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(54) **Capsule for infusion products**

(57) The capsule for infusion products (1) comprises a cup-shaped structure (2) made of plastic material defined by a bottom wall (4) provided with through holes (13) and by a side wall (3), and a lid (21) made of plastic material arranged so as to close said cup-shaped structure (2) and presenting a peripheral edge (25) welded by means of an ultrasonic welding device upon an upper part (6) of the above said side wall (3). The upper part (6) of said side wall (3) presents from the bottom towards

the top a first annular section (16) and a second annular section (17) of an external diameter smaller than the one of said first section (16). The peripheral edge (25) of the lid presents a first annular section (26) facing the second section (17) of the upper portion (6) and a second annular section (27) folded downwards and facing the first section (16) of the upper portion (6) so as to constitute an holding organ of possible molten material deriving from the welding between said first section (26) of the peripheral edge (25) and the second section (17) of the upper portion (6).

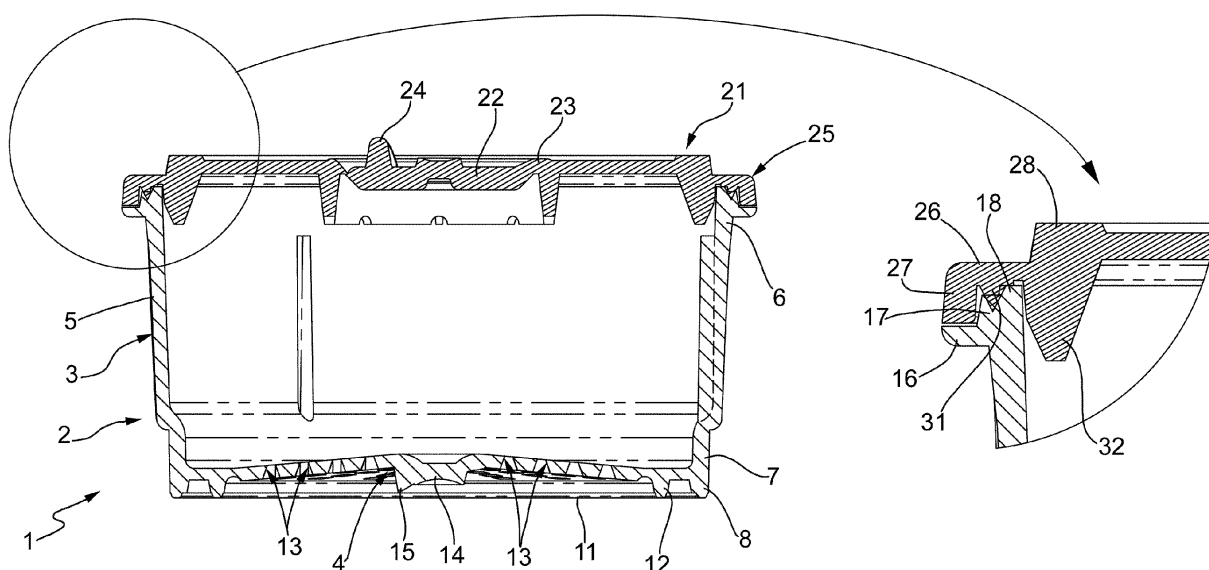


FIG.5

Description

[0001] The present invention relates to a capsule for the infusion of granular, powder or flake products such as coffee, barley, powdered milk, tea, chamomile, etc...

[0002] Generally, the capsules for infusion products comprise a cup made of plastic material and within which is housed the infusion product, and a lid arranged so as to close the cup being also made of plastic material. The lid is welded to the upper edge of the cup by means of an ultrasonic device of a known type by which welding is accomplished by vibration. In addition, the lid has a valve being defined by an element which closes a hole formed upon said lid.

[0003] In the application WO2010/134036 a capsule has been described wherein the cup has, on its bottom wall, a particular conformation to achieve a better hydraulic seal between said bottom wall and a wall of the percolation chamber of a machine.

[0004] In the applications WO2010/115970, WO2010/139575 and WO 2004/087529 a capsule has been described wherein the lid is defined by a thin layer of constant thickness which can be fixed to the upper edge of the cup by the application of ultrasound.

[0005] In the application EP1767467 a capsule has been described wherein the lid has an annular projection which engages an annular recess formed upon the upper edge of the cup and therein fixed by the application of ultrasound.

[0006] When the capsule is inserted within a percolation chamber of a machine for the extraction of drinks, hot water is injected under pressure and this determines the bending of the abovementioned element so that the water internally accesses the cup through the abovementioned hole formed in the lid. The water is mixed with the product and exits the capsule through holes in the bottom wall of the cup.

[0007] The capsules described above have a plurality of drawbacks.

[0008] In particular for the capsules in which the lid in its section object of the welding step has oblique surfaces the welding step is not effective and precise but rather the vibrations that are transmitted to the closing element of the hole made in the lid determine the bending of said element and therefore the opening of the hole from which then exits the infusion product.

[0009] Furthermore the capsules described in the patent applications indicated above have a lid that during the welding step does not prevent the overflow between the lid and the cup of parts of plastic material. It is evident that being food products, the view of external beads caused by the welding is not approved by the consumer.

[0010] The purpose of the present invention is to provide a capsule for the infusion of granular, powder or flake products, being free from the above mentioned drawbacks and therefore having a lid and an upper edge of the cup with a special shape allowing correct and effective welding without producing a flow of plastic mate-

rial to the outside of the capsule and without affecting by vibration the closure element of the hole made in the lid.

[0011] According to the present invention a capsule is provided for infusion products comprising:

a cup-shaped structure of plastic material defined by a bottom wall provided with through holes and by a side wall;

a lid made of plastic material arranged so as to close said cup-shaped structure and presenting a peripheral edge, which is welded by means of an ultrasonic welding device to an upper portion of said side wall;

characterized in that said upper portion of said side wall presents, from the bottom to the top, a first annular section and a second annular section having an external diameter which is smaller than the one of said first section, and **characterized in that** said peripheral edge of said lid presents a first annular section facing said second section of said upper portion and a second annular section, which is folded downwards and faces said first section of said upper portion, so as to build a holding organ for holding possible molten material deriving from the welding between said first section of said peripheral edge and said second section of said upper portion.

[0012] Allowing for a better understanding of the invention is the following embodiment which shows, purely by way of illustration, a non-limitative example accompanied by the attached drawings, wherein:

Figure 1 is a perspective view of a capsule made in accordance with the dictates of the present invention;

Figure 2 is a perspective view of a lid of the capsule of Figure 1;

Figure 3 is a perspective view of a cup of the capsule of Figure 1;

Figure 4 is a sectional view of the capsule of Figure 1 in a step before the welding step between the lid and the cup;

Figure 5 is a sectional view of the capsule of figure 1 in a step subsequent to the welding step between lid and cup, and

Figure 6 is a sectional view of the capsule of Figure 1 with a particular part made according to an embodiment different from that shown in Figure 4.

[0013] In the attached figures is indicated as a whole with 1 a preferred embodiment of the capsule for infusion products according to the present invention; capsule 1 is adapted to be inserted in a percolation chamber and is adapted to contain an infusion product.

[0014] With reference to Figures 1, 3, 4 and 5, the capsule 1 comprises a cup-shaped structure 2 made in a single body in plastic material, a slightly truncated cone-shaped and defined by a side wall 3 and by a bottom wall 4. The side wall 3 has a central annular portion 5, an upper annular portion 6 and a lower annular portion 7. In

correspondence of the central portion 5 on the inner surface of the side wall 3 are formed in one piece reinforcement ribs 8 defined along an axis slightly inclined with respect to a vertical axis. The lower portion 7 has an outer diameter and an inner diameter respectively smaller than the outer diameter and the inner diameter of the central portion 5.

[0015] With reference to Figures 4 and 5, the bottom wall 4 is derived from a central section of the lower portion 7 to which it is defined an annular edge 8 of the lower end of lower portion 7 which extends beyond said bottom wall 4. Said edge 8 supports a filter 11 defined by a filtering film that also lies on a circular projection 12 which extends downwardly from the lower face of the bottom wall 4. It should be noted that the bottom wall 4 is slightly concave towards the inside of the cup-shaped structure 2. Furthermore in the bottom wall is made a plurality of through holes 13. Finally from the lower face of the bottom wall extends a projection 14 having a pointed end 15. In use, for the water pressure inside the cup-shaped structure 2, the bottom wall 4 is pressed towards the filter 11 which is then sliced from the pointed end 15. Consequently, the drink that is formed in the cup-shaped structure 2 through the holes 13 and through the tear defined in the filter 11 overflows from the capsule 1.

[0016] With reference to Figures 3 and 4, the upper portion 6 of the wall 3 presents in a sequence towards the top three annular sections 16, 17 and 18 of different outer diameter which define three steps. In particular the lower section 16 presents an external diameter which is larger than that of central section 17, which, in turn, presents an external diameter larger than that of the upper section 18. The outer diameter of the section 16 being larger than the outer diameter of the central portion 5 of the wall 3. It is necessary to underline that the upper face of the sections 16, 17 and 18 is flat and lies on a respective horizontal plane. Furthermore, the outer side face of the sections 17 and 18 is substantially conical.

[0017] With reference to Figures 1, 2, 4 and 5, the capsule 1 comprises a lid 21 made of plastic material and which in use is welded upon the upper portion 6 of the cup-shaped structure 2 by means of a device of known type adapted to generate ultrasound to define vibrations that fluidize the material subjected to said ultrasound. The lid 21 comprises, integrally, a central part 22 circularly shaped that apart from a section 23 has a peripheral edge of a reduced thickness; from the outer face of the central part 22 originates upwards a projection 24 in a position diametrically opposite to that of the section 23. In use, due to the pressure of the water and/or by the action of an organ (not shown) of the percolation chamber, the central part 22 is pushed towards the inside of the cup-shaped structure 2, and then the material that joins the abovementioned peripheral edge from the central part 22 and the remaining part of the lid 21 is cut. In essence, the central part 22 rotates around the section 23 towards the inside of the cup-shaped structure 2 defining an opening through which the water enters within

the cup-shaped structure 2.

[0018] With reference to Figures 1, 2, 4 and 5 the lid 21 has a peripheral edge defined by an annular flap 25 in an inverted L-shaped section. In fact, the flap 25 comprises an inner section 26 defined on a horizontal plane and an outer section 27 folded at 90° downwards. Between the inner portion 26 and the remaining part of the lid 21 is formed in one piece an annular projection 28 which extends upwards and which as will be better explained later, is to constitute a barrier to the vibrations generated from said ultrasonic welding device which is applied on the upper face of the section 26. From the inner face of the section 26 is originated downwards an annular projection 31 which in section has an isosceles triangle shape with the apex facing the upper face of the section 17. Furthermore, in correspondence with the projection 28 from the lower face of the lid 21 extend downwards 4 ribs 32 which in assembly of the lid 21 on the cup-shaped structure 2 result within said cup-shaped structure 2.

[0019] With reference to Figures 4 and 5, applying the lid 21 upon the upper portion 6 of the cup-shaped structure 2, the lower face of section 27 results facing towards the upper face of the section 16, the projection 31 results facing towards the upper face of the section 17 and the area of the section 26 defined between the projection 31 and the area from which originate the ribs 32 is facing towards the upper face of the section 18. In actual use, by applying an ultrasound device upon the upper face of the portion 26 of the lid 21 are determined vibrations in the area below, i.e. in the section 26 of the lid 21 and in the section 17 of the upper portion 6 of the cup-shaped structure 2. As well known said vibrations induce an increase in temperature in the areas below and therefore a melting of the plastic material is achieved. The consequence is the welding of the lid 21 onto the portion 6 as shown in figure 5 where it is necessary to point out that the projection 31 and the section 17 become a single body. Of course, during welding the lid 21 is pressed onto the portion 6 so that the section 27 comes into contact or almost on the upper face of the section 16 and the section 18 comes into contact or almost on the lower face of the section 26.

[0020] Figure 6 illustrates an embodiment of the upper portion 6 of the cup-shaped structure 2. The upper portion in this case presents the section 16 and the section 17. In essence the sections 17 and 18 illustrated in Figure 4 are represented in Figure 6 by a single section 17. On the upper face of the section 17 is formed an annular recess 51 inside of which extends projection 31.

[0021] Preferably the cup-shaped structure 2 and/or the lid 21 are made of PET which, as is known is a plastic material of the polyester family. Moreover, the entire capsule 11 is preferably made of biodegradable plastic material which as known is defined by plastic material suitably admixed with already known substances that render the capsule 1 biodegradable.

[0022] The capsule 1 described above has a plurality

of advantages.

[0023] In particular, the section 26 of the flap 25 has a flat upper face and lies upon a horizontal plane. Now, given that the ultrasonic welding device is applied on said section 26 it appears evident that the ultrasound generated by the latter are directed exclusively towards the welding area and not towards the central part 22. In fact, while in the capsules currently on the market the part of the lid where the ultrasonic welding device is applied is defined on an oblique plane, and then ultrasound affects the part 22 by determining the melting of the peripheral edge of said part 22 and therefore the overflow of the infusion product from the slot that is created between the part 22 and the remaining part of the lid, in the capsule 1 object of the present invention this drawback does not occur since the ultrasound is directed exclusively towards the welding zone. Consequently, in the capsule 1 during the welding step any gap between the part 22 and the remaining part of the lid 21 does not occur, and, therefore, leakage of the infusion product from the capsule 1 does not occur. To hinder the propagation of ultrasound even more towards the part 22, the capsule 1 presents the projection 28 that constitutes an insurmountable barrier to ultrasound. It is also to be pointed out that the shape of the peripheral edge of the lid 21 and the upper portion 6 of the cup-shaped structure 2 prevents the leakage and therefore the visibility of any beads of molten material during welding. Indeed, this molten material tends to leak but remains trapped between the section 17 and the section 27 which then functions as a holding organ for the leakage of melted material during the welding step.

Claims

1. Capsule for infusion products (1) comprising:

a cup-shaped structure (2) made of plastic material defined by a bottom wall (4) provided with through holes (13) and by a side wall (3);
a lid (21) made of plastic material arranged so as to close said cup-shaped structure (2) and presenting a peripheral edge (25), which is welded by means of an ultrasonic welding device to an upper portion (6) of said side wall (3);
capsule **characterised in that** said upper portion (6) of said side wall (3) presents, from the bottom to the top, a first annular section (16) and a second annular section (17) having an external diameter which is smaller than the one of said first section (16), **and in that** said peripheral edge (25) of said lid (21) presents a first annular section (26) facing said second section (17) of said upper portion (6) and a second annular section (27), which is folded downwards and faces said first section (16) of said upper portion (6), so as to build a holding organ for holding possible molten material deriving from the welding

between said first section (26) of said peripheral edge (25) and said second section (17) of said upper portion (6).

2. Capsule, according to Claim 1, **characterised in that** a first annular projection (31) originates from the lower side of said first section (26) of said peripheral edge (25) and extends towards the upper side of said second section (17) of said upper portion (6), said first projection (31) melting with said second section (17) of said upper portion (6) during the the welding phase, so as to be welded to the latter.
3. Capsule, according to Claim 2, **characterised in that** said first projection (31) presents, in cross section, a triangular shape.
4. Capsule, according to Claim 2 or 3, **characterised in that** said upper portion (6) of said side wall (3) presents, in a sequence towards the top, three annular sections (16, 17 and 18) with different diameters, which define three steps; said first section (16) presenting an external diameter, which is larger than the one of said second section (17), which presents an external diameter, which is larger than the one of a third section (18).
5. Capsule, according to Claim 3, **characterised in that** said upper portion (6) of said side wall (3) presents, in a sequence towards the top, two annular sections (16 and 17) with different diameters; said first section (16) presenting an external diameter, which is larger than the one of said second section (17) and said second section (17) presenting an upper side, wherein an annular recess (51) is obtained, inside which said first annular projection (31) extends.
6. Capsule, according to Claim 4 or 5, **characterised in that** the upper side of said first section (26) of said peripheral edge (25) is flat, is defined on a horizontal plane, and is the area to which said ultrasonic welding device is applied.
7. Capsule, according to any of the previous Claims, **characterised in that** a second annular projection (28) is obtained between said first section (26) of said peripheral edge (25) and the remaining part of the lid (21), said second projection (28) extending upwards and defining a barrier against the vibrations generated by the above-mentioned ultrasonic welding device, which is applied to the upper side of said first section (26) of said peripheral edge (25).
8. Capsule, according to any of the previous Claims, **characterised in that** said lid (21) presents a central part (22), which, during the percolation phase, defines an opening in said lid (21), so as to allow water

to flow into said cup-shaped structure (2), and wherein a filter (11) is applied on said bottom wall (4).

9. Capsule, according to at least one of the previous Claims, **characterised in that** said cup-shaped structure (2) and said lid (21) are made of PET (polyester family). 5
10. Capsule, according to at least one of the previous Claims, **characterised in that** said cup-shaped structure (2) and said lid (21) are made of biodegradable plastic material. 10

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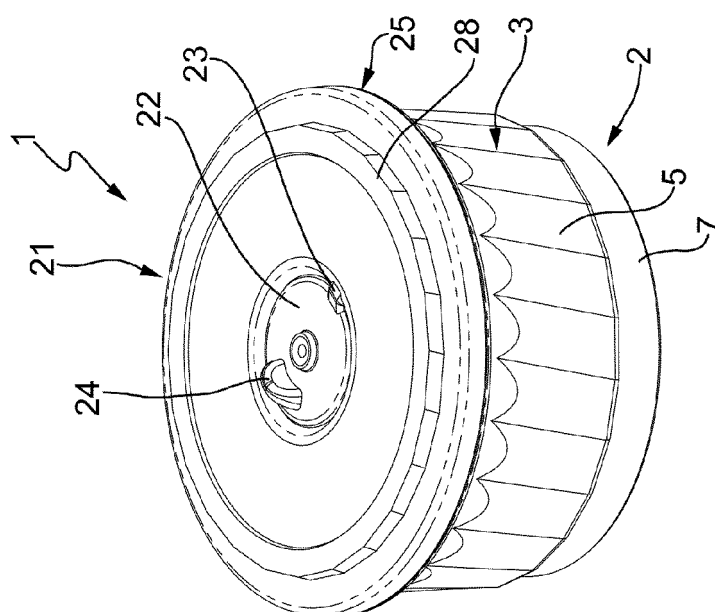


FIG.1

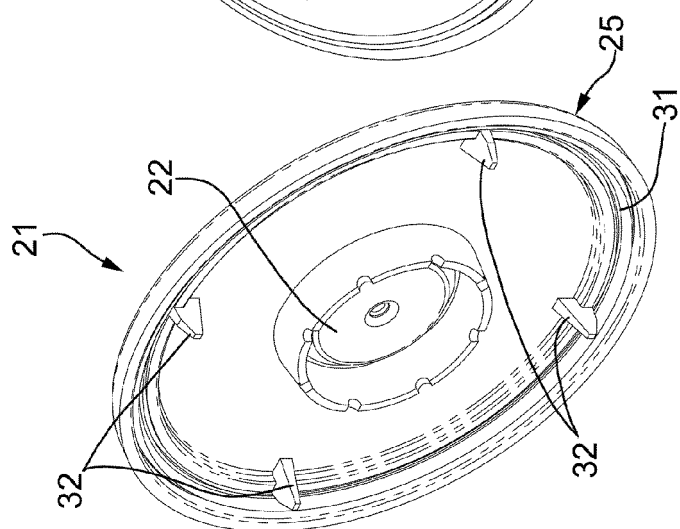


FIG.2

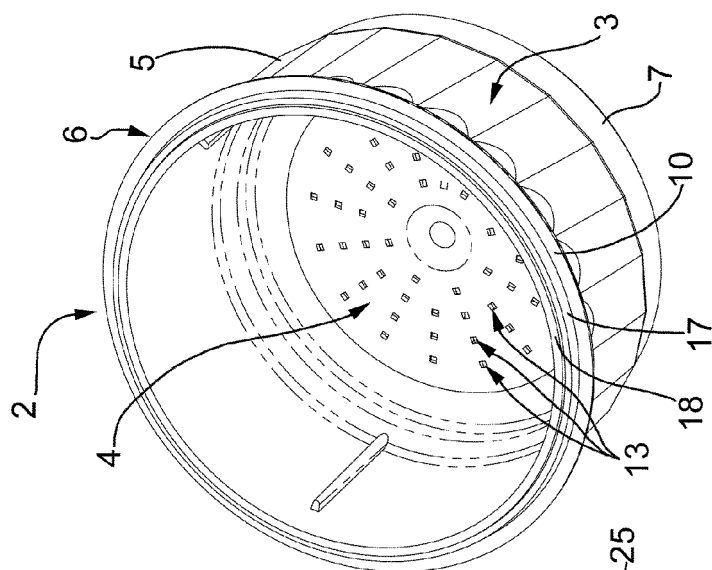


FIG.3

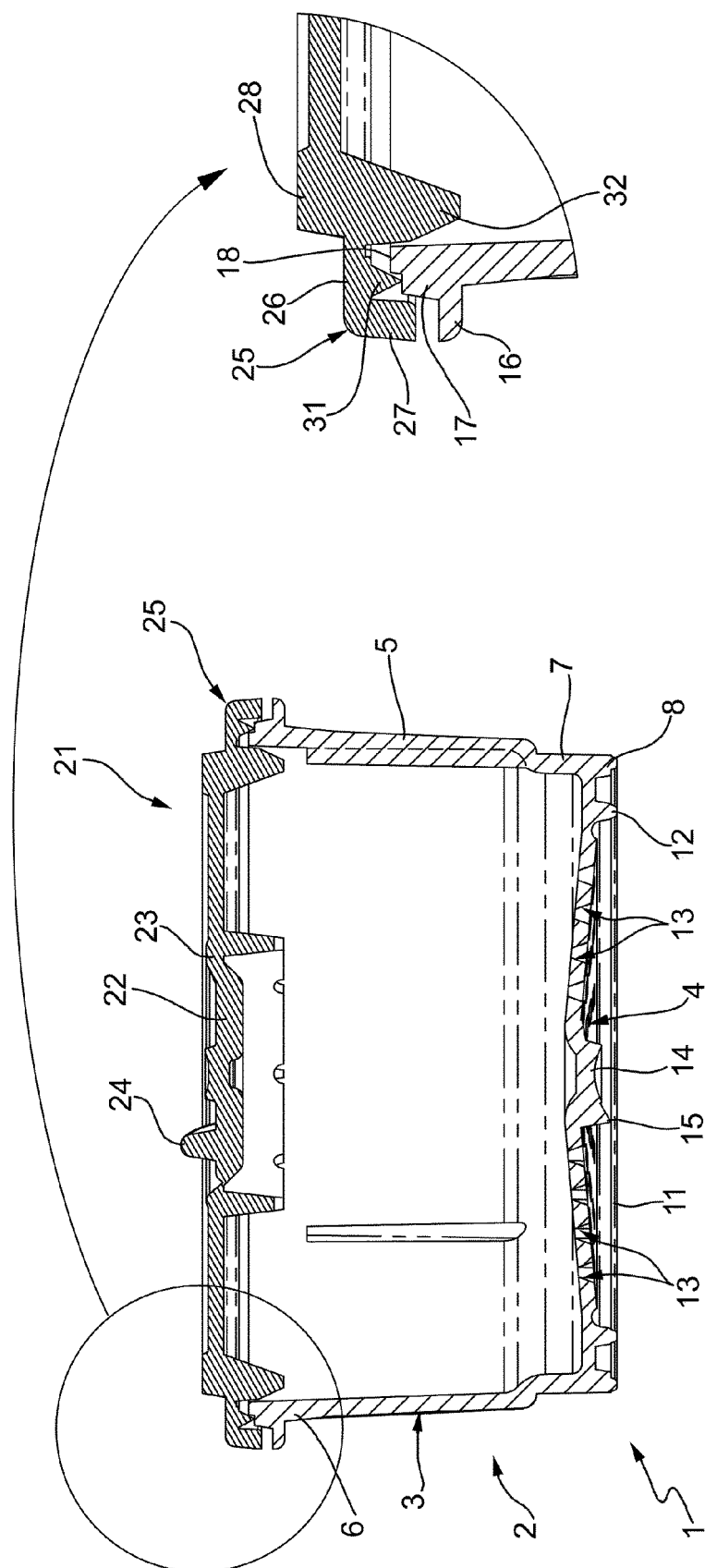


FIG.4

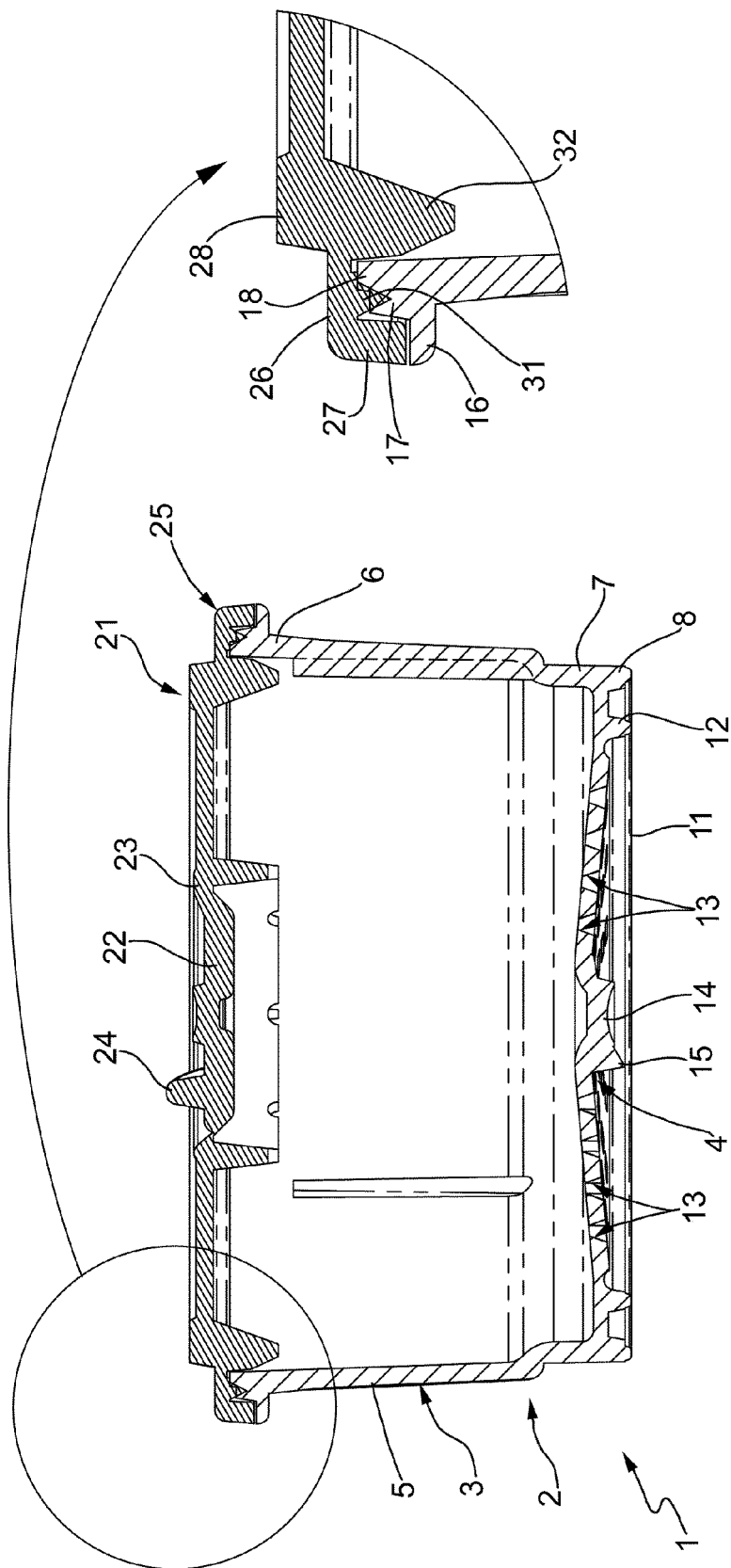


FIG.5

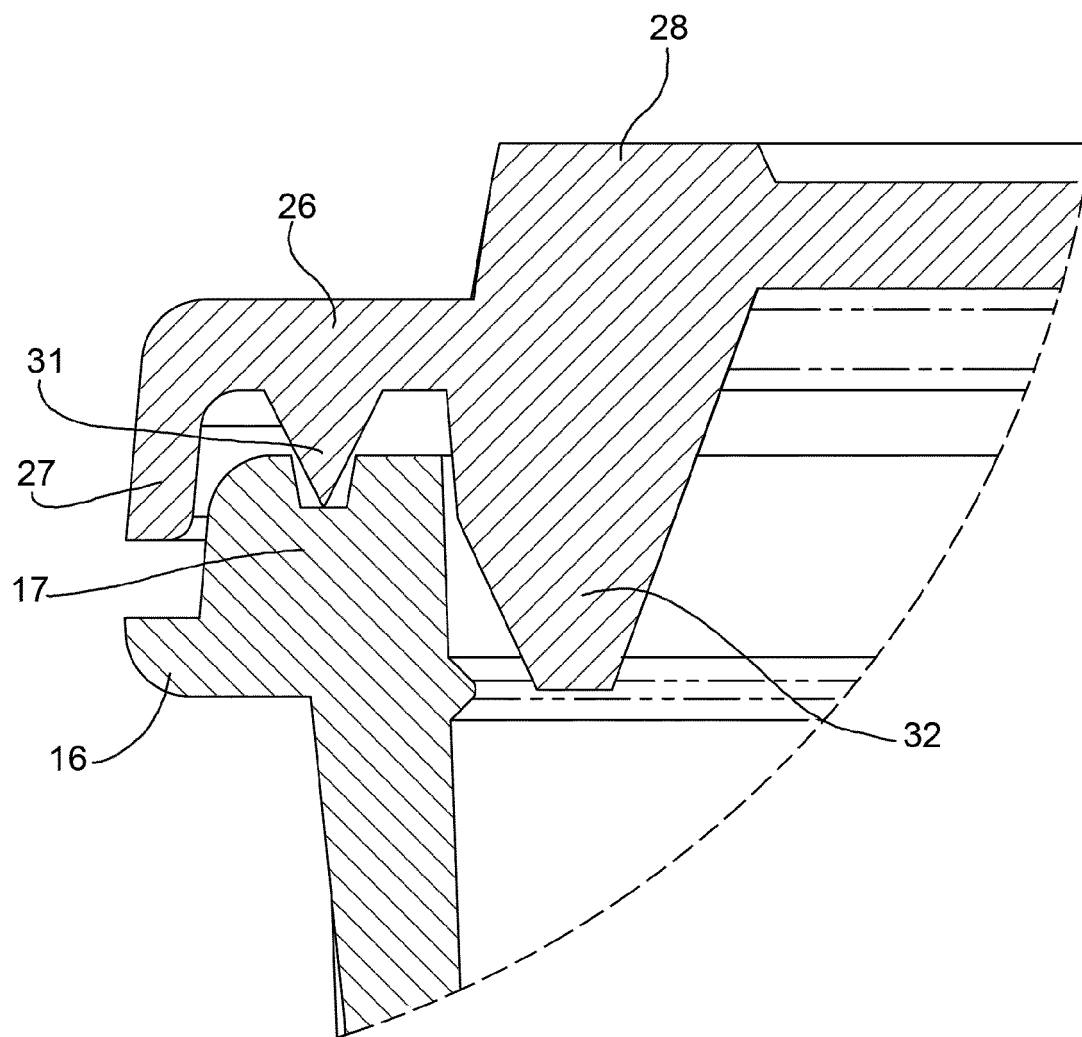


FIG. 6



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Application Number
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