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(54) **CAPSULE FOR BEVERAGES**

KAPSEL FÜR GETRÄNKE

CAPSULE POUR BOISSONS

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(73) Proprietor: **Sarong Societa' Per Azioni**
42046 Reggiolo (RE) (IT)

(72) Inventors:
• **BARTOLI, Andrea**
19031 Ameglia (La Spezia) (IT)
• **CAPITINI, Davide**
19031 Ameglia (La Spezia) (IT)

(74) Representative: **Persi, Patrizia**
Bugnion S.p.A.
Via Mario Vellani Marchi, 20
41124 Modena (IT)

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Description

[0001] The present invention relates to a capsule for beverages that is a capsule that is suitable for containing an initial product to be joined to a fluid to obtain a final product.

[0002] In particular, the invention relates to a single-dose and disposable capsule containing an initial product, for example like coffee powder that is able to make, by interacting with pressurized water, a final product, for example a coffee beverage.

[0003] In detail, the capsule is particularly configured to prepare products, for example beverages, in automatic dispensing machines.

[0004] The known capsules for use in dispensing machines are disposable, single-dose containers comprising an outer casing and having the shape of a glass or cup. The casing usually has a base wall and a side wall defining a cavity containing the initial product, for example ground coffee or tea, from which the final product is to be obtained, for example the beverage. A flanged edge extends from the side wall and is arranged around the cavity on the side opposite the base wall.

[0005] The cavity, at a mouth thereof is hermetically closed by a covering element, fixed to the flanged edge, so as to seal the initial product inside the container.

[0006] The capsule can be used in a dispensing machine in which the capsule can be inserted by a user, into a chamber of the dispensing machine. During dispensing, the base wall of the capsule is perforated by an injection device to inject pressurized liquid, for example water, into the capsule and the covering element is perforated by a dispensing device of the dispensing machine to enable the final product to be dispensed.

[0007] The dispensing device of the dispensing machine comprises a dispensing plate provided with a plurality of pointed elements that, when a pressure of the fluid inside the capsule increases, engage with the covering element and perforate it in a plurality of different zones. The final product can flow into a fruition container through the perforations made by the dispensing device of the dispensing machine.

[0008] For good dispensing results, the capsule further comprises a sealing element arranged at the flanged edge which is configured to make a fluidic seal with the dispensing machine, in particular with a protrusion-shaped housing element of the dispensing machine, the capsule being insertable into the protrusion-shaped housing element.

[0009] The sealing element prevents an outflow of the pressurised liquid at high operating pressure of the dispensing machine and, in use, is crushed between the housing element of the dispensing machine and the dispensing plate of the dispensing device.

[0010] An example of a capsule with sealing element is provided by patent EP1654966, in which the casing is made of aluminium and the sealing element is an elastic ring made of silicone rubber fixed to the flanged edge. Using aluminium for the casing of the capsule is particularly advantageous because it enables the initial product to be kept a long time inside the cavity, being impermeable to oxygen and to water vapour. However, placing the elastomeric ring in the silicone casing requires devices to apply the silicone rubber to the flanged edge and it is difficult to produce, with the consequence that, if the sealing element is applied imprecisely, undesired leaks of water can occur during dispensing of the beverage.

[0011] In addition, although the aluminium itself is recyclable, a body formed by the aluminium casing and by the silicone rubber sealing element is no longer recyclable and this constitutes a problem for the increasingly felt need to make an entirely recyclable product for the purposes of waste disposal. For this purpose, capsules have become widespread on the market in which the casing is made of aluminium and the sealing element is a ring of compostable material, for example the sealing element is made of paper or of natural fibres to ensure that the capsule has only compostable or completely recyclable material.

[0012] WO2019092144 discloses a capsule having a casing made of aluminium and a cellulose-based ring.

[0013] In capsules with an aluminium casing, the flanged edge is planar and comprises an end annular bead, at which a border of the aluminium casing is folded on itself in accordance with the prior art and extends symmetrically, in a direction parallel to an axis of symmetry of the capsule, towards the base wall and on the opposite side thereto.

[0014] By conducting experimental dispensing tests with capsules in which the sealing element is not silicone rubber but cellulose-based material, for example paper and/or cardboard, the Applicant noted that defective dispensing operations may occur.

[0015] For example, the Applicant has verified that in many dispensing operations, for example of espresso coffee, the beverage can be preceded by dispensing of only water.

[0016] This defectiveness is due to the occurrence of leaks of water from the front and/or rear of the dispensing machine that, being conveyed to the fruition container intended to subsequently receive the beverage, dilute in an undesired manner the beverage to be obtained.

[0017] Such leaks are fluidic losses that can be frontal and/or rear losses.

[0018] The Applicant has also verified that in the same or in other dispensing operations, the capsule may remain suspended in the machine and not fall automatically into the inner receptacle dedicated to receiving the capsules already used. The user is thus forced to open the machine to free manually the capsule trapped in order to be able to continue

to use the dispensing machine in the subsequent dispensing operations.

[0019] This other defectiveness is due to the fact that the capsule remains coupled to the housing element of the dispensing machine, without becoming uncoupled automatically.

5 **[0020]** The technical purpose which forms the basis of the present invention is thus to make available a capsule that overcomes the drawbacks of capsules of known type.

[0021] A further purpose of the present invention is to obtain a capsule with aluminium casing and sealing element made of paper material in which the percentage of defects, that is the percentage of defective dispensing operations with respect to the total of dispensing operations conducted, is less than the defects of capsules of known type to increase dispensing efficiency.

10 **[0022]** Another further purpose of the present invention is to obtain a capsule, that is simple to make and of moderate cost, with aluminium casing and a sealing element made of paper material that ensures good beverage extraction quality, reducing fluidic losses, simultaneously ensuring automatic uncoupling at the end of dispensing.

[0023] These purposes specified are achieved by a capsule in accordance with the present invention, comprising the technical characteristics set out in one or more of the appended claims.

15 **[0024]** Further characteristics and advantages of the present invention will become more apparent from the following indicative, and hence non-limiting, description of a preferred, but not exclusive, embodiment of a capsule as illustrated in the appended drawings, in which:

20 Figure 1 is a perspective view of a capsule in accordance with the present invention, on the side of a base wall of the capsule, wherein for the sake of clarity a covering element fixed to a flanged edge of the capsule is detached therefrom;

Figure 2 shows a prospective section of the capsule of Figure 1, on the side opposite the side of the base wall;

Figure 3 shows a sectional view of the capsule of Figure 1;

25 Figure 4 shows an enlargement of the view of Figure 3, in which the flanged edge, an end annular bead and a sealing element made as a ring and associated with the flanged edge are shown in detail;

Figure 5 shows an enlargement of the flanged edge of one variant of the capsule of Figure 1, in which the ring is made by one layer and a further layer, fixed together and fixed to the flanged edge by a joining layer and a further joining layer;

30 Figure 6 shows an enlargement of the flanged edge of another variant of the capsule of Figure 1, in which the ring abuts on a connecting portion of the flanged edge;

Figure 7 shows an enlargement of the flanged edge of another different variant of the capsule of Figure 1, in which the sealing element comprises a ring and a further ring, arranged on the opposite side of the flanged edge and facing the ring;

35 Figure 8 shows an enlargement of the flanged edge of another further variant of the capsule of Figure 1, in which the ring abuts on a connecting portion of the flanged edge and an outer zone of the ring is flexed towards the base wall.

[0025] In the following description, the same elements are indicated with the same reference numbers in the various Figures. It is also pointed out that unless differences are explicitly stated, the same elements are deemed to be applicable to all the different variants.

40 **[0026]** With reference to attached Figures 1 to 8, with 1 a capsule is indicated in accordance with the present invention, which is usable in a dispensing machine, which is not illustrated. More precisely, the capsule 1 is insertable into a chamber, which is not illustrated, of the dispensing machine.

[0027] The capsule 1 comprises a casing 2 that has an axis Z of longitudinal extent shown in Figure 3, for example an axis of symmetry. The casing 2 extends about the axis Z.

45 **[0028]** The casing 2, as will be seen better in detail below, is preferably made of aluminium, for example by drawing.

[0029] The casing 2 is substantially of truncated-cone shape, and i.e. shaped as a glass or cup. The casing 2 comprises a base wall 201 and a side wall 202, defining a cavity that is open, shown in Figures 2 and 3, and a flanged edge 204, which extends from the side wall 202.

[0030] In detail, the side wall 202 is divergent from the base wall 201.

50 **[0031]** The cavity 203 is suitable for containing an initial product (not illustrated) to be combined with a fluid (not illustrated) to obtain a final product (not illustrated). The fluid is, preferably, a hot or cold pressurized liquid delivered into the cavity 203 in a step of injecting the fluid to obtain the final product. As said previously, the initial product is for example a soluble, freeze-dried, dehydrated, concentrated, percolatable, lyophilised, powdered food product -for example coffee; alternatively, the initial preparation can be for example a leaf food product - for example tea. The fluid is preferably water, which is hot and pressurized, which enables a beverage to be obtained, for example coffee, barley, tea or an herbal drink.

55 **[0032]** The flanged edge 204 comprises an annular bead 205, which makes the end of the flanged edge 204.

[0033] A border 2' of the casing 2 can be, preferably, folded in the bead 205 so that it is positioned inside the bead 205. Nevertheless, other configurations of the border 2' can be possible.

[0034] The capsule 1 comprises a covering element 3 fixed to the flanged edge 204 so as to close the cavity 203. The covering element 3 is fixed to the flanged edge 204 by heat or ultrasound welding, or gluing, opposite to the base wall 201.

[0035] The covering element 3 is perforable by a dispensing device of the dispensing machine so that the final product can be dispensed through the covering element 3.

5 **[0036]** A sealing element 4 is associated with the flanged edge 204 on the side of the base wall 201 to make a fluidic seal with the dispensing machine, for example with a housing element of the dispensing machine, the housing element being shaped as a protrusion.

[0037] The sealing element 4 comprises an annular body 401 made by a cellulose-based material that is made as a paper or cardboard ring, or natural fibre ring or ring made of a composition which comprises a combination of these materials.

10 **[0038]** Subsequently, for simplicity's sake but without limiting the scope, the ring 401 will be cited as being made of paper and/or cardboard.

[0039] Owing to the fact that the sealing element 4 comprises the cellulose-based ring 401, the sealing element 4 is easily made and moreover makes the capsule 1 entirely recyclable.

15 **[0040]** The flanged edge 204 comprises a first portion 206, which comprises the annular bead 205, a second portion 207, contiguous to the side wall 202, and a connecting portion 208, between the first portion 206 and the second portion 207.

[0041] The connecting portion 208 is so shaped as to connect together the first portion 206 and the second portion 207.

20 **[0042]** The second portion 207 is annular and lies on a first plane, the first portion 206 is displaced towards the base wall 201 and is at least at a predetermined distance D from the first plane, between the connecting portion 208 and the side wall 202 being defined a seat 209 in which, at least partially, the ring 401 is housed.

[0043] As will be seen, this enables a reinforced fluidic seal and effective uncoupling from the dispensing machine to be obtained after dispensing. The seat 209 is concave and the displacement of the first portion 206, with the entire annular bead 205, towards the base wall 201 contributes to delimiting the seat further 209 towards the base wall 201.

25 **[0044]** Owing to the fact that the first portion 206 is displaced towards the base wall 201 and creates the seat 209 in which the ring 4 is housed at least partially, the Applicant has been able to verify experimentally an improvement of the fluidic seal and thus a reduced quantity of frontal and/or rear fluidic losses, and a considerable improvement in defectiveness due to the fall of the capsule 1 at the end of dispensing.

30 **[0045]** As indicated previously, the term "fluidic losses" means leaks of water from the frontal and/or rear part of the dispensing machine that are due to a defective fluidic seal between the sealing element 4 and the dispensing machine.

[0046] With regard to the fluidic seal, the displacement and the consequent change in level between the first portion 206 in which the annular bead 205 is located and the second portion 207, which lies in the first plane, enables a deformation to be generated in the flanged edge 204, at the connecting portion 208, which makes the flanged edge 204 more easily adaptable when the flanged edge 204, together with the ring 401, is clamped between the housing element and a dispensing plate (not illustrated) of the dispensing machine.

35 **[0047]** As already disclosed previously, the dispensing plate is provided with a plurality of pointed elements (not shown) that, when a pressure of the fluid inside the capsule increases, engage with the covering element 3 to perforate the covering element 3 in a plurality of different zones.

40 **[0048]** On the other hand, with regard to the fall of the capsule 1 at the end of dispensing, the seat 209 is able to contain internally the ring 401 and thus possible friction between the paper and ejection guides (not shown) of the dispensing machine can be avoided that may prevent the capsule 1 from being correctly uncoupled.

[0049] Owing to the fact that the flanged edge 204 has the annular bead 205 displaced and owing to the fact that the paper ring can be housed at least partially in the seat 209, the capsule 1 in accordance with the present invention has a surprising technical effect because it is able to reduce significantly both the defectiveness linked to the fluidic losses and the defectiveness linked to the automatic uncoupling from the dispensing machine.

45 **[0050]** It should be noted that the first portion 206 is contained in a half-space facing towards the base wall 201, which half-space is defined by a second plane which is located at said predetermined distance D.

[0051] In other words, the distance D is the distance to which the outer portion of the flanged edge 204 is displaced, which corresponds to the first portion 206, which also comprises the annular bead 205.

50 **[0052]** It should be noted that the first portion 206 comprises an annular part 206', which is contiguous to the connecting portion 208 and is planar, the annular part 206' lying on the second plane.

[0053] The distance D is thus measurable in a direction parallel to the axis Z between the second portion 207 of the annular flanged edge 204 and the annular part 206' of the first portion 206.

55 **[0054]** The predetermined distance D is preferably comprised between 0.10mm and 0.90mm, still more preferably comprised between 0.20mm and 0.60mm, still more preferably equal to 0.30.

[0055] The predetermined distance D can also be equal to 0.50mm.

[0056] Considering a dimension of the annular bead 205 in a direction parallel to the axis Z, which is for example equal to 1.30mm and considering a distance D equal to 0.30mm, it can be noted that, in this manner, one end 205' of the

annular bead 205 extends to the base wall 201 as far as a distance D' from the first plane that is equal to 1.60mm.

[0057] In relation to the distance D and to the thickness of the ring 401, it is noted that the ring 401 can be contained entirely, in a direction parallel to the axis Z, inside the seat 209 or can protrude therefrom and be delimited by the annular bead 205 and be contained inside the overall dimensions of the annular bead 205 within the distance D'.

[0058] In other words, being displaced entirely towards the base wall 201, the annular bead 205 contributes to delimiting the seat further 209 laterally and defines, together with the connecting portion 208, a respective outer wall of the seat 209, that on the opposite side faces the side wall 202 of the capsule. With the values supplied above by way of example, the seat 209 is delimited laterally by the connecting portion 208 and/or by the annular bead 205 up to 1.60mm.

[0059] In a direction parallel to the axis Z, the distance D' from the first plane is preferably greater than the thickness of the ring 401 to contain the ring 401 entirely inside the seat 209.

[0060] The connecting portion 208 can have a stepped truncated-cone conformation, as shown in Figures 3 to 8, or a curved conformation, for example with a change of inclination, which is not illustrated.

[0061] In other words, the connecting portion 208 can be shaped as a planar surface that connects the first portion 206 and the second portion 207 or as a surface in which a change of curvature is present.

[0062] It should be noted that the ring 401 is associated with the flanged edge 204 at least in a region intended to create the fluidic seal with the dispensing machine and that is in the region with which, during dispensing, the protrusion-shaped housing elements engages.

[0063] As shown in Figures 4, 5 and 7, the ring 401 can be associated only with the second portion 207 without necessarily abutting on the connecting portion 208 and/or the annular bead 205, and/or the side wall 202.

[0064] In this case, as will be seen in detail below, the ring 401 can be joined to the flanged edge 204 by a joining layer, configured to enable the cellulose-based layer to be joined to the flanged edge 204.

[0065] The ring 401 can comprise an outer zone 402, shown in Figures 6 and 8, which extends as far as abutting on the connecting portion 208.

[0066] In other words, the radial extent of the ring 401 can be such as to abut on the connecting portion 208 and/or the annular bead 205, if the thickness of the ring 401 is such as to abut on the latter. The ring 401 can comprise an inner zone 403 from which the outer zone 402 extends.

[0067] Optionally, the ring 401 can be retained associated to the casing 2 by interference between the outer zone 402 and the connecting portion 208 and/or the annular bead 205.

[0068] Owing to this interference with the connecting portion 208 and/or the annular bead 205, the ring 401 can be stably associated with the capsule 1 without the need to be further fixed to the flanged edge 204.

[0069] This increases the constructional simplicity of the capsule 1.

[0070] If the outer zone 402 of the ring 401 abuts on the connecting portion 208, said outer zone 402 can be flexed towards the base wall 201, as shown in Figure 8. If the inner zone 403 is planar, the outer zone 402 that is flexed can extend therefrom.

[0071] Nevertheless, regardless of the fact that the outer zone 402 may or may not abut on the connecting portion 208, the inner zone 403 can extend as far as it abuts on the side wall 202 of the capsule 2, in a non-illustrated manner.

[0072] If, for example, the ring 401 is about 1mm wide and extends as far as to abut on the side wall 202, the fluidic seal with the housing element of the dispensing machine is anyway guaranteed.

[0073] Optionally, the ring 401 can be retained associated to the capsule 1 by interference between the inner zone 403 and the side wall 202.

[0074] Owing to this interference with the side wall 202, the ring 401 can be stably associated with the capsule 1 without the need to be further fixed to the flanged edge 204.

[0075] Again, this increases the constructional simplicity of the capsule 1.

[0076] In one version, the ring 401 can be L-shaped and have a side portion shaped to follow a profile of the side wall 202.

[0077] As shown in Figures 2 to 4, and in Figures 7 and 8, the ring 401 can comprise a single layer of cellulose-based material intended to contact the dispensing machine 5. The layer can be, for example, made of paper or cardboard, with grammage comprised between 250g/m² and 900g/m², preferably comprised between 300g/m² and 750 g/m², preferably equal to 700g/m².

[0078] The term grammage means a density value of the paper and/or of the cardboard, which is expressed as a value in grams by square metre. Although the paper and/or the cardboard has a thickness that usually depends on the grammage used, the thickness of the paper and/or cardboard can vary according to different factors, like for example the type of processing performed during production of the paper and/or cardboard or the quantity of wood fibre present therein.

[0079] In fact, for the same grammage, high density paper and/or cardboard may exist that has a set thickness and low density paper and/or cardboard may exist that has a thickness that is greater than the set thickness.

[0080] For this reason, although the preferred grammage for making the ring of paper is comprised in a grammage range as disclosed above, the thickness of the ring 401 will also be indicated below because the experimental tests conducted were based on the thickness of the ring 401.

[0081] In one version that is not shown, the ring 401 can comprise a cellulose-based layer arranged externally, and a joining layer (which is not shown) configured to enable the cellulose-based layer to be joined to the flanged edge 204.

[0082] In other words, the paper or cardboard ring 401, which makes the sealing element 4, can be made of a single paper and/or cardboard layer, as shown in Figures 2 to 4, and in Figures 7 and 8, and be retained by interference or be additionally optionally fixed by the joining layer to the aluminium flanged edge 204.

[0083] The joining layer is a layer of adhesive material that is activatable by heat. As shown in Figures 5 and 6, the ring 401 can comprise a cellulose-based layer 404, arranged towards the outside in contact with the dispensing machine, the joining layer 405 configured to enable the ring 401 to be joined to the flanged edge 204, but the ring 401 can also comprise a further layer 406 of cellulose-based material and a further joining layer 407, the latter joining together the cellulose-based layer 404 and the further cellulose-based layer 406, the further cellulose-based layer 406 being joined to the flanged edge 204 by the joining layer 405.

[0084] The ring 401 can be, in other words, be made with a double cellulose-based layer.

[0085] Optionally, according to a version that is not shown, the outer layer 404 can be L-shaped to follow at least partially both the flanged edge 204 and the side wall 202.

[0086] The joining layer 405, in the single layer version or in the double layer version of cellulose-based material, can be made of adhesive material or of a material like polythene, or polyolefin or polylactic acid (PLA) that, when it is applied to the flanged edge by heat, becomes sticky and joins the further layer 406 to the flanged edge 204, and more precisely to the second portion 207 of the flanged edge 204.

[0087] The same considerations are also valid for the further joining layer 407, configured to join together the cellulose-based layer 404 and the further cellulose-based layer 406, which is a layer of adhesive material that is activatable by heat.

[0088] The joining layer 405, and optionally the further joining layer 407 can also be made of hot glue that acts when it is activated with heat.

[0089] Otherwise, the joining layer 405 and optionally the further joining layer 407 can be activated by ultrasound welding.

[0090] Each cellulose-based layer, and i.e. the layer 404 and the further layer 406, can have for example a grammage equal to 350g/m² for a total of 700g/m². In accordance with one version, which is not shown, the flanged edge 204, and preferably the entire casing 2, can optionally be coated externally by a lacquer, which can be transparent, or coloured, which is suitable for joining with the joining layer 405 when the joining layer 405 is softened, or melts, by heat or with ultrasound, to obtain adhesion of the joining layer 405 to the flanged edge 204.

[0091] The lacquer is configured to coat externally the aluminium, simultaneously customising the aluminium if it is coloured, and to facilitate the adhesion of the joining layer 405 to the aluminium of the casing 2. The lacquer can in fact combine with the polythene, or with the polylactic acid, when both are heated (the lacquer can also be heated optionally), being activatable by heat, to enable the cellulose ring to be joined to the lacquer coating the aluminium.

[0092] Preferably, the lacquer is selected so as to be compatible with the joining layer 405, thus ensuring a permanent weld or adhesion that is suitable for not detaching the ring 401 from the flanged edge 204 even during dispensing.

[0093] Owing to the fact that the ring 401 can be made by a pair of cellulose-based layers 404, 406 that are joined together it is possible to select each layer 404, 406 in an appropriate manner in terms of the grammage and/or the thickness and/or the composition.

[0094] For example, the layer 404 arranged externally can be chosen with a grammage and/or thickness and/or composition that is different from the further layer 406, arranged internally, such that the ring 401 has the characteristics required for the fluidic seal and uncoupling from the housing element of the dispensing machine, as will be seen in detail below, but at the same time also has a reduced cost.

[0095] For example, the outer layer 404 can be selected with a lower density than the further layer 406 below the outer layer 404, in order to deform better and promote the fluidic seal during dispensing, or can be selected by a colour or texture that is different from the further layer 406 (which is preferably neutral-white), so as to be able to be distinguishable for a user.

[0096] According to one variant shown in Figure 7, the sealing element comprises a further ring 408 made of a cellulose-based material, which is fixed to the covering element 3 on the side opposite the flanged edge 204.

[0097] The further ring 408 is aligned on the ring 401 so as to form a stratified sealing element 4, in which the planar second portion 207 made of aluminium, and the covering element 3 joined thereto are inserted between the ring 401 and the further ring 408, arranged opposite and facing one another.

[0098] For the further ring 408, what was said before applies, and thus also the further ring 408 can be made of a single layer 404 of cellulose-based material, joined to the covering element 3 by the joining layer 405, or the further ring 408 can be made by the layer 404, the further layer 406 and the joining layer 405 and the further joining layer 407.

[0099] The further ring 408 can have a grammage and/or thickness and/or composition that is different from the ring 401.

[0100] It should be noted that, during dispensing, the further ring 408 contributes to the fluidic seal with the dispensing machine but also performs the function of spacer between the capsule 1 and the dispensing machine.

[0101] In fact, the further ring 408, which is placed in contact with the dispensing plate of the dispensing machine,

maintains the flanged edge 204 spaced apart from the dispensing plate and displaces the flanged edge 204 and the ring 401 towards the base wall 201.

[0102] As a result, owing to the presence of the further ring 408, reduced thickness can be sufficient for the ring 401, with a consequent financial advantage for selecting the material with which the ring 401 can be made.

[0103] The ring 401, or if present the further ring 408, preferably have a constant thickness.

[0104] It should be noted that, from experimental tests, it has been shown to be particularly advantageous, in order to minimize the percentage of defective dispensing caused by fluidic losses and/or failed automatic uncoupling of the capsule, that the thickness of the ring 401 is comprised between 0.30mm and 1.2mm, preferably comprised between 0.55mm and 1.10mm, still more preferably comprised between 0.70mm and 1.00mm, preferably equal to 0.90mm.

[0105] In one variant, it has been experimentally proven that the defective dispensing decreases also with a thickness of the ring 401 equal to 0.45mm, as will be demonstrated below.

[0106] In use, the capsule 1 is inserted by a user into a chamber of the dispensing machine that is opened for this purpose by, for example, a lever mechanism. Using the same mechanism, the user can close the chamber to start dispensing and, when the chamber is closed, the protrusion-shaped housing element of the dispensing machine can compress the sealing element 4 that is the ring 401 inelastically to make the fluidic seal. During dispensing, the pressurized fluid is injected into the capsule and the ring 401, compressed inelastically by the housing element, makes the fluidic seal with the dispensing machine.

[0107] The same thing happens if the capsule 1, in addition to the ring 401, comprises also the further ring 408, arranged on the opposite side of the ring 401.

[0108] Owing to the connecting portion 208, in which the flanged edge 204 is deformed to connect the first portion 206 displaced downwards and the planar second portion 207 with which the ring 401 is associated, the flanged edge 4 can adapt more closely to the dispensing machine and thus the fluidic seal made by the ring 401 with the dispensing machine itself can be improved.

[0109] When the pressurized liquid is injected, the pressure of the final product increases inside the capsule, which in turn deforms the covering element 3 towards the pointed elements of the dispensing plate of the dispensing machine, which perforate the covering element 3.

[0110] At the end of dispensing, the user can open the chamber by actuating again the lever mechanism to enable the capsule 1 to be uncoupled.

[0111] Owing to the fact that the connecting portion 208 and/or the first portion 206 which comprises the annular bead 205 contain the ring 401 in the seat 209, friction is avoided between the ring 401 and the expulsion guides of the dispensing machine and this enables the percentage of defects of the dispensing machine to be reduced that are due to the suspension in the machine. The capsule 1 that has just been used, as soon as the user opens the chamber, can be in fact uncoupled from the housing element and can fall into the recovery receptacle of the already used capsules. Experimental tests conducted by the Applicant have shown that by making an aluminium capsule 1 with sealing element 4 made as a paper ring 401 and by moving the first portion 206 of the flanged edge 204 comprising the annular bead 205 towards the base wall 201, the defectiveness that is linked to the front and/or rear fluidic losses and the defectiveness that is linked to the failed uncoupling of the capsule 1 at the end of dispensing are decreased.

[0112] The experimental tests were conducted using the following Nespresso™ coffee machines: Essenza Mini™ and Citiz™.

[0113] A first series of tests and a second series of tests were conducted using capsules with an aluminium casing of known type and sealing element made as a paper ring, in which the casing comprises a planar aluminium flanged edge and an end annular bead that, in a direction parallel to the axis Z, extends symmetrically towards a base wall of the casing and on opposite side thereto.

[0114] In the first series of tests a paper ring with a thickness of 0.45 mm was used, in the second series of tests a paper ring with a thickness of 0.90 mm was used.

[0115] A third series of tests and a fourth series of tests were conducted using capsules 1 with aluminium casings 2 in accordance with the invention and sealing element 4 made as a paper ring, in which the casing 2 comprises a flanged edge 204 comprising a first portion 206 comprising the annular bead 205 displaced towards the base wall 201 by a distance D equal to 0.30mm. In the third series of tests, a paper ring with a thickness of 0.45 mm was used, in the fourth series of trials a paper ring with a thickness of 0.90 mm was used.

[0116] In the tests conducted, the capsules were all filled with the same 5.50g dose of coffee.

Comparative Example 1

[0117] A first series of tests (96 dispensing operations) was conducted using capsules as indicated previously, with aluminium casing of known type with planar flanged edge and a sealing element made as a paper ring that is 0.45mm thick.

Comparative Example 2

[0118] A second series of trials (35 dispensing operations) was conducted using capsules as indicated previously, with aluminium casing of known type with a planar flanged edge and a sealing element made as a paper ring that is 0.90mm thick.

Example 3 in accordance with the invention

[0119] A third series of tests (40 dispensing operations) was conducted using capsules according to the invention, with flanged edge with first portion 206 displaced, in which the sealing element is made as a paper ring 401 that is 0.45mm thick.

Example 4 in accordance with the invention

[0120] A fourth series of tests (40 dispensing operations) was conducted using capsules according to the invention, with flanged edge with first portion 206 displaced, in which the sealing element is made as a paper ring 401 that is 0.90mm thick.

[0121] The following table shows the percentage of defects found in each series of tests, defective dispensing operations being expressed as a percentage of total dispensing operations performed.

	Comparative example 1	Comparative example 2	Example 3	Example 4
suspension in the machine (%)	16.7 (1)	77.1 ⁽²⁾	0.0	0.0
fluidic losses (%)	89.5	14.3 ⁽³⁾	25.0 ⁽⁴⁾	0.0

(1) All the suspensions in the machine were detected in one of the coffee machines tested.

(2) About 66% of the suspensions in the machine were detected in one of the coffee machines tested, the same one in which the suspensions in the machine of Comparative Example 1 occurred.

(3) All the fluidic losses were detected in one of the coffee machines tested, the same one in which the suspensions in the machine of Comparative Example 1 occurred.

(4) All the fluidic losses were detected in one of the coffee machines tested, the same one in which the suspensions in the machine were detected of Comparative Example 1.

[0122] As already indicated previously, suspension in the machine means that the capsule, at the end of dispensing, remains coupled to the housing element of the dispensing machine and is not uncoupled automatically.

[0123] As already indicated previously, fluidic losses mean the frontal and/or rear losses that occur in the presence of leaks of water from the frontal and/or rear part of the dispensing machine.

[0124] Experimentally, it has been established that the conformation of the flanged edge 204 in accordance with the present invention is able to influence positively both the defects due to the fluidic losses and the defects due to the uncoupling of the capsule after dispensing.

Claims

1. A capsule (1) comprising:

- a casing (2) which extends about an axis (Z), which casing (2) comprises a base wall (201) and a side wall (202) defining a cavity (203) containing an initial product to be combined with a fluid to obtain a final product, and a flanged edge (204) extending from said side wall (202) and comprising an annular bead (205);
- a covering element (3), fixed to the flanged edge (204) so as to close the cavity (203);
- a sealing element (4), associated to the flanged edge (204) to make a fluidic seal with a dispensing machine; wherein
- the casing (2) is made of aluminium and the sealing element (4) comprises a cellulose-based ring (401); and wherein
- the flanged edge (204) comprises a first portion (206) which comprises the annular bead (205), a second portion (207), contiguous to the side wall (202), and a connecting portion (208), between the first portion (206) and the second portion (207); wherein the second portion (207) is annular and lies on a first plane between the

connecting portion (208) and the side wall (202) being defined a seat (209) in which, at least partially, the ring (401) is housed; the capsule being **characterized in that** the first portion (206) is displaced towards the base wall (201) and is at least at a predetermined distance (D) from the first plane.

- 5 **2.** The capsule according to claim 1, wherein the first portion (206) is contained in a half-space facing towards the base wall (201), which half-space is defined by a second plane which is located at said predetermined distance (D).
- 10 **3.** The capsule according to claim 2, wherein the first portion (206) comprises an annular part (206'), which is contiguous to the connecting portion (208) and is planar, the annular part (206') lying on the second plane.
- 15 **4.** The capsule according to one of claims 1 to 3, wherein said predetermined distance (D) is comprised between 0.10 mm and 0.90 mm, still more preferably comprised between 0.20 mm and 0.60 mm, still more preferably equal to 0.30.
- 20 **5.** The capsule according to any one of the preceding claims, wherein the connecting portion (208) has a curved conformation with a change of inclination or a stepped truncated-cone conformation.
- 25 **6.** The capsule according to any one of the preceding claims, wherein the ring (401) comprises an outer zone (402) which extends at least up to abutting on the connecting portion (208) and optionally wherein the ring (401) is retained associated to the casing (2) by interference between the outer zone (402) and the connecting portion (208) and/or the annular bead (205).
- 30 **7.** The capsule according to claim 6, wherein the outer zone (402) abuts on the connecting portion (208) and is flexed towards the base wall (201), the ring (401) comprising a planar inner zone (403) from which the flexed outer zone (402) extends.
- 35 **8.** The capsule according to any one of the preceding claims, wherein the ring (401) comprises an inner zone (403) which extends at least up to abutting on the side wall (202) of the capsule (1) and is planar; and optionally wherein the ring (401) is retained associated to the capsule by interference between the inner zone (403) and the side wall (202).
- 40 **9.** The capsule according to any one of the preceding claims, wherein the ring (401) comprises a single layer (404) of cellulose-based material intended to contact the dispensing machine; and wherein the ring (401) additionally comprises a joining layer (405) configured to enable the joining of the ring (401) to the flanged edge (204); wherein the layer (404) and the flanged edge (204) are joined to one another by means of the joining layer (405).
- 45 **10.** The capsule according to one of claims 1 to 8, wherein the ring comprises a layer (404) made of cellulose-based material intended to contact the dispensing machine and in addition a joining layer (405) configured to enable the ring (401) to be joined to the flanged edge (204); the ring (401) further comprising a further layer (406) of cellulose-based material and a further joining layer (407), the further joining layer (407) joining the cellulose-based layer (404) and the further cellulose-based layer (406) to one another, the further cellulose-based layer (406) and the flanged edge (204) being joined to one another by the joining layer (405).
- 50 **11.** The capsule according to one of the preceding claims, wherein the sealing element (4) comprises a further cellulose-based ring (408), the further cellulose-based ring (408) being fixed to the covering element (3) on the side opposite the flanged edge (204); and optionally wherein the further ring (408) is aligned with the ring (401) so as to form a stratified sealing element (4), in which the second portion (207) and the covering element (3) are inserted between the ring (401) and the further ring (408), arranged opposite and facing one another.
- 55 **12.** The capsule according to any one of the preceding claims, wherein the ring (401) has a thickness comprised between 0.30 mm and 1.2 mm, preferably comprised between 0.55 mm and 1.10 mm, still more preferably comprised between 0.70 mm and 1.00 mm, preferably 0.90 mm.
- 13.** The capsule according to one of the preceding claims, wherein the ring (401) can be made, for example, of paper or cardboard, with a grammage comprised between 250g/m² and 900g/m², preferably comprised between 300g/m² and 750g/m².
- 14.** The capsule according to claim 13, when dependent on claim 9, wherein the grammage of the single layer (404) is equal to 700gr/m².

15. The capsule according to claim 13, when dependent on claim 10, wherein the layer (404) and the further layer (406) have a grammage equal to 350gr/m².

5 **Patentansprüche**

1. Kapsel (1), umfassend:

- 10 - eine Hülle (2), die sich um eine Achse (Z) erstreckt, wobei die Hülle (2) eine Bodenwand (201) und eine Seitenwand (202) umfasst, die einen Hohlraum (203) zur Aufnahme eines Ausgangsprodukts bilden, das mit einem Fluid zu kombinieren ist, um ein Endprodukt zu erhalten, sowie einen flanschförmigen Rand (204), der sich von der Seitenwand (202) ausgehend erstreckt und einen ringförmigen Wulst (205) umfasst;
- 15 - ein Abdeckelement (3), das an dem flanschförmigen Rand (204) befestigt ist und zum Verschluss des Hohlraums (203) dient;
- 15 - ein Dichtungselement (4), das mit dem flanschförmigen Rand (204) verbunden ist, um eine Fluiddichtung mit einer Ausgabemaschine zu bilden; wobei
- 20 - die Hülle (2) aus Aluminium hergestellt ist und das Dichtungselement (4) einen Ring auf Cellulosebasis (401) umfasst; und wobei
- 20 - der flanschförmige Rand (204) einen ersten Abschnitt (206) umfasst, der den ringförmigen Wulst (205) umfasst, einen zweiten Abschnitt (207) umfasst, der an die Seitenwand (202) angrenzt, und einen Verbindungsabschnitt (208), zwischen dem ersten Abschnitt (206) und dem zweiten Abschnitt (207) umfasst; wobei der zweite Abschnitt (207) ringförmig ist und auf einer ersten Ebene liegt wobei zwischen dem Verbindungsabschnitt (208) und der Seitenwand (202) ein Sitz (209) definiert ist, in dem, zumindest teilweise, der Ring (401) untergebracht ist; wobei die Kapsel **dadurch gekennzeichnet ist, dass** der erste Abschnitt (206) zur Bodenwand (201) hin versetzt ist und sich zumindest in einem vorbestimmten Abstand (D) von der ersten Ebene befindet,
- 25

2. Kapsel nach Anspruch 1, wobei der erste Abschnitt (206) in einem Halbraum enthalten ist, welcher der Bodenwand (201) zugewandt ist, wobei der Halbraum durch eine zweite Ebene definiert ist, die in dem vorbestimmten Abstand (D) angeordnet ist.
- 30

3. Kapsel nach Anspruch 2, wobei der erste Abschnitt (206) einen ringförmigen Teil (206') umfasst, der an den Verbindungsabschnitt (208) angrenzt und eben ist, wobei der ringförmige Teil (206') auf der zweiten Ebene liegt.

4. Kapsel nach einem der Ansprüche von 1 bis 3, wobei der vorbestimmte Abstand (D) zwischen 0,10 mm und 0,90 mm beträgt, noch bevorzugter zwischen 0,20 mm und 0,60 mm, und noch mehr bevorzugt gleich 0,30 ist.
- 35

5. Kapsel nach einem beliebigen der vorhergehenden Ansprüche, wobei der Verbindungsabschnitt (208) eine kurvenförmige Gestalt mit einer Neigungsänderung oder eine abgestufte kegelförmige Gestalt aufweist.

6. Kapsel nach einem beliebigen der vorhergehenden Ansprüche, wobei der Ring (401) eine äußere Zone (402) umfasst, die sich zumindest bis auf Anschlag an den Verbindungsabschnitt (208) erstreckt, und wobei der Ring (401) optional mittels Presspassung zwischen der äußeren Zone (402) und dem Verbindungsabschnitt (208) und/oder dem ringförmigen Wulst (205) mit der Hülle (2) verbunden gehalten wird.
- 40

7. Kapsel nach Anspruch 6, wobei die äußere Zone (402) an den Verbindungsabschnitt (208) anschlägt und zur Bodenwand (201) hin gebeugt ist, wobei der Ring (401) eine ebene innere Zone (403) umfasst, von der aus sich die gebeugte äußere Zone (402) erstreckt.
- 45

8. Kapsel nach einem beliebigen der vorhergehenden Ansprüche, wobei der Ring (401) eine innere Zone (403) umfasst, die sich zumindest bis auf Anschlag an die Seitenwand (202) der Kapsel (1) erstreckt und eben ist; und wobei der Ring (401) optional mittels Presspassung zwischen der inneren Zone (403) und der Seitenwand (202) mit der Kapsel verbunden gehalten wird.
- 50

9. Kapsel nach einem beliebigen der vorhergehenden Ansprüche, wobei der Ring (401) eine einzelne Schicht (404) eines Materials auf Cellulosebasis umfasst, die für den Kontakt mit der Ausgabemaschine bestimmt ist; und wobei der Ring (401) außerdem eine Verbindungsschicht (405) umfasst, die dafür ausgelegt ist, die Verbindung des Rings (401) mit dem flanschförmigen Rand (204) zu ermöglichen; wobei die Schicht (404) und der flanschförmige Rand (204) durch die Verbindungsschicht (405) miteinander verbunden sind.
- 55

10. Kapsel nach einem der Ansprüche von 1 bis 8, wobei der Ring eine Schicht (404) aus einem Material auf Cellulosebasis umfasst, die für den Kontakt mit der Ausgabemaschine bestimmt ist, und außerdem eine Verbindungsschicht (405) umfasst, die dafür ausgelegt ist, die Verbindung des Rings (401) mit dem flanschförmigen Rand (204) zu ermöglichen; wobei der Ring (401) ferner eine weitere Schicht (406) eines Materials auf Cellulosebasis und eine weitere Verbindungsschicht (407) umfasst, wobei die weitere Verbindungsschicht (407) die Schicht auf Cellulosebasis (404) und die weitere Schicht auf Cellulosebasis (406) miteinander verbindet, wobei die weitere Schicht auf Cellulosebasis (406) und der flanschförmige Rand (204) durch die Verbindungsschicht (405) miteinander verbunden sind.
11. Kapsel nach einem der vorhergehenden Ansprüche, wobei das Dichtungselement (4) einen weiteren Ring auf Cellulosebasis (408) umfasst, wobei der weitere Ring auf Cellulosebasis (408) auf der dem flanschförmigen Rand (204) gegenüberliegenden Seite an dem Abdeckelement (3) befestigt ist; und wobei der weitere Ring (408) optional mit dem Ring (401) ausgerichtet ist, um ein schichtweise aufgebautes Dichtungselement (4) zu bilden, in dem der zweite Abschnitt (207) und das Abdeckelement (3) zwischen dem Ring (401) und dem weiteren Ring (408) eingefügt sind, die einander gegenüberliegend und einander zugewandt angeordnet sind.
12. Kapsel nach einem beliebigen der vorhergehenden Ansprüche, wobei der Ring (401) eine Dicke aufweist, die zwischen 0,30 mm und 1,2 mm beträgt, vorzugsweise zwischen 0,55 mm und 1,10 mm, noch bevorzugter zwischen 0,70 mm und 1,00 mm, und vorzugsweise 0,90 mm ist.
13. Kapsel nach einem der vorhergehenden Ansprüche, wobei der Ring (401) beispielsweise aus Papier oder Pappe hergestellt sein kann, mit einer Grammatur zwischen 250 g/m² und 900 g/m², vorzugsweise zwischen 300 g/m² und 750 g/m².
14. Kapsel nach Anspruch 13, sofern von Anspruch 9 abhängig, wobei die Grammatur der einzelnen Schicht (404) gleich 700 gr/m² ist.
15. Kapsel nach Anspruch 13, sofern von Anspruch 10 abhängig, wobei die Schicht (404) und die weitere Schicht (406) eine Grammatur gleich 350 gr/m² aufweisen.

Revendications

1. Une capsule (1) comprenant :
- une enveloppe (2) qui s'étend autour d'un axe (Z), ladite enveloppe (2) comprend une paroi de base (201) et une paroi latérale (202) définissant une cavité (203) contenant un produit initial à combiner avec un fluide pour obtenir un produit final, et un bord à bride (204) s'étendant à partir de ladite paroi latérale (202) et comprenant un bourrelet annulaire (205) ;
 - un élément de couverture (3), fixé au bord à bride (204) de manière à fermer la cavité (203) ;
 - un élément d'étanchéité (4), associé au bord à bride (204) pour réaliser une étanchéité de fluide avec une machine de distribution ; où
 - l'enveloppe (2) est réalisée en aluminium et l'élément d'étanchéité (4) comprend un anneau à base de cellulose (401) ; et où
 - le bord à bride (204) comprend une première portion (206) qui comprend le bourrelet annulaire (205), une deuxième portion (207), contiguë à la paroi latérale (202), et une portion de raccordement (208), entre la première portion (206) et la deuxième portion (207) ; où la deuxième portion (207) est annulaire et repose sur un premier plan entre la portion de raccordement (208) et la paroi latérale (202) un siège (209) étant défini dans lequel est logé, au moins partiellement, l'anneau (401) ; la capsule étant **caractérisée en ce que** la première portion (206) est décalée vers la paroi de base (201) et est au moins à une distance prédéfinie (D) du premier plan.
2. La capsule selon la revendication 1, dans laquelle la première portion (206) est contenue dans un demi-espace orienté vers la paroi de base (201), ledit demi-espace est défini par un deuxième plan qui est situé à ladite distance prédéfinie (D) .
3. La capsule selon la revendication 2, dans laquelle la première portion (206) comprend une partie annulaire (206'), qui est contiguë à la portion de raccordement (208) et est plate, la partie annulaire (206') reposant sur le deuxième plan.

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4. La capsule selon l'une des revendications de 1 à 3, dans laquelle ladite distance prédéfinie (D) est comprise entre 0,10 mm et 0,90 mm, de façon encore plus préférée comprise entre 0,20 mm et 0,60 mm, de façon encore plus préférée égale à 0,30.
- 5 5. La capsule selon l'une quelconque des revendications précédentes, dans laquelle la portion de raccordement (208) a une conformation courbe avec une variation d'inclinaison ou une conformation tronco-conique à degrés.
6. La capsule selon l'une quelconque des revendications précédentes, dans laquelle l'anneau (401) comprend une zone extérieure (402) qui s'étend au moins jusqu'à buter sur la portion de raccordement (208) et facultativement dans laquelle l'anneau (401) est retenu associé à l'enveloppe (2) par interférence entre la zone extérieure (402) et la portion de raccordement (208) et/ou le bourrelet annulaire (205).
10
7. La capsule selon la revendication 6, dans laquelle la zone extérieure (402) bute sur la portion de raccordement (208) et est fléchie vers la paroi de base (201), l'anneau (401) comprenant une zone intérieure plate (403) à partir de laquelle s'étend la zone extérieure fléchie (402).
15
8. La capsule selon l'une quelconque des revendications précédentes, dans laquelle l'anneau (401) comprend une zone intérieure (403) qui s'étend au moins jusqu'à buter sur la paroi latérale (202) de la capsule (1) et est plate ; et facultativement dans laquelle l'anneau (401) est retenu associé à la capsule par interférence entre la zone intérieure (403) et la paroi latérale (202).
20
9. La capsule selon l'une quelconque des revendications précédentes, dans laquelle l'anneau (401) comprend une couche unique (404) de matériau à base de cellulose destinée à entrer en contact avec la machine de distribution ; et dans laquelle l'anneau (401) comprend en plus une couche de jonction (405) configurée pour permettre la jonction de l'anneau (401) au bord à bride (204) ; dans laquelle la couche (404) et le bord à bride (204) sont joints l'un à l'autre au moyen de la couche de jonction (405).
25
10. La capsule selon l'une des revendications de 1 à 8, dans laquelle l'anneau comprend une couche (404) réalisée dans un matériau à base de cellulose destinée à entrer en contact avec la machine de distribution et en plus une couche de jonction (405) configurée pour permettre à l'anneau (401) d'être joint au bord à bride (204) ; l'anneau (401) comprenant en outre une autre couche (406) de matériau à base de cellulose et une autre couche de jonction (407), l'autre couche de jonction (407) joignant la couche à base de cellulose (404) et l'autre couche à base de cellulose (406) l'une à l'autre, l'autre couche à base de cellulose (406) et le bord à bride (204) étant joints l'un à l'autre par la couche de jonction (405).
30
11. La capsule selon l'une des revendications précédentes, dans laquelle l'élément d'étanchéité (4) comprend un autre anneau à base de cellulose (408), ledit autre anneau à base de cellulose (408) étant fixé à l'élément de couverture (3) du côté opposé au bord à bride (204) ; et facultativement dans laquelle l'autre anneau (408) est aligné avec l'anneau (401) de manière à former un élément d'étanchéité (4) stratifié, dans laquelle la deuxième portion (207) et l'élément de couverture (3) sont insérés entre l'anneau (401) et l'autre anneau (408), disposés opposés l'un de l'autre et orientés l'un vers l'autre.
35
12. La capsule selon l'une quelconque des revendications précédentes, dans laquelle l'anneau (401) a une épaisseur comprise entre 0,30 mm et 1,2 mm, de préférence comprise entre 0,55 mm et 1,10 mm, de façon encore plus préférée comprise entre 0,70 mm et 1,00 mm, de préférence 0,90 mm.
40
13. La capsule selon l'une des revendications précédentes, dans laquelle l'anneau (401) peut être réalisé, par exemple, en papier ou carton, avec un grammage compris entre 250 g/m² et 900 g/m², de préférence compris entre 300 g/m² et 750 g/m².
45
14. La capsule selon la revendication 13, quand dépendant de la revendication 9, dans laquelle le grammage de la couche unique (404) est égal à 700 gr/m².
50
15. La capsule selon la revendication 13, quand dépendant de la revendication 10, dans laquelle la couche (404) et l'autre couche (406) ont un grammage égal à 350 gr/m².
55

Fig.1

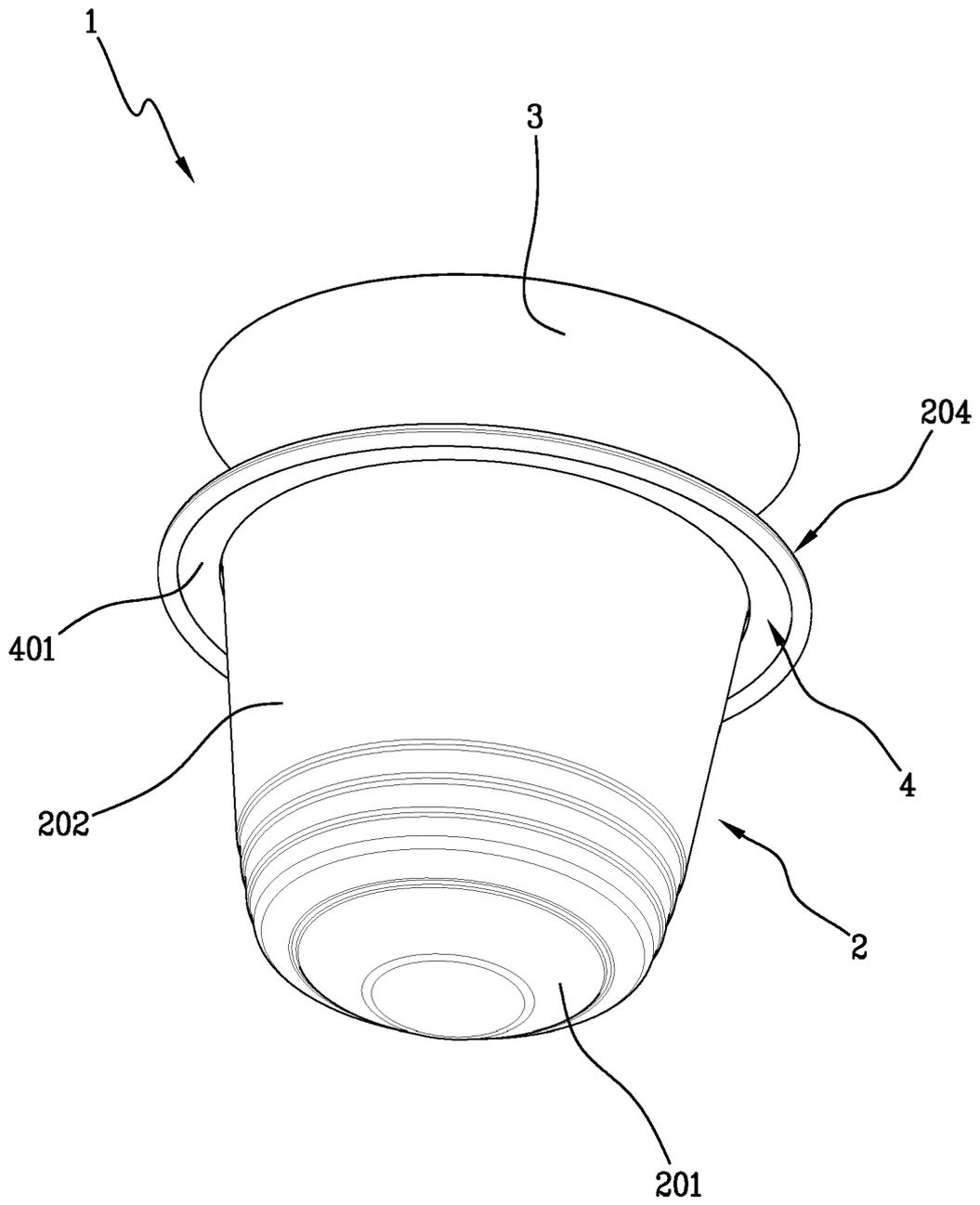
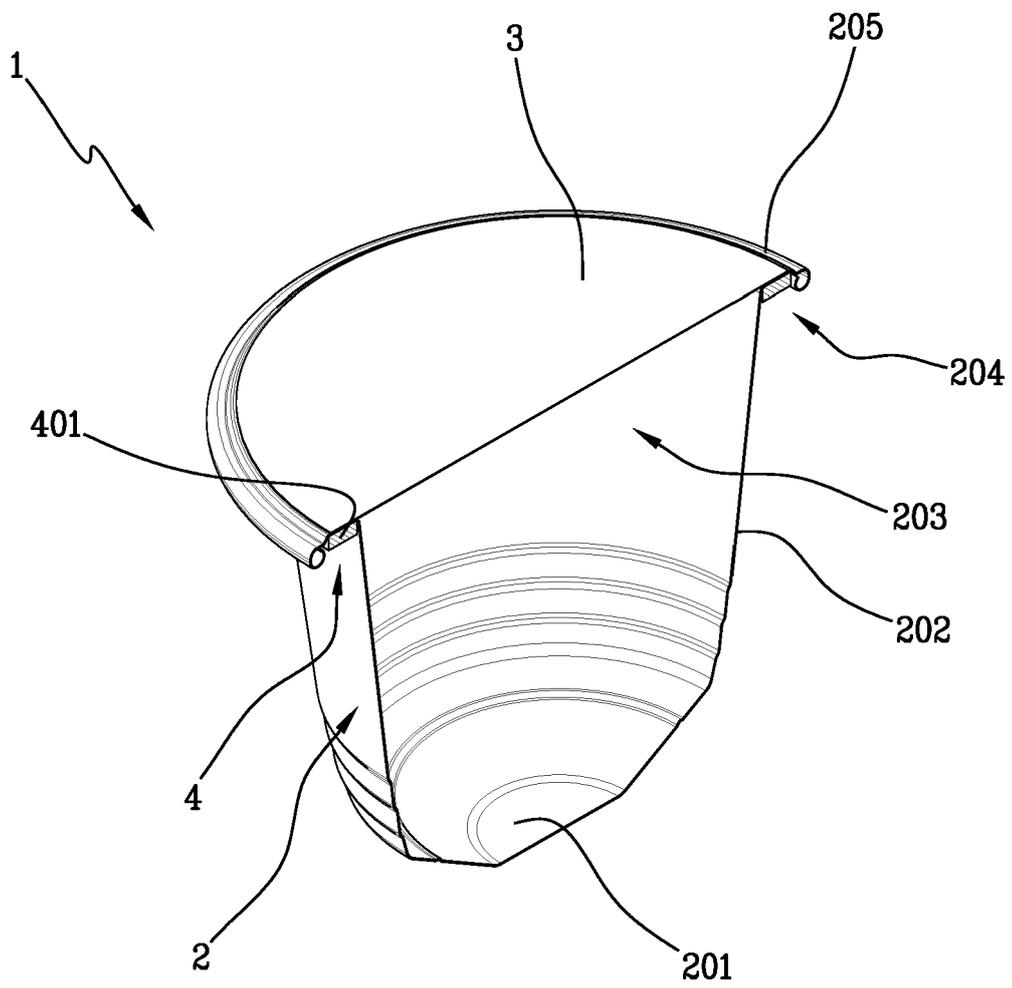


Fig.2



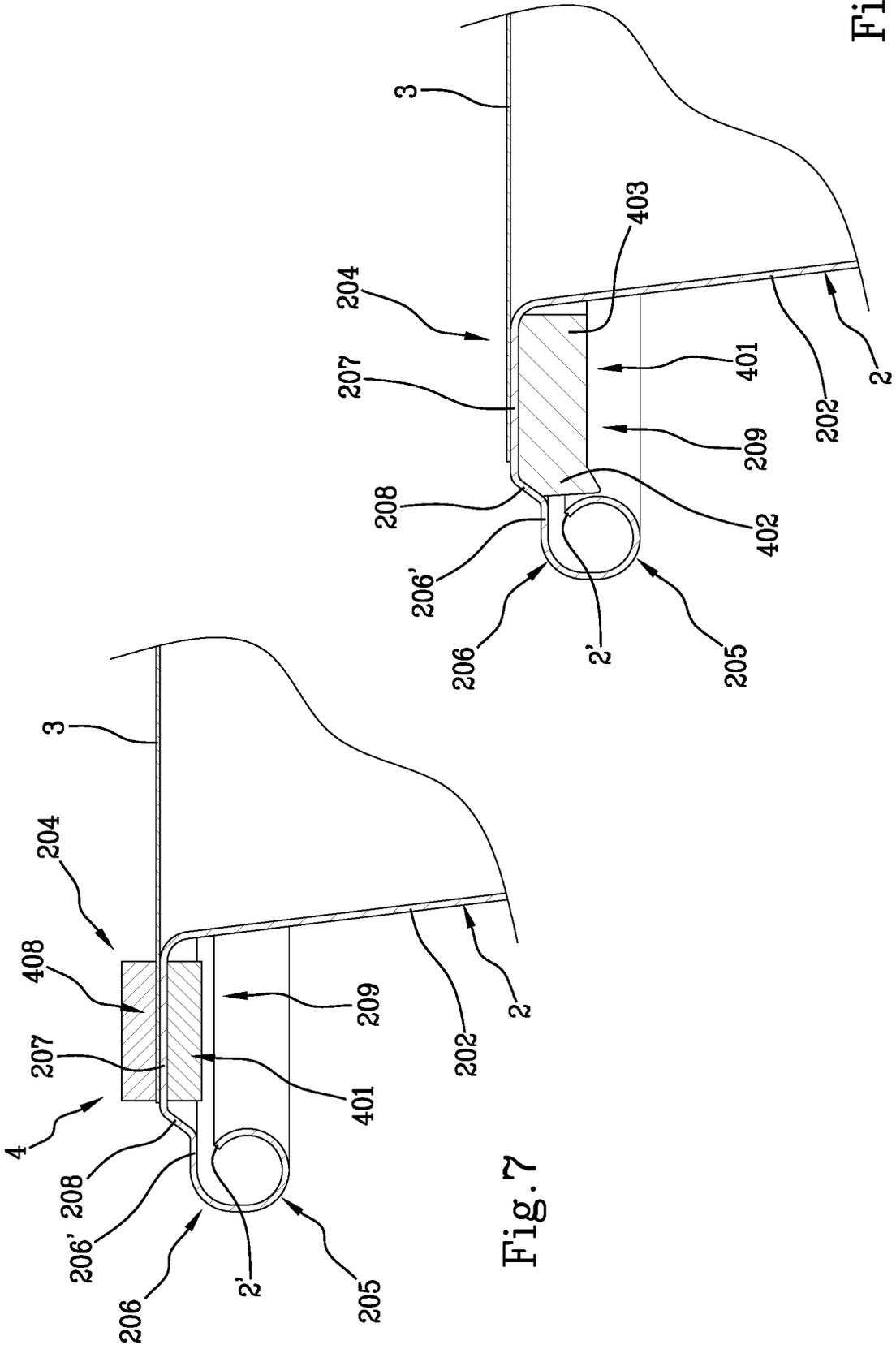


Fig. 7

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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