(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 722 228 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.10.2020 Bulletin 2020/42

(51) Int Cl.:
B65D 85/804 *(2006.01)*

(21) Application number: **19168081.8**

(22) Date of filing: **09.04.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) CAPSULE AND METHOD FOR PREPARING AND DISPENSING A VISCOUS DRINKABLE FOOD PRODUCT

(57) The present invention describes a capsule (C) and a method for preparing and dispensing a viscous drinkable food product, wherein the capsule (C) comprises a capsule body (B), compartments (N), walls, piercing elements (P), homogenizing means constituted by the homogenizing elements (H) which are protrusions on the inner wall of the capsule body (B) and means enabling the product formed by the dispensing elements (D) to flow out. The fluid after being injected under pressure in the central compartment is mixed with the food product. Due to the increasing pressure that is being exerted on the central compartment, the bottom wall flex under this same pressure, and is pierced by the piercing elements (P). The food product which results from the mixing of the substance with the fluid and which is fed into the bottom compartment through the grooves in the bottom wall, being then totally homogenised by the homogenizing elements (H), before flow out to the exterior through the dispensing elements (D).

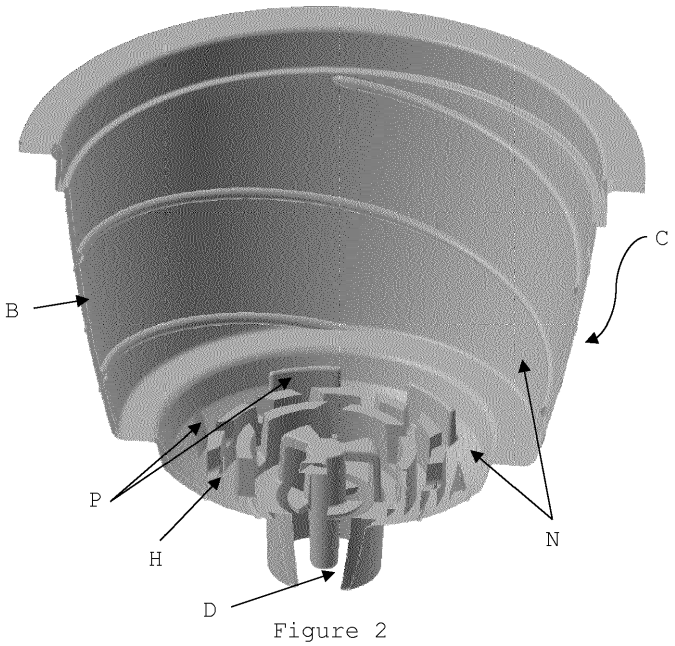

Figure 2

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Description

Scope of the Invention

[0001] The invention described in this document is related to the field of food products containers, more specifically a capsule designed to contain a substance suitable for the preparation of food products, for example a drinkable food product, more specifically a drinkable viscous food product with or without solid particles, such as a juice or a soup. The current invention further relates to a method of preparing food products including a capsule as the one described in the current invention.

Framework of the Invention

[0002] The capsule is a sealed container, including a capsule body with a sidewall, a top wall, a bottom wall and piercing, homogenization and dispensing elements. This capsule contains in its inside a substance that is suitable for the preparation of food products, and means enabling the opening of the capsule at the time of its use and allowing the food product to flow out. The most known capsules are those which enable aromatic drinks to be obtained, such as espresso coffee and similar beverages.

[0003] The capsule body is made of suitable material, for example, in injected or hot moulded plastic, and has liquid and air barrier properties. The top wall, a pierceable membrane which is coupled to the capsule body by the top edge thus allowing the top capsule sealing, is made from suitable material, namely aluminium or with a mono- or a multi- layer plastic film, having liquids and air barrier properties. This membrane is puncturable by a perforating element of the machine, in particular by the injection needle of the machine, which injects a fluid under pressure, for example water, to mix with the contents of the capsule to obtain the final product to be dispensed to the user through the dispensing channel in the lower part of the capsule. The bottom wall, is a pierceable membrane which is coupled to the capsule body by the bottom edge, thereby enabling the lower capsule sealing, is made of suitable material, namely in aluminium or with a mono- or a multi- layer plastic film, having properties of liquid and air barrier. This membrane is pierceable and plunges downwardly as fluid pressure increases in the central compartment (due to the injection of said fluid into the capsule), such that it contacts the drill elements placed immediately below it.

[0004] In order for the final product to be obtained, the capsules are inserted into a machine suitable for the preparation and dispensing of their contents.

[0005] Due to the diversity of existing equipment intended for this purpose, i.e., the preparation and releasing of the contents of capsules to obtain drinks, and the technical specificities of each equipment, the dimensions of the capsules vary according to the equipment for which they are intended, and the specificities of the capsules may vary according to the product for which they are intended.

Background of the invention

[0006] There is currently a large panoply of equipment and capsules on the market whose purpose is the instant preparation and dispensing of beverages. In general, each type of machine is associated with a specific beverage preparation mechanism, which requires capsules with certain characteristics to operate with that particular type of machine. In some situations, capsules which, despite having the characteristics that allow the product to be obtained by a particular type of machine, have specific characteristics to obtain a specific type of beverage.

[0007] Example of this situation can be found in EP3315429A1 document which introduce a capsule to be used in the preparation of nutritional drinks and which has a second sealing zone of the bottom capsule membrane.

[0008] The document EP02000943, which has resulted in patents EP1472156, EP1574452, EP1604915 and EP1808382 and which has a capsule such as the capsule of the present invention, wherein the opening means are positioned in the capsule itself. The capsule referred to in this document, such as the capsule of the present invention, is used in the same type of machines.

[0009] However, unlike the capsule of the present invention, the internal mechanisms of the above capsule are designed to make fine filtering of the contents, which means that with this capsule it is impossible to dispense beverages having small solid particles. Another problem that the capsule presents in the preparation of this type of content, is that it does not have effective mixing mechanisms that allow the contents to be properly mixed before the beverage is delivered.

[0010] Reference should also be made to the document EP3044125 which discloses a capsule and a machine for the preparation of beverages or food products, in which the capsule is equipped with a mixing and centrifuging mechanism, suitable for the preparation of beverages or viscous food products.

[0011] Refer yet the document EP3013710 which sets forth the principles of the method of operation which enables the manufacture and dispensing of the product contained in the capsule of the present invention.

[0012] However, no capsule describing a mixing and opening mechanism of the capsule that provides a solution identical to the solution described in the present invention was found in the state of the art. For the purpose of drafting the present document, the invention described on the document EP3044125 was considered the closest prior art.

Advantages of the Invention

[0013] The object of the invention is a solution which, in a unique and innovative way, solves the method of

instant preparation and dispensing of drinkable viscous food products that may contain small solid particles, such as soups or juices, through a capsule having a homogenization and dispensing mechanism of the contents which allow the effective mixing and passage of the small solid particles which the food product may present.

[0014] The great advantage of the invention is that the homogenizing elements are various protrusions integrated in the inner wall of the capsule body, which due to their configurations and locations allow to create a movement of the liquid that optimizes the mixing and homogenization of its elements.

Brief description of the drawings

[0015] These and other features can be readily understood by the accompanying drawings, which should be considered as examples only and are not to be considered as limiting of in any way the scope of the invention. In the drawings, and for illustrative purposes, the measurements of some of the elements may be exaggerated and not drawn to scale. Absolute and relative dimensions do not correspond to the actual ratios for carrying out the invention.

Figure 1 shows a perspective view of the closed capsule.

Figure 2 shows a cross-sectional view of the capsule, indicating the major groups of components.

Figure 3 shows a cross-sectional view of the capsule, without the top wall and without the bottom wall.

Figure 4 shows a cross-sectional view of the capsule with the top wall and the bottom wall, being also visible the element of the machine that performs the perforation of the top wall and the injection of the fluid into the central compartment.

Figure 5 shows a top perspective view of the capsule without the top wall.

Figure 6 shows a top perspective view of the piercing, homogenizing and dispensing elements.

[0016] In the figures the elements and components of the equipment of the present invention are indicated:

C - capsule
B - capsule body

- B.1 - peripheral top edge
- B.2 - top central wall
- B.3 - peripheral bottom edge
- B.4 - bottom central wall
- B.5 - dispensing channel wall

W - walls

- W.1 - top wall
- W.2 - bottom wall

N - compartments

- N.1 - central compartment
- N.2 - bottom compartment

P - piercing elements
H - homogenizing elements

- H.1 - homogenizing helical
- H.2 - first homogenizing surface
- H.2.1 - channels of the first homogenizing surface
- H.3 - second homogenizing surface
- H.3.1 - channels of the second homogenizing surface
- H.4 - first channel between surfaces
- H.5 - second channel between surfaces
- H.6 - output homogenizer

D - dispensing elements

- D.1 - dispensing channel
- D.2 - dispensing openings
- D.3 - dispensing spike
- D.4 - outflow stabilization tabs

Detailed description of the invention

[0017] By "substantially vertical", "substantially concentric", "substantially centered", "substantially horizontal", "substantially levelled", "immediately above", "immediately below", are understood as preferred positions for carrying out the invention and it may function with other positions.

[0018] By "substantially trunco-conical", "substantially cylindrical", "helical", shall be understood as preferred forms for carrying out the invention since it can operate with other forms.

[0019] Such terms as "substantially vertical," "substantially centered", "substantially horizontal," "immediately above", "immediately below", are positions perceived by an observer located next to the capsule of the invention, with the capsule (C) placed on an horizontal surface and the wall of the dispensing channel wall (B.5) in contact therewith.

[0020] By "viscous product" is meant the product having a consistency between solid and liquid, such as soups and those commonly referred to as *juices with pulp.*

[0021] "Pulp" means the paste resulting from the mashing of fruit and/or vegetables, which contains a fairly small quantity of water, and which has small solid particles.

[0022] "Concentrate" means the paste resulting from

the mashing of fruit and/or vegetables, where the water content was totally or partially reduced, and which may have small solid particles.

[0023] "Powder" means the product resulting from the mashing of the fruit and/or vegetables after cooking, dehydrated or freeze-dried, and which may have small solid particles.

[0024] "Small solid particles" means solid particles not exceeding 3 mm in length.

[0025] "Homogenizing helical" means the element shown in the figures by reference H.1, and which is a helical-shaped protrusion, which is integrated and develops along the inner wall of the top central wall (B.2).

[0026] With reference to the figures, the invention refers to a capsule designed to contain a substance suitable for the preparation of food products, for example a drinkable food product, more specifically a drinkable viscous food product that may contain small solid particles, such as, a juice or a soup. The appropriate substance is a substance which is in the form of a pulp, a concentrate, a mixture of pulp and concentrate or a powder. The preparation and dispensing of the product are carried out in appropriate equipment.

[0027] The capsule(C) has a substantially trunco-conical shape in a substantially vertical position and comprises:

- a capsule body (B) including:
  - a peripheral top edge (B.1),
  - a top central wall (B.2) surrounding the central compartment (N.1) and which together with the top wall (W.1) separates the central compartment (N.1) from the outside,
  - a peripheral bottom edge (B.3),
  - a bottom central wall (B.4) surrounding the bottom compartment (N.2) and separating the bottom compartment (N.2) from the outside,
  - a dispensing channel wall (B.5),
- compartments (N) consisting of:
  - a central compartment (N.1),
  - a bottom compartment (N.2),
- walls (W) consisting of:
  - a top wall (W.1) closing the upper part of the central compartment (N.1),
  - a bottom wall (W.2) closing the lower part of the central compartment (N.1) and separating the central compartment (N.1) from the bottom compartment (N.2),
- piercing elements (P),
- homogenizing means constituted by the homogenizing elements (H) which are protrusions on the inner wall of the capsule body (B),
- means enabling the product formed by the dispensing elements (D) to flow out.

[0028] The central compartment (N.1) stores the substance to be prepared and dispensed.

[0029] The capsule body (B):

- is made of a suitable material, for example in injected or hot moulded plastic, and has liquid and air barrier properties,
- has a homogenizing helical (H.1) integrated in the inner wall of the top central wall (B.2), which is a helical shaped protrusion extending along the inner wall of the top central wall (B.2) and whose purpose is to intensify the creation of swirls in the central compartment (N.1) for a first mixture of the substance contained in the central compartment (N.1) with the fluid, after the injection of the fluid,
- comprises a peripheral top edge (B.1) peripheral to the upper end of the top central wall (B.2) against which the top wall (W.1) rests, being welded and/or glued,
- comprises a peripheral bottom edge (B.3) peripheral to the lower end of the top central wall (B.2) against which the bottom wall (W.2) rests, being welded and/or glued,
- comprises the piercing elements (P) formed by protrusions on the inner wall of the bottom central wall (B.4),
- has a first homogenizing surface (H.2) formed by a protrusion on the inner wall of the bottom central wall (B.4),
- has an output homogenizer (H.6) formed by a protrusion on the inner wall of the bottom central wall (B.4).

[0030] The top wall (W.1) may be a perforable membrane, made of suitable material, namely in plastic or aluminium or a composite mono- or multi- layer perforated, liquid and air impermeable.

[0031] The bottom wall (W.2) may be a perforable membrane, made of suitable material, namely in aluminium or with a mono- or multi- layer plastic film, having liquid and air barrier properties.

[0032] Immediately below the central compartment (N.1) is the bottom compartment (N.2), separated from the central compartment (N.1) by the bottom wall (W.2), which has integrated in its inner wall the piercing elements (P) and the homogenizing elements (H).

[0033] The bottom wall (W.2) is pierceable and frees down when fluid pressure increases in the central compartment (N.1) due to the injection of the fluid in the central compartment (N.1), in such a way that it contacts the piercing elements (P) placed thereunder. These piercing elements (P) also have the purpose of securing the bottom wall (W.2) in position, so that the product circulation through the channels of the homogenizing surfaces (H.2.1) (H.3.1) and the channels between surfaces (H.4)

(H.5) en route to the dispensing channel (D.1) is not blocked.

[0034] The piercing elements (P) are of the shape suitable for piercing and fixing the membrane constituting the bottom wall (W.2), and are disposed on a circumference substantially concentric with the dispensing channel (D.1).

[0035] The first homogenizing surface (H.2) has a substantially cylindrical shape, has spacings at substantially regular intervals forming the oblique channels of the first homogenizing surface (H.2.1), has a position substantially concentric with the dispensing channel (D.1) and is positioned between the piercing elements (P) and the second homogenizing surface (H.3).

[0036] The second homogenizing surface (H.3) has a substantially cylindrical shape, has spacings at substantially regular intervals forming the oblique channels of the second homogenizing surface (H.3.1), has a position substantially concentric with the dispensing channel (D.1) and is positioned between the first homogenizing surface (H.2) and the output homogenizer (H.6).

[0037] The output homogenizer (H.6) has a substantially cylindrical shape, hollow inside and which configures the dispensing channel (D.1), protrudes outwardly through the dispensing channel wall (B.5), the sidewall has dispensing openings (D.2) at substantially regular intervals and in position substantially centered in the interior is coupled the dispensing spike (D.3).

[0038] The space between the first homogenizing surface (H.2) and the second homogenizing surface (H.3) forms the first channel between surfaces (H.4).

[0039] The space between the second homogenizing surface (H.3) and the output homogenizer (H.6) forms the second channel between surfaces (H.5).

[0040] In substantially centered position with the output homogenizer (H.6) are the dispensing elements (D). The dispensing elements (D) are formed by the dispensing channel (D.1), the dispensing openings (D.2), the dispensing spike (D.3) that protrudes outwardly of the capsule (C) through the lower part thereof, to which a plurality of outflow stabilization tabs (D.4) are connected in a radial position.

[0041] The upper surface of the peripheral bottom edge (B.3), of the piercing elements (P), of the first homogenizing surface (H.2), of the second homogenization surface (H.3) and of the output homogenizer (H.6) are all substantially levelled and on which the bottom wall (W.2) rests.

Method of preparation of the drinkable food product

[0042] The capsule (C) according to the invention is placed in the capsule receptacle of a suitable machine for the purpose.

[0043] When starting up the machine, the machine-piercing element, usually the injection needle, perforates the top wall (W.1), injects a fluid under pressure in the central compartment (N.1), which causes the fluid to mix with the substance in the central compartment (N.1). This mixture of the fluid with the substance occurs due to the pressure of the injection of the fluid on the substance, being intensified by the homogenizing helical (H.1) that favours the creation of swirls in the central compartment (N.1).

[0044] Due to the increasing pressure that is being exerted on the central compartment (N.1), the bottom wall (W.2) begins to flex under this same pressure, contacts with the piercing elements (P). Given the shape of the piercing elements (P), the bottom wall (W.2) is pierced. Still due to the shape of the piercing elements (P), the membrane constituting the bottom wall (W.2) gets trapped to these piercing elements (P), resting on the upper surface of the first homogenizing surface (H.2), on the second homogenization surface (H.3) and on the output homogenizer (H.6), causing the bottom wall (W.2) to maintain its position substantially horizontal. Accordingly, the food product which results from the mixing of the substance with the fluid and which is fed into the bottom compartment (N.2) through the grooves in the bottom wall (W.2) can flow through the channels of the homogenizing surfaces (H.2.1) (H.3.1), the channels between surfaces (H.4) (H.5) and the dispensing openings (D.2).

[0045] The food product after passing through the bottom wall (W.2) contacts with the first homogenizing surface (H.2), being routed to the channels of the first homogenizing surface (H.2.1). After passing the first homogenizing surface (H.2), the food product arrives at the first channel between surfaces (H.4), immediately gets into contact with the second homogenizing surface (H.3), being sent to the channels of the second homogenization surface (H.3.1). After passing the second homogenizing surface (H.3), the food product reaches the second channel between surfaces (H.5), collides with the output homogenizer (H.6) and is routed to the dispensing openings (D.2).

[0046] This passage through the channels of the homogenizing surfaces (H.2.1) (H.3.1) and through the channels between surfaces (H.4) (H.5), as well as through the homogenizing surfaces (H.2) (H.3) and in the output homogenizer (H.6), allow the complete homogenization of the food product, which had started with the injection of the fluid in the central compartment (N.1).

[0047] From the dispensing openings (D.2), the food product goes to the dispensing channel (D.1), where it flows outwards for dispensing to the consumer. The flow out of the food product through the dispensing channel (D.1) has its output speed controlled by the outflow stabilization tabs (D.4), to prevent the food product from being dispensed from splashing.

Claims

1. Capsule (C) for preparing and dispensing a viscous drinkable food product by injection of a fluid under pressure, comprising a capsule body (B) and homog-

enizing elements (H) wherein the homogenizing elements (H) are formed by protrusions on the inner wall of the capsule body (B).

2. Capsule (C) according to claim 1 wherein the protrusions of the homogenizing elements (H) are:

- a homogenizing helical (H.1)
- a first homogenizing surface (H.2)
- a second homogenizing surface (H.3)
- a output homogenizer (H.6).

3. Capsule (C) according to any preceding claims wherein the homogenizing elements (H) further comprise:

- channels of the first homogenizing surface (H.2.1) formed by spacings on the first homogenizing surface (H.2)
- channels of the second homogenizing surface (H.3.1) formed by spacings on the second homogenizing surface (H.3)
- a first channel between surfaces (H.4) formed by the spacing between the first homogenizing surface (H.2) and the second homogenizing surface (H.3)
- a second channel between surfaces (H.5) formed by the spacing between the second homogenizing surface (H.3) and the output homogenizer (H.6).

4. Capsule (C) according to claim 1 wherein the capsule (C) further comprises:

- walls (W)
- compartments (N)
- piercing elements (P)
- dispensing elements (D).

5. Capsule (C) according to claims 1 and 4 wherein:

- the capsule body (B) consisting of:
  - a peripheral top edge (B.1)
  - a top central wall (B.2)
  - a peripheral bottom edge (B.3)
  - a bottom central wall (B.4)
  - a wall of the dispensing channel (B.5)
- the walls (W) consisting of:
  - a top wall (W.1)
  - a bottom wall (W.2)
- the compartments (N) consisting of:
  - a central compartment (N.1)
  - a bottom compartment (N.2)
- the dispensing elements (D) consisting of:
  - a dispensing channel (D.1)
  - dispensing openings (D.2)
  - a dispensing spike (D.3)
  - stabilization tabs (D.4).

6. Capsule (C) according to any preceding claims wherein the piercing elements (P), the first homogenizing surface (H.2), the second homogenizing surface (H.3) and the output homogenizer (H.6) are integrated in the inner wall of the bottom central wall (B.4).

7. Capsule (C) according to claims 5 and 6 wherein the upper surface of the peripheral bottom edge (B.3), of the piercing elements (P), of the first homogenizing surface (H.2), of the second homogenization surface (H.3) and of the output homogenizer (H.6) are all substantially levelled and on which the bottom wall (W.2) rests.

8. Capsule (C) according to claims 2 and 5 wherein the homogenizing helical (H.1) is a helical-shaped protrusion that is integrated and develops along the inner wall of the top central wall (B.2).

9. Capsule (C) according to claims 1 to 7, wherein the piercing elements (P) are of the shape suitable for piercing and fixing the membrane constituting the bottom wall (W.2), and are disposed on a circumference substantially concentric with the dispensing channel (D.1) .

10. Capsule (C) according to claims 1 to 7, wherein the first homogenizing surface (H.2) has a substantially cylindrical shape, has spacings at substantially regular intervals forming the oblique channels of the first homogenizing surface (H.2.1), has a position substantially concentric with the dispensing channel (D.1) and is positioned between the piercing elements (P) and the second homogenizing surface (H.3).

11. Capsule (C) according to claims 1 to 7, wherein the second homogenizing surface (H.3) has a substantially cylindrical shape, has spacings at substantially regular intervals forming the oblique channels of the second homogenizing surface (H.3.1), has a position substantially concentric with the dispensing channel (D.1) and is positioned between the first homogenizing surface (H.2) and the output homogenizer (H.6).

12. Capsule (C) according to claims 1 to 7, wherein the output homogenizer (H.6) has a substantially cylindrical shape, hollow inside and which configures the dispensing channel (D.1), protrudes outwardly through the dispensing channel wall (B.5), the side-

wall has dispensing openings (D.2) at substantially regular intervals and in position substantially centered in the interior is coupled the dispensing spike (D.3).

13. Capsule (C) according to any preceding claims wherein the capsule (C) is inserted into a machine for preparing and dispensing drinkable food products.

14. Capsule (C) according to any preceding claims wherein the substance to be prepared is in the form of pulp, concentrate, mixture of pulp and concentrate or powder.

15. A method of preparing a food product from a substance contained in the capsule claimed in the preceding claims, **characterized in that** it comprises the following steps:

a) the capsule (C) is placed in the capsule receptacle of a suitable machine for the purpose,
b) the machine-piercing element perforates the top wall (W.1) and injects a fluid under pressure in the central compartment (N.1),
c) the substance begins to mix with the fluid, being intensified by the homogenization helix (H.1) that favours the creation of swirls in the central compartment (N.1),
d) the bottom wall (W.2) flexes, coming into contact with the piercing elements (P),
e) the piercing elements (P) pierce and fix the bottom wall (W.2),
f) the food product resulting from the mixing of the substance with the fluid is fed into the bottom compartment (N.2) through the grooves in the bottom wall (W.2),
g) the food product after passing the bottom wall (W.2) comes into contact with the first homogenizing surface (H.2), being fed to the channels of the first homogenizing surface (H.2.1),
h) after passing the first homogenization surface (H.2), the food product reaches the first channel between surfaces (H.4), immediately getting into contact with the second homogenizing surface (H.3), being sent to the channels of the second homogenizing surface (H.3.1),
i) after passing the second homogenizing surface (H.3), the food product reaches the second channel between surfaces (H.5), collides with the output homogenizer (H.6) and is routed to the dispensing openings (D.2),
j) the food product proceeds to the dispensing channel (D.1), where it flows outwards for dispensing, the exit velocity being controlled by the outflow stabilization tabs (D.4).

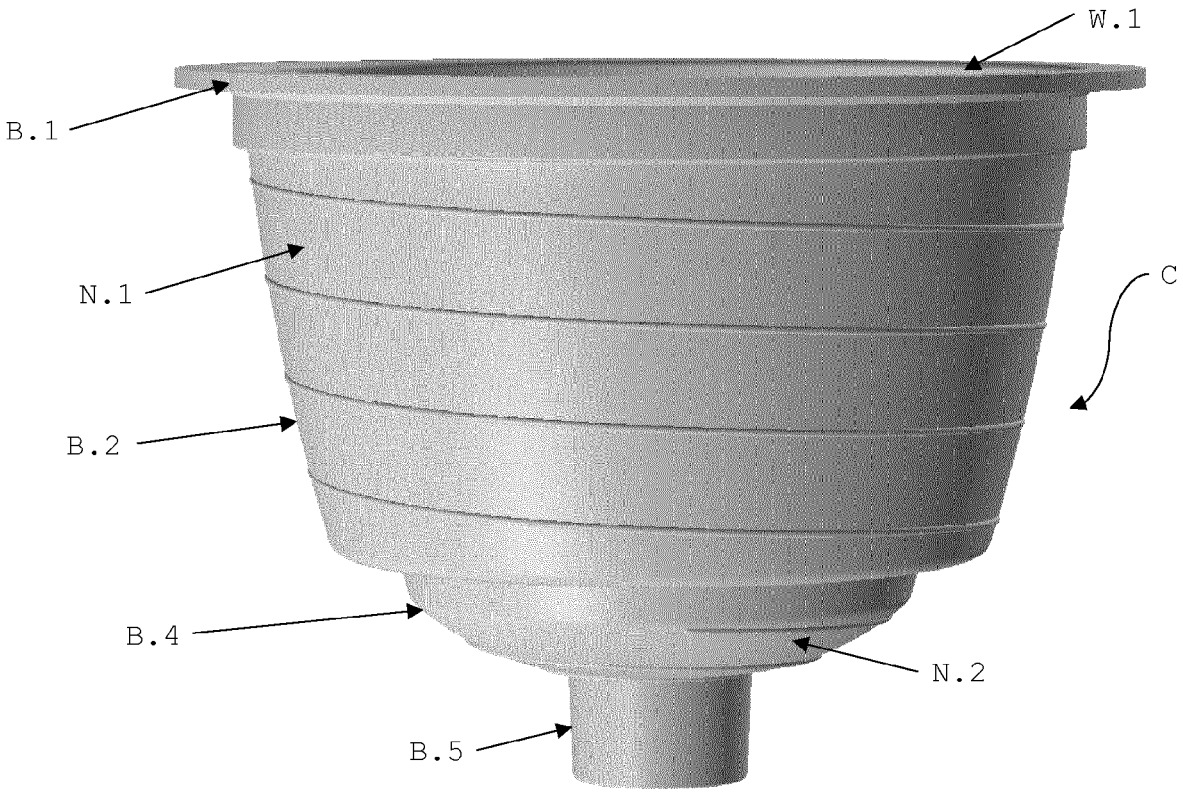

Figure 1

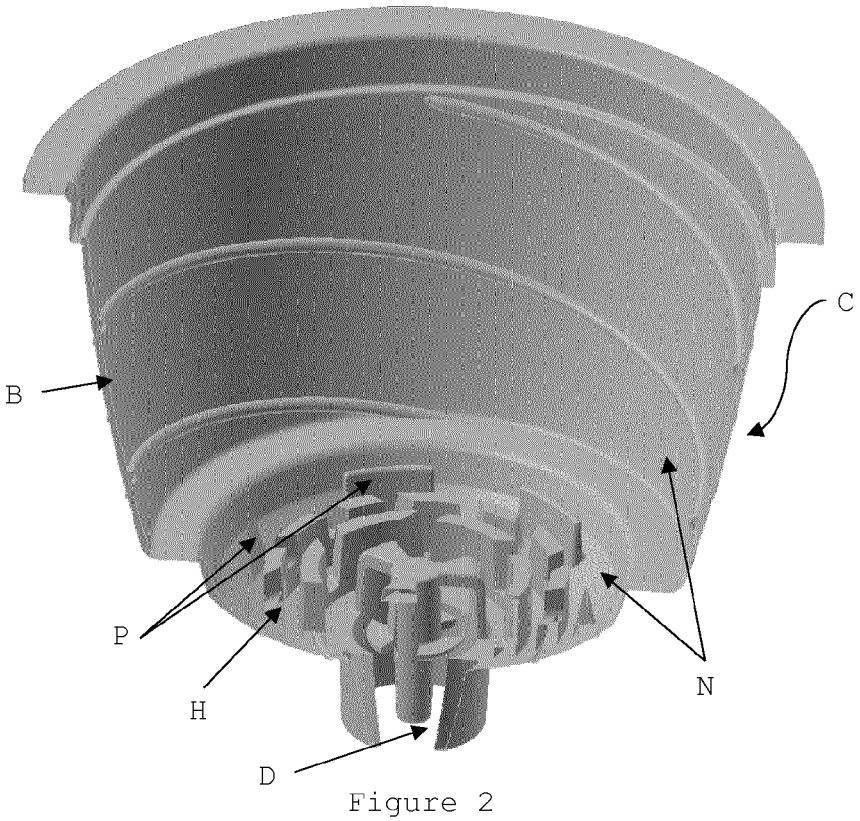

Figure 2

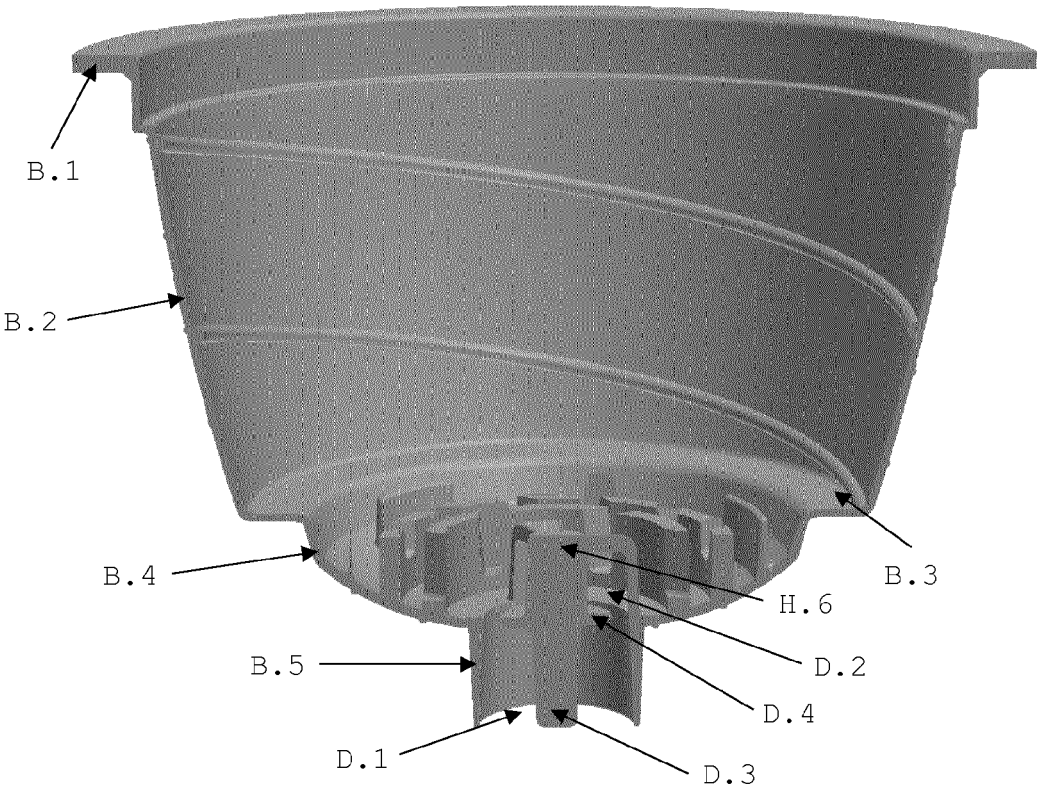

Figure 3

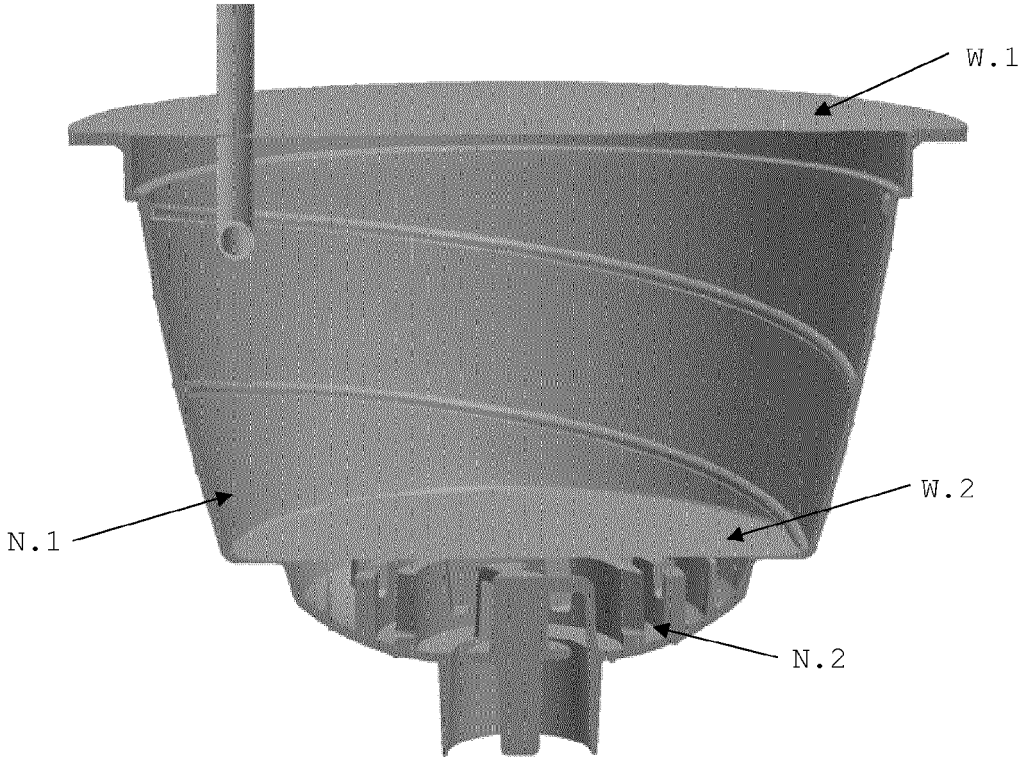

Figure 4

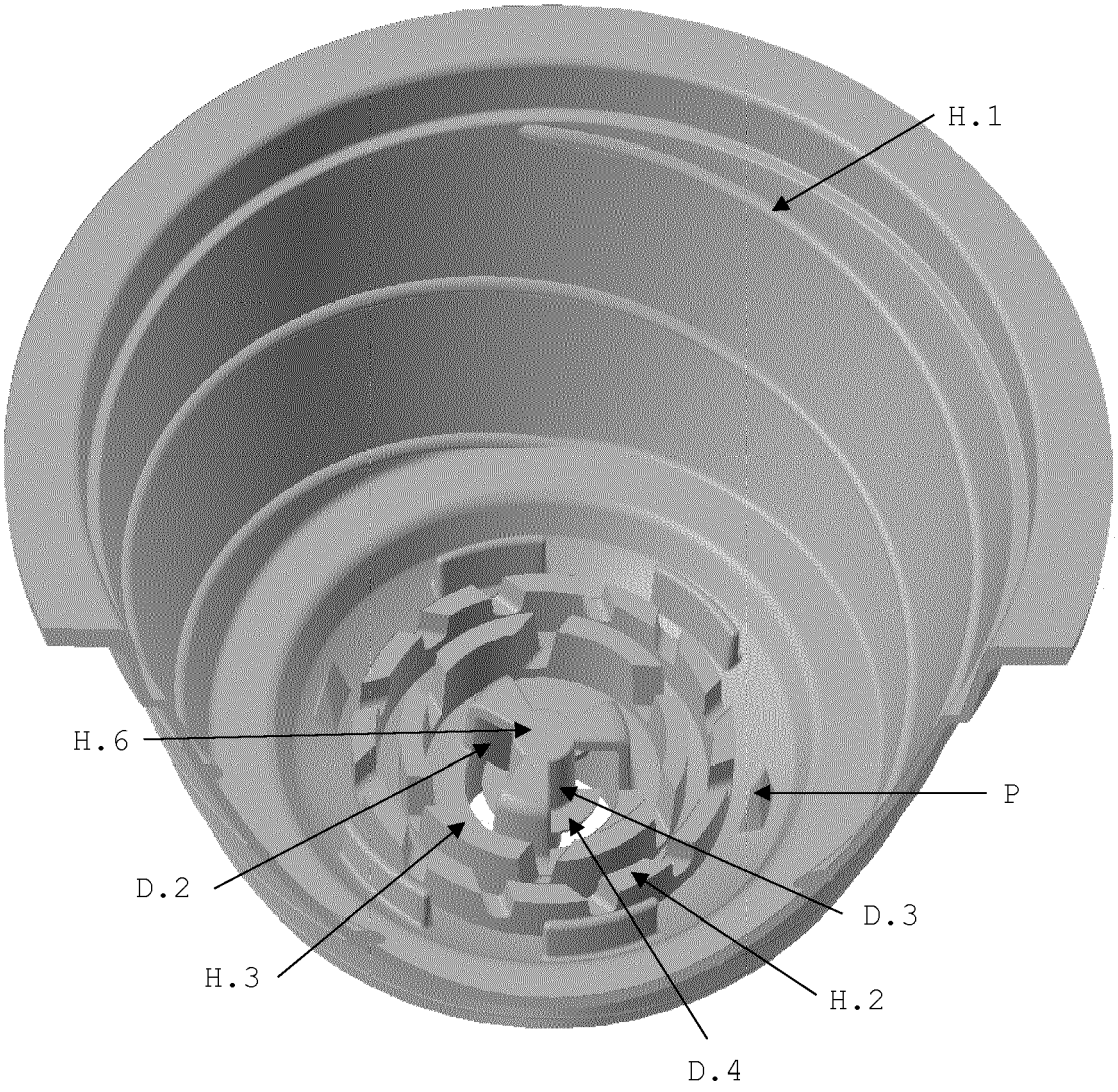

Figure 5

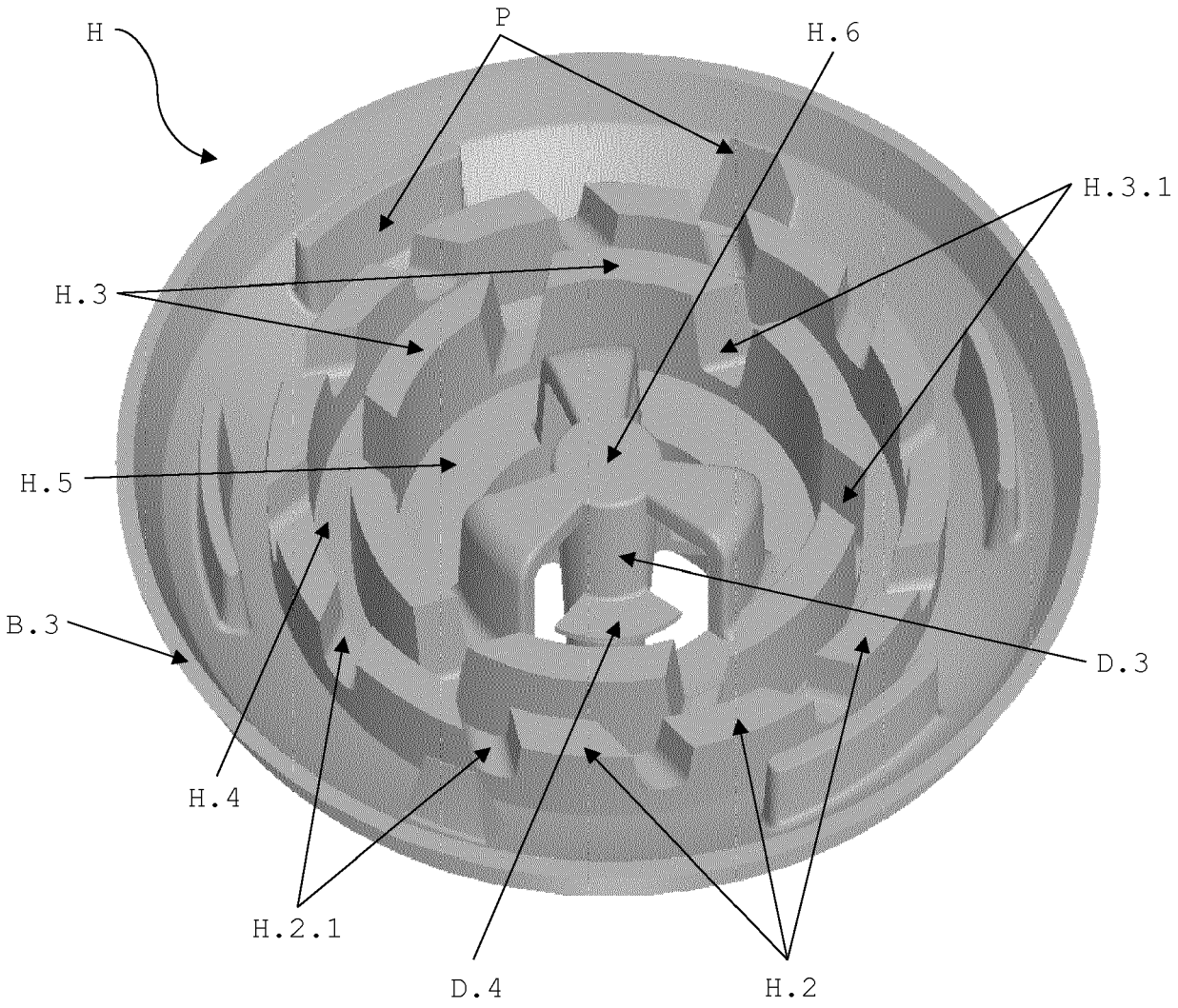

Figure 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 16 8081

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2015/018628 A1 (NESTEC SA [CH]) 12 February 2015 (2015-02-12) * page 10 - page 11; claims 1-6; figures 2,3a *	1-15	INV. B65D85/804
X	WO 2013/032330 A1 (KONINKL DOUWE EGBERTS BV [NL]; HUSBAND DAVID IAN [AU] ET AL.) 7 March 2013 (2013-03-07) * claims 1-16; figures 2,7,8 *	1-15	
X	WO 2009/115475 A1 (NESTEC SA [CH]; EPARS YANN [CH] ET AL.) 24 September 2009 (2009-09-24) * claims 1-15; figures 5,11, *	1-15	
A,D	WO 2015/032787 A1 (NESTEC SA [CH]) 12 March 2015 (2015-03-12) * the whole document *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 October 2019	Brochado Garganta, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
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