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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM,

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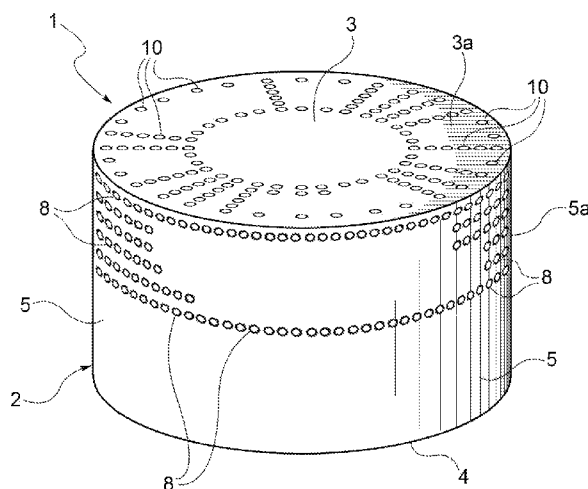
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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
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(54) **Title:** CAPSULE, MACHINE, SYSTEM AND METHOD FOR PREPARING BEVERAGE, PARTICULARLY ESPRESSO COFFEE

**FIG. 1**

(57) **Abstract:** The capsule (1) comprises a casing (2) having first and second end walls (3, 4) spaced one from the other and interconnected by a lateral wall (5) having an essentially annular shape, and defining an internal chamber (6) containing an amount or dose of a substance (7) for the preparation of a beverage. The casing (2) has at least one first and at least one second permeable or pierceable wall portion (5a, 4a), acting as inlet and outlet, respectively, for the introduction of a flow of water into said chamber (6) and the outflow of the beverage from said chamber (6), respectively. An inlet wall portion (5a) for the introduction of water into the chamber (6) is provided in the annular lateral wall (5).

Capsule, machine, system and method for preparing beverages, particularly espresso coffee

The present invention relates in a general way to systems for preparing beverages, particularly espresso coffee, using capsules or the like containing a substance for preparing the beverage, particularly ground roast coffee.

The present invention relates primarily to a capsule of the type comprising:

a casing having first and second end walls spaced apart from each other and interconnected by a lateral wall having an essentially annular shape, and defining an internal chamber containing an amount or dose of a substance for the preparation of a beverage;

the casing having at least one first and at least one second permeable or pierceable wall portion, acting as inlet and outlet, respectively, for the introduction of a flow of water into said chamber and the outflow of the beverage from said chamber, respectively.

Capsules of this type, which can be used, in particular, for preparing espresso coffee, are disclosed, for example, in patents EP-0 584 314 B1 and EP-2 141 093 B1, both in the name of the present applicant.

Known capsules of the type defined above have a casing, typically of cylindrical or frusto-conical shape, wherein the substance for preparing the beverage forms what is known as a filter panel of corresponding shape. In a capsule of this type, the hot pressurized water is introduced at one of the two end faces of the capsule, and the beverage flows out at the other end face.

The wall of the capsule through which the hot pressurized water is introduced and the wall through which the beverage flows out can be of the water-permeable type or of the type which can be pierced by any suitable known piercing devices.

In these capsules, the annular lateral wall is completely impermeable and is not pierced during the preparation of the beverage.

With capsules of the known type described above, it is important to ensure optimal wetting of the filter panel formed by the dose of substance contained in the capsule, in order to achieve optimal extraction of the beverage. For this purpose, it must be ensured that the entry of the hot pressurized water into the capsule takes place over a wide flow area or cross section.

In capsules of the known types produced up to the present time, the maximum area of introduction of the water into the capsule is no greater than the area of the end surface or wall, which is typically circular, through which the water is introduced.

An increase in the diameter of this surface of wall for the purpose of improving the wetting of the substance contained in the capsule is not feasible in practice, because, for a given internal volume of the capsule, it requires a considerable reduction in the height of the capsule, with negative effects on the characteristics of the contact between the water and the substance contained in the capsule.

A first object of the present invention is therefore to provide a capsule which can overcome the drawbacks of the prior art capsules described above, and which, in particular, improves the wetting of the substance contained in the capsule.

This object is achieved according to the invention with a capsule of the type defined in the introduction, characterized in that an inlet wall portion for the introduction of water into the capsule is made in the aforesaid lateral wall of essentially annular shape.

The pressurized water can be introduced into the capsule according to the invention either solely through one of the one or more portions of the annular lateral wall thereof, or through this annular lateral wall and also partially through one of the end surfaces or walls of the capsule.

Further advantageous features of the capsule according to the invention are defined in the dependent claims.

The present invention also proposes a machine for preparing beverages by using a capsule according to any one or more of Claims 1 to 13, the salient features of this machine being defined in Claim 14.

In a machine for preparing a beverage according to the invention, the infusion chamber is configured in such a way that it can define, with respect to the capsule positioned therein, an annular space extending around the portion of the lateral wall of the capsule intended to allow the introduction of water into the capsule, this space being connected to the pressurized water supply means, and being separated in a liquid-tight manner from the discharge means provided for the outflow of the beverage formed in the infusion chamber towards a collecting container.

The present invention also proposes a system for preparing a beverage which, according to Claim 17, comprises a capsule according to any one or more of Claims 1 to 17 and a machine according to any one or more of Claims 18 to 20.

Finally, the invention also includes a method for preparing a beverage, having the salient features defined in Claim 21.

Further features and advantages of the invention will be made clear by the following detailed description, provided purely by way of non-limiting example, with reference to the attached drawings, in which:

Figure 1 is a perspective view of a first capsule for preparing a beverage according to the present invention;

Figure 2 is a schematic representation of a machine for preparing a beverage according to the invention, using a capsule according to Figure 1;

Figure 3 is a perspective view of a variant embodiment of the capsule according to Figure 1;

Figure 4 is a partial sectional view showing the infusion chamber of a machine for preparing a beverage according to the invention, using a capsule according to Figure 3; and

Figure 5 is a perspective view of another variant embodiment of a capsule according to the invention.

In Figure 1, the number 1 indicates the whole of a capsule according to the present invention for preparing a beverage such as espresso coffee.

The capsule 1 of Figure 1 comprises a casing 2, made for example of food grade plastic material.

In the illustrated embodiment, the casing 2 has a generally cylindrical configuration, with a first and a second end wall 3, 4, at the top and bottom respectively, spaced apart from each other and interconnected by a lateral wall 5 of essentially annular shape.

The casing 2 can also be made in a non-cylindrical shape such as a frusto-conical shape.

As shown in Figure 2, the casing 2 defines an internal region or chamber 6, which contains an amount or dose of a substance 7 for preparing a beverage, such as ground roast coffee.

The annular lateral wall 5 of the casing 2 has an upper portion 5a having a plurality of micro-holes 8 to make it water-permeable. The micro-holes 8 can each have a cross section such that they impede the outflow from the casing 2 of the substance contained therein for preparing the beverage, and/or a filter, made for example of paper or the like, can be placed inside the casing 2, immediately adjacent to the inner surface of the lateral wall 5, for retaining the aforesaid substance in the casing 2.

At least one portion, preferably a central portion, of the lower end wall 4 of the casing 2 is also preferably provided with micro-holes, indicated by 9 in Figure 2, such that said wall portion is made permeable to the liquid beverage formed by the contact of the substance 7 contained in the capsule with the water introduced therein through the inlet portion 5a of the lateral wall 5 of the capsule.

Figure 2 shows schematically a machine M which can be used for preparing a beverage, using a capsule 1 of the type described above with reference to Figure 1.

In the illustrated embodiment, the machine M comprises a support casing 50 in which an

electric pump 51 can be actuated in a known way to cause water to flow from a reservoir 52 towards an infusion unit indicated as a whole by 53, after passing through an electric heater device 44 of a known type.

The infusion unit 53 can comprise two elements 54 and 55 which can be moved away from and towards each other, and which can be connected in a sealed way in order to form, in combination, an infusion chamber 56 into which a capsule 1 of the type described above has previously been introduced.

In the schematically illustrated embodiment, the element 54 of the infusion unit 53 carries a toroidal sealing ring 57, and the element 55 carries a sealing ring 58. The arrangement is such that the capsule 1 introduced into the infusion unit 53 is enclosed longitudinally between the sealing rings 57 and 58. In particular, the ring 58 extends around the central portion 4a of the lower wall 4 of the capsule in which the outflow micro-holes 9 are provided.

The infusion chamber 56 is configured so as to define, relative to the capsule 1 enclosed therein, an annular space 60 which extends around the lateral wall 5 of the capsule, and in particular around the portion 5a of this wall in which are provided the micro-holes 8 for the introduction of the water.

The space 60 is connected to the delivery end of the pump 51 through one or more conduits such as those indicated by 61-63 in Figure 2.

In the lower element 55 of the infusion unit 53, the region inside the sealing ring 58 communicates with a discharge passage 59, through which, in use, the beverage flowing out of the capsule 1 through the micro-holes 9 in the lower base of the capsule can pass to a collecting container such as a cup C placed beneath.

The arrangement of the machine M shown schematically in Figure 2 is such that, as a result of the activation of the pump 51 and the heating device 44, a flow of hot pressurized water is sent into the space 60, from where it penetrates into the casing 2 of the capsule 1

through the micro-holes 8 in the inlet wall portion 5a of its annular lateral wall 5.

Streams of hot water in the substance 7 contained in the capsule 1 are indicated in broken lines, for guidance only, in Figure 2. The paths shown here indicate how the substance 7 can be effectively “wetted”, thus allowing optimal infusion.

With reference to Figure 1, a further inlet portion of wall can be provided in the upper end wall 3 of the casing 2 for the introduction of pressurized water into the casing. In the embodiment shown in broken lines in Figure 1, this further inlet portion of wall is indicated by 3a, and is essentially in the form of a circular ring comprising a plurality of micro-holes indicated by 10.

In order to use a capsule which is further provided with a ring of inlet micro-holes 10 as described immediately above, the infusion unit 53 of the machine M according to Figure 2 must be provided with an upper sealing ring 57 with a suitably reduced diameter.

In variant embodiments which are not illustrated, the micro-holed portion 3a of the upper end wall 3 of the capsule 1 can be central, instead of peripheral as shown in the exemplary embodiment of Figure 1.

Ultimately, it is possible for the whole upper end wall 3 of the capsule 1 to be micro-holed, but in any case the flow cross section through this wall 3 is preferably smaller than the flow cross section through the micro-holed portion 5a of the lateral wall 5 of the capsule.

Figure 3 shows a further variant embodiment of the capsule 1 according to the present invention. In this drawing, parts and elements described previously have been given the same reference numerals as those used previously.

In the variant according to Figure 3, the annular lateral wall 5 of the casing 2 of the capsule has an outer peripheral projection 11, whose lower annular surface or face 11a forms a transverse shoulder intended to abut in an essentially watertight way against a corresponding bearing surface 64 (Figure 4) provided in the infusion chamber 56 of the

infusion unit 53 in which the capsule 1 is intended to be used. As seen in Figure 4, the connection by abutment of the perimetric projection 11 of the capsule 1 against the surface 64 of the infusion chamber creates the watertight separation between the space 60 and the beverage discharge conduit 59.

The upper end wall 3 of the capsule according to Figure 3 can also be provided with micro-holes, if required, to assist the introduction of hot pressurized water into the capsule.

Figure 5 shows a further variant embodiment of a capsule 1 according to the invention. In this drawing also, parts and elements described previously have again been given the same reference numerals as those used previously.

In the capsule 1 according to Figure 5, the lateral wall 5 of the casing 2 has a cross-sectional profile which forms a step 12, which defines an external annular surface or transverse shoulder 12a facing downward. The step 12 has the effect of dividing the lateral wall 5 of the casing into an upper portion 5a having a greater cross section and a lower portion 5b having a smaller cross section.

The shoulder 12a defined at the step 12 provides the same sealing function in the infusion chamber as that provided by the peripheral projection 11 of the capsule described above with reference to Figures 3 and 4.

The capsule according to Figure 5 can also have a micro-holed area in the upper end wall 3, for the additional introduction of hot pressurized water into the capsule.

Conveniently, in the capsule according to Figure 5, the ratio between the height h of the upper portion 5a and the overall height H of the capsule is in the range from 0.1 to 0.9. Additionally, the ratio between the diameter d of the portion 5b and the diameter D of the portion 5a is also in the range from 0.1 to 0.9.

In all cases, the ratio between the overall flow area or cross section of the introduction of the water into a capsule 1 according to the invention and the area or cross section of the

outflow of the beverage from the capsule is preferably greater than 1.

In the various embodiments of a capsule according to the invention, the substance 7 for preparing beverages is preferably in the form of granules or a powder, and is deposited so as to form a stratified structure in the capsule 1, with a more dense and compact lower layer and a less dense upper layer adjacent to the inlet wall portion 5a for the introduction of the water. This solution makes it possible to improve the diffusion of the “precursor” of the beverage into the capsule.

The inlet wall portion 5a can be made, if required, with a film or sheet welded around the casing 2 and capable of being pierced or torn by points, blades or the like for the introduction of the water into the chamber 6.

In general, since the capsule 1 can easily be made of a single material, shaped into the final profile by injection moulding, forging, embossing or injection-compression moulding operations, the capsule 1 can conveniently be made of a biodegradable/compostable material, and in particular a polymer material, preferably a polymer extracted from biomass or a compostable synthetic polymer, or a polymer produced by genetically modified micro-organisms or bacteria, or a polymer made from fossil monomers, or a material containing natural fibres as by-products of the food chain (husks of maize, coffee, rice, or the like) or lawn mowing products, conglomerated by means of a binding agent, or a polymer blend.

Clearly, provided that the principle of the invention is retained, the forms of application and the details of construction can be varied widely from what has been described and illustrated purely by way of non-limiting example, without thereby departing from the scope of protection of the invention as defined by the attached claims.

CLAIMS

1. Capsule (1) for preparing a beverage, comprising
a casing (2) having first and second end walls (3, 4) spaced apart from each other and interconnected by a lateral wall (5) having an essentially annular shape, and defining an internal chamber (6) containing an amount or dose of a substance (7) for the preparation of a beverage;
said casing (2) having at least one first and at least one second permeable or pierceable wall portion (5a, 4a), acting as inlet and outlet, respectively, for the introduction of a flow of water into said chamber (6) and the outflow of the beverage from said chamber (6), respectively;
the capsule (1) being characterized in that an inlet wall portion (5a) for the introduction of water into said chamber (6) is provided in said annular lateral wall (5).
2. Capsule according to Claim 1, wherein the inlet wall portion (5a) for the introduction of water into said chamber (6) is provided only in said annular lateral wall (5).
3. Capsule according to Claim 1, wherein one further inlet wall portion (3a) for the introduction of water into the capsule (1) is provided in an end wall (3) of the casing (2).
4. Capsule according to Claim 3, wherein said further inlet wall portion (3a) of the casing (2) for the introduction of water into said chamber (6) has a flow area or cross section smaller than that of the inlet wall portion (5a) provided in the lateral wall (5), such that the introduction of water into the chamber (6) occurs mainly through said lateral wall (5).
5. Capsule according to any of the preceding claims, wherein one of the one or more outlet portions (4a) for the outflow of the beverage from the chamber (6) is provided in an end wall (4) of the casing (2).
6. Capsule according to Claim 5, wherein the outlet wall portion (4a) for the outflow of the beverage from the chamber (6) is provided in a central portion of an end wall (4) of

the casing (2).

7. Capsule according to any of the preceding claims, wherein the casing has a general shape which is essentially cylindrical or frusto-conical.

8. Capsule according to any of the preceding claims, wherein the annular lateral wall (5) of the casing (2) forms a transverse shoulder (11a, 12a) intended to abut in an essentially watertight way against a corresponding surface (64) of the infusion chamber (56) of a machine (M) for the preparation of the beverage.

9. Capsule according to Claim 8, wherein the lateral wall (5) of the casing (2) has a peripheral external projection (11) which defines said transverse shoulder (11a).

10. Capsule according to Claim 8 or 9, wherein the lateral wall (5) of the casing (2) has an axial cross-sectional profile which forms at least one step (12) which externally defines said transverse shoulder (12a) and divides the casing (2) into a first portion (5a) having a greater cross section and a second portion (5b) having a smaller cross section.

11. Capsule according to Claim 10, wherein the ratio between the overall height (H) of the casing (2) and the height (h) of the portion (5a) thereof having the greater cross section is in the range from 0.1 to 0.9.

12. Capsule according to Claim 10 or 11, wherein the end walls (3, 4) of the casing (2) are essentially circular, and the ratio between the diameters (d, D) thereof is in the range from 0.1 to 0.9.

13. Capsule according to any of the preceding claims, wherein the ratio between the total flow area or cross section for the introduction of water into the chamber (6) and the outflow area or cross section of the beverage from the chamber (6) is greater than 1.

14. Capsule according to any of the preceding claims, wherein said substance (7) for the preparation of the beverage is essentially in the form of granules or a powder, and has a

stratified structure comprising at least one upper layer having a smaller density and a lower layer having a greater density.

15. Capsule according to Claim 14, wherein said upper layer is adjacent to said inlet wall portion (5a) for the introduction of water into said chamber (6).

16. Capsule according to any of the preceding claims, wherein said inlet wall portion (5a) for the introduction of water into said chamber (6) is made with a film or a flexible sheet, welded around the casing (2), and adapted to be pierced by points or the like for the introduction of water into said chamber (6).

17. Capsule according to any of the preceding claims, wherein said casing (2) is made of a biodegradable/compostable material, and in particular a polymer material, preferably a polymer extracted from biomass or a compostable synthetic polymer, or a polymer produced by genetically modified micro-organisms or bacteria, or a polymer made from fossil monomers, or from a material containing natural fibres as by-products of the food chain (husks of maize, coffee, rice, or the like) or lawn mowing products, conglomerated by means of a binding agent, or a polymer blend.

18. Machine (M) for preparing a beverage, comprising

a support casing (50) wherein there is defined an infusion chamber (56) into which a capsule (1) according to one or more of the preceding claims can be introduced, and wherein there are provided supply means (51, 52) for supplying a flow of pressurized water intended to be introduced into the capsule (1), and discharge means (59) for the outflow of the beverage formed in the chamber (6) toward a collecting container (C);

the machine (M) being characterized in that the infusion chamber (56) is configured such that it is capable of defining, with respect to a capsule (1) positioned therein, an annular space (60) which extends about the portion (5a) of the lateral wall (5) of the capsule (1) which is intended to allow the introduction of water into the capsule (1); said space (60) being connected to the pressurized water supply means (51, 52) and separated in a liquid-tight manner from the discharge means (59); the arrangement being such that a flow of pressurized water introduced into said space (60) is capable of penetrating into the capsule

(1) through said inlet wall portion (5a) of the annular lateral wall (5) thereof.

19. Machine according to Claim 18, for use with a capsule according to Claim 3, the machine (M) being characterized in that said pressurized water supply means (51, 52) are designed to supply a flow also to said further inlet wall portion (3a) of the casing (2) of the capsule (1).

20. Machine according to Claim 18 or 19, for use with a capsule (1) according to any of Claims 8 to 10, wherein the infusion chamber (56) forms a rest abutment (64) against which the transverse shoulder (11a, 12a) of the lateral wall (5) of the capsule (1) is intended to bear in a substantially liquid-tight manner.

21. System for preparing a beverage, comprising
a capsule (1) according to one or more of Claims 1 to 17, and
a machine (M) according to one or more of Claims 18 to 20.

22. Method for preparing a beverage, comprising the steps of:
providing a capsule (1) according to one or more of Claims 1 to 17,
providing a machine (M) according to one or more of Claims 18 to 20,
introducing a capsule (1) into the infusion chamber (56) of the machine (M), and
activating the water supply means (51, 52) such that a pressurized flow of water is introduced into the space (60) defined between the infusion chamber (56) and the annular lateral wall (5) of the capsule (1) and penetrates into the capsule (1) through the inlet portion (5a) of said annular lateral wall (5), wetting the substance (7) contained in the capsule (1).

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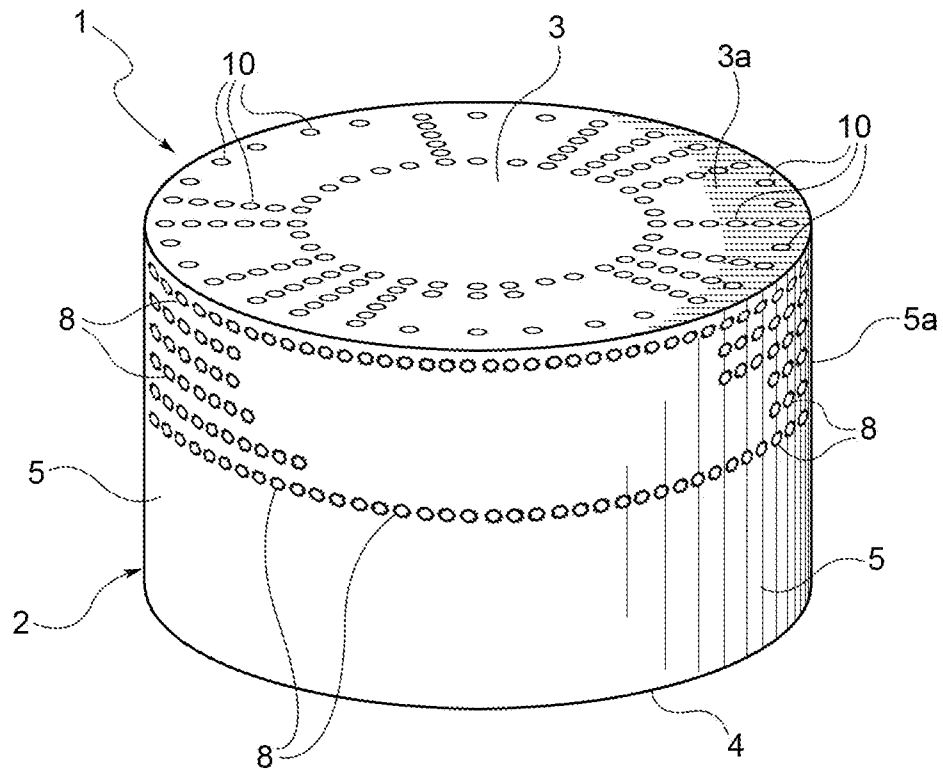


FIG. 1

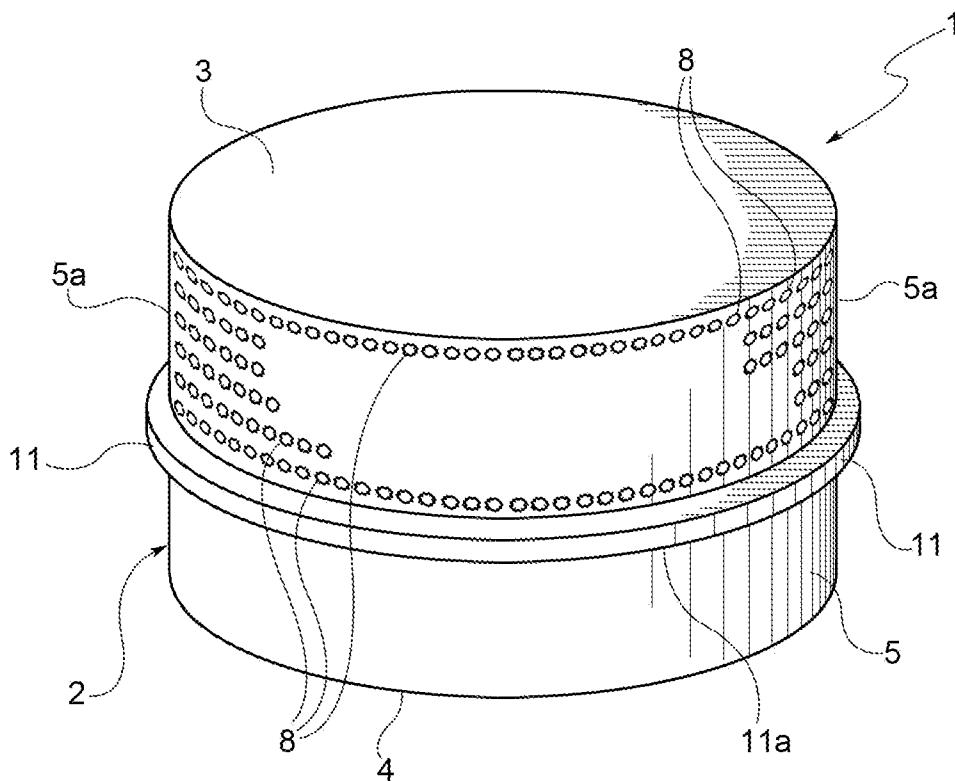


FIG. 3

2/4

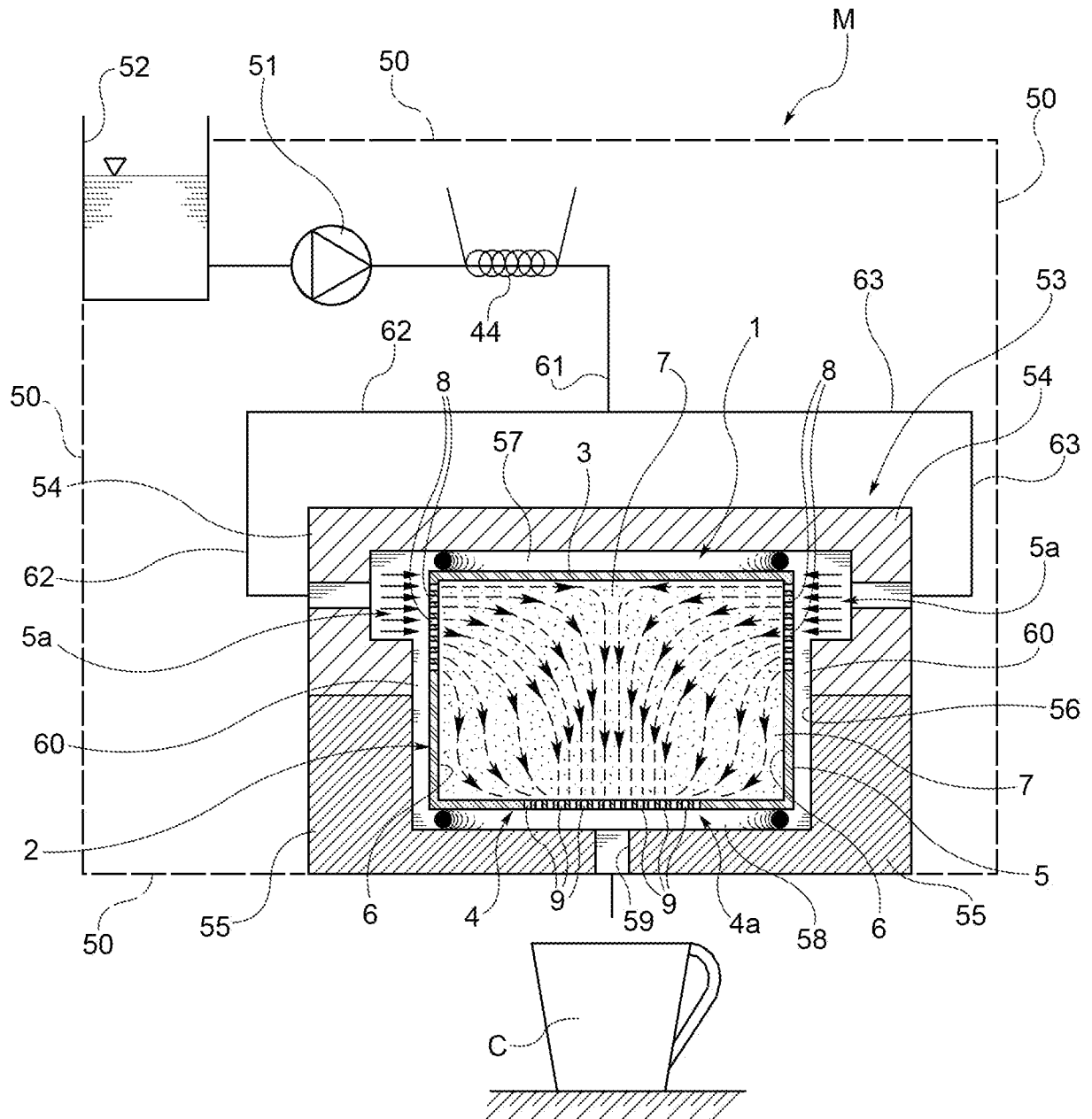


FIG. 2

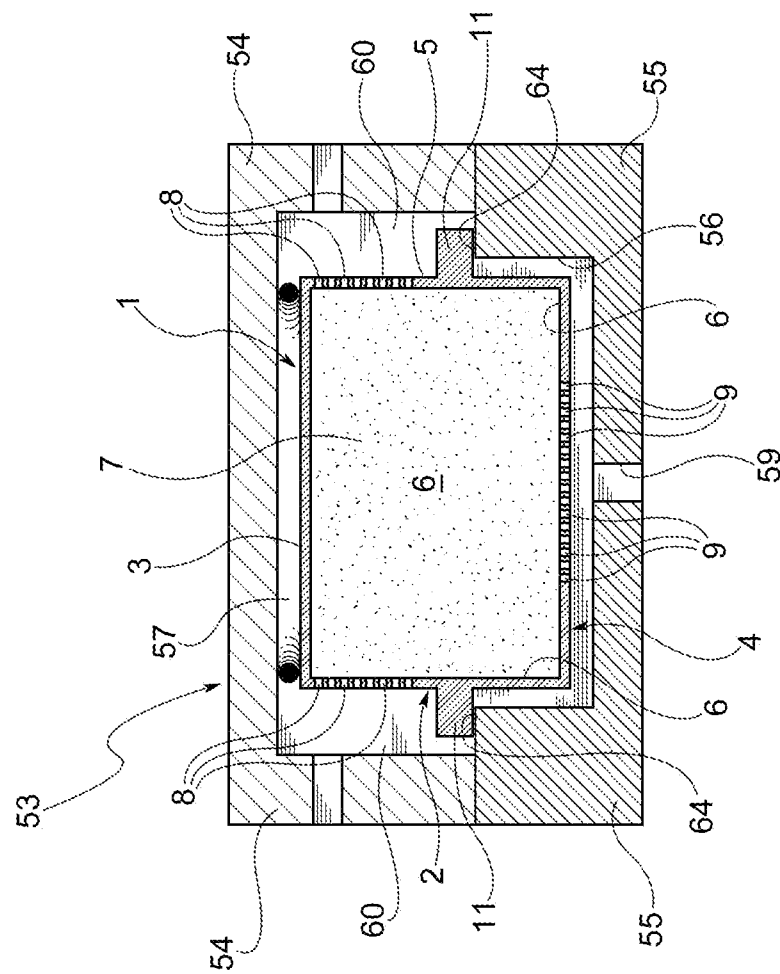


FIG. 4

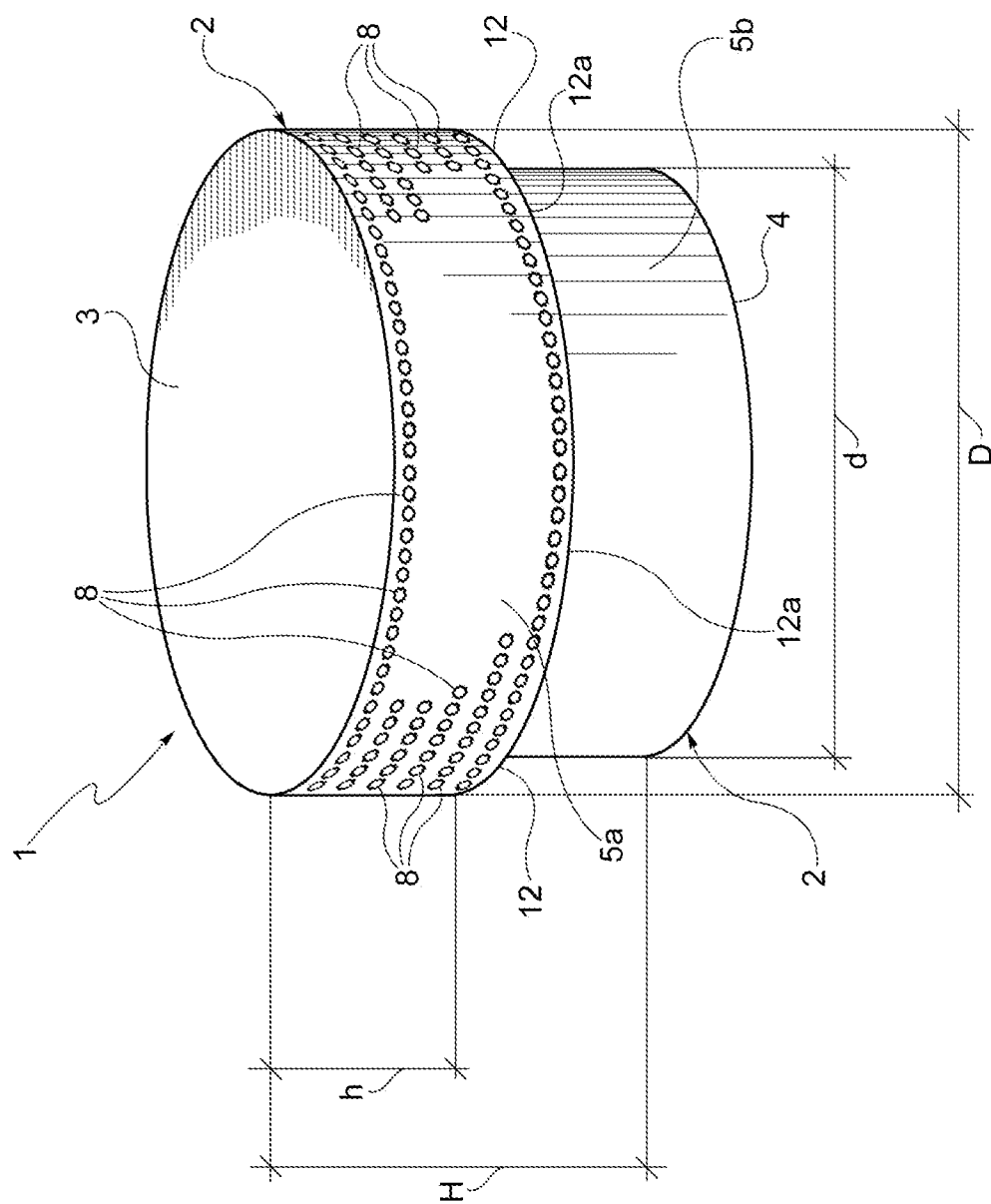


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/052743

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)

EP0-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.
A	US 2010/077928 A1 (SCHMED ARTHUR [CH] ET AL) 1 April 2010 (2010-04-01) abstract; figures -----	1,18,21, 22
A	US 3 309 980 A (BOZEK JOHN S) 21 March 1967 (1967-03-21) sentence 43 - sentence 58 column 3, line 1 - line 10; figures -----	1,18,21, 22
A	US 3 095 801 A (FOGG CHARLES R) 2 July 1963 (1963-07-02) claim 1; figures -----	1,18,21, 22

☐

Further documents are listed in the continuation of Box C.

☒

See patent family annex.

* Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

30 August 2012

Date of mailing of the international search report

07/09/2012

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/052743

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2010077928	A1	01-04-2010	NONE	

US 3309980	A	21-03-1967	NONE	

US 3095801	A	02-07-1963	NONE	
