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DescriptionField of the invention

5 **[0001]** The present invention refers to the field of beverages distribution, preferably in single portion, and in detail concerns a capsule for distributing beverages.

Background of the invention

10 **[0002]** The capsules for distributing beverages are devices suitable for containing a dehydrated beverage in grains or powder or chopped leaves or liquids such as typically are coffee, tea, infusions, powdered milk, powdered supplements and/or liquids or similar.

[0003] In capsules of known type, the beverage is retained within the capsule that is realized with an impermeable body and that offers barrier to oxygen and odors, preventing then the oxidation.

15 **[0004]** The capsule is introduced in a distribution device that by means of a needle or equivalent device pierces an upper protective film (top lid or cover) and injects within the capsule the pressurized liquid, typically water, in such a way as to have a double hydration effect (and in some cases heating) of the dehydrated beverage, which is in this way delivered through an opening arranged at the bottom of the capsule itself in a glass or in a cup.

20 **[0005]** An example of capsule for distributing beverages is known from EP2444339. Furthermore, the Applicant has acknowledged that in conjunction with the outgoing passage of the liquid of part of grains or powder or chopped leaves through the outlet opening, there is often an excessive distribution speed of the beverage. The distribution speed of the beverage depends then directly upon the speed with which the liquid injected in the body of the capsule reaches the lower opening of the capsule itself.

25 **[0006]** The Applicant has acknowledged that locally, in correspondence of the lower opening, that usually has small size, the local increase of the pressure and/or speed of liquid passage in the granular beverage causes a bad mixing.

[0007] The Applicant has also acknowledged that the drawbacks above described are particularly accentuated where the distribution device within which the capsule is inserted is capable of exercising on it a significant pressure that sometimes can exceed also 10 bars.

30 **[0008]** Particularly for the coffee, of which the characteristic of creaminess is index of a correct production and of taste and palate perception, in case of excessive delivery speed, the quality of the resulting beverage is scarce.

[0009] Nonetheless, an excessive speed of local passage in the granular beverage can cause a non-optimal heating of the beverage or, even on the contrary, an excessive heating of other portions of the granular beverage in the capsule, with consequent non optimal transfer of flavorings in the liquid here passing.

35 **[0010]** The Applicant has also acknowledged that the productive process of the capsule for distributing beverages starts always from the realization of a retaining body with substantially circular section that has a bottom portion whose structure varies according to the productive needs.

[0011] The purpose of the present invention is to describe a capsule for distributing beverages that permits to eliminate the above-described drawbacks but at the same time offers a protection from the oxidation and odors of the product therein contained.

Summary of the invention

45 **[0012]** According to the present invention is then realized a capsule for distributing beverages, comprising a body in plastic material obtained through thermoforming process having a first opening and a second opening, respectively arranged in correspondence of an upper and lower end thereof, wherein said body is configured for retaining a beverage in powder, grains, leaves and/or liquids, wherein in correspondence of said second opening is installed a supporting insert for a fluid conveying element, installed on said body in correspondence of said supporting insert, wherein said fluid conveying element has an outlet opening of the beverage, and wherein the overall assembly realized by said body in plastic material and by said fluid conveying element, realizes an hollow element, realized in plastic material with oxygen-barrier performances.

50 **[0013]** According to another non limiting aspect of the present invention, the insertion is alternatively external or internal and/or said supporting insert is an annular supporting insert.

[0014] According to another non limiting aspect of the present invention, the fluid conveying element is installed for snap-fitting.

55 **[0015]** According to another non limiting aspect of the present invention, said insert is obtained by means of injection and/or co-injection molding whereas the body is realized through thermoforming process.

[0016] According to another non limiting aspect of the invention, said capsule is characterized in that said fluid conveying element comprises means of liquid deviation and distribution, through which said liquid passes from said hollow element

to said outlet opening of the beverage in an ending portion of said bottom wall and wherein said means of liquid deviation and distribution integrated on said fluid conveying element comprise means of passing interdiction preventing a passage of said fluid along a substantially rectilinear path from said hollow element to said outlet opening along a longitudinal axis of said capsule.

[0017] According to another non limiting aspect of the invention, the body of the capsule has a lateral wall defining an external side and an internal side, wherein on said internal side is realized a step configured for permitting the snap-fitting of said fluid conveying element.

[0018] According to another non limiting aspect of the invention, said step is arranged at a predetermined distance with respect to said supporting insert.

[0019] According to another non limiting aspect of the invention, the interdiction means detect a route or path for said fluid, in particular when distributed, at least locally not aligned to the longitudinal axis X.

[0020] According to another non limiting aspect of the invention, the welding of the insert, obtained through injection molding process, can be carried out by means of ultrasounds on the thermoformed element both externally and internally to the thermoformed element then in correspondence of the internal and/or external plane shown in figure and/or on the lower end of the thermoformed element.

[0021] According to another non limiting aspect of the invention, the fluid conveying element is ultrasonic welded at the internal side or external side of said supporting insert through an ultrasonic welding or through a thermal welding.

[0022] According to another non limiting aspect of the invention, the liquid deviation and distribution are suitable for a vortex path for said fluid, that causes a delivery of the finished product suitable for a high level of quality of product, both coffee, soluble and/or in powder.

[0023] According to another non limiting aspect of the invention, said means of deviation and distribution of liquid are adapted to create, preferably after filtration of the liquid, a vortex path that permits the foam, dropping and/or keeping of the aroma.

[0024] According to another non limiting aspect of the present invention, said fluid conveying element comprises an annular border in its radially external portion, opposed with respect to a portion within which is present said outlet opening of the beverage, said annular border getting in contrast with said supporting insert and resulting in use at a height - measured with respect to said outlet opening of the beverage - higher than the height at which there is said supporting insert.

[0025] According to another non limiting aspect of the present invention, said body comprises a second supporting insert, positioned at a height higher than said first supporting insert, upon which it is normally positioned one or more lids of plastic and/or filter paper films that retain and/or decelerate the internal products during the delivery of them through the use of the capsule assembly. The division of said body in a first upper portion and a second lower portion generates a better delivery of products with better pre-infusion and/or better dissolving of soluble products.

[0026] According to another non limiting aspect of the present invention, said lid or cover is a substantially planar flexible element.

[0027] According to another non limiting aspect of the present invention, said lid or cover is a substantially laminar or sheet element.

[0028] According to another non limiting aspect of the present invention, said lid or cover is an oxygen-barrier lid or cover.

[0029] According to another non limiting aspect of the present invention, said lid or cover is a peelable lid or cover.

[0030] According to another non limiting aspect of the present invention, the plastic material of the body of the capsule comprises a polyolephynic thermoplastic material.

[0031] According to another non limiting aspect of the present invention, said material comprises polypropylene, polyethylene.

[0032] According to another non limiting aspect of the present invention, in accordance with the previous aspect, said material is polypropylene.

[0033] According to another non limiting aspect of the present invention, said plastic material has a softening temperature according to Vicat (optionally according to ISO 306, 10N-50°C) higher than 120 ° Celsius.

[0034] According to another non limiting aspect of the present invention, the plastic material of the body of the capsule comprises a mixing of a first and a second type of plastic material and a thin inner layer of thickness variable between 5 and 35 μm of EVOH, material that offers excellent oxygen-barrier properties and that permits then to increase the shelf life of the product inside the capsule.

[0035] According to another non limiting aspect of the present invention, the first and the second type of plastic material are both thermoplastic, polyolefin, preferably polypropylene materials, having respectively a first and a second softening temperature and/or respectively a first and a second hardness and/or respectively a first and a second tensile module.

[0036] According to another non limiting aspect of the present invention, said mixing comprises an amount between [40 - 60] % of the first type of material, more preferably between [45 - 55] %, with the second type of material as completion of the 100% of the amount.

[0037] According to another non limiting aspect of the present invention, the capsule comprises a laminar peelable

element comprising at least a layer of Poly ethylene vinyl alcohol material, EVOH, that offers oxygen-barrier performance. This layer of material concurs in the increase of the oxygen-barrier performances partially owned by the traditional lid in PP and/or PET.

[0038] According to another non limiting aspect of the present invention, the layer of vinyl alcoholic material is a cushion layer between two layers of PP material.

[0039] According to another non limiting aspect of the present invention, said mixing and/or the plastic material of the body of the capsule comprise a layer of oxygen-barrier vinyl alcoholic material, more preferably EVOH.

[0040] In particular, according to another non limiting aspect of the present invention, the thickness can be varied between 5 and 35 μm according to the shelf life that is to be obtained on the finished product.

[0041] According to another non limiting aspect of the present invention, said mix comprises 50% of the first type of material and 50% of the second type of material. Preferably though not limiting, in use said beverage in powder, grains, leaves and/or liquids is positioned over said sheet, said sheet being a retaining sheet.

[0042] According to another non limiting aspect of the present invention, said retaining sheet is a filter paper sheet of type at least partially micro-perforated and/or realized in aluminum.

[0043] Capsule for distributing beverages according to claim 8, wherein the fluid conveying element is ultrasonic welded from the outer side of said supporting insert through an ultrasonic welding or through a thermal welding.

[0044] Alternatively, said retaining sheet is a sheet of material impermeable to oxygen and to odors, perforable or already perforated through laser, through which, for pressure induced by a fluid injection in said capsule, flows the beverage. More in details, according to a preferred and non limiting aspect of the present invention, said retaining sheet is a sheet of laser perforated material characterized by pre-holes that in use are opened in their entirety through the pressure induced by an injection of fluid in said capsule.

[0045] According to another non limiting aspect of the present invention, said fluid conveying element is realized in plastic material selectively chosen among PP, PBT, PET, PA6 or other material with oxygen-barrier properties.

[0046] In particular, said fluid conveying element is an anti-splash element and increases the pre-infusion and the dissolution of the product positioned inside the capsule.

[0047] According to another non limiting aspect of the present invention, inside said fluid conveying element there is an anti-splash element coupled with internal side openings that allow the exit of the liquid.

[0048] Advantageously, the capsule object of the present invention offers an oxygen-barrier and safeguards the aroma of the products contained in it; it has a shelf life of 24 months or more by coupling the various components of the product. This is guaranteed by the coupling of the various elements previously described (main body with reference number 102), element or flow conveyor insert (reference number 110 and other lids or peelable covers 119I) which constitute the final capsule.

[0049] According to another non limiting aspect of the present invention, said body is implemented in said fluid conveying element by an ultrasonic or thermal welding.

[0050] According to another non limiting aspect of the present invention, said welding is an ultrasonic welding.

[0051] Alternatively, the junction between said body and said fluid conveying element is realized by thermal welding.

[0052] According to another non limiting aspect of the present invention, said outlet opening comprises a removable laminar peelable element, suitable for realizing an oxygen-barrier.

[0053] In particular, said removable laminar peelable element and/or said retaining sheet are realized by means of a sandwich comprising: a layer of plastic material, an layer of aluminum, a layer of adhesive material placed between said layer of plastic material and said layer of aluminum.

[0054] According to another non limiting aspect of the present invention, said removable laminar peelable element and/or said retaining sheet also comprise a lacquered heat insulation layer.

[0055] According to another non limiting aspect of the present invention, said body comprises a side wall of thickness comprised between 500 and 900 micrometers, preferably between 550 and 750 micrometers.

[0056] According to another non limiting aspect of the present invention, in the flow distributor element, the means of deviation and distribution of liquid comprise at least a single series of walls joining the annular border of the fluid conveying element with the outer crown of column-like elements.

[0057] According to another non limiting aspect of the present invention, the walls extend along a plane which comprises the longitudinal axis X and a secondary axis which extends radially from the center of the capsule towards the perimeter of the capsule itself.

[0058] According to another non limiting aspect of the present invention, the series of walls consists of a predefined number of walls, optionally 4 walls, sequentially orthogonal to each other.

[0059] According to another non limiting aspect, the series of walls divides the funnel formed by the bottom wall into a predefined number of circular sectors.

[0060] According to another non limiting aspect, the fluid conveying element has an annular border provided with perforating elements, optionally of preferably but not limiting triangular shape, which can be arranged in an evenly spaced manner along the circumference detected by the annular border itself.

[0061] According to another non limiting aspect, the plastic material with oxygen-barrier performances has a transmission rate lower than 0,009, preferably lower than 0,007, preferably lower than 0,005 cm³/(package vol.*1 bar) and/or lower than 0,005, preferably lower than 0,00, more preferably lower than 0,001 cm³/(package vol.*0,21 bar).

5 Description of figures

[0062] Further characteristics and advantages of the capsule object of the present invention are described in the following part of the description, which refers to a preferred and non limiting form of embodiment of the present invention described with the aid of the attached figures in which:

- figure 1 shows a sectional view of a capsule for distribution of beverages object of the present invention;
- figure 2 shows a top view of the capsule for distribution of beverages of figure 1;
- figure 3 shows a perspective view of part of the capsule (thermoformed component) for the distribution of beverages object of the present invention;
- figure 4 shows a sectional view of a flow distributor element for a capsule for distribution of beverages object of the present invention (component obtained by injection and/or co-injection molding);
- figure 5 shows a sectional view of a detail of the coupling between the flow distributor element and the body of the capsule object of the present invention;
- figure 6 shows a top view of an alternative form of embodiment of a flow distributor element for the capsule object of the present invention;
- figure 7 shows a sectional view of a further alternative form of embodiment of the capsule object of the present invention wherein a particular labyrinth free from rectilinear elements is shown. This geometry permits an increase of the pressure which ensures an excellent product delivery;
- figure 8 shows a plant view of a further alternative form of embodiment of the capsule object of the invention.

Detailed description of the invention

[0063] With reference number 100 is indicated in its entirety a capsule for distributing beverages.

[0064] In detail, the capsule 100 object of the present invention is adapted to contain a beverage in powder, granules, leaves and/or liquid which is hosted in a cavity of its body. The capsule with said beverage is sealed at least in correspondence of an upper opening thereof.

[0065] The capsule 100 object of the present invention is adapted to be introduced into a beverage distribution device which comprises means for injecting a fluid into said capsule, through a hole of the sealing on the upper opening where it is positioned a first top lid or cover, with laminar or planar structure, preferably but non limiting realized with a sheet of material comprising aluminum configured for realizing a barrier to the passage of the oxygen inside the cavity of said body.

[0066] By effect of said drilling and fluid injection, that preferably but non limiting is pressurized water (hot or cold), the beverage in powder contained therein is partially and/or completely dissolved and its content is subsequently delivered through a bottom opening in a container outside the device for delivering beverages.

[0067] As shown in the attached figures, the capsule 100 object of the present invention comprises a hollow element and impermeable to liquids and offers a barrier to oxygen through the materials of which it is made, preferably but non limiting realized in plastics, which comprises a wall defining a lateral surface 102.

[0068] In particular, the body 101 is made of a thermoformed plastic material with oxygen-barrier. This allows keeping unaltered the aroma of the beverage in grains, powder, leaves and/or liquid contained in the capsule for longer with respect to the case of a plastic material without oxygen-barrier.

[0069] These materials offer a quantifiable oxygen-barrier, according to ISO 15105-2 /DIN 53380-3 in an OTR:

Product	OTR (0,21 Bar O ₂) [cm ³ /(package vol. *0,21bar)]	OTR (1 Bar O ₂) [cm ³ /(package vol. *1bar)]
Caps FAPS (thermoformed + insert)	≤ 0.001	≤ 0.005

[0070] In the aforementioned table, OTR means Oxygen Transmission Rate, and as for "package vol." is intended an internal volume of the capsule body.

[0071] Therefore, according to the present invention, for "oxygen-barrier" in particular with regard to the plastic material of the body of the capsule, it is intended a plastic material whose oxygen permeability is - with partial pressure of oxygen at 1 Bar - lower than 0,009, preferably lower than 0,007, more preferably lower than 0,005 cm³/(package vol.*1bar), and - with partial pressure of oxygen at 0,21 Bar - lower than 0,005, preferably lower than 0,003 and more preferably lower than 0,001 cm³/(package vol.*0,21bar). These values permit the capsule to guarantee to the product a shelf life of 24 months or more, in particular and non limiting when, in use, in this capsule it is contained tea or coffee.

[0072] In a preferred and non-limiting embodiment of the invention, this plastic material is of the polyolefin material family, in particular thermoplastic, and even more preferably, is polypropylene.

[0073] In order to guarantee compatibility with the typical applications of a capsule for beverage distribution, this plastic material has a softening temperature according to Vicat (A50) higher than 120 °Celsius, preferably higher or equal to 125° Celsius. This allows the plastic used for the body of the capsule to be compatible with the latest versions of beverage distributing machines, particularly for the distribution of coffee, where the fluid injected into the capsule can even reach 100 ° Celsius.

[0074] Preferred and non limiting examples of polypropylene which are used for the production of the capsule object of the invention and which, however, have optimal characteristics, are polypropylene with tensile module of 1200 MPa according to the norm ISO 527-1, -2, with hardness - measured according to ISO 2039-1, Ball Indentation Hardness, comprised in the interval [75-80] MPa, preferably 78 MPa or polypropylene with tensile module of 1200 MPa with hardness - measured according to ISO 2039-1, Ball Indentation Hardness, comprised in the interval [60 - 85] MPa and impact resistance according to Izod comprised between 4 and 8 KJ/m² (ISO 180).

[0075] A preferred and non limiting form of embodiment of the capsule object of the invention has a body realized with a mixing of plastic materials, preferably a mixture of plastic materials, in particular polyolefin thermoplastics, and even more particularly thermoplastics, previously described. In this mixing, the first and the second type of plastic material are both thermoplastic, polyolefin, preferably polypropylene plastic materials, having respectively a first and second softening temperature and/or respectively a first and second hardness and/or respectively a first and second tensile module.

[0076] Preferably, although in a non-limiting extent, the aforementioned mixing is equal to 50% of the first type of plastic material and 50% of the second type of plastic material, even if further combinations comprise amounts between [40 - 60] % of the first type of material, more preferably between the [45 - 55] %, with the second type of plastic material as completion of the 100% of the amount of the mixing. In this formulation, therefore, it is inserted a percentage comprised between 0.01 and 1% of EVOH as thin layer of material inserted between the two polyolefin layers. In other terms, to this first and second plastic material, is preferably but non limiting added a first layer of ethylene copolymer material, preferably EVOH in thickness comprised between 5 - 35 micron. This layer of material assists the completion of the oxygen-barrier. Although EVOH (Ethanol) has been mentioned as vinyl alcohol, it is possible to replace this specific type of vinyl alcohol with other vinyl alcohols compatible with the application, offering oxygen-barrier.

[0077] In a preferred and non-limiting embodiment, said capsule 100 comprises a circular section body 101, with a larger diameter in correspondence of a first upper end thereof 101s where there is an upper opening 101 a and that gradually develops towards the opposite direction with the diameter that is progressively more tapered until it reaches a second opening 104 with a diameter smaller than the upper opening. Therefore, preferably but in a non-limiting extent, the body 101 has a flared shape.

[0078] The capsule 100 object of the present invention further comprises a fluid conveying element 110 realized in correspondence of the lower portion. In particular, in correspondence of said second opening, an annular supporting insert 107 is realized on the body 101 for a fluid conveying element 110, installed by air tight, fluid-tight snap-fitting and then waterproof when pressurized in said body 101 in correspondence of said supporting insert 107. The supporting insert 107 represents a contrast external perimetral mechanical element for the fluid conveying element.

[0079] More in detail, said supporting insert 107 is developed along a plane orthogonal to the axis X which represents the axis along which the body 101 develops as a solid or rotation cover; this axis X therefore determines the longitudinal axis of the capsule 100 object of the present invention.

[0080] The fluid conveying element 110 has an outlet opening 106 of the beverage which allows the beverage to exit from the capsule when the fluid injection as described above takes place.

[0081] During the production, the body 101 and the fluid conveying element 110 are separated the one with respect to the other and are advantageously realized on two different sub-processes. This advantageously allows the body 101 to be realized as a stand-alone product, with great cost optimization, separating its productive process from that of the fluid conveying element 110 which is instead characterized by the characteristic of being able to be realized according to different form of embodiments, according to the customer's needs. A particular embodiment of the fluid conveying element 110 is described in the following portion of the description and must not be intended as limiting. The overall assembly realized by said body 101 in plastic material and said fluid conveying element 110 realizes an hollow element suitable for containing the beverage in granular or powder form.

[0082] In a preferred and non-limiting embodiment, the union between the body 101 and the fluid conveying element 110 is realized firstly by means of a snap-fitting, internally by introduction from the inside of the body cavity as shown in the attached figures or alternatively from the outside of the body itself, and subsequently by means of a welding so as to be able to realize a pressurized water-proof coupling, which allows the beverage to exit exclusively from the outlet opening 106 without leaking. The union between the body 101 and the fluid conveying element 110 takes place in this case by means of an introduction step of the fluid conveying element 110 inside the cavity realized by the side wall of the capsule.

[0083] In particular, also the fluid conveying element 110 has an annular border 141 in a perimetral portion thereof, radially opposed with respect to a portion within which there is said outlet opening 106 of the beverage; said annular border, introduced into the cavity realized by the side wall of the capsule, gets in contrast with said supporting insert 107, in particular with the side of the supporting insert which faces the aforementioned cavity. Preferably but in a non-limiting extent, the annular border is in use at a height - measured with respect to said outlet opening 106 of the beverage - higher than the height at which the supporting insert itself is located. Therefore, the fluid conveyor 110 can be welded from the inner side of the supporting ring.

[0084] Alternatively, the fluid conveying element 110 is coupled to the supporting insert 107 by means of welding, in correspondence of the lower side of said supporting insert, facing the latter from the opposite side with respect to the cavity, resulting welded to the outer side.

[0085] The welding can be alternatively an ultrasonic welding or a thermal welding.

[0086] The lateral surface of the body 101 is defined by a wall (here defined lateral surface 102) provided with an inner side and an outer side. In particular, on the inner side of the lateral surface 102 of the body 101, just above the supporting insert 107 there is a step 109 which extends inside the body cavity starting from the inner side, at least partially in a direction orthogonal with respect to the longitudinal axis, defining an undercut that allows a relative blocking of the fluid conveying element 110, inserted starting from the upper opening of the body 101. The step 109 is positioned at a predetermined distance, measured along said longitudinal axis X, with respect to the supporting insert 107. The step element defining the undercut 109 allows to define a so-called "snap-fitting" for the fluid conveying element 110. Further than this snap-fitting, the fluid conveying element 110 gets in contrast with said supporting insert 107.

[0087] The thickness of the side wall is substantially between 500 and 900 micrometers, preferably between 550 and 750 micrometers.

[0088] Subsequently, by means of a welding which preferably but non limiting is carried out by ultrasonic or by thermal welding, the unmovable union between the supporting insert 107 and the annular border 111 is realized, which in this way creates, together with the welding of a plastic or aluminum lid indicated in the attached figures with reference number 120 also a seal from oxygen inlets which could otherwise alter the aroma of the beverage, in particular but non limiting thereto, oxidizing it.

[0089] Upperly to the recess with undercut 109 there is a second supporting insert 120 made in such a way that it is possible to position a film of flexible material on it which advantageously separates the - upper - area within which the beverage is contained from the - lower - area within which there is the fluid conveying element. Again, also the second supporting insert 120 has a development on a plane orthogonal with respect to the axis X. The film of flexible material realizes a retaining sheet 121 for the beverage in grains, in powder, in leaves and/or liquid.

[0090] In a preferred and non limiting form of embodiment, said retaining sheet 121 is a perforated or micro-perforated sheet, optionally made of filter paper and/or plastic material, with a texture sufficiently narrow to prevent the passage of the underlying powder or granules.

[0091] In another preferred and non limiting form of embodiment, said retaining sheet 121 is an impermeable and pre-drilled laser sheet. In other terms, it is partially pre-drilled, and at the moment of injection of the liquid into the capsule, with which said retaining sheet 121 gets into contrast, the pressure opens in their entirety these pre-drilled elements allowing the flow passage through the fluid conveying element 106 and the lid or cover placed above it.

[0092] In particular, in this latter form of embodiment, said retaining sheet 121 is realized by means of a sandwich comprising: a layer of plastic material, a layer of aluminum, a layer of adhesive material interposed between said layer of plastic material and said layer of aluminum, to which is also added a lacquered layer adapted to facilitate the welding between the elements of the capsule (lid or cover and capsule).

[0093] Alternatively, said retaining sheet 121 can be realized with a first layer of PP-PET-PP, a second intermediate

layer of aluminum and a third layer of non-woven fabric, with a thickness varying between 5 and 50 μm .

[0094] The retaining sheet 121 as well as any other lid present on the capsule object of the present invention can also be realized as an assembly of layers wherein an intermediate layer is realized in EVOH, or more generally, in other vinyl alcohols compatible with the application, offering oxygen-barrier. A particular form of embodiment for the retaining sheet 121 can comprise a sequence of plastic materials as follows: PP, terephthalate plastics, oxygen-barrier vinyl alcohol, terephthalate plastics, PP. In particular, this sequence of plastic materials can be: PP, PET, oxygen-barrier vinyl alcohol, PET, PP, and more particularly PP, PET, EVOH, PET, PP.

[0095] The fluid conveying element 110 is an element designed to allow the distribution of the beverage without splashing, with an exit from the capsule with a slow flow. In a preferred and non limiting form of embodiment, the fluid conveying element 110 comprises means of deviation and distribution of liquid 111, 112, 113, 114, 115, 115c, 119, 116c through which the flow of the beverage passes through the body of the capsule to exit from the outlet openings 118 and then through the fluid conveying element indicated in figure with the reference number 106.

[0096] According to the present invention as non-rectilinear path is intended a path where the fluid changes at least once the flowing direction with respect to an axial direction corresponding to the direction detected by the longitudinal axis X. More specifically, the means of deviation and distribution of liquid 111, 112, 113, 114, 115, 115c, 119, 116c through which the flow of the beverage passes through the body of the capsule to exit from the outlet 106 through a non-rectilinear path are integrated into the fluid conveying element 110. This means that they are not removable with respect to the latter.

[0097] In detail, said means of deviation and distribution of liquid 111, 112, 113, 114, 115, 115c, 119, 116c comprise interdiction means 114 for the passage of the liquid injected along a substantially rectilinear path, particularly along a path which is substantially aligned with the longitudinal axis X. These interdiction means 114 therefore represent flow deflecting means, detecting a trail or path for said fluid, in particular when delivered, at least locally not aligned with the longitudinal axis X.

[0098] In other words, the interdiction means 114 prevent the fluid injected by the distribution device within the capsule 100 from traveling a path simple and substantially parallel to the longitudinal axis X and then exiting from the outlet opening 106.

[0099] Due to the injection pressure of the liquid in the capsule 100, pressure which can exceed even 10 bar, in the event of a substantially rectilinear path and as described above, can take place an excess of outlet speed of the fluid with the beverage from the outlet opening. With a rectilinear path, not followed by the beverage during the distribution with the capsule object of the invention, there would be a risk to obtain that the beverage is sprayed out of the container, or that anyway the speed of the liquid through the beverage in powder does not allow the correct pre-infusion of the fluid itself with the flavors of the beverage.

[0100] Nonetheless, the excessive outlet speed of the beverage from the container, risks to cause also part of the powder of the beverage itself to escape from the outlet opening, with detrimental effect on the quality of the product distributed.

[0101] Said interdiction means, as it can be seen in the attached figures, comprise a wall substantially positioned in an orthogonal direction with respect to the longitudinal axis X of the capsule 100.

[0102] The wall 114 is the upper part of a castle that is jointed to the outlet opening 106, the latter protruding out of the bottom wall 103 whereas the castle remains inside the cavity of the body of the capsule 100.

[0103] On the castle, which together with the wall form the interdiction means 114, there is a plurality of longitudinal slots 118, which extend substantially parallel to the direction detected by said longitudinal axis X, which allows the injected fluid to exit through the interdiction means in the outlet opening 106 without spraying and keeping a straight and continuous flow in the cup.

[0104] The number of longitudinal slots 118, which in the embodiment shown in the attached figures is equal to 8, must not be intended in a restrictive way, since this number is variable according to at least the dimensions of the capsule and also according to the quantity of beverage, its granularity and delivery pressure of the liquid.

[0105] Moreover, said means of deviation and distribution of liquid also comprise a plurality of flow directional walls 111, 112, 113 having a first and a second direction of development, wherein the first of said development directions is parallel to a direction detected by the longitudinal axis X. In a preferred and non limiting form embodiment, the flow-guiding walls 111, 112, 113 develop in a direction radial with respect to the longitudinal axis. Preferably, but non limiting, at least part of said plurality of flow directional walls 111, 112, 113 has a downwardly inclined profile. The effect of the flow-guiding walls is to allow to address the flow of fluid and beverage coming from the upper opening, towards the longitudinal slots 118 in a more controlled way, so that no vortexes are created with axes parallel to the longitudinal axis X.

[0106] As illustrated in the attached figures, the flow-driving walls comprise at least a first series of walls 111 of greater radial extension, a second series of walls 112 of intermediate radial extension and a third series of walls 113 of minimum radial extension.

[0107] Preferably but non limiting thereto, each of the walls extends along a plane which comprises the longitudinal axis X of the capsule 100 and a second axis which extends radially from the center of the capsule towards the outer

perimeter of the capsule.

[0108] Each wall of the second series is interposed between two walls of the first series. Each wall of the third series is interposed between two walls of the second series.

[0109] All the walls, both of the first series of walls 111, and of the second series of walls 112 and of the third series of walls 113 have at least one end in contact with an interjunction zone between the surface defining the side wall of the capsule 100 and the bottom wall 103. In detail, in this interjunction zone there is a step 120 upon which a paper filter and/or micro-perforated plastics which acts as a lower supporting element of the powder of the beverage is in use welded. The bottom wall is inclined with respect to the longitudinal axis X and detects a funnel of collection of the beverage towards the crowns 115, 116.

[0110] Having different radial extensions for the flow direction walls 111, 112, 113 advantageously allows not to excessively limit the area available for the fluid in proximity of the longitudinal slots 118 and permits according to the Applicant a more optimal distribution of the flows, allowing the creation of micro vortexes in correspondence of the less radially extended walls, which allow an almost final mixing of the beverage, before the exit of it.

[0111] The capsule for distributing beverages 100 object of the present invention finally comprises a plurality of column-like elements arranged on a pair of concentric crowns 115, 116. Alternatively, the crown of column-like elements can also be only one.

[0112] The crown of column-like elements is detected on a center coinciding with the longitudinal axis X of the capsule 100.

[0113] The first and second crown of column-like elements 115c, 116c extend from the bottom wall 103 and are designed to create at least one barrier which allows the deposit on the bottom of beverage granules which would otherwise be free to exit from the longitudinal slots 118.

[0114] The first and second crown 115c, 116c thus comprise each one a plurality of column-like elements which detect recesses of depth lower than the height of the respective crown; this means that the recesses thus detected do not extend until the bottom of the crown, but leave a portion of the latter completely full, and this portion is precisely the one which acts as a barrier.

[0115] Preferably, but non limiting thereto, in order to optimize the flow direction towards the longitudinal slots 118, the flow direction walls are oriented along the same radial direction of at least a column of said plurality of crowns 115c, 116c of column-like elements.

[0116] This means that by looking in profile the flow-guiding wall, this lies on a straight line that connects it with a top of the column, and therefore with one of the highest possible points between the various points of the crown.

[0117] In the form of embodiment shown in the attached figures, the combination of the first and second crown 115c, 116c of column-like elements advantageously allows an annular recess wherein at the moment of delivering the liquid and the beverage it is created a vortex which allows a second deposit of any beverage granules before they can reach the longitudinal slots 118 from which they would be inevitably expelled.

[0118] The column-like elements of the crowns lie on the same radial line, i.e. the straight line which starts off orthogonally with respect to the tangent to the circumference detected by the respective crown.

[0119] In this way it is possible to have an optimal addressing of the flow of fluid and beverage that is channeled between two flow direction walls and directed towards a recess between two columns having already once changed direction starting from a direction substantially parallel to the direction detected by axis X to a direction oblique with respect to it, and a second time wherein said direction of the flow and beverage after the entry into the longitudinal slots 118, passes again to a direction substantially parallel to the direction detected by the longitudinal axis X for being expelled through the outlet opening 106.

[0120] The Applicant has found that in particular with beverages such as tea or coffee, the presence of a double crown 115c, 116c of column-like elements in combination with flow-guiding walls 111, 112, 113 oriented on a radial straight line connecting them with at least one column of crowns 115c, 116c, allows a further and optimal mixing of the beverage, together with a reduction of the local transit speed and local pressure increase that allows the beverage to be mixed with the fluid and to acquire the maximum of the aroma without losing creaminess when such creaminess becomes a particular characteristic. This applies especially to coffee. The substantially rectilinear path of the flow of the beverage along the direction detected by the axis X is therefore prevented because of the head portion 114t of the interdiction means 114. This portion, extending itself substantially along a direction orthogonal to the axis X itself, as well visible in Figures 1 and 2, causes the flow of the beverage to follow a tortuous or swirling, non-linear path suitable for creating foam and dropping and/or keeping the aroma of the beverage as unaltered as possible. Finally, in the capsule for distributing beverages 100 object of the present invention there is a drop-splitting element 119 within the cavity of the outlet opening 106, which is designed in such a way as to avoid a whirling flow inside it, in particular at least locally in rotation with respect to the longitudinal axis X of the capsule, which can bring spurts out of the glass or cup or anyway out of the container within which said beverage is delivered after it has exited from the capsule 100. Preferably but non limiting thereto, the drop-splitting element comprises a plurality of side openings, which in the attached figures are shown in a number equal to eight.

[0121] Preferably, although in a non-limiting extent, the outlet opening 106 of the beverage is closed by a removable laminar peelable element, adapted to complement the barrier properties of the capsule, already described above for the rest of the product 100. In a preferred and non limiting form of embodiment, said removable laminar peelable element 191 can be realized in the same way as the retaining sheet 121, in particular by means of a sandwich of plastic materials as previously described. Advantageously, through said removable laminar peelable element, it allows to repair the duct adjacent to the outlet opening 106 from dust and microbes, keeping the capsule as most hygienic as possible and never letting the flow of the beverage enter in contact with external plastic parts.

[0122] Figure 6 shows an alternative form of embodiment for the flow distributor element 110, which has similar characteristics with respect to the latter; for this reason, except for the differentiation parts, the reader is referred to the previous portion of the description. However, in the alternative form of embodiment, the means of deviation and distribution of liquid have a single series of walls 111 b joining the annular border of the fluid conveying element with the outer crown of column-like elements 115. The single series of walls 111 b may also be absent, and this case is the one represented in Figure 8, wherein the flow distribution and deviation means comprise the column-like elements and the funnel created is devoid of reinforcing elements.

[0123] The walls 111 b extend along a plane which comprises the longitudinal axis X and a secondary axis which extends radially from the center of the capsule towards the perimeter of the capsule.

[0124] Preferably, but in a non-limiting extent, the single series of walls 111 b consists of 4 walls, which are more preferably mutually orthogonal between them, which divide the funnel formed by the bottom wall 103 into four circular sectors. These 4 walls are supporting ribs for the lid lying above.

[0125] Figure 7 shows a further form of embodiment for the capsule object of the invention, which is characterized in that the fluid conveying element 110 has an annular border 141 provided with perforator elements 190, preferably but non exclusively triangular, which can be arranged evenly spaced along the circumference detected by the annular border 141 itself. These elements are designed to assist the perforation of the lid for the delivery of the beverage.

[0126] Through the production of the capsule described up to this point, it is possible to obtain a complete capsule that produces an assembled product capable of withstanding pressures and temperatures until 16 bar and 100 ° Celsius respectively.

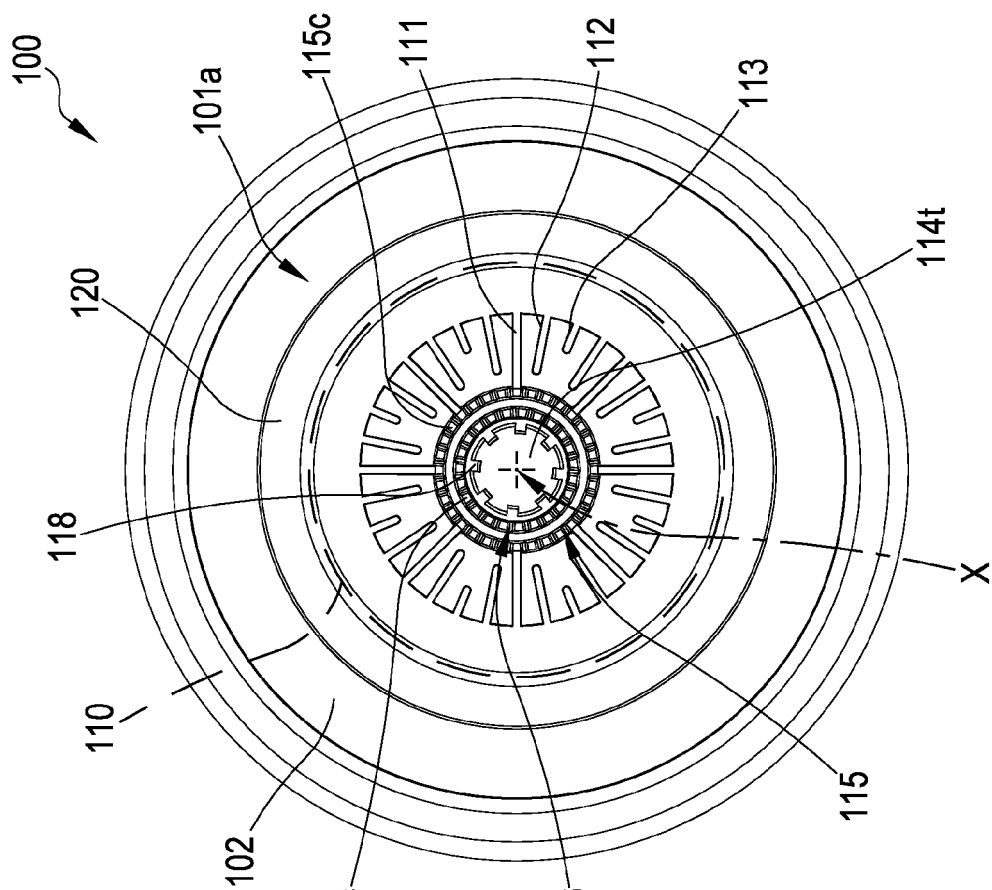
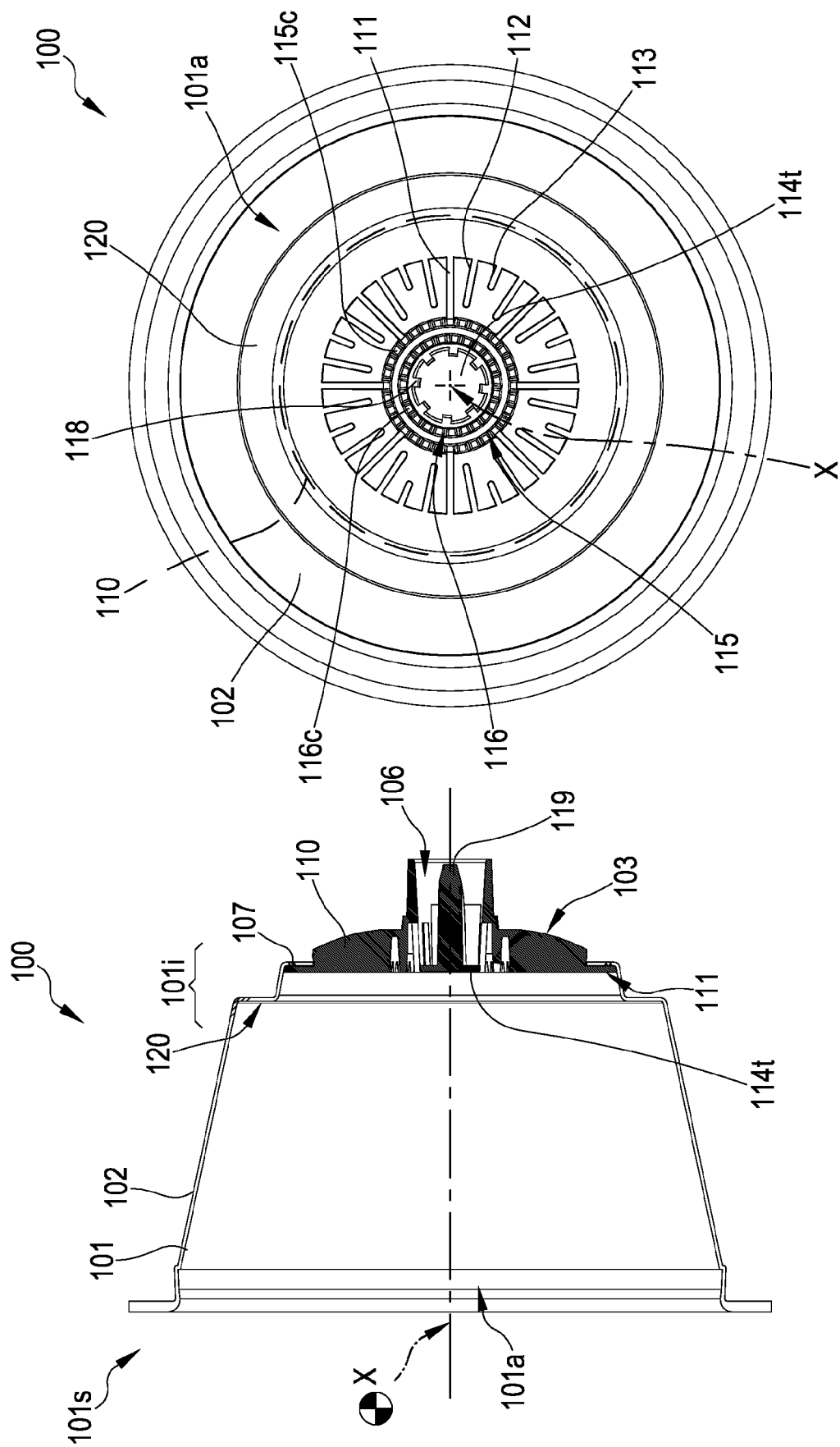
[0127] Finally, it is clear that to the object of the present invention can be applied additions, modifications or variations, which are obvious for the expert in the art, without departing from the scope of protection provided by the attached claims.

Claims

1. Capsule (100) for distributing beverages, comprising a body in plastic material having a first opening and a second opening (104), respectively arranged in correspondence of an upper and lower end thereof, wherein said body is configured for retaining a beverage in powder, grains, leaves and/or liquids, wherein in correspondence of said second opening (104) is realized a first supporting ring (107) for a fluid conveying element (110), installed for snap-fitting insertion with fluid-tightness under pressure in said body in correspondence of said first supporting ring (107), wherein said fluid conveying element has an outlet opening (106) of the beverage, and wherein the overall assembly realized by said body in plastic material and by said fluid conveying element realizes an hollow element, said body being realized in oxygen-barrier plastic material.
2. Capsule for distributing beverages according to claim 1, **characterized in that** said fluid conveying element (110) is realized by injection or co-injection molding and comprises means of deviation and delivery of liquid (111, 112, 113, 114, 115, 115c, 119, 116c), through which said fluid transits from said hollow element towards said outlet opening (106) of the beverage in an ending portion of said bottom wall (103) and wherein said means of deviation and delivery of liquid (111, 112, 113, 114, 115, 115c, 119, 116c) integrated on said fluid conveying element (110) comprise means of interdiction to the passage (114) preventing a passage of said fluid along a substantially rectilinear path from said hollow element to said outlet opening (106) along a longitudinal axis of said capsule and/or detecting a trail or path for said fluid, in particular when distributed, at least locally not aligned to the longitudinal axis X.
3. Capsule for distributing beverages according to claim 1, wherein said fluid conveying element (110) comprises an annular border (141) in its external radially portion, opposed with respect to a portion within which there is said outlet opening (106) of the beverage, said annular border getting into contrast with said first supporting ring (107) and resulting in use at a height - measured with respect to said outlet opening (106) of the beverage - higher than the height at which said supporting ring is found.
4. Capsule for distributing beverages according to claim 4, wherein in use said beverage in powder, grains, leaves and/or liquid is positioned above said retaining sheet (121) and said retaining sheet (121) is a sheet of filter paper

of the type also at least partially micro-perforated and/or realized in aluminum.

- 5 5. Capsule for distributing beverages according to claim 6, wherein said retaining sheet is a sheet of laser pre-perforated material **characterized by** pre-holes that in use are opened by the pressure induced by an injection of fluid in said capsule.
- 10 6. Capsule according to any of the previous claims, wherein the body of the capsule (100) has a side wall (102) detecting an outer face and an inner face, wherein on said inner face is realized a step (109) configured to permit snap-fitting insertion of said fluid conveying element (110); said step (109) being positioned at a predetermined distance with respect to said supporting ring.
- 15 7. Capsule for distributing beverages according to any of the previous claims, wherein said fluid conveying element (110) is an anti-splash element and in which there is a drop-splitting element coupled with internal side openings that allow the exit of the liquid.
- 20 8. Capsule for distributing beverages according to any of the previous claims, wherein the junction between said body and said fluid conveying element (110) is achieved by means of ultrasonic or thermal welding.
- 25 9. Capsule for distributing beverages according to any of the previous claims, wherein the body of the capsule (100) comprises a mixing of a first and a second type of plastic material therein comprising a thin layer of EVOH comprised between 5 and 45 microns.
- 30 10. Capsule for distributing beverages according to claim 10 or claim 11, wherein said mixing comprises an amount between [40 - 60] % of the first material type, more preferably between [45 - 55] %, with the second type of plastic material as completion of 100% of the amount.
- 35 11. Capsule for distributing beverages according to claim 2, wherein said outlet opening (106) comprises a removable laminar peelable element (191), adapted to complete the oxygen-barrier properties of said capsule (100).
- 40 12. Capsule for distributing beverages according to claim 1, wherein the fluid conveying element (Fig. 110) is ultrasonically welded from the inner side or from the external side of said supporting insert (107) through an ultrasonic welding or through a thermal welding.
- 45 13. Capsule for distributing beverages according to the previous claims, wherein the final capsule is suitable to withstand temperatures and pressures of up to 16 bar and 95 °C respectively.
- 50 14. Capsule for distributing beverages according to one or more of the previous claims, wherein the means of deviation and delivery of liquid (111, 112, 113, 114, 115, 115c, 119, 116c) are adapted to create a vortex path for said fluid, which causes a delivery of the finished product in accordance with a high level of product quality, both soluble and/or powder coffee.
- 55 15. Capsule for distributing beverages according to claim 14, wherein said means of deviation and delivery of liquid are adapted to create, preferably after filtration of the liquid, a vortex path that permits foam, dropping and/or keeping of the aroma.



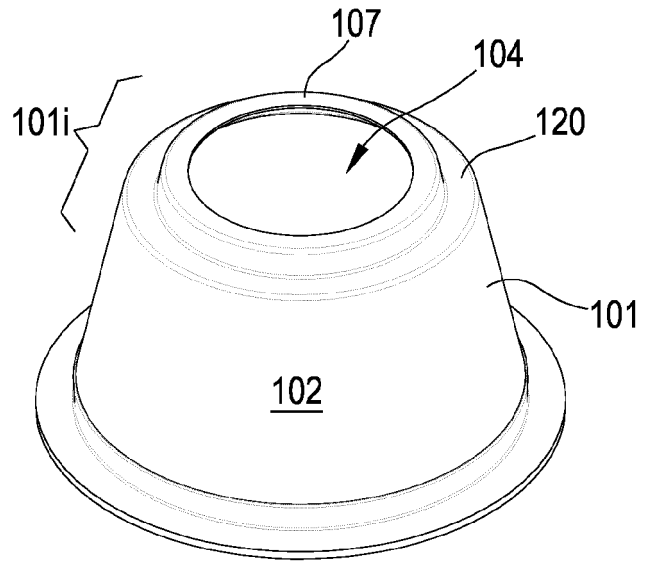


FIG.3

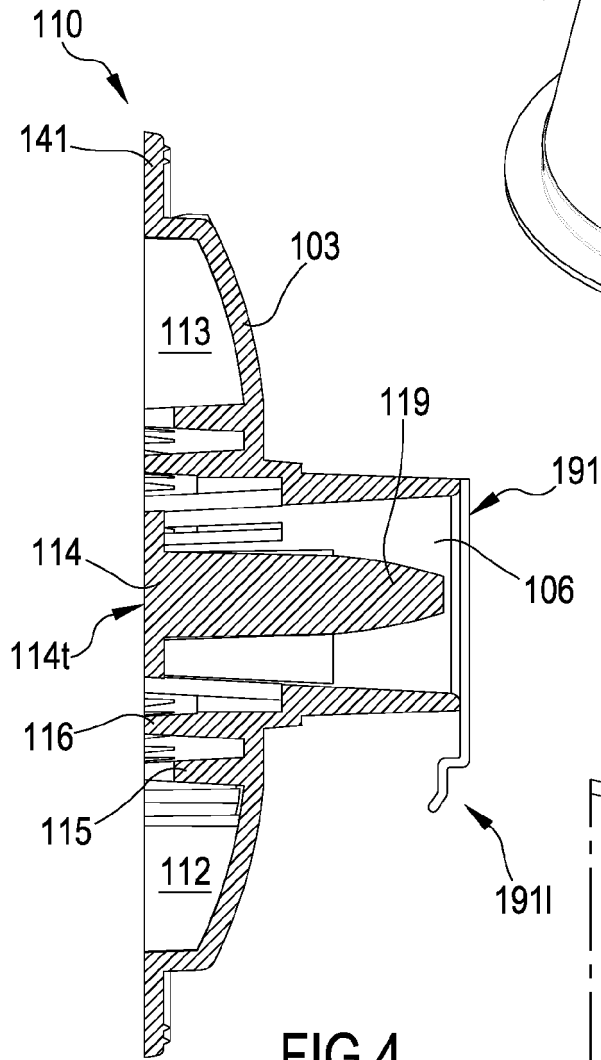


FIG.4

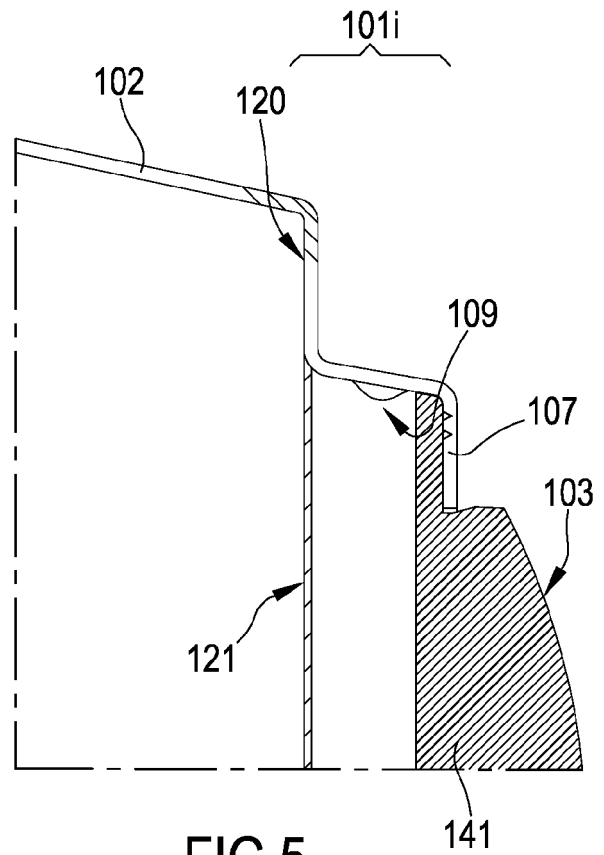


FIG.5

FIG.6

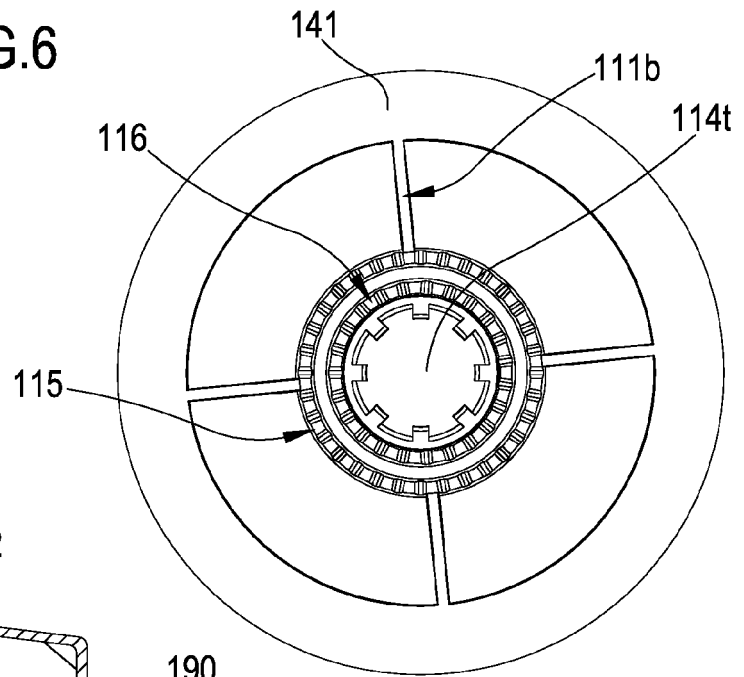


FIG.7

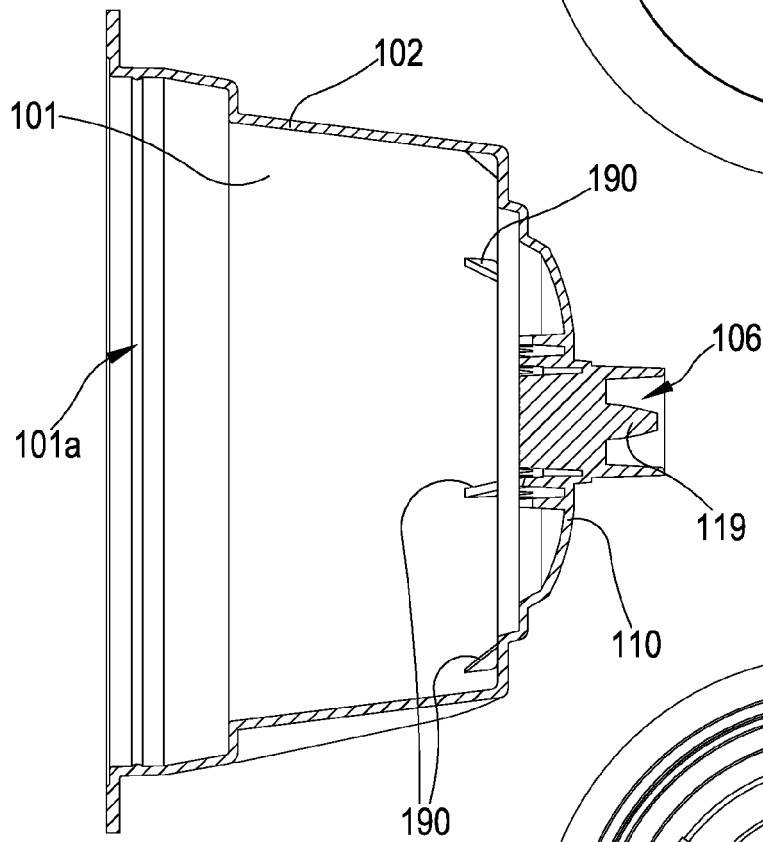
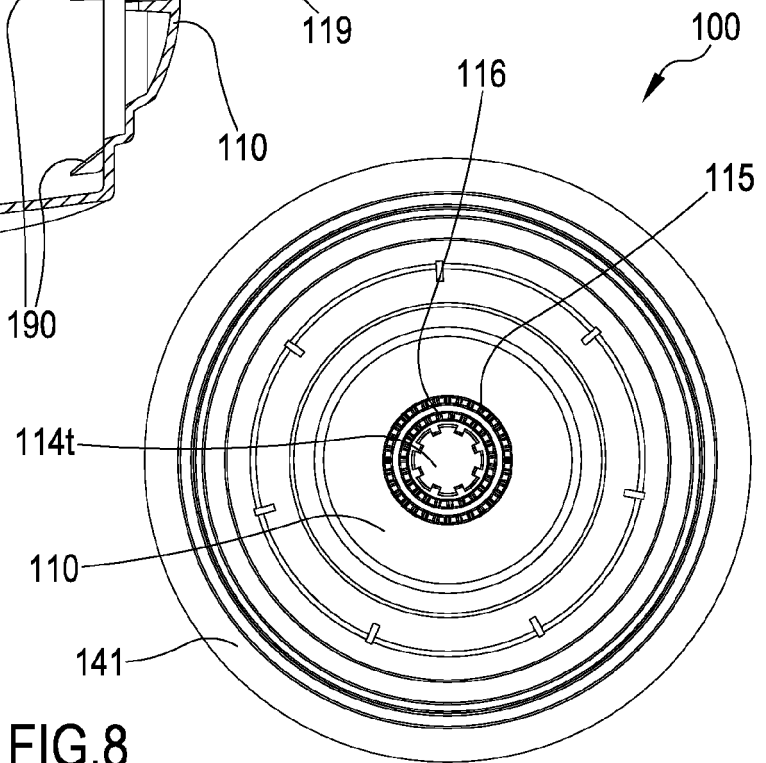


FIG.8





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A	* page 4, line 7 - line 9 * * page 7, line 30 - page 8, line 4 * * page 11, line 13 - page 12, line 2 * * page 13, line 14 - line 19; claims 1-11; figures 1-9 *		
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