) includes a central area (6a) with at least one outlet hole (7) for the beverage;
   - a laminar membrane (5) which separates a lower chamber from an upper chamber which is configured to house a food substance (10); wherein said laminar membrane (5) includes a circumferential pre-slit (5b); and wherein the upper chamber is delimited between a part of the lateral wall (9), the cover (3) and the laminar membrane (5), while the lower chamber is delimited between the base (6) and the laminar membrane (5); **characterised in that**:

     - the base (6) of the cup structure (1) comprises a first annular plateau (6b) which surrounds the central area (6a), and a second annular plateau (6c) which surrounds a channel (6d) located around the first annular plateau (6b); wherein said channel (6d) constitutes a valley which separates the first annular plateau (6b) and the second annular plateau (6c); and wherein the circumferential pre-slit (5b) of the laminar membrane (5) is facing the channel (6b);
     - the laminar membrane (5) is attached to a first surface of the first annular plateau (6b) of the base (6) by means of a first welded attachment, which corresponds to a first internal part (5c) by way of a central disc of the laminar membrane (5); wherein an annular portion of said first internal part (5c) is welded to the first surface of the first annular plateau (6b) of the cup structure (1);
     - the laminar membrane (5) is attached to a second surface of the second annular plateau (6c) of the base (6) by means of a second continuous welded attachment which corresponds to a second end part (5a) of the laminar membrane (5) welded to the second surface of the second annular plateau (6c) of the cup structure (1);
     - the lower chamber comprises the channel (6d) and a central cavity (11) delimited between the central area (6a) of the base (6) and a central part of the laminar membrane (5); wherein said channel (6d) and the central cavity (11) communicate with each other through a maze (8) located in the first annular plateau (6b); and wherein the outlet hole (7) communicates with said central cavity (11).

2. The capsule for infusing a beverage, according to claim 1, **characterised in that** the maze (8) comprises a grooved structure located on the first surface of the first annular plateau (6b) of the base (6) of the cup structure (1); wherein said grooved structure interrupts the continuity of said first surface on which the laminar membrane (5) is attached by means of the first welded attachment.

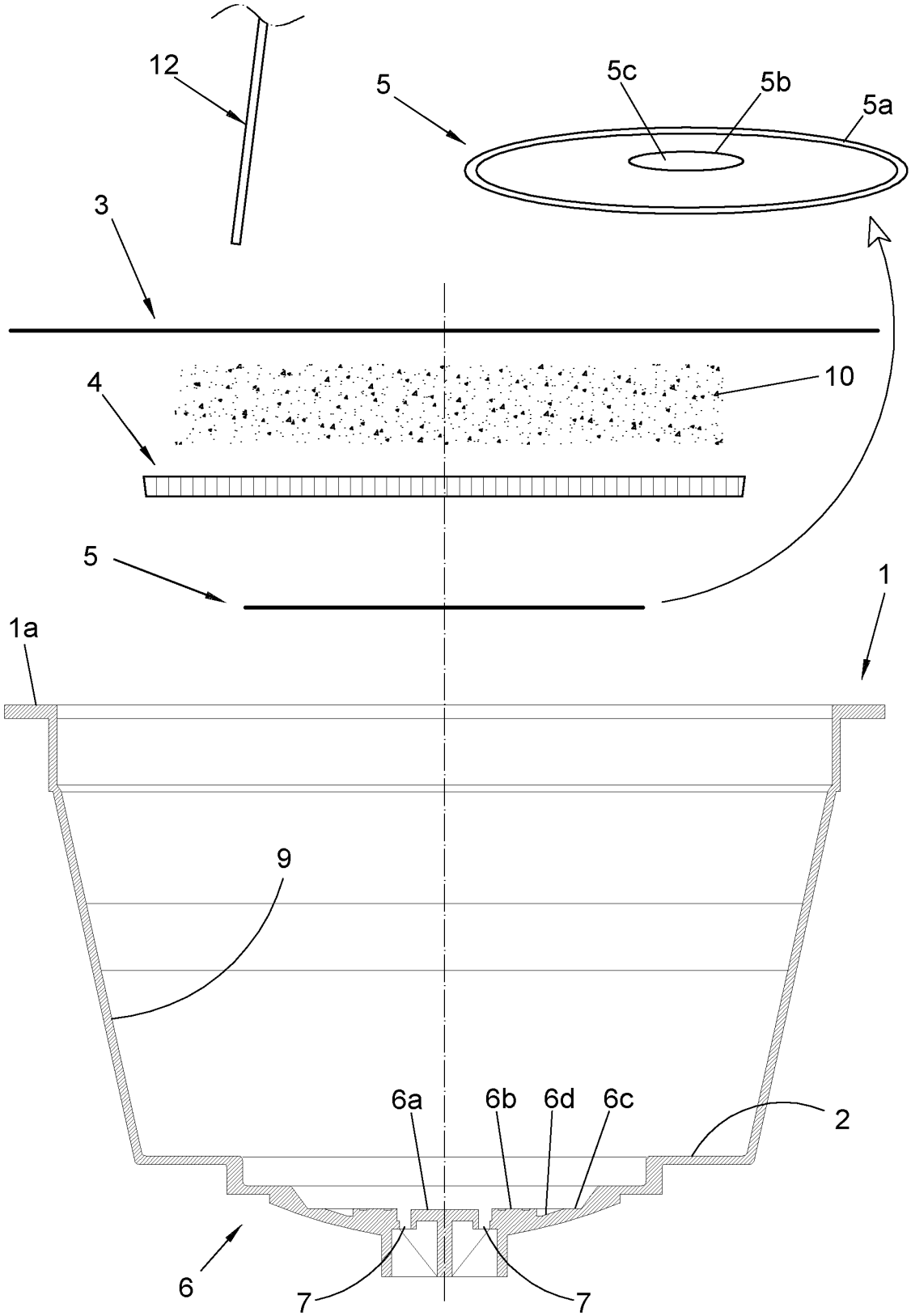


FIG. 1

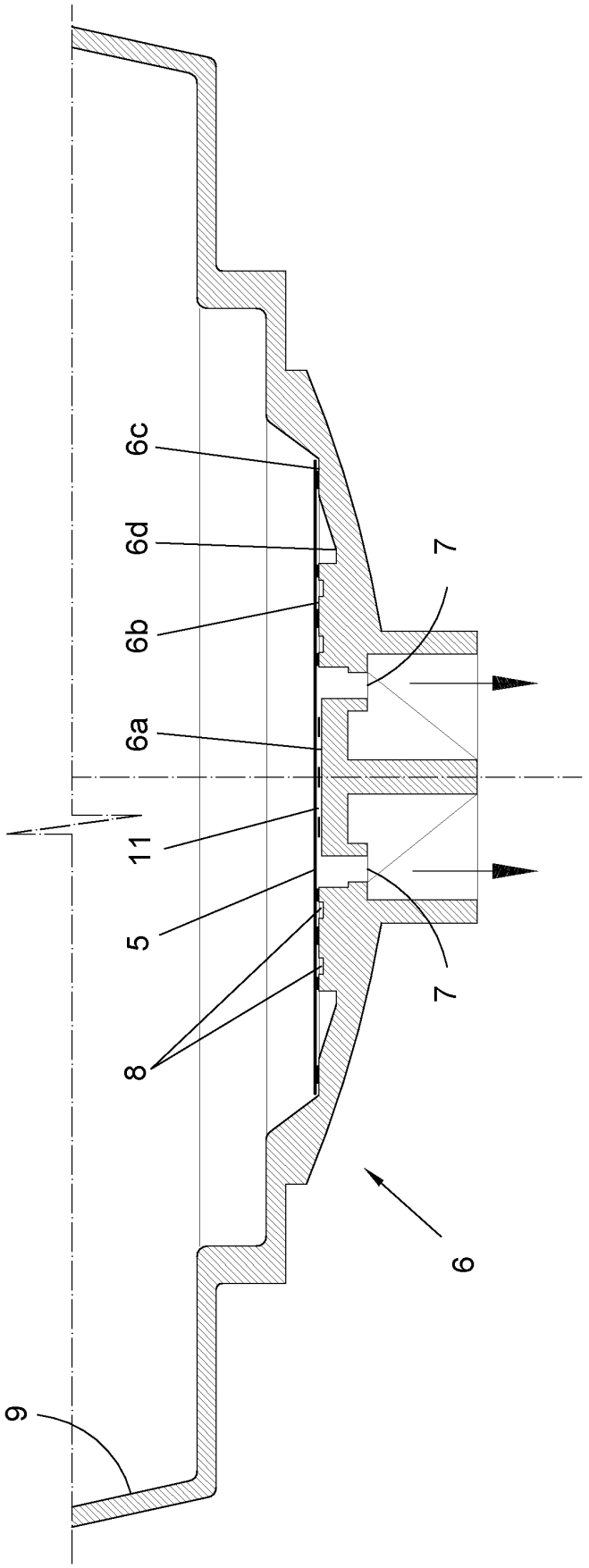


FIG. 2

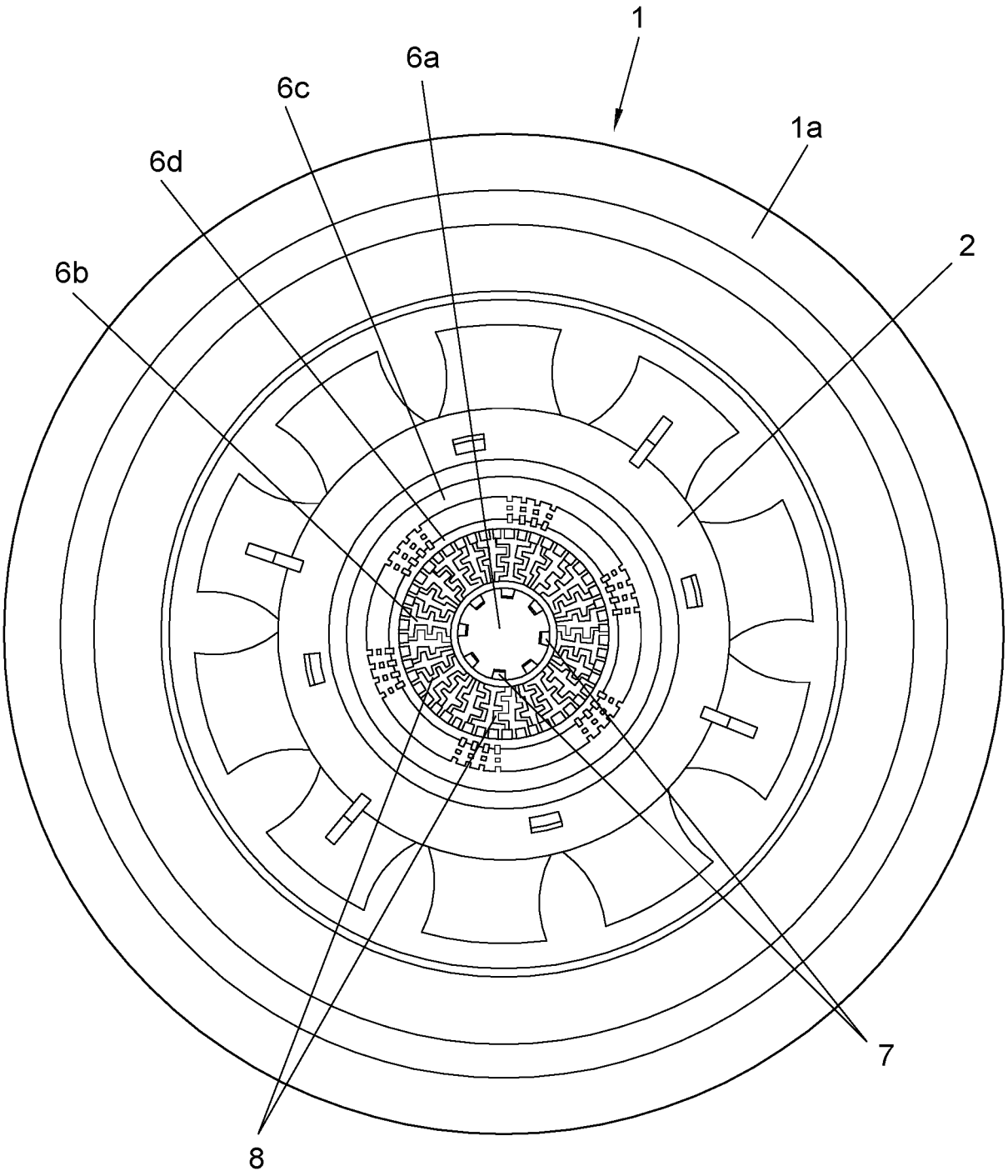


FIG. 3

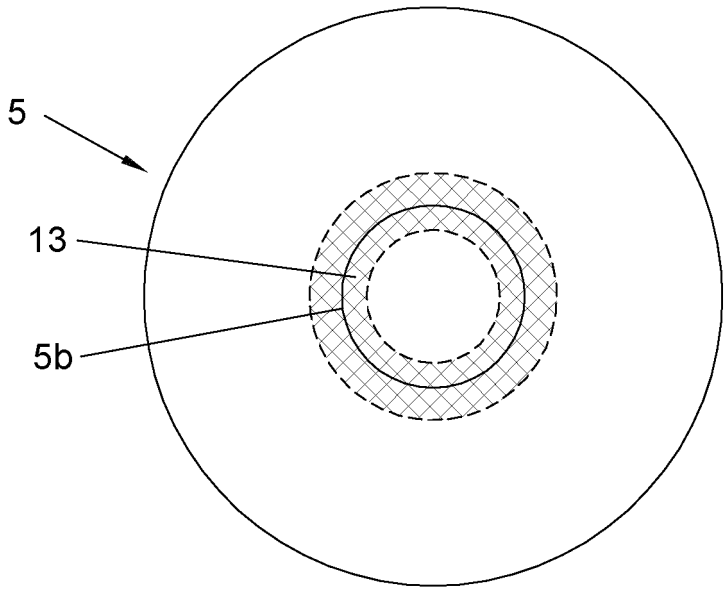


FIG. 4

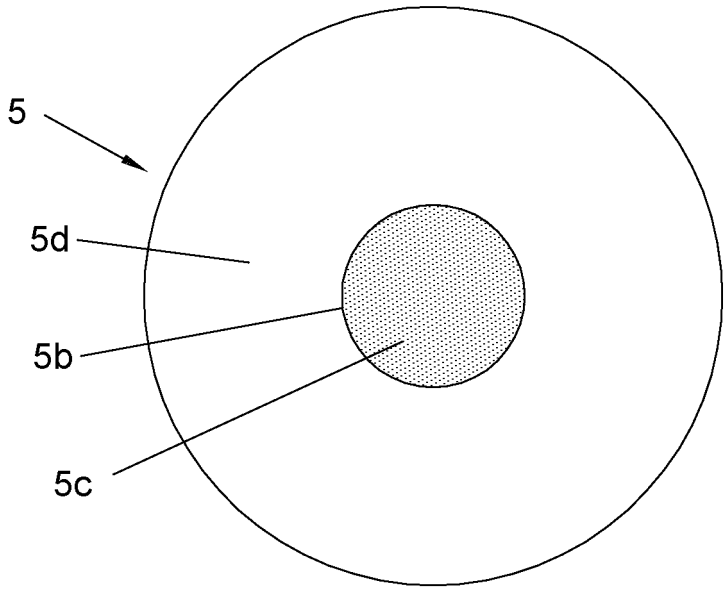


FIG. 5

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2020/070159

A. CLASSIFICATION OF SUBJECT MATTER

***B65D85/804*** (2006.01)

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)

EPODOC, INVENES, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | EP 3315429 A1 (COCATECH S L U) 02/05/2018, description; figures 1 - 3. | 1-2 |
| Y | WO 2018025120 A1 (BISIO PROGETTI SPA) 08/02/2018, description; figures 1 - 14. | 1-2 |
| A | WO 2008087553 A1 (REWISA AG ET AL.) 24/07/2008, description; figures 1 - 9. | 1-2 |
| A | EP 3071495 A1 (BISIO PROGETTI SPA) 28/09/2016, description; figures 1 - 3. | 1-2 |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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| 15/06/2020 | **(16/06/2020)** |
| Name and mailing address of the ISA/<br>OFICINA ESPAÑOLA DE PATENTES Y MARCAS<br>Paseo de la Castellana, 75 - 28071 Madrid (España)<br>Facsimile No.: 91 349 53 04 | Authorized officer<br>J. Moreno Rodriguez<br><br>Telephone No. 91 3495556 |

Form PCT/ISA/210 (second sheet) (January 2015)

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
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