during use allows the flow of the aqueous medium through the cartridge to be optimized. If the cartridge is oriented vertically, water or other aqueous medium will flow rapidly under the influence of gravity and will bypass the beverage ingredient. If the cartridge is oriented horizontally, this problem can be avoided, especially by arranging the upward flow element between the inlet and outlet positions.

Preferably, the inflow of the aqueous medium is directed to the first chamber and the outflow of the beverage is from the second chamber. The first chamber may be a manifold chamber. The second chamber may be a discharge chamber. Preferably, there is provided a storage chamber comprising one or more beverage components separate from the manifold chamber and the discharge chamber.

In the following description, the terms & quot; upper & quot; and & quot; lower & quot; and their equivalent terms will be used to describe the relevant positional relationship of the features of the present invention. The terms & quot; upper & quot; and & quot; lower & quot; and their equivalent terms refer to the insertion into the beverage preparation machine and the subsequent placement of the cartridge (or other component) in its normal orientation for dispensing, As used herein. In particular, & quot; top & quot; and & quot; bottom & quot; refer to relative positions that are close or farther from the top surface 11 of the cartridge, respectively. In addition, the terms & quot; inner & quot; and & quot; outer & quot; and their equivalent terms will be used to describe the relevant positional relationship of the features of the present invention. The terms & quot; inner & quot; and & quot; outer & quot; and their equivalent terms refer to the relative position of the cartridge (or other component) in the state of being close to or farther from the center of the cartridge 1 (or other component) As used herein.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which: Fig.

1 is a sectional view of an outer member of first and second embodiments of a cartridge for use with the present invention.

Figure 2 is a cross-sectional view of the details of the outer member of Figure 1, showing the inwardly cylindrical extension;

Figure 3 is a cross-sectional view of the detail of the outer member of Figure 1, showing the slot.

FIG. 4 is a perspective view of the outer member of FIG. 1 seen from the top; FIG.

Figure 5 is a perspective view from above of the outer member of Figure 1 in a conductive orientation.

Figure 6 is a top plan view of the outer member of Figure 1;

7 is a sectional view of the inner member of the first embodiment of the cartridge.

8 is a perspective view from above of the inner member of Fig.

FIG. 9 is a perspective view from above of the inner member of FIG. 7 in a conductive orientation.

10 is a top plan view of the inner member of Fig. 7; Fig.

11 is a sectional view of the first embodiment of the cartridge in the assembled state.

12 is a sectional view of the inner member of the second embodiment of the cartridge.

Figure 13 is a cross-sectional view of the detail of the inner member of Figure 12, showing the opening;

14 is a perspective view of the inner member of Fig. 12 viewed from above.

Figure 15 is a perspective view from above of the inner member of Figure 12 in a conductive orientation.

Figure 16 is another cross-sectional view of the inner member of Figure 12;

Figure 17 is a cross-sectional view of another detail of the inner member of Figure 12, showing the air inlet.

18 is a sectional view of a second embodiment of the cartridge in the assembled state.

19 is a sectional view of the outer member of the third and fourth embodiments of the cartridge for use with the present invention.

Figure 20 is a cross-sectional view of the details of the outer member of Figure 19, showing the inwardly cylindrical extension.

Figure 21 is a top plan view of the outer member of Figure 19;

Figure 22 is a perspective view of the outer member of Figure 19 viewed from above.

Fig. 23 is a perspective view from above of the outer member of Fig. 19 in a conductive orientation.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

24 is a sectional view of the inner member of the third embodiment of the cartridge.

Figure 25 is a top plan view of the inner member of Figure 24,

Figure 26 is a cross-sectional view of the detail of the inner member of Figure 24, showing the inwardly directed upper rim.

27 is a perspective view of the inner member of Fig. 24 viewed from above.

Figure 28 is a perspective view from above of the inner member of Figure 24 as it is conducting and oriented;

29 is a sectional view of a third embodiment of the cartridge in the assembled state.

30 is a sectional view of the inner member of the fourth embodiment of the cartridge.

31 is a plan view of the inner member of Fig. 30 viewed from above.

32 is a perspective view of the inner member of Fig. 30 viewed from above.

33 is a perspective view from above of the inner member of Fig. 30 in a conductive orientation;

34 is a sectional view of a fourth embodiment of the cartridge in the assembled state.

35 is a front perspective view of a beverage preparation machine according to the present invention.

Figure 36 is a front perspective view of the machine of Figure 35 with the cartridge head in the open position;

37 is a rear perspective view of the machine of FIG. 35, with some portions omitted for clarity.

Figure 38 is another rear perspective view of the machine of Figure 35, with some portions omitted for clarity.

39 is a perspective view of the cartridge head of the machine of FIG. 35, with some portions omitted for clarity.

40 is another perspective view of the cartridge head of the machine of FIG. 35, with some portions omitted for clarity.

41 is a sectional view of the cartridge head in the closed position;

42 is a sectional view of the cartridge head in the open position;

Figure 43 shows a schematic layout of the machine of Figure 35;

44A and 44B show a schematic layout of the first and second code recognition means for the machine of FIG.

45 is a plan view of a beverage of the present invention comprising a bar code.

11, the cartridge 1 of the present invention generally includes an outer member 2, an inner member 3, and a laminate 5. As shown in Fig. The outer member 2, the inner member 3 and the laminate 5 have an inner portion 120 containing one or more beverage ingredients, an inlet 121, an outlet 122 and an inlet 121 at an outlet 122 To form a cartridge (1) having a beverage flow path that connects and passes through the interior (120). The inlet 121 and the outlet 122 are initially sealed by a laminate 5 and are opened by the punching or cutting of the laminate 5 in use. The beverage flow path is formed by the spatial interrelationship between the outer member 2, the inner member 3 and the laminate 5 as described later. Other components such as the filter 4, which will be described further below, may optionally be included in the cartridge 1. A first form of the cartridge 1 to be described for the purpose of providing background information is shown in Figs. The first form of the cartridge 1 is specifically designed for use in the distribution of filtered products such as roast and ground coffee or leaf tea. However, this type of cartridge 1, as well as other forms described below, may also be used in a variety of applications such as chocolate, coffee, tea, sweeteners, cordials, flavorings, alcoholic beverages, flavored milk, , Fruit juices, squash, sauces, and desserts. As can be seen from Fig. 5, the overall shape of the cartridge 1 is generally circular or disc-shaped, with the diameter of the cartridge 1 being significantly larger than its height. The main axis X passes through the center of the outer member as shown in Fig. Typically, the total diameter of the outer member 2 is 74.5 mm 6 mm and the total height is 16 mm 3 mm. Typically, the volume of the cartridge 1 when assembled is 30 2 ml 20%.

The outer member 2 generally includes a bowl-shaped shell 10 having a curved annular wall 13, a closed top end 11 and an open bottom end 12. The diameter of the outer member 2 is smaller than the diameter at the lower end portion 12 as compared to the diameter at the upper end portion 12, which is the result that the annular wall 13 is spread from the closed upper end portion 11 to the open lower end portion 12. The annular wall 13 and the closed top end 11 together form a receptacle with an interior 34. [A hollow inwardly cylindrical extension 18 is provided in the closed top 11 centered on the main axis X. [As shown more clearly in FIG. 2, the cylindrical extension 18 includes a stepped profile having first, second and third portions 19, 20, 21. The first portion 19 is a circular cylinder with a right angle. The second portion 20 has a conical shape and is tapered inward. The third part is another exactly circular cylinder and is closed by the lower surface 31. The diameter of the first, second and

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

http://translationportal.epo.org/emtp/translate/?ACTION=description-retrieval&COUNTRY=KR&ENGINE=google&FORMAT=docdb&KIND=&LOCALE=en_EP&NUM

third portions 19,20 and 21 is such that the diameter of the cylindrical extension 18 extends from the upper end 11 of the cylindrical extension 18 to the closed lower face 31 Decrease with increasing amount. A generally horizontal shoulder 32 is formed on the cylindrical extension 18 at the junction between the second and third portions 20, An outwardly extending shoulder (33) is formed in the outer member (2) towards the lower end (12). The outwardly extending shoulder 33 forms a secondary wall 15 that is coaxial with the annular wall 13 so that the annular wall 13 forms a manifold 16 between the secondary wall 15 and the annular wall 13. [. The manifold 16 passes around the circumference of the outer member 2. A series of slots 17 are provided in the annular wall 13 in alignment with the manifold 16 to provide gas and liquid communication between the interior 34 of the outer member 2 and the manifold 16. [do. As shown in FIG. 3, the slot 17 includes vertical slits in the annular wall 13. 20To 40 slots are provided.

In the illustrated embodiment, 37 slots 17 are provided at substantially equal intervals around the circumference of the manifold 16. [The slot 17 preferably has a length of 1.4 to 1.8 mm. Typically, the length of each slot is 1.6 mm, representing 10% of the total height of the outer member 2. The width of the slot is 0.25 to 0.35 mm. Typically, the width of each slot is 0.3 mm. The width of the slot 17 is narrow enough to prevent the beverage ingredients from passing therethrough into the manifold 16 during storage or use. An inlet chamber 26 is formed in the outer member 2 at the periphery of the outer member 2. A cylindrical wall 27 is provided which forms an inlet chamber 26 therein and separates the inlet chamber 26 from the interior 34 of the outer member 2, as best seen in FIG. The cylindrical wall 27 has a closed upper surface 28 formed on a plane perpendicular to the main axis X and an open lower end 29 coplanar with the lower end 12 of the outer member 2. [The inlet chamber 26 communicates with the manifold 16 via two slots 30 as shown in FIG. Alternatively, one to four slots may be used for communication between the manifold 16 and the inlet chamber 26. At the lower end of the outwardly extending shoulder 33 is provided an outwardly extending flange 35 extending perpendicular to the main axis X. [Typically, the flange 35 has a width of 2 to 4 mm. A portion of the flange 35 is enlarged to form a handle to which the outer member 2 can be retained. The handle 24 is provided with an upwardly directed rim 25 to improve grip. The outer member 2 is formed as a unitary single piece from high density polyethylene, polypropylene, polystyrene, polyester, or two or more of these materials. Suitable polypropylenes are a range of polymers available from DSM UK Limited (Reddy, England). The outer member may be opaque, transparent or translucent. The manufacturing process may be injection molding.

The inner member 3 as shown in Figures 7 to 10 includes an annular frame 41 and a cylindrical funnel 40 extending downwardly. The main axis X passes through the center of the inner member 3 as shown in Fig. As best seen in FIG. 8, the annular frame 41 includes an inner rim 51 and an inner hub 52 joined by ten equally spaced radial spokes 53. The inner hub 52 is integral with and extends from the cylindrical funnel 40. A filtration opening 55 is formed in the annular frame 41 between the radial spokes 53. The filter 4 is arranged on the annular frame 41 so as to cover the filtration opening 55. [The filter is preferably made from a material having a high wet strength, such as, for example, polyester nonwoven fibrous material. Other materials that may be used include water impermeable cellulose based materials such as cellulosic materials including woven paper fibers. The woven paper fibers may be blended with fibers of polypropylene, polyvinyl chloride and / or polyethylene. The incorporation of these plastic materials into the cellulosic material allows the cellulosic material to be heat sealed. The filter 4 can also be treated or coated with a material which is activated by heat and / or pressure, and can be sealed in this manner in the annular frame 41. 7, the inner hub 52 is located at a lower position than the outer rim 51, so that the annular frame 41 has a sloping lower profile. The upper surface of each spoke 53 is provided with a standing web 54 which divides the empty space above the annular frame 41 into a plurality of passages 57. Each passage 57 is in contact with the lower surface by the filter 54 and on both sides by the web 54. The passageway 57 extends downwardly into and opens into the cylindrical funnel 40 from the opening 56 formed by the inner end of the web 54 from the outer rim 51. [The cylindrical funnel 40 includes an outer tube 42 surrounding a discharge spout 43.

The outer tube (42) forms the outside of the cylindrical funnel (40). The outlet 43 is coupled to the outer tube 42 at the upper end of the outlet 43 by an annular flange 47. The outlet 43 includes an inlet 45 at the upper end communicating with the opening 56 of the passage 57 and an outlet 44 at the lower end through which the prepared beverage is discharged into the cup or other receptacle. The outlet 43 includes a conical portion 48 at the upper end and a cylindrical portion 58 at the lower end. The cylindrical portion 58 may have a slight taper to narrow toward the outlet 44. The conical portion 48 helps channel the beverage downwardly from the passageway 57 toward the outlet 44 without creating turbulence in the beverage. The upper surface of the conical portion 48 is provided with four support webs 49 spaced equidistantly about the circumference of the cylindrical funnel 40. The support web 49 forms a channel 50 therebetween. The upper edges of the support webs 49 are at the same height as one another and are perpendicular to the main axis X. The inner member 3 can be formed as an integral single piece by injection molding in the same manner as the outer member 2, from polypropylene or a material similar to the above-mentioned material. Alternatively, the inner member 3 and / or the outer member 2 may be made from a biodegradable polymer. Examples of suitable materials include degradable polyethylenes (e.g., SPITEK supplied by Symphony Environmental of Bourhamwood, England), biodegradable polyester amides (such as BAK 1095 supplied by Symphony Environmental), polylactic acid PLA supplied by Cargill of the company), starch-based polymers, cellulosic derivatives and polypeptides. The laminate 3 is formed of

IPR2023-00502,
Nespresso USA, Inc. Ex. 1002 Part 2

http://translationportal.epo.org/emtp/translate/?ACTION=description-retrieval&COUNTRY=KR&ENGINE=google&FORMAT=docdb&KIND=&LOCALE=en_EP&NUM

two layers: a first layer of aluminum and a second layer of cast polypropylene. The aluminum layer has a thickness of 0.02 to 0.07 mm. The cast polypropylene layer has a thickness of 0.025 to 0.064 mm.

In one embodiment, the aluminum layer is 0.06 mm thick and the polypropylene layer is 0.025 mm thick. Such laminates are advantageous because they have a high resistance to curling, especially during assembly. As a result, the laminate 5 can be pre-cut in precise size and shape, and subsequently transferred to the assembly station on the production line without being deformed. As a result, the laminate 5 is particularly suitable for welding. Other laminate materials including PET / aluminum / PP, PE / EVOH / PP, PET / metal / PP, and aluminum / PP laminates may also be used. Roll laminate stock may be used instead of die cutting stock. The cartridge 1 may be closed by a rigid or semi-rigid lid instead of a flexible laminate. The assembly of the cartridge 1 involves the following steps: a) the inner member 3 is inserted into the outer member 2, b) the filter 4 is cut to the shape and the inner member 3 C) the step of the inner member 3, the outer member 2 and the filter 4 being joined by ultrasonic welding, d) the step of assembling the inner member 3, the outer member 2 and the filter 4, (1) is filled with one or more beverage ingredients, e) the laminate (5) is attached to the outer member (2). These steps will be discussed in more detail below. The outer member 3 is oriented with the open lower end 12 facing upward. The inner member 3 is then inserted into the outer member 2 in such a state that the outer rim 51 is accommodated so as to loosely fit in the axial extending portion 14 at the upper end portion 11 of the cartridge 1 . At the same time, the cylindrical extension 18 of the outer member 2 is received in the upper portion of the cylindrical funnel 40 of the inner member 3. The third portion 21 of the cylindrical extension 18 is in a state in which the closed lower surface 31 of the cylindrical extension 18 is supported against the support web 49 of the inner member 3, And is mounted inside the funnel 40. The filter 4 is then placed on the inner member 3 so that the filter material is in contact with the annular rim 51.

An ultrasonic welding process is then used to join the filter 4 to the inner member 3 and at the same time to join the inner member 3 to the outer member 2 in the same process step. The inner member 3 and the filter 4 are welded around the outer rim 51. The inner member 3 and the outer member 3 are joined by a weld around the outer rim 51 and also at the upper edge of the web 54. 11, the outer member 2 and the inner member 3 are connected together by a cylindrical funnel 40 forming an interior 120 below the annular flange 41 and a filtration chamber, Thereby forming an empty space 130 in the outside of the semiconductor device. The passage 57 on the annular frame 41 and the filtration chamber 130 are separated by the filter paper 4. The filtration chamber 130 contains one or more beverage components 200. One or more beverage ingredients are filled into the filtration chamber 130. For filtration type beverages, the ingredients are typically roasted and ground coffee or leaf tea. The fill density of the beverage ingredients in the filtration chamber 130 may be varied as needed. Typically, for filtered coffee products, the filtration chamber typically contains 5.0 to 10.2 grams of roasted and ground coffee in a 5 to 14 mm thick filter bed. Optionally, the exterior 120 may include one or more objects, such as spheres, that are free to move in the interior 120 to assist mixing by creating turbulence in the sediment of the beverage ingredients during disposal of the beverage and disturbing it have. The laminate 5 is then affixed to the outer member 2 by forming a weld 126 around the periphery of the laminate 5 to engage the laminate 5 on the lower surface of the outwardly extending flange 35. The welds 126 extend to seal the laminate 5 against the lower edge of the cylindrical wall 27 of the inlet chamber 26. The welds 126 are also formed between the laminate 5 and the lower edge of the outer tube 42 of the cylindrical funnel 40. The laminate 5 forms the bottom wall of the filtration chamber 130 and also seals the inlet chamber 26 and the cylindrical funnel 40.

However, a small clearance 123 exists between the laminate 5 and the lower edge of the outlet 43 before dispensing. Depending on the material properties of the laminate 5, various welding methods such as heat and ultrasonic welding may be used. Advantageously, the inner member (3) extends between the outer member (2) and the laminate (5). The inner member 3 is formed from a relatively rigid material such as polypropylene. As such, the inner member 3 forms a load supporting member which functions to keep the laminate 5 and the outer member 2 in a spaced apart state when the cartridge 1 is compressed. It is preferable that the cartridge 1 is subjected to a compressive load of 130 to 280 N in use. The compressive force acts to prevent the cartridge from being broken under internal pressure, and also serves to squeeze the inner member 3 and the outer member 2 together. This ensures that the internal dimensions of the passageways and openings in the cartridge 1 are fixed such that the cartridge 1 can not be changed during the pressurized condition. To use the cartridge 1, the cartridge is first inserted into the beverage preparation machine, and the inlet 121 and the outlet 122 are opened by a perforating member of the beverage preparation machine, which pierces the laminate 5 and folds it. An aqueous medium under pressure, typically water, enters the cartridge 1 through the inlet 121 into the inlet chamber 26 at a pressure of 0.1 to 2.0 bar. From there, the water is guided through the slot 30 to flow around the manifold 16 and through the plurality of slots 17 into the filtration chamber 130 of the cartridge 1. Water is forced to flow radially inwardly through the filtration chamber 130 and mixed with beverage ingredients 200 contained therein. At the same time, the water flows through the beverage ingredient and forces it upward. The beverage prepared by the passage of water through the beverage ingredients passes through the filter 4 and the filtration opening 55 into the passage 57 which rests on the annular frame 41. The sealing of the filter 4 on the spokes 53 and the welding of the rim 51 to the outer member 2 ensure that all the beverage passes through the filter 4 without interruption.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

http://translationportal.epo.org/emtp/translate/?ACTION=description-retrieval&COUNTRY=KR&ENGINE=google&FORMAT=docdb&KIND=&LOCALE=en_EP&NUM

The beverage then flows downwardly into the cylindrical funnel 40 through the opening 56 along the radial passage 57 formed between the webs 54. The beverage passes down the channel 50 between the support webs 47 and down through the outlet 43 to the outlet 44 where the beverage is discharged into the receptacle, such as a cup. Preferably, the beverage preparation machine comprises an air purification facility which is pressurized through the cartridge 1 at the end of the dispensing cycle to eject the beverage remaining compressed air into the receptacle. A second form of the cartridge 1 is shown in Figures 12-18. The second type of cartridge 1 is designed to be used for dispensing espresso type products such as roast and ground coffee, which is desirable for preparing beverages with small foam bubbles, especially known as crema. Many features of the second type of cartridge 1 are the same as the first type, and like reference numerals are used to refer to like features. In the following description, differences between the first and second embodiments will be discussed. Common features that function in the same manner will not be discussed in detail. The outer member 2 has the same configuration as the first type of the cartridge 1 as shown in Figs. 1 to 6. The annular frame 41 of the inner member 3 is the same as in the first embodiment. Further, the filter 4 is disposed on the annular frame 41 so as to cover the filtration opening 55. The outer tube 42 of the cylindrical funnel 40 is also identical to the first type. However, there are many differences in the configuration of the inner member 2 of the second embodiment as compared with the first embodiment. As shown in Fig. 16, a discharge port 43 is provided with a partition wall 65 partially extending upwardly from the outlet 44 to the discharge port 43. As shown in Fig. The partition 65 helps prevent the beverage from spitting and / or splashing as it exits the outlet 43. The profile of the outlet 43 is also different and includes a stepped profile with a pronounced dog-leg 66 adjacent the upper end of the tube 43.

The rim 67 is provided upright from the annular flange 47 to couple the outer tube 42 to the outlet 43. The rim 67 surrounds the inlet 45 to the outlet 43 and an annular channel 69 is formed between the upper portion of the rim 67 and the outer tube 42. The rim 67 is provided with an inwardly directed shoulder 68. At one point about the circumference of the rim 67, the opening 70 extends from the upper edge of the rim 67 to the edge point below the shoulder 68, as best seen in Figures 12 and 13, And is provided in the form of an extending slot. The slot has a width of 0.64 mm. The air inlet 71 is provided circumferentially aligned with the opening 70 in the annular flange 47 as shown in Figs. The air inlet 71 has an opening through the flange 47 to provide communication between a point on the flange 47 and an empty space below the flange 47 between the outer tube 42 and the outlet 43. [. Preferably, as shown, the air inlet 71 includes an upper conical portion 73 and a lower cylindrical portion 72. The air inlet 71 is typically formed by a forming tool, such as a fin. The tapered profile of the air inlet 71 allows the forming tool to be more easily removed from the molded component. The wall of the outer tube 42 near the air inlet 71 is shaped to form a chute 75 extending from the air inlet 71 to the inlet 45 of the outlet 43. 17, a canted shoulder 74 is formed in such a manner that the jet of beverages that flow out of the slot 70 is directed right above the upper surface of the flange 47 at a portion immediately adjacent to the air inlet 71 is formed between the air inlet (71) and the chute (75) so as not to clog it. The assembly procedure for the second version of the cartridge 1 is similar to the assembly of the first version. However, there are some differences. 18, the third portion 21 of the cylindrical extension 18 lies inside the support rim 67 rather than against the support web.

The shoulder 32 of the cylindrical extension 18 between the second portion 20 and the third portion 21 is supported against the upper edge of the support rim 67 of the inner member 3. A boundary zone 124 comprising a face seal between the cylindrical extension 18 and the support rim 67 extending adjacent the entire circumference of the cartridge 1 is provided between the inner member 3 and is formed between the outer member (2). The seal between the cylindrical extension 18 and the support rim 67 is such that the slot 70 in the support rim 67 extends downward through the support rim 67 to the edge point below the shoulder 68, The fluid is not airtight. As a result, the interface fit between the cylindrical extension 18 and the support rim 67 deforms the slot 70 into an opening 128, as best seen in Figure 18, Lt; RTI ID = 0.0 & gt; 43 & lt; / RTI & gt; The apertures typically have a width of 0.64 mm and a length of 0.69 mm. The operation of the second type of cartridge 1 for dispensing beverage is similar to the operation of the first type, but with certain differences. The beverage in the radial passage 57 flows downwardly along the passageway 57 formed between the webs 54 and into the annular channel 69 of the cylindrical funnel 40 through the opening 56. From the annular channel 69, the beverage is forced to flow under pressure through the opening 128 by the negative pressure of the beverage collected in the filtration chamber 130 and the passageway 57. Therefore, the beverage is forced to flow into the expansion chamber formed by the upper end of the discharge port 43 through the opening 128 as an ejection. As shown in Fig. 18, the jet of the beverage passes directly over the air inlet 71. As the beverage enters the outlet 43, the pressure of the beverage jet falls. As a result, air is introduced into the beverage stream in the form of a number of small bubbles as it passes through the air inlet 71. The jet of the beverage flowing out of the opening 128 is gathered downward toward the outlet 44 where the beverage is discharged into the receptacle, such as a cup, which forms the crema required for bubbles.

Therefore, the opening 128 and the air inlet 71 together form an eductor that serves to carry air into the beverage. The flow of the beverage into the eductor must be kept as soft as possible to reduce the pressure loss. Advantageously, the wall of the eductor should be recessed to reduce loss due to & quot; wall effect & quot; friction. The dimensional tolerance of the opening 128 is small. Preferably, the aperture size is fixed to +/- 0.02 mm & lt; 2 & gt ;. Hair, microfibers or other irregular surface areas may be provided in the eductor or at its outlet to increase the effective cross-sectional area, which has been found to increase the degree of air entrainment. A third form of the cartridge 1 is shown in Figures [illegible]

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 5 of 421

designed for use in the distribution of soluble products, which may be in particular powders, liquids, syrups, gels or the like. The soluble product is dissolved by the aqueous medium or forms a suspension in the aqueous medium when the aqueous medium, such as water, is passed through the cartridge 1 in use. Examples of beverages include chocolate, coffee, milk, tea, soup, or other rehydratable or water-soluble products. Many features of the third form of the cartridge 1 are the same as the previous ones, and similar reference numerals are used to refer to similar features. In the following description, differences between the third and previous forms will be discussed. Common features that function in the same manner will not be described in detail. Compared to the outer member 2 of the previous type, the hollow inwardly cylindrical extension 16 of the outer member 2 of the third type has a larger total diameter as shown in Fig. In particular, the diameter of the first portion 19 is typically 16 to 18 mm, compared to 13.2 mm for the outer member 2 of the previous type. The first portion 19 is also provided with a convex outer surface 19a or a bulge, as best seen in FIG.

However, the diameter of the third portion 21 of the cartridge 1 is the same, so that the area of the shoulder 32 is larger than in this third form of the cartridge 1. [Typically, the volume of the cartridge 1 is 32.5 ml + 20% when assembled. The number and position of the slots in the lower end of annular wall 13 are also different. 3To five slots are provided. In the embodiment as shown in Figure 23, four slots 36 are provided at equal intervals around the circumference of the manifold 16. The slot 36 has a width of 0.35 to 0.45 mm, preferably 0.4 mm, slightly wider than the previous form of the cartridge 1. In other respects, the outer member 2 of the cartridge 1 is the same. The configuration of the cylindrical funnel 40 of the inner member 3 is the same as the first form of the cartridge 1 in which the outer member 42, the discharge port 45, the annular flange 47 and the support web 49 are provided . The only difference is that the outlet 45 is shaped to have a top conical section 92 and a bottom cylindrical section 93. 24 to 28, the annular frame 41 surrounds the cylindrical funnel 40 and is connected to the cylindrical funnel 40 at or near the annular flange 47, is replaced by a skirt portion 80 that is coupled to the funnel by a radial strut 87. The cylindrical extension 81 of the skirt portion 80 extends upwardly from the strut 87 to form a chamber 90 having an open top surface. The upper rim 91 of the cylindrical extension 81 has an inward profile as shown in Fig. The annular wall 82 of the skirt portion 80 extends downwardly from the strut 87 to form an annular channel 86 between the skirt portion 80 and the outer tube 42. The annular wall 82 includes an outer flange 83 at the lower end that lies perpendicular to the main axis X. [The rim 84 includes five openings 85 suspended from the bottom surface of the flange 83 and spaced equidistantly in the circumferential direction around the rim 84.

Thus, the rim 84 is provided with a castellated lower profile. An opening 89 is provided between the struts 87 to allow communication between the chamber 90 and the annular channel 86. The assembly procedure for the third type of cartridge 1 is similar to the assembly of the first type, but there are some differences. The outer member 2 and the inner member 3 are pressed together as shown in Fig. 29 and held by a snap-fit arrangement rather than being welded together.

2

The inwardly extending cylindrical portion 18 is received inside the upper cylindrical extension 81 of the skirt portion 80. As shown in Fig. The inner member 3 is formed by frictional engagement of the convex outer surface 19a of the first portion 19 of the cylindrical extension 18 with the inward rim 91 of the upper cylindrical extension 81,). By positioning the inner member 3 within the outer member 2, the mixing chamber 134 is formed to be positioned externally relative to the skirt portion 80. The mixing chamber 134 holds the beverage ingredients 200 prior to dispensing.

4

It should be noted that the dog's mouth 36 and the five openings 85 are staggered circumferentially about each other. It is not necessary to determine or fix two parts of the radial arrangement of the two parts relative to each other during assembly, since four inlets 36 and five openings 85 may be defined between the inlet and opening & lt; RTI ID = 0.0 & gt; As shown in FIG. One or more beverage ingredients are filled into the mixing chamber 134 of the cartridge. The filling density of the beverage ingredients in the mixing chamber 134 can be varied as needed. Thereafter, the laminate 6 is attached to the outer member 2 and the inner member 3 in the same manner as described in the previous embodiment. In use, the water enters the mixing chamber 134 through the four slots 36 in the same manner as the previous form of the cartridge. Water is pressurized radially inwardly through the mixing chamber and mixed with beverage ingredients contained therein. The product is dissolved or mixed with water to prepare the beverage in the mixing chamber 134 and then into the annular channel 86 by the negative pressure of the beverage and water in the mixing chamber 134 through the opening 85 . 4The circumferential misalignment of the two inlet slots 36 and the five openings 85 may cause the water jets to pass radially directly from the inlet slots 36 to the openings 85 without first being circulated in the mixing chamber 134 Ensuring that you do not have to. In this way, the degree and consistency of dissolution or mixing of the product increases significantly. The beverage is forced upward in the annular channel 86 into the chamber 90 through the opening 89 between the struts 87. The beverage passes from the chamber 90 through the inlet 45 between the support webs 49 into the outlet 43 and into the outlet 44 through which the beverage is dispensed into a receptacle such as a cup. The cartridges have been found to be particularly applicable to beverage ingredients in the form of

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

http://translationportal.epo.org/emtp/translate/?ACTION=description-retrieval&COUNTRY=KR&ENGINE=google&FORMAT=docdb&KIND=&LOCALE=en_EP&NUM

viscous liquids or gels. In one application, the liquid chocolate component has a viscosity of from 1700 to 3900 mPa at ambient temperature and a viscosity of from 5000 to 10000 mPa at 0 ° C and a refractive index of 67 Brix ± 3 to the cartridge 1).

In another application, the liquid coffee is contained within the cartridge 1 at a viscosity of 70 to 2000 mPa at ambient temperature and a viscosity of 80 to 5000 mPa at 0 ° C, wherein the coffee contains 40 to 70% . A fourth embodiment of the cartridge 1 is shown in Figures 30-34. The fourth form of the cartridge 1 is specifically designed for use in dispensing liquid products such as concentrated liquid milk. Many features of the fourth version of the cartridge 1 are the same as the previous versions, and similar reference numerals are used to refer to similar features. In the following description, differences between the fourth and previous forms will be discussed. Common features that function in the same manner will not be discussed in detail. The outer member 2 is the same as the third embodiment of the cartridge 1 as shown in Figs. 19 to 23. The cylindrical funnel 40 of the inner member 3 is similar to that shown in the second form of the cartridge 1, but with certain differences. 30, the outlet 43 is shaped to have an upper conical section 106 and a lower cylindrical section 107. 3Are provided on the inner surface of the discharge port 43 to guide the beverage dispensed from the dispenser into the outlet 44 and to prevent the discharged beverage from swirling within the discharge port. As a result, rib 105 acts as a baffle. As in the second form of the cartridge 1, the air inlet 71 is provided through an annular flange 47. [However, the chute 75 under the air inlet 71 is longer than in the second embodiment. The skirt portion 80 is provided similar to that shown in the third form of the cartridge 1 described above.

5

To twelve openings 85 are provided in the rim 84. Typically, more than ten openings provided in the third version of the cartridge 1 are provided. An annular bowl 100 extends from the flange 83 of the skirt portion 80 and is provided integrally therewith. The annular bowl 100 includes a flared body 101 having an upwardly open upper mouth 104. Four feed openings 103 as shown in Figures 30 and 31 are disposed in the body 101 at or near the lower end of the bowl 100 to which the skirt portion 80 is coupled. Preferably, the feed openings are equally spaced about the circumference of the bowl 100. The laminate 5 is of the kind described above in the previous embodiment. The assembling procedure for the fourth form of the cartridge 1 is the same as the assembling for the third form. The operation of the fourth type of cartridge is similar to that of the third type. The water enters the cartridge 1 and the mixing chamber 134 in the same manner as before. Here, the water is mixed with the liquid product and diluted, and then is forced through the opening 85 toward the outlet 44 as described above. A predetermined proportion of the liquid product is initially contained in the annular bowl 100 as shown in Figure 34 and is not immediately diluted by the water entering the mixing chamber 134. The diluted liquid product in the lower portion of the mixing chamber 134 will likely be discharged through the opening 85 rather than being forced into the annular bowl 100 through the upper mouse 104. As a result, the liquid product in the annular bowl 100 will remain relatively concentrated compared to the product in the lower portion of the mixing chamber 134. The liquid product in the annular bowl 100 falls through the feed opening 103 into the stream of product exiting the mixing chamber 134 through the opening 85. The annular bowl 100 maintains the concentration of the diluted liquid product entering the cylindrical funnel 40 uniformly by retaining a predetermined proportion of the concentrated liquid product and discharging it into a more steadily discharged liquid stream throughout the dispensing period Function.

From the annular channel 86, the beverage is forced to flow under pressure through the opening 128 by the negative pressure of the beverage being collected in the filtration chamber 134 and the chamber 90. Therefore, the beverage is pressurized into the expansion chamber formed by the upper end of the discharge port 43 and the opening 128 as an ejection. As shown in Figure 34, the jet of beverage passes directly over the air inlet 71. As the beverage enters the outlet 43, the pressure of the beverage jet falls. As a result, air is introduced into the beverage stream in the form of a number of small bubbles as it passes through the air inlet 71. The air is introduced into the beverage stream via the air inlet 71 in the form of a number of small bubbles. The jet of the beverage flowing out of the opening 128 is gathered downward into the inlet 44 through which the liquid is discharged into the receptacle, such as a cup, in which the bubbles produce the desired foam shape. Advantageously, the inner member 3, the outer member 2, the laminate 5 and the filter 4 can both be easily disinfected because the components can be separated and do not include twisted passageways or narrow gaps individually have. Rather, the necessary passageways may only be formed after the components have been combined and disinfected. This is especially important when the beverage ingredient is a dairy product such as a liquid milk concentrate. The fourth embodiment of the beverage cartridge is particularly advantageous for dispensing concentrated liquid dairy products such as liquid milk. Previously, powdered milk products have been provided in the form of starch added to ready-made beverages. However, in the case of cappuccino drinks, it is necessary to produce foam in the milk. This has previously been achieved by passing steam through a liquid milk product. However, this requires providing a vapor source that increases the cost and complexity of the machine used to dispense the beverage. The use of steam also increases the risk of injury during operation of the cartridge. Accordingly, the present invention is provided for a beverage cartridge having an internal concentrated liquid dairy product. It has been found that by concentrating the milk product, a higher amount of foam can be produced for a certain volume of milk as compared to fresh milk of the same

This reduces the size required for the milk cartridge. Fresh semi-skimmed milk contains approximately 1.6% fat and 10% total solids. The concentrated liquid milk contains 3 to 10% fat and 25 to 40% total solids. In a typical example, the preparation contains 4% fat and 30% total solids. Concentrated milk preparations are suitable for producing bubbles using a low pressure preparation machine as described below. In particular, the foam of milk is achieved using the cartridge of the fourth embodiment described above at a pressure of less than 2 bar, preferably about 1.5 bar. The cartridge of the fourth embodiment is also advantageous for dispensing the liquid coffee product. It has been found that the embodiment of the beverage cartridge of the present invention provides improved lidization of the dispensed beverage compared to conventional cartridges. Referring to Table 1 below, the results of extraction yields for 20 samples of each cartridge A and B containing roasted and ground coffee are shown. The cartridge A is the beverage cartridge according to the first embodiment of the present invention. Cartridge B is a prior art beverage cartridge as described in the applicant's patent application WO 01/58786. The refractive index of the extracted beverage is measured in Brix and converted to a percentage of soluble solids (% SS) using the standard table and formula. Here is an example. & Lt; Table 1 & gt; & lt; Cartridge A & gt; & lt; Cartridge B & gt; For t-test statistical analysis, the following results are given. T-Experiment: Two sample analyzes assuming homogeneous dispersion showed that the lead of the% yield (equivalent to 95% confidence level) equivalent to the brew strength for the cartridge of the present invention was significantly Good & quot; shows a standard deviation of 0.88% as compared with 2.24%.

This means that the beverage extracted by the cartridge of the present invention can be more repeated and has a uniform strength. This is preferable to a consumer who does not want the beverage to always have the same taste and to change the extraction strength at will. The material of the cartridges described above may be provided with a barrier coating to improve resistance to entry of oxygen and / or moisture and / or other contaminants. The barrier coating may also reduce the extent of filtration of the extract from the cartridge material that may improve the resistance of the beverage ingredients from leaking out of the cartridge and / or adversely affect the beverage ingredients. The barrier coating may be a material selected from the group consisting of PET, polyamide, EVOH, PVDC or a metallic material. The barrier coating can be applied by a number of mechanisms including, but not limited to, vapor deposition, vacuum deposition, plasma coating, coextrusion, in-mold labeling, and 2 / multistage molding. A beverage preparation machine 201 according to the present invention for use with the aforementioned beverage cartridge is shown in Figs. 35-45. The beverage preparation machine 201 generally includes a housing 210 including a water tank 220, a water heater 225, a water pump 230, an air compressor 235, a control processor, a user interface 240, And a cartridge head 250. The cartridge head 250 generally includes a cartridge holder 251 for holding in use, a beverage cartridge 1, a cartridge recognition means 252 and an inlet 121 and an outlet 122 in the beverage cartridge 1 in use And entrance and exit perforations 253 and 254 in order. The housing 210 holds and holds the other components of the machine 201 in place. The housing 210 is preferably made entirely or partially from a strong plastic material such as ABS. Alternatively, the housing 210 may be wholly or partially fabricated of a metallic material such as stainless steel or aluminum. The housing 210 preferably includes a front half portion 211 that allows access for installation of the machine 210 components during assembly and is then coupled together to form an interior 213 of the housing 210, And a half portion 212 of the shell.

The rear half 212 provides a recess 214 for attachment of the water tank 220. The housing 210 is provided with means such as indents, abutments, bosses and threaded portions for retaining the components of the machine 201 in place without requiring a separate chassis. This reduces the overall cost and weight of the machine 201. The base 215 of the housing 210 is preferably provided with feet for erecting the machine thereon in a stable manner. Alternatively, the base 215 itself may have a shape that forms a stable support. The front half 211 of the housing 210 includes a dispensing station 270 where the dispensing of beverage occurs. The dispensing station 270 includes a receptacle stand 271 with a hollow interior that forms a drip tray 272. The upper surface 273 of the receptacle stand is provided with a grill 274 on which the receptacle is located. The solution receiver 272 can be removed from the housing 210 to easily empty the collected water. The recess 275 is formed in the front half of the housing 210 above the receptacle stand 271 to receive a receptacle of a predetermined size. The cartridge head 250 is positioned toward the top of the housing 210 above the receptacle stand, as shown in Figs. Preferably, the height of the grille 274 relative to the cartridge head 250 can be adjusted to accommodate receptacles of different sizes. The receptacle should be as close to the cartridge head 250 as possible so that the receptacle can be inserted into or withdrawn from the dispensing station 270 so as to minimize the height of the dispensed beverage before contact with the receptacle. This serves to minimize the spraying and splashing of the beverage and minimize the loss of existing entrained bubbles. Preferably, a receptacle having a height of 70 mm to 110 mm may be inserted between the grille 274 and the cartridge head 250. The machine user interface 240 is located on the front portion of the housing 210 and includes a start / stop button 241 and a plurality of status indicators 243 to 246.

The status indicators 243 to 246 preferably include light emitting diodes (LEDs) 243 that indicate the ready state of the machine 201, LEDs 244 that indicate whether errors occurred during operation of the machine 201, And one or more LEDs 245 to 256 indicating whether the lamp 201 is operating in a manual or automatic mode. The LEDs 243 to 246 may be controlled to be illuminated with a constant intensity according to the state of the machine 201, intermittently flashing, or both. LEDs 243 through 246 may have various colors including green, red, and yellow. The start / stop button 241 controls the start of the dispensing cycle, and is manually operated as a push button, a switch, or the like. A volume [illegible]

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

http://translationportal.epo.org/emtp/translate/?ACTION=description-retrieval&COUNTRY=KR&ENGINE=google&FORMAT=docdb&KIND=&LOCALE=en_EP&NUM

the machine 201 to manually adjust the volume of the beverage delivered without altering other operating characteristics. Preferably, the volume control section allows the volume to be adjusted to +/- 20%. The volume control may be a rotary knob, a linear slider, a digital readout with increment and decrement buttons, or a similar device. More typically, the volume is controlled by actuating the start / stop button 241 by the user. A manual power switch (not shown) may be provided on the machine 201. Alternatively, the power supply can be simply controlled by inserting or removing a power supply plug from the main power supply. The water tank 220 is located behind the housing 210 and is connected to the rear half 212 of the housing 210. The water tank 220 includes a cylindrical body 221, which can be an exact circular or frustum, if desired, for general aesthetic reasons. The tank includes an inlet for filling the tank with water, which is closed during use by a lid 222 that can be manually removed. The outlet is provided toward the lower end of the tank and communicates with the water pump 230. The water tank 220 may be made from a transparent or translucent material so that the consumer can see the amount of water remaining in the tank.

Alternatively, the water tank 220 is fabricated from an opaque material, but an internal viewing window may be provided. Additionally or alternatively, instead of the water tank 220, a low water level sensor (not shown) that prevents operation of the water pump 230 and selectively activates a warning indicator such as an LED when the water level in the tank is reduced to a pre- May be provided. The water tank 220 preferably has an internal capacity of about 1.5 liters. The water pump 230 is operatively connected between the water tank 220 and the water heater 225 as schematically shown in Figure 43 and is controlled by the control processor. The pump provides a maximum flow rate of 900 ml / min of water at a maximum pressure of 2.5 bar. Preferably, during normal use, the pressure will be limited to 2 bar. The flow rate of water through the machine 201 can be controlled by the control processor at a predetermined rate of maximum flow rate of the pump by a cycle of chopping the electrical supply to the pump. Preferably, the pump can be driven at any flow rate among the maximum rate of flow of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100%. The accuracy of the volume of pumped water is preferably + or - 5%, so that the final volume of the dispensed beverage will have an accuracy of + or - 5%. A suitable pump is Ulka S.r.l. (Evia EP8 pump manufactured by Pabla, Italy). It is preferred that a volumetric flow sensor (not shown) is provided in the flow line upstream or downstream of the water pump 230. Preferably, the volumetric flow sensor is a rotational sensor. The water heater 225 is located inside the housing 210. The heater 225 has an output of 1550 W and can heat the water received from the water pump 230 from an initial temperature of about 20 ° C to an operating temperature of about 85 ° C in one minute. Preferably, the delay time between the end of the dispense cycle and the point at which the heater 226 can start a subsequent dispense cycle is less than 10 seconds.

The heater maintains the selected temperature within + or - 2 ° C during the dispense period. As will be described later, water for the dispensing cycle can be delivered to the cartridge head 260 at 83 ° C to 93 ° C. The heater 225 can quickly regulate the transfer temperature from a nominal water temperature of 86 ° C to 83 ° C or 93 ° C. The heater 226 includes an over-temperature cut-off that stops the heater if the temperature exceeds 98 ° C. The water output from the heater 225 is conveyed to the cartridge head 250 and the cartridge 1 by the three-way valve. If the pressure of the flowing water can be accommodated, the water passes through the cartridge 1. If the pressure is lower or higher than the predetermined limit value, the water is converted into the solution receiving receptacle 270 by the three-way valve. The air compressor 235 is operatively connected to the cartridge head 250 by a one-way valve and is controlled by a control processor. The air compressor 235 provides a maximum flow rate of 500 ml / min at 1.0 bar. In use, a working volume of 35 ml is pressurized to 2.0 bar. Preferably, the air compressor 235 can produce two flow rates, a high (maximum) flow rate and a low flow rate. The control processor of the beverage preparation machine 201 includes a processing module and a memory. The control processor is operatively connected to the water heater 225, the water pump 230, the air compressor 235, and the user interface 240 to control their operation. The memory of the control processor includes one or more parameters for one or more operating parameters for the beverage preparation machine 201. [In the illustrated embodiment, the operating parameters include the temperature of the water passing through the beverage cartridge 1 during the operating phase, the filling rate of the beverage cartridge 1, the presence of a soak step, the total dispense volume of the beverage, The flow rate of water in the purification step, and the flow rate and duration of the purification step. The variables for the operating parameters are stored in memory. The cartridge 1 contains a code on or in the cartridge 1 indicating the operating parameters required for optimal dispensing of the beverage in the cartridge 1 [

The code is in binary form and comprises a plurality of data bits corresponding to variables stored in the control processor memory. Table 3 illustrates how 13 bits of data can be used to represent the required parameters for the operating parameters as described above. The code on or within the cartridge 1 will typically include one or more redundant data bits for error checking. In one example, a 16 bit code is provided. For example, by using the variables listed in Table 3, the cartridge 1 containing the code & quot; 1000100011110 & quot; will have the following operating parameters: 10 Water temperature at 83 ° C 00 Fast filling by dipping 1000 150 ml The flow rate of the dispensed beverage 111 is 100% 10 High Speed Air Flow Purification / Short Time Unlike the previous beverage dispensing machines, therefore, the memory of the control processor is operated by a command for the beverage cartridge based on the cartridge type, Commands for chocolate cartridges, orders for car cartridges, and the like. Instead, the memory of the control processor stores [illegible] operating

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

http://translationportal.epo.org/emtp/translate/?ACTION=description-retrieval&COUNTRY=KR&ENGINE=google&FORMAT=docdb&KIND=&LOCALE=en_EP&NUM

parameters of the dispense cycle. This has many advantages. First, a higher degree of control over the dispense cycle can be performed. For example, rather than using the same parameters for all coffee types, slightly different operating parameters can be used for different grades or blends of coffee. Conventional coding algorithms that store instructions by cartridge type rather than individual parameters are unsuitable for subtle differences in the dispense cycle for similar beverage types because they quickly consume available storage space within the coding medium and the control processor . Secondly, the coding method of the present invention can be applied to a new beverage cartridge type, even if the operating parameters for the dispensing cycle for the new beverage cartridge 1 are determined after the beverage dispensing machine 201 is sold, Making it possible to use it in a preparation machine.

This is because the control processor of the beverage preparation machine 201 need not recognize that the beverage is a new type. Rather, the operating parameters of the dispense cycle are set without directly referring to the drink type. Therefore, the coding methods of the present invention provide excellent post-compatibility of beverage preparation machines for new beverage types. Conversely, in the case of conventional machines, the manufacturer limits the distribution of new beverage types and uses one of the existing distribution cycles determined by the machines being traded. The cartridge head 250 is shown in Figures 39-42. The cartridge holder 251 of the cartridge head 250 includes a fixed bottom portion 255, a rotatable top portion 256 and a pivotable cartridge & lt; RTI ID = 0.0 & gt; And includes a mounting portion 257. The upper portion 256, the lower portion 255 and the cartridge mounting portion 257 are rotated about the common hinge axis 258. 39 to 42 illustrate the cartridge holder 251 with some components of the machine 201 omitted for the sake of clarity. The rotatable upper portion 256 and the pivotable cartridge mount 257 are moved relative to the lower portion 255 secured by the clamping mechanism 280. Clamping mechanism 280 includes a clamping lever having first and second members or portions 281, 282. The first portion 281 of the clamping lever includes a U-shaped arm pivotally mounted on the upper portion 256 at the two first pivot points 283 on each side of the cartridge holder 251. The second portion of the clamping lever has two over-centers on each side of the cartridge pivotally mounted on the upper portion 256 from the second pivot point 285 located on the hinge axis 258, Including the arm 282, the upper portion 256 is coupled to the fixed lower portion 255. Each eccentric arm 282 is a reciprocating member that includes a cylinder 282a, a stem 282b, and an elastic sleeve 282c.

The cylinder 282a has an inner bore and is rotatably mounted at one end of the hinge shaft 258. [The first end of the stem 282b is slidably received in the bore of the cylinder 282a. The opposite end of the stem 282b is rotatably mounted to the U-shaped arm 281 at the third pivot point 286. [The third pivot point 286 is not connected to the upper portion 256 and the lower portion 255 and can be moved freely relative thereto. The resilient sleeve 282c is mounted externally on the stem 282b and extends between the abutment surfaces on the cylinder 282a and the stem 282b in use. The elastic sleeve 282c regulates the minor axis of the eccentric arm 282, but deflects the eccentric arm 282 into an elongated shape. Therefore, movement of the third pivot point 286 toward and away from the hinge axis 258 is enabled by the relative movement of the stem 282b within the cylinder 282a. The resilient sleeve 282c is preferably formed from silicon. The U-shaped arms 281 extend around the front of the cartridge holder 251 and extend downwardly on two sides on each side of the cartridge holder 251, including a cam surface 288 facing the hinge axis 258 And includes a hanging hook member 287. The fixed lower portion 255 of the cartridge holder 251 is provided with two bosses (not shown) positioned on each side of the lower portion 255 at or near the front edge 260, which is generally aligned with the hook member 287 259) or indentations are provided. As shown in Figure 39, the U-shaped arm 281 is formed from a piece of plastic molded article including an ergonomic hand grip and hook member 287 integral with the arm. The cartridge mounting portion 257 is rotatably mounted between the upper and lower portions 255, 256 of the cartridge holder 251. The mounting portion 257 is provided with a substantially circular recess 290 for receiving the beverage cartridge 1 in use. The recess 290 includes an irregularity 291 which serves to receive the handle portion 24 of the beverage cartridge 1 and also to prevent the rotation of the beverage cartridge 1 in the cartridge holder 251.

The cartridge mounting portion 257 is configured such that the cartridge mounting portion 257 is deflected from the contact with the fixed lower portion 255 at the open position as shown in Figure 41 so that the cartridge mounting portion 257 is positioned at the outlet and the inlet perforation members 254 and 253 To be moved away from the contact with the lower portion 255. [The cartridge mounting portion 257 is provided with an opening 292 for receiving the inlet and outlet perforations 253 and 254 and the head 300 of the cartridge recognizing means 252 when the cartridge mounting portion 257 is moved to the closed position . The upper portion 255 is a generally circular body 310 that allows the consumer to see the beverage cartridge 1 during the dispensing cycle and also whether or not the cartridge 1 is mounted within the machine 201. [And a window 312. FIG. The observation window 312 is cup-shaped with a downward rim 311 which engages and grips the flange 35 of the beverage cartridge 1 against the lower portion 256 when the cartridge holder 251 is closed. At the same time, the window 312 contacts the closed upper end 11 of the cartridge 1. A wave spring (not shown) is positioned between the viewing window 312 and the circular body 310 such that the viewing window 312 moves a little in the axial direction relative to the circular body 310. The pressure applied by the window 312 on the rim 311 and the closed top end 11 on the flange 35 ensures fluid hermetic sealing between the cartridge 1 and the cartridge holder 251. The lower portion 255 includes inlet and outlet perforations 253 and 254 and a head 300 of the cartridge recognition means 252. The inlet perforation 253 includes a hollow needle-like tube 260 having a sharp end 261 for puncturing the laminate 5 of the beverage cartridge 1 during [illegible]

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

communication with the water conduit 262 as shown in FIG. 42, passing through the bottom portion 255, and is connected to the outlet conduit 263 of the water heater 225. The exit perforation 254 is of a type similar to the exit perforations described in the applicants' European patent EP 0 389 141 and EP 0 334 572 and has a circular or D-shaped cross section with a dimension greater than the outlet 43 Open ended cylinder 264.

The arcuate portion 265 of the upper end of the exit perforation 254 is serrated to puncture the lid of the beverage cartridge 1 and eventually to cut it. The remainder of the upper end is cut back at least in the longitudinal direction of the cylinder at the base of teeth 266 of the serrated portion to fold away or draw the cut laminate 5 away through the exit opening before the beverage is dispensed. The outlet perforation 254 punctures the laminate 5 out of the discharge port 43 and causes the outlet 43 of the dispensing funnel 40 to move between the outlet 43 and the outer wall 42 when the cartridge mounting portion 257 is in the closed position. As shown in FIG. Outlet perforation 254 folds the laminate 105 annularly. Thereby, the outlet piercing 254 and the out laminate 105 are retained from the path of the beverage being discharged. The exit perforation 254 is surrounded by a ledge 254a that is 0.5 mm higher than its periphery. Advantageously, the exit perforations 254 can be removed from the lower portion 255 to be completely cleaned, for example, in a dishwasher. A removable outlet perforation 254 is received within the recess 267 in the lower portion 255 to be disposed. The inlet perforation 253 and / or outlet perforation 254 may be made from a metal, such as stainless steel, or from a plastic material. Advantageously, the use of plastic cutting elements is made possible by the use of laminates which can be punched or cut with non-metallic materials. As a result, the perforations 253 and 254 can be made less sharper to lower the risk of injury to the consumer. Also, the plastic perforation element is not corroded. The inlet perforation 253 and the outlet perforation 24 are formed as a single integral unit that can be removed from the lower portion 255. [The upper portion 256 of the cartridge holder 251 is in contact with the lower member 255 and the cartridge mounting portion 257 which are substantially horizontally fixed from an open position oriented vertically or vertically, To a closed position oriented to engage.

The upper portion 256 is moved from the open position to the closed position by actuation of the clamping lever. To close the upper member 256, the user holds the clamping lever by the U-shaped arm 281 and pulls it downward. As a result, the upper portion 256 first allows the rim 311 of the viewing window 312 to contact the flange 35 of the beverage cartridge 1 in the cartridge mounting portion 257 and / And is brought into contact with the closed upper end 11 of the cartridge 1. [By continued rotation of the upper portion 256, the upper portion 256 and the cartridge mounting portion 257 are rotated downwardly in contact with the lower portion 255. The U-shaped arm 281 is rotated about the upper portion 256 and the lower portion 255 such that the hook member 287 of the upper portion 256 is engaged with the cam surface 284, And engages with the boss 259 of the lower portion 255 in a state where the upper portion 288 is placed on the boss 259. During the final stage of rotation, the cartridge 1 is compressed between the cartridge mounting portion 257 and the observation window 312. As a result, the viewing window 312 is moved axially relative to the circular body 310 of the upper portion 256 against the deflection of the corrugated spring. This movement ensures the tolerance within the beverage cartridge 1 and the beverage preparation machine, and ensures that the amount of compressive force applied to the cartridge is maintained within an acceptable range. The clamping force of the mechanism, which is mitigated by the action of corrugated or helical springs, ensures a clamping pressure of 130 to 280 N on the cartridge. Preferably, the force is about 200 N. A force of less than about 130 N does not provide adequate sealing, while a force of greater than about 280 N results in plastic failure of the components of cartridge 1. [During the closing of the cartridge head the laminate 5 of the cartridge 1 is tensioned as it comes into contact with the ridge 254a surrounding the outlet perforation 254 so that the distal end of the outer tube 42 of the cylindrical funnel is pulled out of the flange 35 so that the laminate 5 is bent from the plane.

This movement also ensures that most of the compressive force applied to the cartridge acts through the central area of the cartridge 1 through the load bearing inner member 3. [Therefore, in the closed position, the cartridge 1 can be clamped around the flange 35 by the rim 311 of the viewing window 312, and by the contact of the viewing window 312 with the ridge 254a, is always firmly clamped between the outer tube 42 of the cartridge 3 and the closed top end 11 of the cartridge. This clamping force aids in preventing breakage of the cartridge 1 during pressurization and also ensures that the inner member 3 and the outer member 2 are perfectly positioned with respect to each other, Ensuring that they are maintained at their intended dimensions. A virtual baseline can be drawn between the first and second pivot points 283 and 285 of the cartridge holder 251. [41, at the open position, the second pivot point 286 is located on the reference line side closest to the fixed lower portion 255. As shown in Fig. As the upper portion 256 reaches the closed position the third pivot point 286 of the clamping lever is moved away from the fixed lower portion 255 through the reference line at which the first and second pivot points 283 and 285 meet it passes to the opposite side of the distant line. As a result, the U-shaped arm 281 " snaps through " from the stable first position to the stable second position. The snap-through action is controlled by the short axis of the eccentric arm 282 and the compression of the subsequent elastic sleeve 282c. When the third pivot point 286 passes the virtual reference line, the recovery of the elastic sleeve 282c acts to keep the movement of the third pivot point 286 away from the virtual baseline. Thus, the clamping lever is unstable at the point where the lever is stable in the open or closed position but the third pivot point 286 lies on a virtual baseline where the first and second pivot points 283 and 285 meet Stable operation. Thus, the snap-through action of the clamping lever is such that the snap-through action of the U-shaped [illegible]

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

stage of rotation of the clamping lever causes the hook member 287 to engage with the boss 259 Lt; RTI ID = 0.0 & gt; closed & lt; / RTI & gt;

The elastic sleeve 282c is also used to compress the third pivot point 286 to move the sleeve 282c sufficiently to align again with the reference line at which the first and second pivot points 283 and 285 meet It provides resistance to re-opening of the upper portion 256, since minimal force is required. Advantageously, mutual engagement of the hook member 287 and the boss 259 prevents separation of the hook member 287 and the boss 259 by means other than rotation of the clamping lever. This is useful for preventing the cartridge head 250 from being opened during operation when the cartridge head 250 is subjected to internal pressurization. The purpose of the cartridge recognition means 252 is to allow the machine 201 to recognize the type of beverage cartridge 1 inserted and adjust one or more operating parameters accordingly. In a typical embodiment, the cartridge recognition means 252 comprises an optical barcode reader for reading the printed barcode 320 provided on the laminate 5 of the beverage cartridge 1 as shown in Fig. The barcode 320 is formed from a plurality of barcodes of a contrasting color. Preferably, the bar is black with a white background to maximize contrast. Barcode 320 does not have to conform to published standards, but standard formats for barcodes such as EAN-13, UPC-A, or Interleaf 2 of 5 may be used. The optical barcode reader includes one or more LEDs 321 for illuminating the barcode 320, a focus lens 322 for acquiring an image of the barcode, a charge coupled device (CCD) for generating an electrical signal representative of the acquired image 323), and support circuitry for the LED and CCD. The space in the lower portion for accommodating the bar code reader is limited. Mirrors or mirrors 324 may be used to reflect light from the LEDs 321 to a focus lens that is not located in the lower portion 255. [A schematic arrangement is shown in Figs. 44A and 44B. The lower portion 255 includes an opening 326 having the same size as the bar code 320 on the beverage cartridge 1. [

In use, the generated electrical signal is decoded by the signal processing software and the result is passed to the control processor. The software can recognize whether or not an error has been included in the reading of the bar code. Barcode 320 may be re-scanned several times before an error message is presented to the consumer. If the machine 201 can not read the bar code, the consumer can use the manual operation mode to allow the beverage cartridge 1 to dispense the beverage. The cartridge head 250 also includes a cartridge sensor that detects whether or not a cartridge is present in the cartridge holder 251. [The cartridge head 250 also includes a lock sensor that detects whether the cartridge holder 251 is properly closed. Preferably, the lock sensor includes a micro switch that is actuated when the cartridge holder 251 is closed and locked. Preferably, the cartridge sensor and the lock sensor are connected in series so that the outputs of both sensors are satisfactory, that is, the cartridge is present and the mechanism is locked before the dispensing cycle is started. The operation of the machine 201 involves inserting the beverage cartridge 10 into the cartridge head 250 and performs a dispensing cycle in which the beverage is dispensed and the cartridge 10 is removed from the machine. The operation of the machine 201 during use is determined by the software embedded in the control processor. The operation of the machine may be described in terms of a & quot; State & quot ;, and the machine 201 will normally be in a specific state unless an accident occurs that changes the state, which is a step called a state change. Table 4 shows a state change table illustrating state and state changes for one embodiment of the beverage preparation machine 201. & lt; tb & gt; & lt; TABLE & gt; The following example illustrates a distribution cycle illustrating the use of state changes by the control processor. It is assumed that the machine 201 is initially turned off and that there is no cartridge 1 inserted in the cartridge head 250. When the machine 201 is turned on, the control processor is in state 1. The water heater 225 is turned on.

When the temperature reaches 85 ° C, the control processor changes to state 2. At any time during states 1 and 2, if the cartridge holder 251 is closed, the lock sensor will be activated to send a signal to the control processor indicating that the cartridge holder 251 has been properly closed. The control processor then sends a signal to the cartridge sensor by sending a 'readpod' command. The cartridge sensor sends back a signal to the control processor indicating whether the cartridge is in position in the cartridge holder 251. [If there is no cartridge, the control processor changes to state 3, which remains ready until the cartridge holder 251 is reopened at the time the control processor changes back to state 2. If a cartridge is present, in state 2, the control processor changes to state 4, and operation is automatically initiated. In states 4 to 9, the water temperature is controlled in the background so that it is kept within the required tolerance range of the required temperature set by the operating parameter set by the bar code on the beverage cartridge 1. [Once the discharge stage of the dispensation is complete, air purification is started in state 8. When air purification is complete, the operating cycle is complete and the machine enters standby mode at state 10. [During operation, if an error occurs, the processor changes to state 11. When a low water level is detected, the processor changes to state 12. In order to insert the cartridge 1, the cartridge holder 251 is opened as described above to expose the cartridge mounting portion 257. The cartridge 1 is then placed on the cartridge mounting portion 257 accommodated in the recess 290 such that the handle 24 of the cartridge is positioned within the irregular portion 291. The optical or magnetic bar code 320 of the cartridge 1 is oriented just above the opening 326 in the cartridge mounting portion 257. [Thereafter, the cartridge holder 251 is closed by the operation of the clamping lever as described above. During the closure, the inlet and outlet perforations 253 and 254 perforate the laminate 5 of the cartridge 1 to form the cartridge inlet 121 and the outlet 122.

It should be noted that the perforations 253 and 254 remain static during operation and that the cartridge 1 moves relative to the perforation. As described above, the laminate 5 cut by the outlet perforation 254 is folded into an annular shape surrounding the outlet 43. [When closed, the cartridge holder 251 is positioned between the cartridge mount 257 and the top portion 256 and / or between the cartridge mount 257 and the top portion 256 to form a fluid tight seal having sufficient integrity to withstand the pressure generated during the dispense period. And grasps around the rim 35 between the window 311 and the upper end 11 of the cartridge 1. To initiate the operating cycle, the consumer activates the start / stop button 241. The operation cycle includes a cartridge recognition step and a discharge cycle. The cartridge recognition is performed by the optical cartridge recognizing means 252 as described above, assuming that the input from the cartridge sensor and the lock sensor is satisfactory. Once the bar code 320 is decoded, the operating parameters of the machine 201 are adjusted by the control processor. Thereafter, the discharge cycle is automatically started. (I) Pre-wet, (ii) Pause, (iii) Brew / Mixing, and (iii) (iv) Purge In the preliminary wetting step, the cartridge 1 is filled with water from the water storage tank 220 by the water pump 230. By filling with water, the beverage ingredient 200 in the filtration chamber 130 is wetted. Charging can be performed at a & quot; high & quot; flow rate of 600 ml / min or a & quot; low & quot; flow rate of 325 ml / min. The slow filling rate is particularly useful for cartridges containing viscous liquid beverage ingredients that require a predetermined dilution before the beverage ingredients are pumped at a higher volumetric flow rate. The volume of water ejected into the cartridge 1 is selected to ensure that the water or beverage does not fall off the cartridge outlet 122 during this step.

The stopping step allows the beverage component 200 to be submerged by the water spouted during the preliminary wetting step for a predetermined period of time. Both the pre-wetting and dipping steps are known to increase the yield that can be extracted from the beverage ingredient 200 and improve the final flavor of the beverage. Preliminary wetting and soaking are used particularly when the beverage ingredients are roasted and ground coffee. In the extraction / mixing step, the water is passed through the cartridge 1 to prepare the beverage from the beverage component 200. The temperature of the water is determined by a control processor that sends a command to the water heater 225 to heat the water passing from the water tank 220 to the cartridge head 250. The water enters the lower portion 255 of the cartridge holder 251 into the inlet chamber 126 of the beverage cartridge 1 via the inlet valve and inlet perforation 253 through the conduit 262. [The distribution of the beverage from the beverage cartridge 1 subsequent to the extraction and / or mixing is as described above with respect to the shape of the beverage cartridge 1. Air purification involves blowing pressurized air through the beverage dispensing machine and beverage cartridge 1 to ensure that all of the beverage is dispensed and that the flow path has been cleaned to prepare for dispensing of other beverages. Air purification is not initiated immediately upon stopping the extraction / mixing step to allow most of the fluid to be flushed in the flow path. This prevents an unacceptable rapid increase in internal pressure by the onset of air purification. In normal operation, the user manually stops the machine 201 by activating the start / stop button 241. [When the operation cycle is completed, the consumer removes the cartridge 1 by opening the cartridge holder 251 and manually removing and arranging the cartridge. Alternatively, the machine 201 may be provided with an automatic release mechanism for automatically removing the cartridge when the cartridge holder 251 is opened. The time for delivering the beverage using the machine 201 and the cartridge 1 is typically 10 to 120 seconds, preferably 30 to 40 seconds for roasted and ground coffee, 5 to 120 seconds for chocolate, is 10 to 20 seconds, and in the case of milk is 5 to 120 seconds, preferably 10 to 20 seconds.

The machine 201 also advantageously includes a memory for storing information about the type of beverage dispensed by the user and in operative communication with the control processor. Thereafter, the operating period of the machine 201 can be adjusted for the next cartridge 1. This is particularly advantageous when two or more beverage cartridges 1 are used continuously to dispense beverages. For example, a coffee cartridge may be followed by a milk cartridge to prepare a cappuccino drink. Alternatively, the chocolate cartridges may be used subsequent to the milk cartridges to form creamy hot chocolate beverages. By using a memory that stores information about the first beverage dispensed, the manner of dispensing the second cartridge, i.e., the milk cartridge, can be modified to achieve the optimal beverage. In the above example, the milk dispensed for hot chocolate may be less diluted than the milk typically added to coffee. In addition, the milk dispensed for chocolate may be dispensed at a lower flow rate to reduce the degree of foam formation in the beverage. Various combinations of cartridges are possible, and operating parameters will be apparent to those skilled in the art. In addition, a memory may be used that allows the machine 201 to & quot; predict & quot; the type of beverage the user would like to distribute next. For example, if the user mainly drinks one beverage type, the machine may instruct the water heater to maintain an optimal temperature for this beverage type.

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS KR20050107747

1.

A cartridge (1) comprising one or more beverage components (200) and substantially formed of a material that is impermeable to air and water, the cartridge comprising a storage chamber (130, 134) comprising one or more beverage components and a manifold chamber (12) defining a first chamber (16) and closed by a lid (5) having a first portion covering the manifold chamber and a second portion covering the storage chamber, wherein the opening Wherein the first portion of the lid is pierceable in use to receive the introduction of the aqueous medium into the manifold chamber and wherein the lid is operatively coupled to one or more beverage components in the storage chamber and an aqueous medium The cartridge being pierceable to receive the outflow of the beverage formed from the interaction.

2.

The cartridge of claim 1, further comprising a discharge chamber that is covered by a third portion of the perforable lid (5) to receive a beverage effluent formed from interaction between one or more beverage ingredients in the storage chamber and the aqueous medium in use .

3.

3. A cartridge according to claim 2, wherein the discharge chamber comprises an outlet (43).

4.

4. A manifold according to any one of claims 1 to 3, wherein the manifold chamber (16) and the storage chamber (130; 134) are separated from each other by a partition (27) .

5.

The cartridge of claim 4, wherein the opening (17; 36) is sized to prevent one or more beverage ingredients from passing from the storage chamber (130; 134) into the manifold chamber (16).

6.

6. The cartridge according to any one of claims 1 to 5, wherein the manifold chamber (16) at least partially surrounds the storage chamber (130; 134).

7.

7. The cartridge according to claim 6, wherein the manifold chamber (16) substantially completely encloses the storage chamber (130; 134).

8.

5. The cartridge of claim 4, wherein the manifold chamber (16) substantially completely surrounds the reservoir chamber (130; 134) and the opening (17; 36) is provided along virtually any interface between the manifold chamber and the reservoir chamber.

9.

9. A cartridge according to any one of claims 4 to 8, wherein the opening (17; 36) has a width of 0.25 to 0.35 mm.

10.

10. A cartridge according to any one of claims 4 to 9, wherein the opening (17; 36) has a length of 1.4 to 1.8 mm.

11.

11. A cartridge according to any one of claims 4 to 10, wherein 20 to 40 openings (17; 36) are provided.

12.

12. A device according to any one of the preceding claims, wherein the manifold chamber (16) comprises an inlet section (26) through which an aqueous medium is introduced, said inlet section (26) And communicates with the remainder of the manifold chamber (16).

13.

13. A cartridge according to claim 12, wherein the inlet portion (26) is circular.

14.

3. A cartridge according to claim 2, wherein the storage chamber (130; 134) and the discharge chamber are divided by an inner member (3)

15.

15. A cartridge according to claim 14, wherein the inner member (3) comprises one or more openings (55; 85).

16.

16. A device according to claim 14 or 15, wherein the inner member (3) comprises a filter (4) to prevent one or more beverage ingredients (200) from entering the discharge chamber from the storage chamber (130, 134) & Lt; / RTI & gt;

17.

17. A cartridge according to any one of claims 14 to 16, wherein the lid (5) is engaged with the outer member (2) and the inner member (3).

18.

18. The cartridge according to claim 17, wherein the lid (5) engages the outer member (2) around the periphery of the cartridge and engages the inner member (3) at or near the center of the cartridge.

19.

19. A cartridge according to claim 18, wherein the lid (5) is coupled to the discharge funnel (43) of the inner member.

20.

20. A cartridge according to any one of the preceding claims, wherein the outer member (2) has a greater rigidity than the lid (5).

21.

21. A cartridge according to any one of claims 1 to 20, wherein the puncturing position of the lid for receiving the inflow and outflow causes the aqueous medium through the cartridge to typically move inwardly from the inlet to the outlet.

22.

22. A cartridge according to any one of the preceding claims, wherein the aqueous medium is adapted to typically penetrate the storage chamber upwardly.

23.

23. A plurality of cartridges according to any one of claims 1 to 22, wherein the yield rate of the beverage produced from the one or more beverage ingredients (200) contained in each cartridge is maintained within a 1.0 standard deviation.

24.

A method for using the cartridge of any one of claims 1 to 23, wherein the cartridge is displaced relative to one or more static perforation elements to form an inlet to the cartridge or an outlet from the cartridge.

25.

Claims 1. Cartridge (1) comprising one or more beverage ingredients (200) and consisting essentially of air and water impermeable material, the cartridge defining a chamber containing one or more beverage ingredients and further comprising a lid Wherein the cartridge is formed such that the lid is perforable when the cartridge is in a horizontal orientation to accommodate both the inflow and outflow of the aqueous medium in use so that the beverage is formed from the interaction of one or more beverage ingredients in the chamber with the aqueous medium.

26.

26. The cartridge of claim 25, wherein the inlet of the aqueous medium is directed to the first chamber and the outlet of the beverage is from the second chamber.

27.

27. The cartridge of claim 26, wherein the first chamber is a manifold chamber.

28.

28. The cartridge according to claim 26 or 27, wherein the second chamber is a discharge chamber.

29.

29. The cartridge of claim 28, further comprising a storage chamber containing one or more beverage components separate from the manifold chamber and the discharge chamber.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number
WO 01/60712 A1

(51) International Patent Classification[7]: B65D 81/00

(21) International Application Number: PCT/US01/04881

(22) International Filing Date: 16 February 2001 (16.02.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/183,708 18 February 2000 (18.02.2000) US
09/782,622 13 February 2001 (13.02.2001) US

(71) Applicant: KEURIG, INC. [US/US]; 101 Edgewater Drive, Wakefield, MA 01880 (US).

(72) Inventors: SWEENEY, Richard; 9 Alden Lane, Winchester, MA 01890 (US). LAZARIS, Nicholas, G.; 1947 Beacon Street, Newton, MA 02468 (US). BEAULIEU, Roderick, H.; 196 Hines Road, Cumberland, RI 02864 (US). BUCUZZO, William, P.; 41 Eudora Street, Haverhill, MA 01832 (US). LAI, Shih-Hao; 168 Webster Avenue, Cambridge, MA 02141 (US).

(74) Agents: GAUTHIER, Maurice, E., et al.; Samuels, Gauthier & Stevens, LLP, Suite 3300, 225 Franklin Street, Boston, MA 02110 (US).

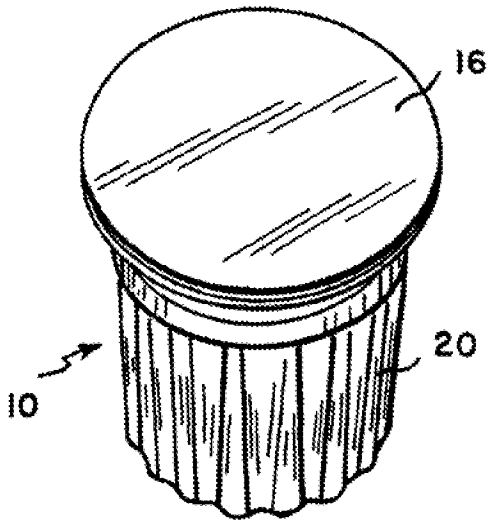
(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BEVERAGE FILTER CARTRIDGE



(57) Abstract: A beverage filter cartridge (10) includes a cup-shaped outer container (12) with a bottom (18) and a side wall (20) extending upwardly from the bottom wall (18) to a circular rim (22) surrounding an upper opening (24). The side wall (29) has an upper section (20a) extending downwardly from the rim (22) to an intermediate section, and a tapered lower section (20c) configured to provide a plurality of circumferentially spaced flutes (20e) extending downwardly from the intermediate section to the bottom wall (18). A filter element (14) subdivides the interior of the container (12) into first (A) and second (B) chambers. A beverage medium is stored in the first chamber (A). A cover (16) is joined to the side wall (20) at the rim (22) to close the upper opening (24). The cover (16) is yieldably piercable to accommodate an injection of liquid into the first chamber (A) for combination with the beverage medium to produce a beverage. The filter element (14) is permeable to accommodate a flow of the beverage from the first chamber (A) into the second chamber (B), and the bottom wall (18) is yieldably piercable to accommodate an outflow of the beverage from the second chamber (B) to the exterior of the cartridge.

WO 01/60712 A1

BEVERAGE FILTER CARTRIDGE

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority from U.S. Provisional Patent Application Serial No. 60/183,708 filed 02/18/2000 and U.S. Utility Patent Application filed on February 13, 2001 (serial no. unknown), both of which are incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

This invention relates to disposable single serve beverage filter cartridges.

DESCRIPTION OF THE PRIOR ART

A known disposable single serve beverage filter cartridge is disclosed in U.S. Patent Nos. 5,325,765 and 5,840,189 (Sylvan et al.), dated respectively July 5, 1994 and November 24, 1998, the disclosures of which are herein incorporated by reference.

This beverage filter cartridge is comprised basically of an impermeable yieldably-piercable cup-shaped outer container internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powdered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably piercable lid.

During a processing cycle, the lid and container bottom are pierced, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid under pressure into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from which it exits via the outlet probe for delivery to an underlying cup.

This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding several problems that have persisted since its initial introduction. One such problem stems from a tendency of the container side

wall to buckle under the force exerted by the outlet probe as it pierces the container bottom. This sometimes results in a failure of the outlet probe to achieve bottom penetration, thus aborting the brewing process because the brewed beverage cannot be delivered to the underlying cup. Buckling of the container side wall also can distort the punctured orifice in the container bottom, thus compromising sealing and resulting in leakage of the brewed beverage.

Problems have also been encountered in reliably sealing the rim of the filter component to the interior side wall of the container, as well as in centrally securing the bottom of the filter component to the container bottom. Failure to achieve a proper rim seal can cause the unsealed portion of the filter to collapse under brew pressure, resulting in the brewed beverage being contaminated by beverage medium residue escaping from the collapsed filter. By the same token, contamination of the brewed beverage also can occur if the filter bottom is not centrally secured, resulting in the filter being punctured by the outlet probe as it projects upwardly through the container bottom. Contamination of the brewed beverage also occurs occasionally when a filter element bursts under the pressure exerted by the heated liquid being infused with the beverage medium.

Still another problem stems from heat sealing the upper rim of the filter at or closely adjacent to the upper rim of the container side wall. This increases the unoccupied so called "head space" between the outside of the filter and the surrounding container wall, and also limits the maximum amount of beverage medium that can be stored in the cartridge to that which can be contained within the filter. In some cases, this can compromise the strength of the resulting brewed beverage. Beverage strength can be optimized by filling the filter to its maximum capacity, but this can result in errant granules of the beverage medium spilling onto the container rim. This in turn can disrupt the integrity of the seal between the cover and the container rim.

Among the objectives of the present invention is a strengthening of the container side wall to thereby resist buckling when the container bottom is punctured by the outlet probe of the brewer.

Companion objectives include a beneficial increase in beverage medium storage capacity, improvements in the manner in which the filter component is sealed to and radially supported by the container side wall, as well as improvements in the manner in which the lower end of the filter is positioned and anchored to the cartridge bottom.

SUMMARY OF THE INVENTION

In accordance with the present invention, the container side wall is provided with circumferentially spaced flutes which are strategically positioned to enhance resistance to buckling without interfering with or compromising the integrity of the seal between the side wall and the filter component. The location at which the filter component is joined to the interior side wall of the container is lowered to achieve a beneficial increase in beverage medium storage capacity. This location is defined by a tapered circular ledge against which the tapered filter component is reliably sealed.

The channels formed between the circumferentially spaced flutes serve to efficiently direct the brewed beverage downwardly towards the pierced container bottom, with an accompanying beneficial increase in turbulence in the head space defined between the filter element and container side wall.

In a second embodiment of the invention, the container bottom is configured to provide a downwardly protruding centrally disposed boss defining a reduced diameter interior sump surrounded by an annular planar bottom area. The annular bottom area is available for piercing by the outlet probe. The filter projects downwardly into and is secured within the sump at a location safely out of harms way with respect to the piercing action of the outlet probe. A beneficial decrease in head space is also realized by locating the lower end of the filter in the reduced diameter sump.

In a third embodiment of the present invention, the circumferentially spaced flutes protrude sufficiently inwardly into the container interior to radially contact the filter element at circumferentially spaced locations. This radial contact beneficially guides the filter element into its centrally located position during assembly of the cartridge components, and, during the processing cycle, provides radial support which resists distortion and possible bursting of the filter element.

These and other features, objectives and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a disposable beverage filter cartridge in

accordance with one embodiment of the present invention;

Figure 2 is an exploded perspective view of the basic components of the beverage filter cartridge shown in Figure 1;

Figure 3 is a side elevational view of the beverage filter cartridge shown in Figure 1;

Figures 4 and 5 are vertical and horizontal sectional views taken, respectively, on lines 4-4 and 5-5 of Figure 3;

Figure 6 is an enlarged sectional view of a rim portion of the filter cartridge as shown in Figure 4;

Figure 7 is an enlarged view of a portion of the side wall of the beverage cartridge;

Figure 8 is a sectional view taken along line 8-8 of Figure 7;

Figure 9 is a bottom perspective view of a disposable filter cartridge in accordance with a second embodiment of the present invention;

Figure 10 is a side elevational view of the filter cartridge shown in Figure 9;

Figure 11 is a bottom view of the filter cartridge shown in Figures 9 and 10;

Figure 12 is an enlarged cross sectional view taken along line 12-12 of Figure 10;

Figure 13 is a perspective view of a disposable beverage filter cartridge in accordance with a third embodiment of the present invention;

Figure 14 is an exploded perspective view of the components of the beverage filter cartridge shown in Figure 13;

Figure 15 is a side elevational view looking in the direction depicted by the arrow "x" in Figure 13;

Figure 16 is another side elevational view looking in the direction depicted by the arrow "Y" in Figure 13;

Figure 17 is an enlarged bottom view of the beverage filter cartridge shown in Figures 13-16;

Figure 18 is an enlarged vertical sectional view taken along line 18-18 of Figure 16;

Figure 19 is a vertical sectional view taken along line 19-19 of Figure 18;

Figure 20 is a horizontal sectional view taken along line 20-20 of Figure 19; and

Figure 21 is an enlarged sectional view of a rim portion of the cartridge as shown in Figures 18 and 19.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference initially to Figures 1-5, a beverage filter cartridge in accordance with a first embodiment of the invention is generally depicted at 10. As shown in Figure 2, the basic components of the beverage filter cartridge include an outer cup-shaped container 12, a generally cone-shaped filter element 14, and a planar circular lid 16.

The cup-shaped container 12 has a bottom 18, and a side wall 20 extending upwardly from the bottom to a circular rim 22 surrounding an upper opening 24. With reference additionally to Figures 6-8, it will be seen that the side wall 20 has an upper section 20a extending downwardly from the rim 22 to an intermediate section defined by an inwardly tapered ledge 20b, and a lower tapered section 20c extending downwardly from ledge 20b to the bottom 18.

The upper wall section 20a is preferably subdivided into upper and lower segments 20a′ and 20a″. Moving down the cup, segment 20a′ is flared outwardly, and segment 20a″ tapers inwardly, with the juncture therebetween defining a stacking shoulder 20d. The bottom 18 is optionally and preferably provided with an upwardly protruding central boss 18a.

The lower tapered wall section 20c is configured to provide a plurality of circumferentially spaced flutes 20e, the upper ends of which terminate beneath the intermediate section defined by ledge 20b, and the lower ends of which terminate as indentations in the bottom wall 18.

It will be seen from Figure 8 that the depths "d" of the flutes 20e gradually increase from a minimum at their upper ends to a maximum at their lower ends. Likewise, as can be seen from Figure 7, the widths "w" of the flutes also gradually increase from a minimum at their upper ends to a maximum at their lower ends.

The cup-shaped container is preferably thermo-formed vacuum molded from an impermeable yieldably piercable heat sealable material having a nominal thickness of 0.031″ and comprising, for example, polyethylene/EVOH/polystyrene supplied by

Curwood Packaging of Oshkosh, Wisconsin, U.S.A.

The filter element 14 is formed of a pliable and permeable heat sealable material such as for example cellulose polypropylene supplied by J. R. Crompton, Ltd of Bury, Lancashire, England. The bottom of the filter element is supported on and secured as by heat sealing to the central boss 18a.

The lid may be cut or blanked from any suitable impermeable heat sealable and yieldably piercable material, such as for example, a metallic/polymer laminate supplied by Winpak Heat Seal Packaging, Inc. of Montreal, Canada.

As can best be seen in Figure 6, the filter element is heat sealed as at 26 to the intermediate wall section defined by tapered ledge 20b. The taper angle of the ledge 20b closely approximates the taper angle of the filter element 14, thereby facilitating the task of securely and reliably heat sealing the two together. The filter element serves to subdivide the interior of the container 12 into first and second chambers A, B. A dry granular or powdered beverage medium "M", typically ground roasted coffee, is stored in chamber A, and the container opening 24 is closed by heat sealing the lid 16 to the rim 22.

At the onset of a processing cycle, the lid 16 and container bottom 18 are pierced, respectively, by tubular inlet and outlet probes 28, 30 (see Figure 3). The inlet probe 28 admits a heated liquid, typically hot water, into chamber A where it infuses and combines with the beverage medium M to produce a beverage. The beverage passes through the filter element 14 into chamber B, from which it exits via outlet probe 30.

The second embodiment illustrated in Figures 9-11 is similar in many respects to the above-described first embodiment. Similar features of the second embodiment have been identified with similar reference numerals in a two hundred series. Thus, for example, reference numeral 10 identifies the filter cartridge of the first embodiment, and reference numeral 210 identifies the filter cartridge of the second embodiment.

In the second embodiment, the container bottom 218 is configured to provide a downwardly protruding centrally disposed reduced diameter boss 218a defining an interior sump 218b surrounded by an annular substantially planar bottom area. The bottom of the conical filter element is received in and secured to the bottom of the sump as at 218c.

The third embodiment illustrated in Figures 13-21 is also similar in many respects to the first embodiment. Again, similar features have been identified with similar reference numerals, but in a three hundred series.

The major difference between the first and third embodiments is that the latter has fewer and much deeper flutes 320e. As can be best seen in Figure 19, the deeper flutes 320e contact and provide radial support for the filter element 314.

In light of the foregoing, it will now be appreciated by those skilled in the art that the present invention offers significant advantages over the known beverage filter cartridge described in the previously referenced patents. For example, the circumferentially spaced flutes 20e, 220e and 320e strengthen the container side wall against buckling when the bottom is pierced by the outlet probe 30. The deeper flutes 320e of the third embodiment offer the added advantage of radially supporting the filter element, which can be particularly beneficial during the processing cycle, when the filter element is being stressed by the infusion of pressurized heated liquid into the beverage medium.

In all embodiments, the downwardly diverging and gradually deepening of the flutes serves to promote downward flow of the brewed beverage in chamber B while beneficially encouraging turbulence. The upwardly protruding bosses 18a, 318a on the container bottoms of the first and third embodiments provide readily accessible support platforms for the bottoms of the filter elements. Securing the bottoms of the filter elements to the bosses 18a, 218a insures that the filter elements will not be punctured by the outlet probe 30.

The small diameter sump 218b defined by the downwardly protruding boss 218a of the second embodiment receives the lower end of the filter component in a confined space which beneficially decreases head space and further assists in positively locating and safeguarding the filter from damaging contact with the outlet probe.

The tapered ledges 20b, 220b, 320b of all embodiments provide distinct and readily accessible lands to which the filter elements may be reliably joined by heat sealing. The upper ends of the flutes 20e, 220e, 320e terminate below the ledges 20b, 220b, 320b, thereby insuring that the ledges are not interrupted by discontinuities that would be detrimental to the critical seal of the filter elements to the container side walls.

The upper container sections 20a, 220a, 320a above the filters provide

beneficial increases in available storage capacity for the beverage medium. This increased storage capacity makes it unnecessary to fill the interior chamber A to its maximum capacity, thereby safeguarding the container rim from contamination by errant granules of the beverage medium.

Although the outer container and cover have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

Although the present invention has been described with reference to several embodiments, various changes, modifications and additions may be made without departing from the spirit and scope of the appended claims.

We claim:

1. A beverage filter cartridge comprising:

a cup-shaped outer container having a bottom and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an intermediate section, and having a tapered lower section extending downwardly from said intermediate section to said bottom wall, said tapered lower section being configured to provide a plurality of circumferentially spaced flutes;

a filter element received in said container, said filter element being joined to said side wall and being configured and positioned to subdivide the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being yieldably piercable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom wall being yieldably piercable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

2. The beverage filter cartridge of claim 1 wherein said flutes extend downwardly from upper ends terminating beneath said intermediate section to lower ends at said bottom wall.

3. The beverage filter cartridge of claim 2 wherein the lower ends of said flutes define indentations in said bottom wall.

4. The beverage filter cartridge of claims 2 or 3 wherein the depths of said flutes gradually increase from a minimum at said upper ends to a maximum at said lower ends.

5. The beverage filter cartridge of claims 2 or 3 wherein the widths of said flutes gradually increase from a minimum at said upper ends to a maximum at said lower ends.

6. The beverage filter cartridge of claim 1 wherein said filter element is joined to said side wall at said intermediate section.

7. The beverage filter cartridge of claim 1 wherein said intermediate section is defined by a ledge joining said upper section to said lower section, and wherein said filter element is joined to said side wall at said ledge.

8. The beverage filter cartridge of claim 7 wherein said ledge tapers inwardly from said upper section to said lower section, and wherein the taper angle of said intermediate section is greater than the taper angle of said lower section.

9. The beverage filter cartridge of claim 1 wherein said upper section has an upper segment extending downwardly from said circular rim and a lower segment extending upwardly from said intermediate section, said upper segment being flared outwardly and said lower segment being tapered inwardly, with the juncture of said upper and lower segments defining an exterior stacking shoulder.

10. The beverage filter cartridge of claim 1 wherein said bottom wall is provided with an upwardly protruding centrally disposed boss, a lower end of said filter element being supported on said boss.

11. The beverage filter cartridge of claim 10 wherein the lower end of said filter is secured to said boss.

12. The beverage filter cartridge of claim 1 wherein said filter element is in contact with and radially supported by said flutes.

13. The beverage filter cartridge of claim 1 wherein said bottom is provided with a downwardly protruding centrally disposed boss defining an interior sump, and wherein the lower end of said filter element is received in said sump.

14. The beverage filter cartridge of claim 13 wherein said filter element is secured to the bottom of said sump.

15. The beverage filter cartridge of claim 1 wherein said outer container is impermeable.

16. The beverage filter cartridge of claims 1 or 15 wherein said cover is impermeable.

17. A beverage filter cartridge comprising:

a cup-shaped outer container having a bottom and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an intermediate section, and having a tapered lower section extending downwardly from said intermediate section to said bottom wall, said tapered section being configured to provide a plurality of circumferentially spaced flutes;

a filter element received in said container, said filter element being in contact with and radially supported by said flutes and being joined to said side wall at a location subdividing the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being yieldably piercable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom wall being yieldably piercable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

18. A beverage filter cartridge comprising:

a cup-shaped container having a bottom and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an intermediate section, and having a tapered lower section extending downwardly from said intermediate section to said bottom wall, said tapered section being configured to provide a plurality of circumferentially spaced flutes, said bottom being provided with a downwardly protruding centrally disposed boss defining an interior sump;

a conical filter element received in said container, the bottom of said filter element protruding downwardly into and being secured within said sump, said filter element being joined to said side wall and being configured and positioned to subdivide the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being yieldably piercable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter being permeable to accommodate a flow of said beverage from said first chamber into

said second chamber, and said bottom wall being yieldably piercable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

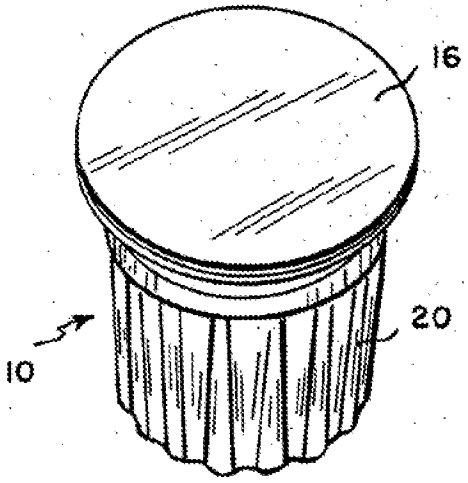


FIG. 1

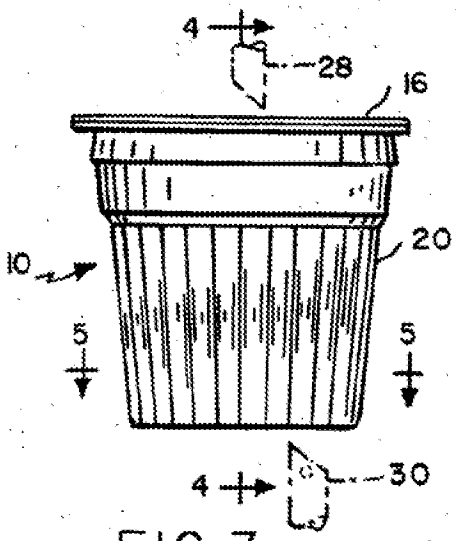


FIG. 3

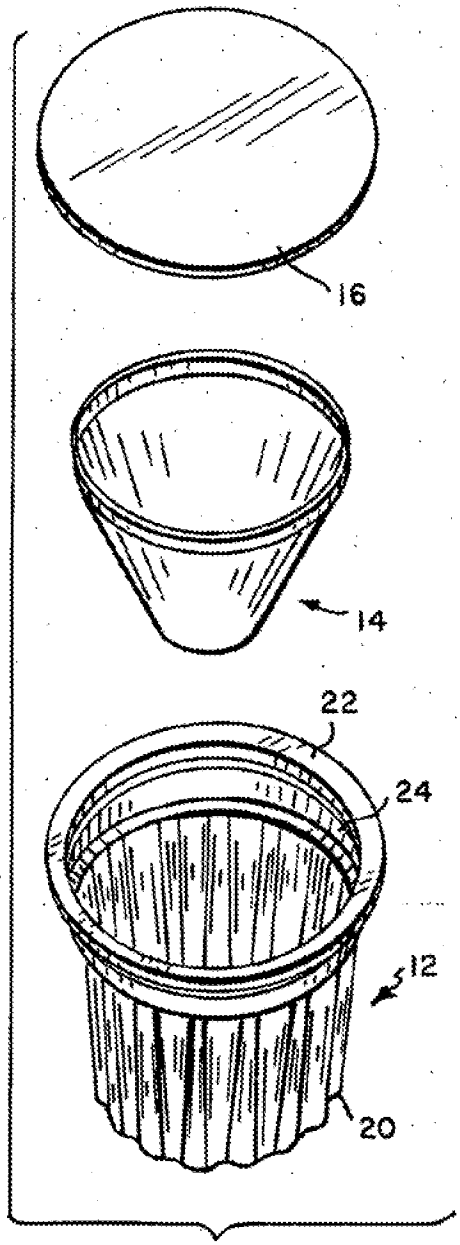


FIG. 2

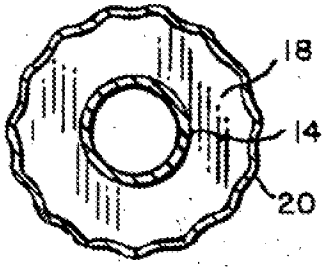


FIG. 5

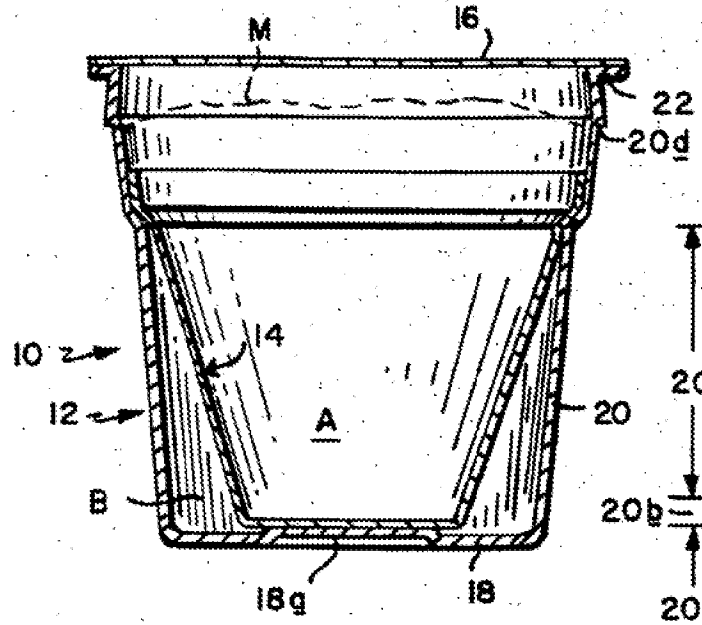


FIG. 4

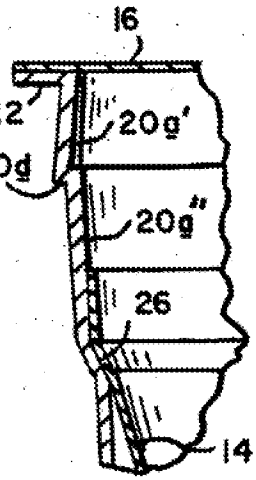


FIG. 6

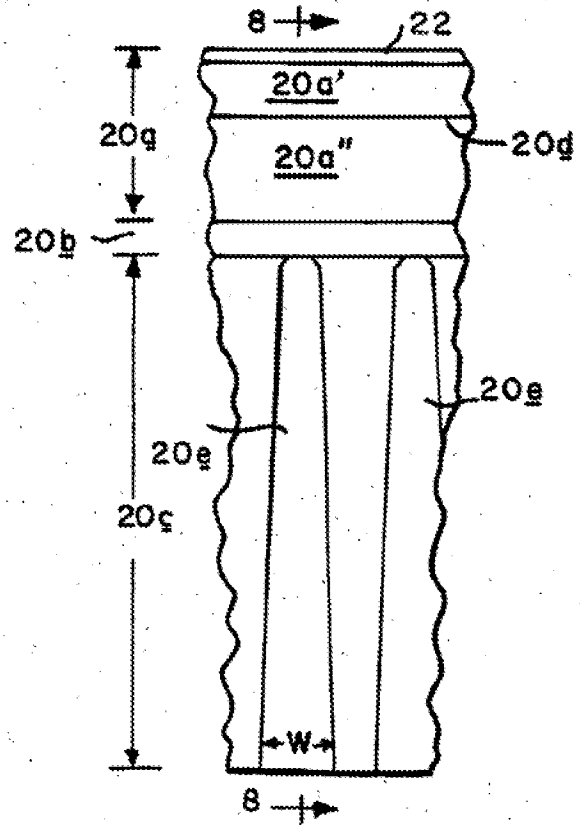


FIG. 7

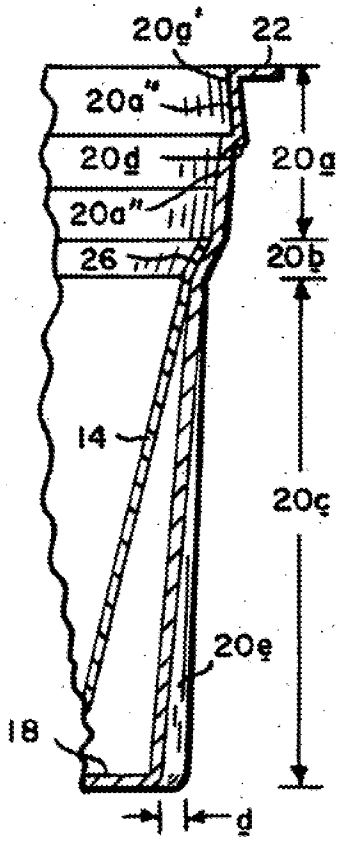


FIG. 8

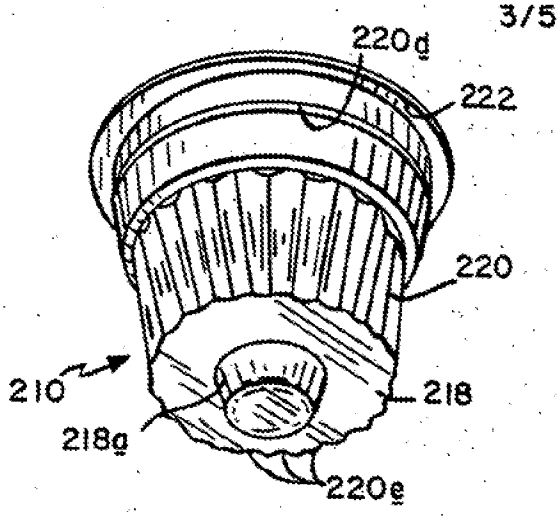


FIG. 9

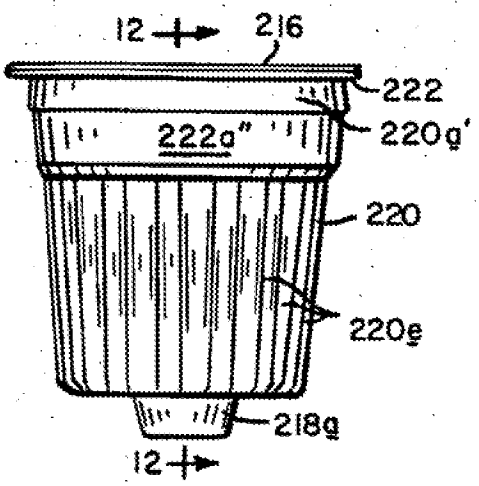


FIG. 10

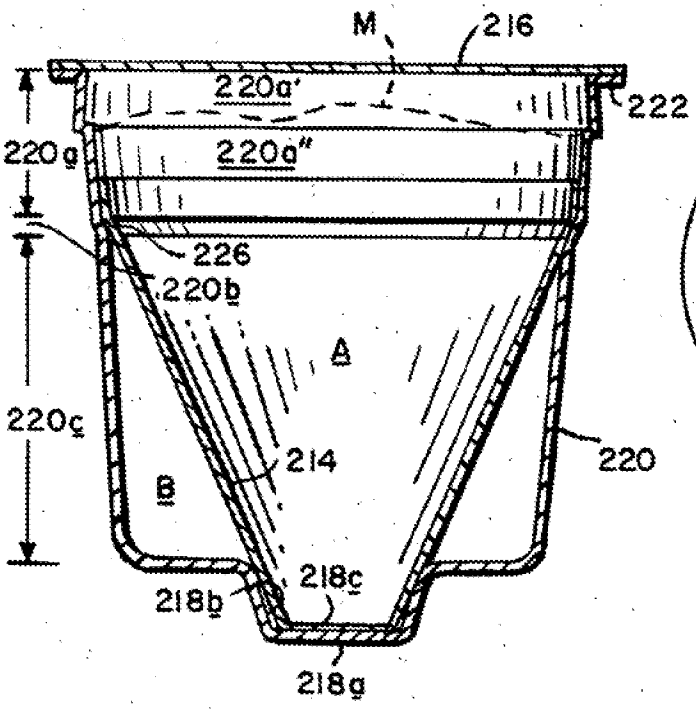


FIG. 12

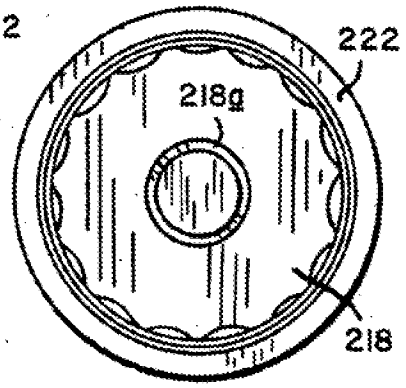


FIG. 11

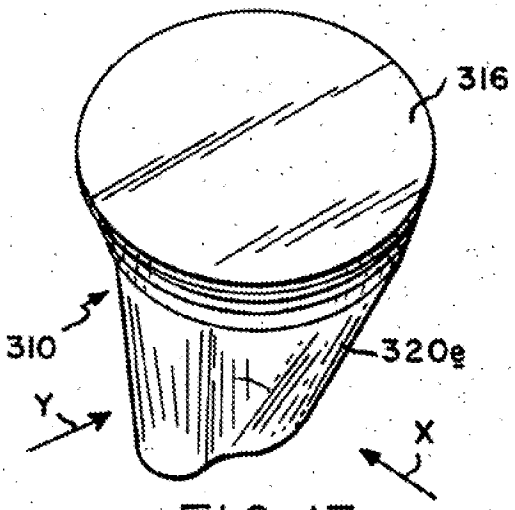


FIG. 13

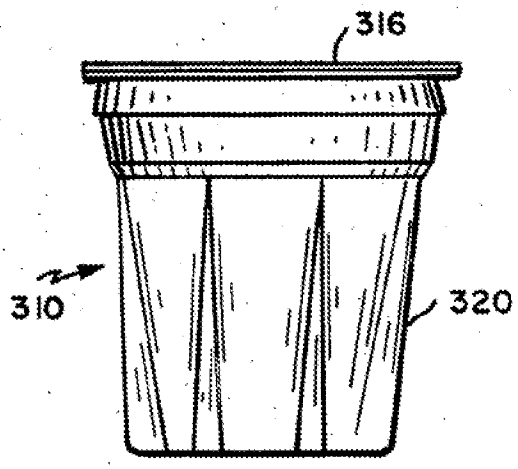


FIG. 15

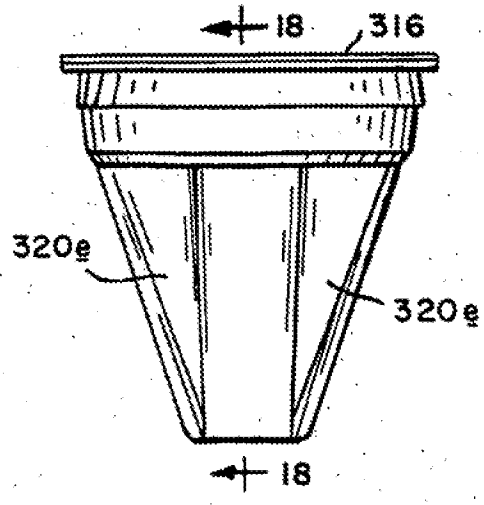


FIG. 16

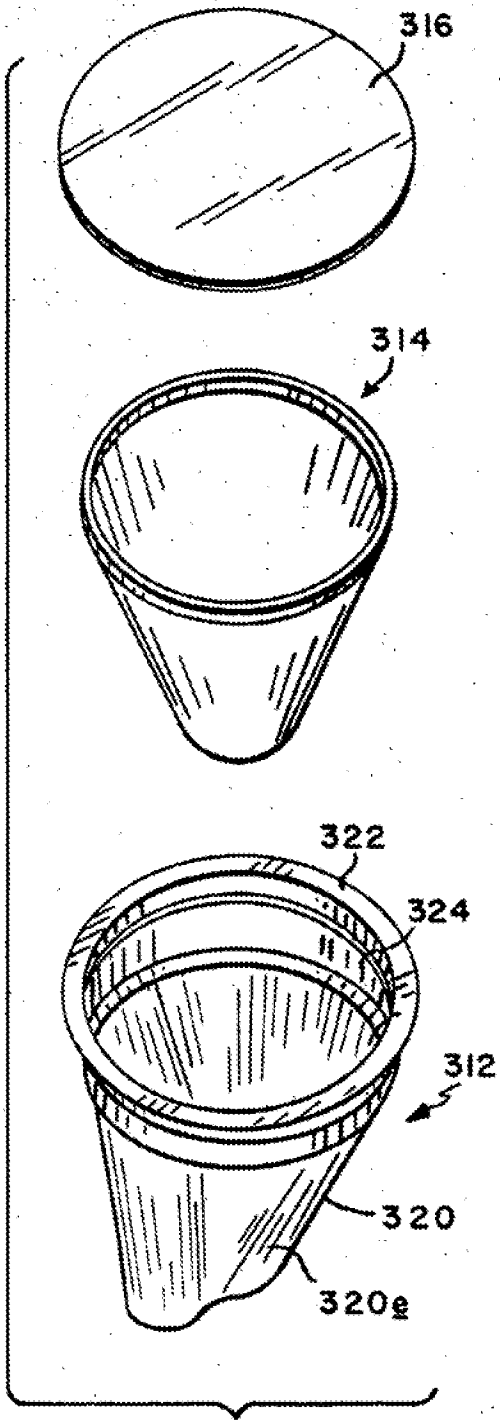


FIG. 14

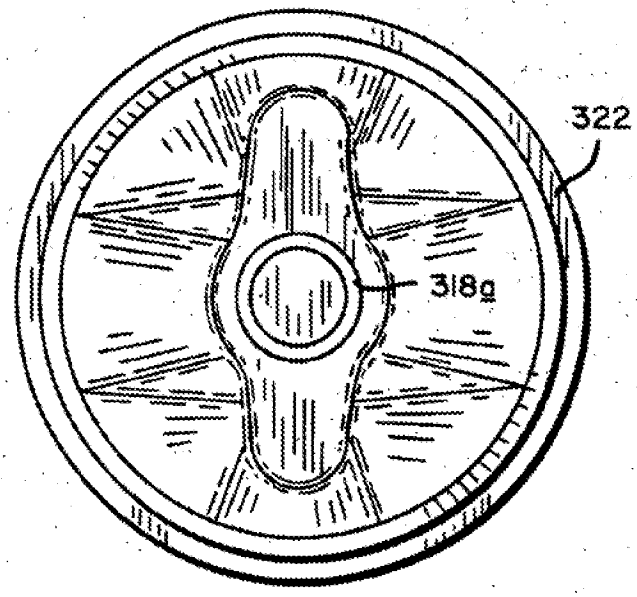


FIG. 17

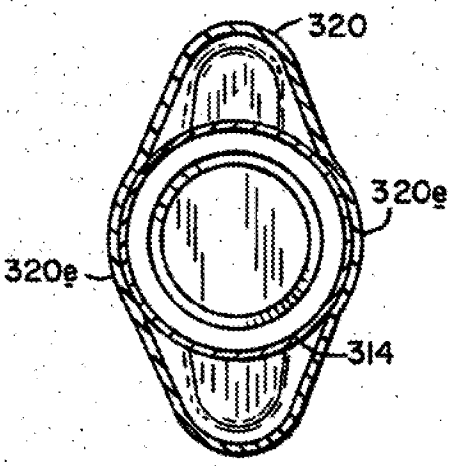


FIG. 20

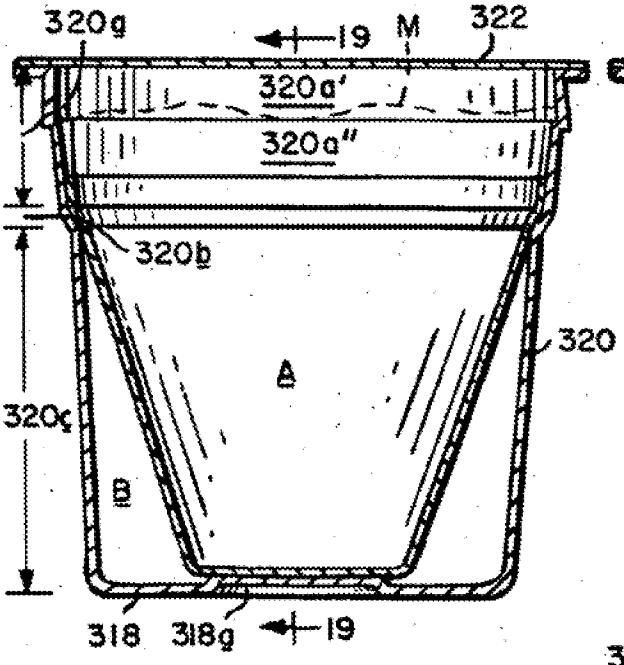


FIG. 18

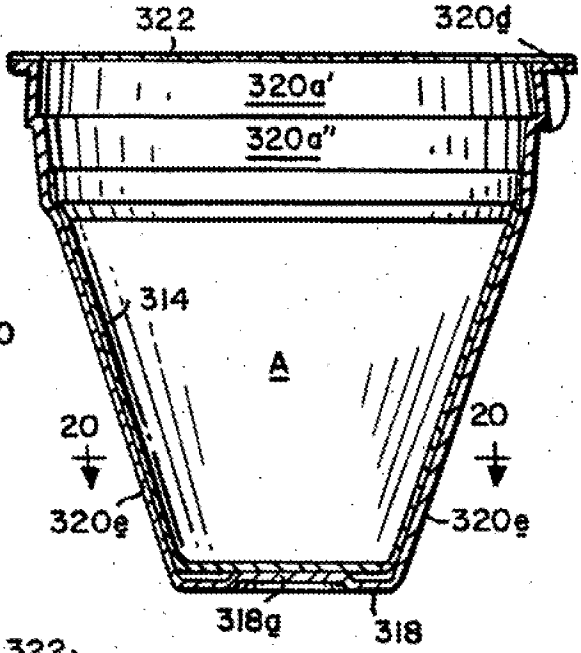


FIG. 19

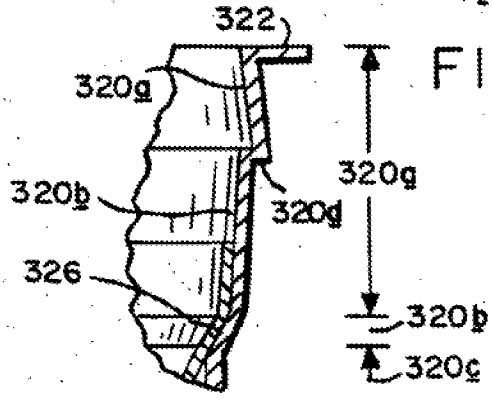


FIG. 21

INTERNATIONAL SEARCH REPORT

tional Application No
PCT/US 01/04881

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D81/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 840 189 A (SYLVAN JOHN E ET AL) 24 November 1998 (1998-11-24) cited in the application	1,6,7, 15-17
A	column 2, line 66 -column 3, line 58; claims 1-5; figures 1,2,5	10,18
Y	DE 15 36 372 A (WEBER, W.) 15 January 1970 (1970-01-15)	1,6,7, 15-17
A	page 3, line 17-21 page 6	12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

'A' document defining the general state of the art which is not considered to be of particular relevance

'E' earlier document but published on or after the international filing date

'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

'O' document referring to an oral disclosure, use, exhibition or other means

'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2001	30/07/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Novelli, B

2

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Tional Application No
PCT/US 01/04881

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5840189 A	24-11-1998	US 5325765 A	05-07-1994
DE 1536372 A	15-01-1970	CH 448878 A	15-12-1967

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 36 of 421

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 August 2004 (05.08.2004)

PCT

(10) International Publication Number
WO 2004/065258 A2

(51) International Patent Classification[7]: B65D 81/00, B65B 43/42, A47J 31/40, B65B 59/00

(21) International Application Number: PCT/GB2004/000276

(22) International Filing Date: 23 January 2004 (23.01.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

0301738.1	24 January 2003 (24.01.2003)	GB
0301745.6	24 January 2003 (24.01.2003)	GB
0301739.9	24 January 2003 (24.01.2003)	GB

(71) Applicant *(for all designated States except US)*: **KRAFT FOODS R & D, INC.** [DE/DE]; Zweigniederlassung Munchen, Unterbiberger Str. 15, 81737 MUNICH (DE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **GOMEZ, Maria** [GB/GB]; Ruscote Avenue, Banbury, Oxfordshire OX16 7QU (GB). **HALLIDAY, Andrew** [GB/GB]; Ruscote Avenue, Banbury, Oxfordshire OX16 7QU (GB). **BALLARD, Colin** [GB/GB]; Ruscote Avenue, Banbury, Oxfordshire OX16 7QU (GB). **PANESAR, Satwinder** [GB/GB]; Ruscote Avenue, Banbury, Oxfordshire OX16 7QU (GB).

(74) Agent: **BOULT WADE TENNANT**, Verulam Gardens, 70 Gray's Inn Road, London WX1X 8BT (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

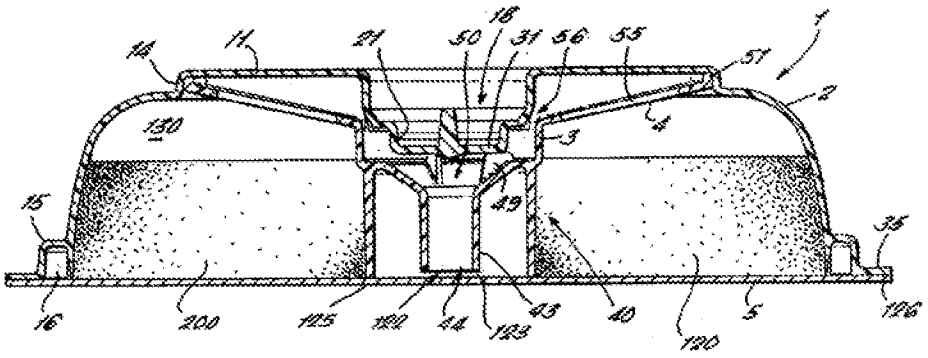
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

---- *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CARTRIDGE AND METHOD FOR THE PREPARATION OF BEVERAGES



(57) Abstract: A cartridge (1) containing one or more liquid beverage ingredients (200) and being formed from substantially air- and water-impermeable materials, the cartridge comprising an inlet (121) for the introduction of an aqueous medium into the cartridge, a compartment (134) containing the one or more liquid beverage ingredients and an outlet (122) for a beverage produced by dilution of the one or more liquid beverage ingredients by the aqueous medium, characterised in that the compartment includes means for controlling dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

WO 2004/065258 A2

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 37 of 421

CARTRIDGE AND METHOD FOR THE PREPARATION OF BEVERAGES

The present invention relates to a cartridge and method for the preparation of beverages and, in particular, using sealed cartridges which are formed from substantially air- and water-impermeable materials and which contain one or more ingredients for the preparation of beverages.

It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee preparation machines which are generally termed "espresso" machines. In the production of coffee using these preparation machines the coffee cartridge is placed in a brewing chamber and hot water is passed though the cartridge at relatively high pressures, thereby extracting the aromatic coffee constituents from the ground coffee to produce the coffee beverage. Typically, such machines operate at a pressure of greater than 6×10^5 Pa. The preparation machines of the type described have to date been relatively expensive since components of the machine, such as the water pumps and seals, must be able to withstand the high pressures.

In WO01/58786 there is described a cartridge for the preparation of beverages which operates at a pressure generally in the range 0.7 to 2.0×10^5 Pa. However, the cartridge is designed for use in a beverage preparation machine for the commercial or industrial market and is relatively expensive and limited in the types of beverage produced. Hence, there remains a requirement for a cartridge for the preparation of beverages wherein the

cartridges and beverage preparation machine are suitable, in particular, for the domestic market in terms of cost, performance and reliability. There is also a need for a beverage preparation machine for such a system which is simple to operate and reliable in operation and can produce a wide range of beverage types.

It is known to provide dairy-based beverage ingredients in cartridges in the form of a powder or other dehydrated form. However, consumers consistently indicate that the use of such powdered dairy-based products adversely affects the taste, colour and texture of the final beverage. It has proven difficult to provide liquid dairy-based products in a cartridge due to the requirement to sterilise the cartridge components. Further, it has been found to be difficult to control the dilution and dispensing of the liquid milk products to arrive at a consistent and acceptable final beverage.

In addition, powdered dairy products cannot be used to produce an authentic looking frothy milk-based foam as desired by consumers for cappuccino-style beverages. A number of beverage preparation machines provide a steam wand or similar for frothing of a quantity of milk. However, the addition of the steam wand increases the cost of the machine and requires a means for generating steam. Operation of the steam wand must be done manually and requires experience to be successful. In addition, since steam is being used there is the potential for the consumer to be burnt by either the steam or hot components of the machine. Further, the consumer must keep a supply of milk available separate from the machine and carry out a further process step of a different type in order to produce a cappuccino style

beverage. This increases the complexity and time required to produce such beverages.

Hence, there remains a requirement for a system for the preparation of beverages wherein the cartridges and beverage preparation machine of the system are suitable, in particular, for the domestic market in terms of cost, performance and reliability. There is also a need for a beverage preparation machine for such a system which is simple to operate and reliable in operation and can produce a wide range of beverage types.

Accordingly, the present invention provides a cartridge containing one or more liquid beverage ingredients and being formed from substantially air- and water-impermeable materials, the cartridge comprising an inlet for the introduction of an aqueous medium into the cartridge, a compartment containing the one or more liquid beverage ingredients and an outlet for a beverage produced by dilution of the one or more liquid beverage ingredients by the aqueous medium, characterised in that the compartment includes means for controlling dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

Advantageously, the cartridge of the present invention provides superior dilution and dispensing of liquid beverage ingredients by ensuring that the liquid beverage ingredients are dispensed more evenly over the operating cycle rather that being dispensed all at the start of the operating cycle followed by substantially pure aqueous medium, which is, for example, water. This steady dispensation of the liquid beverage ingredients leads to improved homogeneity of the dispensed liquid beverage. In addition, where the diluted

liquid beverage is subsequently subjected to foaming, by for example, jetting through an orifice, the improved homogeneity of the liquid leads to a greater consistency of foaming and improved quality and quantity of foam produced per unit volume of liquid beverage.

Preferably, the means for controlling dilution delays dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

Preferably, in use, an aqueous medium flow path is established from the inlet to the outlet, the means for delaying dilution comprising a partition which hinders entry of at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path. In one embodiment the partition comprises one or more apertures for controllably releasing the at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path. Four apertures may be provided.

The partition may comprise a cup-shaped member having an open mouth directed away from the aqueous medium flow path. The cup-shaped member is preferably annular. The one or more apertures are preferably provided at or near a base of the cup-shaped member. The at least a proportion of the liquid beverage ingredients in the cup-shaped member, for example, drain by gravity through the one or more apertures in use.

In one embodiment, the cup-shaped member is spaced from a bottom of the cartridge, such that the aqueous medium flow path passes between the cup-shaped member and the bottom of the cartridge. Consequently, the at least a proportion of the liquid beverage ingredients in the cup-shaped member

drains by gravity through the one or more apertures in use vertically downwards into the aqueous medium flow path.

Preferably, the cartridge comprises an inner member and an outer member, wherein the inner member comprises the cup-shaped member. The components of the inner member and the outer member may more easily be sterilised prior to assembly when they are separated. Once the components are conjoined a number of small-apertured, tortuous pathways are created which cannot effectively be sterilised using known methods. The ability to sterilise the components is a particularly advantageous feature where the cartridges are used for dispensing dairy-based beverages such as milk.

Preferably, the cartridge further comprises means for producing a jet of the beverage, wherein said means for producing the jet of the beverage comprises an aperture in the aqueous medium flow path. The aperture may be delimited by an interface between the inner member and the outer member.

Preferably, the cartridge further comprises at least one inlet for air and means for generating a pressure reduction of the jet of beverage, whereby, in use, air from the at least one air inlet is incorporated into the beverage as a plurality of small bubbles. At least one air inlet may be provided in the inner member downstream of the aperture.

In one embodiment the at least one air inlet and means for producing a pressure reduction in the jet of beverage produces a foaming of the one or more liquid beverage ingredients of greater than 40%. Preferably, greater than 70%. Preferably, the cartridge is disc-shaped. The outer member and/or inner member are formed, for example, from polypropylene.

In one example, the liquid beverage ingredient is a concentrated liquid milk composition. Preferably, the concentrated liquid milk contains between 25 and 40% total solids. More preferably, the concentrated liquid milk contains 30% total solids. Also preferably, the concentrated liquid milk contains between 0.1 and 12% fat. Alternatively, the one or more liquid beverage ingredients are selected from the group of cocoa solids, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

The present invention also provides a method of dispensing a beverage from a cartridge containing one or more liquid beverage ingredients during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid ingredients as dispensed has a concentration at the start of the operating cycle of between 30 and 70% total solids and a concentration at the end of the operating cycle of between 1 and 15% total solids.

In one embodiment the concentration at the start of the operating cycle is between 30 and 35% total solids. The concentration at the end of the operating cycle is approximately 10% total solids. The liquid ingredient may be concentrated milk. In another embodiment, the concentration at the start of the operating cycle is between 60 and 70% total solids. The concentration at the end of the operating cycle is between 12 and 15% total solids. The liquid ingredient may contain cocoa solids. In another embodiment, the concentration at the start of the operating cycle is

between 40 and 70% total solids. The concentration at the end of the operating cycle is between 1 and 2% total solids. The liquid ingredient may contain coffee.

The present invention further provides a method of dispensing a beverage from a cartridge containing one or more liquid beverage ingredients during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid beverage ingredients is foamed on dispense to a ratio of between 20 and 150%.

Preferably the one or more liquid beverage ingredients are foamed to a ratio between 70 and 100%.

The one or more liquid beverage ingredients may include one or more of concentrated milk, coffee and cocoa solids.

The present invention further provides a beverage as produced by the above methods.

The present invention also provides a method of manufacturing a cartridge for dispensation of a beverage comprising the steps of:

a. manufacturing a plurality of outer members comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;
b. manufacturing a plurality of inner members comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;
c. storing said plurality of outer members and said inner members;

d. selecting one of the first type of outer member or the second type of outer member from the plurality of outer members;

e. selecting one of the first type of inner member or the second type of inner member from the plurality of inner members;

f. conjoining the selected inner member to the selected outer member such the inner member is within the outer member;

g. filling the outer member with one or more beverage ingredients selected from a plurality of beverage ingredients; and

h. sealing the outer member with a lid to form the cartridge.

The method of manufacture of the present invention provides an economical means for producing cartridges for the dispensation of one of a plurality of beverages. Advantageously, the cartridge is easily assembled from the main components of the inner member, the outer member, the beverage ingredient and the lid. Different types of outer member, inner member and lid are manufactured depending on the beverage ingredient to be dispensed. However, the differing types of inner member, outer member and lid are interchangeable so that individual cartridges may be assembled from specific combinations of the stock components. This results in a reduced number of total components that need to be manufactured without affecting the flexibility of the type of cartridges that can be produced. For example, the same type of outer member may be used for dispensing filter coffee and espresso-style coffee.

The cost of manufacturing the range of beverage cartridges is reduced by using interchangeable components. In addition, the types of outer member share substantially the same external shape and configuration so that all cartridges in the range can be dispensed using the same beverage preparation machine.

Optionally the method further comprises in step b. joining a filter member to the first type and/or second type of inner member.

The first type of outer member may be suitable for containing roast and ground beverage ingredients or the like. The second type of outer member may be suitable for containing soluble or liquid beverage ingredients or the like.

The first type of inner member may be suitable for filtering roast and ground beverage ingredients and the like. The second type of inner member may be suitable for filtering roast and ground beverage ingredients and the like and for entraining a plurality of air bubbles in the dispensed beverage.

The first and second type of inner member may comprise a frame having a filter disposed thereupon, and wherein a peripheral rim of the frame is conjoined to the selected type of outer member by welding.

By using separate components for the inner and outer members which are then conjoined on assembly by a welding process the manufacture of each component and the assembly of the cartridge can be optimised. This is particularly advantageous in the present cartridge where very small tolerances are desirable since the beverage flow path through the cartridge is defined by the interface between

the outer member and the inner member. In addition the components of the inner member and the outer member may more easily be sterilised prior to assembly when they are separated. Once the components are welded together a number of small-apertured, tortuous pathways are created which cannot effectively be sterilised using known methods. The ability to sterilise the components is a particularly advantageous feature where the cartridges are used for dispensing dairy-based beverages. A welded arrangement provides a quick to assemble but secure method of conjoining the inner member and outer member. Advantageously, the welding method avoids the need for glues or other such adhesives in the interior of the cartridge which will be exposed to the beverage ingredients.

Preferably, the second type of inner member comprises means for producing a jet of the beverage, which means comprises an aperture in a beverage flow path between an inlet and an outlet of the cartridge.

Preferably, the method further comprises manufacturing and storing a third type of inner member. The third type of inner member may be suitable for dispensing soluble beverage ingredients and the like.

Preferably, the method further comprises manufacturing and storing a fourth type of inner member. The fourth type of inner member may be suitable for dispensing a liquid beverage ingredients and the like.

The third or fourth type of inner member may comprise a skirt surrounding an outlet, the skirt comprising an upper extension having an upper rim which engages, on assembly of the cartridge, a co-operating formation of the selected type of outer member to form a snap-fit arrangement for

conjoining the third or fourth type of inner member to the selected type of outer member.

The present invention also provides a cartridge system for dispensing a plurality of beverages comprising:

a. a plurality of outer members comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;
b. a plurality of inner members comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;
c. a plurality of beverage ingredients; and
d. at least one lid to seal the cartridge;

wherein each cartridge comprises an outer member, an inner member, one or more beverage ingredients and a lid.

The present invention also provides a method of preparing a beverage comprising the steps of:

a. inserting a first beverage cartridge containing one or more beverage ingredients into a beverage preparation machine;
b. operating said beverage preparation machine to pass an aqueous medium through the first beverage cartridge to dispense a first portion of said beverage into a receptacle;
c. inserting a second beverage cartridge containing one or more beverage ingredients into the beverage preparation machine; and
d. operating the beverage preparation machine to pass an aqueous medium through the second beverage cartridge to dispense a second portion of said beverage into the receptacle;

characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

By using two or more cartridges to prepare a beverage a large variety of beverage can be produced by the same beverage preparation machine. In addition, each cartridge can be optimised for dispensing particular beverage ingredients. In particular, the ability to dispense liquid dairy-based ingredients allows for the formation of beverages having an authentic look, taste and mouth feel which have previously only been possible using non-cartridge based systems such as the use of a separate steam wand to froth bulk quantities of milk. The present method provides a reliable and easy to operate system for forming such beverages.

Preferably, one of the first or second beverage cartridges contains an ingredient for forming a brewed portion of a beverage.

Preferably, the method further comprises the step of removing the first beverage cartridge before inserting the second beverage cartridge.

In one embodiment, the beverage ingredient in the first or second beverage cartridge is roast and ground coffee. In another embodiment, the beverage ingredient in the first or second beverage cartridge is leaf-based tea. In another, the beverage ingredient in the first or second beverage cartridge is a liquid coffee ingredient.

Preferably, the liquid beverage ingredient is a concentrated dairy-based product. Advantageously, the concentrated dairy-based product is concentrated liquid milk. Preferably, the concentrated liquid milk contains

between 25 and 40% total solids. More preferably, the concentrated liquid milk contains 30% total solids. In addition, preferably, the concentrated liquid milk contains between 0.1 and 12% fat.

Preferably, the method further comprises the step of foaming the one or more liquid dairy-based ingredients during dispensation.

The present invention also provides a beverage preparation system comprising a beverage preparation machine having means for receiving a range of beverage cartridges and means for passing an aqueous medium through said beverage cartridges, a first beverage cartridge containing one or more beverage ingredients for preparing a first portion of said beverage, and a second beverage cartridge containing one or more beverage ingredients for preparing a second portion of said beverage, characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

It will be understood that by the term "cartridge" as used herein is meant any package, container, sachet or receptacle which contains one or more beverage ingredients in the manner described. The cartridge may be rigid, semi-rigid or flexible.

The cartridge of the present invention contains one or more liquid beverage ingredients suitable for the formation of a beverage product. The beverage product may be, for example, one of coffee, tea, chocolate or a dairy-based beverage including milk.

In the following description the terms "upper" and "lower" and equivalents will be used to describe the relational positioning of features of the invention. The

terms "upper" and "lower" and equivalents should be understood to refer to the cartridge (or other components) in its normal orientation for insertion into a beverage preparation machine and subsequent dispensing as shown, for example, in Figure 4. In particular, "upper" and "lower" refer, respectively, to relative positions nearer or further from a top surface 11 of the cartridge. In addition, the terms "inner" and "outer" and equivalents will be used to describe the relational positioning of features of the invention. The terms "inner" and "outer" and equivalents should be understood to refer to relative positions in the cartridge (or other components) being, respectively, nearer or further from a centre or major axis X of the cartridge 1 (or other component).

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is cross-sectional drawing of an outer member of first and second embodiments of cartridge;

Figure 2 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing an inwardly directed cylindrical extension;

Figure 3 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing a slot;

Figure 4 is a perspective view from above of the outer member of Figure 1;

Figure 5 is a perspective view from above of the outer member of Figure 1 in an inverted orientation;

Figure 6 is a plan view from above of the outer member of Figure 1;

Figure 7 is a cross-sectional drawing of an inner member of the first embodiment of cartridge;

Figure 8 is a perspective view from above of the inner member of Figure 7;

Figure 9 is a perspective view from above of the inner member of Figure 7 in an inverted orientation;

Figure 10 is a plan view from above of the inner member of Figure 7;

Figure 11 is a cross-sectional drawing of the first embodiment of cartridge in an assembled condition;

Figure 12 is a cross-sectional drawing of an inner member of the second embodiment of cartridge;

Figure 13 is a cross-sectional drawing of a detail of the inner member of Figure 12 showing an aperture;

Figure 14 is a perspective view from above of the inner member of Figure 12;

Figure 15 is a perspective view from above of the inner member of Figure 12 in an inverted orientation;

Figure 16 is another cross-sectional drawing of the inner member of Figure 12;

Figure 17 is a cross-sectional drawing of another detail of the inner member of Figure 12 showing an air inlet;

Figure 18 is a cross-sectional drawing of the second embodiment of cartridge in an assembled condition;

Figure 19 is cross-sectional drawing of an outer member of third and fourth embodiments of cartridge;

Figure 20 is a cross-sectional drawing of a detail of the outer member of Figure 19 showing an inwardly directed cylindrical extension;

Figure 21 is a plan view from above of the outer member of Figure 19;

Figure 22 is a perspective view from above of the outer member of Figure 19;

Figure 23 is a perspective view from above of the outer member of Figure 19 in an inverted orientation;

Figure 24 is a cross-sectional drawing of an inner member of the third embodiment of cartridge;

Figure 25 is a plan view from above of the inner member of Figure 24;

Figure 26 is a cross-sectional drawing of a detail of the inner member of Figure 24 showing an in-turned upper rim;

Figure 27 is a perspective view from above of the inner member of Figure 24;

Figure 28 is a perspective view from above of the inner member of Figure 24 in an inverted orientation;

Figure 29 is a cross-sectional drawing of the third embodiment of cartridge in an assembled condition;

Figure 30 is a cross-sectional drawing of an inner member of the fourth embodiment of cartridge according to the present invention;

Figure 31 is a plan view from above of the inner member of Figure 30;

Figure 32 is a perspective view from above of the inner member of Figure 30;

Figure 33 is a perspective view from above of the inner member of Figure 30 in an inverted orientation;

Figure 34 is a cross-sectional drawing of the fourth embodiment of cartridge in an assembled condition;

Figure 35 is a front perspective view of a beverage preparation machine for use with the present invention;

Figure 36 is a front perspective view of the machine of Figure 35 with a cartridge head in an open position;

Figure 37 is a rear perspective view of the machine of Figure 35 with some parts omitted for clarity;

Figure 38 is another rear perspective view of the machine of Figure 35 with some parts omitted for clarity;

Figure 39 is a perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;

Figure 40 is another perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;

Figure 41 is a cross-sectional view of the cartridge head in a closed position;

Figure 42 is a cross-sectional view of the cartridge head in an open position;

Figure 43 is a schematic layout of the machine of Figure 35;

Figure 44a and 44b are schematic layouts of first and second code recognition means for the machine of Figure 35;

Figure 45 is a plan view of a beverage of the present invention comprising a barcode;

Figure 46a is a graph of concentration vs. operating cycle time;

Figure 46b is a graph of foamability vs. operating cycle time; and

Figure 46c is a graph of temperature vs. operating cycle time.

As shown in Figure 11, the cartridge 1 generally comprises an outer member 2, an inner member 3 and a laminate 5. The outer member 2, inner member 3 and laminate 5 are assembled to form the cartridge 1 which has an interior 120 for containing one or more beverage ingredients, an inlet 121, an outlet 122 and a beverage flow path linking the inlet 121 to the outlet 122 and which passes through the interior 120. The inlet 121 and outlet 122 are initially sealed by the laminate 5 and are opened in use by piercing or cutting of the laminate 5. The beverage flow path is defined by spatial inter-relationships between the outer member 2, inner member 3 and laminate 5 as discussed below. Other components may optionally be included in the cartridge 1, such as a filter 4, as will be described further below.

A first version of cartridge 1 which will be described for background purposes is shown in Figures 1 to 11. The first version of the cartridge 1 is particularly designed for use in dispensing filtered products such as roast and ground coffee or leaf tea. However, this version of the cartridge 1 and the other versions described below may be used with other products such as chocolate, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

As can be seen from Figure 5, the overall shape of the cartridge 1 is generally circular or disc-shaped with the diameter of the cartridge 1 being significantly greater than its height. A major axis X passes through the centre of the outer member as shown in Figure 1. Typically the overall diameter of the outer member 2 is 74.5 mm ±6mm and the

overall height is 16 mm ±3mm. Typically the volume of the cartridge 1 when assembled is 30.2 ml ±20%.

The outer member 2 generally comprises a bowl-shaped shell 10 having a curved annular wall 13, a closed top 11 and an open bottom 12. The diameter of the outer member 2 is smaller at the top 11 compared to the diameter at the bottom 12, resulting from a flaring of the annular wall 13 as one traverses from the closed top 11 to the open bottom 12. The annular wall 13 and closed bottom 11 together define a receptacle having an interior 34.

A hollow inwardly directed cylindrical extension 18 is provided in the closed top 11 centred on the major axis X. As more clearly shown in Figure 2, the cylindrical extension 18 comprises a stepped profile having first, second and third portions 19, 20 and 21. The first portion 19 is right circular cylindrical. The second portion 20 is frusto-conical in shape and is inwardly tapered. The third portion 21 is another right circular cylinder and is closed off by a lower face 31. The diameter of the first, second and third portion 19, 20 and 21 incrementally decreases such that the diameter of the cylindrical extension 18 decreases as one traverses from the top 11 to the closed lower face 31 of the cylindrical extension 18. A generally horizontal shoulder 32 is formed on the cylindrical extension 18 at the junction between the second and third portions 20 and 21.

An outwardly extending shoulder 33 is formed in the outer member 2 towards the bottom 12. The outwardly extending shoulder 33 forms a secondary wall 15 co-axial with the annular wall 13 so as to define an annular track forming a manifold 16 between the secondary wall 15 and the annular wall 13. The manifold 16 passes around the

circumference of the outer member 2. A series of slots 17 are provided in the annular wall 13 level with the manifold 16 to provide gas and liquid communication between the manifold 16 and the interior 34 of the outer member 2. As shown in Figure 3, the slots 17 comprise vertical slits in the annular wall 13. Between 20 and 40 slots are provided. In the embodiment shown thirty-seven slots 17 are provided generally equi-spaced around the circumference of the manifold 16. The slots 17 are preferably between 1.4 and 1.8 mm in length. Typically the length of each slot is 1.6 mm representing 10% of the overall height of the outer member 2. The width of each slot is between 0.25 and 0.35 mm. Typically, the width of each slot is 0.3 mm. The width of the slots 17 is sufficiently narrow to prevent the beverage ingredients passing therethrough into the manifold 16 either during storage or in use.

An inlet chamber 26 is formed in the outer member 2 at the periphery of the outer member 2. A cylindrical wall 27 is provided, as most clearly shown in Figure 5, which defines the inlet chamber 26 within, and partitions the inlet chamber 26 from, the interior 34 of the outer member 2. The cylindrical wall 27 has a closed upper face 28 which is formed on a plane perpendicular to the major axis X and an open lower end 29 co-planar with the bottom 12 of the outer member 2. The inlet chamber 26 communicates with the manifold 16 via two slots 30 as shown in Figure 1. Alternatively, between one and four slots may be used to communicate between the manifold 16 and the inlet chamber 26.

A lower end of the outwardly extending shoulder 33 is provided with an outwardly extending flange 35 which extends

perpendicularly to the major axis X. Typically the flange 35 has a width of between 2 and 4 mm. A portion of the flange 35 is enlarged to form a handle 24 by which the outer member 2 may be held. The handle 24 is provided with an upturned rim 25 to improve grip.

The outer member 2 is formed as a single integral piece from high density polyethylene, polypropylene, polystyrene, polyester, or a laminate of two or more of these materials. A suitable polypropylene is the range of polymers available from DSM UK Limited (Redditch, United Kingdom). The outer member may be opaque, transparent or translucent. The manufacturing process may be injection moulding.

The inner member 3 as shown in Figures 7 to 10, comprises an annular frame 41 and a downwardly extending cylindrical funnel 40. A major axis X passes through the centre of the inner member 3 as shown in Figure 7.

As best shown in Figure 8, the annular frame 41 comprises an outer rim 51 and an inner hub 52 joined by ten equi-spaced radial spokes 53. The inner hub 52 is integral with and extends from the cylindrical funnel 40. Filtration apertures 55 are formed in the annular frame 41 between the radial spokes 53. A filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The filter is preferably made from a material with a high wet strength, for example a non-woven fibre material of polyester. Other materials which may be used include a water-impermeable cellulosic material, such as a cellulosic material comprising woven paper fibres. The woven paper fibres may be admixed with fibres of polypropylene, polyvinyl chloride and/or polyethylene. The incorporation of these plastic materials into the cellulosic material

renders the cellulosic material heat-sealable. The filter 4 may also be treated or coated with a material which is activated by heat and/or pressure so that it can be sealed to the annular frame 41 in this way.

As shown in the cross-sectional profile of Figure 7, the inner hub 52 is located at a lower position than the outer rim 51, resulting in the annular frame 41 having a sloping lower profile.

The upper surface of each spoke 53 is provided with an upstanding web 54 which divides a void space above the annular frame 41 into a plurality of passages 57. Each passage 57 is bounded on either side by a web 54 and on a lower face by the filter 4. The passages 57 extend from the outer rim 51 downwardly towards, and open into, the cylindrical funnel 40 at openings 56 defined by the inner extremities of the webs 54.

The cylindrical funnel 40 comprises an outer tube 42 surrounding an inner discharge spout 43. The outer tube 42 forms the exterior of the cylindrical funnel 40. The discharge spout 43 is joined to the outer tube 42 at an upper end of the discharge spout 43 by means of an annular flange 47. The discharge spout 43 comprises an inlet 45 at an upper end which communicates with the openings 56 of the passages 57 and an outlet 44 at a lower end through which the prepared beverage is discharged into a cup or other receptacle. The discharge spout 43 comprises a frusto-conical portion 48 at an upper end and a cylindrical portion 58 at a lower end. The cylindrical portion 58 may have a slight taper such that it narrows towards the outlet 44. The frusto-conical portion 48 helps to channel beverage from the passages 57 down towards the outlet 44 without inducing

turbulence to the beverage. An upper surface of the frusto-conical portion 48 is provided with four support webs 49 equi-spaced around the circumference of the cylindrical funnel 40. The support webs 49 define channels 50 therebetween. The upper edges of the support webs 49 are level with one another and perpendicular to the major axis X.

The inner member 3 may be formed as a single integral piece from polypropylene or a similar material as described above and by injection moulding in the same manner as the outer member 2.

Alternatively, the inner member 3 and/or the outer member 2 may be made from a biodegradable polymer. Examples of suitable materials include degradable polyethylene (for example, SPITEK supplied by Symphony Environmental, Borehamwood, United Kingdom), biodegradable polyester amide (for example, BAK 1095 supplied by Symphony Environmental), poly lactic acids (PLA supplied by Cargil, Minnesota, USA), starch-based polymers, cellulose derivatives and polypeptides.

The laminate 5 is formed from two layers, a first layer of aluminium and a second layer of cast polypropylene. The aluminium layer is between 0.02 and 0.07 mm in thickness. The cast polypropylene layer is between 0.025 and 0.065 mm in thickness. In one embodiment the aluminium layer is 0.06 mm and the polypropylene layer is 0.025 mm thick. This laminate is particularly advantageous as it has a high resistance to curling during assembly. As a result the laminate 5 may be pre-cut to the correct size and shape and subsequently transferred to the assembly station on the production line without undergoing distortion. Consequently,

the laminate 5 is particularly well suited to welding. Other laminate materials may be used including PET/Aluminium/PP, PE/EVOH/PP, PET/metallised/PP and Aluminium/PP laminates. Roll laminate stock may be used instead of die cut stock.

The cartridge 1 may be closed by a rigid or semi-rigid lid instead of a flexible laminate.

Assembly of the cartridge 1 involves the following steps:

a) the inner member 3 is inserted into the outer member 2;

b) the filter 4 is cut to shape and placed onto the inner member 3 so to be received over the cylindrical funnel 40 and come to rest against the annular frame 41;

c) the inner member 3, outer member 2 and filter 4 are joined by ultrasonic welding;

d) the cartridge 1 is filled with one or more beverage ingredients;

e) the laminate 5 is affixed to the outer member 2.

These steps will be discussed in greater detail below.

The outer member 2 is orientated with the open bottom 12 directed upwards. The inner member 3 is then inserted into the outer member 2 with the outer rim 51 being received as a loose fit in an axial extension 14 at top 11 of the cartridge 1. The cylindrical extension 18 of the outer member 2 is at the same time received in the upper portion of the cylindrical funnel 40 of the inner member 3. The third portion 21 of the cylindrical extension 18 is seated inside the cylindrical funnel 40 with the closed lower face 31 of the cylindrical extension 18 bearing against the support webs 49 of the inner member 3. The filter 4 is then

placed over the inner member 3 such that the filter material contacts the annular rim 51. An ultrasonic welding process is then used to join the filter 4 to the inner member 3 and at the same time, and in the same process step, the inner member 3 to the outer member 2. The inner member 3 and filter 4 are welded around the outer rim 51. The inner member 3 and outer member 2 are joined by means of weld lines around the outer rim 51 and also the upper edges of the webs 54.

As shown most clearly in Figure 11, the outer member 2 and inner member 3 when joined together define a void space 130 in the interior 120 below the annular flange 41 and exterior the cylindrical funnel 40 which forms a filtration chamber. The filtration chamber 130 and passages 57 above the annular frame 41 are separated by the filter paper 4.

The filtration chamber 130 contains the one or more beverage ingredients 200. The one or more beverage ingredients are packed into the filtration chamber 130. For a filtered style beverage the ingredient is typically roast and ground coffee or leaf tea. The density of packing of the beverage ingredients in the filtration chamber 130 can be varied as desired. Typically, for a filtered coffee product the filtration chamber contains between 5.0 and 10.2 grams of roast and ground coffee in a filtration bed of thickness of typically 5 to 14 mm. Optionally, the interior 120 may contain one or more bodies, such as spheres, which are freely movable within the interior 120 to aid mixing by inducing turbulence and breaking down deposits of beverage ingredients during discharge of the beverage.

The laminate 5 is then affixed to the outer member 2 by forming a weld 126 around the periphery of the laminate 5 to

join the laminate 5 to the lower surface of the outwardly extending flange 35. The weld 126 is extended to seal the laminate 5 against the lower edge of the cylindrical wall 27 of the inlet chamber 26. Further, a weld 125 is formed between the laminate 5 and the lower edge of the outer tube 42 of the cylindrical funnel 40. The laminate 5 forms the lower wall of the filtration chamber 130 and also seals the inlet chamber 26 and cylindrical funnel 40. However, a small gap 123 exists prior to dispensation between the laminate 5 and the lower edge of the discharge spout 43. A variety of welding methods may be used, such as heat and ultrasonic welding, depending on the material characteristics of the laminate 5.

Advantageously, the inner member 3 spans between the outer member 2 and the laminate 5. The inner member 3 is formed from a material of relative rigidity, such as polypropylene. As such, the inner member 3 forms a load-bearing member that acts to keep the laminate 5 and outer member 2 spaced apart when the cartridge 1 is compressed. It is preferred that the cartridge 1 is subjected to a compressive load of between 130 and 280N in use. The compressive force acts to prevent the cartridge failing under internal pressurisation and also serves to squeeze the inner member 3 and outer member 2 together. This ensures that the internal dimensions of passageways and apertures in the cartridge 1 are fixed and unable to change during pressurisation of the cartridge 1.

To use the cartridge 1 it is first inserted into a beverage preparation machine and the inlet 121 and outlet 122 are opened by piercing members of the beverage preparation machine which perforate and fold back the

laminate 5. An aqueous medium, typically water, under pressure enters the cartridge 1 through the inlet 121 into the inlet chamber 26 at a pressure of between 0.1-2.0 bar. From there the water is directed to flow through the slots 30 and round the manifold 16 and into the filtration chamber 130 of the cartridge 1 through the plurality of slots 17. The water is forced radially inwardly through the filtration chamber 130 and mixes with the beverage ingredients 200 contained therein. The water is at the same time forced upwardly through the beverage ingredients. The beverage formed by passage of the water through the beverage ingredients passes through the filter 4 and filtration apertures 55 into the passages 57 lying above the annular frame 41. The sealing of the filter 4 onto the spokes 53 and the welding of the rim 51 with the outer member 2 ensures that there are no short-circuits and all the beverage has to pass through the filter 4.

The beverage then flows downwardly along the radial passages 57 formed between the webs 54 and through the openings 56 and into the cylindrical funnel 40. The beverage passes along the channels 50 between the support webs 47 and down the discharge spout 43 to the outlet 44 where the beverage is discharged into a receptacle such as a cup.

Preferably, the beverage preparation machine comprises an air purge facility, wherein compressed air is forced through the cartridge 1 at the end of the operating cycle to flush out the remaining beverage into the receptacle.

A second version of cartridge 1 will now be described for background purposes with reference to Figures 12 to 18. The second version of the cartridge 1 is particularly designed for use in dispensing espresso-style products such

as roast and ground coffee where it is desirable to produce a beverage having a froth of tiny bubbles known as a crema. Many of the features of the second version of the cartridge 1 are the same as in the first version and like numerals have been used to reference like features. In the following description the differences between the first and second versions will be discussed. Common features which function in the same manner will not be discussed in detail.

The outer member 2 is of the same construction as in the first version of cartridge 1 and as shown in Figures 1 to 6.

The annular frame 41 of the inner member 3 is the same as in the first version. Also, a filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The outer tube 42 of the cylindrical funnel 40 is also as before. However, there are a number of differences in the construction of the inner member 2 of the second version compared to the first version. As shown in Figure 16, the discharge spout 43 is provided with a partition 65 which extends part way up the discharge spout 43 from the outlet 44. The partition 65 helps to prevent the beverage spraying and/or splashing as it exits the discharge spout 43. The profile of the discharge spout 43 is also different and comprises a stepped profile with a distinct dog-leg 66 near an upper end of the tube 43.

A rim 67 is provided upstanding from the annular flange 47 joining the outer tube 42 to the discharge spout 43. The rim 67 surrounds the inlet 45 to the discharge spout 43 and defines an annular channel 69 between the rim 67 and the upper portion of the outer tube 42. The rim 67 is provided with an inwardly directed shoulder 68. At one point around

the circumference of the rim 67 an aperture 70 is provided in the form of a slot which extends from an upper edge of rim 67 to a point marginally below the level of the shoulder 68 as most clearly shown in Figures 12 and 13. The slot has a width of 0.64 mm.

An air inlet 71 is provided in annular flange 47 circumferentially aligned with the aperture 70 as shown in Figures 16 and 17. The air inlet 71 comprises an aperture passing through the flange 47 so as to provide communication between a point above the flange 47 and the void space below the flange 47 between the outer tube 42 and discharge spout 43. Preferably, and as shown, the air inlet 71 comprises an upper frusto-conical portion 73 and a lower cylindrical portion 72. The air inlet 71 is typically formed by a mould tool such as a pin. The tapered profile of the air inlet 71 allows the mould tool to be more easily removed from the moulded component. The wall of the outer tube 42 in the vicinity of the air inlet 71 is shaped to form a chute 75 leading from the air inlet 71 to the inlet 45 of the discharge spout 43. As shown in Figure 17, a canted shoulder 74 is formed between the air inlet 71 and the chute 75 to ensure that the jet of beverage issuing from the slot 70 does not immediately foul on the upper surface of the flange 47 in the immediate vicinity of the air inlet 71.

The assembly procedure for the second version of cartridge 1 is similar to the assembly of the first version. However, there are certain differences. As shown in Figure 18, the third portion 21 of the cylindrical extension 18 is seated inside the support rim 67 rather than against support webs. The shoulder 32 of the cylindrical extension 18 between the second portion 20 and third portion 21 bears

against the upper edge of the support rim 67 of the inner member 3. An interface zone 124 is thus formed between the inner member 3 and the outer member 2 comprising a face seal between the cylindrical extension 18 and the support rim 67 which extends around nearly the whole circumference of the cartridge 1. The seal between the cylindrical extension 18 and the support rim 67 is not fluid-tight though since the slot 70 in the support rim 67 extends through the support rim 67 and downwardly to a point marginally below the shoulder 68. Consequently the interface fit between the cylindrical extension 18 and the support rim 67 transforms the slot 70 into an aperture 128, as most clearly shown in Figure 18, providing gas and liquid communication between the annular channel 69 and the discharge spout 43. The aperture is typically 0.64 mm wide by 0.69 mm long.

Operation of the second version of cartridge 1 to dispense a beverage is similar to the operation of the first version but with certain differences. Beverage in the radial passages 57 flows downwardly along the passages 57 formed between the webs 54 and through the openings 56 and into the annular channel 69 of the cylindrical funnel 40. From the annular channel 69 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 130 and passages 57. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 18, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is entrained into the beverage stream in the form of a multitude of small air

bubbles as the air is drawn up through the air inlet 71. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired crema. Thus, the aperture 128 and the air inlet 71 together form an eductor which acts to entrain air into the beverage. Flow of beverage into the eductor should be kept as smooth as possible to reduce pressure losses. Advantageously, the walls of the eductor should be made concave to reduce losses due to 'wall effect' friction. The dimensional tolerance of the aperture 128 is small. Preferably the aperture size is fixed plus or minus 0.02 mm^2. Hairs, fibrils or other surface irregularities can be provided within or at the exit of the eductor to increase the effective cross-sectional area which has been found to increase the degree of air entrainment.

A third version of cartridge 1 will now be described for background purposes and is shown in Figures 19 to 29. The third version of the cartridge 1 is particularly designed for use in dispensing soluble products which may be in powdered, liquid, syrup, gel or similar form. The soluble product is dissolved by or forms a suspension in, an aqueous medium such as water when the aqueous medium is passed, in use, through the cartridge 1. Examples of beverages include chocolate, coffee, milk, tea, soup or other rehydratable or aqueous-soluble products. Many of the features of the third version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the third and previous versions will be discussed.

Common features which function in the same manner will not be discussed in detail.

Compared to the outer member 2 of the previous versions, the hollow inwardly directed cylindrical extension 18 of the outer member 2 of the third version has a larger overall diameter as shown in Figure 20. In particular the diameter of the first portion 19 is typically between 16 and 18 mm compared to 13.2 mm for the outer member 2 of the previous versions. In addition, the first portion 19 is provided with a convex outer surface 19a, or bulge, as most clearly shown in Figure 20, the function of which will be described below. The diameter of the third portions 21 of the cartridges 1 are however the same resulting in the area of the shoulder 32 being greater in this, the third version of the cartridge 1. Typically the volume of the cartridge 1 when assembled is 32.5 ml ±20%.

The number and positioning of the slots in the lower end of the annular wall 13 is also different. Between 3 and 5 slots are provided. In the embodiment as shown in Figure 23, four slots 36 are provided equi-spaced around the circumference of the manifold 16. The slots 36 are slightly wider than in the previous versions of the cartridge 1 being between 0.35 and 0.45 mm, preferably 0.4 mm wide.

In other respects the outer members 2 of the cartridges 1 are the same.

The construction of the cylindrical funnel 40 of the inner member 3 is the same as in the first version of cartridge 1 with an outer tube 42, discharge spout 45, annular flange 47 and support webs 49 being provided. The only difference is that the discharge spout 45 is shaped

with an upper frusto-conical section 92 and a lower cylindrical section 93.

In contrast to the previous versions and as shown in Figures 24 to 28, the annular frame 41 is replaced by a skirt portion 80 which surrounds the cylindrical funnel 40 and is joined thereto by means of eight radial struts 87 which adjoin the cylindrical funnel 40 at or near the annular flange 47. A cylindrical extension 81 of the skirt portion 80 extends upwardly from the struts 87 to define a chamber 90 with an open upper face. An upper rim 91 of the cylindrical extension 81 has an in-turned profile as shown in Figure 26. An annular wall 82 of the skirt portion 80 extends downwardly from the struts 87 to define an annular channel 86 between the skirt portion 80 and the outer tube 42.

The annular wall 82 comprises at a lower end an exterior flange 83 which lies perpendicular to the major axis X. A rim 84 depends downwardly from a lower surface of the flange 83 and contains five apertures 85 which are circumferentially equi-spaced around the rim 84. Thus, the rim 84 is provided with a castellated lower profile.

Apertures 89 are provided between the struts 87 allowing communication between the chamber 90 and the annular channel 86.

The assembly procedure for the third version of cartridge 1 is similar to the assembly of the first version but with certain differences. The outer member 2 and inner member 3 are push-fitted together as shown in Figure 29 and retained by means of a snap-fit arrangement rather than welded together. On joining the two members the inwardly directed cylindrical extension 18 is received inside the

upper cylindrical extension 81 of the skirt portion 80. The inner member 3 is retained in the outer member 2 by frictional interengagement of the convex outer surface 19a of the first portion 19 of the cylindrical extension 18 with the in-turned rim 91 of the upper cylindrical extension 81. With the inner member 3 located in the outer member 2 a mixing chamber 134 is defined located exterior to the skirt portion 80. The mixing chamber 134 contains the beverage ingredients 200 prior to dispensation. It should be noted that the four inlets 36 and the five apertures 85 are staggered circumferentially with respect to one another. The radial location of the two parts relative to each other need not be determined or fixed during assembly since the use of four inlets 36 and five apertures 85 ensures that misalignment occurs between the inlets and apertures whatever the relative rotational positioning of the components.

The one or more beverage ingredients are packed into the mixing chamber 134 of the cartridge. The density of packing of the beverage ingredients in the mixing chamber 134 can be varied as desired.

The laminate 5 is then affixed to the outer member 2 and inner member 3 in the same manner as described above in the previous versions.

In use, water enters the mixing chamber 134 through the four slots 36 in the same manner as previous versions of the cartridge. The water is forced radially inwardly through the mixing chamber and mixes with the beverage ingredients contained therein. The product is dissolved or mixed in the water and forms the beverage in the mixing chamber 134 and is then driven though the apertures 85 into the annular

channel 86 by back pressure of beverage and water in the mixing chamber 134. The circumferential staggering of the four inlet slots 36 and the five apertures 85 ensures that jets of water are not able to pass radially directly from the inlet slots 36 to the apertures 85 without first circulating within the mixing chamber 134. In this way the degree and consistency of dissolution or mixing of the product is significantly increased. The beverage is forced upwardly in the annular channel 86, through the apertures 89 between the struts 87 and into the chamber 90. The beverage passes from chamber 90 through the inlets 45 between the support webs 49 into the discharge spout 43 and towards the outlet 44 where the beverage is discharged into a receptacle such as a cup. The cartridge finds particular application with beverage ingredients in the form of viscous liquids or gels. In one application a liquid chocolate ingredient is contained in the cartridge 1 with a viscosity of between 1700 and 3900mPa at ambient temperature and between 5000 and 10000mPa at 0°C and a refractive solids of 67 Brix ±3. In another application liquid coffee is contained in the cartridge 1 with a viscosity of between 70 and 2000mPa at ambient and between 80 and 5000mPa at 0°C where the coffee has a total solids level of between 40 and 70%. The liquid coffee ingredient may contain between 0.1 and 2.0% by weight sodium bicarbonate, preferably between 0.5 and 1.0% by weight. The sodium bicarbonate acts to maintain the pH level of the coffee at or below 4.8 enabling a shelf-life for coffee-filled cartridges of up to 12 months.

A fourth version of cartridge 1 embodying the present invention is shown in Figures 30 to 34. The fourth version of the cartridge 1 is particularly designed for use in

dispensing liquid products such as concentrated liquid milk. Many of the features of the fourth version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the fourth and previous versions will be discussed. Common features which function in the same manner will not be discussed in detail.

The outer member 2 is the same as in the third version of cartridge 1 and as shown in Figures 19 to 23.

The cylindrical funnel 40 of the inner member 3 is similar to that shown in the second version of cartridge 1 but with certain differences. As shown in Figure 30 the discharge spout 43 is shaped with an upper frusto-conical section 106 and a lower cylindrical section 107. Three axial ribs 105 are provided on the inner surface of the discharge spout 43 to direct the dispensed beverage downwards towards the outlet 44 and prevent the discharged beverage from spinning within the spout. Consequently, the ribs 105 act as baffles. As in the second version of cartridge 1, an air inlet 71 is provided through the annular flange 47. However, the chute 75 beneath the air inlet 71 is more elongated than in the second version.

A skirt portion 80 is provided similar to that shown in the third version of the cartridge 1 described above. Between 5 and 12 apertures 85 are provided in the rim 84. Typically ten apertures are provided rather than the five provided in the third version of cartridge 1.

An annular bowl 100 is provided extending from and integral with the flange 83 of the skirt portion 80. The annular bowl 100 comprises a flared body 101 with an open upper mouth 104 which is directed upwards. Four feed

apertures 103 shown in Figures 30 and 31 are located in the body 101 at or near the lower end of the bowl 100 where it joins the skirt portion 80. Preferably, the feed apertures are equi-spaced around the circumference of the bowl 100. The bowl 100 joins the skirt portion 80 part-way up its length such that a discrete gap is provided between the bowl 100 and the laminate 5 when the cartridge is assembled. Thus, the apertures 85 are located below the level of the bowl 100. As can be seen from Figure 34, when the cartridge 1 is assembled and filled the bowl 100 contains a proportion of the liquid beverage ingredients therein, effectively partitioning that proportion of the beverage ingredients from the apertures 85.

The laminate 5 is of the type described above in the previous embodiments.

The assembly procedure for the fourth version of cartridge 1 is the same as that for the third version.

Operation of the fourth version of cartridge is similar to that of the third version. The water enters the cartridge 1 and the mixing chamber 134 in the same manner as before. There the water mixes with and dilutes the liquid product which is then forced out below the bowl 100 and through the apertures 85 towards the outlet 44 as described above. The proportion of the liquid product initially contained within the annular bowl 100 as shown in Figure 34 is not subject to immediate dilution by the water entering the mixing chamber 134. Rather, the diluted liquid product in the lower part of the mixing chamber 134 will tend to exit through apertures 85 rather than be forced up and into the annular bowl 100 through upper mouth 104. Consequently, the liquid product in the annular bowl 100 will remain

relatively concentrated during the initial stages of the operating cycle compared to the product in the lower part of the mixing chamber 134. The liquid product in the annular bowl 100 drips through the feed apertures 103 under gravity into the stream of product exiting the mixing chamber 134 through the apertures 85 and below the bowl 100. The annular bowl 100 acts to even out the concentration of the diluted liquid product entering the cylindrical funnel 40 by holding back a proportion of the concentrated liquid product and releasing it into the exiting liquid stream flow path steadily throughout the operating cycle as illustrated in Figure 46a where the concentration of the milk measured as a percentage of the total solids present is shown during an operating cycle of approximately 15 seconds. Line a illustrates the concentration profile with the bowl 100 whilst line b illustrates a cartridge without the bowl 100. As can be seen the concentration profile with the cup 100 is more even during the operating cycle and there is no immediate large drop in concentration as occurs without the bowl 100. The initial concentration of the milk is typically 30-35% SS and at the end of the cycle 10% SS. This results in a dilution ratio of around 3 to 1, although dilution ratios of between 1 to 1 and 6 to 1 are possible with the present invention. For other liquid beverage ingredients the concentrations may vary. For example for liquid chocolate the initial concentration is approximately 67% SS and at the end of the cycle 12-15% SS. This results in a dilution ratio (ratio of aqueous medium to beverage ingredient in dispensed beverage) of around 5 to 1, although dilution ratios of between 2 to 1 and 10 to 1 are possible with the present invention. For liquid coffee the initial concentration is

between 40-67% and the concentration at the end of dispense 1-2% SS. This results in a dilution ratio of between 20 to 1 and 70 to 1, although dilution ratios of between 10 to 1 and 100 to 1 are possible with the present invention.

From the annular channel 86 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 134 and chamber 90. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 34, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is entrained into the beverage stream in the form of a multitude of small air bubbles as the air is drawn up through the air inlet 71. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired frothy appearance.

Advantageously, the inner member 3, outer member 2, laminate 5 and filter 4 can all be readily sterilised due to the components being separable and not individually comprising tortuous passageways or narrow crevices. Rather, it is only after conjoining the components, after sterilisation, that the necessary passageways are formed. This is particularly important where the beverage ingredient is a dairy-based product such as liquid milk concentrate.

The fourth embodiment of beverage cartridge is particularly advantageous for dispensing a concentrated dairy-based liquid product such as liquid milk. Previously, powdered milk products have been provided in the form of

sachets for adding to a pre-prepared beverage. However, for a cappuccino-style beverage it is necessary to foam the milk. This has been achieved previously by passing steam through a liquid milk product. However this necessitates the provision of a steam supply which increases the cost and complexity of the machine used to dispense the beverage. The use of steam also increases the risk of injury during operation of the cartridge. Accordingly the present invention provides for a beverage cartridge having a concentrated dairy-based liquid product therein. It has been found that by concentrating the milk product a greater amount of foam can be produced for a particular volume of milk when compared to fresh or UHT milk. This reduces the size required for the milk cartridge. Fresh semi-skimmed milk contains approximately 1.6% fat and 10% total solids. The concentrated liquid milk preparations of the present invention contain between 0.1 and 12% fat and 25 to 40% total solids. In a typical example, the preparation contains 4% fat and 30% total solids. The concentrated milk preparations are suitable for foaming using a low pressure preparation machine as will be described below. In particular, foaming of the milk is achieved at pressures below 2 bar, preferably approximately 1.5 bar using the cartridge of the fourth embodiment described above.

The foaming of the concentrated milk is particularly advantageous for beverages such as cappuccinos and milk shakes. Preferably the passing of the milk through the aperture 128 and over the air inlet 71 and the optional use of the bowl 100 enables foaming levels of greater than 40%, preferably greater than 70% for milk. For liquid chocolate foaming levels of greater than 70% are possible. For liquid

coffee foaming levels of greater than 70% are possible. The foamability level is measured as the ratio of the volume of the foam produced to the volume of liquid beverage ingredient dispensed. For example, where 138.3ml of beverage is dispensed, of which 58.3ml is foam the foamability is measured as [58.3/(138.3-58.3)]*100 = 72.9%. The foamability of the milk (and other liquid ingredients) is enhanced by the provision of the bowl 100 as can be seen in Figure 46b. The foamability of the milk dispensed with the bowl 100 present (line a) is greater than that of milk dispensed without the bowl present (line b). This is because the foamability of the milk is positively correlated to the concentration of the milk and as shown in Figure 35a the bowl 100 maintains a higher concentration of the milk a larger part of the operating cycle. It is also known that foamability of the milk is positively correlated to temperature of the aqueous medium as shown in Figure 46c. Thus the bowl 100 is advantageous since more of the milk remains in the cartridge until near the end of the operating cycle when the aqueous medium is at its hottest. This again improves foamability.

The cartridge of the fourth embodiment is also advantageous in dispensing liquid coffee products.

It has been found that the embodiments of beverage cartridge of the present invention advantageously provide an improved consistency of the brewed beverage when compared to prior art cartridges. Reference is made to Table 1 below which shows the results of brew yields for twenty samples each of cartridges A and B containing roast and ground coffee. Cartridge A is a beverage cartridge according to the first embodiment of the present invention. Cartridge B is a

prior art beverage cartridge as described in the applicant's document WO01/58786. The refractive index of the brewed beverage is measured in Brix units and converted to a percentage of soluble solids (%SS) using standard tables and formulae. In the examples below:

$$\%SS = 0.7774 * (\text{Brix value}) + 0.0569.$$

$$\%\ \text{Yield} = (\%SS * \text{Brew Volume (g)})/(100 * \text{Coffee Weight (g)})$$

Table 1

CARTRIDGE A

Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	105.6	6.5	1.58	1.29	20.88
2	104.24	6.5	1.64	1.33	21.38
3	100.95	6.5	1.67	1.36	21.05
4	102.23	6.5	1.71	1.39	21.80
5	100.49	6.5	1.73	1.40	21.67
6	107.54	6.5	1.59	1.29	21.39
7	102.70	6.5	1.67	1.36	21.41
8	97.77	6.5	1.86	1.50	22.61
9	97.82	6.5	1.7	1.38	20.75
10	97.83	6.5	1.67	1.36	20.40
11	97.6	6.5	1.78	1.44	21.63
12	106.64	6.5	1.61	1.31	21.47
13	99.26	6.5	1.54	1.25	19.15
14	97.29	6.5	1.59	1.29	19.35
15	101.54	6.5	1.51	1.23	19.23
16	104.23	6.5	1.61	1.31	20.69
17	97.5	6.5	1.73	1.40	21.03
18	100.83	6.5	1.68	1.36	21.14
19	101.67	6.5	1.67	1.36	21.20
20	101.32	6.5	1.68	1.36	21.24
				AVERAGE	20.99

CARTRIDGE B

Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (°)	% Yield
1	100.66	6.5	1.87	1.511	23.39
2	95.85	6.5	1.86	1.503	22.16
3	98.4	6.5	1.8	1.456	22.04
4	92.43	6.5	2.3	1.845	26.23
5	100.26	6.5	1.72	1.394	21.50
6	98.05	6.5	2.05	1.651	24.90
7	99.49	6.5	1.96	1.581	24.19
8	95.62	6.5	2.3	1.845	27.14
9	94.28	6.5	2.17	1.744	25.29
10	96.13	6.5	1.72	1.394	20.62
11	96.86	6.5	1.81	1.464	21.82
12	94.03	6.5	2.2	1.767	25.56
13	96.28	6.5	1.78	1.441	21.34
14	95.85	6.5	1.95	1.573	23.19
15	95.36	6.5	1.88	1.518	22.28
16	92.73	6.5	1.89	1.526	21.77
17	88	6.5	1.59	1.293	17.50
18	93.5	6.5	2.08	1.674	24.08
19	100.88	6.5	1.75	1.417	22.00
20	84.77	6.5	2.37	1.899	24.77
				AVERAGE	23.09

Performing a t-test statistical analysis on the above data gives the following results:

Table 2

t-Test: Two-Sample Assuming Equal Variances

	% Yield (Cartridge A)	*% Yield (Cartridge B)*
Mean	20.99	23.09
Variance	0.77	5.04
Observations	20	20
Pooled Variance	2.90	
Hypothesized Mean Difference	0	
df	38	
t Stat	-3.90	
P(T<=t) one-tail	0.000188	

t Critical one-tail	1.686	
P(T<=t) two-tail	0.000376	
t Critical two-tail	2.0244	
Standard Deviation	0.878	2.245

The analysis shows that the consistency of % yield, which equates to brew strength, for the cartridges of the present invention is significantly better (at a 95% confidence level) than the prior art cartridges, with a standard deviation of 0.88% compared to 2.24%. This means that beverages brewed with the cartridges of the present invention have a more repeatable and uniform strength. This is preferred by consumers who like their drinks to taste the same time after time and do not want arbitrary changes in brew strength.

The materials of the cartridges described above may be provided with a barrier coating to improve their resistance to oxygen and/or moisture and/or other contaminant ingress. The barrier coating may also improve the resistance to leakage of the beverage ingredients from within the cartridges and/or reduce the degree of leaching of extractibles from the cartridge materials which might adversely affect the beverage ingredients. The barrier coating may be of a material selected from the group of PET, Polyamide, EVOH, PVDC or a metallised material. The barrier coating may be applied by a number of mechanisms including but not limited to vapour deposition, vacuum deposition, plasma coating, co-extrusion, in-mould labelling and two/multi-stage moulding.

A beverage preparation machine 201 for use with the present invention for use with the above described beverage cartridges is shown in Figures 35 to 45. The beverage

preparation machine 201 generally comprises a housing 210 containing a water tank 220, a water heater 225, a water pump 230, an air compressor 235, a control processor, a user interface 240 and a cartridge head 250. The cartridge head 250 in turn generally comprises a cartridge holder 251 for holding, in use, the beverage cartridge 1, cartridge recognition means 252 and inlet and outlet piercers 253, 254 for forming, in use, the inlet 121 and the outlet 122 in the beverage cartridge 1.

The housing 210 contains and holds in position the other components of the machine 201. The housing 210 preferably made in whole or in part from a robust plastics material such as ABS. Alternatively, the housing 210 can be made in whole or in part from a metallic material such as stainless steel or aluminium. The housing 210 is preferably comprises a clam-shell design having a front half 211 and a rear half 212 which allow access during assembly for fitting of the machine 201 components and can afterwards be joined together to define an interior 213 of the housing 210. The rear half 212 provides a recess 214 for the attachment of the water tank 220. The housing 210 is formed with means, such as detents, abutments, bosses and threaded portions, for retaining the components of the machine 201 in position without the need for a separate chassis. This reduces the overall cost and weight of the machine 201. A base 215 of the housing 210 is preferably provided with feet for standing the machine thereon in a stable manner. Alternatively, the base 215 itself may have a shape forming a stable support.

The front half 211 of the housing 210 comprises a dispense station 270 where dispensation of the beverage

takes place. The dispense station 270 comprises a receptacle stand 271 having a hollow interior forming a drip tray 272. An upper surface 273 of the receptacle stand is provided with a grill 274 on which the receptacle is positioned. The drip tray 272 is removable from the housing 210 to ease emptying of the collected water. A recess 275 is formed in the front half of the housing 210 above the receptacle stand 271 to accommodate the dimensions of the receptacle.

The cartridge head 250 is located towards the top of the housing 210 above the receptacle stand as shown in Figures 35 and 36. Preferably, the height of the grill 274 relative to the cartridge head 250 can be adjusted to accommodate different sizes of receptacle. It is preferred that the receptacle is as close to the cartridge head 250 as possible, whilst still allowing the receptacle to be inserted and withdrawn from the dispense station 270, so as to minimise the height that the dispensed beverage has to descend before contacting the receptacle. This acts to minimise spraying and splashing of the beverage and minimise loss of entrained air bubbles where these are present. Preferably receptacles of between 70mm and 110 mm in height can be inserted between the grill 274 and cartridge head 250.

The machine user interface 240 is located on the front of the housing 210 and comprises a start/stop button 241, and a plurality of status indicators 243-246.

The status indicators 243-246 preferably include a light emitting diode (LED) 243 to indicate readiness of the machine 201, a LED 244 to indicate if an error has occurred in the machine 201 operation, and one or more LEDs 245-256

to indicate whether the machine 201 is operating in manual or automatic modes. The LEDs 243-246 may be controlled to illuminate at a constant intensity, to flash intermittently, or both depending on the status of the machine 201. The LEDs 243-246 may have a variety of colours including green, red and yellow.

The start/stop button 241 controls commencement of the operating cycle and is a manually operated push-button, switch or similar.

A volume adjustment control may be provided to allow a user of the machine 201 to manually adjust the volume of the delivered beverage without altering the other operating characteristics. Preferably the volume adjustment control allows an adjustment in volume of plus or minus 20%. The volume adjustment control may be a rotary knob, a linear slider, a digital readout with increment and decrement buttons, or similar. More typically, volume is controlled by a user operating the start/stop button 241.

A manual power switch (not shown) may be provided on the machine 201. Alternatively, power supply can be controlled simply by insertion or removal or the power supply plug from the mains power supply.

The water tank 220 is located to the rear of the housing 210 and is connected to the rear half 212 of the housing 210. The water tank 220 comprises a generally cylindrical body 221 which may be right circular or a frustum as desired for aesthetic reasons. The tank comprises an inlet for filling the tank with water which is closed off in use by a manually removable lid 222. An outlet is provided towards a lower end of the tank which communicates with the water pump 230. The water tank 220 may

be made from a transparent or translucent material to allow a consumer to view the quantity of water remaining in the tank. Alternatively, the water tank 220 may be made from an opaque material but have provided a viewing window therein. In addition, or in place of the above, the water tank 220 may be provided with a low level sensor which prevents operation of the water pump 230 and optionally triggers a warning indicator, such as an LED, when the water level in the tank descends to a preselected level. The water tank 220 preferably has an internal capacity of approximately 1.5 litres.

The water pump 230 is operatively connected between the water tank 220 and the water heater 225 as shown schematically in Figure 43 and is controlled by the control processor. The pump provides a maximum flow rate of 900 ml/min of water at a maximum pressure of 2.5 bar. Preferably, in normal use, the pressure will be limited to 2 bar. The flow rate of water through the machine 201 can be controlled by the control processor to be a percentage of the maximum flow rate of the pump by cycle chopping the electrical supply to the pump. Preferably the pump can be driven at any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100% of the maximum rated flow rate. The accuracy of the volume of water pumped is preferably + or - 5% leading to a + or - 5% accuracy in the final volume of the dispensed beverage. A suitable pump is the Evolution EP8 pump produced by Ulka S.r.l. (Pavia, Italy). A volumetric flow sensor (not shown) is preferably provided in the flow line either upstream or downstream of the water pump 230. Preferably, the volumetric flow sensor is a rotary sensor.

The water heater 225 is located in the interior of the housing 210. The heater 225 has a power rating of 1550 W and is able to heat water received from the water pump 230 from a starting temperature of approximately 20 °C to an operating temperature of around 85 °C in under 1 minute. Preferably the dwell time between the end of one operating cycle and the heater 225 being able to commence a subsequent operating cycle is less than 10 seconds. The heater maintains the selected temperature to within + or - 2 °C during the operating cycle. As discussed below, the water for the operating cycle may be delivered to the cartridge head 250 at 83 °C or 93 °C. The heater 225 is able to quickly adjust the delivery temperature to either 83 °C or 93 °C from a nominal water temperature of 85 °C. The heater 225 comprises an over-temperature cut-off which shuts off the heater if the temperature exceeds 98 °C. Water output from the heater 225 is fed to the cartridge head 250 and cartridge 1 by means of a three-way valve. If the pressure of the water flow is acceptable the water is passed to the cartridge 1. If the pressure is below or above predetermined limits then the water is diverted by means of the three-way valve into the drip tray recovery receptacle 270.

The air compressor 235 is operatively connected to the cartridge head 250 by means of a one-way valve and controlled by the control processor. The air compressor 235 provides a maximum flow rate of air of 500 ml/min at 1.0 bar. In use a working volume of 35 ml is pressurised to 2.0 bar. Preferably, the air compressor 235 can produce two flow rates: a fast (or maximum) flow rate and a slow flow rate.

The control processor of the beverage preparation machine 201 comprises a processing module and a memory. The

control processor is operatively connected to, and controls operation of, the water heater 225, water pump 230, air compressor 235 and user interface 240.

The memory of the control processor includes one or more variables for one or more operational parameters for the beverage preparation machine 201. In the illustrated embodiment the operational parameters are the temperature of the water passed through the beverage cartridge 1 during the operating stage, the speed of charging the beverage cartridge 1, the presence or otherwise of a soak step, the total dispensed volume of the beverage, the flow rate of the water during the discharge stage, and the flow rate and period of the purge stage.

The variables for the operational parameters are stored in the memory. The cartridge 1 comprises a code provided on or in the cartridge 1 representing the operational parameters required for optimal dispensation of the beverage in that cartridge 1. The code is in binary format and comprises a plurality of data bits corresponding to the variables stored in the control processor memory. Table 3 illustrates how 13 bits of data can be used to represent the necessary variables for the operational parameters described above.

Table 3

Bit	Parameter	Description
0 & 1	Water temperature	00 = cold 01 = warm 10 = 83 °C 11 = 93 °C
2 & 3	Cartridge charge	00 = fast charge with soak 01 = fast charge without soak

		10 = slow charge with soak 11 = slow charge without soak
4, 5, 6 & 7	Beverage volume	0000 = 50 ml 0001 = 60 ml 0010 = 70 ml 0011 = 80 ml 0100 = 90 ml 0101 = 100 ml 0110 = 110 ml 0111 = 130 ml 1000 = 150 ml 1001 = 170 ml 1010 = 190 ml 1011 = 210 ml 1100 = 230 ml 1101 = 250 ml 1110 = 275 ml 1111 = 300 ml
8, 9 & 10	Flow rate	000 = 30% 001 = 40% 010 = 50% 011 = 60% 100 = 70% 101 = 80% 110 = 90% 111 = 100%
11 &12	Purge	00 = slow flow/short period 01 = slow flow/long period 10 = fast flow/short period 11 = fast flow/long period

The code on or in the cartridge 1 will normally comprises one or more extra data bits for error checking. In one example a 16 bit code is provided. For example, using the variables listed in Table 3, a cartridge 1 bearing the

code "1000100011110" would have the following operational parameters:

10	Water temperature of 83 °C
00	Fast charge with soak
1000	Dispensed drink volume of 150ml
111	Flow rate equals 100%
10	Fast air flow purge/short period.

Thus, unlike in previous beverage preparation machines, the memory of the control processor does not store operational instructions for beverage cartridges based on the cartridge type, i.e. instructions for a coffee cartridge, instructions for a chocolate cartridge, instructions for a tea cartridge etc. Instead the memory of the control processor stores variables for adjusting the individual operational parameters of the operating cycle. This has a number of advantages. Firstly, a greater degree of control of the dispensation cycle can be exercised. For example, slightly different operational parameters can be used for different grades or blends of coffee rather than using the same parameters for all types of coffee. Prior coding solutions relying on storing instructions by cartridge type rather than by individual parameters are unsuited to such subtle differences in operating cycles for similar beverage types because they quickly consume the available storage space in the coding medium and control processor. Secondly, the coding method of the present invention allows for new beverage cartridge types to be used in pre-existing beverage preparation machines even where the operational parameters for the operating cycle for the new beverage cartridge 1 are only decided upon after sale of the beverage preparation machine 201. This is because the

control processor of the beverage preparation machine 201 does not need to recognise that the beverage is of a new type. Rather the operational parameters of the operating cycle are set without direct reference to the beverage type. Hence the coding method of the present invention provides excellent backward compatibility of the beverage preparation machines for new beverage types. In contrast, with prior machines, the manufacturer is restricted to dispensing a new beverage type using one of the pre-existing dispensation cycles as determined by the in-market machines.

The cartridge head 250 is shown in Figures 39 to 42. The cartridge holder 251 of the cartridge head 250 comprises a fixed lower part 255, a rotatable upper part 256 and a pivotable cartridge mount 257 positioned inbetween the fixed lower part 255 and the rotatable upper part 256. The upper part 256, lower part 255 and cartridge mount 257 are rotated about a common hinge axis 258. Figures 39 to 42 show the cartridge holder 251 with some components of the machine 201 omitted for clarity.

The rotatable upper part 256 and pivotable cartridge mount 257 are moved relative to the fixed lower part 255 by means of a clamping mechanism 280. The clamping mechanism 280 comprises a clamping lever having first and second members or parts 281 and 282. The first part 281 of the clamping lever comprises a U-shaped arm which is pivotably mounted to the upper part 256 at two first pivot points 283, one on each side of the cartridge holder 251.

The second part of the clamping lever comprises two over-centre arms 282, one on each side of the cartridge holder 251 which are each pivotably mounted to the upper part 256 at a second pivot point 285 located on the hinge

axis 258 coupling the upper part 256 to the fixed lower part 255. Each over-centre arm 282 is a reciprocal member comprising a cylinder 282a, a stem 282b and a resilient sleeve 282c. The cylinder 282a has an internal bore and is rotatably mounted at one end at the hinge axis 258. A first end of the stem 282b is slidingly received in the bore of the cylinder 282a. The opposite end of the stem 282b is rotatably mounted to the U-shaped arm 281 at a third pivot point 286. The third pivot points 286 are unconnected to, and freely moveable relative to, the upper part 256 and lower part 255. The resilient sleeve 282c is mounted externally on the stem 282b and extends, in use, between abutment surfaces on the cylinder 282a and stem 282b. The resilient sleeve 282c accommodates shortening of the over-centre arm 282 but biases the over-centre arm 282 into an extended configuration. Movement of the third pivot points 286 towards and away from the hinge axis 258 is thus possible by relative movement of the stems 282b in the cylinders 282a. The resilient sleeves 282c are preferably formed from silicone.

The U-shaped arm 281 extends around the front of the cartridge holder 251 and comprises two downwardly dependant hook members 287, one on each side of the cartridge holder 251, each comprising a cam surface 288 facing the hinge axis 258. The fixed lower part 255 of the cartridge holder 251 is provided with two bosses 259, or detents, located one on each side of the lower part 255 at or near a front edge 260 thereof aligned generally with the hook members 287.

As shown in Figure 39, the U-shaped arm 281 may be formed from a one piece plastics moulding comprising an

ergonomic hand grip and the hook members 287 integral to the arm.

The cartridge mount 257 is rotatably mounted between the upper and lower parts 255, 256 of the cartridge holder 251. The mount 257 is provided with a substantially circular recess 290 which receives in use the beverage cartridge 1. The recess 290 includes an irregularity 291 for accommodating the handle portion 24 of the beverage cartridge 1 which also acts to prevent rotation of the beverage cartridge 1 in the cartridge holder 251. The cartridge mount 257 is sprung relative to the fixed lower part 255 such that in the open position, as shown in Figure 41, the cartridge mount 257 is biased out of contact with the fixed lower part 255 so that the cartridge mount 257 is moved out of contact with the outlet and inlet piercer members 254, 253. The cartridge mount 257 is provided with an aperture 292 for receiving therethrough the inlet and outlet piercers 253, 254 and a head 300 of the cartridge recognition means 252 when the cartridge mount 257 is moved into the closed position.

The upper part 255 comprises a generally circular body 310 housing a circular viewing window 312 through which a consumer can view the beverage cartridge 1 during an operating cycle and also visually confirm whether a cartridge 1 is loaded in the machine 201. The viewing window 312 is cup-shaped having a downwardly directed rim 311 which engages and grips the flange 35 of the beverage cartridge 1 against the lower part 256 when the cartridge holder 251 is closed. At the same time the window 312 contacts the closed top 11 of the cartridge 1. A wave spring (not shown) is positioned between the viewing window 312 and the circular

body 310 to enable the viewing window 312 to move axially relative to the circular body 310 by a small degree. The pressure exerted by the rim 311 on the flange 35 and by the window 312 on the closed top 11 ensures a fluid tight seal between the cartridge 1 and the cartridge holder 251.

The lower part 255 comprises the inlet and outlet piercers 253, 254 and the head 300 of the cartridge recognition means 252. The inlet piercer 253 comprises a hollow needle-like tube 260 having a sharpened end 261 for perforating the laminate 5 of the beverage cartridge 1 in use. The inlet piercer 253 is in fluid communication with a water conduit 262 as shown in Figure 42 which passes through the lower part 255 and is connected to an outlet conduit 263 of the water heater 225. The outlet piercer 254 is similar in type to the outlet piercer described in the applicant's European patents EP 0 389 141 and EP 0 334 572 and comprises an open ended cylinder 264 of circular or D-shaped cross-section having dimensions larger than the discharge spout 43. An arcuate portion 265 of the upper end of the outlet piercer 254 is serrated to pierce and eventually cut the laminate of the beverage cartridge 1. The remainder of the upper end is cut back longitudinally of the cylinder at least to the base of the teeth 266 of the serrated portion to fold or pull the cut laminate 5 away from the outlet aperture before the beverage is dispensed therethrough. The outlet piercer 254 pierces the laminate 5 externally of the discharge spout 43 and when the cartridge mount 257 is in the closed position, rests in the annulus between the discharge spout 43 and the outer wall 42 of the discharge funnel 40. The outlet piercer 254 folds back the cut laminate 105 into the annulus. Thereby both the outlet

piercer 254 and the cut laminate 105 are held out of the way of the discharged beverage.

The outlet piercer 254 is surrounded by a ledge 254a which is raised relative to its surroundings by 0.5mm.

Advantageously, the outlet piercer 254 is removable from the lower part 255 to enable it to be thoroughly cleaned, for example, in a dishwasher. The removable outlet piercer 254 is received in a recess 267 in the lower part 255 where it is seated. The inlet piercer 253 and/or the outlet piercer 254 may be made of a metal, such as stainless steel, or from a plastics material. Advantageously, the use of plastic cutting elements is enabled by use of a laminate 5 which is able to be punctured and cut by a non-metallic material. Consequently, the piercers 253, 254 can be made less sharp which lowers the risk of injury to the consumer. In addition, plastic piercing elements are not prone to rust. Preferably, the inlet piercer 253 and the outlet piercer 24 are formed as a single, integral unit which is removable from the lower part 255.

In use, the upper part 256 of the cartridge holder 251 is movable from an open position in which it is orientated vertically or towards the vertical as shown in Figure 36, to a closed position in which it is orientated substantially horizontally and in interengagement with the fixed lower part 255 and cartridge mount 257. The upper part 256 is moved from the open to the closed positions by operation of the clamping lever. To close the upper part 256 a user takes hold of the clamping lever by the U-shaped arm 281 and pulls downwards. Consequently, the upper part 256 rotates which first brings the rim 311 of the viewing window 312 into contact with the flange 35 of the beverage cartridge 1 in

the cartridge mount 257 and the window 312 itself into contact with the closed top 11 of the cartridge 1. Continued rotation of the upper part 256 rotates the upper part 256 and cartridge mount 257 down into contact with the lower part 255. Further rotation of the U-shaped arm 281 causes the U-shaped arm 281 to rotate relative to the upper part 256 and the lower part 255 resulting in the hook members 287 of the upper part 256 engaging the bosses 259 of the lower part 255 with the cam surface 288 riding over the bosses 259. During this last stage of rotation the cartridge 1 is compressed between the cartridge mount 257 and the viewing window 312. As a result, the viewing window 312 is moved axially relative to the circular body 310 of the upper part 256 against the bias of the wave spring. This movement allows for a take up of tolerances in the beverage cartridge 1 and beverage preparation machine and ensures that the amount of compressive force applied to the cartridge is kept within an acceptable range. The clamping force of the mechanism as moderated by the action of the wave spring ensures a clamping pressure on the cartridge of between 130 and 280N. Preferably the force is approximately 200N. A force less than about 130N does not provide an adequate seal, whilst a force greater than about 280N leads to plastic failure of the components of the cartridge 1. During closure of the cartridge head the laminate 5 of the cartridge 1 is tensioned as it is brought into contact with the ledge 254a surrounding the outlet piercer 254 which causes the laminate 5 to flex out of plane as the distal end of the outer tube 42 of the cylindrical funnel is moved upwardly by 0.5mm relative to the flange 35. This movement also ensures that the great majority of the compressive

force applied to the cartridge acts through the central region of the cartridge 1 through the load-bearing inner member 3. In the closed position the cartridge 1 is thus clamped around the flange 35 by means of the rim 311 of the viewing window 312 and firmly clamped between the closed top 11 of the cartridge and the outer tube 42 of the inner member 3 by contact with the viewing window 312 and the ledge 254a. These clamping forces help prevent failure of the cartridge 1 during pressurisation and also ensure that the inner member 3 and outer member 2 are fully seated relative to one another and thus that all internal passageways and apertures remain at their intended dimensions even during internal pressurisation.

An imaginary datum line can be drawn between the first and second pivot points 283, 285 of the cartridge holder 251. As can be seen in Figure 41, in the open position the third pivot points 286 are located on the side of the datum line nearest the fixed lower part 255. As the upper part 256 reaches the closed position, the third pivot points 286 of the clamping lever pass through the datum line joining the first and second pivot points 283, 285 to the opposite side of the line, furthest from the fixed lower part 255. Consequently, the U-shaped arm 281 'snaps through' from a first stable position to a second stable position. The snap through action is accommodated by shortening of the over-centre arms 282 and consequential compression of the resilient sleeves 282c. Once the third pivot points 286 are past the imaginary datum line then recovery of the resilient sleeves 282c acts to continue the motion of the third pivot points 286 away from the imaginary datum line. The clamping lever thus has a bi-stable operation in that the lever is

stable in the open or closed positions but unstable at the point when the third pivot points 286 lie on the imaginary datum line joining the first and second pivot points 283, 285. Thus, the snap-through action of the clamping lever provides a positive closure mechanism which leads to a definite closure action wherein in the final stages of the clamping lever's rotation, the snap-through action of the U-shaped arm 281 and second arms 284 forces the hook members 287 firmly into engagement with the bosses 259. In addition, the resilient sleeves 282c provide a resistance to re-opening of the upper part 256 since a minimum force is required to compress the sleeves 282c sufficiently to move the third pivot points 286 back into line with the datum line joining the first and second pivot points 283, 285. Advantageously, the interengagement of the hook members 287 and the bosses 259 prevents separation of the upper and lower parts other than by rotation of the clamping lever. This is useful in preventing opening of the cartridge head 250 during operation when the cartridge head 250 is subject to internal pressurisation.

The purpose of the cartridge recognition means 252 is to allow the machine 201 to recognise the type of beverage cartridge 1 that has been inserted and to adjust one or more operational parameters accordingly. In a typical embodiment, the cartridge recognition means 252 comprises an optical barcode reader which reads a printed barcode 320 provided on the laminate 5 of the beverage cartridge 1 as shown in Figure 45. The barcode 320 is formed from a plurality of bars of contrasting colour. Preferably the bars are black on a white background to maximise the contrast. The barcode 320 is not required to conform to a published standard but a

standard format for barcodes, such as EAN-13, UPC-A, or Interleaf 2 of 5 may be used. The optical barcode reader comprises one or more LEDs 321 to illuminate the barcode 320, a focusing lens 322 to acquire an image of the barcode, a charge coupled device (CCD) 323 for producing an electrical signal representative of the acquired image and support circuitry for the LEDs and CCD. The space in the lower part for accommodating the barcode reader is limited. A mirror or mirrors 324 may be used to reflect the light from the LEDs 321 to a focussing lens which is not located in the lower part 255. Schematic arrangements are shown in Figures 44a and 44b. The lower part 255 comprises an aperture 326 which is the same size as the barcode 320 on the beverage cartridge 1. In use the electrical signals produced are decoded by signal processing software and the results forwarded to the control processor. The software can recognise whether the read of the barcode contained errors. The barcode 320 may be rescanned a number of times before an error message is presented to the consumer. If the machine 201 is unable to read the barcode the consumer is able to use the beverage cartridge 1 to dispense a beverage using a manual mode of operation.

The cartridge head 250 also includes a cartridge sensor for detecting whether a cartridge is present in the cartridge holder 251.

The cartridge head 250 also includes a lock sensor which detects whether the cartridge holder 251 is properly closed. Preferably the lock sensor comprises a micro-switch which is triggered when the cartridge holder 251 is closed and locked. Preferably the cartridge sensor and lock sensor are connected in series such that the output of both sensors

must be satisfactory, i.e. cartridge present and mechanism locked, before the operating cycle can be commenced.

Operation of the machine 201 comprises insertion of a beverage cartridge 1 into the cartridge head 250, carrying out an operating cycle in which the beverage is dispensed and removal of the cartridge 1 from the machine.

The operational behaviour of the machine 201 is determined by software embedded in the control processor. Operation of the machine can be described in terms of 'States', wherein the machine 201 will normally exist in a particular State until an event occurs to change the State, a step called a State transition.

Table 4 shows a State Transition Table which illustrates the States and State transitions for one embodiment of the beverage preparation machine 201.

Table 4

State	State Description	Temperature	Lock Sensor	Cartridge Sensor variable (OK, NOK, CLR)	Water level indicator	Water flow rate	StartStop
1	WATER HEATING	> or = 85 goto 2	Closed: [Cartridge Sensor= readpod()] Open: [Cartridge Sensor =CLR]	N/A	Low goto 10	N/A	No Action
2	WATER READY If timeout 10mins goto 9	< 85 goto 2	Closed: [Cartridge Sensor = readpod()] Open: [Cartridge Sensor =CLR]	Cartridge Sensor =OK goto 4 Cartridge Sensor =NOK goto 3	Low goto 10	N/A	No Action
3	READY TO BREW AUTO	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 2	N/A	Low goto 10	N/A	Goto 5
4	BREW IN PROGRESS AUTO [Run Brew State] goto 7	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Water off goto 6
5	BREW SUSPENDED	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	N/A	Goto 5
6	READY TO BREW MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 2	N/A	Low goto 10	N/A	[Water On] Goto 8

7	BREW IN PROGRESS MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Released goto 7
8	PURGE [Water off; air on, timeout n sec then goto 9]	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	No action	N/A	No Action
9	BREW DONE [air purge] [Cartridge Sensor =CLR] if timeout 10s goto 2	N/A [temperature controlled in background]	Open goto 2	N/A	Low goto 10	N/A	Goto 9
10	STANDBY	N/A [heater off]	Open: [Cartridge Sensor =CLR] goto 1 Closed: [Cartridge Sensor = readpod()]	N/A	Low goto 10	N/A	Goto 1
11	ERROR Power off/on required to clear	N/A	N/A	N/A	N/A	N/A	N/A
12	WATER LOW				Low goto 10		

The following example illustrates an operating cycle to exemplify the use of the State Transitions by the control processor.

It is assumed that the machine 201 is initially switched off and with no cartridge 1 inserted in the cartridge head 250. When the machine 201 is switched on the control processor is in State 1. The water heater 225 is switched on. Once the temperature reaches 85 °C the control

processor transits to State 2. If at any time during State 1 or 2 the cartridge holder 251 is closed the lock sensor will be triggered to send a signal to the control processor indicating that the cartridge holder 251 is properly closed. The control processor then interrogates the cartridge sensor by sending a 'readpod' instruction. The cartridge sensor returns a signal to the control processor indicating whether a cartridge is in place in the cartridge holder 251. If no cartridge is present the control processor transits to State 3 where it remains in a readiness state until the cartridge holder 251 is reopened at which point the control processor transits back to State 2. If a cartridge is present in State 2 then the control processor transits to State 4 and operation is commenced automatically. During States 4 to 9 the water temperature is controlled in the background to remain within the required tolerance range of the desired temperature as set by the operational parameters set by the barcode on the beverage cartridge 1. Once the discharge stage of dispense is completed an air purge is commenced in State 8. Once the air purge is completed the operating cycle is completed and the machine enters to standby mode in State 10. If, during operation, an error occurs then the processor transits to State 11. If a low water level is detected then the processor transits to State 12.

To insert the cartridge 1 the cartridge holder 251 is opened as described above to expose the cartridge mount 257. The cartridge 1 is then placed on the cartridge mount 257 received within the recess 290 such that the handle 24 of the cartridge is located in the irregularity 291. The optical or magnetic barcode 320 of the cartridge 1 is orientated directly above the aperture 326 in the cartridge

mount 257. The cartridge holder 251 is then closed by operation of the clamping lever as described above. During closure the inlet and outlet piercers 253, 254 pierce the laminate 5 of the cartridge 1 to form the cartridge inlet 121 and outlet 122. As described above the laminate 5 cut by the outlet piercer 254 is folded up into the annulus surrounding the discharge spout 43. When closed the cartridge holder 251 grips the cartridge 1 around the rim 35 between the cartridge mount 257 and the upper part 256 and between the window 311 and the top 11 of the cartridge 1 to form a fluid tight seal of sufficient integrity to withstand the pressures developed during the operating cycle.

To commence the operating cycle the consumer operates the start/stop button 241.

The operating cycle comprises the steps of cartridge recognition and the discharge cycle.

Cartridge recognition is performed by the optical cartridge recognition means 252 as described above assuming that the outputs from the cartridge sensor and lock sensor are satisfactory. Once the barcode 320 has been decoded the operational parameters of the machine 201 are adjusted by the control processor. The discharge cycle is then automatically commenced.

The discharge cycle has four main stages, not all of which are used for all beverage types:

(i) Pre-wet

(ii) Pause

(iii) Brew/Mixing

(iv) Purge

In the pre-wet stage the cartridge 1 is charged with water from the water storage tank 220 by means of the water

pump 230. The charging with water causes the beverage ingredients 200 in the filtration chamber 130 to be wetted. The charging may take place at a "fast" flow rate of 600 ml/min or a "slow" flow rate of 325 ml/min. The slow charging rate is particularly useful for cartridges containing viscous liquid beverage ingredients where the ingredients require some dilution before they are able to be pumped at a higher volume flow rate. The volume of water injected into the cartridge 1 is selected to ensure that water or beverage does not drip out of the cartridge outlet 122 during this stage.

The pause stage allows the beverage ingredients 200 to soak in the water injected during the pre-wet stage for a predetermined period of time. Both the pre-wetting and soaking stages are known to increase the yield of the extractibles from the beverage ingredients 200 and to improve the end flavour of the beverage. Pre-wetting and soaking are particularly used where the beverage ingredients are roast and ground coffee.

In the brew/mixing stage water is passed through the cartridge 1 in order to produce the beverage from the beverage ingredients 200. The temperature of the water is determined by the control processor which sends instructions to the water heater 225 to heat the water passing from the water tank 220 to the cartridge head 250. Water enters the lower part 255 of the cartridge holder 251 through the conduit 262 via the inlet valve and the inlet piercer 253 into the inlet chamber 126 of the beverage cartridge 1. Brewing and/or mixing and subsequent dispensing of the beverage from the beverage cartridge 1 is as described above with reference to the versions of the beverage cartridge 1.

The air purge comprises the blowing of pressurised air through the beverage preparation machine and the beverage cartridge 1 to ensure that all beverage is dispensed and that the flow path is cleared ready for dispensing another beverage. The air purge does not commence immediately on cessation of the brew/mixing stage to allow for the majority of the fluid to clear the flow path. This prevents an unacceptable spike in internal pressure on commencement of the air purge.

In normal operation a user manually stops the machine 201 by operating the start/stop button 241.

Once the operating cycle has been completed the consumer removes the cartridge 1 by opening the cartridge holder 251 and manually removing and disposing of the cartridge. Alternatively, the machine 201 may be provided with an automatic ejection mechanism for removing the cartridge automatically on opening the cartridge holder 251.

As described above, two or more of the beverage cartridges are used in combination according to the present invention to produce a wide variety of beverages including incorporating the advantage of dispensing a liquid dairy-based beverage portion from a cartridge of the same overall size as the cartridges used to prepare the remainder of the beverage. Thus a single beverage preparation machine may be used with all types of cartridges since the interface between the cartridges and the machine are the same irrespective of the beverage ingredients contained in the cartridges.

The delivery times for beverages using the machine 201 and cartridges 1 are typically between 10 and 120 seconds, preferably 30 to 40 seconds for roast and ground coffee,

between 5 and 120 seconds, preferably 10 to 20 seconds for chocolate and between 5 and 120 seconds, preferably 10 to 20 seconds for milk.

The machine 201 may also advantageously comprise a memory in operative communication with the control processor that stores information on the type of beverage dispensed by a user. The operating cycle of the machine 201 may then be adjusted for the next cartridge 1. This is especially advantageous where two or more beverage cartridges 1 are used sequentially to form a beverage. For example a coffee cartridge may be dispensed followed by a milk cartridge to form a cappuccino beverage. Alternatively a chocolate cartridge could be used followed by a milk cartridge to produce a creamy hot chocolate beverage. By using a memory that stores information on the first beverage dispensed, the manner of dispensing the second cartridge, say a milk cartridge, may be altered to achieve an optimum beverage. In the above example the milk dispensed for hot chocolate may, typically, be diluted less than the milk added to the coffee. In addition, the milk dispensed for chocolate may be dispensed at a slower flow rate to lessen the degree of foaming of the beverage. Many combinations of cartridges are possible and operating parameters as will be obvious to the skilled person. In addition, the memory may be used to allow the machine 201 to 'predict' the type of beverage that a user will next want to dispense. For example, if a user predominantly drinks one beverage type then the machine can instruct the water heater to remain at the optimum temperature for that beverage type.

Claims:

1. A cartridge (1) containing one or more liquid beverage ingredients (200) and being formed from substantially air- and water-impermeable materials, the cartridge comprising an inlet (121) for the introduction of an aqueous medium into the cartridge, a compartment (134) containing the one or more liquid beverage ingredients and an outlet (122) for a beverage produced by dilution of the one or more liquid beverage ingredients by the aqueous medium, characterised in that the compartment includes means for controlling dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

2. A cartridge (1) as claimed in claim 1 wherein the means for controlling dilution delays dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

3. A cartridge (1) as claimed in claim 1 or claim 2 wherein, in use, an aqueous medium flow path is established from the inlet to the outlet, the means for delaying dilution comprising a partition (100) which hinders entry of at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path.

4. A cartridge (1) as claimed in claim 3 wherein the partition (100) comprises one or more apertures (103) for controllably releasing the at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path.

5. A cartridge (1) as claimed in claim 4 wherein four apertures (103) are provided.

6. A cartridge (1) as claimed in any of claims 3 to 5 wherein the partition comprises a cup-shaped member having an open mouth (104) directed away from the aqueous medium flow path.

7. A cartridge (1) as claimed in claim 6 wherein the cup-shaped member is annular.

8. A cartridge (1) as claimed in claim 6 or claim 7 wherein one or more apertures (103) are provided at or near a base of the cup-shaped member.

9. A cartridge (1) as claimed in claim 8 wherein the at least a proportion of the liquid beverage ingredients in the cup-shaped member (100) drain by gravity through the one or more apertures (103) in use.

10. A cartridge (1) as claimed in claim 9 wherein the cup-shaped member is spaced from a bottom of the cartridge, such that the aqueous medium flow path passes between the cup-shaped member and the bottom of the cartridge.

11. A cartridge (1) as claimed in claim 10 wherein the at least a proportion of the liquid beverage ingredients in the cup-shaped member (100) drain by gravity through the one or more apertures (103) in use vertically downwards into the aqueous medium flow path.

12. A cartridge (1) as claimed in any of claims 6 to 11 comprising an inner member (3) and an outer member (2), wherein the inner member comprises the cup-shaped member.

13. A cartridge as claimed in any of claims 3 to 12 further comprising means for producing a jet of the beverage, wherein said means for producing the jet of the beverage comprises an aperture (128) in the aqueous medium flow path.

14. A cartridge as claimed in claim 13 as dependent on claim 11 wherein the aperture (128) is delimited by an interface between the inner member and the outer member.

15. A cartridge as claimed in claim 13 or claim 14 further comprising at least one inlet (71) for air and means for generating a pressure reduction of the jet of beverage, whereby, in use, air from the at least one air inlet is incorporated into the beverage as a plurality of small bubbles.

16. A cartridge (1) as claimed in claim 15 wherein the at least one air inlet (71) is provided in the inner member downstream of the aperture (128).

17. A cartridge (1) as claimed in claim 16 wherein the at least one air inlet (71) and means for producing a pressure reduction in the jet of beverage produces a foaming of the one or more liquid beverage ingredients of greater than 40%.

18. A cartridge (1) as claimed in claim 17 wherein the foaming is greater than 70%.

19. A cartridge (1) as claimed in any preceding claim wherein the cartridge is disc-shaped.

20. A cartridge (1) as claimed in any preceding claim wherein the outer member and/or inner member are formed from polypropylene.

21. A cartridge (1) as claimed in any preceding claim wherein the outer member and/or inner member is formed by injection moulding.

22. A cartridge (1) as claimed in any preceding claim wherein the liquid beverage ingredient is a concentrated liquid milk composition.

23. A cartridge (1) as claimed in claim 22 wherein the concentrated liquid milk contains between 25 and 40% total solids.

24. A cartridge (1) as claimed in claim 23 wherein the concentrated liquid milk contains 30% total solids.

25. A cartridge (1) as claimed in any of claims 22 to 24 wherein the concentrated liquid milk contains between 0.1 and 12% fat.

26. A cartridge (1) as claimed in any of claims 1 to 21 wherein the one or more liquid beverage ingredients are selected from the group of cocoa solids, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

27. A method of dispensing a beverage from a cartridge (1) containing one or more liquid beverage ingredients (200) during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid ingredients as dispensed has a concentration at the start of the operating cycle of between 30 and 70% total solids and a concentration at the end of the operating cycle of between 1 and 15% total solids.

28. A method as claimed in claim 27 wherein the concentration at the start of the operating cycle is between 30 and 35% total solids.

29. A method as claimed in claim 28 wherein the concentration at the end of the operating cycle is approximately 10% total solids.

30. A method as claimed in claim 28 or claim 29 wherein the liquid ingredient is concentrated milk.

31. A method as claimed in claim 27 wherein the concentration at the start of the operating cycle is between 60 and 70% total solids.

32. A method as claimed in claim 31 wherein the concentration at the end of the operating cycle is between 12 and 15% total solids.

33. A method as claimed in claim 31 or claim 32 wherein the liquid ingredient contains cocoa solids.

34. A method as claimed in claim 27 wherein the concentration at the start of the operating cycle is between 40 and 70% total solids.

35. A method as claimed in claim 34 wherein the concentration at the end of the operating cycle is between 1 and 2% total solids.

36. A method as claimed in claim 34 or claim 35 wherein the liquid ingredient is contains coffee.

37. A method of dispensing a beverage from a cartridge (1) containing one or more liquid beverage ingredients

(200) during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid beverage ingredients is foamed on dispense to a ratio of between 20 and 150%.

38. A method as claimed in claim 37 wherein the one or more liquid beverage ingredients are foamed to a ratio between 70 and 100%.

39. A method as claimed in claim 37 or claim 38 wherein the one or more liquid beverage ingredients includes one or more of concentrated milk, coffee and cocoa solids.

40. A beverage as produced by the method of any of claims 27 to 39.

41. A method of manufacturing a cartridge (1) for dispensation of a beverage comprising the steps of:

a. manufacturing a plurality of outer members (2) comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;

b. manufacturing a plurality of inner members (3) comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;

c. storing said plurality of outer members and said inner members;

d. selecting one of the first type of outer member or the second type of outer member from the plurality of outer members;

e. selecting one of the first type of inner member or the second type of inner member from the plurality of inner members;

f. conjoining the selected inner member to the selected outer member such the inner member is within the outer member;

g. filling the outer member with one or more beverage ingredients (200) selected from a plurality of beverage ingredients; and

h. sealing the outer member with a lid (5) to form the cartridge.

42. A method as claimed in claim 41 further comprising in step b. of joining a filter member (4) to the first type and/or second type of inner member (3).

43. A method as claimed in claim 41 or claim 42 wherein the first type of outer member (2) is suitable for containing roast and ground beverage ingredients or the like.

44. A method as claimed in any of claims 41 to 43 wherein the second type of outer member (2) is suitable for containing soluble or liquid beverage ingredients or the like.

45. A method as claimed in any of claims 41 to 44 wherein the first type of inner member (3) is suitable for

filtering roast and ground beverage ingredients and the like.

46. A method as claimed in any of claims 41 to 45 wherein the second type of inner member (3) is suitable for filtering roast and ground beverage ingredients and the like and for entraining a plurality of air bubbles in the dispensed beverage.

47. A method as claimed in claim 45 or claim 46 wherein the first and second type of inner member (3) comprise a frame (41) having a filter (4) disposed thereupon, and wherein a peripheral rim (51) of the frame is conjoined to the selected type of outer member by welding.

48. A method as claimed in claim 47 wherein the second type of inner member (3) comprises means (70) for producing a jet of the beverage, which means comprises an aperture in a beverage flow path between an inlet and an outlet of the cartridge.

49. A method as claimed in any of claims 41 to 48 further comprising manufacturing and storing a third type of inner member (3).

50. A method as claimed in claim 49 wherein the third type of inner member is suitable for dispensing soluble beverage ingredients and the like.

51. A method as claimed in any of claims 41 to 50 further comprising manufacturing and storing a fourth type of inner member (3).

52. A method as claimed in claim 51 wherein the fourth type of inner member (3) is suitable for dispensing a liquid beverage ingredients and the like.

53. A method as claimed in any of claims 49 to 52 wherein the third or fourth type of inner member (3) comprises a skirt (80) surrounding an outlet, the skirt comprising an upper extension (81) having an upper rim (91) which engages, on assembly of the cartridge, a co-operating formation (19) of the selected type of outer member (2) to form a snap-fit arrangement for conjoining the third or fourth type of inner member to the selected type of outer member.

54. A cartridge system for dispensing a plurality of beverages comprising:

a. a plurality of outer members (3) comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;
b. a plurality of inner members (2) comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;
c. a plurality of beverage ingredients (200); and
d. at least one lid (5) to seal the cartridge;

wherein each cartridge comprises an outer member, an inner member, one or more beverage ingredients and a lid.

55. A cartridge system as claimed in claim 54 wherein each cartridge further comprises a filter (4).

56. A cartridge system as claimed in claim 54 or claim 55 wherein the first type of outer member (3) is suitable for containing roast and ground beverage ingredients or the like.

57. A cartridge system as claimed in any of claims 54 to 56 wherein the second type of outer member (3) is suitable for containing soluble or liquid beverage ingredients or the like.

58. A cartridge system as claimed in any of claims 54 to 57 wherein the first type of inner member (3) is suitable for filtering roast and ground beverage ingredients and the like.

59. A cartridge system as claimed in any of claims 54 to 58 wherein the second type of inner member (3) is suitable for filtering roast and ground beverage ingredients and the like and comprises means entraining a plurality of air bubbles in the dispensed beverage.

60. A cartridge system as claimed in any of claims 54 to 59 wherein the first and second type of inner member (3) comprise a frame (41) having a filter (4) disposed

thereupon, and wherein a peripheral rim (51) of the frame is conjoined to the selected type of outer member by welding.

61. A cartridge system as claimed in claim 59 or claim 60 wherein the second type of inner member (3) comprises means (70) for producing a jet of the beverage, which means comprises an aperture in a beverage flow path between an inlet and an outlet of the cartridge.

62. A cartridge system as claimed in any of claims 54 to 61 further comprising a third type of inner member (3).

63. A cartridge system as claimed in claim 62 wherein the third type of inner member (3) is suitable for dispensing soluble beverage ingredients and the like.

64. A cartridge system as claimed in any of claims 54 to 63 further comprising a fourth type of inner member (3).

65. A cartridge system as claimed in claim 64 wherein the fourth type of inner member (3) is suitable for dispensing a liquid beverage ingredients and the like.

66. A cartridge system as claimed in any of claims 62 to 65 wherein the third or fourth type of inner member (3) comprises a skirt (80) surrounding an outlet, the skirt comprising an upper extension (81) having an upper rim (91) which engages, on assembly of the cartridge, a co-operating formation (19) of the selected type of outer member to form a snap-fit arrangement for conjoining

the third or fourth type of inner member to the selected type of outer member.

67. A method of preparing a beverage comprising the steps of:

a) inserting a first beverage cartridge (1) containing one or more beverage ingredients (200) into a beverage preparation machine (201);

b) operating said beverage preparation machine to pass an aqueous medium through the first beverage cartridge to dispense a first portion of said beverage into a receptacle;

c) inserting a second beverage cartridge (1) containing one or more beverage ingredients (200) into the beverage preparation machine; and

d) operating the beverage preparation machine to pass an aqueous medium through the second beverage cartridge to dispense a second portion of said beverage into the receptacle;

characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

68. A method as claimed in claim 67 wherein one of the first or second beverage cartridges (1) contains an ingredient for forming a brewed portion of a beverage.

69. A method as claimed in claim 67 or claim 68 further comprising the step of removing the first beverage

cartridge (1) before inserting the second beverage cartridge (1).

70. A method as claimed in any of claims 67 to 69 wherein the beverage ingredient in the first or second beverage cartridge is roast and ground coffee.

71. A method as claimed in any of claims 67 to 69 wherein the beverage ingredient in the first or second beverage cartridge is leaf-based tea.

72. A method as claimed in any of claims 67 to 69 wherein the beverage ingredient in the first or second beverage cartridge is a liquid coffee ingredient.

73. A method as claimed in any of claims 67 to 69 wherein the liquid dairy-based ingredient is a concentrated dairy-based product.

74. A method as claimed in claim 73 wherein the concentrated dairy-based product is concentrated liquid milk.

75. A method as claimed in claim 74 wherein the concentrated liquid milk contains between 25 and 40% total solids.

76. A method as claimed in claim 75 wherein the concentrated liquid milk contains 30% total solids.

77. A method as claimed in any of claims 73 to 76 wherein the concentrated liquid milk contains between 0.1 and 12% fat.

78. A method as claimed in any of claims 73 to 77 further comprising the step of foaming the one or more liquid dairy-based ingredients during dispensation.

79. A beverage preparation system comprising a beverage preparation machine (201) having means for receiving a range of beverage cartridges (1) and means for passing an aqueous medium through said beverage cartridges, a first beverage cartridge (1) containing one or more beverage ingredients (200) for preparing a first portion of said beverage, and a second beverage cartridge (1) containing one or more beverage ingredients (200) for preparing a second portion of said beverage, characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

FIG. 1.

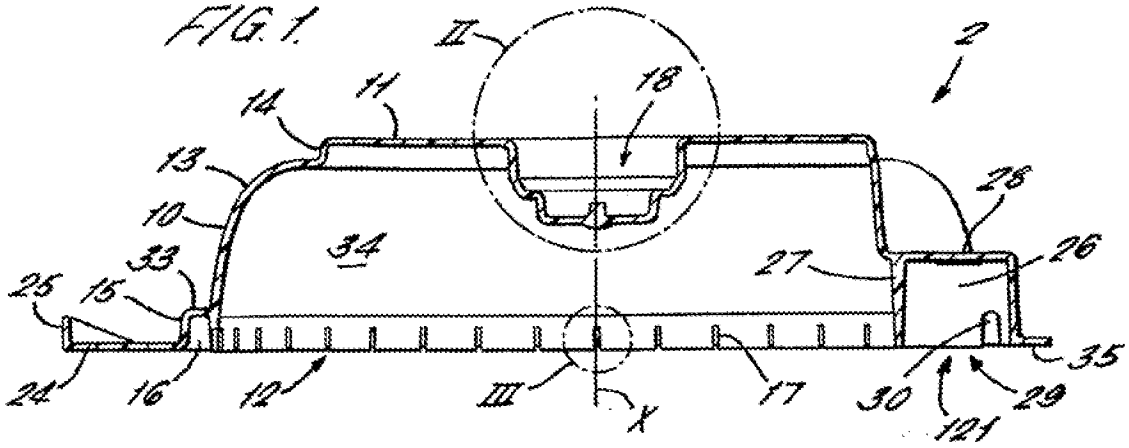


FIG. 2.

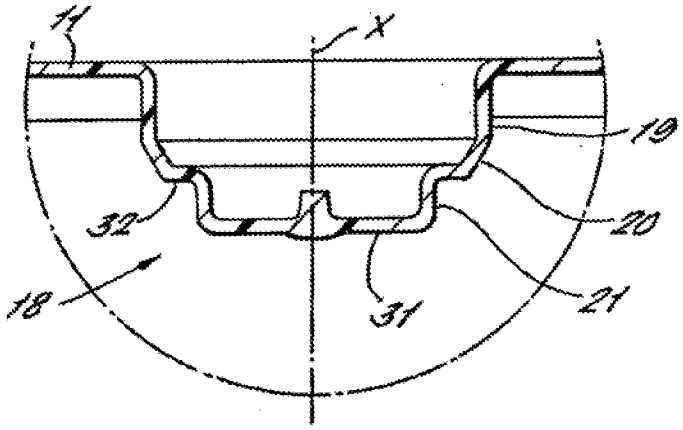


FIG. 3.

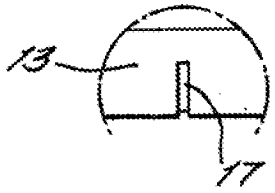


FIG. 4.

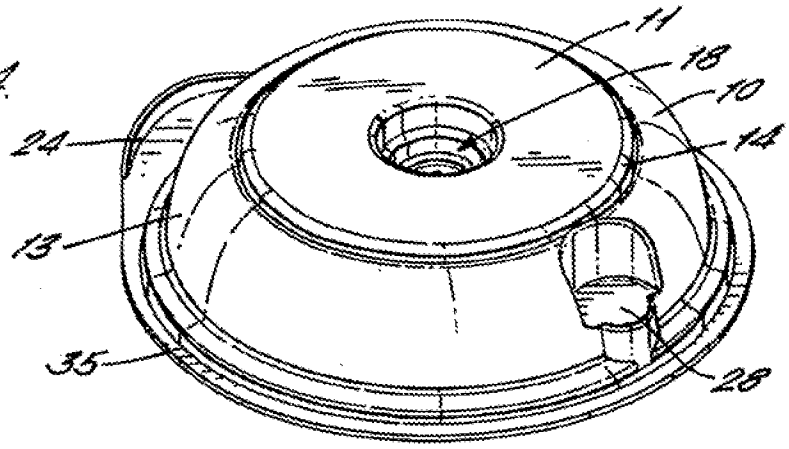


FIG. 5.

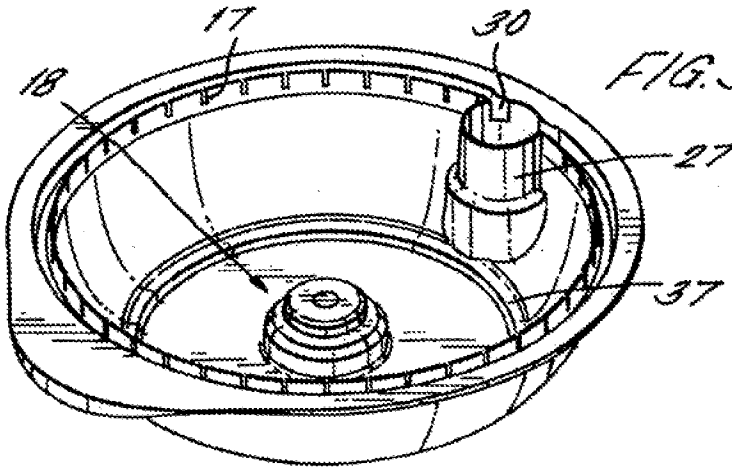


FIG. 6.

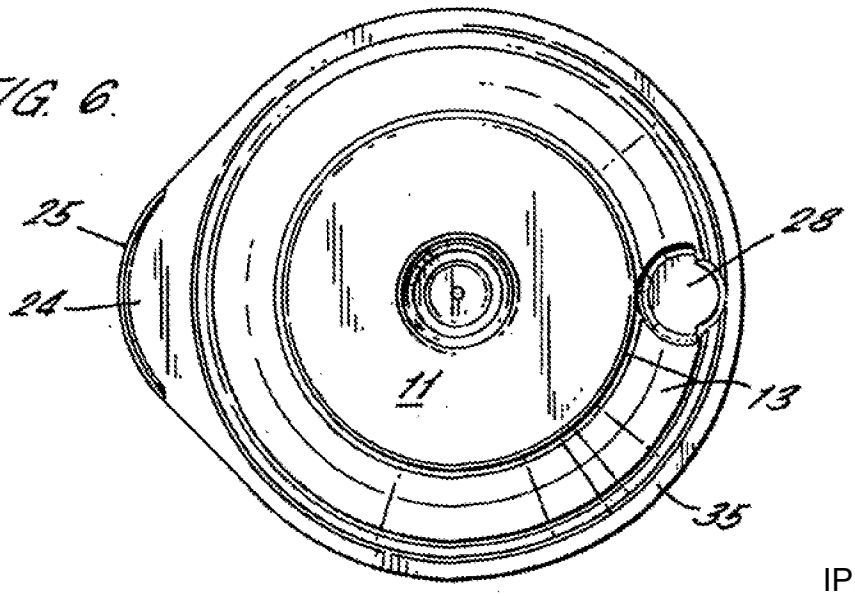


FIG. 7.

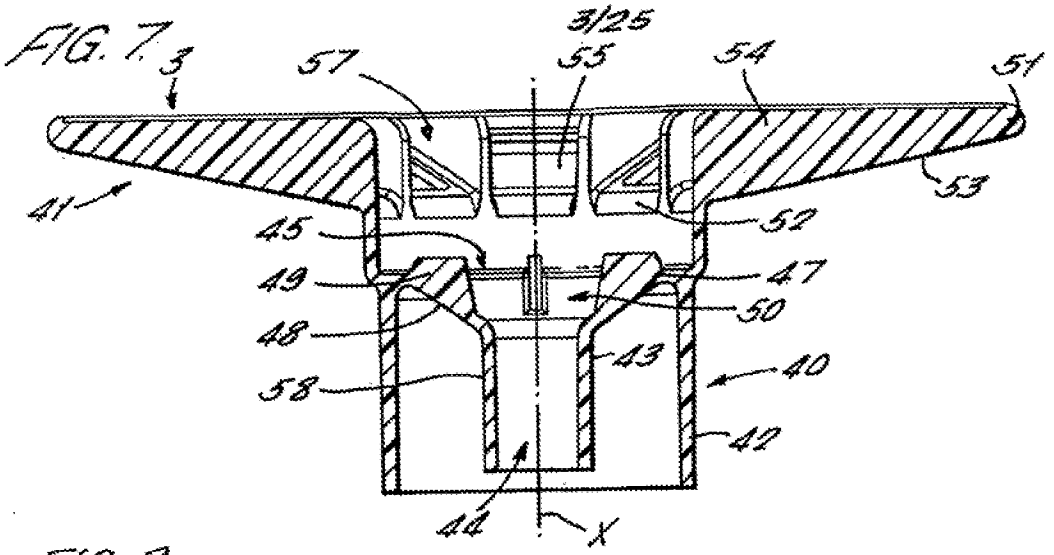


FIG. 8.

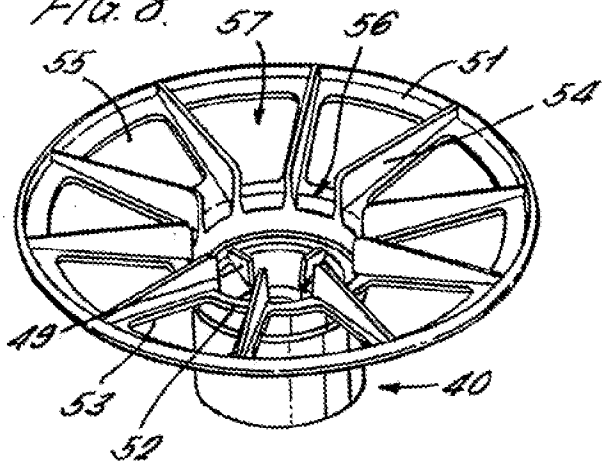


FIG. 9.

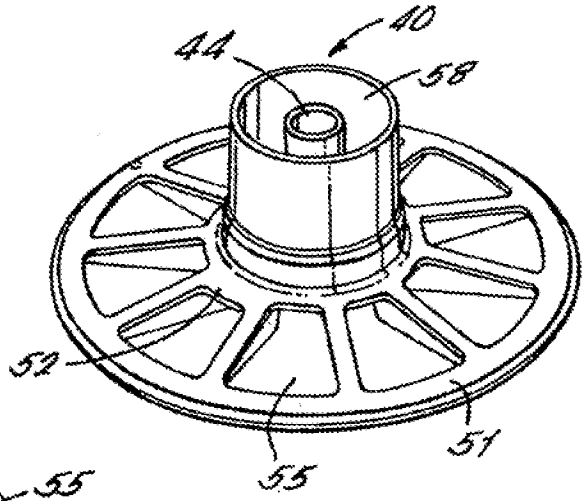


FIG. 10.

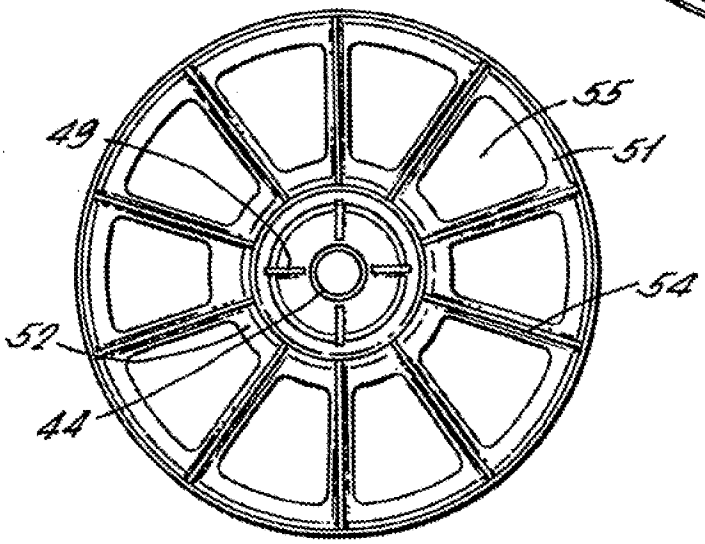


FIG. 11.

10
11
21
50
18
31
56
55
51
1
2
130
4
3
15
49
35
16
200
125
122
44
123
43
40
120
5
126

FIG. 12.

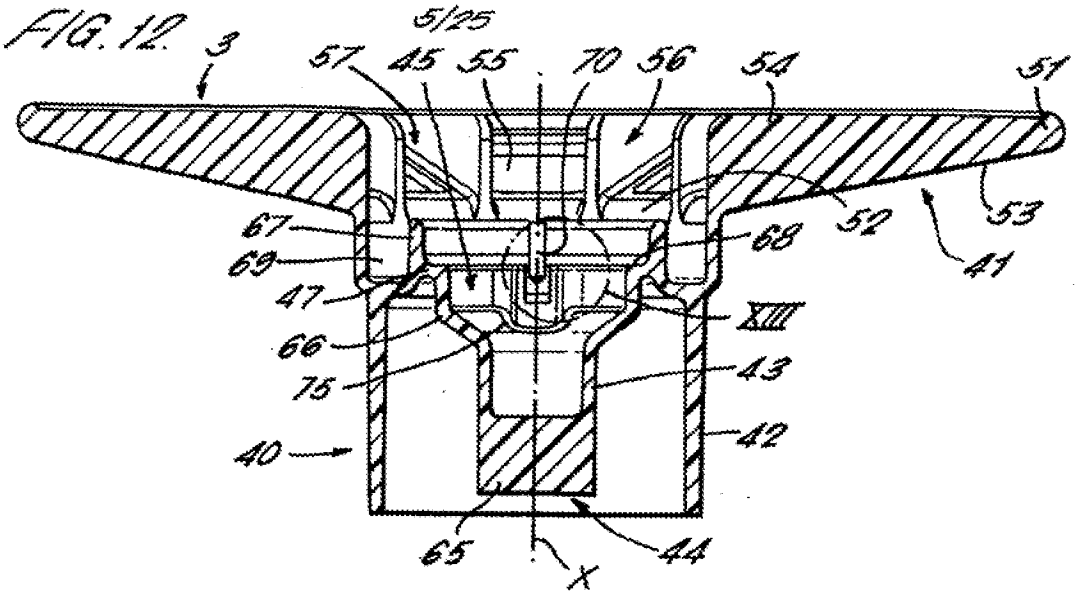


FIG. 13.

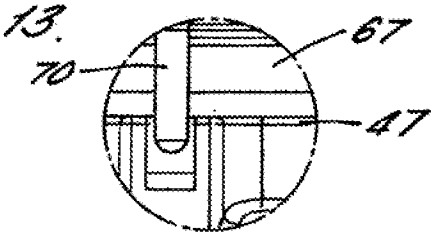


FIG. 14.

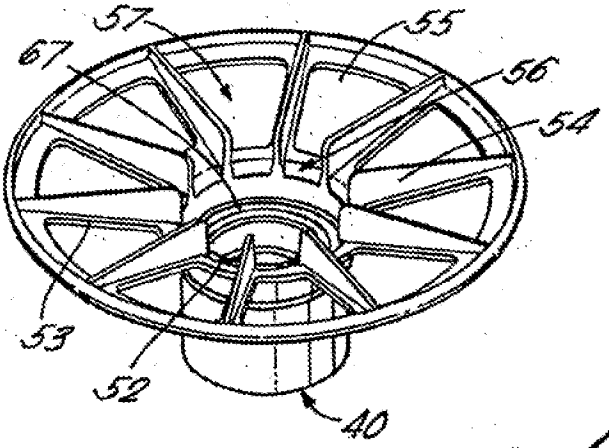


FIG. 15.

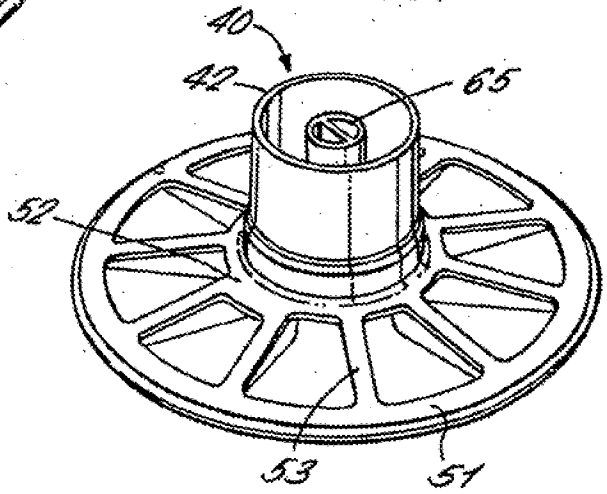


FIG. 16.

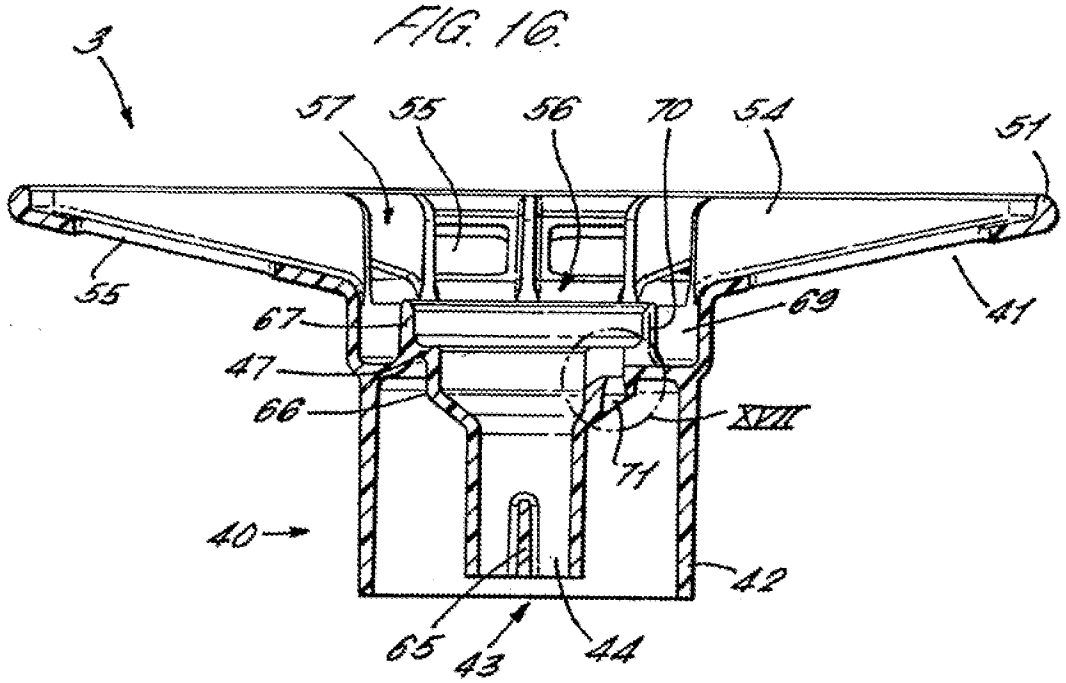
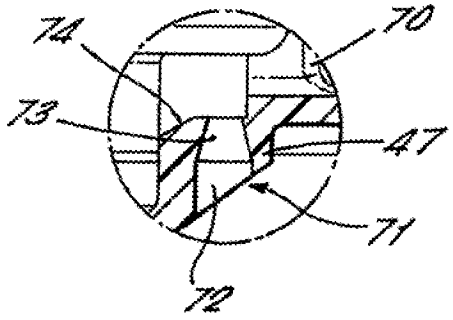

3
57
55
56
70
54
51
55
67
69
41
47
66
XVII
71
40
42
65
43
44

FIG. 17.


74
70
73
47
71
72

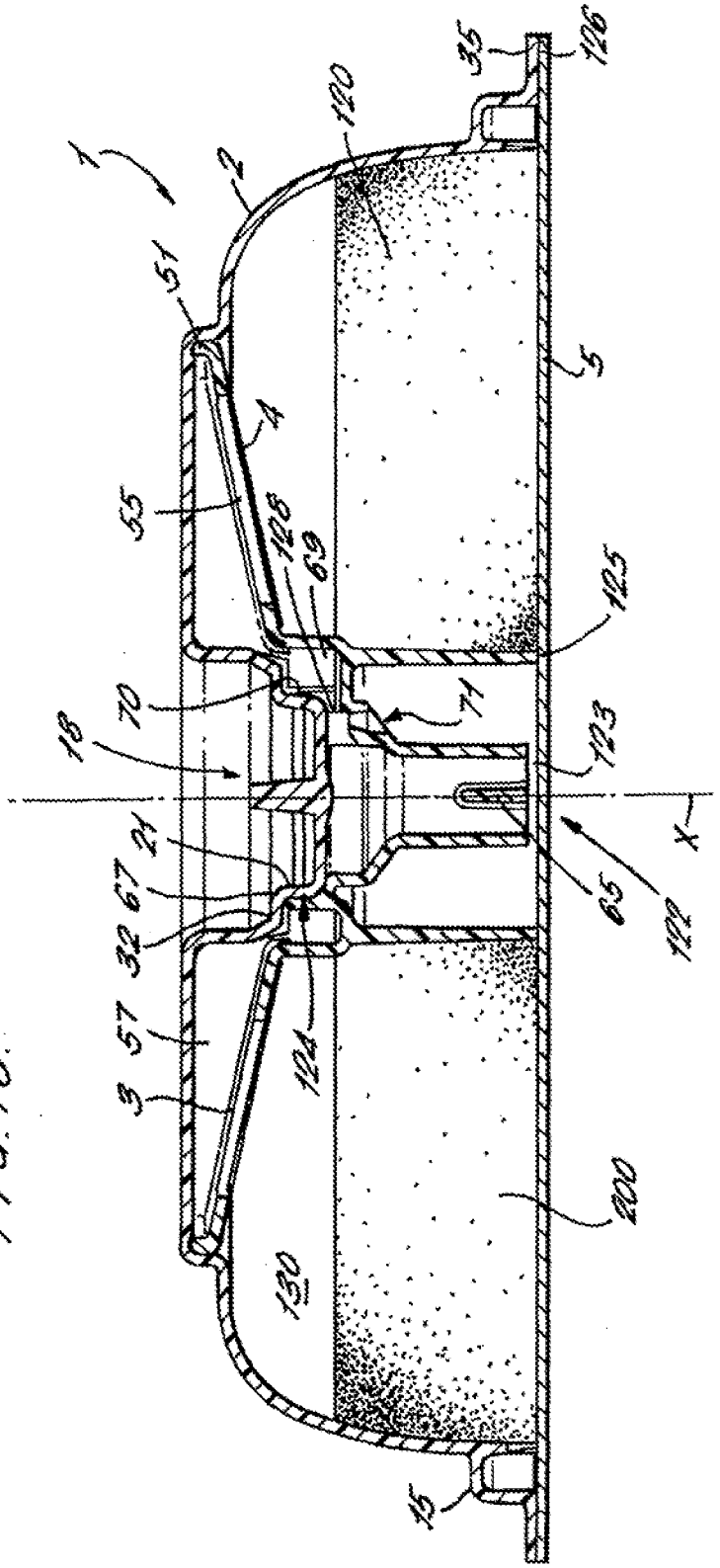

1
2
120
35
106
51
5
4
55
126
69
125
70
71
18
123
21
67
X
65
122
32
57
3
124
200
130
15

FIG. 18.

FIG. 19.

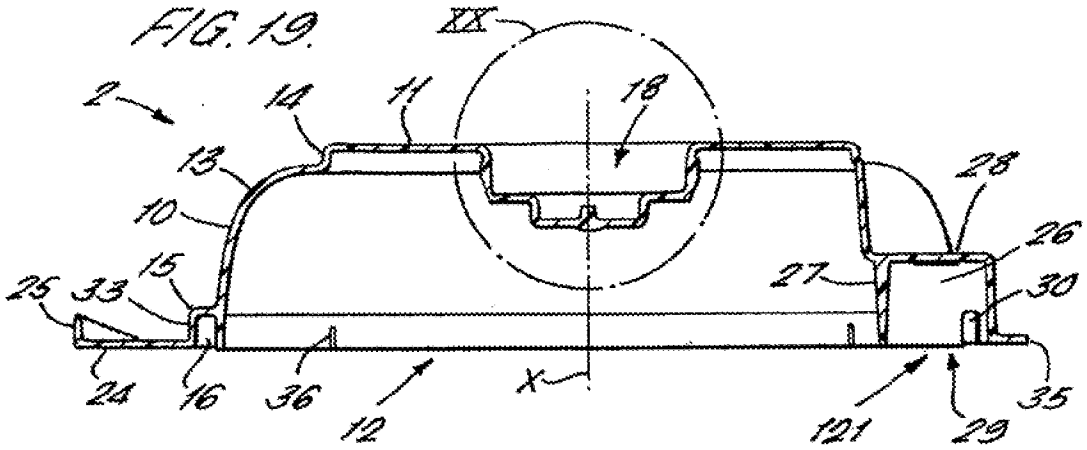

XX
2
14
11
18
13
28
10
26
27
15
30
25
33
24
16
36
12
X
121
29
35

FIG. 20.

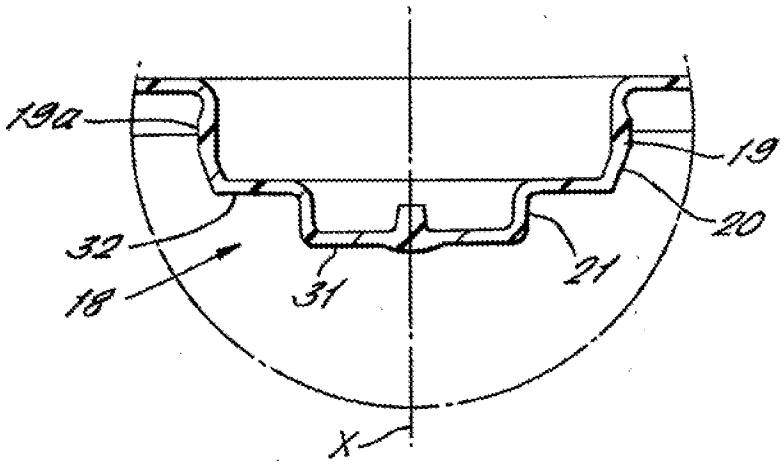

19a
19
20
32
18
31
21
X

FIG. 21.

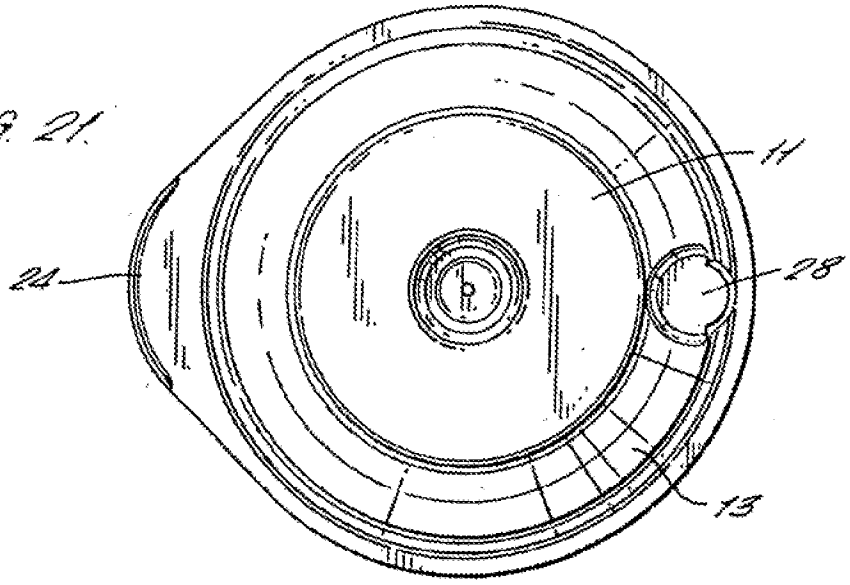


FIG. 22.

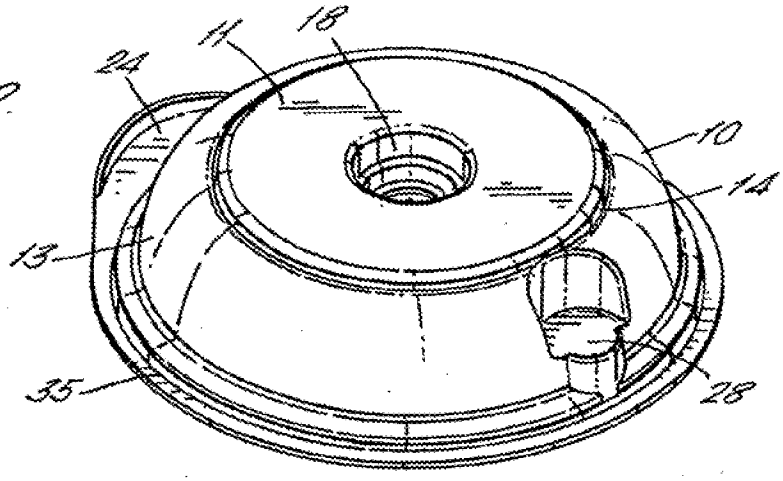


FIG. 23.

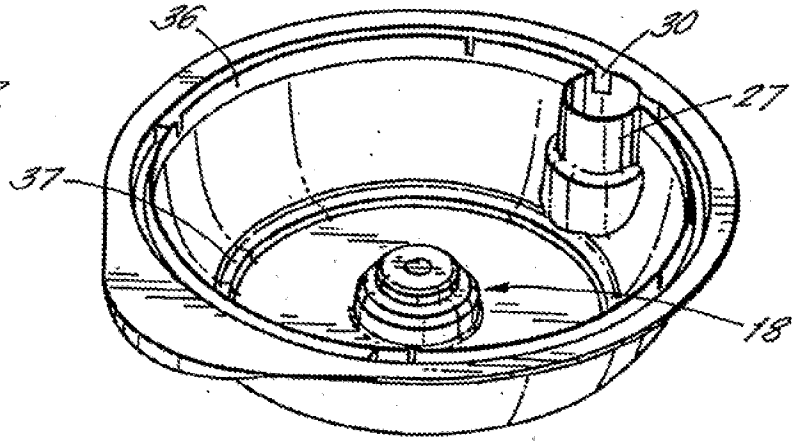


FIG. 24.

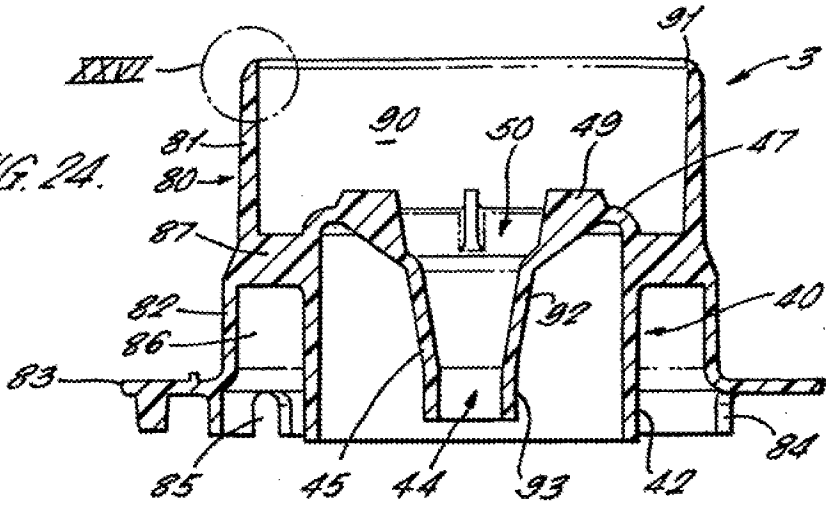


FIG. 25.

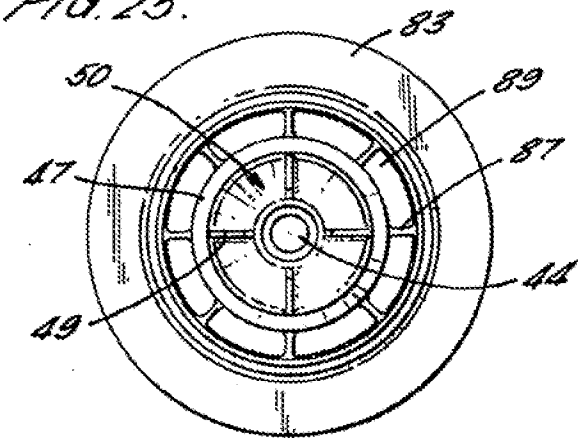


FIG. 26.

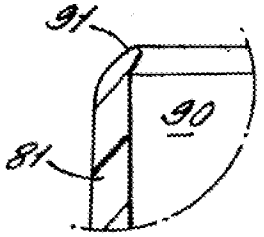


FIG. 27.

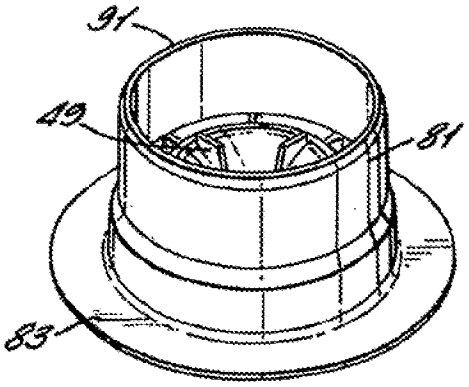
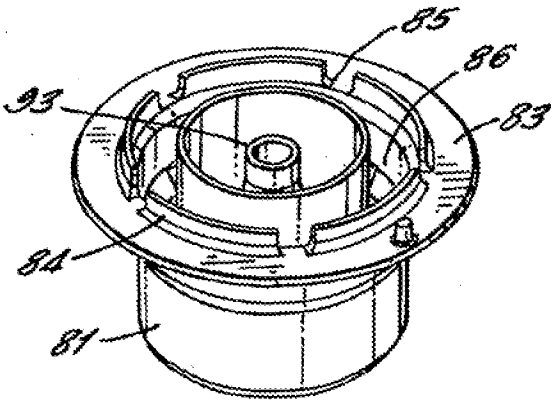


FIG. 28.



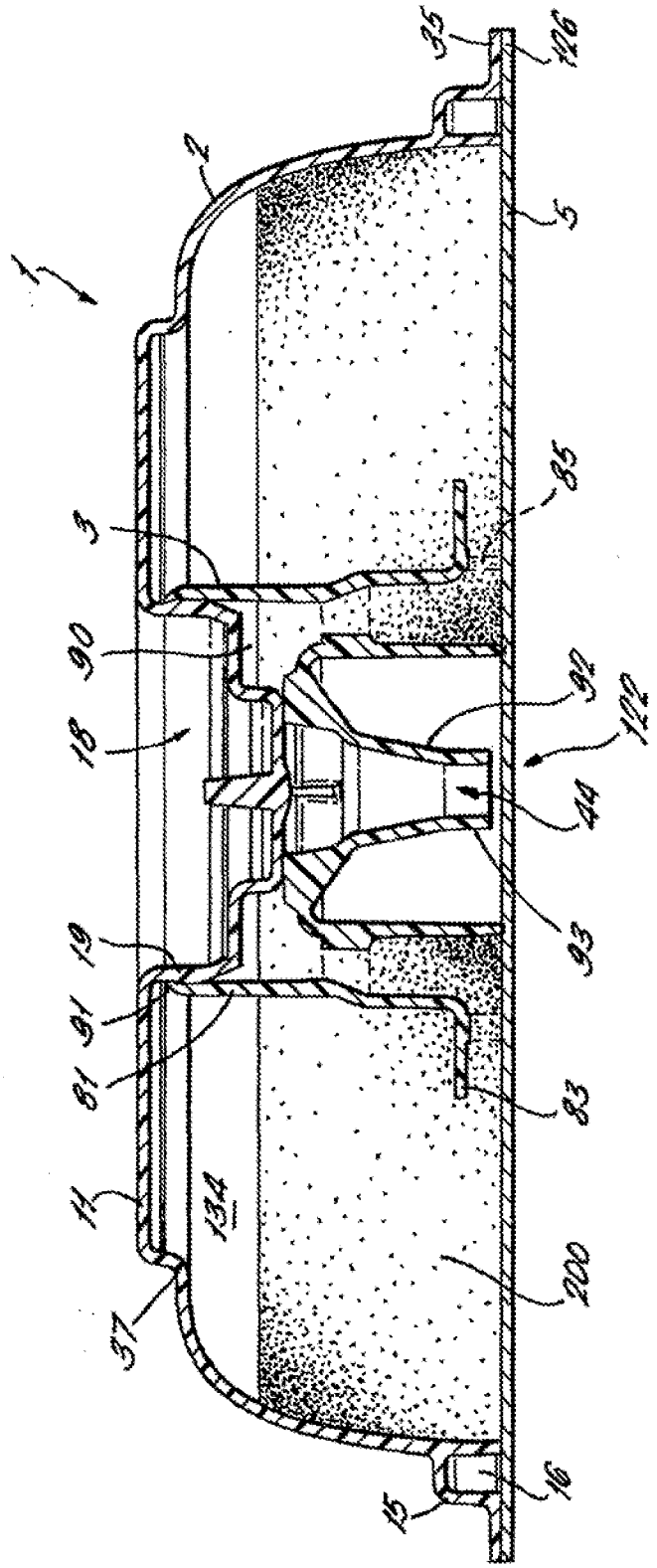


FIG. 29.

FIG.30.

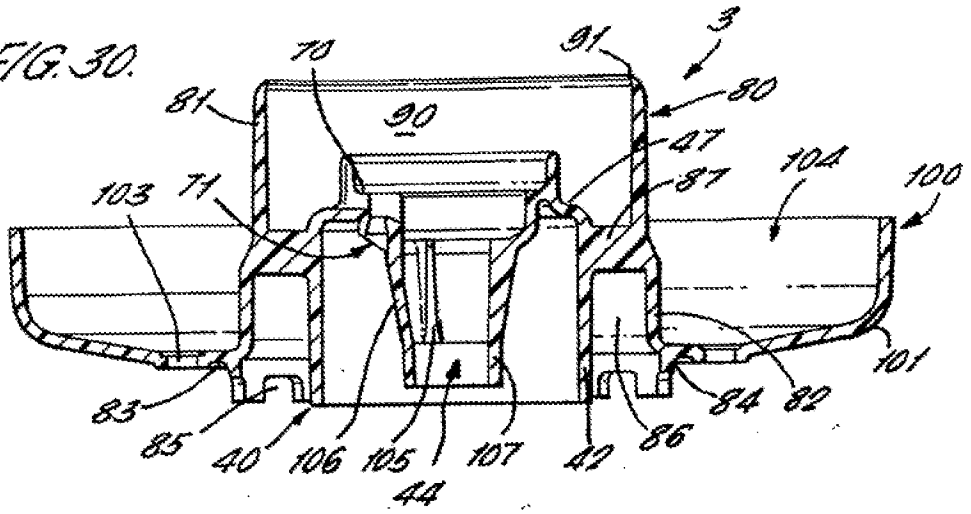


FIG.32.

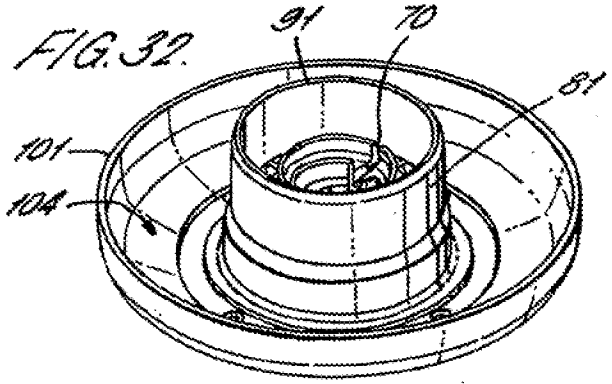


FIG.31.

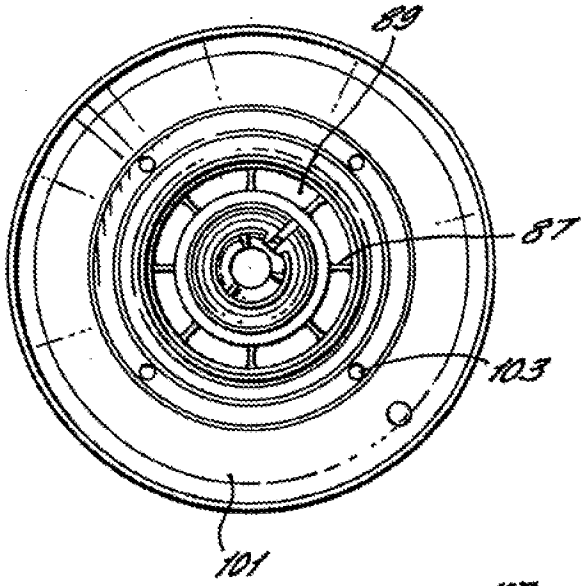


FIG.33.

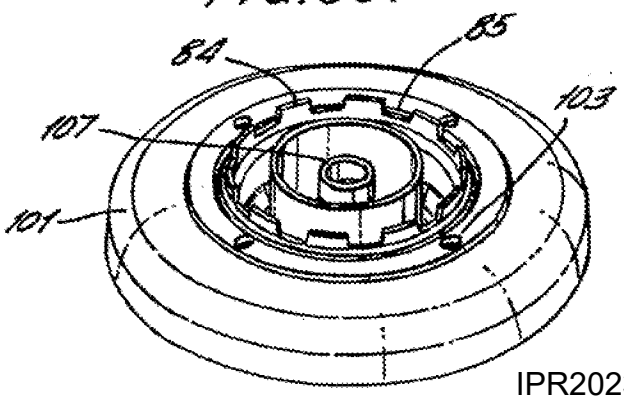


FIG. 34.

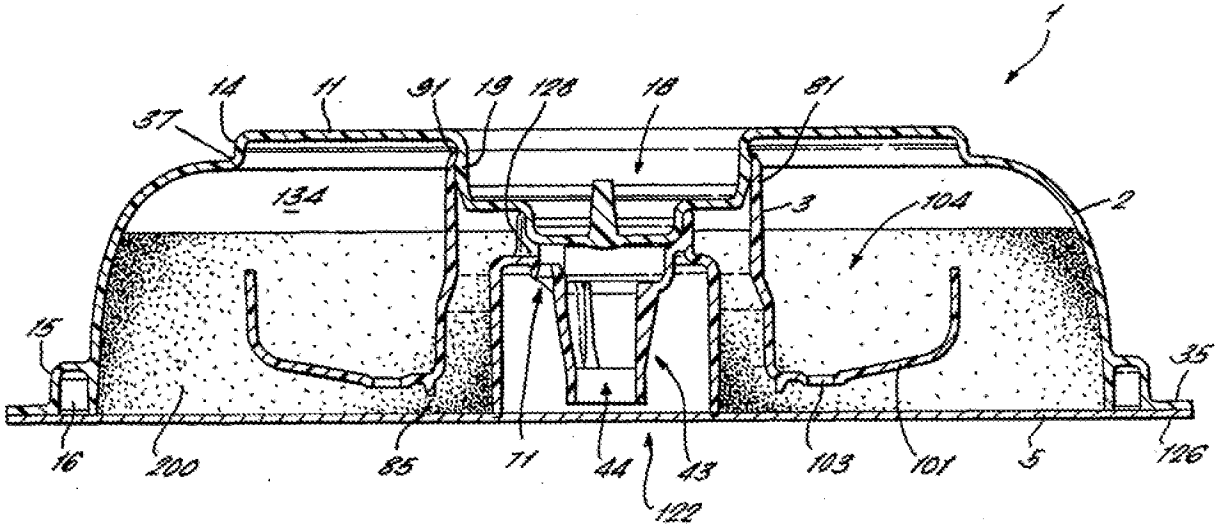

1
14
11
91
19
128
18
81
37
134
3
104
2
15
35
16
200
85
71
44
43
103
101
5
126
122

FIG.35.

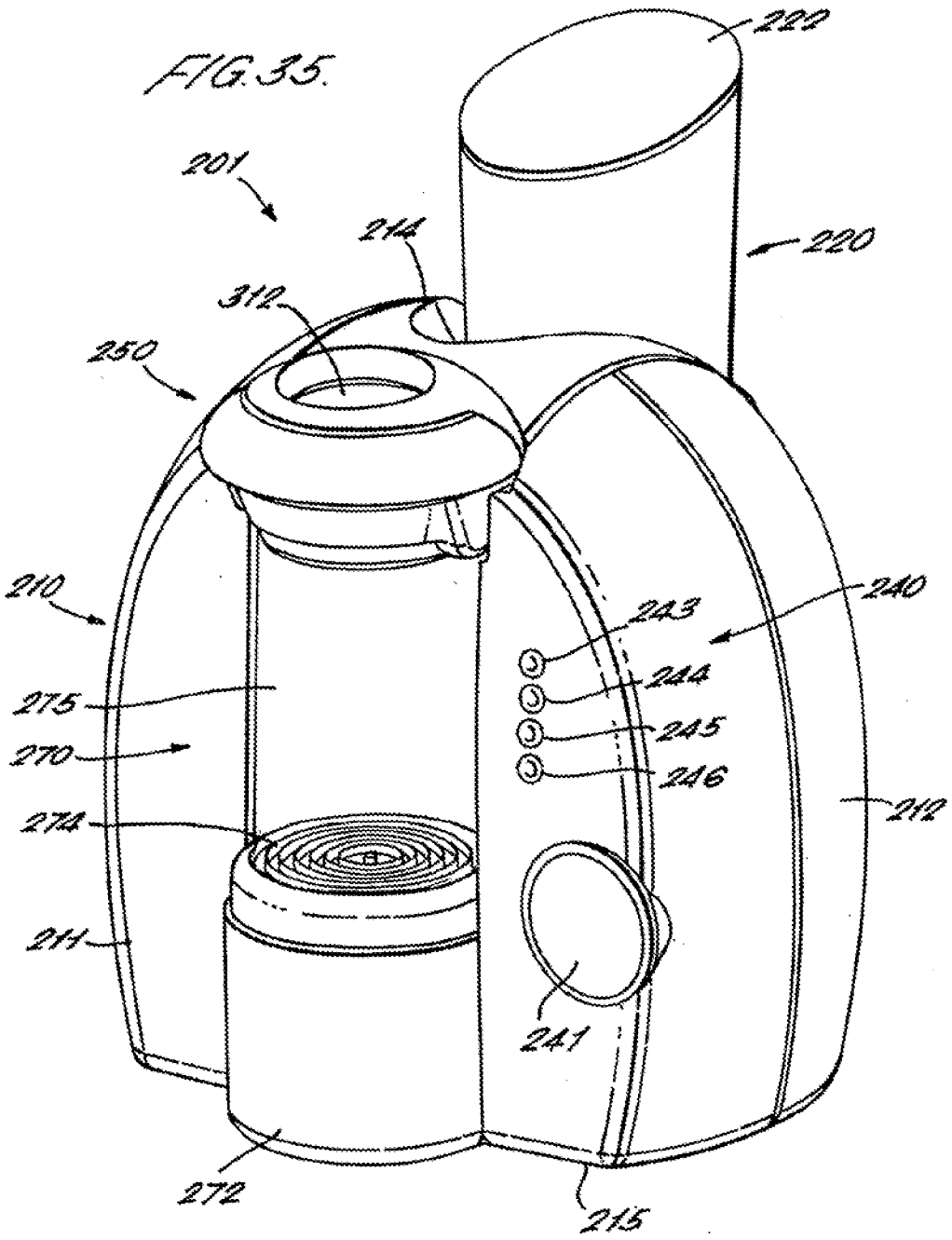

202
201
214
220
312
250
210
240
243
244
245
246
275
270
212
274
211
241
272
215

FIG. 36.

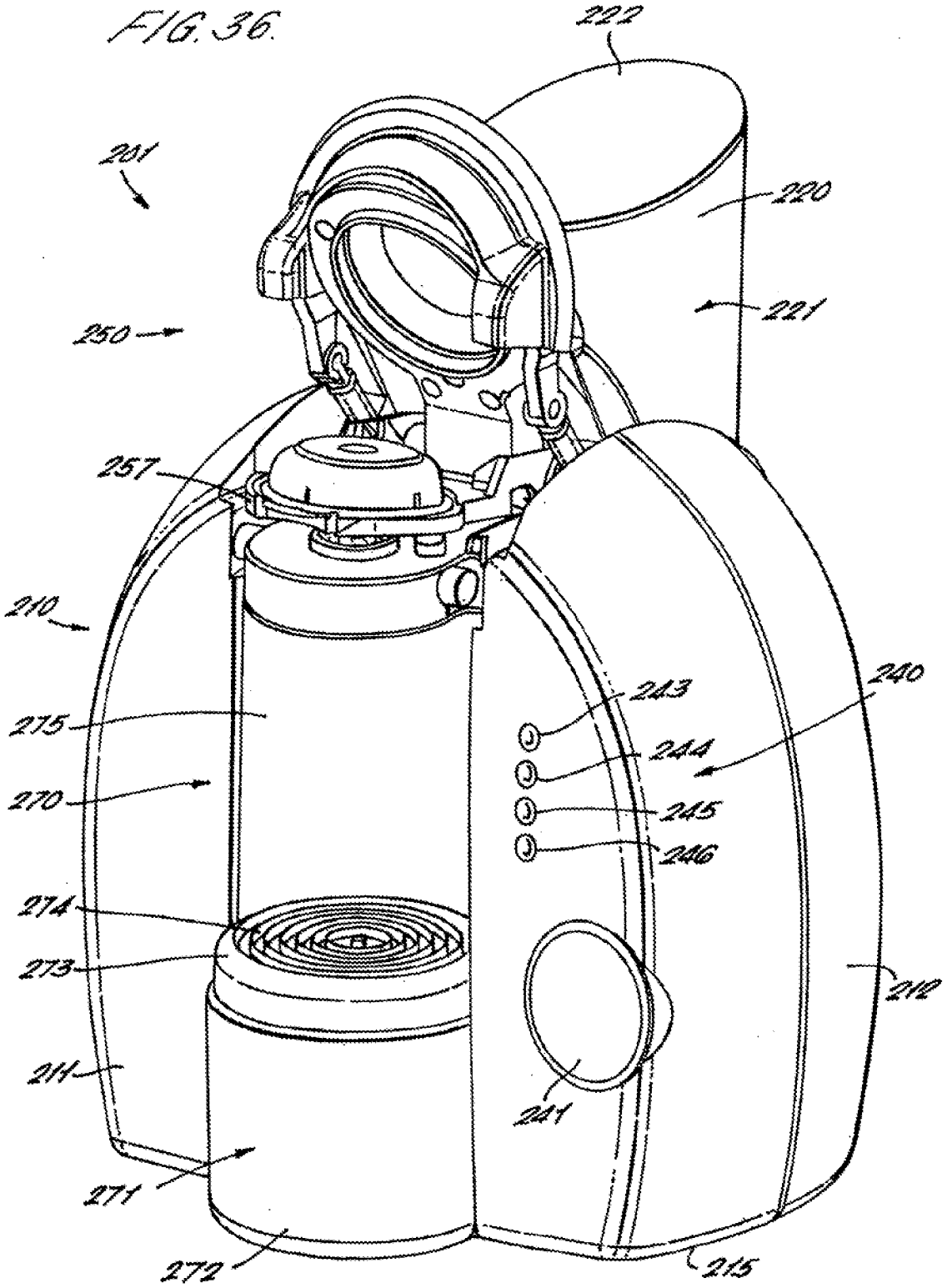

222
201
220
221
250
257
210
243
240
275
244
270
245
246
274
273
212
214
241
271
272
215

FIG. 37.

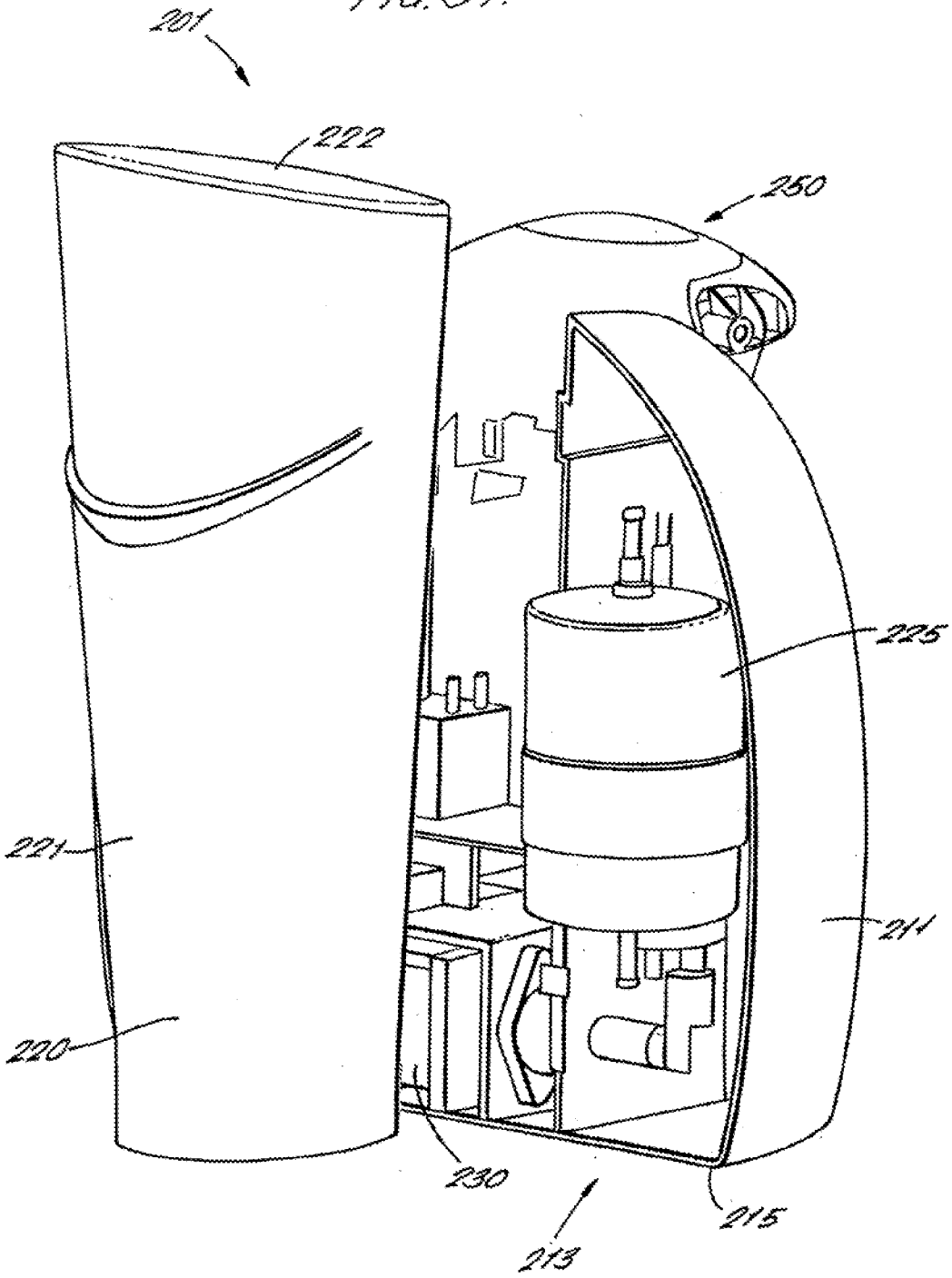
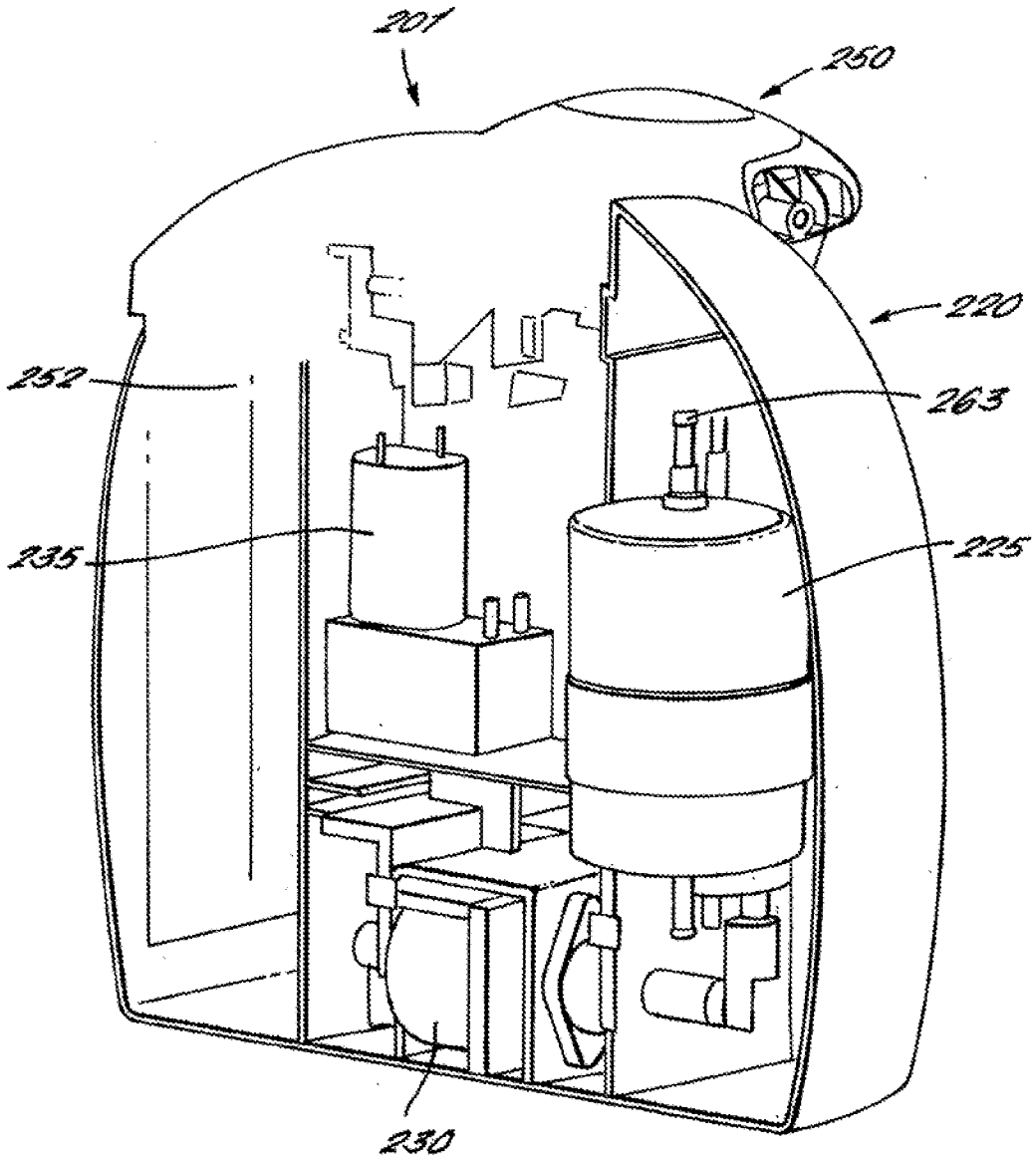


FIG. 38.



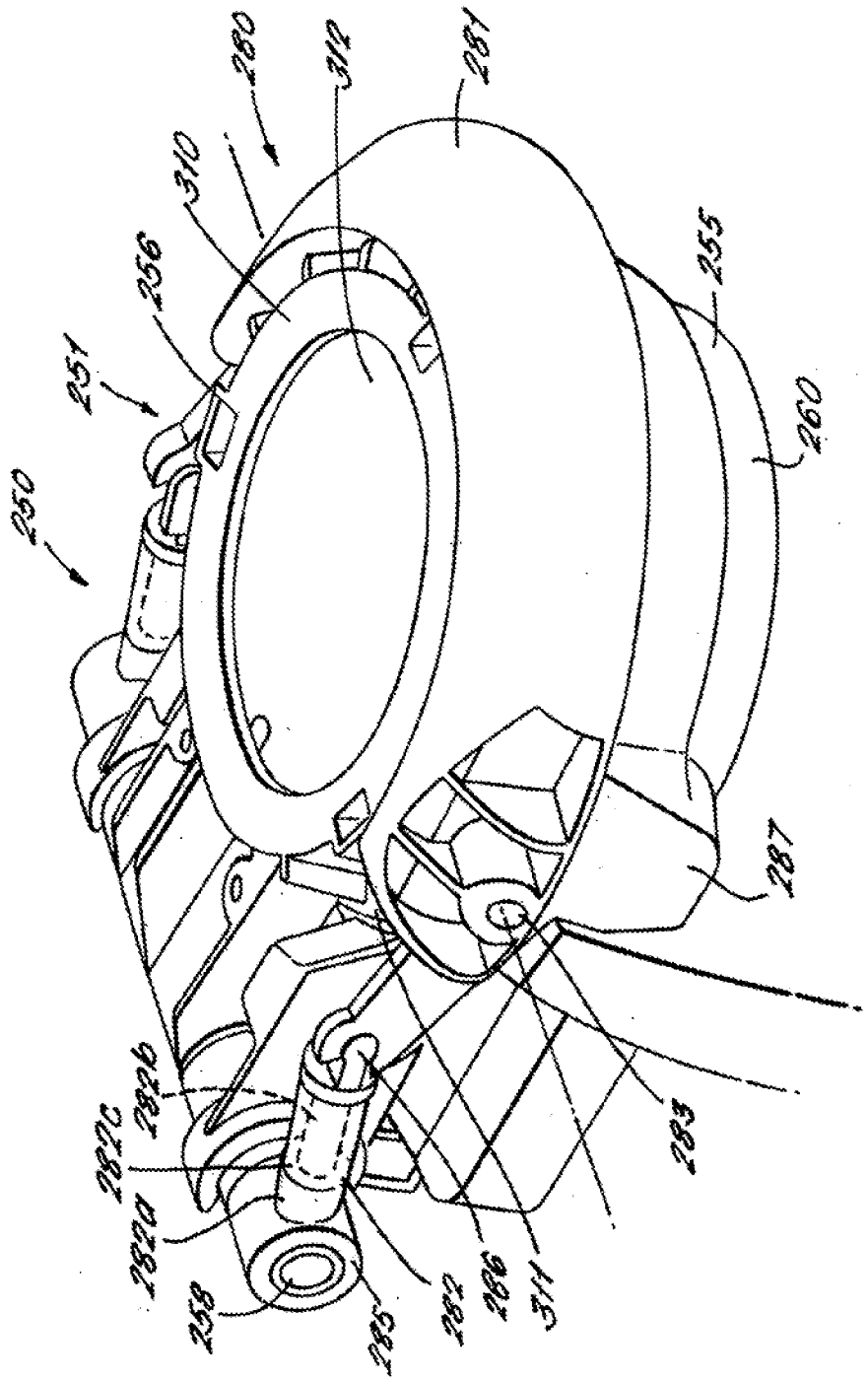

260
310
281
310
256
255
251
260
250
287
294
294c
294d
294b
294a
258
295
292
296
311

FIG. 39.

FIG. 40.

258
253
300
252
261
254
260
290
286
265
257
254
266
254a
291
255
259
260
292

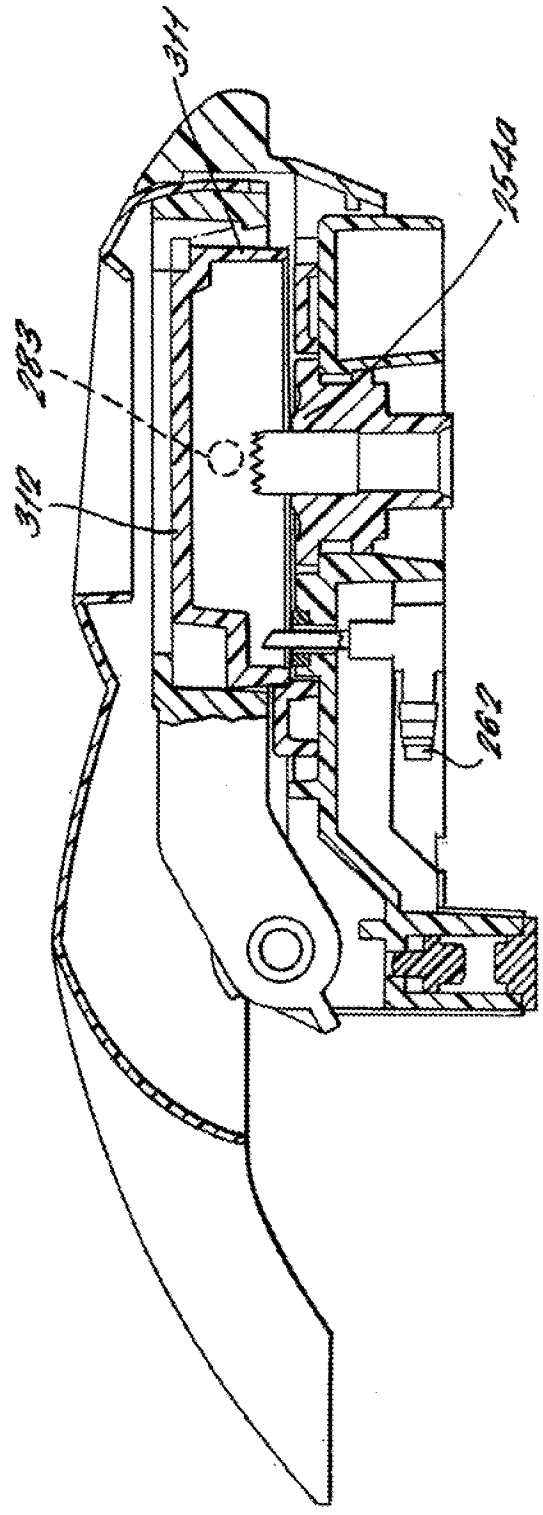
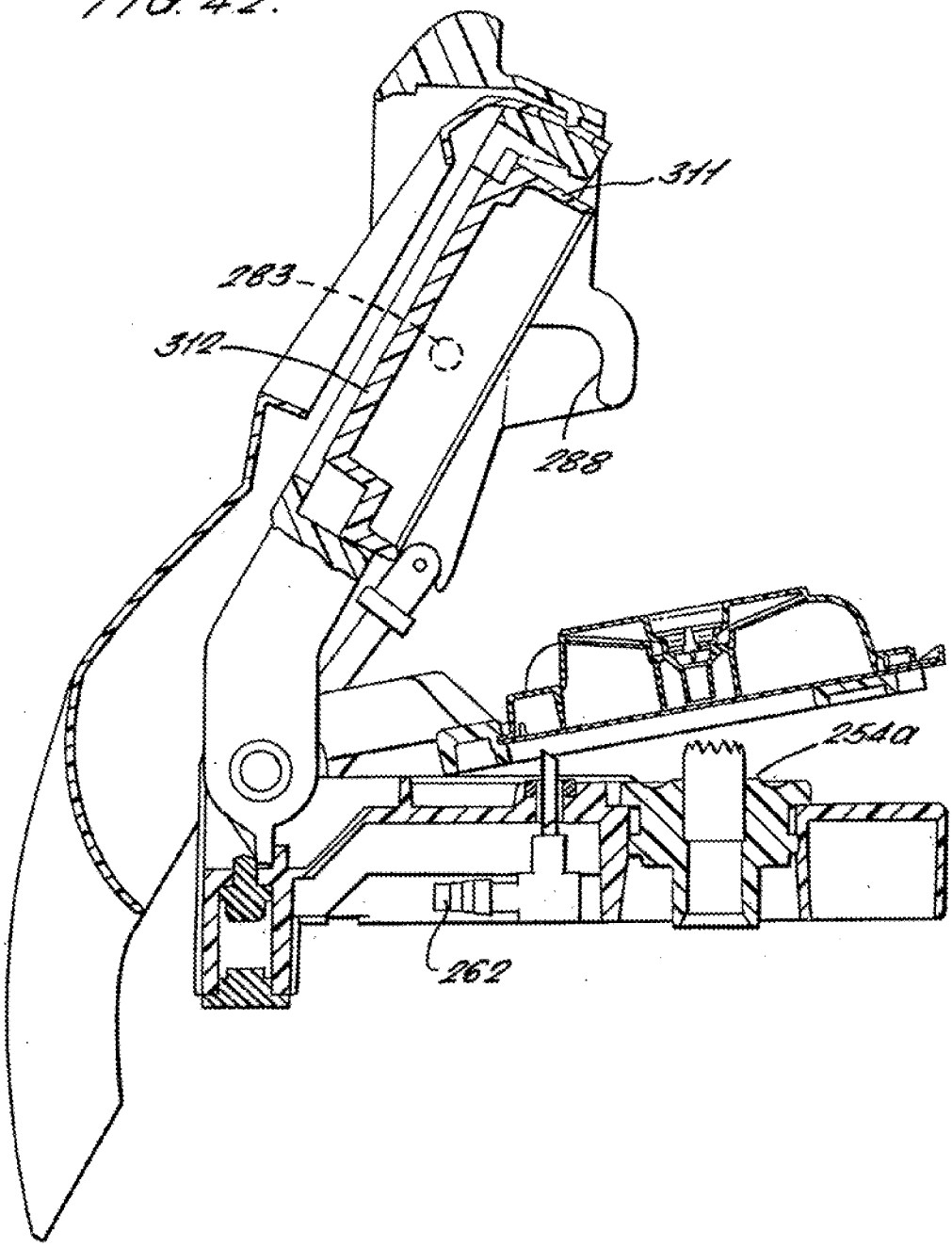


FIG. 41.

FIG. 42.



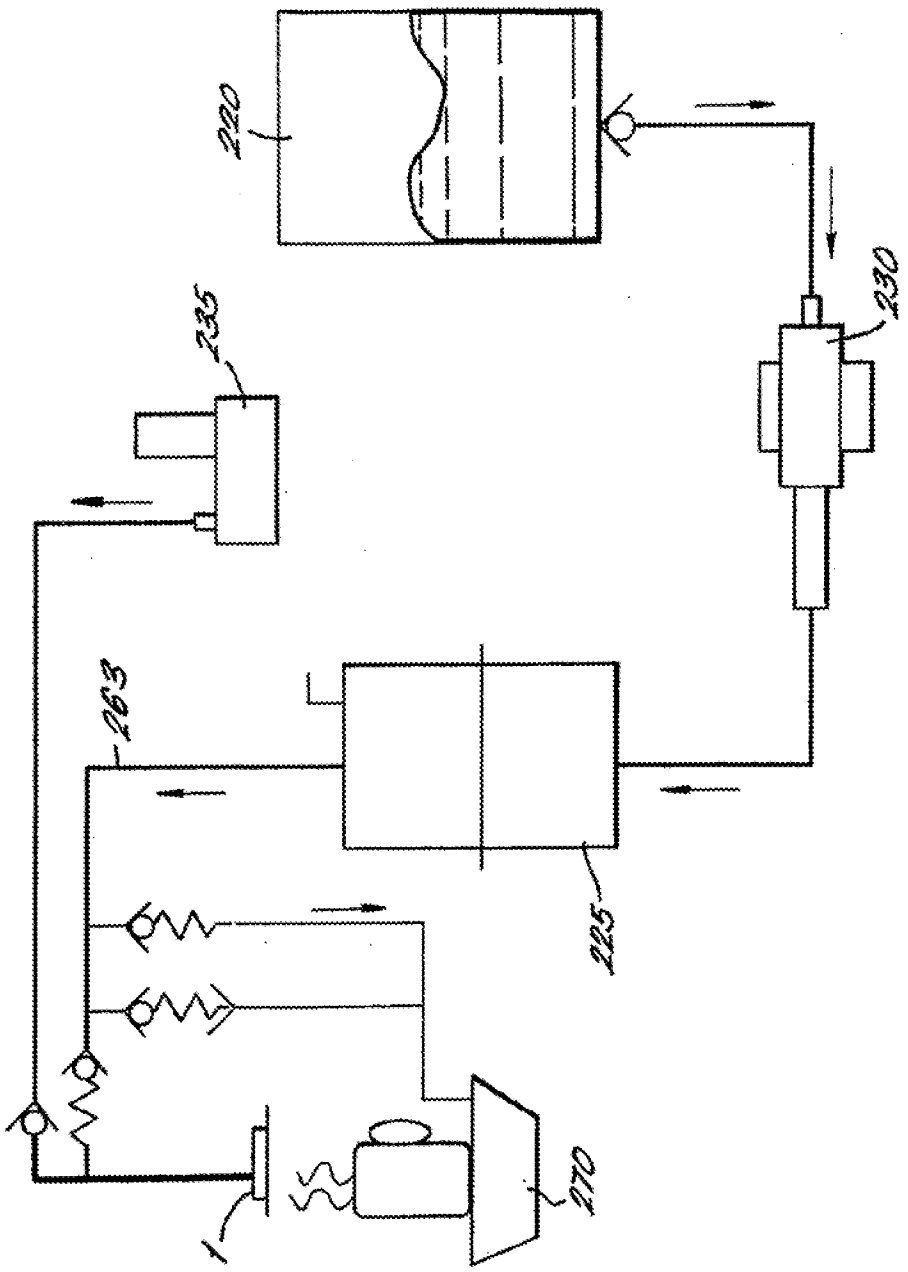


FIG. 43.

FIG. 44a.

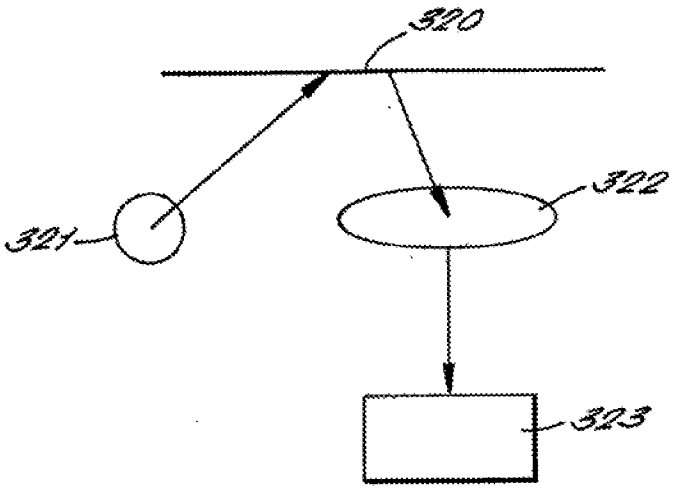


FIG. 44b.

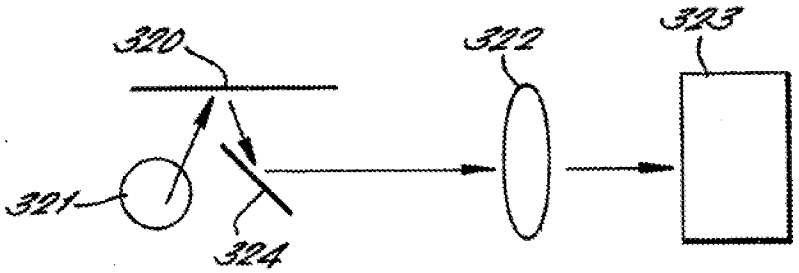


FIG. 45.

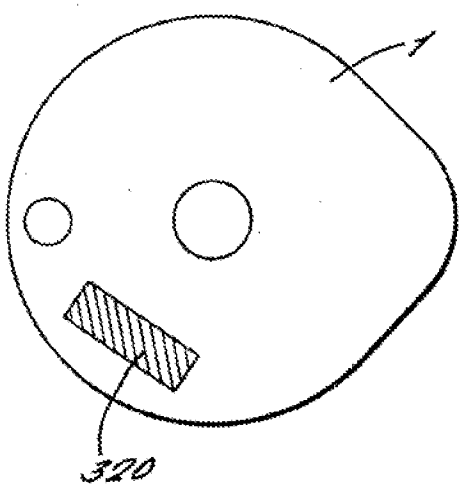


FIG. 46a.

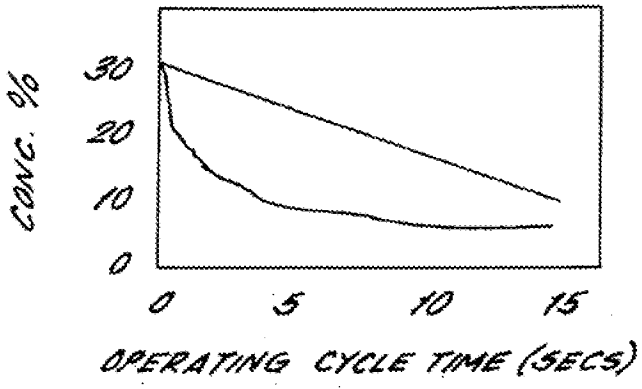


FIG. 46b.

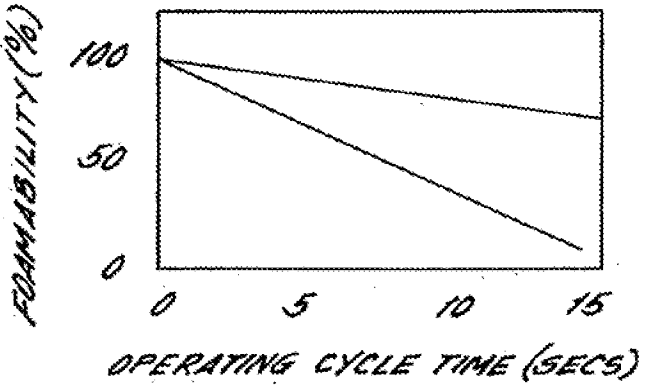
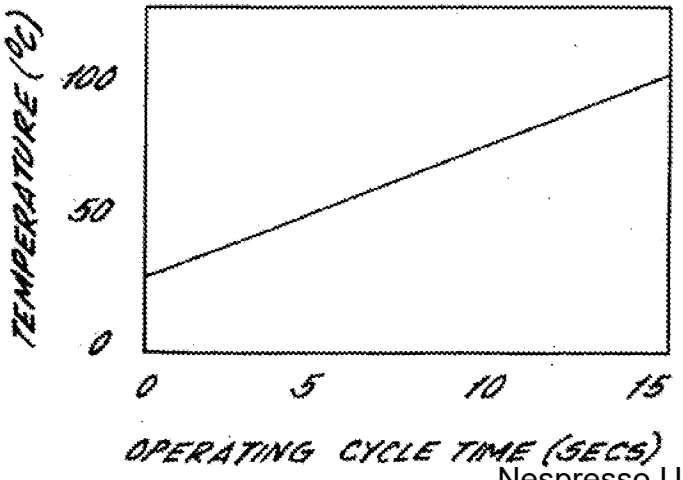


FIG. 46c.



IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 146 of 421

(12) DEMANDE INTERNATIONALE PUBLIÉE EN VERTU DU TRAITÉ DE COOPÉRATION EN MATIÈRE DE BREVETS (PCT)

(19) Organisation Mondiale de la Propriété Intellectuelle
Bureau international

(43) Date de la publication internationale
19 mai 2005 (19.05.2005)

PCT

(10) Numéro de publication internationale
WO 2005/044067 A1

(51) Classification internationale des brevets[7] : A47J 31/40, B65D 81/00

(21) Numéro de la demande internationale :
PCT/IB2004/003524

(22) Date de dépôt international :
26 octobre 2004 (26.10.2004)

(25) Langue de dépôt : français

(26) Langue de publication : français

(30) Données relatives à la priorité :
01896/03 5 novembre 2003 (05.11.2003) CH

(71) Déposant et
(72) Inventeur : RUCHONNET, Jean-François [CH/CH]; Résidence du Soleil, CH-1271 Givrins (CH).

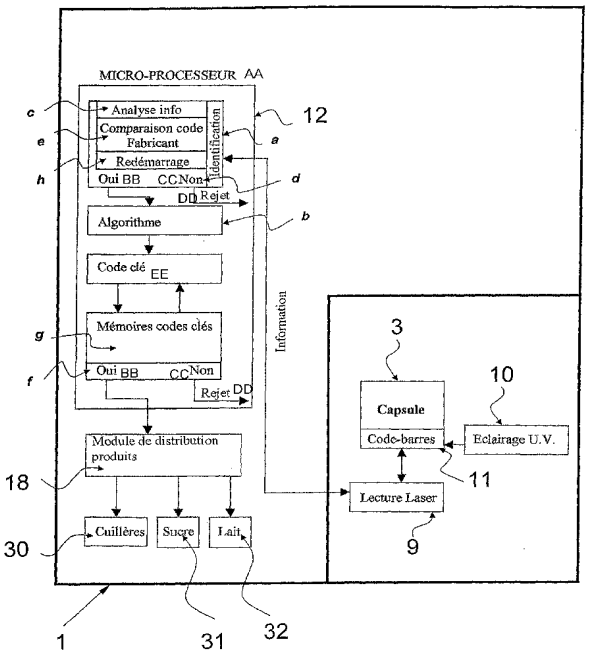
(74) Mandataire : GRIFFES, CONSULTING, SA; Route de Florissant, 81, CH-1206 Genève (CH).

(81) États désignés *(sauf indication contraire, pour tout titre de protection nationale disponible)* : AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH,

[Suite sur la page suivante]

(54) Title: APPARATUS FOR DETERMINING THE TRACEABILITY OF THE CONTENTS OF A CONTAINER AND THE ORIGIN THEREOF

(54) Titre : APPAREIL PERMETTANT D'ETABLIR LA TRACABILITE D'UN CONTENU DANS UN RECEPTACLE ET L'ORIGINE DUDIT RECEPTACLE



AA MICROPROCESSOR
C PROCESS INFORMATION
E COMPARE MANUFACTURER CODE
H RESTART
BB YES
CC NO
DD REJECTION
B ALGORITHM
EE KEY CODE
G KEY CODE MEMORIES
18 PRODUCT DISPENSER MODULE
30 SPOONS
31 SUGAR
32 MILK
11 BARCODE
10 UV LIGHT
9 LASER READOUT

(57) Abstract: The aim of the present invention is to provide an apparatus for determining the traceability of the contents of a container (3) as well as the origin of said container (3), wherein information (11) provided on said container can be read out using an optical and/or magnetic reader but is invisible to the naked eye. Said container (3) comprises a pierceable upper portion for injecting a liquid into the container (3), and a pressure-pierceable lower diaphragm for discharging the liquid flavoured by the contents of the container (3). The apparatus includes an optical and/or magnetic reader (9) for reading said information (11) off a container (3) placed inside the apparatus, a microprocessor for encrypting and decrypting, processing, comparing, approving or rejecting and storing the information (11) read off a container (3), and for selectively initiating or not initiating an operative cycle which includes piercing the upper portion of the container (3) and injecting the liquid, as well as for storing (11) said information to ensure readiness for the initiation of a fresh cycle.

(57) Abrégé : Le but de la présente invention est de proposer un appareil permettant d'établir la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle (3) sur lequel figurent des informations (11) lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'ceil nu. Ledit réceptacle (3) est du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle (3) et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle (3). L'appareil comprend un lecteur (9) optique et/ou magnétique pour la lecture desdites informations (11) sur un réceptacle

[Suite sur la page suivante]

WO 2005/044067 A1

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 147 of 421

PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) États désignés *(sauf indication contraire, pour tout titre de protection régionale disponible)* **:** ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), eurasien (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), européen (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Déclarations en vertu de la règle 4.17 :

— *relative au droit du déposant de demander et d'obtenir un brevet (règle 4.17.ii)) pour toutes les désignations*

— *relative au droit du déposant de revendiquer la priorité de la demande antérieure (règle 4.17.iii)) pour toutes les désignations*

— *relative à la qualité d'inventeur (règle 4.17.iv)) pour US seulement*

Publiée :

— *avec rapport de recherche internationale*

En ce qui concerne les codes à deux lettres et autres abréviations, se référer aux "Notes explicatives relatives aux codes et abréviations" figurant au début de chaque numéro ordinaire de la Gazette du PCT.

(3) introduit dans l'appareil, un microprocesseur (12) permettant de crypter/décrypter, analyser, comparer, approuver/refuser et stocker des informations (11) lues sur un réceptacle (3), et agencé pour sélectivement démarrer ou non un cycle d'opérations comprenant le perçage de la partie supérieure du réceptacle (3) et l'injection du liquide, ainsi que pour le stockage des informations (11) lues afin d'être prêt pour démarrer un nouveau cycle.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 148 of 421

APPAREIL PERMETTANT D'ETABLIR LA TRAÇABILITE D'UN CONTENU DANS UN RECEPTACLE ET L'ORIGINE DUDIT RECEPTACLE

La présente invention est relative au domaine des réceptacles, plus particulièrement aux réceptacles permettant l'emmagasinage ou le transport de substances destinées à aromatiser des boissons.

Un réceptacle est un contenant qui reçoit son contenu de diverses provenances.

La traçabilité est la possibilité d'identifier l'origine d'un produit tout en reconstituant son parcours, depuis sa production jusqu'à sa diffusion.

Il est connu d'utiliser des appareils permettant d'obtenir du café par infusion, ce dernier étant conservé dans un réceptacle appelé capsule.

Un tel appareil est décrit dans la publication EP 0607159 A1 qui présente une machine pour produire automatiquement des cafés ou boissons similaires à partir d'une pluralité de réceptacles préformés. Ce type d'appareil n'utilise pas de moyens électroniques de reconnaissance des réceptacles dont la seule fonction est de préserver l'arôme du contenu afin qu'il conserve les meilleures saveurs.

Un procédé pour extraire une substance aromatique contenue dans un réceptacle hermétique est décrit dans le document EP 025810 A1 qui préconise l'injection d'eau chaude dans ledit réceptacle et, une fois des conditions de température/pression obtenues, amener une membrane de celui-ci à s'ouvrir permettant au liquide imprégné de la substance aromatique de s'en échapper. Ce dispositif n'utilise pas des réceptacles sécurisés permettant la traçabilité du contenu desdits réceptacles.

Le document DE20105605U présente un dispositif qui garantit l'hermétisme d'un réceptacle, assurant ainsi la qualité du produit qu'il contient. Il est à noter que ce dispositif est muni d'un transpondeur et permet de détruire un système visible de sécurité porté par les réceptacles qu'il utilise.

Le document WO02078498 présente un identificateur lisible situé sur le sommet de réceptacles utilisés par des machines à café Expresso, ce qui permet de garantir la qualité d'un produit en détruisant des informations d'hermétisme portées par ledit réceptacle. Ce dispositif est visible ce qui permet la reprise des informations contenues dans le dispositif.

Le but de la présente invention est de proposer un appareil permettant de lire la traçabilité d'un contenu dans un réceptacle et de déterminer l'origine des contenants que ledit appareil utilise.

Ce but est atteint par un appareil permettant d'établir la traçabilité d'un contenu dans un réceptacle et l'origine dudit réceptacle sur lequel figurent des informations lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'œil nu, ledit réceptacle étant du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle, l'appareil comprenant un lecteur optique et/ou magnétique pour la lecture desdites informations sur un réceptacle introduit dans l'appareil, et un microprocesseur permettant de crypter/décrypter, analyser, comparer, approuver/refuser et stocker des informations lues sur un réceptacle, et agencé pour sélectivement démarrer ou non un cycle d'opérations comprenant le perçage de la partie supérieure du réceptacle et l'injection du liquide, ainsi que pour le stockage des informations lues afin d'être prêt pour démarrer un nouveau cycle.

On obtient ainsi un système qui identifie un réceptacle, compare l'information que porte celui-ci au code du fabricant contenu dans une mémoire du système, accepte ou refuse l'information, mémorise celle-ci afin de ne pas permettre sa récupération, autorise la distribution de produits et recommence un cycle de travail. Il est à noter que l'information contient les données concernant la traçabilité du produit mais également celles concernant l'origine du réceptacle et sont apposées sur ce dernier par le fabricant au moment de la production de celui-ci.

L'identification est opérée, notamment sur une base magnétique portant les informations de traçabilité et d'origine, par un lecteur à tête magnétique tournante qui lit l'information et la transmet.

L'acceptation/refus sont déterminés par un microprocesseur qui, après avoir crypter les informations d'origine, compare celles-ci aux codes clés du fabricant afin de libérer/refuser la distribution de produits.

La mémorisation est fournie par le fabricant au moyen notamment de puces électroniques qui sont installées sur le dispositif.

En fin de séquence, un redémarrage du cycle est entamé par logiciel incorporé ce qui permet à l'utilisateur de ne pas devoir agir manuellement d'une part et garantit la mise en place automatique des fonctions susmentionnées d'autre part.

Dans une forme d'exécution, l'information sur le réceptacle est indiquée sous forme de code-barre U.V. situé notamment autour de la surface latérale extérieure du réceptacle. Dans ce cas le dispositif comporte avantageusement des moyens de lecture à tête laser tridimensionnels. Le code-barre U.V. est inscrit à l'aide d'encre incolore, visible seulement sous exposition de rayons ultra violets (U.V.).

Dans une autre forme d'exécution, le réceptacle est en matière amagnétique et l'information se trouve sur un ruban circulaire à l'intérieur dudit réceptacle.

Enfin, une autre variante de l'invention présente un réceptacle où le code magnétique est placé entre le couvercle et le corps du réceptacle. Dans ce cas l'information est stockée dans une bande magnétique souple en forme d'anneau.

L'invention sera mieux comprise grâce à la description détaillée qui va suivre en se référant aux dessins annexés dans lesquels :

- La figure 1 représente, à titre d'exemple, un schéma de principe d'un système permettant de déterminer la traçabilité d'un contenu dans un réceptacle et l'origine dudit réceptacle.

- La figure 2 représente schématiquement une vue en perspective d'une information en code-barre visible par exposition aux rayons U.V. et lisible par lecture laser.

- La figure 3 représente une vue en perspective de la disposition du marquage code-barre sur un réceptacle.

- La figure 4 représente, en variante, une vue en perspective d'une bande magnétique contenant les informations de traçabilité/origine perpendiculaire à son support et introduite dans son support.

- La figure 5 représente, en variante, une vue en perspective et partiellement en coupe d'un assemblage du support des informations dans la base duquel s'introduit une bande magnétique contenant les informations.

- La figure 6 représente, en variante, une vue en perspective d'une bande magnétique contenant les informations de traçabilité/origine perpendiculaire à son support et située à l'extérieur dudit support.

- La figure 7 représente une vue en perspective et en coupe d'un fil magnétique entourant la base du support et contenant les informations de traçabilité/origine.

Dans une forme d'exécution, illustrée aux figures 1, 2 et 3, un système permettant la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle comprend :

- un support (1),

- un microprocesseur (12),

- un module de distribution (18) de produits,
- un dispositif de lecture laser (9),
- un dispositif d'émission de rayons U.V. (10), et
- un réceptacle (3) comportant les informations (11) de traçabilité/origine.

Le support (1) est notamment une machine à café permettant l'injection de liquide dans le réceptacle (3).

Le microprocesseur (12) contrôle les fonctions suivantes et tel qu'illustré à la figure 1:

- L'identification (a) de la base portant les informations (11) de traçabilité/origine.
- Cryptage ou décryptage (b) des informations (11) situées sur le réceptacle (3).
- Analyse (c) des informations (11).
- Acceptation ou refus (d) des informations (11).
- Comparaison (e) des informations (11) situées sur le réceptacle (3) avec les données que contient le système.
- Approbation ou refus (f) de la distribution des produits (30, 31, 32).
- Stockage (g) des informations (11) après usage, notamment dans la mémoire.
- Redémarrage (h) automatique d'un cycle.

Le module de distribution de produits (18) comporte une électronique de commande des ouvertures notamment du liquide à injecter dans le réceptacle (3), des matières, telles que du sucre (31) et du lait (32), à insérer dans ledit

liquide aromatisé délivré par le réceptacle (3) et des dispositifs tels que des cuillères (30) permettant le brassage des matières au liquide et par simple numérotation de celle-ci, d'identifier le destinataire.

Le dispositif de lecture laser (9) est équipé notamment d'une tête de lecture (5 – Fig. 2) à travers laquelle les informations (11) sont distribuées au microprocesseur (12). La tête de lecture laser (5) est fixée au support (1) et située de manière à permettre la lecture des informations (11) sur un réceptacle (3) lorsque ce dernier est introduit dans le support (1).

Le réceptacle (3) comporte un support (13) de forme notamment cylindrique ou tronc conique sur lequel, dès son conditionnement, les informations (11) ont été apposées sur son pourtour, d'une base (14) circulaire qui permet de retenir la substance, notamment du café, devant être filtrée. Cette base (14) est perforable sous l'action de la pression du liquide de manière à laisser passer le liquide à filtrer et à aromatiser.

Les informations (11) se présentent sous forme de code-barre (23 – Fig. 2) invisible inscrit à l'aide d'une encre réactive à l'éclairage ultra-violet (U.V.). Le code-barre (23) est visible lorsqu'il est soumis à une source (6 – Fig. 2) de rayonnement ultra-violet (U.V.). Les informations (11) comportent toutes les indications relatives à la traçabilité du produit contenu dans le réceptacle (3) et à l'origine de ce dernier.

Le réceptacle (3), disposant du code-barre (23), est acheminé sous la tête de lecture laser (5). Le code-barre (23) est soumis au rayonnement U.V. émis par la source (6).

Les informations (11) sont lues et transmises au microprocesseur (12) qui déclenche, en cas de reconnaissance positive de celle-ci, les opérations susmentionnées et, en cas de reconnaissance négative, rejette lesdites informations (11) et arrête la procédure de déclenchement du module de distribution (18) pour interrompre la procédure de perçage de la partie supérieure du réceptacle (3) et d'extraction des produits (30, 31, 32).

Il est à noter que le microprocesseur (12) émet une clé, recalculée par algorithme, sous forme de chiffres et de lettres ce qui représente l'indication comparée aux données du fabricant. Toutes les clés, après traitement, sont mémorisées dans la mémoire interne du microprocesseur (12).

Une clé est attribuée avantageusement à un seul code-barre (23) ce qui permet d'utiliser le réceptacle (3) une seule fois. Un réceptacle (3) sans code-barre (23) est automatiquement rejeté de même qu'un code-barre (23) erroné et la réutilisation d'un code-barre (23) usagé sont rejetés par comparaison des clés.

Les figures 4 et 5 illustrent une forme d'exécution où le réceptacle (3) est en matière amagnétique et les informations (11) se trouvent sur un ruban notamment magnétique circulaire (20) à l'intérieur dudit réceptacle (3).

La figure 6 illustre une variante de l'invention qui présente un réceptacle (3) où les informations (11) sont placées entre un couvercle (17) perforable et la base (14) du réceptacle (3), sous la forme d'un anneau (15).

La figure 7 illustre une variante qui consiste à loger un fil métallique (8) dans la base (14) du réceptacle (3) de telle façon que les informations (11) soient enregistrées notamment sous forme magnétique.

REVENDICATIONS

1. Appareil permettant d'établir la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle (3) sur lequel figurent des informations (11) lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'œil nu, ledit réceptacle (3) étant du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle (3) et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle (3), l'appareil comprenant :

   - un lecteur (9) optique et/ou magnétique pour la lecture desdites informations (11) sur un réceptacle (3) introduit dans l'appareil,

   - un microprocesseur (12) permettant de crypter/décrypter, analyser, comparer, approuver/refuser et stocker des informations (11) lues sur un réceptacle (3), et agencé pour sélectivement démarrer ou non un cycle d'opérations comprenant le perçage de la partie supérieure du réceptacle (3) et l'injection du liquide, ainsi que pour le stockage des informations (11) lues afin d'être prêt pour démarrer un nouveau cycle.

2. Appareil selon la revendication 1 caractérisé en ce qu'il comporte un dispositif d'émission de rayons UV permettant la lecture d'un code-barre (23) invisible à l'œil nu situé sur le réceptacle (3).

3. Appareil selon la revendication 1 ou 2 caractérisé en ce qu'il comporte une tête de lecture magnétique qui lit les informations (11) magnétiques portées par le réceptacle (3).

4. Appareil selon l'une des revendications précédentes caractérisé en ce qu'il comporte un module (18) pour distribuer des produits, tels que du sucre (31) et du lait (32) et des dispositifs tels que des cuillères (30) permettant le brassage avec le liquide et permettant l'identification du destinataire, ceci conjointement avec la sortie du liquide aromatisé.

5. Appareil selon l'une des revendications précédentes caractérisé en ce qu'il comporte une tête de lecture laser (5) fixée au support (1).

6. Réceptacle du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle (3) et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle (3), utilisable par l'appareil selon l'une quelconque des revendications précédentes caractérisé en ce qu'il comporte des informations (11) lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'œil nu.

7. Réceptacle utilisable par l'appareil selon la revendication 6 caractérisé en ce qu'il est en matière amagnétique et les informations (11) se trouvent sur un ruban circulaire (20) à l'intérieur dudit réceptacle (3).

8. Réceptacle utilisable par l'appareil selon l'une des revendications 6 ou 7 caractérisé en ce qu'il dispose d'un code magnétique (15) placé entre son couvercle (17) et sa base (14).

9. Réceptacle utilisable par l'appareil selon l'une des revendications 6, 7 ou 8 caractérisé en ce que les informations (11) qu'il porte se présentent sous forme de code-barre (23) invisible inscrit à l'aide d'une encre réactive à l'éclairage ultra-violet (UV).

10. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 9 caractérisé en ce que les informations (11) qu'il porte comportent des indications relatives à la traçabilité.

11. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 10 caractérisé en ce que les informations (11) qu'il porte comportent des indications relatives à l'origine du réceptacle (3).

12. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 11 caractérisé en ce que les informations (11) qu'il porte sont stockées sur une bande magnétique (15) souple.

13. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 12 caractérisé en ce que les informations (11) qu'il porte sont stockées sur un anneau (8).

14. Système permettant d'établir la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle (3), comportant un appareil selon l'une des revendications 1 à 5 et une pluralité de réceptacles selon l'une des revendications 6 à 13.

15. Procédé d'utilisation d'un appareil selon l'une des revendications 1 à 5 et/ou d'un réceptacle selon l'une des revendications 6 à 13 caractérisé en ce qu'il comporte les étapes suivantes :

- identification (a) de la base portant les informations (11) de traçabilité du contenu dans le réceptacle (3) et d'origine dudit réceptacle (3),
- cryptage/décryptage (b) des informations (11) situées sur le réceptacle (3),
- analyse (c) des informations (11),
- acceptation ou refus (d) des informations (11),
- comparaison (e) des informations (11) situées sur le réceptacle (3) avec les données qu'il contient,
- approbation/refus (f) du perçage de la partie supérieure du réceptacle (3) et l'injection du liquide, éventuellement aussi de la distribution des produits (30, 31, 32) conjointement avec la sortie du liquide aromatisé.
- stockage (g) des informations (11) dans la mémoire interne après usage,
- redémarrage (h) automatique d'un cycle.

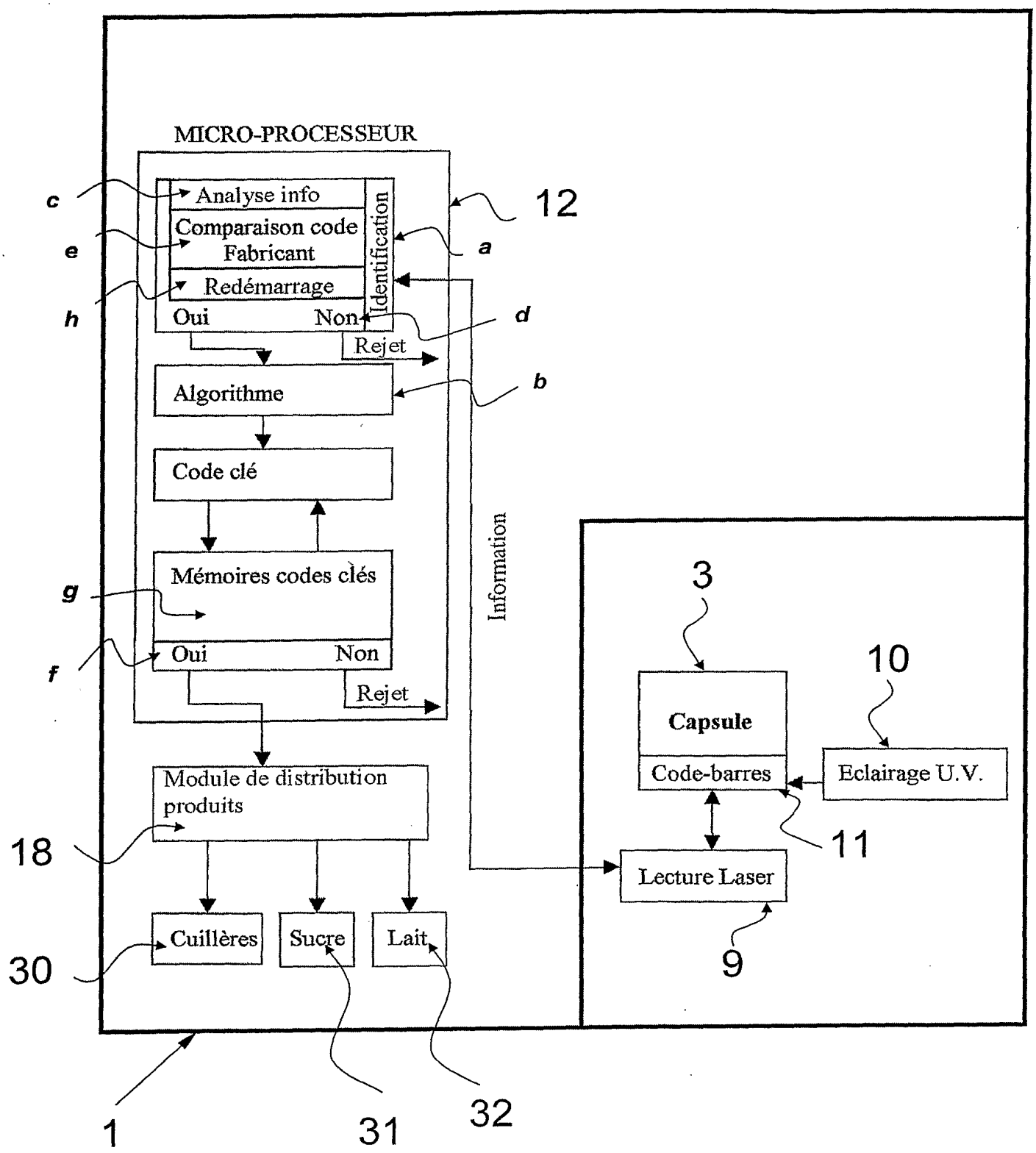

MICRO-PROCESSEUR
Analyse info
Comparaison code Fabricant
Redémarrage
Identification
Oui
Non
Rejet
Algorithme
Code clé
Mémoires codes clés
Oui
Non
Rejet
Module de distribution produits
Cuillères
Sucre
Lait
Information
Capsule
Code-barres
Eclairage U.V.
Lecture Laser
12
a
b
c
d
e
f
g
h
3
10
11
9
18
30
1
31
32

Fig. 1

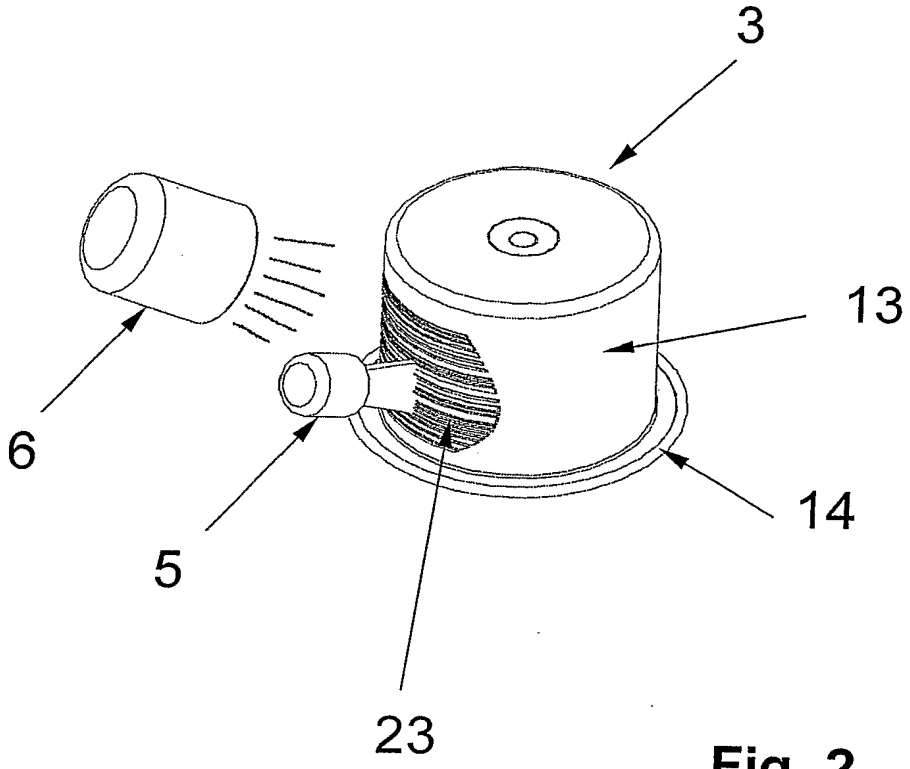


Fig. 2

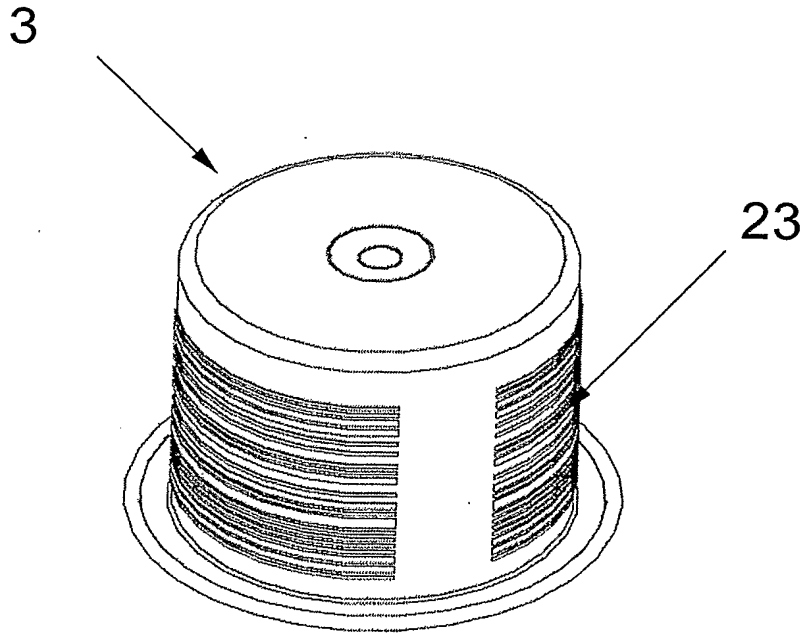


Fig. 3

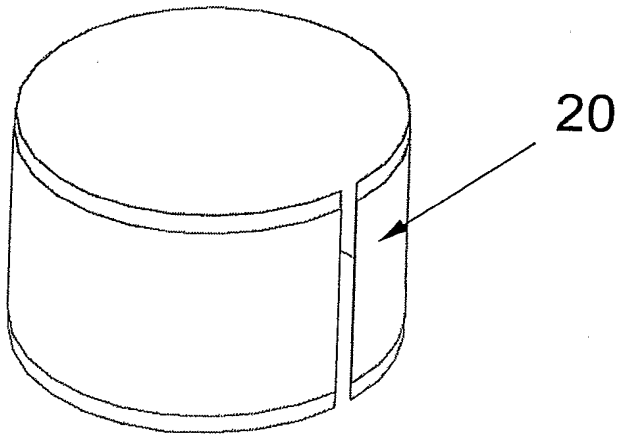


Fig. 4

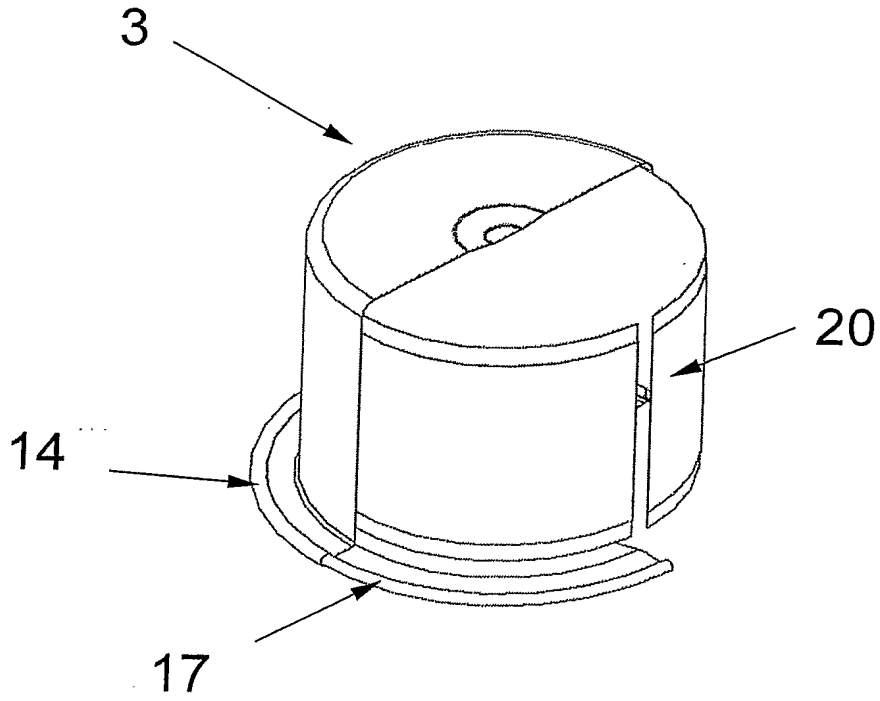


Fig. 5

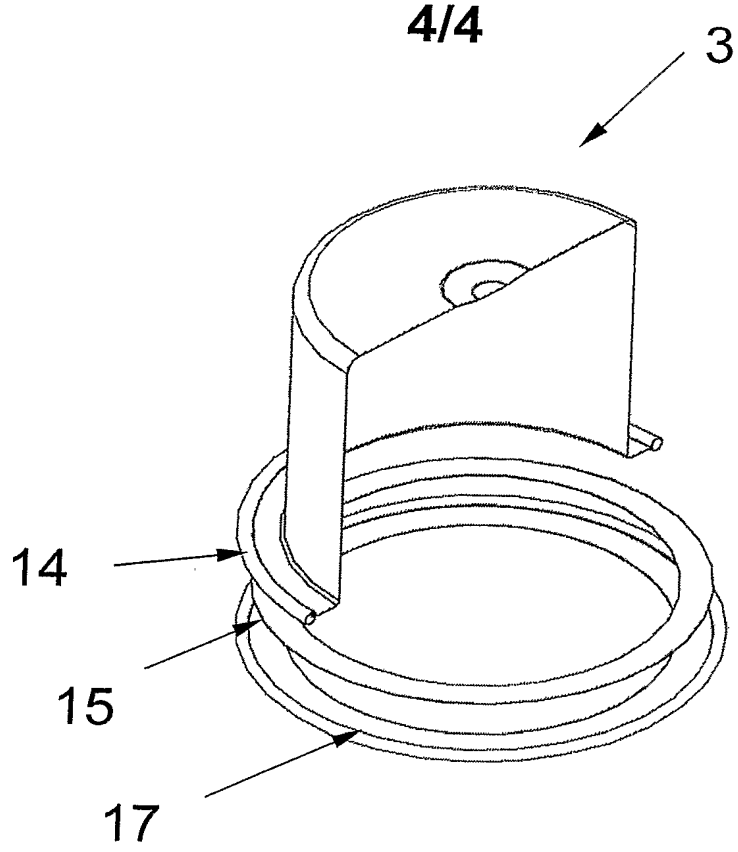


Fig. 6

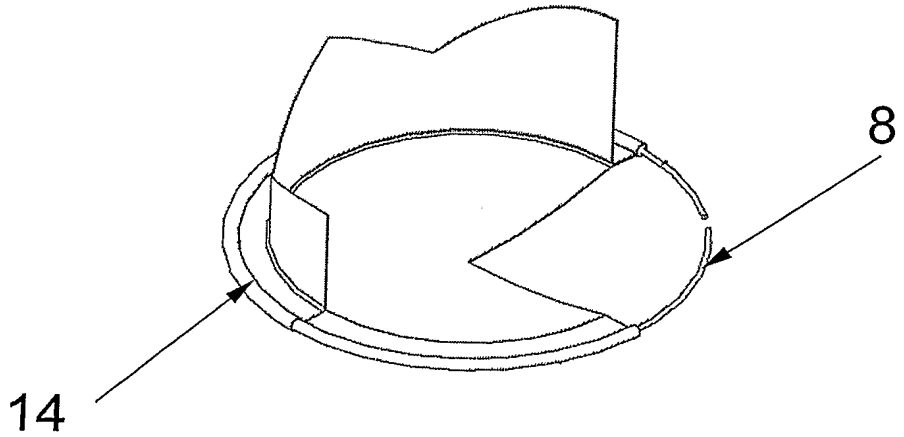


Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No
IB2004/003524

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47J31/40 B65D81/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47J B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/28241 A (BOYD COFFEE CO) 11 April 2002 (2002-04-11) page 5, paragraph 4 - page 11, paragraph 3 page 11, paragraph 3; figures claim 7	1,3,4,6, 8,10-15
A	WO 02/078498 A (EUGSTER FRISMAG AG ; MAHLICH GOTTHARD (DE)) 10 October 2002 (2002-10-10) cited in the application page 8, line 6 - page 10, line 9; figures	6-13
A	US 6 117 471 A (KING ALAN M) 12 September 2000 (2000-09-12) column 3, line 39 - column 5, line 23; figures	1,6,14, 15

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 January 2005	21/01/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Terlizzi, M

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 163 of 421

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 858 523 A (HELBLING EDWARD) 22 August 1989 (1989-08-22) column 10, lines 25-35; claims 11,12; figure 2	1,6

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 164 of 421

INTERNATIONAL SEARCH REPORT

International Application No
IB2004/003524

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 0228241	A	11-04-2002	AU	1148902 A	15-04-2002
			WO	0228241 A1	11-04-2002
			US	2002048621 A1	25-04-2002
WO 02078498	A	10-10-2002	DE	10116239 A1	17-10-2002
			CA	2442389 A1	10-10-2002
			DE	20121494 U1	17-10-2002
			WO	02078498 A1	10-10-2002
			EP	1379153 A1	14-01-2004
			JP	2004525829 T	26-08-2004
			NO	20034325 A	05-11-2003
			US	2004089158 A1	13-05-2004
US 6117471	A	12-09-2000	US	5974950 A	02-11-1999
US 4858523	A	22-08-1989	US	4967648 A	06-11-1990
			US	5080008 A	14-01-1992
			US	5072660 A	17-12-1991
			US	5158793 A	27-10-1992

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 165 of 421

RAPPORT DE RECHERCHE INTERNATIONALE

Demande Internationale No
IB2004/003524

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
CIB 7 A47J31/40 B65D81/00

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
CIB 7 A47J B65D

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si réalisable, termes de recherche utilisés)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie °	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
X	WO 02/28241 A (BOYD COFFEE CO) 11 avril 2002 (2002-04-11) page 5, alinéa 4 - page 11, alinéa 3 page 11, alinéa 3; figures revendication 7	1,3,4,6, 8,10-15
A	WO 02/078498 A (EUGSTER FRISMAG AG ; MAHLICH GOTTHARD (DE)) 10 octobre 2002 (2002-10-10) cité dans la demande page 8, ligne 6 - page 10, ligne 9; figures	6-13
A	US 6 117 471 A (KING ALAN M) 12 septembre 2000 (2000-09-12) colonne 3, ligne 39 - colonne 5, ligne 23; figures	1,6,14, 15

-/--

[X] Voir la suite du cadre C pour la fin de la liste des documents

[X] Les documents de familles de brevets sont indiqués en annexe

° Catégories spéciales de documents cités:

"A" document définissant l'état général de la technique, non considéré comme particulièrement pertinent

"E" document antérieur, mais publié à la date de dépôt international ou après cette date

"L" document pouvant jeter un doute sur une revendication de priorité ou cité pour déterminer la date de publication d'une autre citation ou pour une raison spéciale (telle qu'indiquée)

"O" document se référant à une divulgation orale, à un usage, à une exposition ou tous autres moyens

"P" document publié avant la date de dépôt international, mais postérieurement à la date de priorité revendiquée

"T" document ultérieur publié après la date de dépôt international ou la date de priorité et n'appartenenant pas à l'état de la technique pertinent, mais cité pour comprendre le principe ou la théorie constituant la base de l'invention

"X" document particulièrement pertinent; l'inven tion revendiquée ne peut être considérée comme nouvelle ou comme impliquant une activité inventive par rapport au document considéré isolément

"Y" document particulièrement pertinent; l'inven tion revendiquée ne peut être considérée comme impliquant une activité inventive lorsque le document est associé à un ou plusieurs autres documents de même nature, cette combinaison étant évidente pour une personne du métier

"&" document qui fait partie de la même famille de brevets

Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale
14 janvier 2005	21/01/2005

Nom et adresse postale de l'administration chargée de la recherche internationale	Fonctionnaire autorisé
Office Européen des Brevets, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	De Terlizzi, M

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 166 of 421

C.(suite) DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie °	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
A	US 4 858 523 A (HELBLING EDWARD) 22 août 1989 (1989-08-22) colonne 10, ligne 25-35; revendications 11,12; figure 2 -----	1,6

Document brevet cité au rapport de recherche		Date de publication	Membre(s) de la famille de brevet(s)		Date de publication
WO 0228241	A	11-04-2002	AU	1148902 A	15-04-2002
			WO	0228241 A1	11-04-2002
			US	2002048621 A1	25-04-2002
WO 02078498	A	10-10-2002	DE	10116239 A1	17-10-2002
			CA	2442389 A1	10-10-2002
			DE	20121494 U1	17-10-2002
			WO	02078498 A1	10-10-2002
			EP	1379153 A1	14-01-2004
			JP	2004525829 T	26-08-2004
			NO	20034325 A	05-11-2003
			US	2004089158 A1	13-05-2004
US 6117471	A	12-09-2000	US	5974950 A	02-11-1999
US 4858523	A	22-08-1989	US	4967648 A	06-11-1990
			US	5080008 A	14-01-1992
			US	5072660 A	17-12-1991
			US	5158793 A	27-10-1992

Espacenet

Bibliographic data: WO2005044067 (A1) — 2005-05-19

APPARATUS FOR DETERMINING THE TRACEABILITY OF THE CONTENTS OF A CONTAINER AND THE ORIGIN THEREOF

Inventor(s): RUCHONNET JEAN-FRANCOIS [CH] ± (RUCHONNET, JEAN-FRANCOIS)

Applicant(s): RUCHONNET JEAN-FRANCOIS [CH] ± (RUCHONNET, JEAN-FRANCOIS)

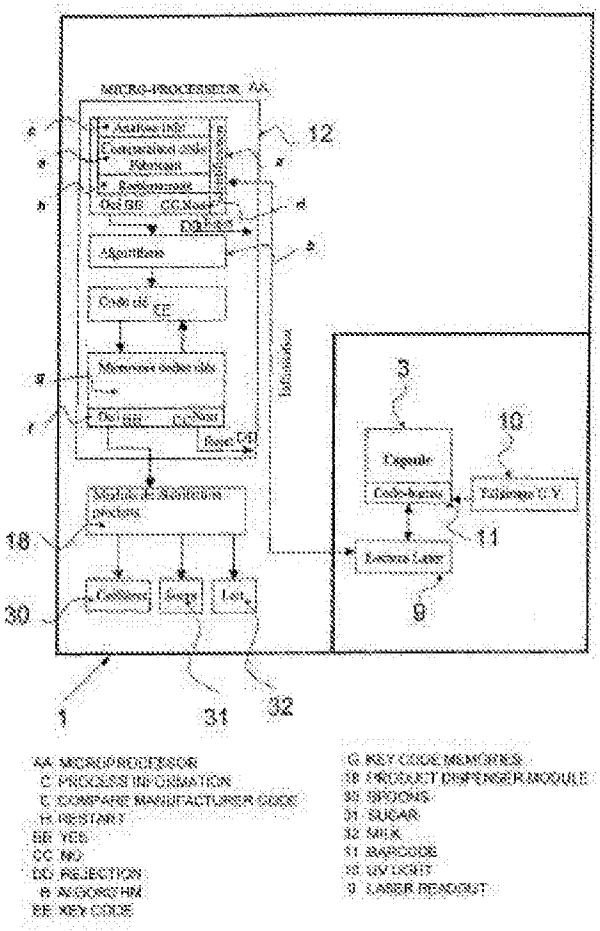
Classification: **- international:** ***A47J31/36; A47J31/40; B65D81/00; B65D85/804;*** (IPC1-7): A47J31/40; B65D81/00
- cooperative: **A47J31/3623; A47J31/4492; B65D85/8043;** B65D2203/06; B65D2203/10

Application number: WO2004IB03524 20041026 Global Dossier

Priority number(s): CH20030001896 20031105

Abstract of WO2005044067 (A1)

The aim of the present invention is to provide an apparatus for determining the traceability of the contents of a container (3) as well as the origin of said container (3), wherein information (11) provided on said container can be read out using an optical and/or magnetic reader but is invisible to the naked eye. Said container (3) comprises a pierceable upper portion for injecting a liquid into the container (3), and a pressure-pierceable lower diaphragm for discharging the liquid flavoured by the contents of the container (3). The apparatus includes an optical and/or magnetic reader (9) for reading said information (11) off a container (3) placed inside the apparatus, a microprocessor for encrypting and decrypting, processing, comparing, approving or rejecting and storing the information (11) read off a container (3), and for selectively initiating or not initiating an operative cycle which includes piercing the upper portion of the container (3) and injecting the liquid, as well as for storing (11) said information to ensure readiness for the initiation of a fresh cycle.


MICRO-PROCESSOR AA
12
3
10
11
9
16
30
1
31
32

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION WO2005044067

The present invention relates to the field of receptacles, more particularly to containers for storing or transporting substances for flavoring beverages. BACKGROUND OF THE INVENTION

A receptacle is a container that receives its contents from various sources.

Traceability is the ability to identify the origin of a product while reconstructing its path, from production to dissemination.

It is known to use apparatus for obtaining coffee by infusion, the latter being kept in a receptacle called capsule.

Such an apparatus is described in EP 0607159 A1 which discloses a machine for automatically producing coffees or similar drinks from a plurality of preformed receptacles. This type of device does not use electronic means of receptacle recognition whose sole function is to preserve the aroma of the content so that it retains the best flavors.

A method for extracting an aromatic substance contained in a hermetic receptacle is described in EP 025810 A1 which recommends injecting hot water into said receptacle and, once temperature / pressure conditions have been obtained, to bring a membrane of this receptacle. ci to open allowing the liquid impregnated with the aromatic substance to escape.

This device does not use secure containers for traceability of the contents of said receptacles.

The document DE20105605U has a device that ensures the hermeticism of a receptacle, thus ensuring the quality of the product it contains. It should be noted that this device is equipped with a transponder and can destroy a visible security system carried by the receptacles it uses.

Document W002078498 discloses a readable identifier located on the top of receptacles used by Expresso coffee machines, which makes it possible to guarantee the quality of a product by destroying hermetic information carried by said receptacle. This device is visible which allows the recovery of the information contained in the device.

The object of the present invention is to provide an apparatus for reading the traceability of a content in a receptacle and to determine the origin of the containers that said device uses.

This purpose is achieved by an apparatus for establishing the traceability of a content in a receptacle and the origin of said receptacle on which readable information by means of an optical and / or magnetic reader but invisible to the naked eye , said receptacle being of the type comprising a pierceable upper part for injecting the liquid into the receptacle and a lower membrane perforable under pressure for the output of said flavored liquid by the contents of the receptacle, the apparatus comprising an optical and / or magnetic reader for reading said information on a receptacle introduced into the apparatus, and a microprocessor for encrypting / decrypting, analyzing, comparing, approving / rejecting and storing information read on a receptacle, and arranged to selectively start or not start a cycle of operations including piercing the upper part of the receptacle and injecting the liquid; as well as storing the information read in order to be ready to start a new cycle.

A system is thus obtained that identifies a receptacle, compares the information that it carries with the manufacturer's code contained in a system memory, accepts or refuses the information, stores it in order not to allow its recovery, authorizes product distribution and starts a work cycle again. It should be noted that the information contains the data relating to the traceability of the product but also those concerning the origin of the receptacle and are affixed to it by the manufacturer at the time of production thereof.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 171 of 421

The identification is performed, in particular on a magnetic base carrying the traceability and origin information, by a reader with rotating magnetic head that reads the information and transmits it.

Acceptance / refusal is determined by a microprocessor that, after encrypting the original information, compares it to the manufacturer's key codes in order to release / reject the product distribution.

Storage is provided by the manufacturer by means of particular electronic chips that are installed on the device.

At the end of the sequence, a restart of the cycle is started by embedded software which allows the user not to have to act manually on the one hand and guarantees the automatic implementation of the aforementioned functions on the other hand.

In one embodiment, the information on the receptacle is indicated in the form of U.V. bar code located in particular around the outer lateral surface of the receptacle. In this case, the device advantageously comprises reading means with three-dimensional laser heads. The U.V. barcode is inscribed with colorless ink, visible only under ultraviolet (U.V.) exposure.

In another embodiment, the receptacle is of non-magnetic material and the information is on a circular ribbon inside said receptacle.

Finally, another variant of the invention has a receptacle where the magnetic code is placed between the lid and the body of the receptacle. In this case the information is stored in a flexible ring-shaped magnetic tape.

The invention will be better understood from the following detailed description with reference to the accompanying drawings in which:

FIG. 1 represents, by way of example, a block diagram of a system making it possible to determine the traceability of a content in a receptacle and the origin of said receptacle.

FIG. 2 diagrammatically represents a perspective view of a barcode information visible by exposure to UV light and readable by laser reading.

Figure 3 shows a perspective view of the arrangement of the barcode marking on a receptacle.

FIG. 4 represents, in a variant, a perspective view of a magnetic strip containing the traceability information that is perpendicular to its support and introduced into its support.

Figure 5 shows, in a variant, a perspective view and partially in section of an assembly of the information carrier in the base of which is introduced a magnetic tape containing the information.

FIG. 6 represents, in a variant, a perspective view of a magnetic strip containing the traceability / origin information perpendicular to its support and situated outside said support.

Figure 7 shows a perspective view in section of a magnetic wire surrounding the base of the support and containing traceability information / origin.

In one embodiment, illustrated in FIGS. 1, 2 and 3, a system allowing the traceability of a content in a receptacle (3) and the origin of said receptacle comprises: a support (1), a microprocessor (12) ,

a product dispensing module (18), a laser reading device (9), a U.V. ray emission device (10), and a receptacle (3) comprising the traceability / origin information (11).

The support (1) is in particular a coffee machine for injecting liquid into the receptacle (3).

The microprocessor (12) controls the following functions and as shown in Figure 1: - The identification (a) of the base carrying the information (11) traceability / origin.

- Encryption or decryption (b) information (11) located on the receptacle (3).

- Analysis (c) of information (11).

- Acceptance or refusal (d) of information (11).

-comparison (e) information (11) located on the receptacle (3) with the data contained in the system.

Approval or refusal (f) of product distribution (30,31,32).

Storing (g) information (11) after use, especially in memory.

Automatic restart (h) of a cycle.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 172 of 421

The product dispensing module (18) comprises a control electronics for the openings, in particular the liquid to be injected into the receptacle (3), materials, such as sugar (31) and milk (32), to be inserted into said

flavored liquid delivered by the receptacle (3) and devices such as spoons (30) for mixing the materials to the liquid and by simply numbering thereof, to identify the recipient.

The laser reading device (9) is equipped in particular with a read head (5- Fig. 2) through which the information (11) is distributed to the microprocessor (12). The laser reading head (5) is fixed to the support (1) and located so as to allow the reading of the information (11) on a receptacle (3) when the latter is introduced into the support (1).

The receptacle (3) comprises a support (13) of particular cylindrical shape or conical trunk on which, since its packaging, the information (11) has been affixed on its periphery, a base (14) circular which allows to retain the substance, in particular coffee, to be filtered. This base (14) is perforable under the action of the pressure of the liquid so as to let the liquid to be filtered and aromatized.

The information (11) is in the form of an invisible barcode (23-Fig. 2) inscribed with an ultraviolet (U.V.) light-reactive ink. . The bar code (23) is visible when subjected to a source (6-Fig. 2) of ultraviolet radiation (U.V.) . The information (11) includes all the indications relating to the traceability of the product contained in the receptacle (3) and at the origin of the latter.

The receptacle (3), having the bar code (23), is conveyed under the laser reading head (5). The barcode (23) is subjected to U.V radiation emitted by the source (6).

The information (11) is read and transmitted to the microprocessor (12) which triggers, in case of positive recognition thereof, the aforementioned operations and, in case of negative recognition, rejects said information (11) and stops the triggering procedure. dispensing module (18) for interrupting the drilling procedure of the upper part of the receptacle (3) and the extraction of the products (30, 31, 32).

It should be noted that the microprocessor (12) issues a key, recalculated by algorithm, in the form of numbers and letters, which represents the indication compared to the data of the manufacturer. All keys, after processing, are stored in the internal memory of the microprocessor (12).

A key is advantageously assigned to a single barcode (23) which allows to use the receptacle (3) only once. A receptacle (3) without a barcode (23) is automatically rejected as well as an erroneous barcode (23) and the reuse of a used barcode (23) is rejected by comparison of the keys.

Figures 4 and 5 illustrate an embodiment where the receptacle (3) is non-magnetic material and the information (11) are on a particular circular magnetic tape (20) within said receptacle (3).

FIG. 6 illustrates a variant of the invention which has a receptacle (3) where the information (11) is placed between a perforable lid (17) and the base (14) of the receptacle (3), in the form of a ring (15).

FIG. 7 illustrates a variant which consists of housing a wire (8) in the base (14) of the receptacle (3) so that the information (11) is recorded in particular in magnetic form.

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS WO2005044067

CLAIMS

1. Apparatus for establishing traceability of a content in a receptacle (3) and the origin of said receptacle (3) on which information (11) readable by means of an optical and / or magnetic reader but invisible to the user can be read naked eye, said receptacle (3) being of the type comprising a pierceable upper part for the injection of the liquid into the receptacle (3) and a perforable lower membrane under pressure for the outlet of said flavored liquid by the contents of the receptacle (3) the apparatus comprising: - an optical and / or magnetic reader (9) for reading said information (11) on a receptacle (3) introduced into the apparatus, - a microprocessor (12) for encrypting / decrypting, analyzing, comparing, approving / rejecting and storing information (11) read on a receptacle (3), and arranged to selectively start or not a cycle of operations comprising drilling the upper portion of the receptacle (3) and injecting liquid, so i only for storing the information (11) read in order to be ready to start a new cycle.

2. Apparatus according to claim 1 characterized in that it comprises a UV emission device for reading a barcode (23) invisible to the naked eye located on the receptacle (3).

3. Apparatus according to claim 1 or 2 characterized in that it comprises a magnetic reading head which reads the magnetic information (11) carried by the receptacle (3).

4. Apparatus according to one of the preceding claims characterized in that it comprises a module (18) for dispensing products, such as sugar (31) and milk (32) and devices such as spoons (30) allowing the mixing with the liquid and allowing identification of the recipient, this together with the output of the flavored liquid.

5. Apparatus according to one of the preceding claims characterized in that it comprises a laser reading head (5) fixed to the support (1).

6. Receptacle of the type comprising a perforable upper part for injecting the liquid into the receptacle (3) and a perforable lower membrane under pressure for the outlet of said flavored liquid by the contents of the receptacle (3), usable by the apparatus according to the any of the preceding claims characterized in that it comprises information (11) readable by means of an optical reader and / or magnetic but invisible to the naked eye.

7. Receptacle usable by the apparatus according to claim 6 characterized in that it is non-magnetic material and the information (11) are on a circular ribbon (20) inside said receptacle (3).

8. Receptacle usable by the apparatus according to one of claims 6 or 7 characterized in that it has a magnetic code (15) placed between its cover (17) and its base (14).

9. Receptacle usable by the apparatus according to one of Claims 6, 7 or 8, characterized in that the information (11) which it bears is in the form of an invisible barcode (23) inscribed with the help of a reactive ink with ultraviolet (UV) light.

10. Receptacle usable by the device according to one of claims 6 to 9 characterized in that the information (11) it carries include indications relating to traceability.

11. Receptacle usable by the device according to one of claims 6 to 10 characterized in that the information (11) it carries include indications relating to the origin of the receptacle (3).

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 174 of 421

12. Receptacle usable by the device according to one of claims 6 to 11 characterized in that the information (11) it carries are stored on a magnetic tape (15) flexible.

13. Receptacle usable by the device according to one of claims 6 to 12 characterized in that the information (11) it carries are stored on a ring (8).

14. System for establishing the traceability of a content in a receptacle (3) and the origin of said receptacle (3), comprising an apparatus according to one of claims 1 to 5 and a plurality of receptacles according to one of the claims 6 to 13.

15. A method of using a device according to one of claims 1 to 5 and / or a receptacle according to one of claims 6 to 13 characterized in that it comprises the following steps: - identification (a) of the base carrying the information (11) traceability of the contents in the receptacle (3) and origin of said receptacle (3), - encryption / decryption (b) information (11) located on the receptacle (3), - analysis (c) information (11), - acceptance or refusal (d) of the information (11), - comparison (e) of the information (11) located on the receptacle (3) with the data it contains, -approval / refusing (f) piercing the upper portion of the receptacle (3) and injecting the liquid, optionally also the product distribution (30,31,32) together with the outlet of the flavored liquid.

- storage (g) of the information (11) in the internal memory after use, - automatic restart (h) of a cycle.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 May 2005 (26.05.2005)

PCT

(10) International Publication Number
WO 2005/047111 A1

(51) International Patent Classification[7]: B65B 29/02, 9/04

(21) International Application Number:
PCT/IB2004/003589

(22) International Filing Date:
3 November 2004 (03.11.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
BO2003A000666
12 November 2003 (12.11.2003) IT

(71) Applicant (*for all designated States except US*): **AROMA SYSTEM SRL** [IT/IT]; VIA DEL BATTIRAME 6, I-40138 BOLOGNA (IT).

(72) Inventor; and
(75) Inventor/Applicant (*for US only*): **RAPPARINI, Gino** [IT/IT]; Via Battirame 6, I-40138 Bologna (IT).

(74) Agent: **TROMBETTI, Gioia**; Via Portazza 8, I-40139 Bologna (IT).

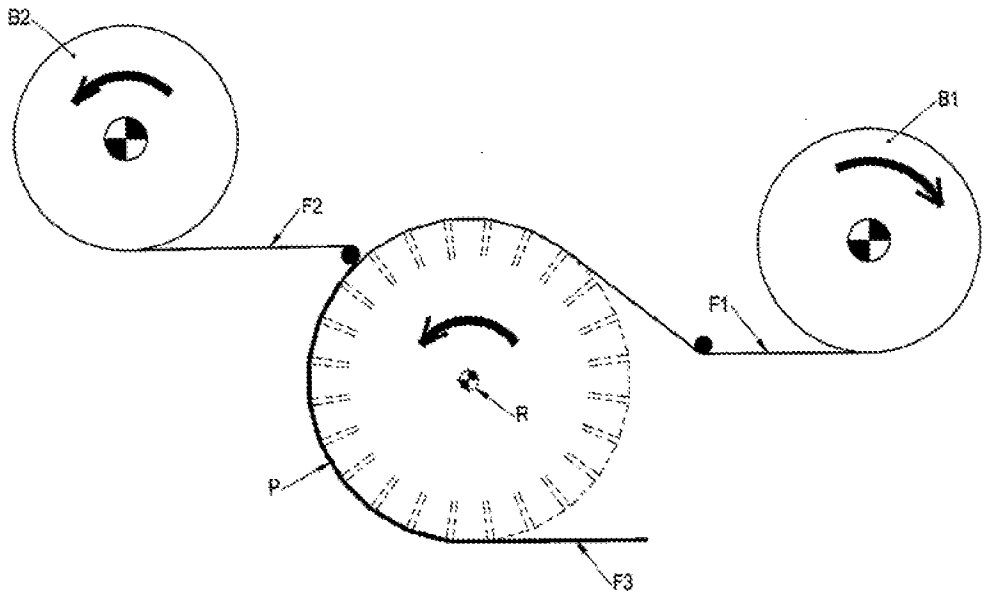
(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FILTER PAPER POD PACKAGING MACHINE



(57) Abstract: A filter paper pod packaging machine characterised by the fact that it comprises a polygonal prismatic wheel (P) with an intermittently rotating horizontal axis (R), each flat face (L) of the prism (P) directly incorporating at least one recess (G) matching the size and shape of the pods to be produced.

WO 2005/047111 A1

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 176 of 421

FILTER PAPER POD PACKAGING MACHINE

Field of the art

The present invention refers to the engineering of machines for packaging products in filter paper pods. International reference classification B65b.

State of the art

The use of filter paper pods to package individual portions of ground products is well known in the art. Pods containing ground coffee of varying particle size are widely used. All the machines known up to now pose specific problems, especially as regards control over the degree of compacting. Moreover, the presently available machines do not perform reliably and are incapable of maintaining the high output rates demanded by the market. The problem to be solved, therefore, is to produce economical and reliable pods at a fast rate and with constant precision in terms both of the product weight per packaged dose and its degree of compactness, also where the particle size is not homogeneous.

The pod packaging machine as envisaged in the present invention solves all the above-described problems and is highly economical both to manufacture and to operate in an industrial setting.

Besides occupying a minimal surface area, the machine of the present invention has a highly compact en bloc structure.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 177 of 421

Description

The invention will now be explained referring to the appended drawings, which serve solely illustrative purposes and in no way limit the scope of the invention itself.

Figure 1 is a schematic axonometric representation of a carousel with an intermittently rotating horizontal axis (R) and a circumference shaped as a polygonal prism (P) whose flat faces (L) have recesses which are directly impressed in the surface (G) and geometrically match the shape and size of the pods that will be made. It is possible to note the presence of twin recesses (G) on each face of the prism.

Figure 1bis is a schematic axonometric representation of a carousel with an intermittently rotating horizontal axis (R) and a circumference shaped as a polygonal prism (P) whose flat faces (L) are equipped with interchangeable dies (S) featuring twin recesses (G).

Figure 2 schematically represents the routing of two webs of filter paper (F1, F2), fed out from their respective spools (B1, B2) and wrapped, one overlying the other, around the flat faces of the polygonal carousel (P).

Figure 3 is an axonometric diagram showing the routing of the filter paper on the infeed (F1, F2) and outfeed (F3) side.

Figure 4 illustrates the execution, using means known to the art and hence not shown, of a first series of cuts (t) on the flat section (1) of the

filter paper (F1).

Figure 5 illustrates the execution of a second series of cuts in the second flat section (2) and a depression (G) in the central part of the flat section (1) obtained by means of a forming punch indicated by the arrow (M).

Figure 6 illustrates the feeding of a predetermined dose (I) of product into the zone of the respective depression (C).

Figure 7 illustrates the operation of a flat tamping punch (N') for forming asymmetrical pods.

Figure 7bis, similar to figure 7, illustrates the operation of a concave tamping punch (N) for forming symmetrical pods.

Figure 8 illustrates the arrival of the filter paper (F2), which is applied over the compacted dose.

Figure 9 shows, on a duly enlarged scale, the greater flaring (W) of the cuts (t) during the action of the forming punch (M), which serves to obtain a deeper depression (C). It may be noted that the action of the flat tamping punch (N') has compacted the entire dose flush with the face of the prism so as to create an asymmetrical pod. Figure 9bis, similar to figure 9, shows, on a duly enlarged scale, the lesser flaring (I) of the cuts (t) during the action of a forming punch (M) serving to obtain a shallower depression (C). It may be noted that the action of the concave tamping punch (N) has compacted the coffee so as to create a symmetrical pod.

Figure 10 illustrates the configuration of the operating sequence for asymmetrical compacted pods.

Figure 10bis, similar to figure 10, refers to the operating sequence for producing symmetrical compacted pods.

Figure 11 illustrates the operation of die cutting around the edge of the packaged pods. Figure 12 illustrates the separation of the asymmetrical pods (A) from the double layer of filter paper (F3).

Figure 12 bis illustrates the separation of symmetrical pods (E).

Figure 13 illustrates, on a duly enlarged scale, the separation of a type (A) asymmetrical flat-topped compacted pod.

Figure 13bis illustrates, on a duly enlarged scale, the separation of a type (E) symmetrical compacted pod.

Figure 14 is an axonometric view of a type (A) asymmetrical flat-topped compacted pod.

Figure 14bis is an axonometric view of a symmetrical compacted pod (E).

Figure 15 is a front view of an asymmetrical flat-topped compacted pod (A).

Figure 15b is a front view of a symmetrical compacted pod (E).

Figure 16 shows the distribution, as seen from above, of a series of cuts (t) around the central zone of the flat face (L) of the prism (P).

Figure 17 shows how the cuts are flared (I) to make symmetrical pods.

Figure 18 shows how the cuts are flared to a greater degree (W) to make an asymmetrical flat-topped compacted pod, given the greater depth of the depression formed.

Figure 19 schematically represents, in a cross-section view, the action of a forming punch (M), which is such as to lend the filter paper (F1) the deeper shape (C) required for the bottom half of a flat-topped pod.

Figure 20 illustrates a dose of product being fed for packaging in a type (A) asymmetrical flat-topped pod.

Figure 21 illustrates the action of a flat tamping punch (N'), which is such as to level out the dose of product in the depression (C) formed in the filter paper (F1) to create an asymmetrical pod. Figure 22 illustrates the sealing of a compacted asymmetrical pod with a flat filter paper top (F2).

Figures 19bis, 20bis, 21bis and 22bis are similar to figures 19, 20, 21 and 22 and represent the action of a concave punch (N"), which is such as to increase the degree of compacting of the same dose of product to create a concave asymmetrical pod.

Figures 19ter, 20ter, 21ter and 22ter represent the action of a concave punch (N), which is such as to increase the degree of compacting of the same dose of product to create a symmetrical pod.

In the figures, the individual details are marked as follows:

A is a flat-topped compacted pod.

B1 is the spool of filter paper (F1).

B2 is the spool of filter paper (F2).

C is the depression formed in the filter paper (F1)

E is a compacted pod of standard shape and size.

F1 is the filter paper to be impressed with the forming punch (M).

F2 is the filter paper for creating the pods.

F3 indicates the overlaying of the two filter papers (F1, F2).

G indicates a recess directly impressed in the flat faces of the prism or the interchangeable dies (S).

L indicates the flat faces of the polygonal prism.

N indicates the tamping punch for the standard type of pods (E).

N' indicates the tamping punch for type (A) compacted pods.

N" indicates the convex tamping punch for type (A) pods.

P is the polygonal prism-shaped carousel.

R indicates the axis around which the carousel rotates intermittently.

t indicates the cuts on the filter paper (F1).

T indicates the flaring of the cuts (t).

W indicates a larger flaring of the cuts (t) to enable the formation of deeper recesses (C).

I, II, III, IV indicate the doses fed for packaging in pods.

1, 2, 3, 4 indicate an orderly sequence of sections where the filter paper

will be flat during the pod packaging process.

The figures clearly evidence the compact structural architecture of the packaging machine to which the present invention relates. The invention naturally lends itself to different embodiments as regards both the dimensions and structural proportions of the various parts making up the packaging machine.

It is apparent that the number of sides of polygon may vary, as may the geometric proportions of the prismatic carousel.

It is likewise apparent that the number of recesses (G) and their distribution on the faces (L) of the prism may vary. The choice of cuts (t) will also be adapted to the depth of the depression required.

All the devices that are not illustrated are understood as being made using known systems and actuated with technological components known in the art. Therefore, the scope of the present invention shall encompass all packaging machines featuring the basic, original characteristics described and illustrated herein.

The technological choices that may optimise the functionality of the packaging machine of the present invention are: the number of sides of the polygon, the diameter of the polygonal wheel, the length of each side of the polygon, the width of the prism, the number of recesses (G) and their distribution on the faces of the prism, the distribution and size of the

cuts (t), the proportions of the forming and tamping punches (M; N, N', N"), the devices actuating the intermittent rotation of the wheel with a horizontal axis and the filling device for measuring out and dispensing the pre-established doses.

Now that the original innovative characteristics of the present invention have been made apparent, anyone with average skill in the art may construct filter paper pod packaging machines having the basic characteristics as described and illustrated in the following claims.

Claims

1) A filter paper pod packaging machine **characterised by the fact that** it comprises a polygonal prismatic wheel (P) with an intermittently rotating horizontal axis (R), each flat face (L) of the prism (P) directly incorporating at least one recess (G) matching the size and shape of the pods to be produced.

2) The filter paper pod packaging machine of the previous claim, **characterised by the fact that** each flat face (L) of the prism (P) may be equipped with interchangeable dies (S) featuring recesses (G) that geometrically match the size and shape of the pods to be produced.

3) The filter paper pod packaging machine of claims 1 or 2, **characterised by the fact that** by varying the length of each side of the polygon and by varying the width of each face of the prism it is possible to create a plurality of recesses (G) on each flat face (L) of the prism, either in a radial or axial configuration, in one or more rows.

4) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** a web of filter paper (F1), fed out from its respective spool (B1), and overlaid by a second web of filter paper (F2) fed out from its respective spool, is wrapped

around the flat faces (L) of the polygonal prismatic wheel (P).

5) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** a series of cuts (t) are made in the flat filter paper (F1) in appropriate positions around the central zone corresponding to the recess (G) impressed in the prismatic wheel (P).

6) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** a forming punch (M) is applied on the web (F1) in the central zone surrounded by the cuts (t) to mould the web (F1) to the shape (C) of the recess (G), said moulding of the filter paper being optimised by the presence of cuts which flare out (T) to facilitate the formation of a depression in the filter paper web (F1) by action of the forming punch (M), while the peripheral zone of the filter paper (F1) remains flat and adherent to the face (L) of the prism (P).

7) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the forming punch (M) creates a deeper recess (C) in the web (F1) by flaring the cuts (t) to a greater width (W), while the peripheral zone of the filter paper (F1) remains flat and adherent to the face (L) of the prism (P).

8) The filter paper pod packaging machine of the previous claims,

characterised by the fact that the greater depth of the recess (C) allows the pod to hold the same quantity of compacted product as symmetrical pods (E), the diameter being equal.

9) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the recesses (G) feature holes (f) through which suction is applied to attract the filter paper (F1), thereby facilitating the moulding of the latter to a shape (C) matching that of the recess (G) during the operation of the forming punch (M).

10) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the suction applied through the holes (f) in the recesses (G) remains on even after the forming punch (M) has completed its action in order to assure the adherence of the filter paper (F1) to the recesses (G) during subsequent processing.

11) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the depression (C), obtained by the action of the forming punch (M) on the filter paper (F1), is filled with a pre-measured volume of product that will be compacted by means of a specific concave tamping punch (N) for producing symmetrical pods.

12) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the deeper depression (C), obtained by the action of the forming punch (M) on the filter paper (F1), is filled with a pre-measured volume of product that will be compacted by means of a specific flat tamping punch (N') for producing asymmetrical pods and subsequently sealed with a flat top made from filter paper (F2) fixed onto the pod along the edges adherent to the faces (L) of the prismatic polygon (P).

13) Filter pod obtained with the packaging machine of the previous claims; **characterised by the fact that** being compacted and having a flat top it may be used to make an espresso of good quality with less coffee or an espresso of better quality with the same quantity of coffee.

FIG. 1

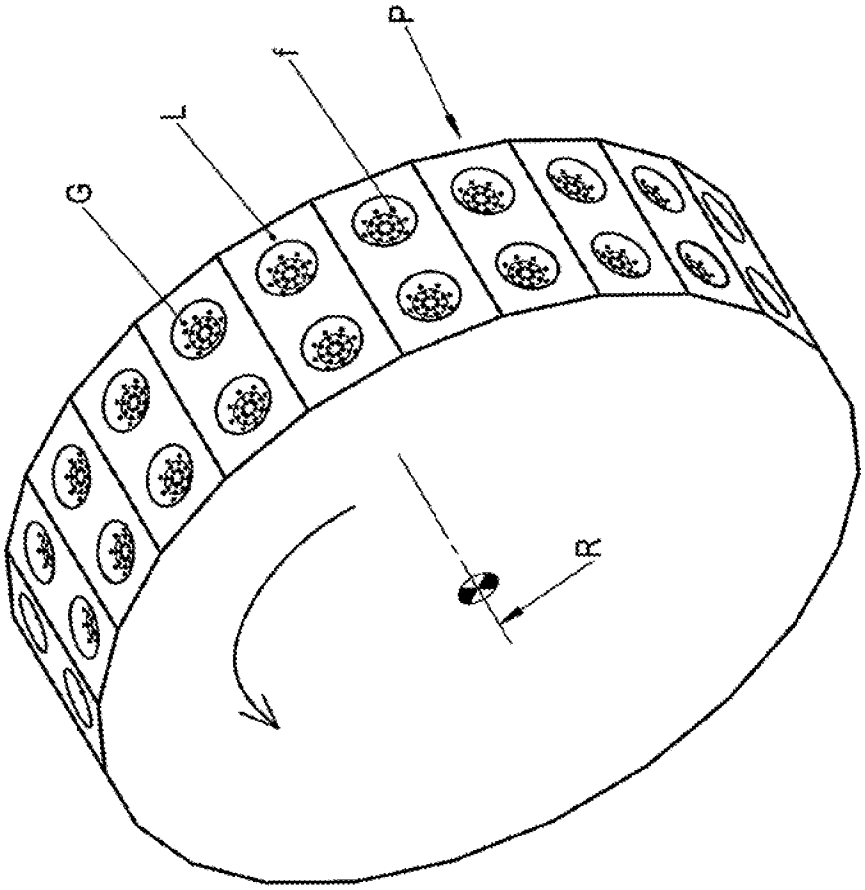


FIG. 1 BIS

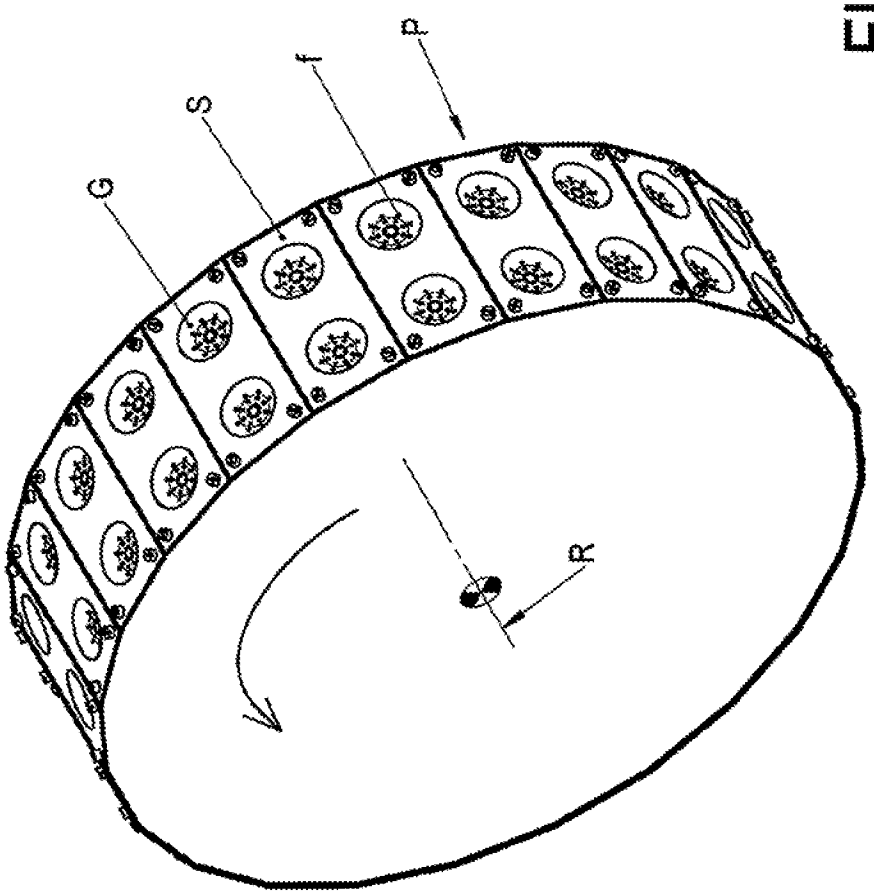


FIG. 2

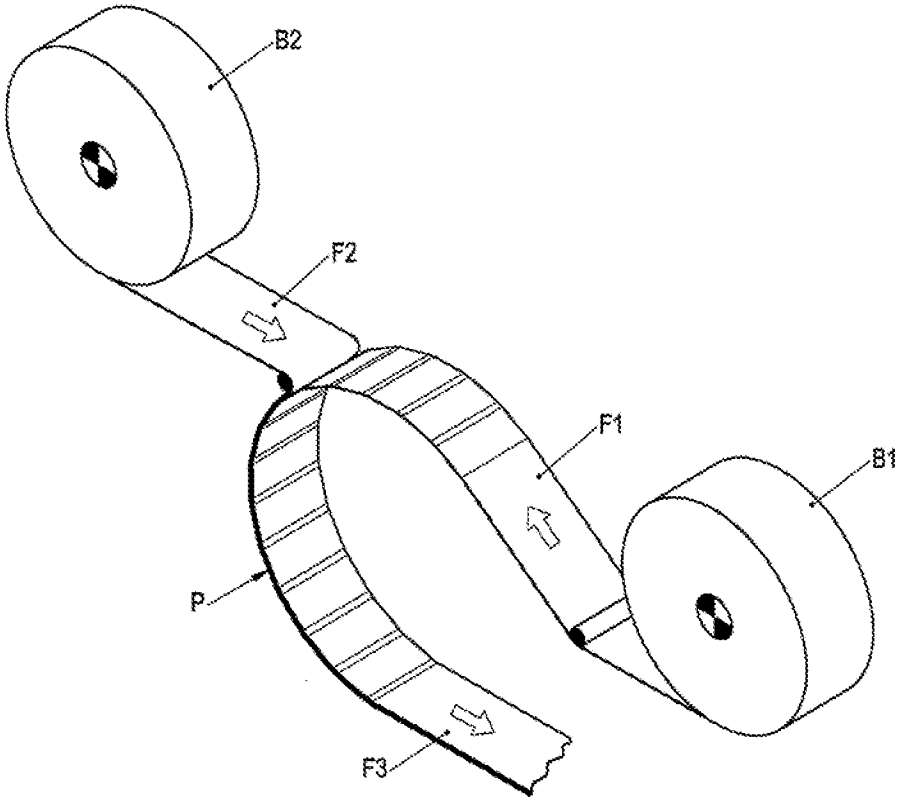


FIG. 3

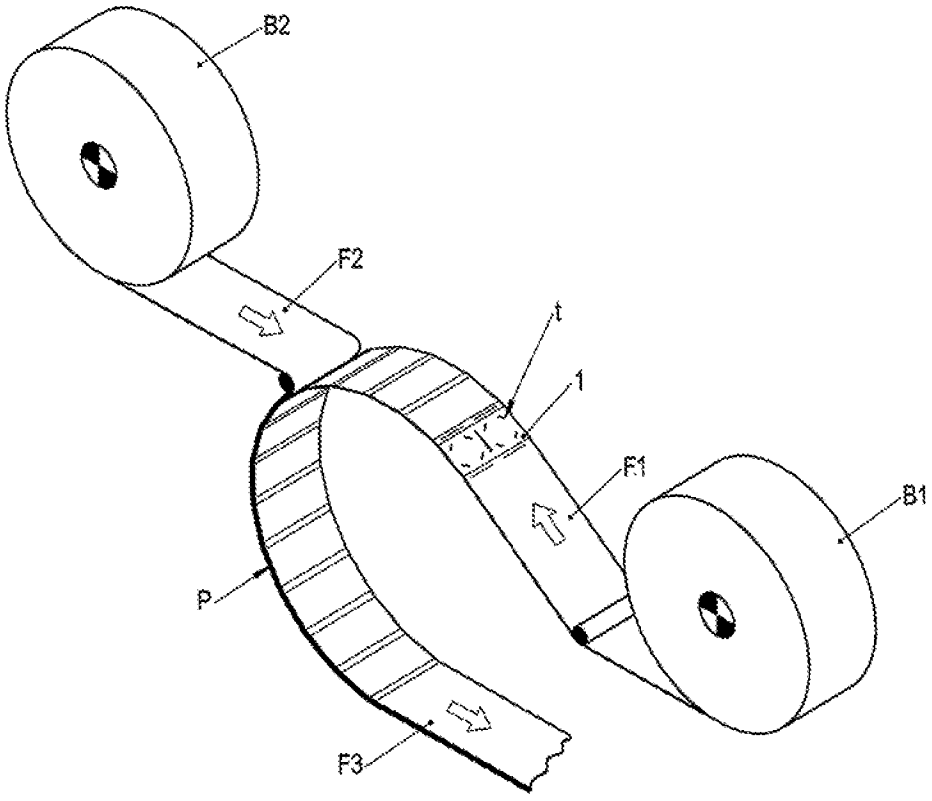


FIG. 4

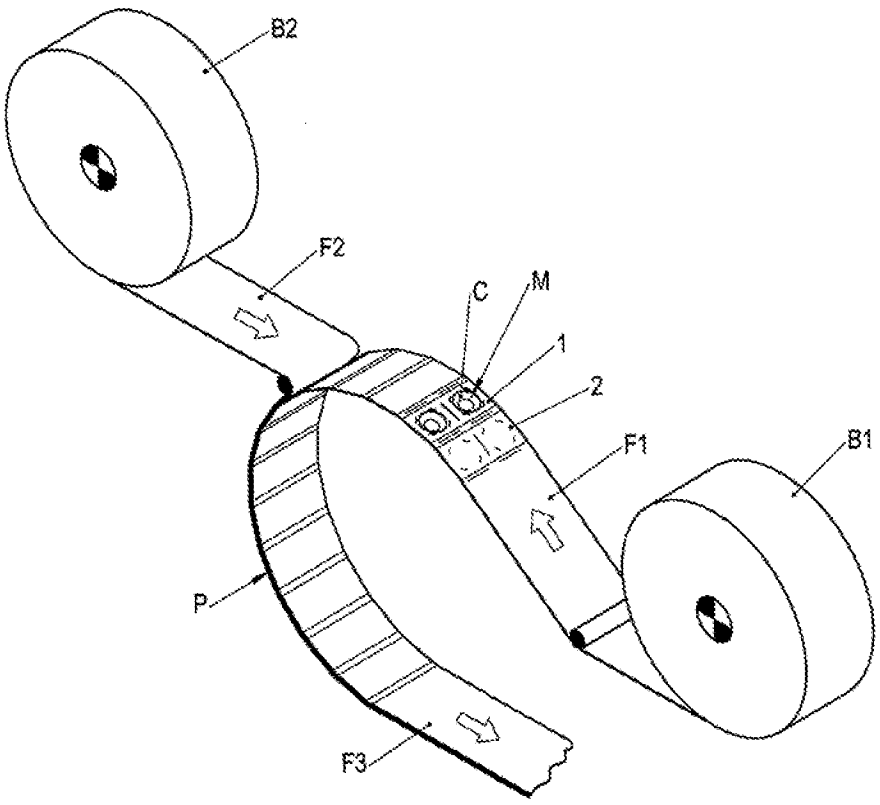


FIG. 5

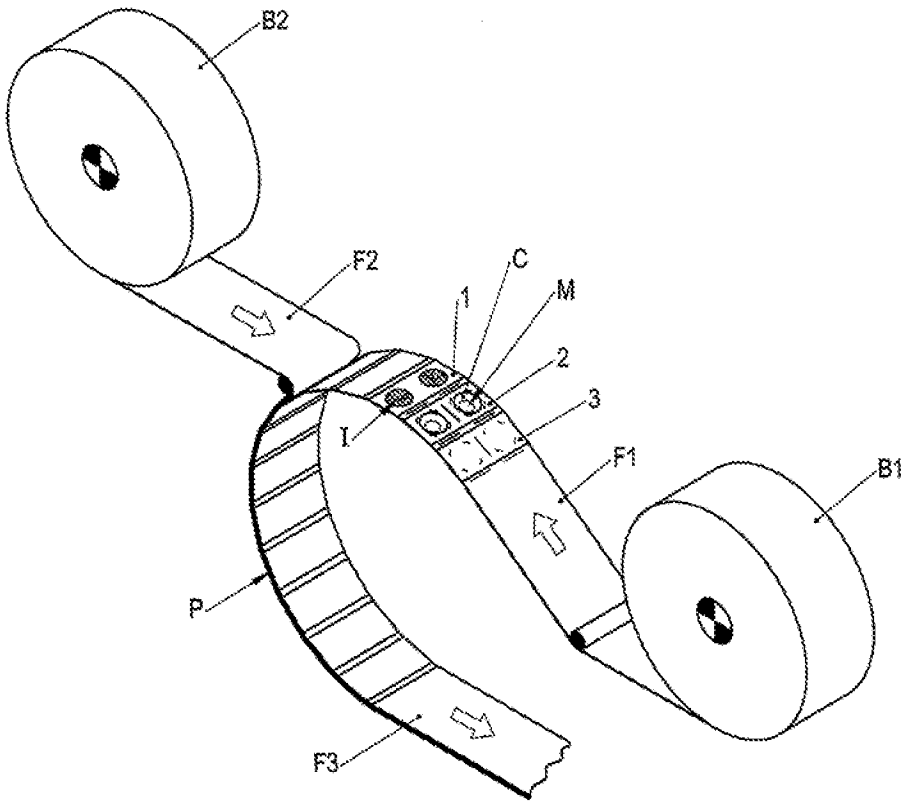


FIG. 6

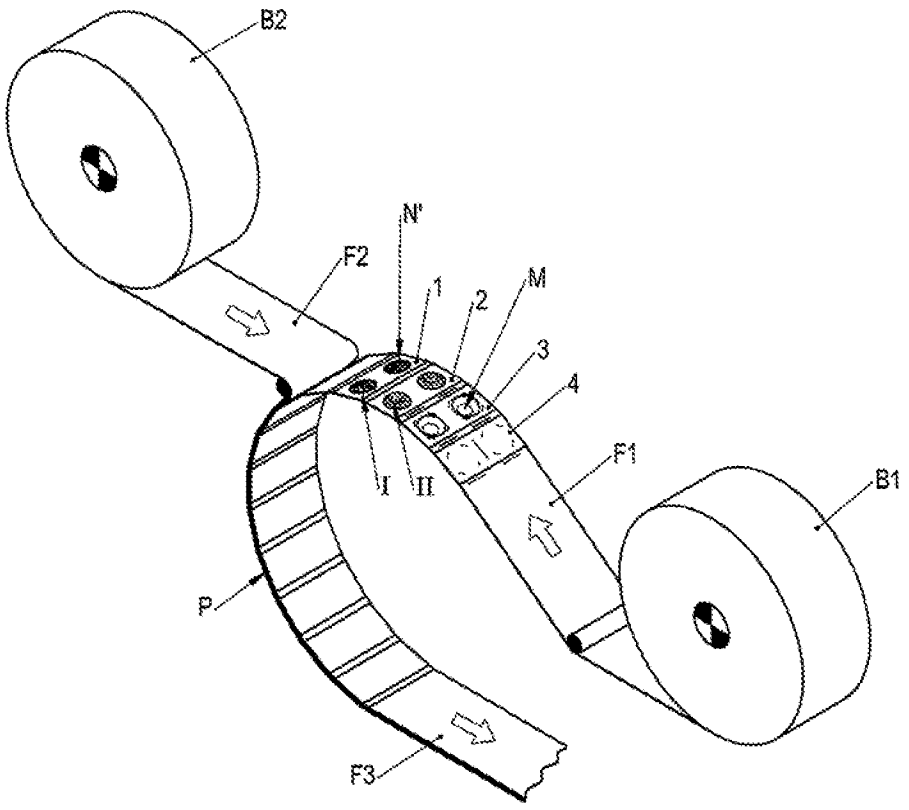


FIG. 7

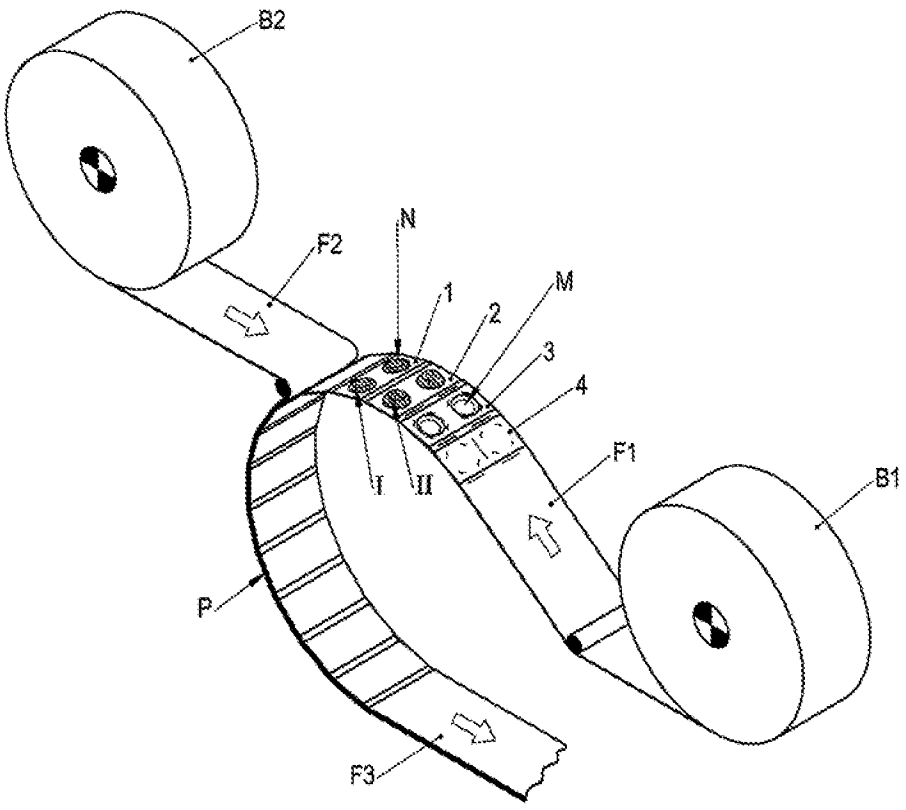


FIG. 7 BIS

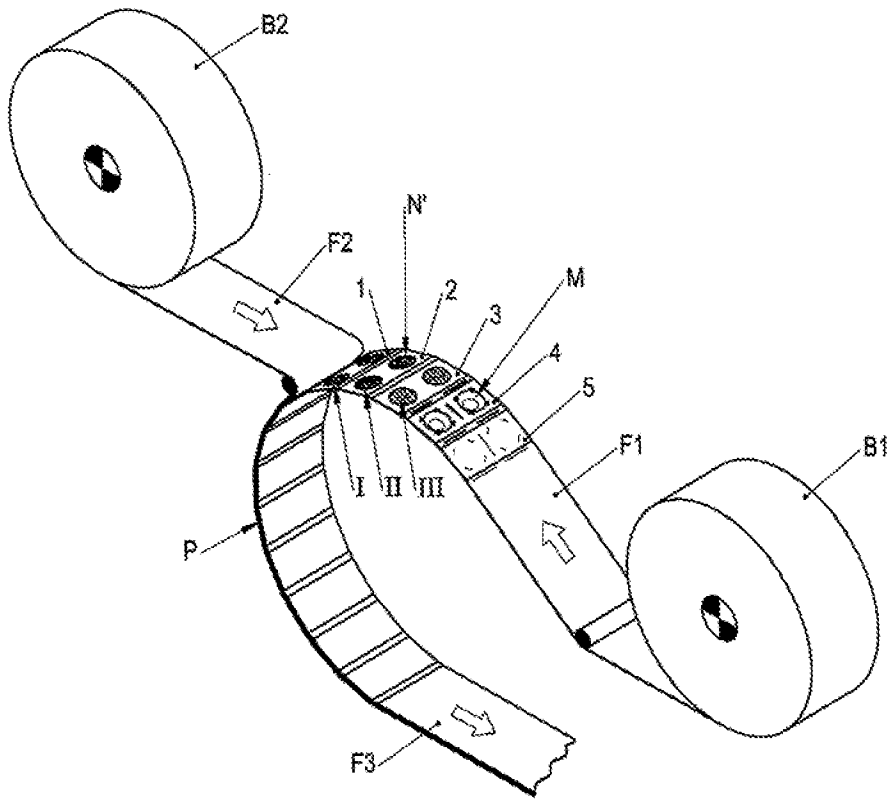


FIG. 8

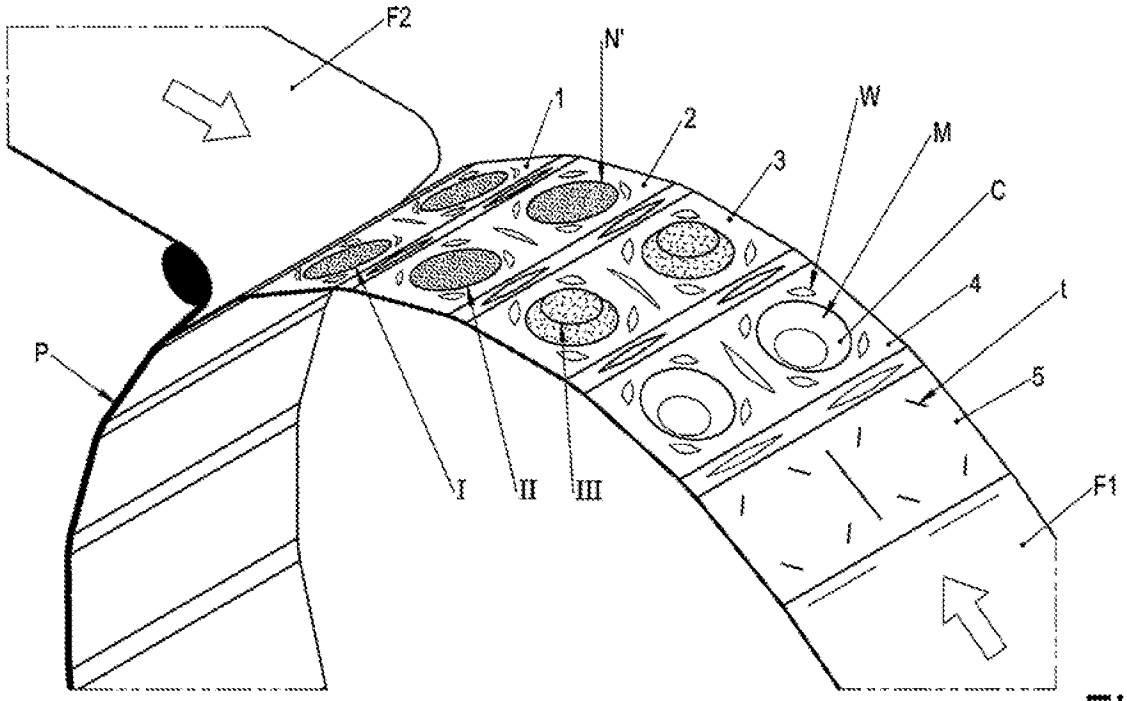


FIG. 9

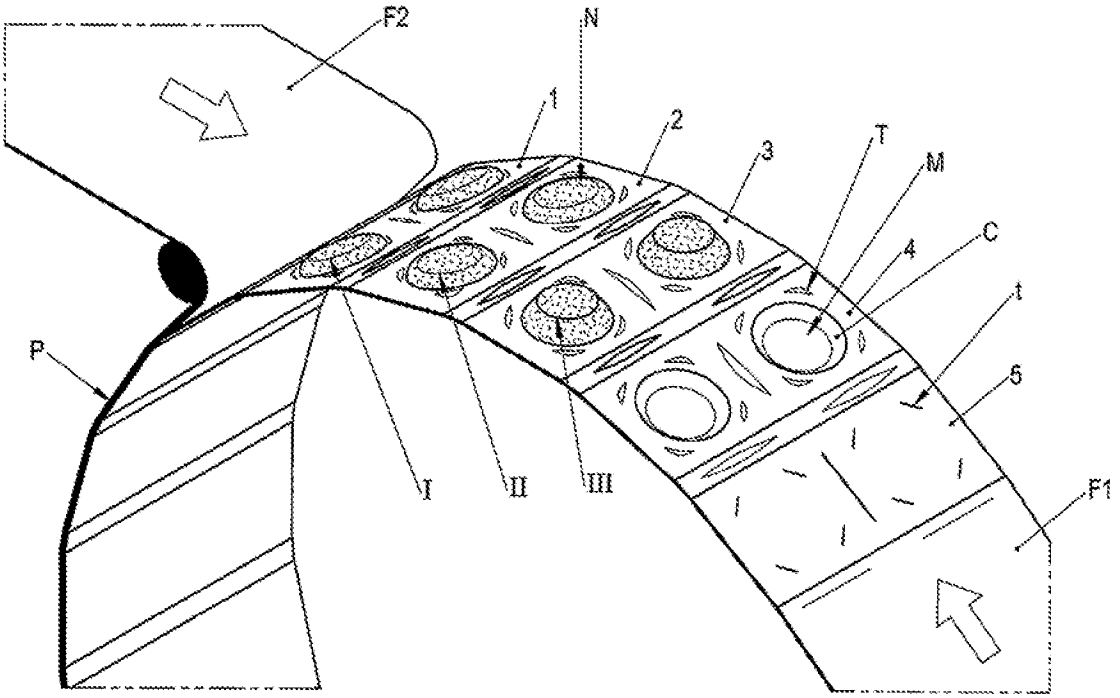


FIG. 9 BIS

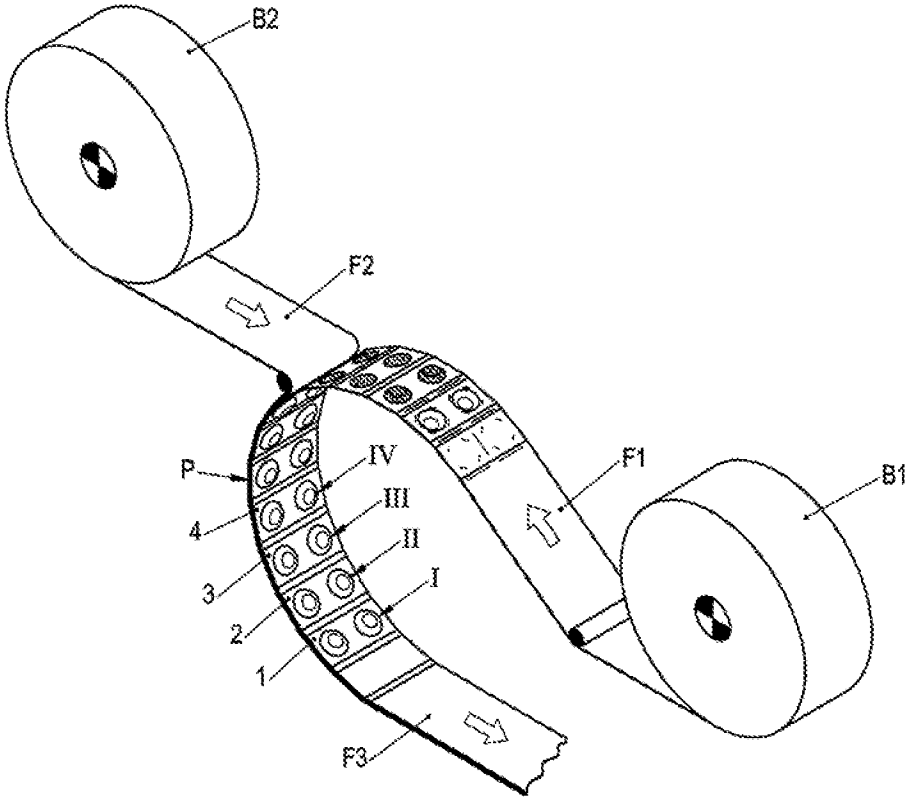


FIG. 10

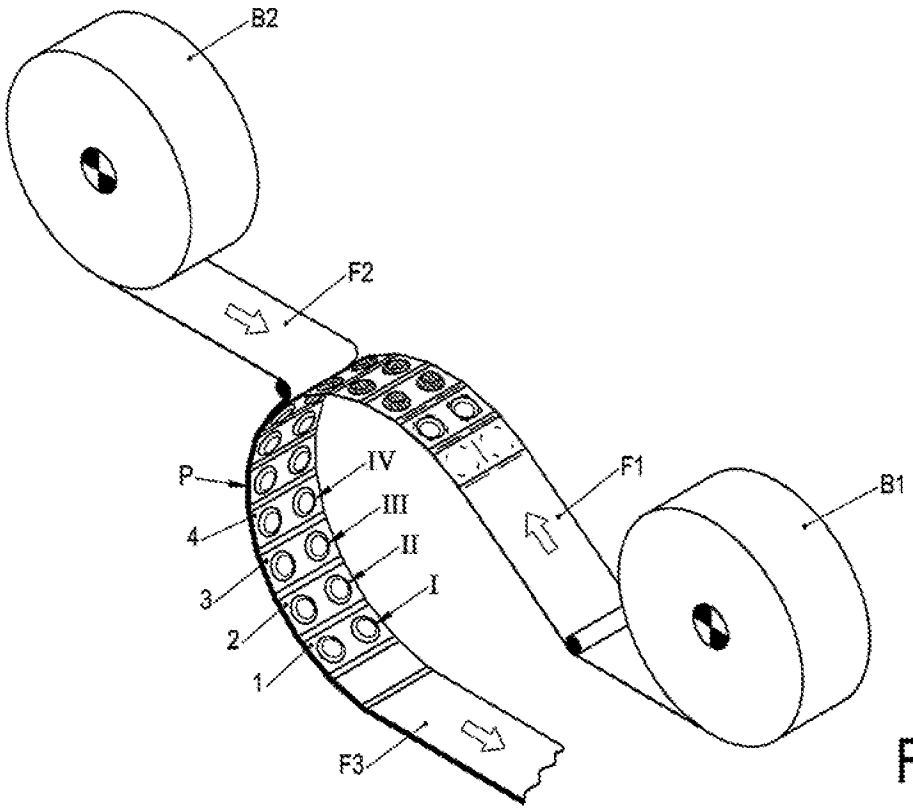


FIG. 10 BIS

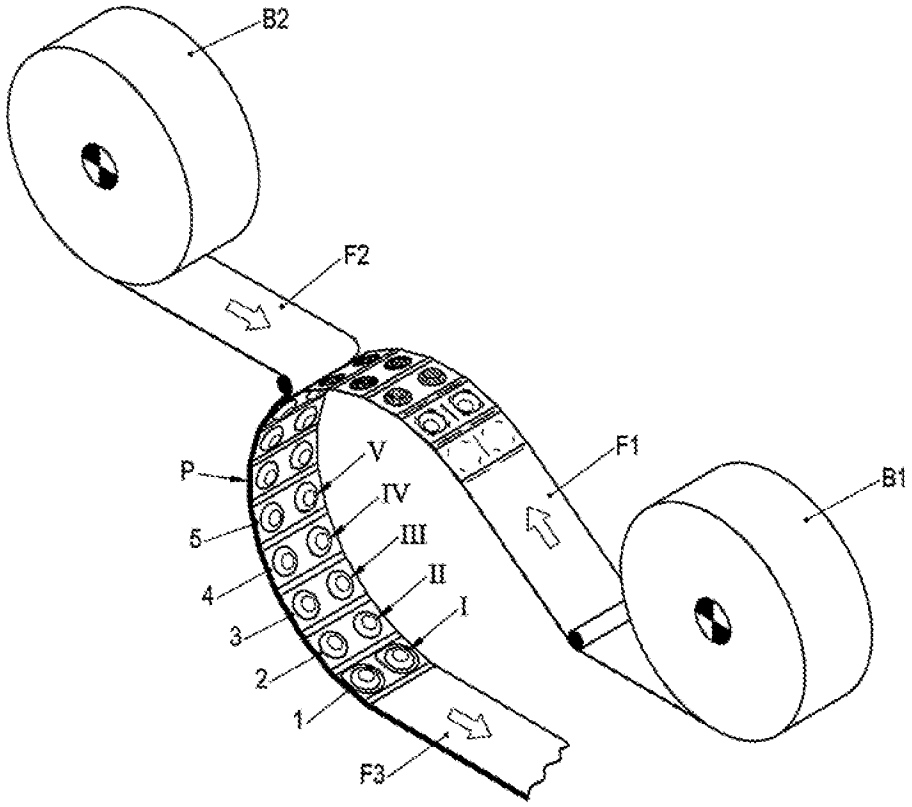


FIG. 11

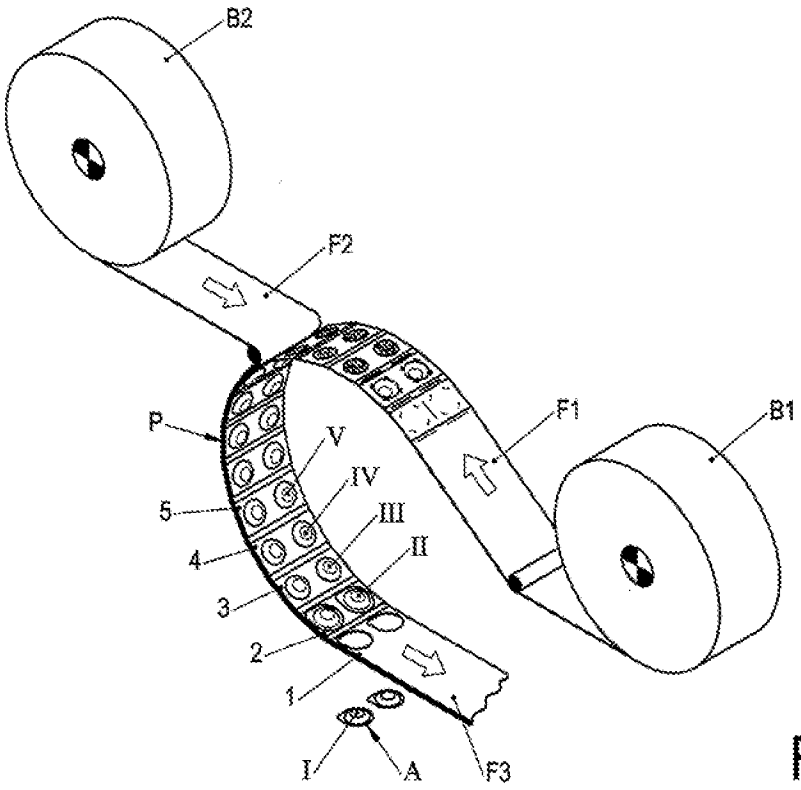


FIG. 12

FIG. 12 BIS

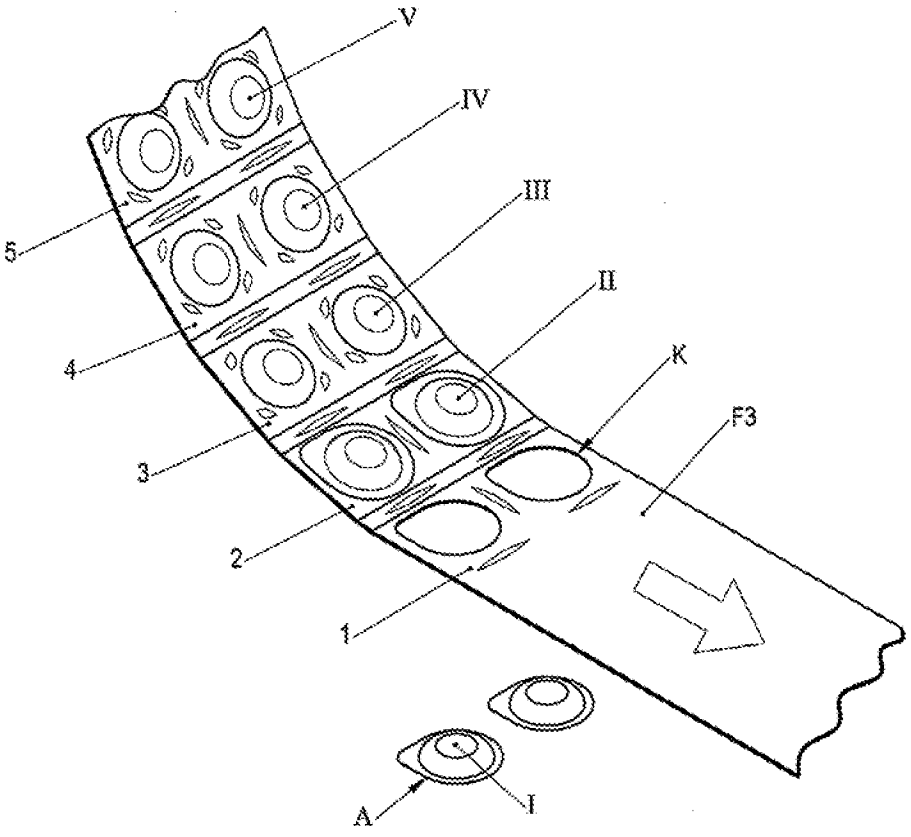


FIG. 13

FIG. 13 BIS

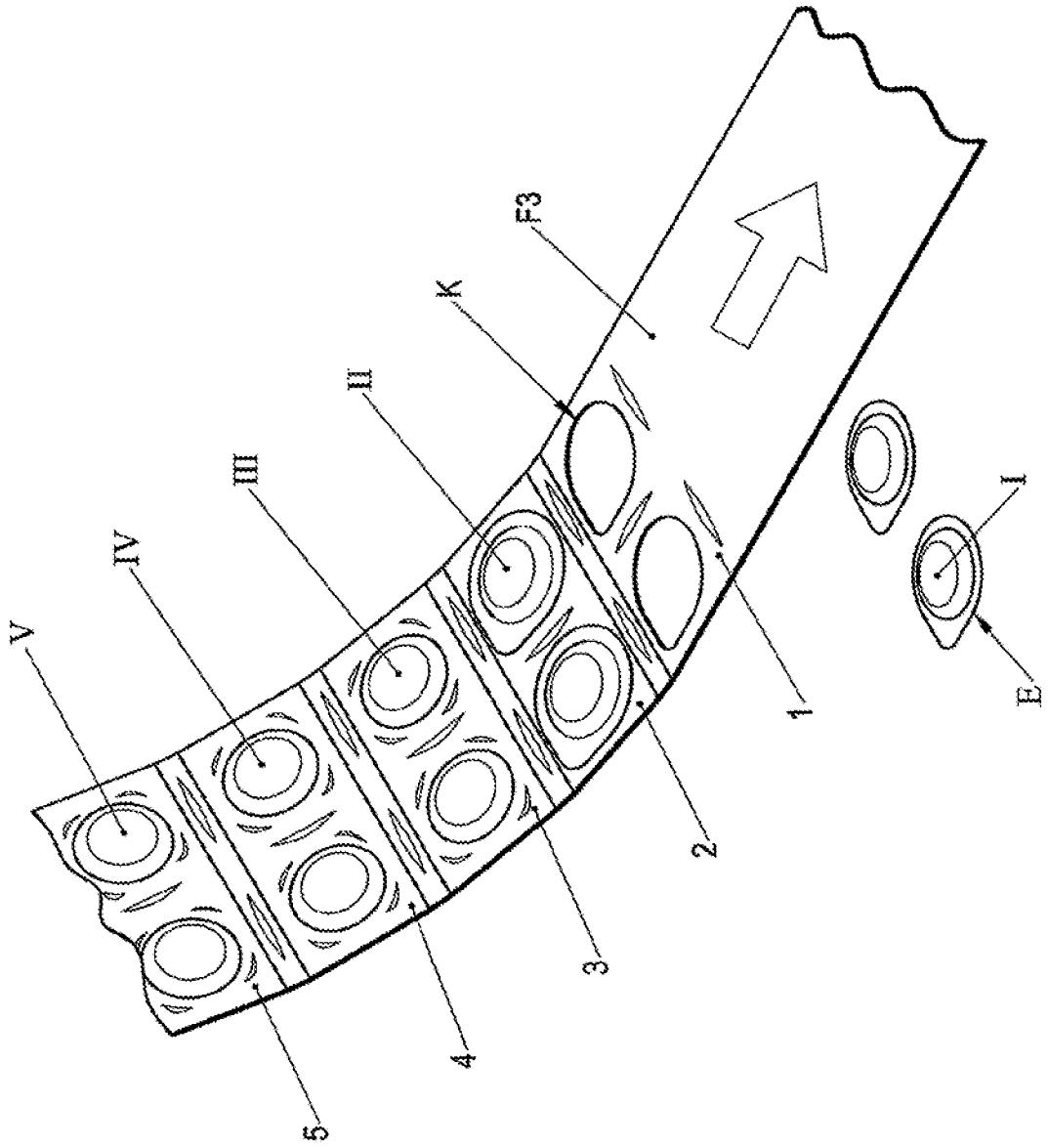


FIG. 14 BIS

FIG. 14

FIG. 15 BIS

FIG. 15

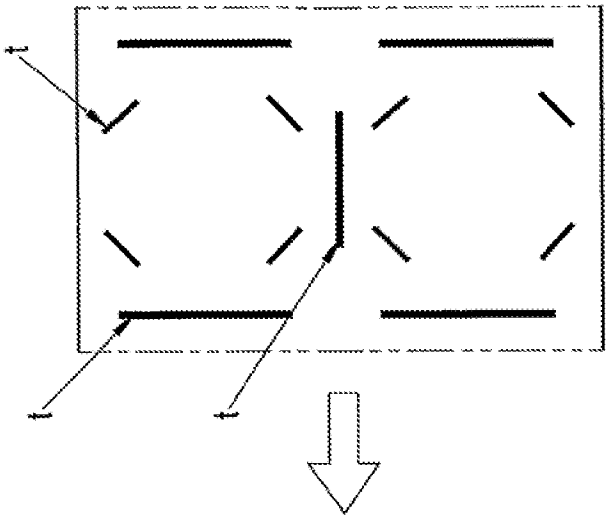


FIG. 16

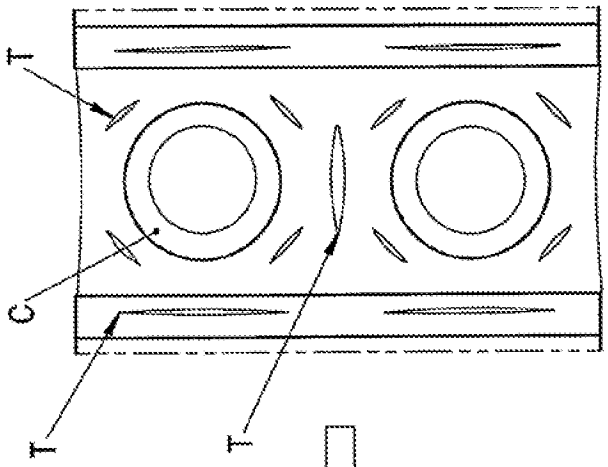


FIG. 17

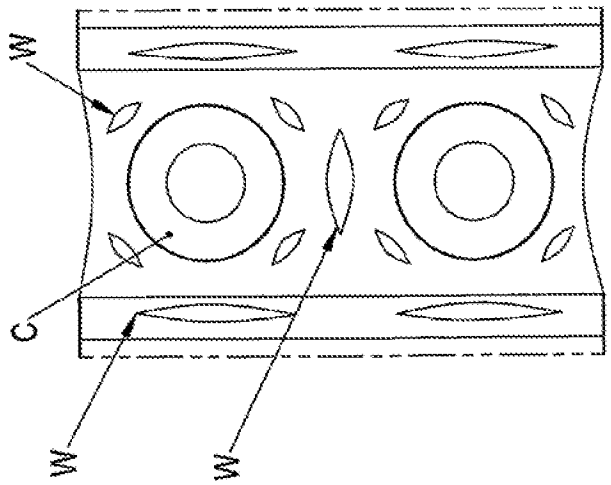


FIG. 18

FIG. 19

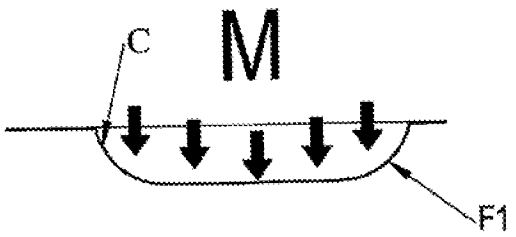


FIG. 20

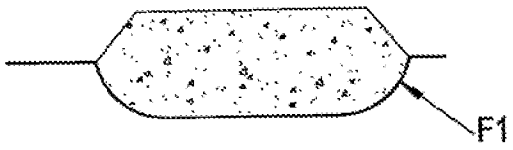


FIG. 21

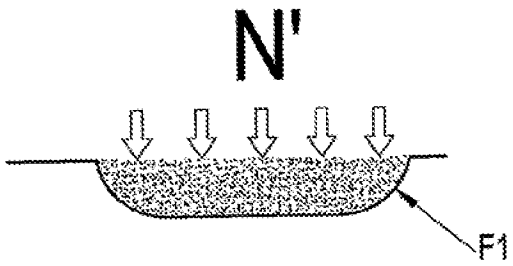


FIG. 22

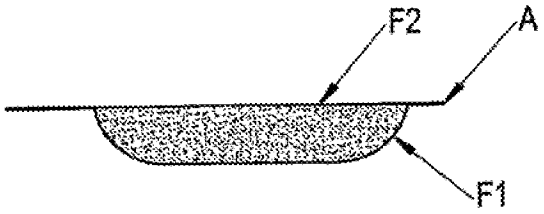


FIG. 19 BIS

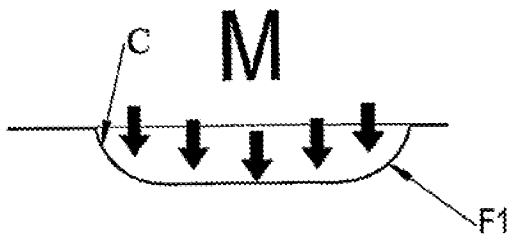


FIG. 20 BIS



FIG. 21 BIS

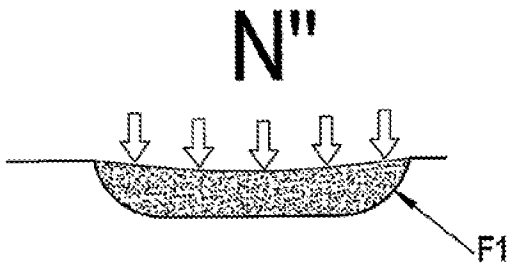


FIG. 22 BIS

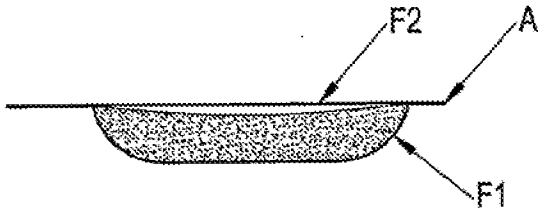


FIG. 19 TER

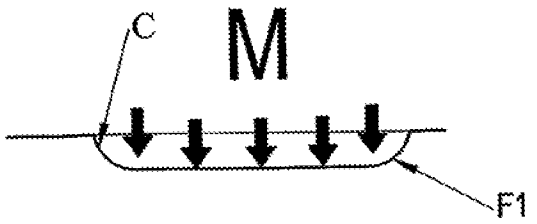


FIG. 20 TER

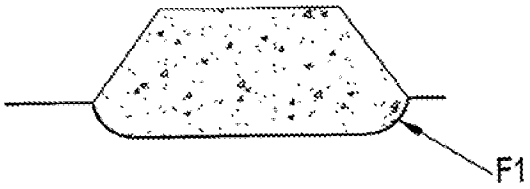


FIG. 21 TER

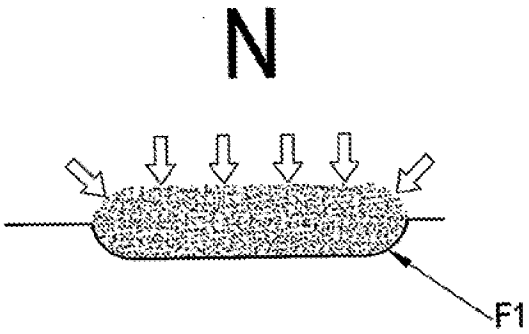
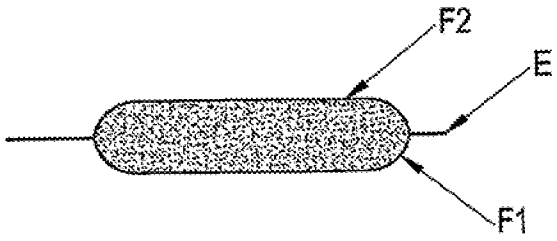


FIG. 22 TER



INTERNATIONAL SEARCH REPORT

Int[illegible]onal Application No
PCT/IB2004/003589

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65B29/02 B65B9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 012 629 A (REHMAN ET AL) 7 May 1991 (1991-05-07) column 14, line 24 - column 15, line 35; figures 2-6	1,6,9, 10,13
A	EP 0 943 544 A (DIMA S.R.L) 22 September 1999 (1999-09-22) claim 1; figures 1-9	1,6,11
A	EP 0 432 126 A (CLOUD CORPORATION) 12 June 1991 (1991-06-12) abstract; figures 8-14	1,6,9,13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 February 2005	02/03/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Grentzius, W

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

Int onal Application No
PCT/IB2004/003589

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5012629 A	07-05-1991	AT 111855 T	15-10-1994
		CA 2025876 A1	12-04-1991
		DE 69012729 D1	27-10-1994
		DE 69012729 T2	02-02-1995
		DK 422898 T3	17-10-1994
		EP 0422898 A1	17-04-1991
		ES 2060061 T3	16-11-1994
		JP 2898076 B2	31-05-1999
		JP 3200558 A	02-09-1991
		KR 175926 B1	01-02-1999
EP 0943544 A	22-09-1999	IT BO980184 A1	20-09-1999
		EP 0943544 A1	22-09-1999
EP 0432126 A	12-06-1991	US 5081819 A	21-01-1992
		CA 2006747 A1	04-06-1991
		DE 69013303 D1	17-11-1994
		DE 69013303 T2	11-05-1995
		EP 0432126 A1	12-06-1991

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 214 of 421

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 March 2010 (11.03.2010)

PCT

(10) International Publication Number
WO 2010/026053 A1

(51) International Patent Classification:
A47J 31/22 (2006.01)

(21) International Application Number:
PCT/EP2009/060771

(22) International Filing Date:
20 August 2009 (20.08.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
08163530.2 2 September 2008 (02.09.2008) EP
08167584.5 27 October 2008 (27.10.2008) EP

(71) Applicant *(for all designated States except US)*: **NESTEC S.A.** [CH/CH]; Avenue Nestlé 55, CH-1800 Vevey (CH).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DENISART, Jean-Paul** [FR/CH]; Ch. de la Jaque 15, CH-1093 La Conversion (CH). **RYSER, Antoine** [CH/CH]; Rue du Simplon 19, CH-1006 Lausanne (CH).

(74) Agent: **BORNE, Patrice**; Ave Nestlé 55, CH-1800 Vevey (CH).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) Title: CONTROLLED BEVERAGE PRODUCTION DEVICE USING CENTRIFUGAL FORCES

(57) Abstract: The present invention relates to a beverage production device for preparing a liquid comestible from a portioned food substance contained in a sealed capsule (3), comprising a centrifugal unit (2) for receiving the sealed capsule (3), driving means (5) connected to the centrifugal unit (2) for enabling a rotational motion of the centrifugal unit (2), liquid supply means (4,6,7) being connected to the centrifugal unit (2), means (8) for measuring the flow rate or the pressure of the supplied liquid and control means (9) for controlling the rotational speed of the driving means dependent on the measured flow rate or the measured pressure of the liquid.

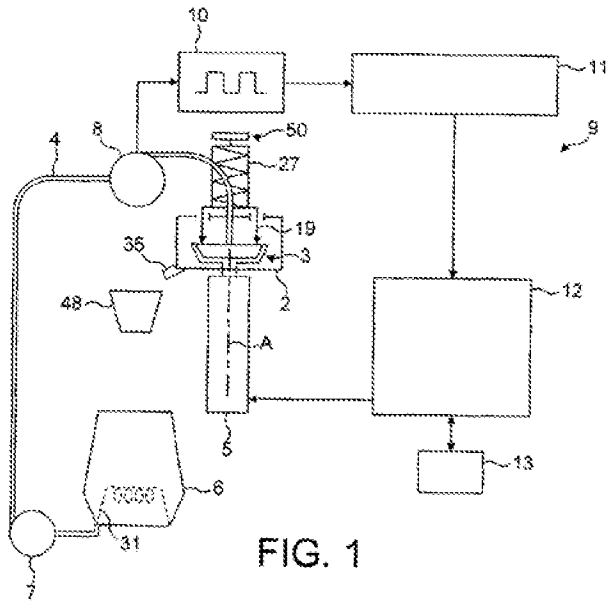


FIG. 1

WO 2010/026053 A1

- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Controlled beverage production device using centrifugal forces

Field of the invention

The present invention relates to a device and a capsule system for preparing a liquid comestible from a food substance contained in a receptacle by passing liquid through the food substance using centrifugal forces. In particular, the invention relates to a device and a method for controlling the flow rate of a liquid during the beverage preparation.

Background of the invention

It is known to prepare beverages by separating a mixture consisting of brewed coffee and coffee powder with centrifugal forces. Such a mixture is obtained by the interaction of hot water and coffee powder for a defined time. The water is then forced through a screen, on which screen powder material is present.

The existing centrifugal systems suffer the inconvenience that the strength of coffee cannot be regulated properly.

For instance, GB1506074 relates to a centrifugal device comprising a filter for filtering coffee. However, the contact time between coffee and hot water is not controllable. For example, the coffee granulometry can influence the residence time of liquid in the coffee and so the extraction quality.

On the other hand, solutions are known for increasing the pressure in the cell such as by a fixed or pressure-responsive restriction means.

It is known to increase the pressure in the centrifugal cell by increasing the rotational speed such as in EP651963. In this document, the pressure increase is obtained by a rubber-elastic element interposed at the interface between the lid and the cup of the centrifugal cell. Such an element deforms elastically to leave a filtering passage for the liquid when a certain pressure is attained at the interface.

FR2487661, US4545296 and WO2006/112691 relate to centrifugal systems wherein a fixed restriction is placed downstream of the filter to increase the pressure. However, in these systems, the contact time of the coffee and water is not truly controlled. As in EP651963, the taste of the coffee can be modified by changing the speed consequently the pressure in the cell.

GB2227405 discloses an apparatus for preparing a coffee infusion wherein the speed and/or duration of rotation is set to give a predetermined strength of infusion.

WO2007/041954 relates to a coffee maker with combined milling stage and brewing stage. Different approaches can be used to control the flavours of the brewed coffee. A first approach is to control the grain size of coffee powder during milling stage. A second approach is to control the speed of water penetration through the milled coffee powder. Therefore, different rotational speeds of the brewing basket are set up by the controller. A

disadvantage is that depending on the flow characteristics in the ground coffee taking into account the powder characteristics, coffee compaction, water quality, temperatures, etc., the strength and other quality attributes (e.g., crema) of the coffee can fluctuate a lot.

In PCT/EP08/056310, a solution is proposed into which a flow restriction is placed in or outside the centrifugal cell, e.g., a capsule containing coffee powder. The flow restriction can comprise a regulating valve offering a back-pressure. The valve opens under the effect of pressure in the cell. The valve can be preloaded by a resilient element (rubber or spring). A control unit can be provided in the device for setting the rotational speed according to the nature of the liquid to be brewed and/or the substance of the capsule.

Based on the prior art, the present invention aims at providing a device and a method for allowing an efficient control of the strength of a liquid comestible such as a coffee or tea beverage in a centrifugal beverage production device which takes into account the flow attributes through the ingredients.

The present invention also aims at providing a device and a method for allowing the production of different levels of foam or "crema" of the liquid comestible, in particular for coffee beverages.

In particular, one aspect of the invention, is to ensure that the key quality attributes of the beverage can be controlled properly. In particular, one aspect of the invention is to ensure that the strength or concentration

of the beverage is reproducible, i.e., that this characteristic does not fluctuate much for a same desired beverage. Still an aspect of the invention is to ensure the key quality attributes (i.e., concentration, coffee crema level) as well as the volume of the beverage can be produced and selected in a controllable manner depending on the type of beverages desired.

Object and summary of the invention

In a first aspect, the present invention relates to a beverage production device for preparing a liquid comestible from a portioned food substance contained in a capsule or cell, comprising a centrifugal unit for receiving the capsule or cell, driving means connected to the centrifugal unit for enabling a rotational motion of the capsule or cell in the unit, liquid supply means being connected to the centrifugal unit to supply liquid in the capsule or cell, means for measuring the flow rate, or respectively the pressure, of the liquid, and a control unit for controlling the flow rate of liquid, or respectively the pressure of liquid, to match a flow rate reference, or respectively a pressure reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure, of the liquid.

With a device according to the present invention it is possible to enable a controlled interaction between a preferably portioned food substance provided in a capsule or cell and a liquid such as water. Thereby, the interaction is particularly enabled due to the

centrifugal forces exerted on the capsule or cell during and after liquid has been provided thereto and, the substance:liquid interaction control is particularly obtained by monitoring and adjusting the flow rate of liquid that feeds the capsule or cell.

In a preferred embodiment, the capsule is removably insertable into the centrifugal unit of the device. The centrifugal unit of the device preferably comprises two enclosing members which are movably arranged relatively to each other and which are designed to enclose the capsule within the device.

One enclosing member is preferably equipped with a liquid injection assembly which enables the provision of liquid to the capsule enclosed within the centrifugal unit of the device. Preferably, the injection assembly is arranged centrically with respect to a rotational axis of the centrifugal unit. The injection assembly preferably comprises a tubular member for providing liquid to a central inlet port of the capsule. In a possible embodiment, the injection assembly comprises a piercing member designed to pierce the inlet port in a face of the capsule. The injection assembly is connected to the liquid supply means of the device.

A second enclosing member of the centrifugal unit is preferably a rotary drum which is of complementary shape to the capsule. Hence, a user may insert the capsule into said rotary drum which is held in the drum a stable manner.

The driving means for driving the centrifugal unit is preferably a motor such as an electric motor which is

connected to the control means of the device. Thereby, the driving means are connected to the rotary drum by means of a motor axle which thus enables a rotational movement of the rotary drum and the capsule housed by the rotary drum.

The liquid supply means of the device comprise a reservoir for storing liquid. Preferably, the reservoir is a boiler which comprises heating means in order to heat the liquid therein. However, the liquid supply means may as well comprise a liquid reservoir and an in-line heating element such as a thermoblock or an instant heater placed downstream of the reservoir in the fluid circuit.

Moreover, the liquid supply means preferably comprise a pump for providing liquid from the reservoir to the injection assembly and thus, to the centrifugal unit of the device. The pump is preferably connected to the control means of the device.

The means for measuring the flow rate of the liquid are preferably arranged in the fluid circuit between the liquid supply means and the centrifugal unit of the device.

The control unit preferably comprises an event-triggered state machine connected to the driving means and the means for measuring the flow rate of the liquid provided to the centrifugal unit. Moreover, the control unit is preferably connected to a manual interface which can be operated by a user.

In particular, the flow rate reference can be a flow rate set point which is set as a constant during an extraction phase. The extraction phase is here defined as the main phase during which liquid is supplied by the supply means to the capsule and said liquid passes through the ingredients in the capsule and beverage liquid is thus dispensed from the capsule.

In a possible alternative, the flow rate reference represents a variable profile of flow rate, i.e., set points varying in function of time. Indeed, it might be advantageous in some case to vary the flow rate set point during the extraction phase in order to achieve particular extraction profiles. In this case, the control unit can store a variable profile of flow rate which corresponds to a particular selected beverage. However, for avoiding too much control complexity, preference is given to a constant flow rate set point for a same desired beverage.

In a preferred mode, the control unit is preferably configured for selecting or calculating different preset flow rates corresponding to respectively different beverage (e.g., coffee) strengths. The control unit is preferably connected to a user's interface for a selection of the different beverages by the user.

Therefore, the control unit enables the regulation of the flow rate (as a constant or variable profile) by adjusting the speed of the driving means during at least one essential phase of the beverage preparation in order to set the strength (i.e., the concentration) of the beverage to be prepared. Thereby, the strength can be

selected by a user of the device by means of the manual interface.

Moreover, the control unit is configured for controlling the volume of the beverage by receiving data from the flow measuring means and controlling accordingly the volume of liquid supplied by the liquid supply means, in particular, the pump, to the capsule or cell.

However, it may as well be possible that the strength and/or volume are set by identification means arranged within the device which interact with the capsule provided to the device. Such identifications means may be a barcode scanner for example which reads a barcode provided on an outside face of the capsule and which enables a detection of the type of capsule and/or the nature of ingredients provided within the capsule in order to apply a predefined extraction profile for the beverage to be prepared.

During the beverage extraction phase of a beverage preparation cycle, the speed of the driving means is thus regulated in control loop to correct the flow rate at a substantially constant value or, eventually to follow a predefined flow rate profile. Hence, a preset nominal flow rate is obtained during the extraction phase of the beverage production. Since the flow rate is directly linked to the contact time of the liquid with the ingredient in the capsule, the strength of the beverage is thus essentially determined by maintaining the flow rate to said predefined set point or profile corresponding to the selected strength of the beverage.

During the extraction phase, a centrifugal cell which is placed within the centrifugal unit acts as a centrifugal pump by drawing liquid such as water from the liquid supply. Accordingly, the rotational speed of the motor driving the centrifugal unit in rotation compensates for the flow rate fluctuation to the set point. In particular, when the measured flow rate becomes lower than the set point, the rotational speed is increased by the control unit to raise the flow rate up to the set point and, inversely, when the measured flow rate becomes higher than the set point, the rotational speed is decreased by the control unit to lower the flow rate down to the set point. Obviously, the lowest possible fluctuations of flow rates to the set point are preferred.

The centrifugal cell according to the present invention may be a single-use capsule provided to the centrifugal unit. Furthermore, the centrifugal cell may as well be a refillable filter cell.

The single-use capsule to be used with the present invention can be closed before use in a gas impervious manner to maintain freshness of the food ingredients housed therein. The capsule preferably contains a protective atmosphere for the ingredients such as inert gas. The capsule can be closed by a membrane which is pierced or peeled off during the beverage preparation process. The capsule may comprise coding means such as a barcode for example which is read by the machine. Accordingly, corresponding parameters, such as for example the beverage strength, the beverage volume and/or the beverage crema or foam, can be adjusted by the control means.

In case a refillable filter cell is provided to the centrifugal cell, said filter cell is preferably removably arranged within the device. Furthermore, the filter cell is preferably designed to be accessible from the outside of the device. Therefore, removing and loading of food substance from or to the centrifugal cell is enabled.

The pump of the liquid supply means is set to supply a sufficient quantity of water during the beverage preparation cycle to the centrifugal cell whereas the rotational speed of the centrifugal cell actually regulates the flow rate of the dispensed liquid. The pump is preferably a low pressure pump such as a centrifugal pump or any other suitable low pressure pump.

The contact time between the food ingredients and hot water contained in the capsule varies in inverse proportion to the water flow rate which circulates in the liquid supply circuit and thus, through the centrifugal cell. In general, for obtaining a higher concentration or strength of the beverage to be prepared, the water flow rate can be set at a relatively low value, whereas for obtaining a lighter concentration or strength of the beverage, the water flow rate is set at a relatively higher value.

This is in particular advantageous for preparing a hot beverage such as coffee, tea, hot chocolate or the like with a desired concentration respectively a desired strength.

The flow rate is measured by flow rate sensing means which are placed in the liquid flow path of the device.

Such flow metering means provide continuous indications to the control means which, in response, regulate the speed of the motor.

The flow rate sensing means is preferably a pulse-coded flow-metering turbine placed between the water supply, e.g., a water reservoir and the liquid injection assembly of the centrifugal cell. The turbine thus generates electrical impulses which period is proportional to the velocity of the flow. Accordingly, the control means are designed to calculate the flow rate based on the electrical impulses provided by the pulse coded flow-metering turbine.

Preferably, the control means are also configured to control the volume of the delivered beverage. Accordingly, the volume is set up by receiving information of the flow meter such as by counting the number of impulses generated by the flow meter or by measuring the period of the impulses.

The manual interface of the device preferably comprises a selection means for the user to select the strength of the beverage and preferably also the volume of the beverage. The user may thus select the concentration and/or volume of the beverage to be prepared. For example for a coffee beverage, different strength of coffees can be selected (e.g., light, medium, strong) and different volumes (e.g., 25, 40, 110, 250 mL) corresponding to different cup sizes. For example, for simplifying the selection of the user interface but still meeting the larger possible preference of the users, the choices can be made possible amongst a limited number of selectable combinations relative to coffee strengths and volumes,

for example, under coffee selections which are explicit for the user (e.g., ristretto, espresso light/strong, lungo light/strong, Americano, etc.).

When different kinds of beverage are proposed such as coffee, tea, milk, etc., the selection means may also be used to select the kind of beverage to be prepared in such as coffee, tea, herbal tea, soup or hot chocolate for example. Thereby, the selections means may provide information about different liquid comestibles to be prepared for which different extraction profiles are stored.

In a possible embodiment relating to the preparation of a coffee beverage with the present device, the manual interface may be used for selecting a desired kind of coffee, such as a 'ristretto', an 'espresso', a 'lungo' or an 'Americano' which may express a particular combination of coffee strength and volume. Furthermore, the strength of coffee can eventually be further adjusted selectively for one or more of these kinds of coffees.

Moreover, the desired coffee strength is preferably chosen by selection means such as a potentiometer of the manual interface. Accordingly, the strength of a coffee beverage to be prepared can be varied by a continuous or incremental variation of the flow rate set point which has been set initially by the device. In a possible embodiment, the strength of coffee beverage can be set, for instance, after the selection of coffee volume is carried out.

Considering in particular, coffee preparation from ground coffee contained in the cell, i.e., a single-use capsule,

the extraction profile set by the control means of the device preferably comprises at least a pre-wetting phase, an extraction phase and a dry-spinning phase which differ normally in at least the associated rotational speed of the driving means.

The pre-wetting phase of the extraction profile takes place at the beginning of the beverage preparation cycle. Thereby, liquid such as water is supplied to the centrifugal cell, i.e. the capsule, which is maintained static or is rotated at relatively low speed, preferably lower than 200 rpm, most preferably lower than 100 rpm. Accordingly, the pre-wetting phase enables a homogeneous wetting of the dry food ingredients, i.e., ground coffee, housed within the capsule. Hence, the compacting of dry ingredients and a resulting blockage during the beverage preparation cycle can be effectively prevented.

The amount of liquid provided to the centrifugal cell respectively to the capsule during the pre-wetting phase is preferably chosen such that the cell respectively the capsule is full of liquid and gas is essentially expelled out of the capsule. Accordingly, the food ingredients are completely flooded. During this phase, there is essentially no extracted liquid being dispensed from the capsule as the centrifugal pressure at low speed in the capsule remains too low to enable to overcome the pressure losses created in the capsule and the possible restriction means in the flow path (e.g., valve means).

After the pre-wetting phase, the extraction phase of the extraction profile takes place. It preferably comprises a ramp up of the driving means to the extraction speed level which is a higher rotational speed than during the

pre-wetting phase. Preferably, a predefined extraction speed is set to avoid important fluctuation of the flow rate during the ramp-up phase. Once the predefined extraction speed is reached, the rotational speed of the driving means is controlled by the control means in order to provide a relatively constant flow rate of the liquid.

In order to control the contact time between food ingredients and water during the beverage preparation cycle, the value of the liquid flow rate is calculated by the detection of the period of the impulses generated by the flow meter.

Depending on the type of beverage to be delivered, during the extraction phase, the rotational speed can be comprised between 5,000 and 15,000 rpm, preferably 8,000 and 12,000 rpm. In particular, the speed can be influenced by the flow resistance in the capsule and by the restriction means.

After the extraction phase, the spin-drying phase of the extraction profile takes place. Thereby, the water pump of the liquid supply means is stopped by the control means in order to stop supply of water to the centrifugal cell. Moreover, a second ramp-up phase or acceleration of the rotational speed is carried out followed by a phase where the rotational speed is maintained at a relatively elevated constant value to perform spin-drying of the food ingredients in the centrifugal cell respectively within the capsule. The beverage preparation cycle can be ended up by a deceleration phase where the rotational speed is progressively lowered to the zero value.

Accordingly, any residual liquid present in the centrifugal cell or the capsule is eliminated and discharged via a spout of the device. The rotational speed of the spin-drying phase is set higher than the rotational speed controlled during the extraction phase.

Since the concentration of the residual liquid discharged by the centrifugal cell may have a different concentration than the liquid comestible discharged during the extraction phase, the residual liquid may be discharged by purging means which can be selectively connected to a spout of the device. Therefore, the concentration of the beverage to be prepared is not influenced by the residual liquid discharged during the spin-drying phase.

It should be understood that the spin-drying phase can be carried out for a predetermined time (e.g., a few seconds).

The extraction profile and particularly the rotational speed may vary for each kind of beverage to be prepared in order to influence the concentration or strength of the beverage. Accordingly, different extraction profiles may be chosen by means of the manual interface. The predefined extraction profiles are preferably stored in the control means or memory means connected thereto.

Furthermore, the centrifugal unit of the device preferably comprises flow restriction means at a delivery side of the centrifugal unit.

The flow restriction means at the delivery side of the centrifugal unit may comprise a pressure-responsive valve

which opens under the pressure of the liquid coming out of the unit. Such a valve is for example described in PCT/EP08/056310.

In an embodiment, the restriction means is a fixed Venturi duct (eductor) formed of one or more small outlets. The restriction means can be provided at the delivery outlets of the capsule or downstream of the capsule.

The advantage is that a certain pressure is necessary before the liquid can exit the centrifugal unit and therefore, the contact time of liquid is promoted in the cell by creating a delayed release. Accordingly, an improved interaction between water and the substance contained in the capsule is obtained. For coffee, for example, it may be advantageous to optimize interaction of water and the ground coffee particles contained in the centrifugal cell to obtain a good extraction of the coffee and aroma compounds.

Moreover, the restriction such as the valve provides a relatively high pressure drop which promotes the generation of a nice amount of crema or foam of the beverage.

During the extraction phase, the food ingredients within the centrifugal cell are traversed by liquid provided by the liquid supply means. The beverage resulting from the interaction of liquid and food ingredients, which is discharged from the centrifugal cell due to the centrifugal forces acting thereon, forces the flow restriction valve to open when the pressure of liquid exceeds the preload of the valve. The beverage extract is

thus discharged from the centrifugal cell via the spout with a relatively consistent flow.

In a preferred embodiment, the flow restriction valve can be formed by at least one engaging portion of the device which is adapted to move relatively to an engaged portion of the device or, alternatively, of an engaged portion of the capsule under the effect of the pressurized liquid exiting the capsule, for making a thin annular laminating passage for the liquid.

The preload of the flow restriction valve is preferably adjustable. Thus, the preload of the valve can be increased to force the rotational speed to increase for maintaining the same flow rate. Conversely, the preload can be decreased to lower the rotational speed for maintaining the same flow rate. Thereby, the adjustment of the preload of the valve can impact on the level of crema or foam of the beverage which can be created.

Thereby, it has been found that a higher rotational speed of the driving means during the extraction phase provides a higher amount of crema or foam of the beverage. This is particularly advantageous for coffee beverages for which a distinctive crema or foam is desired.

According to the described embodiment, it can be possible to control both the beverage strength (for example the coffee concentration in the coffee liquid extract in the cup) and the amount of foam or crema on the beverage.

It is thus possible to provide for example a 'ristretto' coffee extract with a relatively high concentration of coffee and a high amount of crema by adjusting,

respectively, the volume of 25mL, a relatively low flow rate and a relatively high preload of the flow restriction valve. On the contrary, it is for example also possible to prepare a relatively light 'lungo' coffee extract with a low amount of crema by adjusting the volume to 110mL, a relatively high flow rate and a relatively low preload of the restriction valve.

In a preferred embodiment, the preload on the flow restriction valve is adjustable by mechanical actuation means driven manually or by a motor controllable by the control unit. Hence, the amount of foam or crema of the beverage to be prepared can be adjusted by the user.

In a possible alternative, the speed of the driving means may be controlled in relation to a detected pressure of liquid in the centrifugal cell respectively in the capsule or of the pressure of liquid reigning in the liquid supplying line before the cell. Thereby, the pressure in the cell or before the cell is preferably measured by a pressure sensor positioned within the cell or upstream of the cell, e.g., in the liquid supplying line between the pump and the water injection point in the cell. It should be noted the present invention can be adapted to a control of the pressure of liquid as an alternative to a control of flow rate or as an additional control means to regulate the rotational speed and, consequently, the strength of the beverage.

In a second aspect, the present invention relates to a system for producing a beverage from portioned ingredients provided within a capsule, the system comprising a beverage producing device having a centrifugal unit comprising at least two enclosing

members for enclosing the capsule by a relative movement of the enclosing members,

driving means connected to the centrifugal unit for enabling a rotational motion of the centrifugal unit,

a liquid injection assembly designed to interact with the capsule provided to the device and connected to liquid supply means,

means for measuring the flow rate, or respectively the pressure, of the liquid,

control means for controlling the flow rate, or respectively the pressure, of liquid to match a flow rate reference, or respectively a pressure reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure,

wherein the capsule is designed to be removably inserted into the centrifugal unit of the device.

The capsule to be used with the device according to the present invention is preferably a single-use capsule sealed in a protective atmosphere before use. The capsule can have a rigid dished body and a lid, wherein the lid of the capsule comprises outlet openings arranged at a peripheral portion of the lid. In a possible alternative, the capsule can be capsule permeable to liquid and gas when inserted in the device such as a filter capsule.

The capsule preferably contains ground coffee, soluble coffee, tea, cocoa, milk and combinations thereof.

For coffee, the amount of coffee can differ in the capsule depending on the type of coffee beverage to be delivered. For instance, a lungo-type coffee can be

prepared from a higher amount of coffee contained in the capsule compared to a ristretto or an espresso-type coffee. The coffee powder may also be prepared from many different blends and origins.

The capsule to be used in the device can be associated to a code containing information relative to one or more of the following parameters: flow rates, beverage volumes, speeds, beverage temperatures, etc.

The injection of the liquid provided by the device preferably takes place at an upper face of the capsule which may already have an inlet port and the injection of liquid can be done by connecting an injection member such as a tube to an inlet port of the capsule. In a possible alternative, a foil of the capsule which covers the lid can be pierced by a piercing member connected to the injection member of the device. The output of the beverage to be prepared takes place at a peripheral section of the lid of the capsule which is provided with a plurality of outlet openings.

It should be understood that the single-use capsule according to the present invention may contain any of a culinary liquid such as soup or sauce, a beverage liquid such as coffee, chocolate, milk, tea, etc., or a nutritional liquid such as an infant formula.

In a third aspect, the present invention relates to a method for preparing a liquid comestible from a portioned food substance contained in a capsule or cell by passing liquid through the substance using centrifugal forces, comprising the steps of

connecting the capsule or cell to a liquid supply,

rotating the capsule or cell about its rotational axis to enable an interaction between the liquid and the portioned ingredients provided within the capsule,

controlling the flow rate, or respectively the pressure, of liquid to match a flow rate reference, or respectively a pressure reference, by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure, of liquid.

In particular, the flow rate is controlled in relation to a selection of strength of the beverage carried out by the user.

Furthermore, the level of crema or foam can also be controlled by adjusting the load on the restriction valve at the exit of the capsule or cell.

In order to avoid unnecessary repetitions, the method can be defined as including all the possible operations as aforementioned described in relation to the operations of the device or system of the invention.

Brief description of the drawings

Further features, advantages and objects of the present invention will become apparent for a skilled person when reading the following detailed description of embodiments of the present invention, when taking in conjunction with the figures of the enclosed drawings.

Fig. 1 is a schematic representation of the centrifugal system;

Fig. 2 is a graphical representation of the speed as a function of time during a typical brewing cycle for a concentrated strong coffee beverage and a comparatively lighter coffee beverage;

Fig. 3 is a cross sectional view of the centrifugal unit according to a non-limiting example;

Fig. 4 is an enlarged view of a detail of figure 3.

Fig. 5 is a sectional side view of a capsule according to the present invention.

Fig. 6 is a perspective side view of a capsule according to figure 5 with its top membrane being removed.

Fig. 7 is a sectional side view of a centrifugal unit according to a variant of the invention.

Fig. 8 is an enlarged view of a detail of figure 7 when centrifuged liquid is delivered.

Fig. 9 shows an example of a user's interface of the device of the invention.

Detailed description of the figures

Figure 1 is a schematic drawing of the centrifugal system according to the present invention.

As can be seen in figure 1, the system comprises a centrifugal unit 2 in which a centrifugal cell 3 can be

placed. The centrifugal cell 3 may be a single-use capsule which contains portioned food ingredients. Before its insertion in the unit, the capsule is preferably sealed in a gastight manner to maintain freshness of the food ingredients contained therein. Alternatively, the centrifugal cell 3 may be a re-fillable filter cell removably connectable to the centrifugal unit 2.

The centrifugal unit 2 is connected to driving means 5 which is preferably an electric motor. The driving means 5 is designed to rotate a rotary drum of the centrifugal unit 2 along an axis of rotation A and thus, the centrifugal cell 3 housed within the rotary drum of the centrifugal unit 2 about the same axis A of the centrifugal cell 3. It should be noted that the cell could be part of or all the rotary drum, in particular, when the cell is not specifically a single-use capsule but a refillable part of the device.

The centrifugal unit 2 further comprises a collecting part and an outlet duct 35 through which the beverage to be prepared is discharged into a provided receptacle 48 such as a cup or mug, for example.

The system further comprises liquid supply means which comprise a water reservoir 6 and a fluid circuit 4. The reservoir 6 preferably comprises water heating means 31 for heating the water contained within the reservoir 6. The heating means 31 may be a heating coil. The heating of the water may as well be obtained by a thermoblock in the fluid circuit 4 and placed downstream relatively to the water reservoir 6.

The liquid supply means further comprise a pump 7 connected to the reservoir 6. The pump 7 is preferably a centrifugal pump. Moreover, the pump 7 is connected to the centrifugal unit 2 by means of the fluid circuit 4.

The pump 7 is preferably a low pressure pump which serves the purpose of providing sufficient liquid to the centrifugal unit 2 at low pressure. In addition, during operation of the centrifugal unit 2, the centrifugal cell 3 acts as a centrifugal pump by drawing water from the liquid supply.

In the centrifugal unit 2, a flow restriction means 19 is provided to create a restriction of the flow of the centrifuged liquid which leaves the cell 3 before it is collected in the collecting part of the unit. The flow restriction means 19 enables to increase the dwell time of liquid in the cell and therefore improves the extraction, in particular, for coffee or tea, between the liquid and the ingredients contained in the cell. Furthermore, due to the high rotational forces necessary for the flow to pass through restriction means, the velocity of the flow is significantly high. As a result, a nice amount of foam or crema can be obtained. Preferably, the flow restriction means 19 is a valve which opens or at least provides an increase of a flow opening(s) by pressure of the centrifuged liquid in the cell. For this, the valve 19 comprises elastic biasing means 27 for counter-acting the pressure of the centrifuged liquid up to a given load. Furthermore, the valve's load acting in restriction or closing on the flow can be made adjustable by means of a load actuating means 50. For instance, the load actuating means 50 acts on the elastic biasing means 27 to vary positively or negatively

the pre-load on the valve 19. Therefore, the higher the elastic means are pre-stressed, e.g., by a compressive constraint of the actuating means 50 on the resilient member, the higher the pressure of liquid is necessary for overcoming the restriction means, i.e., for opening the valve, and maintaining the flow rate, therefore, the higher the rotational speed must be. As a result, the level of foam or crema can be controlled by adjusting the load of the valve means 19.

In the fluid circuit 4 between the liquid supply means and the centrifugal unit 2, metering means 8 for the flow rate of the liquid are situated. The metering means 8 is preferably a pulse-coded flow-metering turbine which generates electrical impulse data 10. Thereby, the period of the generated impulses is preferably proportional to the velocity of the liquid flow within the fluid circuit 4.

The system further comprises control means 9 which comprise a counter 11, a central controller 11 such as a PID (proportional-integral-derivative) controller able to provide control loop feedback mechanism, and a manual user interface 13. The control means 9 are preferably connected to the flow-metering turbine 8 to receive the process variable relative to the flow rate and to the driving means 5 of the rotational motor for input of the manipulated variable to the motor, i.e., the rotational speed. Furthermore, the controller 12 is connected to the pump 7 to start and stop the liquid supply in the circuit.

The counter 11 connected to the flow-metering turbine 8 enables an analysis of the generated impulse data 10. The analysed data is then transferred to the central

controller 12. Accordingly, the exact actual flow rate of the liquid within the fluid circuit 4 can be calculated in real-time.

Therefore, the central controller 12 connected to the driving means 5 may adjust the rotational speed of the driving means depending on the measured flow rate of the liquid.

Moreover, the central controller 12 preferably comprises a memory (not shown) in which certain parameters of the extraction profile can be saved such as rotational speeds of the centrifugal cell, initial extraction speed of the cell, calibration of the flow meter, prewetting time, dry spinning time, acceleration and deceleration speed ramps, etc. In particular, the controller 12 may contain the set points and values of the rotational speed of the driving means 5 at different phases of the beverage preparation cycle. These parameters serve as part of different predetermined beverage preparation profiles in relation to control algorithms for processing the different profiles on demand.

In addition, a manual interface 13 is connected to the central controller 12 which enables a user of the device of the invention to choose at least the strength of the beverage and, preferably also, the dispensing volume of the beverage to be prepared. Thus, the central controller 12 controls the flow rate during the extraction phase which corresponds to the selected beverage strength in response to an input of the manual interface by varying the rotational speed of the driving means accordingly. The manual interface can be any mechanical, interactive or multimedia user: machine interfacing means which is

associated to the device or remote. Thus, the manual interface can be a keyboard, touch screen, cellular phone, personal computer, laptop, palm, etc.

Figure 2 is a graph showing examples of variation of the rotational speeds of the driving means as a function of time during typical beverage preparation cycles for a highly concentrated beverage and for a comparatively lighter beverage.

The characteristic curve 14 of figure 2 may for example represent an extraction profile for a strong short coffee, such as an 'espresso' or ristretto' type coffee. By contrast, the characteristic curve 15 of figure 2 may for example represent an extraction profile for a lighter 'lungo' type coffee.

Next, a beverage preparation cycle according to the present invention will be described with reference to figure 1 and the characteristic curves 14 and 15 of figure 2.

At the beginning of the beverage preparation cycle, and after the user's selection, the centrifugal pump 7 is switched on by the controller 12 and thus, hot water is pumped from the reservoir 6 to the centrifugal cell 3 through the flow-metering turbine 8.

Simultaneously or shortly after, the motor speed is started at a low speed to ensure a pre-wetting of the dry food ingredients, e.g., roast and ground coffee, provided within the centrifugal cell respectively the capsule 3. Preferably, said pre-wetting phase A lasts for a given time t_1 between 3 and 10 seconds. The prewetting time is

preferably a time as determined by a count of impulse data generated by the flow sensing means, which is already stored or storable such as by transfer from a code on the capsule or cell in the memory of the controller 12.

During said pre-wetting phase A, the motor speed S_A is preferably as low as 10-200 rpm (round-per-minute) to ensure a homogeneous distribution of water in the ingredients. Normally, the speed is too low to enable the liquid to overcome the restriction valve 19. Therefore, during this phase, the liquid remains in the cell and simply fills the volume non-occupied by the ingredients.

Thereby, the counter 11 analyses the impulse data 10 generated by the flow-metering turbine 8. For example, the counter 11 counts the amount of impulses for a pre-defined period of time. At a predefined count N_1, the end of the pre-wetting phase A is reached. Thereby, the count N1 can be adjusted by software loaded in the memory of the control means. Moreover, it may be possible to define the time of the pre-wetting phase A and/or the volume to be provided to the centrifugal cell 3 during the pre-wetting phase by means of the manual interface 13.

The parameters regarding the rotational speed S_A, the volume of the provided liquid and the time t_1 of the pre-wetting phase A are preferably equal for all different kinds of beverages to be prepared. For example, for different types of coffee beverages such as e.g. 'ristretto', 'espresso' or 'lungo', N_1 or t_1 may be the same. However, the parameters of the pre-wetting phase A may as well be set different for different kinds of beverages to provide different wetting profiles.

After the pre-wetting phase A, the extraction phase B of the beverage preparation cycle takes place. Hence, when the number N_1 of counted impulses is reached, the control means 12 accelerate the driving means 5 in a ramp-up phase B' to the extraction phase B to reach a predetermined speed set-point S_1 respectively S_2 for the rotational speed of the driving means 5.

It should be understood that the time for the described ramp up B' may differ for different kinds of beverages to be prepared.

The set point S_1,S_2 is the initial speed value for the extraction phase which can be determined in relation to the selection made at the manual interface. The set point S_1,S_2 preferably differs for different beverages such as different coffee beverages for example. As can be seen in figure 2, the set point S_2 of the lighter beverage 15 relates to a higher rotational speed of the driving means 5 than the set point S_1 of the comparatively strong beverage 14, as the contact time between water and the food ingredients within the centrifugal cell 3 is proportionally shorter at a higher rotational speed (at set point S_2).

The increase of the rotational speed from S_A to S_1 or S_2, provides the liquid a sufficient momentum to traverse the ingredients in the cell and forces the valve means 19 to open under the pressure of the centrifuged liquid. Therefore, the ramp-up phase causes the opening of the valve or enlargement of the valve's opening and, thereby, the centrifuged liquid starts being discharged through the duct 35.

At the beginning of the extraction phase B, the distinctive flow rate at the set point S_1,S_2 is calibrated by the impulse data 10 received from the flow meter 8. Accordingly, the flow rate at the beginning of the extraction phase B is linked to a predefined rotational speed of the driving means.

It should be understood that the initial flow rate through the centrifugal cell 3 during the centrifugal beverage preparation process can be affected due to progressive compaction of the food ingredients within the centrifugal cell 3 for example. Accordingly, the pressure drop at the centrifugal cell 3 changes and thus, the flow rate through the centrifugal cell 3 diverges. Therefore, in order to maintain a substantially constant flow rate through the centrifugal cell 3, the rotational speed of the driving means 5 is varied such as being increased or decreased in order to compensate for the changes of the flow rate.

Hence, after the above described calibration of the flow rate at the set point S_1,S_2, the control means 9 may vary the rotational speed of the driving means 5 continuously or at small intervals to maintain a relatively constant nominal flow rate during the extraction phase B. In order to provide a relatively stable flow rate and avoid too much oscillation, the correction of flow rate can be typically controlled by using a PID control algorithm implemented in the controller wherein the process value (PV) is the measured flow rate, the desired flow rate is the set point (ST) and the manipulated variable (MV) is the speed output from the controller to the rotational motor.

More precisely, the counter 11 particularly measures the periods of the impulses generated by the flow meter 8. Hence, if the measured period is higher than a set reference value, which was calibrated before, an acceleration of the speed is necessary and vice versa. The speed can be varied stepwise or continuously. In a stepwise speed control, the flow rate correction can be made by the control unit varying the speed of + or - 200 rpm, for instance.

Accordingly, during the extraction phase B, the rotational speed of the driving means 5 is constantly adjusted by the control means 9 in response to the sensed flow rate data 10.

Accordingly, a substantial constant value of the flow rate which differs only by a certain tolerance of, for instance, +/- 10% can be obtained. The rotational speed of the driving means 5 is adjusted preferably at intervals of less than 1 second, for instance, in the order of a few milliseconds.

After a second count N_2 of the flow-metering means 8 is reached, the water pump 7 is stopped by the control means 9. Thereby, the count N_2 of the flow-metering means 8 determines the total volume of the beverage to be dispensed.

It should be understood that the count N_2, N'_2 may vary for different kinds of beverages.

Preferred volumes of different types of coffee beverages are for example 25mL for a 'ristretto', 40mL for an

'espresso', 110mL for a 'lungo', and 250mL for an 'Americano' type coffee beverage.

Accordingly, the indicated reference numeral N_2 may refer to a short beverage such as a 'ristretto' or 'espresso' type coffee for example, whereas the reference numeral N_2' which relates to a greater number of counted impulses and thus, to a greater liquid volume may refer to a 'lungo' type coffee beverage for example.

After the pump 7 is stopped, a dry-spinning phase C of the beverage preparation cycle takes place in order to empty the cell from residual liquid. The rotational speed of the driving means 5 is preferably higher than during the extraction phase B. Hence, at second count N_2, an acceleration ramp up C' takes place until a predefined set point S_C of rotational speed is reached. Then, spin-drying of the ingredients within the centrifugal cell 3 is carried out for a predefined period of time t_C. Thereby, said predefined time t_C for the spin-drying phase C can be predetermined in the software of the control means, e.g., 5-10 seconds.

After the spin-drying phase C, the rotational speed of the driving means 5 is decelerated as indicated by the deceleration phase D in figure 2. Accordingly, the beverage preparation cycle is finished.

Of course, the spin-drying phase C could be run at the same rotational speed as the extraction phase or at a lower speed.

Before the start of each beverage preparation cycle, the manual interface 13 of the system preferably comprises a

pre-selection for enabling a user to choose preferably two parameters:

- the volume of beverage (e.g., 25, 40, 110, 250 mL) and,
- the coffee concentration (e.g., from light to strong).

The selection is then received by the control means 9 which calculates the corresponding flow rate by measuring the periodicity of the impulses which then serves as a reference for controlling the rotational speed of the driving means 5. Thereby, in order to avoid a too big oscillation of the control loop at the start of the extraction phase B according to the selection made, the system is first set up around the set point value of speed S_1,S_2.

In a preferred embodiment, the following data is saved in the memory of the control means 9 and can be adjusted by means of dedicated software:

- The motor speed S_A at the pre-wetting phase (i.e., a few rpm),
- The calibration of the flow meter in volume unit per impulse (e.g., mL/Impulse),
- The number N of impulsions during prewetting,
- The acceleration ramp up to the extraction phase B',
- The acceleration phase to the spin-drying phase C',
- The spin-drying speed S_C,
- The spin-drying time t_C,
- The deceleration rate D.

Of course, these functions can be assured by an integrated circuit.

Figure 3 is a cross sectional view of an embodiment of the centrifugal unit 2 according to the present invention.

The centrifugal unit 2 of the device comprises an upper enclosing member 20 and a lower enclosing member 32 which can be moved relative to each other.

The capsule 3 to be used with the device or the system according to the present invention may be any of the capsules described in PCT/EP08/056310 (WO 2008/148646).

The capsule 3 as shown in figure 3 is pre-opened before it is inserted in the device, i.e., a sealing foil arranged at an upper face of the capsule is removed by peeling, or a central hole is perforated in the foil of the capsule when the capsule is inserted in the device .

The capsule 3 optionally comprises an inner member forming a lid 17 which is inserted in the dished body of the capsule. The lid 17 and body 42 delimit together an internal enclosure 33 for receiving a portioned food substance. The lid 17 comprises outlet openings 34 (see figure 4) at a peripheral section 47 of the lid 17 for filtering the beverage and maintaining the food (coffee) particles within the capsule 3 during the beverage preparation. Accordingly, only the liquid comestible to be prepared is discharged through the outlet openings 34.

The lower enclosing member 32 of the centrifugal unit 2 is a receiving assembly which comprises a liquid duct 35, for example, protruding on a side of the assembly 32 for guiding the centrifuged liquid coming out of the capsule 3 to a receptacle 48 such as a cup or glass (see figure 1).

The liquid outlet 35 is in communication with a liquid receiver 36 forming a cylindrical wall placed at a short distance about a rotating drum 16 into which the capsule is inserted as illustrated in figure 3. Thereby, the rotary drum 16 is preferably a hollow capsule holder with an internal cavity complementary shaped to receive the capsule. The liquid receiver 36 defines with the drum 16 an intermediate cavity 37 for collecting the liquid.

Below the liquid receiving assembly 32, are placed means for driving the capsule receiving drum 16 in rotation inside the receiving assembly 32. The driving means 5 comprise preferably a rotary motor which can be supplied by electricity or gas power. The drum 16 and the driving means 5 are connected by a motor axle 23 which preferably protrudes through an aperture in the bottom of the liquid receiver 36.

The upper enclosing member of the centrifugal unit 2 is a liquid injection assembly 20 which comprises a water line 22 which is in fluid connection with the pump 7 and the flow meter 8 (see figure 1). Moreover, the water line 22 is connected to a water injector 21 which is arranged co-centrically to the rotational axis A of the capsule 3 within the centrifugal unit 2.

In the shown embodiment, the water injector 21 is designed as a simple water inlet of the capsule. However, the water injector 21 may as well be equipped with puncturing means which are designed to puncture or tear a membrane or foil provided at an upper face of the capsule 3.

About the water injector 21 is mounted a capsule rotary engaging part 39. The engaging part 39 has a central bore 39a for receiving the water injector 21 and rotational guiding means such as a ball or needle bearing 25 inserted between the engaging part 39 and the injector 21.

In order to enable sealing of the water inlet of the capsule, a sealing member 24 is arranged around the water injector 21 at a lower face of the rotary engaging part 39. The sealing member 24 is thus arranged between the rotary engaging part 39 and an upper face of the capsule 3. Thereby, the sealing member 24 applies a certain sealing pressure on the upper lid 17 of the capsule. Hence, water is effectively prevented from leaking along the upper surface of the capsule 3 and from by-passing the capsule to release directly through liquid outlet 35 of the centrifugal unit 2. Furthermore, a venting means (not shown) can be provided through the injection assembly 20 for enabling gas to escape from the capsule as liquid is filled in the capsule.

The liquid receiving assembly 32 and the liquid injection assembly 20 are preferably arranged to encase the capsule or centrifugal cell 3, the receiving drum 16 and the water injector 21. Preferably, the receiving assembly 32 and the injection assembly 20 can be moved relatively to each other such that a user of the device may access the rotary drum 16 in order to exchange the capsule 3 for example. Therefore, a closing mechanism (not shown) may be connected to the receiving and the injection assembly 32,20 in order to enable a relative movement of the receiving and the injection assembly 32,20.

In order to enable a sealing of the receiving assembly 32 and the injection assembly 20 during the operation of the device, sealing means such as an O-ring 49 for example are provided at the contact surfaces of the assemblies.

The water injection assembly 20 further comprises a valve system 19 for controlling the flow of liquid that is discharged from the capsule 3 during operation of the device. The valve system 19 can be arranged on the capsule rotary engaging part 39 in the form of an annular engaging portion 40 which is biased under the force of elastic loading means 27.

As can be seen in figure 4, the annular engaging portion 40 includes a pressing peripheral pinching edge 26 which applies a closing force on the peripheral rim 41 of the capsule 3 to be able to restrict the flow of liquid under the force of the elastic loading means 27.

As can be seen in figure 4, the elastic loading means 27 can be a rubber-elastic ring member which is supported by an upper and a lower annular seat portion 28, 29. Other means such as spring-biased loading means 27 may as well be applied to the device.

It should be understood that the load of the elastic loading means 27 is preferably adjustable. Hence, the pressure of the liquid which has to be exerted on the flow restriction valve 19 in order to enable a discharging of liquid from the capsule 3 to the outlet 35 of the device can be adjusted.

As can be seen in the figure, the pinching edge 26 is preferably 'V'-shaped or cone-shaped. Thus, the sealing

pressure in a localized area is increased. The valve means 19 further comprises an internal base member 30 which is preferably an integral part with the rotary engaging part 39 of the injection assembly 20. The elastic loading means 27 thus are inserted in a space located between the base portion 30 the engaging portion 40.

Therefore, at a rest position, the engaging portion 40 of the valve 19 keeps closing on the rim 41 of the capsule 3 under the compressive effect of the resilient means 27

The operation of the device is described in the following.

The capsule device is opened by moving the two assemblies 20, 32 relatively one another, e.g., by means of a dedicated closing mechanism and separating the two assemblies 20, 32. As a result, a single-use capsule 3 containing a food substance can be inserted in the device, i.e., placed in the cavity of the rotating drum 16. The device is then closed by the assembly 20 being connected back onto the assembly 32 and locked by the closing mechanism. In the locked position, the water injector 21 is connected to a water inlet 44 of the capsule. Water can thus be introduced in the capsule via the central water injector 21. The capsule can be driven in rotation by activating the driving means 5. The centrifugation is carried out by rotating the capsule around the central axis of rotation of the device that is preferably aligned to the central axis Z of the capsule. During the prewetting phase as described, previously, the capsule is filled with water and the ingredients are entirely wetted. The control means control the speed as such a low speed that liquid pressure is insufficient to open the valve 19.

After a sufficient acceleration of the rotational speed is carried out and the extraction phase 'per se' begins, the centrifuged liquid is allowed to pass through the plurality of outlet openings 34 provided in a peripheral portion 47 of the lid 17 of the capsule. Under the effect of high centrifugal forces, the food substance, such as e.g. ground coffee powder, tends to compact itself radially whereas water is forced to flow through the substance. This results in the substance being both compacted and intimately wetted by water. Due to the high rotational movement of the capsule, the centrifugal forces exert themselves uniformly on the mass of the substance. Consequently, the water distribution is also more uniform compared to usual methods using a pressure pump to exert the pressure in the capsule. As a result, there is lower risk of preferential flow path through the substance which could lead to areas which are not properly wetted and so not properly brewed, dispersed or dissolved. As result of the high centrifugal forces during the extraction phase, the valve is forced to open and liquid is so projected as a laminar flow at relatively high velocity in direction of the wall 36.

Figures 5 and 6 relate to a capsule which is preferably used with the device and system according to the present invention. However, it should be understood that the shown embodiment is just an exemplary embodiment and that the capsule according to the invention can take various different embodiments.

The capsule 3 comprises a rigid dished body 42 which comprises an annular rim portion 41. The capsule is preferably design as being rotationally symmetric about

central axis Z. Thereby, it should be noted that the capsule may not necessarily have a circular section around axis Z but may take another form such as a square, rectangle or a polygonal form. Thereby, axis Z is preferably aligned to the axis of rotation A when the capsule is inserted in the device.

Moreover, the capsule 3 comprises a lid 17 which preferably has the form of a disc of plastic comprising a central portion 46 and a peripheral portion 47. The central portion 46 can be substantially flat and may comprise an inlet port 44 for enabling the fitting or introduction of a water injection member 21 of the beverage production device.

It should be noticed that the lid 17 can be a rigid or semi-rigid member made of thermoformed or injected plastic for instance. However, this part could also be made of a flexible membrane which is sealed to the inner surface of the dished body without departing from the scope of the invention.

At the side of the lid 17 which faces the inside of the capsule 3, the inlet port 44 can extend by a tubular inlet portion 43 which serves for ensuring the water is guided toward the direction of the bottom of the body to ensure complete wetting of the substance 38 in the enclosure and so reduced risk of leaving for example "dry powder spots".

The upper surface of the capsule 3 may be equipped with a foil 45 which enables sealing of the capsule 3. The foil preferably covers the lid 17 and is welded or adhesively connected onto the peripheral edge 41 of the body of the

capsule. The foil can be permanently connected to the edge if the foil is intended to be pierced for forming the inlet and outlets or, alternatively, the connection is peelable. Before the capsule is inserted into the rotary drum 16 of the device, said foil 45 needs to be pierced or removed in order to enable a preparation of the beverage.

The lid 17 further comprises a peripheral portion 47 including a collecting recess 18. The collecting recess 18 forms a U-shape in transversal section (figure 6) which opens in the direction of the sealing foil 45. The recess is preferably continuously extending at the periphery of the lid 17 although it can be replaced by several discontinuous recessed portions which may be separated by reinforcing elements or walls, for example.

The collecting recess 18 comprises an inner peripheral portion of wall 47 of the lid 17 into which is provided a series of outlet openings 34 forming a fluid communication between the enclosure 33 and the collecting recess 18.

Furthermore, the outlet openings 34 may be formed by a filter paper, a woven or non-woven portion or another meshed or porous membrane (not shown). Thus, the lid 17 which is inserted in the dished body 42 comprises a circumferential band of a porous material. The porous material provides restriction of the flow, creating a certain pressure drop, e.g., between 0.5 and 4 bar, and leading to a filtering of the solid particles. In particular, the size of the pores of the material can be chosen to retain also the coffee fines, i.e., the particles of particle size as low as 90 microns. The

paper, fabric, meshed or porous material can be formed of a band or bands which can be welded or otherwise combined to the lid.

During operation of the device, the capsule 3 is rotated about its axis Z. Thereby, the liquid which is centrically injected into the capsule 3 will tend to be guided along the inner surface of the side wall of the body, up to the inner side of the lid, and then through the outlet openings 34. Due to the centrifugation of the liquid provided centrically to the capsule 3, the liquid and the ingredients 38 provided within the capsule are made to interact in order to form a liquid comestible.

Figs. 7 and 8 provide a variant of the beverage preparation system of the invention in which the load of the valve means is adjustable for enabling a control of the opening pressure in order to control the foam or crema level. For simplifying the present description and avoid repetitions, the same numerical references have been used to refer to similar technical means as in the previous embodiments. The novel aspects of the present embodiment essentially lie in piercing means of the device for piercing inlet/outlets in the capsule and in a different configuration of the flow restriction valve 19 compared to the other embodiments.

As illustrated, the water injector 21 extends coaxially in the capsule 3 by a hollow piercing member 51. The piercing member extends below the upper surface of the capsule 3, in the cavity 33. The piercing member is formed as a hollow tube to supply liquid in the capsule at its tip. The piercing member can so be used to pierce a sealing membrane 52 of the capsule which closes the lid

in a gastight manner before the capsule is inserted in the device.

The capsule rotary engaging member 39 can further comprise outlet piercing members 53 placed in axial alignment with the liquid collector of the capsule when the member 39 is engaged in closure on the capsule. The outlet piercing members 53 serve to pierce the membrane 52 of the capsule to define a plurality of outlets at the periphery of the capsule from which liquid collected in the collector can leave the capsule. The outlet piercing members are introduced in the collecting recess 18 of the capsule which is sized in such a way that the peripheral portion 47 of the lid cannot be perforated. The centrifuged liquid can thus be discharged from the collecting recess 18 via the holes which are formed in the sealing foil 52 by the piercing members.

The device further comprises a flow restriction means forming a valve assembly 19 which operates in opening when the pressure of centrifuged liquid has reached a certain threshold. For this, the rotary engaging member 39 has a protruding peripheral edge 40 which engages on the peripheral edge 41 of the capsule. The engagement is forced by an elastic biasing mechanism 27 which provides elastic compressive forces onto the rotary engagement member 39. In this particular embodiment, the elastic biasing mechanism 27 comprises a base 54 at one end into which is fitted a compression spring 55 and an abutting member 56 at the opposite end. The base 54, spring 55 and abutting member 56 are housed into a tubular frame 57. The abutting member 56 is further connected to a screw element 58 which protrudes externally from the frame. The screw element and tubular frame 57 form together an

actuating means 50. They comprise a complementary thread 80 assembly enabling to tune the compressive load of the elastic member on the engagement member 39.

As illustrated in Fig. 8, the engagement member 39 which normally applies a closing force onto the edge 41 of the capsule by pressing edge 81, is pushed upwards by the pressure exerted by the centrifuged liquid during the extraction phase, as soon as the rotational speed has reached a sufficient value. The annular gap 59 which is formed between the protruding peripheral edge 41 of the capsule and the pressing edge 81 of the valve determines the laminar flow of liquid. A very thin gap of about 0.1 to 1 mm is maintained opened by the pressure of the centrifuged liquid, thus enabling the liquid to be released at a high velocity in the direction of the impact wall 61 of the receiver. Therefore, as the flow rate of liquid increases during the ramp up phase B', the flow gap 59 increases proportionally. When the flow rate is stabilized during extraction phase B as controlled by the controller, a relatively consistent jet of liquid 60 is projected onto the impact wall 61 of the receiver. This results in a reproducible level of crema, extraction after extraction. When the load of the elastic member is increased by forcing the spring in compression, this results in an increase of the speed by the controller to maintain the flow rate at the set point. For coffee, it is noticed that a higher amount of coffee crema can be obtained accordingly. If a lower amount of crema is desired, the user can reduce the compression on the elastic member by the actuating means, which results in an automatic reduction of the speed for maintaining the same flow rate. Therefore, it is possible to control simply the level of foam of the beverage by adjusting the

load on the flow restriction valve. Of course, the screw element can be actuated manually by the user or by use of a motor. If a motor is utilized, it is also possible to automatically control the actuation by the controller which can send input command to the motor. In such case, it is also offered the possibility to use the valve compressive load as a manipulated variable to control the speed and/or flow rate in a control loop scheme.

It should also be noted that the valve 19 can leave one or more minimal outlets in its closed state and that the opening of the valve by the pressure of liquid causes the enlargement of the one or more outlets. For example, a few radial channels forming minimal oulets can be provided in the edge 81 pressing on the surface of the capsule. Channels forming outlets may also be provided within the surface of the edge 41 of the capsule or both in the edges 81 or 41.

It should also be noted that the flow restriction valve could also be made downstream of the capsule without necessarily engaging a part of the capsule but it could be entirely designed in the device itself.

As illustrated in Fig. 9, a user's manual interface 13 can provide a choice of beverages, such as coffee, regarding a volume selection area 70, a strength selection area 71 and, optionally, a selection area 72 for a "crema" or foam level. The volume selection area 70 can present a plurality of discrete selecting keys 700, 701, 702 such pressure-sensitive switches, each one prompting for a user to select a predetermined volume of the beverage. For instance, key 700 represents the shortest cup, e.g., for a ristretto coffee volume of

about 25 mL; key 701 represents a short espresso coffee cup of about 40 mL and key 702 represents a lungo coffee cup of about 110 mL. The strength selection area 71 can so be actuated independently to set the desired concentration for each desired volume, e.g., amongst low, medium or high strength levels. The actuation of this strength selection key 710, e.g., a potentiometer, will fix the flow rate set point in the controller, as aforementioned, which finally determine the interaction time of the liquid with the ingredients in the capsule. The crema or foam selection area 72 may also comprise a selection key 720, e.g., a potentiometer, for adjusting the level of crema desired. The different levels, e.g., low, medium, high, will be obtained by varying, e.g., continuously or stepwise, the load constraint applied on the restriction valve and, consequently, will have a direct influence on the rotational speed necessary to open the restriction valve during beverage extraction for regulating the flow rate at the set point as fixed by the strength selection. It should be noted that the selection key 720 for crema can be the mechanical actuation means 50 of Fig. 7 if the adjustment system is not automated. Of course the user interface may include a touch screen or an array of membranes or mechanical buttons for receiving input from the user. Additionally, the user interface 112 may include a graphical or character display, such as in the form of a color, monochrome, or LCD display. The user interface may also include a voice prompt interface, wherein the local food waste monitoring device includes a speaker and provides audio instructions, data, and prompts to a user. The user may then press buttons to provide input in response. Alternatively, the user may speak instructions in response to the prompts, and the instructions may be collected via a microphone

and interpreted to commands through voice recognition software installed on the controller or interface.

Although the present invention has been described with reference to preferred embodiments thereof, many modifications and alternations may be made by a person having ordinary skill in the art without departing from the scope of this invention which is defined by the appended claims.

Claims

1. A beverage production device for preparing a liquid comestible from a portioned food substance contained in a capsule or cell, comprising

a centrifugal unit (2) for receiving the capsule or cell (3),

driving means (5) connected to the centrifugal unit (2) for enabling a rotational motion of the capsule or cell in the centrifugal unit,

liquid supply means (4,6,7) being connected to the centrifugal unit to supply liquid in the capsule or cell,

means (8) for measuring the flow rate, or respectively the pressure, of the liquid,

and

a control unit (9) for controlling the flow rate, or respectively the pressure, to match a flow rate reference, or respectively a pressure reference, in a control loop by automatically adjusting the rotational speed of the driving means during an extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure.

2. A beverage production device according to claim 1, wherein the reference flow rate is a constant set point or a variable profile of flow rates stored in or calculated by the control unit (9).

3. A beverage production device according to claim 2,

wherein the control unit is arranged for selecting or calculating different flow rate set points

corresponding to respectively different beverage strengths.

4. A beverage production device according to claim 3,

wherein it comprises a manual interface (13) configured to enable at least a selection of the strength of the beverage during the beverage production process and the volume of the beverage to be prepared.

5. A beverage production device according to claim 3,

wherein it comprises an identification means for receiving information from a capsule code as to the strength and/or volume of the beverage to be prepared.

6. A beverage production device according to any of claims 1 to 5,

wherein the liquid supply means comprise a pump (7) which is designed for supplying fluid to the centrifugal unit (2) and which is operated by the control means (9).

7. A beverage production device according to any of claims 1 to 6,

wherein the centrifugal unit (2) is designed to act as a centrifugal pump by drawing water from the liquid supply means (4,6,7).

8. A beverage production device according to any of claims 1 to 7,

wherein the control means (9) are designed to detect the electrical impulses (10) of the flow meter in order to calculate the flow rate and the dispensing volume during the beverage production.

9. A beverage production device according to claim 8,

wherein the means for measuring the flow rate is a pulse-coded flow metering turbine (8).

10. A beverage production device according to any of claims 1 to 9,

wherein the control unit is arranged to control extraction profile comprises at least a pre-wetting phase (A) and an extraction phase (B) which differ in at least the associated rotational speeds (S_0,S_1,S_2) of the driving means (5).

11. A beverage production device according to any of claims 1 to 10,

wherein device further comprises flow restriction means (19) at a delivery side of the centrifugal unit (2).

12. A beverage production device according to claim 11, wherein the flow restriction means comprises a valve (19).

13. A beverage production device according to claim 12, wherein the valve (19) is adjustable.

14. A system for producing a beverage from portioned ingredients provided within a capsule, the system comprising a beverage producing device having a centrifugal unit (2) comprising at least two enclosing members (20,32) for enclosing the capsule by a relative movement of the enclosing members (20,32),

driving means (5) connected to the centrifugal unit (2) for enabling a rotational motion of the centrifugal unit (2),

a liquid injection assembly (20) designed to interact with the capsule (3) provided to the device and connected to liquid supply means (4,6,7),

means (8) for measuring the flow rate, or respectively the pressure, of the liquid,

control means (9) for controlling the flow rate, or respectively the pressure, to match a flow rate reference, or respectively a pressure of reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure,

wherein the capsule (3) is designed to be removably inserted into the centrifugal unit (2) of the device.

15. A system according to claim 14,

wherein the capsule (3) is a single-use capsule sealed in a protective atmosphere before use.

16. A system according to claims 14 or 15,

wherein the capsule (3) contains ground coffee, soluble coffee, tea, cocoa and/or milk.

17. A method for preparing a liquid comestible from a portioned food substance contained in a capsule or cell (3) by passing liquid through the substance (38) using centrifugal forces, comprising the steps of

connecting the capsule or cell (3) to a liquid supply (4,6,7),

rotating the capsule or cell (3) about its rotational axis (Z) to enable an interaction between the liquid and the portioned ingredients (38) provided within the capsule (3),

controlling the flow rate, or respectively the pressure of supplied liquid, to match a flow rate reference, or respectively a pressure of reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure.

18. The method according to claim 17,

wherein controlling the flow rate is carried out in relation to a selection of the strength of the beverage.

19. The method according to claims 17 or 18,

wherein the level of crema or foam can be controlled by adjusting the load on a flow restriction valve (19) at the exit of the capsule or cell.

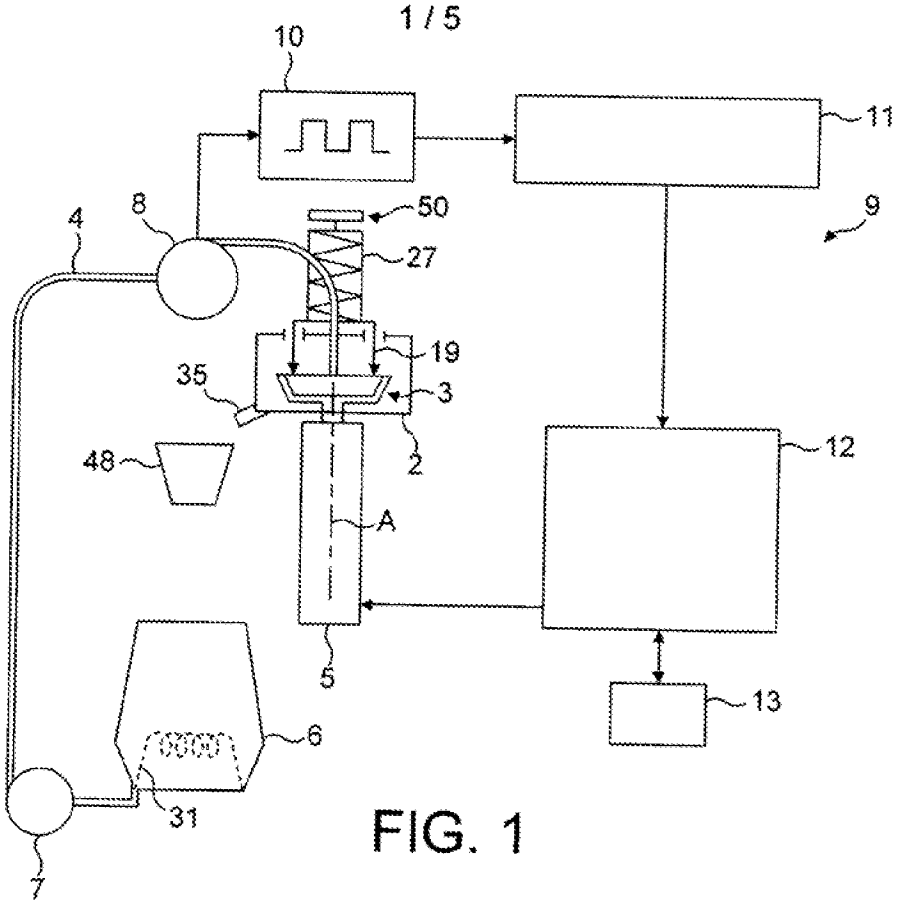

10
11
9
4
8
50
27
19
35
3
2
48
12
A
5
13
6
31
7

FIG. 1

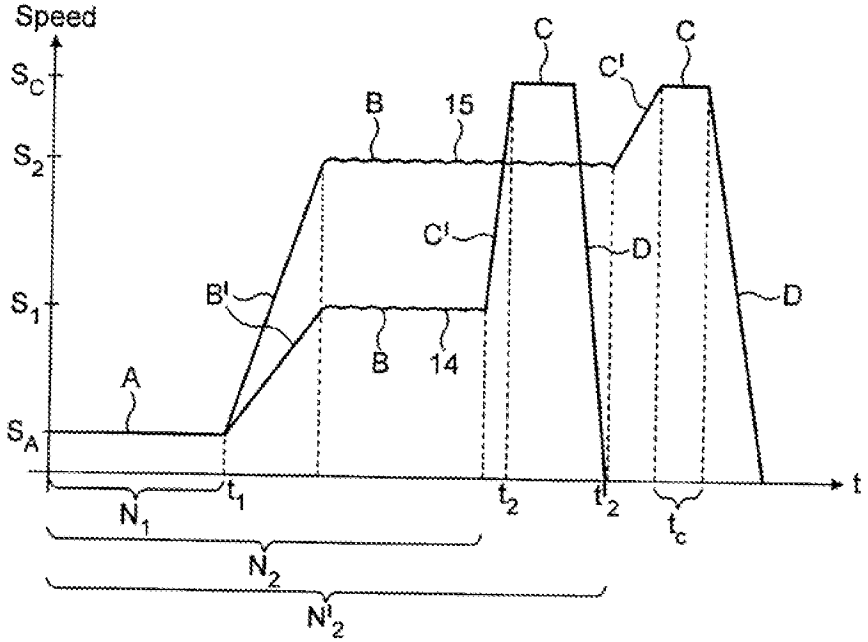

Speed
S_C
S_2
S_1
S_A
A
B
15
C
C'
C
B'
B
14
C'
D
D
t
t_1
t_2
t'_2
t_c
N_1
N_2
N'_2

FIG. 2

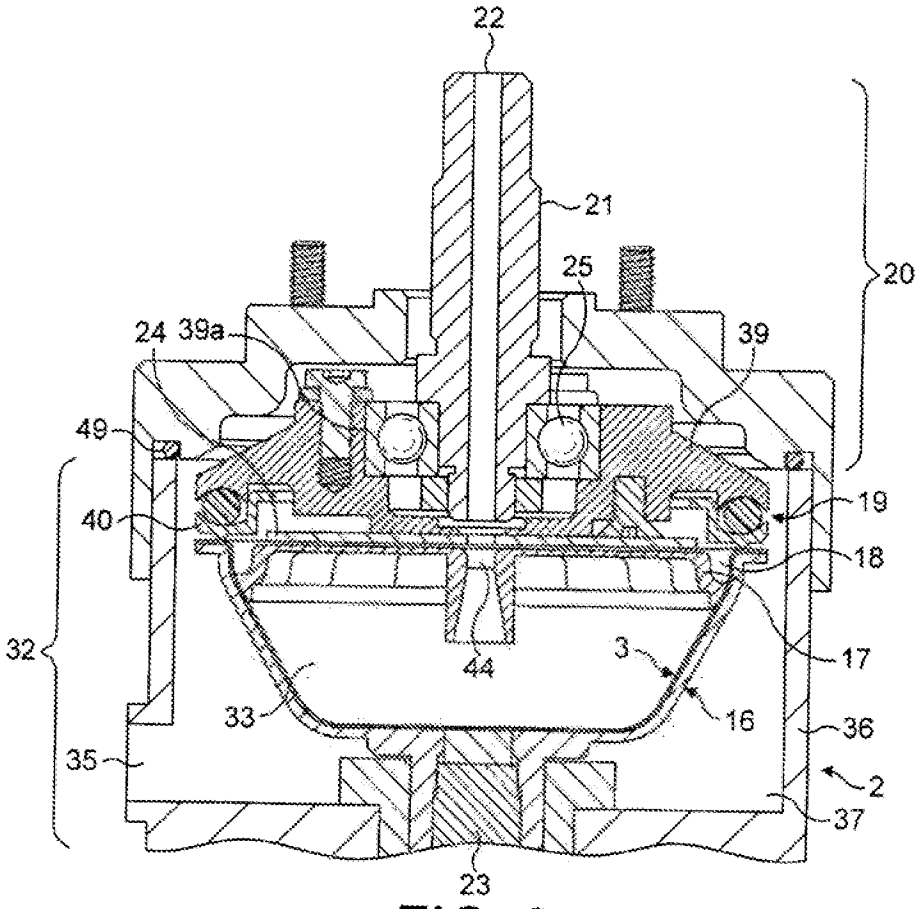

22
21
20
25
24
39a
39
49
40
19
18
32
44
3
17
33
16
36
35
2
37
23

FIG. 3

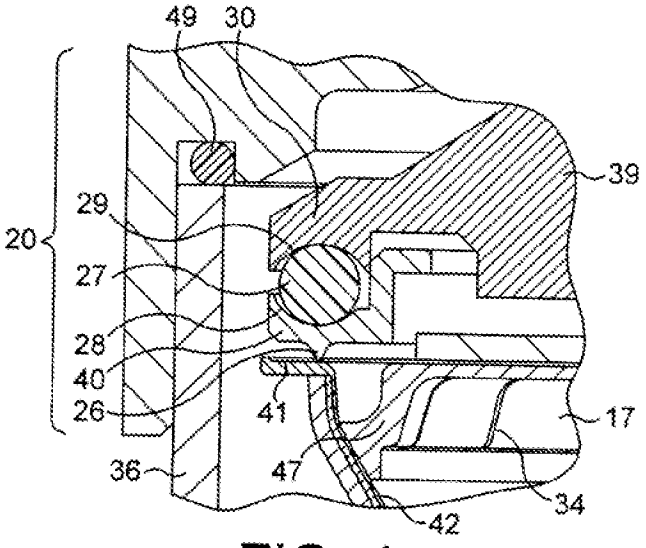

49
30
39
29
20
27
28
40
26
41
17
36
47
34
42

FIG. 4

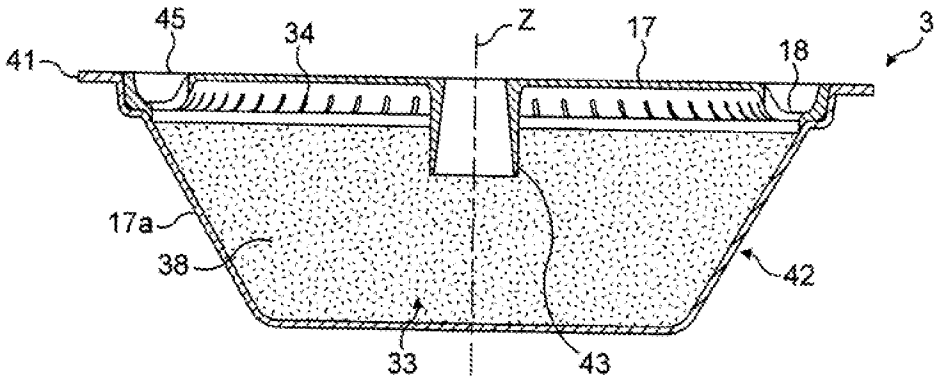


FIG. 5

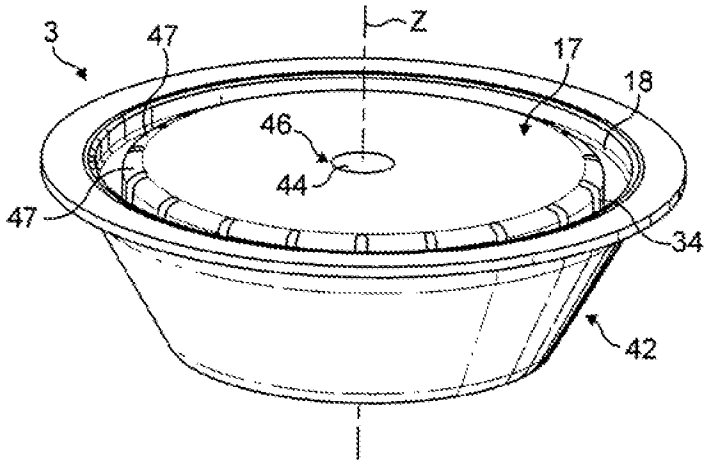


FIG. 6

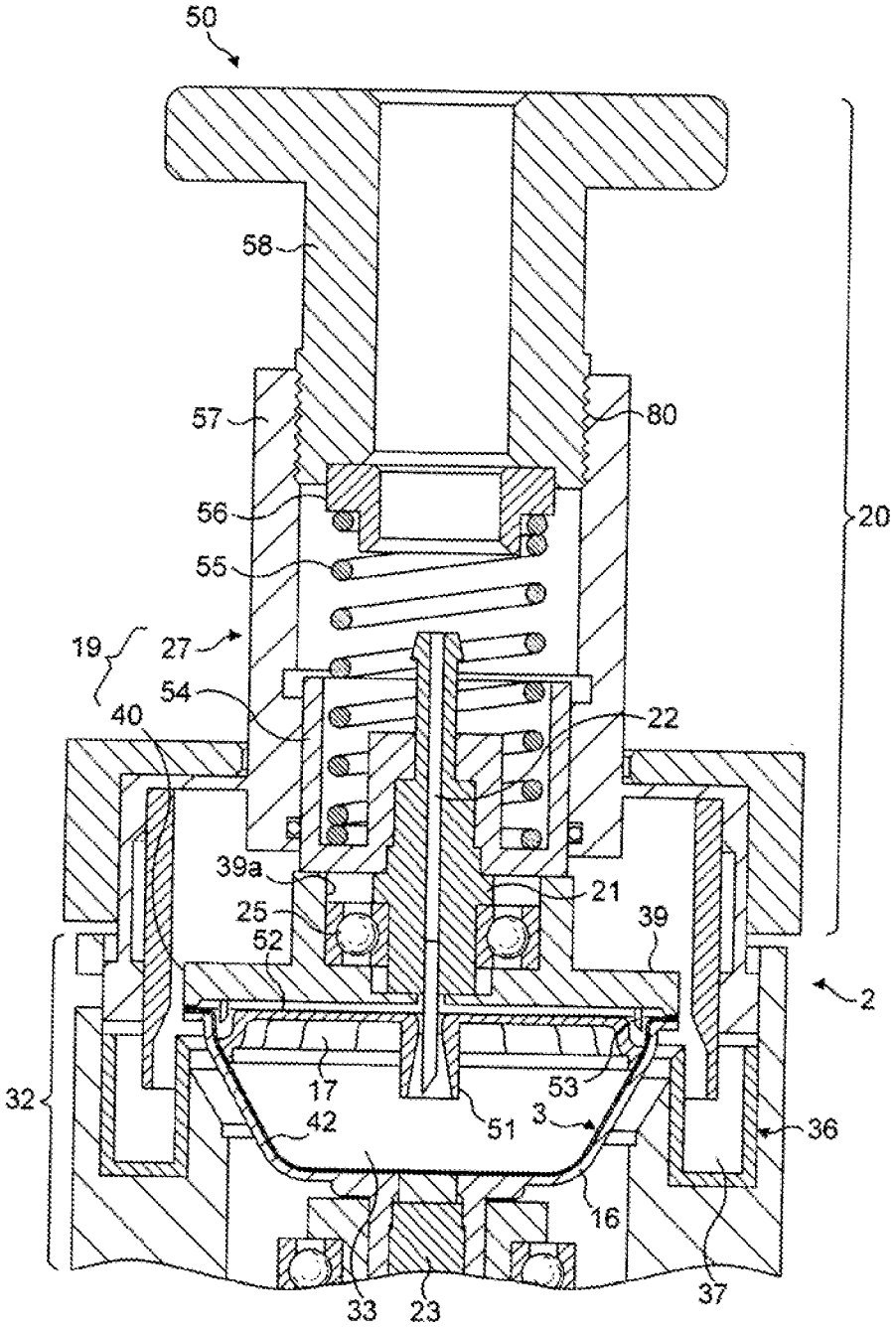

50
58
57
80
56
55
20
19
27
54
40
22
39a
21
25
52
39
2
32
17
53
42
51
3
36
16
33
23
37

FIG. 7

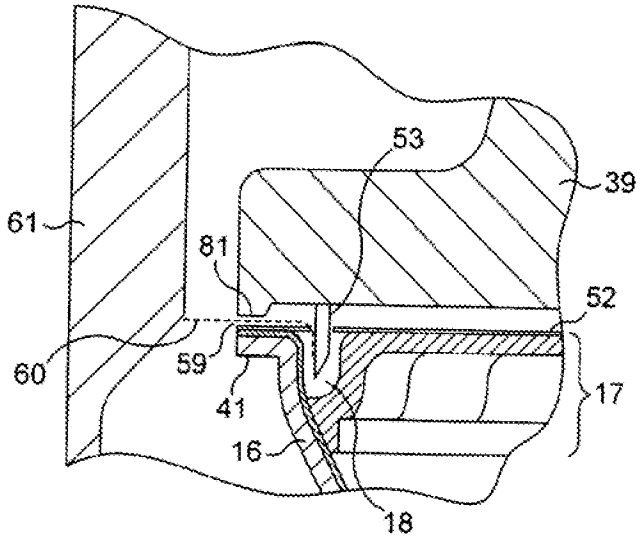

53
39
61
81
52
60
59
17
41
16
18

FIG. 8

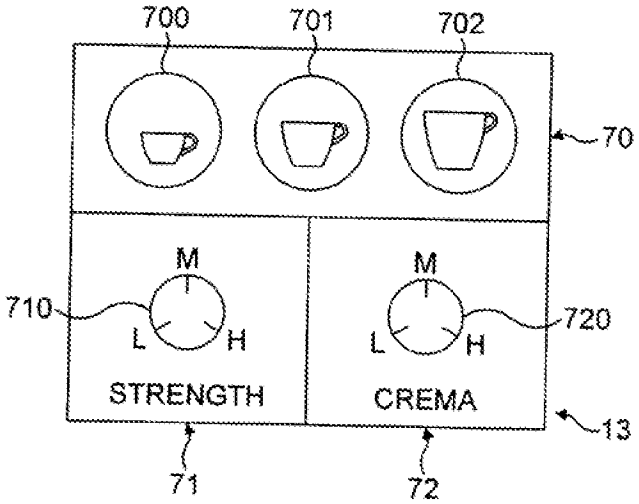

700
701
702
70
M
710
L
H
STRENGTH
M
720
L
H
CREMA
13
71
72

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/060771

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J31/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 367 600 A (TOKYO SHIBAURA ELECTRIC CO [JP]) 9 May 1990 (1990-05-09) column 7, line 23 - line 31 column 10, line 33 - column 11, line 28 figure 1	1,14,17
A	WO 2007/041954 A (LI ZHIPING [CN]) 19 April 2007 (2007-04-19) page 13, paragraph 3 figure 1a	1,14,17
A	BE 894 031 A1 (GUERIN A) 4 February 1983 (1983-02-04) the whole document	14

-/---

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 February 2010	08/02/2010

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kempeneers, Johanna

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/060771

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 545 296 A (BEN-SHMUEL SONJA [US]) 8 October 1985 (1985-10-08) column 7, line 36 - line 59 figures 1,2	1,14,17
A	WO 2007/110768 A2 (TUTTOESPRESSO SPA [IT]; DOGLIONI MAJER LUCA [IT]) 4 October 2007 (2007-10-04) page 4, line 8 - line 10 page 4, line 17 - line 29 page 9, line 3 - page 11, line 27 figures 1,4,5	1,14,17
A	EP 0 651 963 A1 (SEB SA [FR]) 10 May 1995 (1995-05-10) column 3, line 52 - column 6, line 53 figures 1,4,5	1,14,17
E	WO 2009/106598 A1 (NESTEC SA [CH]; COLANTONIO JEAN-LUC [CH]; BONACCI ENZO [CH]; DENISART) 3 September 2009 (2009-09-03) page 4, paragraph 3 page 19, line 17, paragraph 2 - page 20, last line, paragraph 2 page 23, paragraph 2 page 24, line 4 - line 10 page 25, line 4 - line 7 figure 1	1-2,6, 8-17,19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2009/060771

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0367600 A	09-05-1990	DE 68906509 D1	17-06-1993
		DE 68906509 T2	30-09-1993
		US 4962693 A	16-10-1990
WO 2007041954 A	19-04-2007	CN 101374442 A	25-02-2009
BE 894031 A1	04-02-1983	NONE	
US 4545296 A	08-10-1985	NONE	
WO 2007110768 A2	04-10-2007	AR 060176 A1	28-05-2008
		AU 2007231019 A1	04-10-2007
		CA 2646718 A1	04-10-2007
		CL 8452007 A1	08-02-2008
		EP 2001343 A2	17-12-2008
		JP 2009531106 T	03-09-2009
		US 2009136639 A1	28-05-2009
EP 0651963 A1	10-05-1995	DE 69408088 D1	26-02-1998
		DE 69408088 T2	10-06-1998
		ES 2114155 T3	16-05-1998
		FR 2712163 A1	19-05-1995
WO 2009106598 A1	03-09-2009	NONE	

(12) DEMANDE INTERNATIONALE PUBLIÉE EN VERTU DU TRAITÉ DE COOPÉRATIONEN MATIÈRE DE BREVETS (PCT)

(19) Organisation Mondiale de la Propriété Intellectuelle
Bureau international

(43) Date de la publication internationale
15 avril 2010 (15.04.2010)

PCT

(10) Numéro de publication internationale
WO 2010/041179 A2

(51) Classification internationale des brevets :
B65D 85/804 (2006.01)

(21) Numéro de la demande internationale :
PCT/IB2009/054314

(22) Date de dépôt international :
2 octobre 2009 (02.10.2009)

(25) Langue de dépôt : français

(26) Langue de publication : français

(30) Données relatives à la priorité :
PCT/IB2008/054130
8 octobre 2008 (08.10.2008) IB

(71) Déposant *(pour tous les États désignés sauf US)* : **ETHICAL COFFEE COMPANY SA** [CH/CH]; Rue de Faucigny 5, CH-1700 Fribourg (CH).

(72) Inventeur; et

(75) Inventeur/Déposant *(pour US seulement)* : **MARILLER, Alain** [CH/CH]; chemin de l'Hôtel du Parc 3, CH-1801 Le Mont-Pèlerin (CH).

(74) Mandataire : **ROLAND, André**; c/o André Roland S.A., P.O. Box 1255, CH-1001 Lausanne (CH).

(81) États désignés *(sauf indication contraire, pour tout titre de protection nationale disponible)* : AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) États désignés *(sauf indication contraire, pour tout titre de protection régionale disponible)* : ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), eurasien (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), européen (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

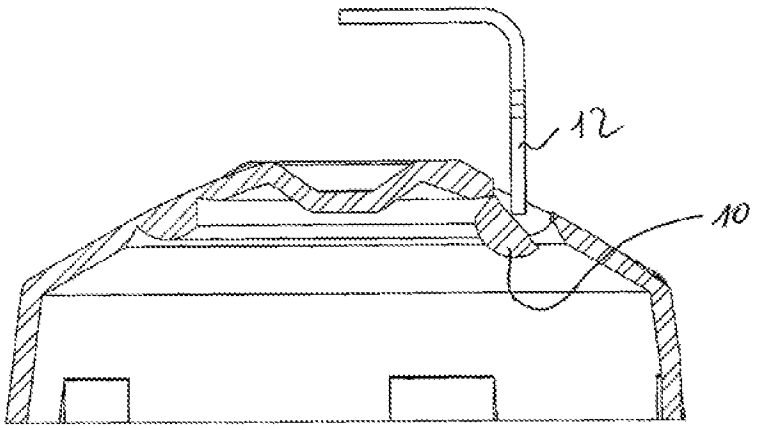
Publiée :

— *sans rapport de recherche internationale, sera republiée dès réception de ce rapport (règle 48.2.g))*

(54) Title : CAPSULE FOR PREPARING A BEVERAGE

(54) Titre : CAPSULE POUR LA PRÉPARATION D'UNE BOISSON

FIG 12



(57) Abstract : The invention relates to a capsule (1) for preparing a beverage, for example coffee, comprising a hollow element intended to contain a metered amount, for example of ground coffee, said hollow element including a side wall (2), a top wall (3) and a bottom wall (4) comprising an extraction membrane; the top wall (3) comprising, on the inner surface thereof, a weakened area (11) capable of moving when an external element (12) exerts a force thereon, thereby providing a passage for the liquid to flow between the outside and the inside of the capsule (1).

(57) Abrégé :

(Suite sur la page suivante)

WO 2010/041179 A2

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 277 of 421

Capsule (1) pour la préparation d'une boisson, par exemple du café, comprenant un élément creux destiné à contenir une dose, p.ex. de café moulu, ledit élément creux comprenant une paroi latérale (2), une paroi supérieure (3) et une paroi inférieure (4) comportant une membrane d'extraction; la paroi supérieure (3) comportant sur sa face interne une zone d'affaiblissement (11) adaptée de manière à subir un déplacement lorsqu'un élément externe (12) exerce une force sur elle, offrant de la sorte un passage d'écoulement de liquide entre l'extérieur et l'intérieur de la capsule (1).

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 278 of 421

CAPSULE POUR LA PREPARATION D'UNE BOISSON

Domaine de l'invention

La présente invention se situe dans le domaine de la préparation de boissons, p.ex. à base de café, par extraction d'une dose concentrée, p.ex. de café moulu, contenue dans une capsule. Elle se rapporte plus particulièrement aux doses utilisées à cet effet ainsi qu'aux dispositifs utilisant de telles doses.

Etat de la technique

Des capsules et des machines fonctionnant selon le principe précité existent depuis de nombreuses décennies.

Les brevets US 2 899 886, US 2 968 560, US 3 403 617 et US 3 607 297 décrivent des dispositifs où la capsule est initialement perforée en plusieurs endroits, puis traversée par de l'eau sous pression.

La capsule décrite dans le brevet CH 605 293 ou dans le brevet EP 0 242 556 B1 comporte une membrane dans sa partie inférieure. De l'eau sous pression est initialement introduite dans la partie supérieure de la capsule, après percement de ladite capsule au moyen d'un élément tranchant (p.ex. une lame), ce qui entraîne un gonflement de la capsule, principalement au niveau de la membrane. A partir d'une certaine pression, la membrane se déchire, autorisant de la sorte l'écoulement d'un mélange eau-café.

D'autres capsules munies d'une membrane sont décrites dans les documents brevets suivants : EP 0 468 079 A, EP 0 806 373 A, EP 0 554 469 A.

Exposé général de l'invention

La présente invention comporte plusieurs améliorations par rapport aux capsules de l'état de la technique-

A cet effet, elle concerne une capsule pour la préparation d'une boisson, par exemple du café, comprenant un élément creux destiné à contenir une dose,

p.ex. de café moulu, ledit élément creux comprenant une paroi latérale, une paroi supérieure et une paroi inférieure comportant une membrane d'extraction; la paroi supérieure comportant sur sa face interne une zone d'affaiblissement adaptée de manière à subir un déplacement lorsqu'un élément externe exerce une force sur elle, offrant de la sorte un passage d'écoulement de liquide entre l'extérieur et l'intérieur de la capsule.

Un des avantages offert par la présente invention réside dans la possibilité de ménager des passages d'écoulement de liquide de section suffisamment large. Cela vaut particulièrement pour des capsules constituées d'un matériau biodégradable. Celui-ci a tendance à se gonfler en présence de liquide. En l'absence d'une zone d'affaiblissement de section suffisamment large le percement de la capsule par un élément tranchant n'autorise pas un écoulement suffisant du liquide au travers de la zone percée.
En dotant la capsule selon l'invention d'une zone d'affaiblissement de section large, la présence d'un espace d'écoulement est garantie.

Exposé détaillé de l'invention

L'invention est décrite plus en détail ci-après au moyen d'exemples non-limitatifs illustrés par les figures suivantes :

La figure 1 illustre un premier exemple de capsule selon l'invention
La figure 2 illustre une variante de la partie supérieure de la capsule de la figure 1
Les figures 3 illustre une autre variante de la partie supérieure de la capsule de la figure 1
La figure 4 présente l'intérieur de la capsule de la figure1
La figure 5 illustre un agrandissement d'une partie de l'intérieur de la capsule de la figure 1

La figure 6 illustre un enfoncement sur la face externe de la paroi latérale
La figure 7 présente un deuxième exemple de capsule selon l'invention.
La figure 8 présente un troisième exemple de capsule selon l'invention.
Les figures 9 et 10 illustrent la zone d'affaiblissement disposée sur la face interne de la paroi supérieure
Les figures 11 et 12 illustrent la rupture de la zone d'affaiblissement.

Liste des références numériques utilisées dans les figures :

1. Capsule
2. Paroi latérale
3. Paroi supérieure
4. Paroi inférieure
5. Evidement
6. Elément rigidifiant paroi supérieur
7. Elément rigidifiant paroi latérale
8. Elément rigidifiant bord supérieur
9. Protubérance interne
10. Bourrelet
11. Zone d'affaiblissement
12. Elément perçant

Il convient de relever en particulier les caractéristiques suivantes liées à la capsule selon l'invention :

a) Renforcement de la partie supérieure de la capsule par une architecture dite « poutraison », « renfort » ou « charpente » qui a pour but de renforcer la capsule à la pression de l'eau ainsi que lors de sa perforation. Il est également possible d'obtenir une structure renforcée au moyen de plis de matière. La renforcement

de la rigidité peut également être obetnu par une architecture de type « poutraison » ou « charpente » concave à la capsule (voir figure 2).
Avec cette structure, il est possible de diminuer la quantité de matière utilisée, p.ex. de matière biodégradable, des matières fines type PET, métal, ou tout autre matière à base des dérivés du pétrole.

b) L'intérieur de la capsule présente des éléments internes saillants ou une collerette circonférentielle qui ont pour fonction d'éviter un coincement lors de l'empilement des capsules à vide, préalablement à leur remplissage en usine. Ces mêmes éléments saillants offrent par ailleurs un renfort latéral de la capsule. (voir Figure 4).

c) A l'extérieur de la capsule, en regard de chaque élément saillant ou d'une collerette circonférentiel, un évidement est créé ce qui permet de renforcer les parties latérales de la capsule par effet de charpente, tout en économisant de la matière, (voire coupe) et permet notamment d'utiliser de la matière biodégradable et des matières fines type PET, métal, ou tout autre matière dérivée du pétrole. Le renfort latéral de la capsule peut aussi être créé par des plis de la matière (voir figure 5-6).

d) La partie latérale extérieure de la capsule présente des pants qui peuvent s'étendre jusque vers la partie inférieure de la capsule ou à une certaine distance sur la hauteur. Dans cette variante également, il est donc possible d'économiser de la matière tout en renforçant les parties latérales de la capsule (voir Figure 7-8).

En résumé, tous les systèmes de renfort mentionnés ci-dessus permettent d'être rigide avec moins de matière utilisée et d'utiliser avantageusement des matières biodégradables ou tout autre matière de type (PET, Métal), ou toute autre matière dérivée du pétrole.

La partie supérieure interne de la capsule est munie d'un bourrelet de matière au niveau des éléments perçants de la capsule (voir figure 4).
Sur les flans du bourrelet sont disposés des amorces de fissure. Lorsque qu'un élément perçant exerce une pression suffisante au niveau du bourrelet les amorces de fissure éclatent ce qui a pour effet de laisser de l'eau pénétrer dans la capsule (voir figure 9-12).

L'invention ne se limite pas aux exemples illustrés.

N'importe quelle structure de renfort peut être envisagée.

De préférence, la capsule est formée d'un matériau biodégradable.

Avantageusement, le matériau biodégradable peut être d'origine végétale.

Selon une variante, le matériau comprend les composants suivants :
Amidon (> 70 %), fibres, protéines, lipides, glycérine d'origine végétale, résines biodégradables.

Selon une autre variante, le matériau comprend les composants suivants :
Amidon (> 70 %), fibres, protéines, lipides, résine biodégradable, colorant minéral.

A relever enfin que la capsule selon l'invention peut également être utilisée avec des dispositifs de l'état de la technique qui sont dotés de lames pour l'introduction de l'eau dans la capsule.

Revendications

1. Capsule (1) pour la préparation d'une boisson, par exemple du café, comprenant un élément creux destiné à contenir une dose, p.ex. de café moulu, ledit élément creux comprenant une paroi latérale (2) , une paroi supérieure (3) et une paroi inférieure (4) comportant une membrane d'extraction; la paroi supérieure (3) comportant sur sa face interne une zone d'affaiblissement (11) adaptée de manière à subir un déplacement lorsqu'un élément externe (12) exerce une force sur elle, offrant de la sorte un passage d'écoulement de liquide entre l'extérieur et l'intérieur de la capsule (1).

2. Capsule selon la revendication 1 dans laquelle ladite zone d'affaiblissement se présente sous la forme d'un bourrelet dont les bords ont une épaisseur inférieure à l'épaisseur moyenne de la paroi supérieure.

3. Capsule selon la revendication 1 ou 2 dans laquelle la section de la zone d'affaiblissement est supérieure à la section dudit élément externe.

4. Capsule selon l'une des revendications 1 à 3 comprenant des évidements latéraux auxquels sont associés des protubérances internes.

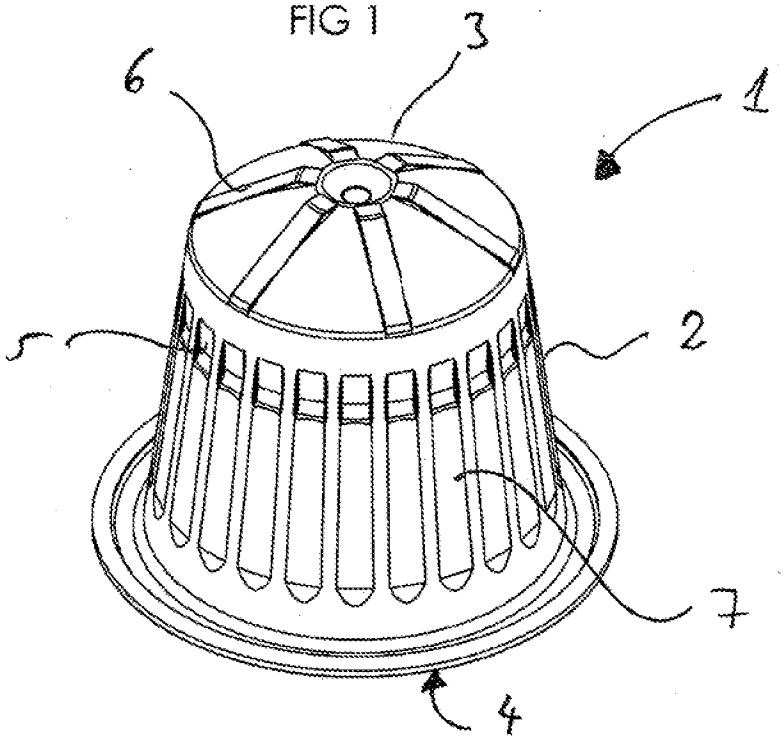
5. Capsule selon l'une des revendications précédentes comportant des éléments de renforcement de sa rigidité.

6. Capsule selon la revendication 5 dans laquelle lesdits éléments de renforcement sont disposés sur la paroi supérieure de la capsule.

7. Capsule selon la revendication 5 ou 6 dans laquelle lesdits éléments de renforcement sont disposés sur la paroi latérale de la capsule.

8. Capsule pour la préparation d'une boisson, par exemple du café, constituée d'un matériau biodégradable comprenant les éléments suivants : Amidon (> 70 %), fibres, protéines, lipides et au moins une résine biodégradable.

FIG 1



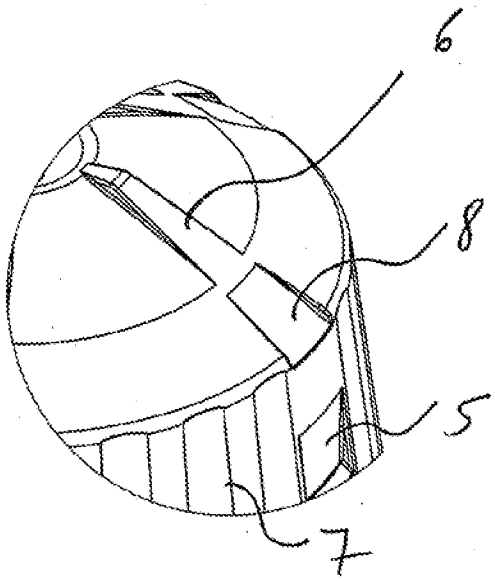


FIG 2

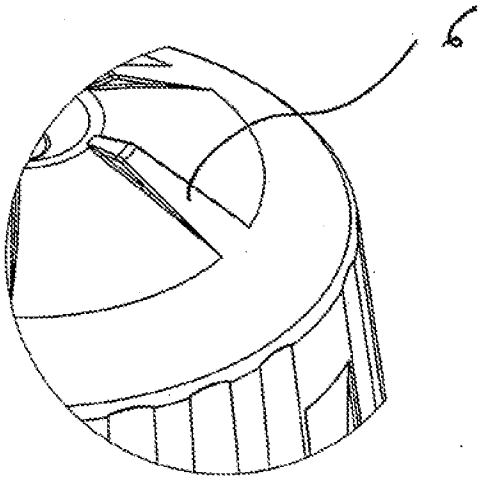


FIG 3

FIG 4

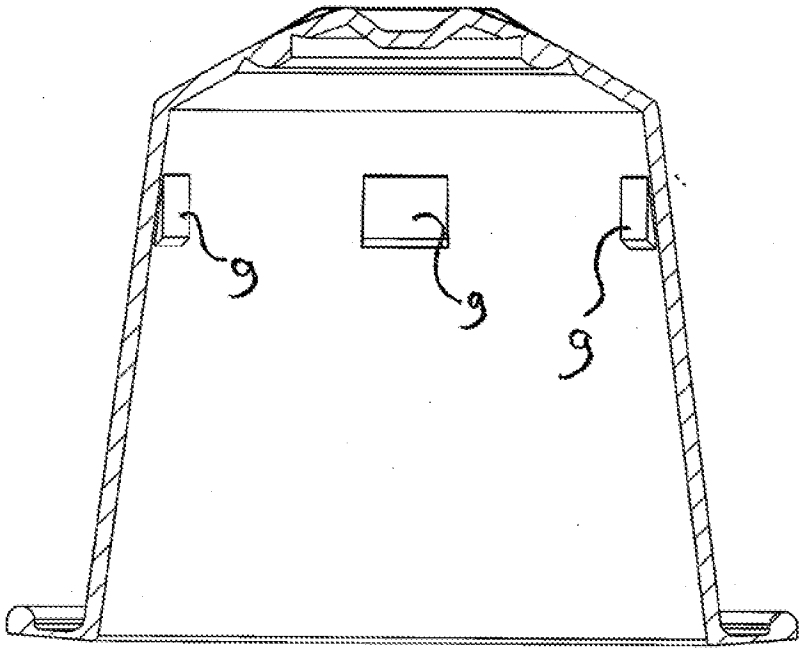


FIG 5

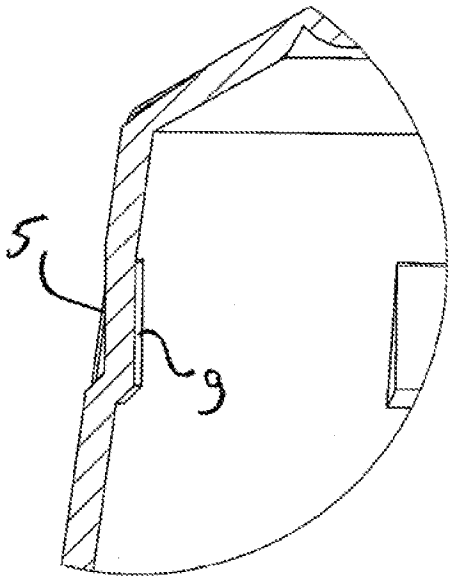


FIG 6

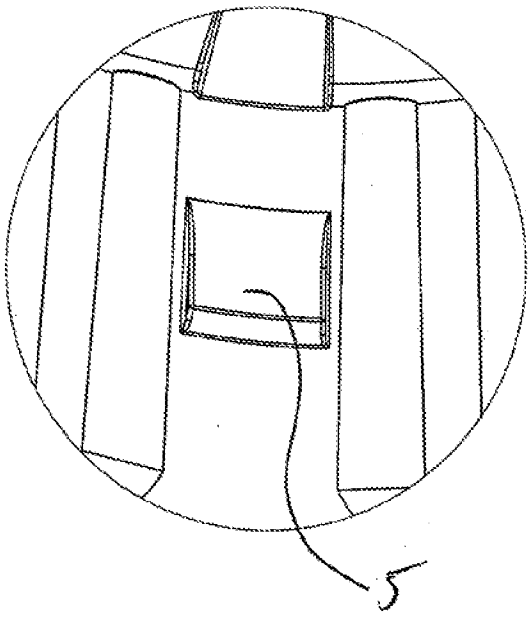


FIG 7

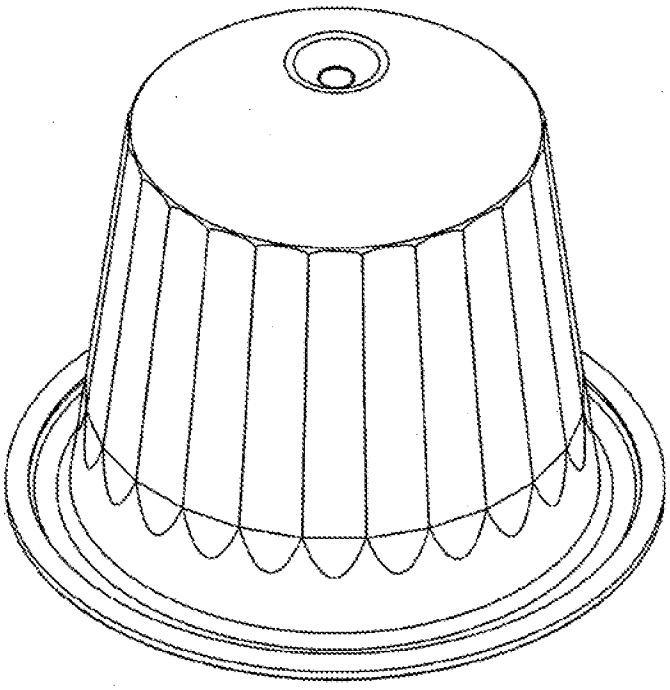


FIG 8

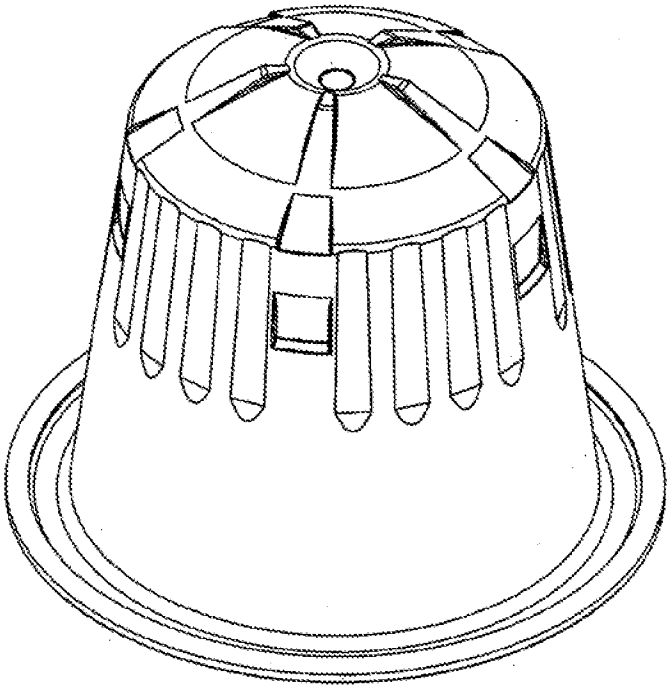


FIG 9

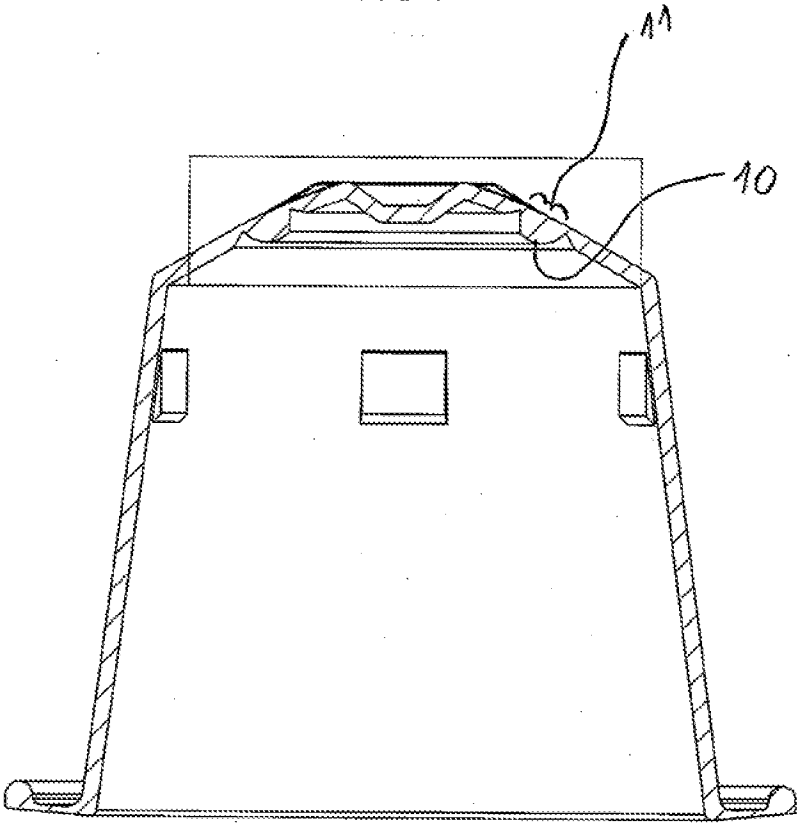


FIG 10

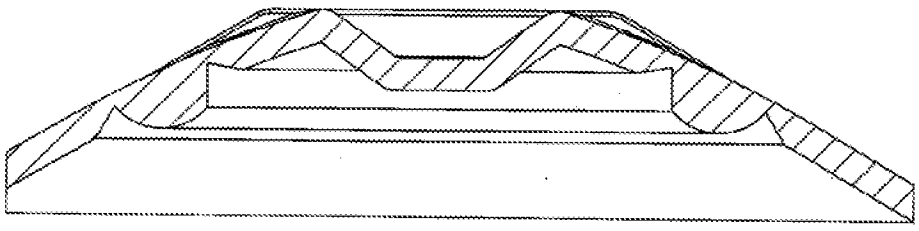


FIG 11

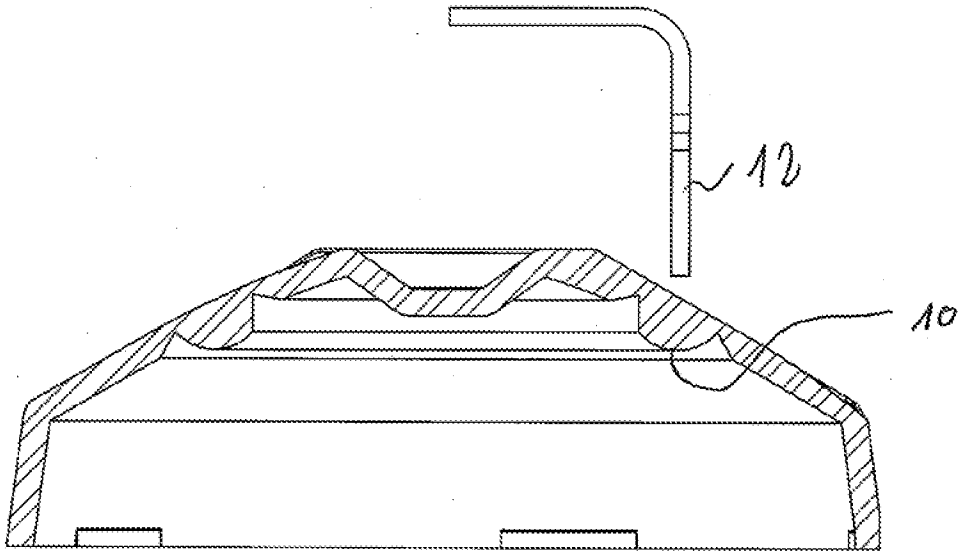
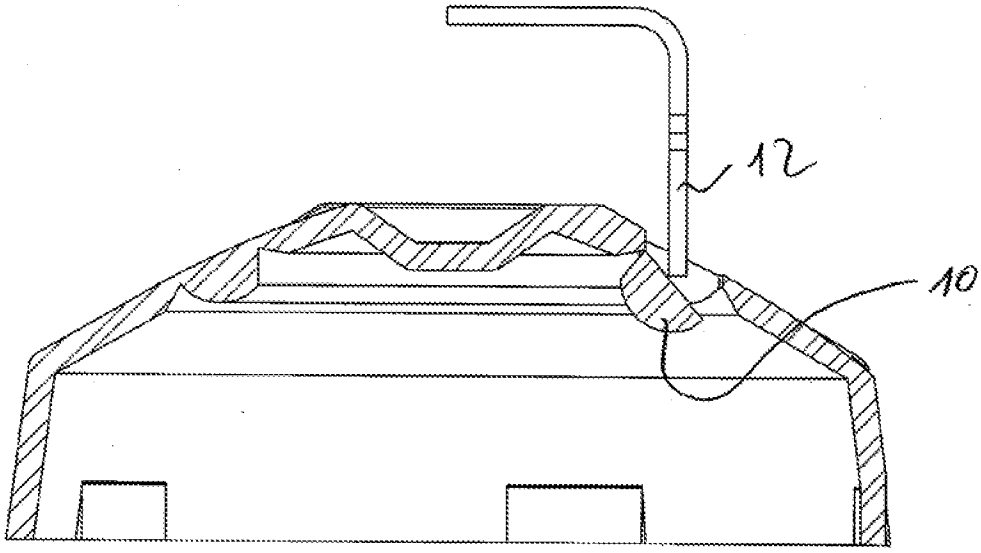


FIG 12



Espacenet

Bibliographic data: WO2010041179 (A2) — 2010-04-15

CAPSULE FOR PREPARING A BEVERAGE

Inventor(s): MARILLER ALAIN [CH] ± (MARILLER, ALAIN)

Applicant(s): ETHICAL COFFEE COMPANY SA [CH]; MARILLER ALAIN [CH] ± (ETHICAL COFFEE COMPANY SA, ; MARILLER, ALAIN)

Classification: - international: ***B65D85/804***
- cooperative: **B65D65/466; B65D85/8043**

Application number: WO2009IB54314 20091002 Global Dossier

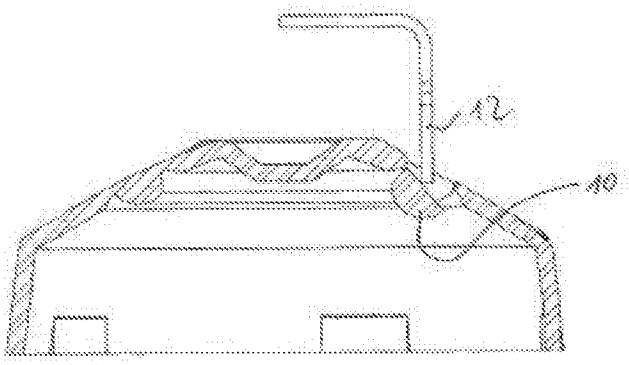
Priority number(s): WO2008IB54130 20081008

Also published as: WO2010041179 (A3) CN102186747 (A) CN102186747 (B) EP2337753 (A2) EP2337753 (B1) more

Abstract of WO2010041179 (A2)

The invention relates to a capsule (1) for preparing a beverage, for example coffee, comprising a hollow element intended to contain a metered amount, for example of ground coffee, said hollow element including a side wall (2), a top wall (3) and a bottom wall (4) comprising an extraction membrane; the top wall (3) comprising, on the inner surface thereof, a weakened area (11) capable of moving when an external element (12) exerts a force thereon, thereby providing a passage for the liquid to flow between the outside and the inside of the capsule (1).

FIG 12



Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION WO2010041179

CAPSULE FOR PREPARING A BEVERAGE

Field of the invention

The present invention is in the field of the preparation of beverages, eg coffee-based, by extraction of a concentrated dose, e.g. ex. ground coffee, contained in a capsule. It relates more particularly to the doses used for this purpose as well as devices using such doses.

State of the art Capsules and machines operating according to the aforementioned principle have existed for many decades.

US Pat. Nos. 2,899,886, US 2,968,560, US 3,403,617 and US 3,607,297 disclose devices in which the capsule is initially perforated in a plurality of locations and then passed through water under pressure.

The capsule described in patent CH 605 293 or in patent EP 0 242 556 B1 comprises a membrane in its lower part. Water under pressure is initially introduced into the upper part of the capsule, after piercing said capsule by means of a cutting element (eg a blade), which causes the capsule to swell, mainly at the level of the capsule. of the membrane. From a certain pressure, the membrane tears, thus allowing the flow of a water-coffee mixture.

Other capsules provided with a membrane are described in the following patent documents: EP 0 468 079 A, EP 0 606 373 A, EP 0 554 469 A.

General presentation of the invention

The present invention has several improvements over prior art capsules.

For this purpose, it relates to a capsule for the preparation of a beverage, for example coffee, comprising a hollow element intended to contain a dose, eg ground coffee, said hollow element comprising a side wall, an upper wall and a bottom wall having an extraction membrane; the upper wall having on its inner side a weakening zone adapted to be displaced when an outer member exerts a force on it, thereby providing a liquid flow passage between the outside and the inside; of the capsule.

One of the advantages offered by the present invention lies in the ability to provide liquid flow passages of sufficiently large section. This is particularly true for capsules made of a biodegradable material. It tends to swell in the presence of liquid. in the absence of a zone of weakening of sufficiently large section the piercing of the capsule by a cutting element does not allow a sufficient flow of liquid through the pierced zone. By providing the capsule according to the invention with a zone of weakening of wide section, the presence of a flow space is guaranteed.

Detailed exposition of the invention

The invention is described in more detail below by means of non-limiting examples illustrated by the following figures:

FIG. 1 illustrates a first example of the capsule according to the invention. FIG. 2 illustrates a variant of the upper part of the capsule of FIG. 1. FIG. 3 illustrates another variant of the upper part of the capsule of FIG.

Figure 4 shows the inside of the capsule of the figurel

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 292 of 421

Figure 5 illustrates an enlargement of a portion of the interior of the capsule of Figure 1 Figure 6 illustrates a depression on the outer face of the side wall

Figure 7 shows a second example of capsule according to the invention.

Figure 8 shows a third example of capsule according to the invention.

Figures 9 and 10 illustrate the weakening zone disposed on the inner face of the upper wall

Figures 1 1 and 12 illustrate the rupture of the weakening zone.

List of numerical references used in the figures:

1. Capsule

2. Side wall 3. Upper wall

4. Bottom wall

5. Obviously

6. Upper wall stiffening element

7. Sidewall stiffening element 8. Upper edge stiffening element

9. Internal protrusion

10. bead

11. Zone of weakening

12. Piercing element

It should be noted in particular the following characteristics related to the capsule according to the invention:

a) Reinforcement of the upper part of the capsule by an architecture called "beam", "reinforcement" or "frame" [illegible] to strengthen the capsule to the pressure of the water and during its perforation.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 293 of 421

It is also possible to obtain a reinforced structure by means of folds of material.

The reinforcement of rigidity can also be obetnu by a type of architecture "beam" or "framework" concave to the capsule (see Figure 2).

With this structure, it is possible to reduce the amount of material used, eg biodegradable material, PET-type fine materials, metal, or any other material based on petroleum derivatives.

b) The interior of the capsule has protruding internal elements or a circumferential collar whose function is to avoid jamming during stacking of the vacuum capsules, prior to filling them in the factory.

These same projecting elements also offer a lateral reinforcement of the capsule, (see Figure 4).

c) On the outside of the capsule, facing each projecting element or a circumferential collar, a recess is created which reinforces the lateral parts of the capsule by structural effect, while saving material, (or cut) and allows in particular to use biodegradable material and fine materials such as PET, metal, or any other material derived from petroleum.

The lateral reinforcement of the capsule can also be created by folds of the material (see Figure 5-6).

d) The outer lateral part of the capsule has pants which can extend as far as the lower part of the capsule or at some distance over the height.

In this variant also, it is possible to save material while strengthening the lateral parts of the capsule (see Figure 7-8).

In summary, all reinforcement systems mentioned above can be rigid with less material used and advantageously use biodegradable materials or any other material of the type (PET, Metal), or any other material derived from petroleum. The inner upper part of the capsule is provided with a bead of material at the piercing elements of the capsule (see Figure 4). On the blanks of the bead are arranged crack primers. When a piercing member exerts sufficient pressure at the bead, the crack primers burst which has the effect of allowing water to enter the capsule (see Figure 9-12).

The invention is not limited to the illustrated examples.

Any reinforcing structure can be envisaged.

Preferably, the capsule is formed of a biodegradable material.

Advantageously, the biodegradable material may be of plant origin.

According to one variant, the material comprises the following components: Starch (> 70%), fibers, proteins, lipids, glycerin of vegetable origin, biodegradable resins.

According to another variant, the material comprises the following components: starch (> 70%), fibers, proteins, lipids, biodegradable resin, mineral dye.

Finally, note that the capsule according to the invention can also be used with devices of the state of the art which are provided with blades for introducing water into the capsule.

Europäisches Patentamt
European Patent Office
Office européen des brevets

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS WO2010041179

Claims 1. Capsule (1) for the preparation of a beverage, eg coffee, comprising a hollow member for containing a dose, eg ground coffee, said hollow member comprising a side wall (2), an upper wall (3) and a bottom wall (4) having an extraction membrane; the upper wall (3) having on its inner side a weakening zone (1 1) adapted to move when an outer member (12) exerts a force on it, thereby providing a flow passage of liquid between the outside and the inside of the capsule (1).

2.

The capsule of claim 1 wherein said weakening zone is in the form of a bead whose edges have a thickness less than the average thickness of the top wall.

3.

The capsule of claim 1 or 2 wherein the section of the weakening zone is greater than the section of said outer member.

4.

Capsule according to one of claims 1 to 3 comprising lateral recesses which are associated with internal protuberances.

5.

Capsule according to one of the preceding claims comprising reinforcing elements of its rigidity.

6.

The capsule of claim 5 wherein said reinforcing members are disposed on the top wall of the capsule.

7.

The capsule of claim 5 or 6 wherein said reinforcing members are disposed on the side wall of the capsule.

8.

Capsule for the preparation of a beverage, for example coffee, consisting of a biodegradable material comprising the following elements: starch (> 70%), fibers, proteins, lipids and at least one biodegradable resin.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 April 2011 (28.04.2011)

PCT

(10) International Publication Number
WO 2011/047836 A1

(51) International Patent Classification:
B65D 85/804 (2006.01) *B65D 85/812* (2006.01)
B65D 85/808 (2006.01)

(21) International Application Number:
PCT/EP2010/006389

(22) International Filing Date:
19 October 2010 (19.10.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
BO2009A000679 21 October 2009 (21.10.2009) IT

(72) Inventor; and
(71) Applicant : **RAPPARINI, Gino** [IT/IT]; Via Croara 3/5, I-40068 Bologna (IT).

(74) Agent: **TORTI, Carlo**; Grünecker, Kinkeldey, Stockmair & Schwanhäusser, Leopoldstrasse 4, 80802 München (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

---- *with international search report (Art. 21(3))*

(54) Title: FILTERING AND PERMEABLE CONTAINER FOR SUBSTANCES SUITABLE FOR THE PREPARATION OF BEVERAGES

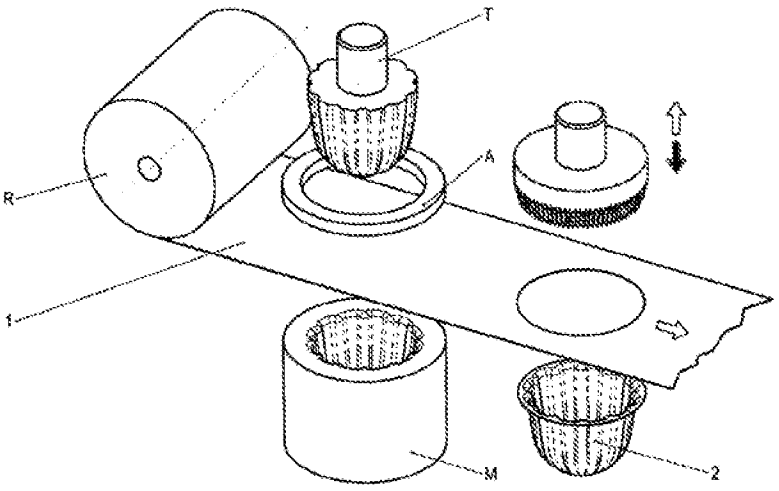


FIG. 5

(57) Abstract: Filtering and permeable container for substances (6) suitable for the preparation of beverages, the container being made by means of thermoforming starting from a flat strip (1) of permeable, filtering and thermoformable material, wherein the body (2) of the container comprises longitudinal stiffening ribs (4) wherein the length of the ribs (4) is variable along the surface of the body (2). The container can be adapted to contain water-soluble products or coffee, tea, herbal tea, or similar products adapted to obtain hot or cold beverages.

WO 2011/047836 A1

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 296 of 421

FILTERING AND PERMEABLE CONTAINER FOR SUBSTANCES SUITABLE FOR THE PREPARATION OF BEVERAGES

FIELD OF THE INVENTION

The present invention relates to the field of containers for substances suitable for the preparation of beverages. In particular, the present invention relates to the field of filtering and permeable containers for substances such as water-soluble substances, coffee, tea, herbal tea or the like.

STATE OF THE ART

Several kinds of bags or flexible pads are known in the art for obtaining beverages such as tea, herbal teas, coffee or similar beverages such as water-soluble substances based beverages.

These kinds of bags or pads are easily deformed so that the handling of same is complicated and particularly critical, especially in the case of filling and/or packaging machines working at high production rates.

In order to try to overcome these problems, capsule packages have been provided such as those described for example in EP 0 521 186 A1 and in US 2005/0051478 A1.

EP 0 521 186 A1 describes a capsule package containing roast and ground coffee for the preparation of a coffee beverage. The capsule package described in EP 0 521 186 A1 has body and membrane components. The body has a frusto conical shape with base portion capable of allowing flow of a coffee beverage therethrough, an annular sidewall portion which extends transversely from the base about a package body interior space and defines an opening which opposes the base portion, and a rim portion which extends about the opening and transversely from the sidewall portion in a direction away from the opening. The body and the membrane are made of a permeable flexible plastic material. The stability of the system described in EP 0 521 186 A1 is not optimized. In particular, the capsule packages according to EP 0 521 186 A1 are still easily deformed, especially when they are handled by filling and/or packaging machines working at very high production rates.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 297 of 421

US 2005/0051478 A1 describes a beverage filter cartridge having an impermeable cup-shaped out container internally subdivided by a generally cup-shaped filter element into a first chamber inside the filter and a second chamber located between the filter bottom and the container bottom. The upper rim of the filter is joined at a peripheral juncture to the container side wall, and the filter side wall has exterior channels that face the container side wall and lead downwardly from the peripheral juncture to the second chamber. In particular, the channels are provided by forming the filter side wall with a fluted configuration or by pleats in the filter side wall so that the channels increase in width from a minimum at the upper rim of the filter to a maximum at the filter bottom. The channels formed in the filter sidewall according to US 2005/0051478 A1 are not provided for improving the stability of the structure of the system especially for its handling in filling and/or packaging machines working at very high production rates. Accordingly, the structure of these channels is not optimized for the purpose of improving the stability of the structure but rather for encouraging through flow in upper regions of the filter wall. The cartridges described in US 2005/0051478 A1 still exhibit therefore a low stability and render the handling procedures in packaging and/or filling machines extremely industrious, time consuming and costly.

The present invention allows overcoming the problems and drawbacks of the systems known in the prior art. In particular, the present invention guarantees stability of the structure of filtering and permeable containers so that they can easily be handled in packaging and/or filling machines even when these machines operate at very high rates. Moreover, the present invention provides containers which are easily employed in automatic machines both for domestic and industrial use.

SUMMARY

The present invention relates to filtering and permeable containers for substances suitable for the preparation of beverages, such as water-soluble substances or coffee, tea, herbal tea or the like.

The present invention is based on the idea of providing the body of the container with longitudinal stiffening ribs wherein the length of the ribs is variable along the surface of the body. The presence of ribs having different lengths on the body of the container allows the optimization of the stability of the container. The modulation of the length of the ribs along the surface of the container allows improving the stability and rigidity of the system.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 298 of 421

According to an embodiment of the present invention, a filtering and permeable container for substances suitable for the preparation of beverages is provided, the container being made by means of thermoforming starting from a flat strip of permeable, filtering and thermoformable material, wherein the body of the container comprises longitudinal stiffening ribs, wherein the length of the ribs is variable along the surface of the body.

According to a further embodiment of the present invention, a container is provided, wherein long and short ribs are alternated along the surface of the body. The stability of the container is accordingly optimized by providing for example long ribs extending at least partially in the bottom region of the container alternated to short ribs extending only along the side region of the container.

According to a further embodiment of the present invention, a container is provided, wherein the depth of one or more of the ribs decreases toward the bottom of the container. In particular, since one or more of the ribs have a depth which is decreasing toward the bottom of the container, the stability and handling of the container are optimized.

According to a further embodiment of the present invention, a container is provided, wherein at least along a portion of one or more of the ribs, the width of the ribs decreases toward the bottom of the container, so that said one or more of the ribs have a pointed shape. In this way the stability of the container is further optimized. In particular, the side portion of the body is stiffened by the presence of the stiffening ribs and the bottom portion is minimally altered by the presence of those ribs having a pointed shape pointing toward the bottom of the container.

According to a further embodiment of the present invention, a container is provided, wherein the stiffening ribs increase the filtering surface of the body.

According to a further embodiment of the present invention, a container is provided, further comprising an upper annular rim adapted to stiffen the structure of the body.

According to a further embodiment of the present invention, a container is provided, wherein the rim is substantially flat and has a thickness substantially corresponding to the thickness of the flat strip.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 299 of 421

According to a further embodiment of the present invention, a container is provided, wherein the container is sealed by means of a filtering film after having been filled with a substance suitable for the preparation of beverages.

According to a further embodiment of the present invention, a container is provided, wherein the container is hermetically contained into a hermetic and impermeable capsule so as to guarantee the preservation of the organoleptic properties of the substances contained in the container.

According to a further embodiment of the present invention, a container is provided, wherein the container is adapted to be employed in automatic espresso machines. In particular, the container can be adapted to be employed for example for automatic domestic espresso machines or for industrial espresso machines.

According to a further embodiment of the present invention, a container is provided, wherein the container is adapted to be employed in moka pots. For example, the total height of the container can be adapted to insert the container in the basket of existing moka pots.

According to a further embodiment of the present invention, a container is provided, wherein the container further comprises a suspension wire comprising a label so that the container can be introduced into a pot containing boiling water, such as a tea pot or the like.

According to a further embodiment of the present invention, a container is provided, wherein the container further comprises a suspension tab, the suspension tab being adapted to support writings, signs or the like.

According to a further embodiment of the present invention, a method for the production of a filtering and permeable container for substances suitable for the preparation of beverages is provided, the container being made by means of thermoforming starting from a flat strip of permeable, filtering and thermoformable material, the method comprising the step of the formation of longitudinal stiffening ribs on the body of the container, wherein the length of the ribs is variable along the surface of the body.

According to a further embodiment of the present invention, a method for the production of a filtering and permeable container for substances suitable for the preparation of beverages is provided, wherein the formation of the body of the container is performed

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 300 of 421

by means of a thermoforming punch and a matrix, the thermoforming punch comprising longitudinal ribs on its outer surface adapted to shape the longitudinal stiffening ribs of the body of the container, the matrix being adapted to house the thermoforming punch so as to form simultaneously the body and the stiffening ribs starting from the flat strip.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described with reference to the enclosed drawings wherein the same reference numbers refer to the same and/or similar parts of the system. In the drawings:

Figure 1 schematically displays the starting phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 2 schematically displays an operative phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 3 schematically displays a further operative phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 4 schematically displays a further operative phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 5 schematically displays a further operative phase of the process for the formation of a container according to an embodiment of the present invention wherein the formed container is cut from the strip of permeable, filtering and thermoformable material;

Figure 6 schematically displays a 3D view of the inner region of the container according to an embodiment of the present invention;

Figure 6bis schematically displays a 3D view of the outer region of the container shown in figure 6;

Figure 7 schematically displays a 3D view of the container according to an embodiment of the present invention filled with a substance suitable for the preparation of beverages;

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 301 of 421

Figure 8 schematically displays a 3D view of the container shown in figure 7 sealed by means of a filtering film;

Figure 9 schematically displays a 3D view of the upper region of a container according to an embodiment of the present invention adapted to be employed in a moka pot and sealed by means of a filtering film;

Figure 10 schematically displays a 3D view of the bottom region of the container shown in figure 9;

Figure 11 schematically displays a 3D cut of the bottom region of the container shown in figures 9 and 10;

Figure 12 schematically displays a 3D exploded view of a moka pot employing a container according to an embodiment of the present invention;

Figure 13 schematically displays a vertical cross section of a moka pot employing a container according to an embodiment of the present invention;

Figure 14 schematically displays a 3D view of a hermetic and impermeable capsule containing the container according to an embodiment of the present invention;

Figure 15 schematically displays a 3D view of a cut of the hermetic and impermeable capsule shown in figure 14;

Figure 16 schematically displays a container comprising a suspension wire according to an embodiment of the present invention;

Figure 17 schematically displays a container comprising a suspension tab according to an embodiment of the present invention.

DETAILED DESCRIPTION

In the following, the present invention is described with reference to particular embodiments as shown in the enclosed drawings. Nevertheless, the present invention is not limited to the particular embodiments described in the following detailed description and shown in the figures, but, instead, the embodiments described simply exemplify several aspects of the present invention, the scope of which is defined by the appended claims.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 302 of 421

Further modifications and variations of the present invention will be clear for the person skilled in the art. Therefore, the present description has to be considered as including all the modifications and/or variations of the present invention, the scope of which is defined by the appended claims.

Figure 1 schematically displays the starting phase of the thermoforming process for the formation of a container according to an embodiment of the present invention. The figure displays a reel R of permeable, filtering and thermoformable material. A flat strip 1 of this material is unwound from the roll R. The system for forming the container comprises a thermoforming punch T, a stabilizing ring A and a matrix M.

The outer surface of the apex portion of the punch T comprises ribs adapted to form ribs in the body of the container as described in detail below. The matrix M is adapted to house the punch T. In particular, as can be seen in figure 1, the matrix M comprises an inner cavity with a lateral surface provided with grooves adapted to engage the ribs of the apex portion of the punch T.

As can be seen in figure 2, the stabilizing ring A is employed to press the strip 1 against the upper portion of the matrix M. Accordingly, by means of the stabilizing ring A, the strip 1 is safely kept in place for the formation of the container.

In figure 3, the punch T is lowered through the ring A into the matrix M so as to insert a portion of the strip 1 into the matrix M. The action of the thermoforming punch T in cooperation with the matrix M allows the formation of the body 2 of the container. In other words, both the bottom and the side portion of the container are simultaneously formed in this step. Moreover, since the punch T is provided with ribs and the matrix M is provided with corresponding grooves adapted to engage the ribs of the punch T, the body 2 is formed with stiffening ribs 4 with the optimized stiffening structure as described below. In particular, the body 2 and the stiffening ribs 4 are formed simultaneously.

Figure 4 displays the situation of the system when the punch T and the ring A are lifted. As can be seen, the body 2 of the container is formed with stiffening ribs 4 due to the combined action of the matrix M and of the punch T. Moreover, the region of the strip 1 located below the stabilizing ring A is not deformed. In particular, the portion of the strip 1 located below the stabilizing ring A is substantially flat and has substantially the same thickness as the strip 1.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 303 of 421

Figure 5 schematically displays a further operative phase of the process for the formation of the container wherein the formed body 2 is cut from the strip 1 of permeable, filtering and thermoformable material. In particular, a cutting tool is employed to detach the formed body 2 from the strip 1. By means of the cutting tool, in particular by properly choosing the diameter of the cutting tool or by selecting an appropriate line of cutting, the container is provided with an upper annular rim 3. Since the upper annular rim 3 corresponds to the region of the strip below the stabilizing ring A, the annular rim 3 is substantially flat and has a thickness substantially corresponding to the thickness of the strip 1.

Figures 6 and 6bis schematically display 3D views of the container according to an embodiment of the present invention. The container is provided with longitudinal stiffening ribs 4, and the length L of the stiffening ribs 4 is variable along the surface of the body 2 of the container. In particular, long and short ribs are alternated along the surface of the body 2. The long ribs extends toward the bottom region 5 of the container. In particular, the long ribs occupy a portion of the bottom region 5 of the container. The container has a cup-shaped bottom region 5. The long stiffening ribs occupy, therefore, a portion of the cup-shaped bottom region 5. Each short rib is placed between two long ribs and extends along the lateral region of the container. Accordingly, the stabilization of the structure is optimized and, at the same time, the filtering surface of the container is increased.

Further, as can be seen in figures 6 and 6bis, both the long and short stiffening ribs 4 have a depth which decreases toward the bottom of the container. In particular, the ribs 4 have maximum depth in correspondence to the upper annular rim 3 and minimum depth at their opposed end, i.e. toward the bottom region 5 of the container. This allows improving the stability of the container and, at the same time, increasing the filtering surface of the system. The varying depth of the ribs 4 allows to integrate them in the structure of the container so as to penetrate even in the bottom region of the container. In particular, since toward the bottom of the container the depth of the ribs 4 is minimal, the bottom region can be easily provided with the ribs 4.

Moreover, as can be seen in figures 6 and 6bis, the width of the ribs decreases toward the bottom 5 of the container so that the ribs 4 have a pointed shape. In particular, the pointed end of the ribs 4 points toward the bottom region 5 of the container. This allows inserting a large number of stiffening ribs 4 even if the container is cup-shaped as

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 304 of 421

shown in figures 6 and 6bis. In particular, even the narrow bottom region 5 of the cup shaped container can be provided with ribs 4 because the width of the ribs 4 is reduced in this region with respect to the width of the ribs 4 in their upper portion.

As can be further seen in figures 6 and 6bis, the container is provided with an upper annular rim 3 adapted to further stiffen the structure of the body of the container. The annular rim 3 is substantially flat and has substantially the same thickness as the flat strip 1 of permeable, filtering and thermoformable material.

The annular rim 3 and the stiffening ribs 4 guarantee the rigidity of the body 2 of the container so that it can be easily and quickly handled even at very high automated filling and/or production speeds.

Figure 7 schematically displays a 3D view of the container according to an embodiment of the present invention filled with a substance suitable for the preparation of beverages. The substance can be suitable for the preparation of hot or cold beverages. Examples of such substances are water-soluble substances such as milk powder or tea powder for ice tea. Further examples of such substances are infusion substances such as tea or herbal tea. Further examples of such substances are granular substances such as ground coffee or the like.

Figure 8 schematically displays a 3D view of the container shown in figure 7 sealed by means of a filtering film 1'. The filtering film 1' is permeable. Moreover, the filtering film 1' is sealed to the upper annular rim 3 of the container.

Figure 9 schematically displays a 3D view of the upper region of a container 2A according to an embodiment of the present invention adapted to be employed in a moka pot and sealed by means of a filtering film. Figure 10 schematically displays a 3D view of the bottom region of the container 2A shown in figure 9. Figure 11 schematically displays a 3D cut of the bottom region of the container shown in figure 9.

The height of the container shown in figures 9, 10 and 11 is lower than the height of the container shown in figures 6 and 6bis. In particular, the height of the container shown in figures 9, 10 and 11 is adapted to employ the container in the basket of existing moka pots.

As can be seen in figure 10, the alternate length of the stiffening ribs 4 is particularly advantageous in the present case. In particular, in the present case, the container 2A

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 305 of 421

has substantially a cylindrical shape with a substantially flat bottom. The short ribs run only along the side wall of the container 2A. In particular, the short ribs run along the entire height of the side wall of the container 2A. The long ribs extend beyond the side wall of the container 2A in the bottom portion of same so as to meet substantially at the centre of the bottom portion of the container 2A. In particular, the pointed endings of the long ribs point toward the centre of the bottom portion of the container 2A. Moreover, the depth of the long ribs decreases toward the centre of the bottom 5 of the container 2A so as to maintain the stability of the central portion. The short ribs have substantially constant depth along their entire length. Moreover, the short ribs have substantially constant width along their entire length and do not exhibit pointed endings.

Figure 12 schematically displays a 3D exploded view of a moka pot employing a container 2A according to an embodiment of the present invention, and figure 13 schematically displays a vertical cross section of the system. As can be seen in the figures, the container 2A is fitted into the basket of the moka pot. Moreover, the moka pot is a traditional existing moka pot, and no modifications are necessary for employing the container 2A according to an embodiment of the present invention.

Figure 14 schematically displays a 3D view of a hermetic and impermeable capsule 10 containing the container according to an embodiment of the present invention. Figure 15 schematically displays a 3D view of a cut of the system shown in figure 14. The container is hermetically contained into the hermetic and impermeable capsule 10 so as to guarantee the preservation of the organoleptic properties of the substances 6 contained in the container.

Figure 16 schematically displays a container 2 comprising a suspension wire 7 according to an embodiment of the present invention. The suspension wire 7 is provided with a label 8. Accordingly, the container according to this embodiment of the present invention can be employed in a similar way to common tea bags. In particular, the container 2 can be easily inserted into pots containing boiling water, such as tea pots or the like. According to the present invention, also the container 2A having reduced height and substantially cylindrical shape can be provided with a suspension wire.

Figure 17 schematically displays a container 2 comprising a suspension tab 9 according to an embodiment of the present invention. The suspension tab 9 is adapted to support

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 306 of 421

writings, signs or the like. The suspension tab 9 is formed as an extension of the filtering film 1' sealing the container 2. According to the present invention, also the container 2A having reduced height and substantially cylindrical shape can be provided with a suspension tab.

While the invention has been described with respect to the preferred physical embodiments constructed in accordance therewith, it will be apparent to those skilled in the art that various modifications, variations and improvements of the present invention may be made in the light of the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

For instance, several kinds of materials can be employed for realizing the containers according to the present invention. Moreover, the containers according to the present invention can have several dimensions. For example, the containers can be adapted to be employed for domestic machines such as moka pots or automatic espresso machines. Alternatively, the containers can be adapted to be employed for industrial machines.

In addition, those areas in which it is believed that those of ordinary skill in the art are familiar have not been described herein in order not to unnecessarily obscure the invention described. Accordingly, it has to be understood that the invention is not to be limited by the specific illustrative embodiments, but only by the scope of the appended claims.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 307 of 421

CLAIMS

1. Filtering and permeable container for substances (6) suitable for the preparation of beverages, said container being made by means of thermoforming starting from a flat strip (1) of permeable, filtering and thermoformable material,

characterized in that:

the body (2) of said container comprises longitudinal stiffening ribs (4), wherein the length of said ribs (4) is variable along the surface of said body (2).

2. Container according to claim 1, wherein long and short ribs (4) are alternated along the surface of said body (2).

3. Container according to one of claims 1 or 2, wherein the depth of one or more of said ribs (4) decreases toward the bottom (5) of said container.

4. Container according to one of claims 1 to 3, wherein at least along a portion of one or more of said ribs (4), the width of said ribs (4) decreases toward the bottom (5) of said container, so that said one or more of said ribs (4) have a pointed shape.

5. Container according to one of claims 1 to 4, wherein said stiffening ribs (4) increase the filtering surface of said body (2).

6. Container according to one of claims 1 to 5, further comprising an upper annular rim (3) adapted to stiffen the structure of said body (2).

7. Container according to claim 6, wherein said rim (3) is substantially flat and has a thickness substantially corresponding to the thickness of said flat strip (1).

8. Container according to one of claims 1 to 7, wherein said container is sealed by means of a filtering film (1') after having been filled with a substance (6) suitable for the preparation of beverages.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 308 of 421

9. Container according to one of claims 1 to 8, wherein said container is hermetically contained into a hermetic and impermeable capsule (10) so as to guarantee the preservation of the organoleptic properties of the substances (6) contained in said container.

10. Container according to one of claims 1 to 9, wherein said container is adapted to be employed in automatic espresso machines.

11. Container according to one of claims 1 to 10, wherein said container is adapted to be employed in moka pots.

12. Container according to one of claims 1 to 11, wherein said container further comprises a suspension wire (7) comprising a label (8) so that said container can be introduced into a pot containing boiling water, such as a tea pot or the like.

13. Container according to one of claims 1 to 11, wherein said container further comprises a suspension tab (9), said suspension tab (9) being adapted to support writings, signs or the like.

14. Method for the production of a filtering and permeable container for substances (6) suitable for the preparation of beverages, said container being made by means of thermoforming starting from a flat strip (1) of permeable, filtering and thermoformable material, said method comprising the following steps:

formation of longitudinal stiffening ribs (4) on the body (2) of said container, wherein the length of said ribs (4) is variable along the surface of said body (2).

15. Method according to claim 14, wherein the formation of the body (2) of said container is performed by means of a thermoforming punch (T) and a matrix (M), said thermoforming punch (T) comprising longitudinal ribs on its outer surface adapted to shape said longitudinal stiffening ribs (4), said matrix (M) being adapted to house said thermoforming punch (T) so as to form simultaneously said body (2) and said stiffening ribs (4) starting from said flat strip (1).

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 309 of 421

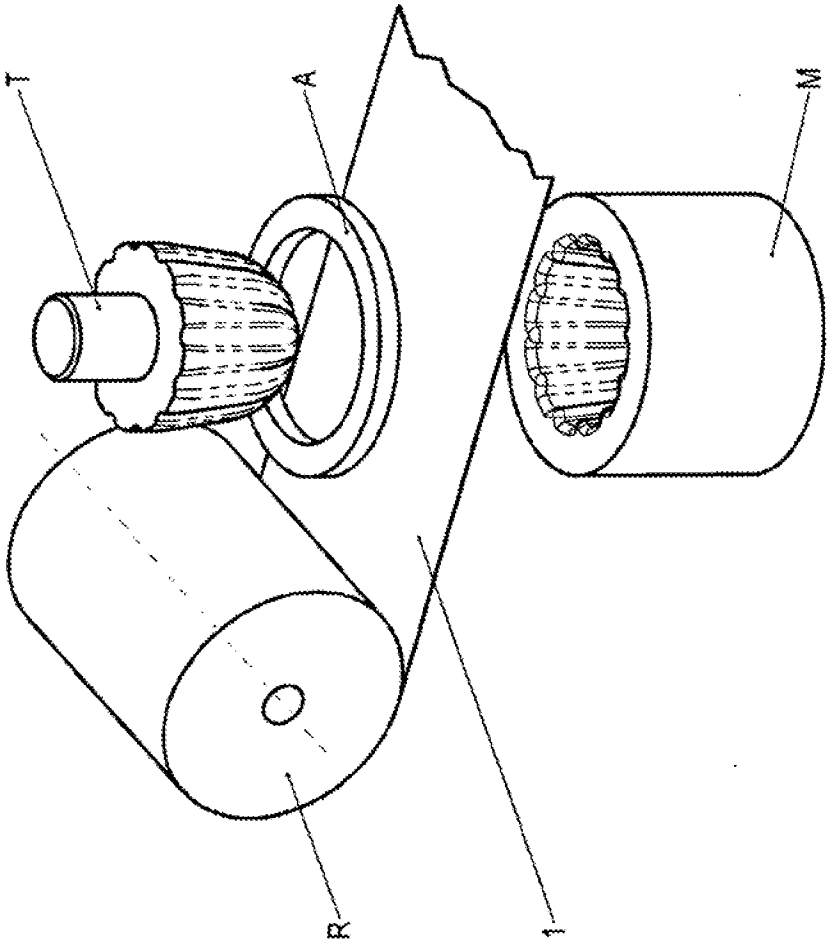


FIG. 1

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 310 of 421

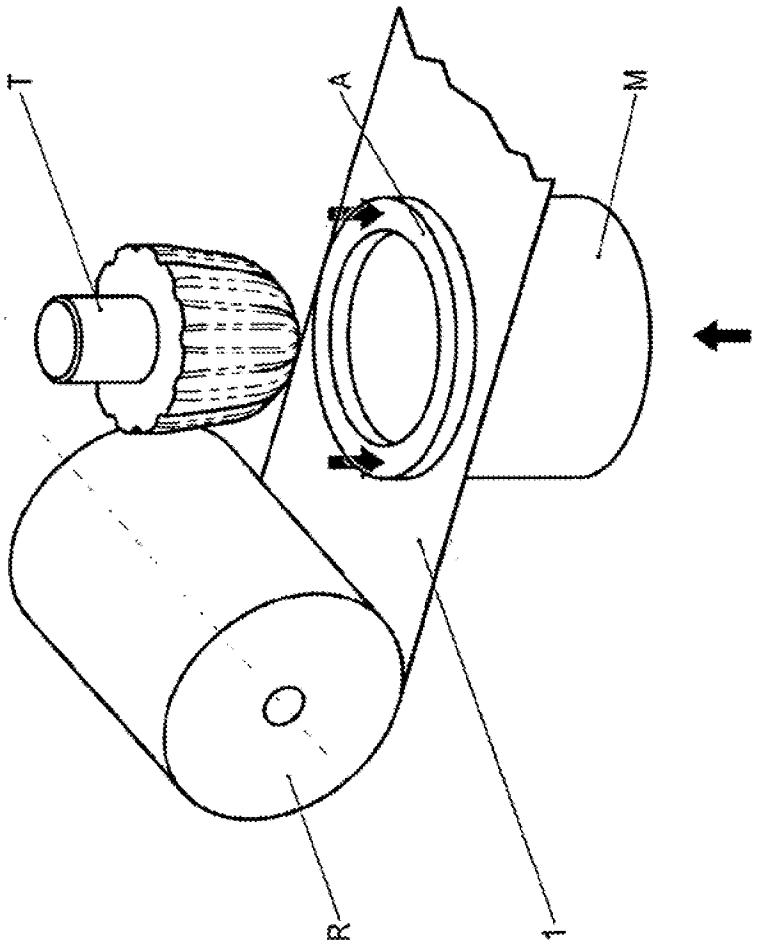


FIG. 2

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 311 of 421

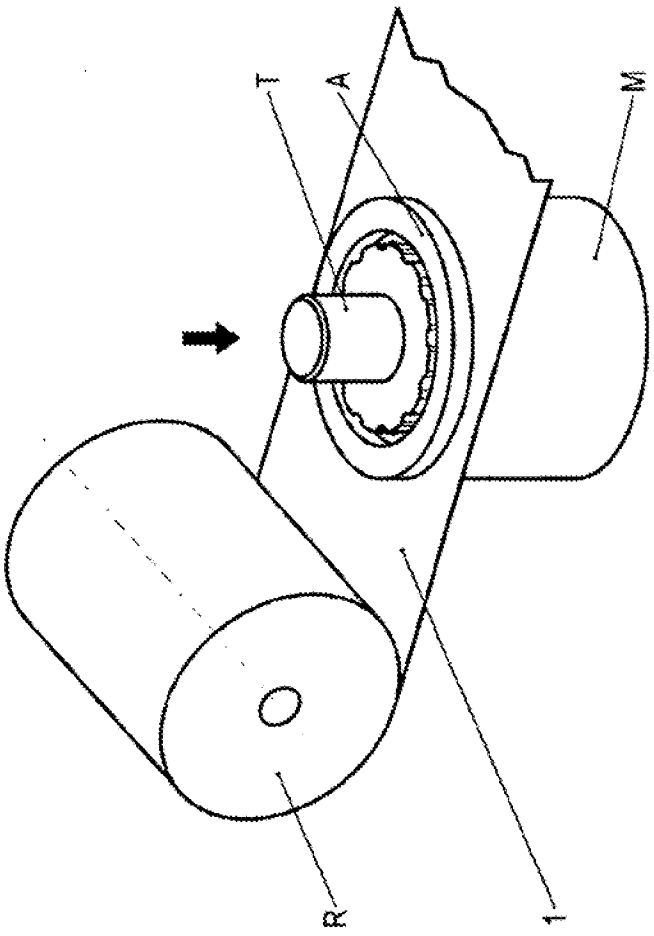


FIG. 3

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 312 of 421

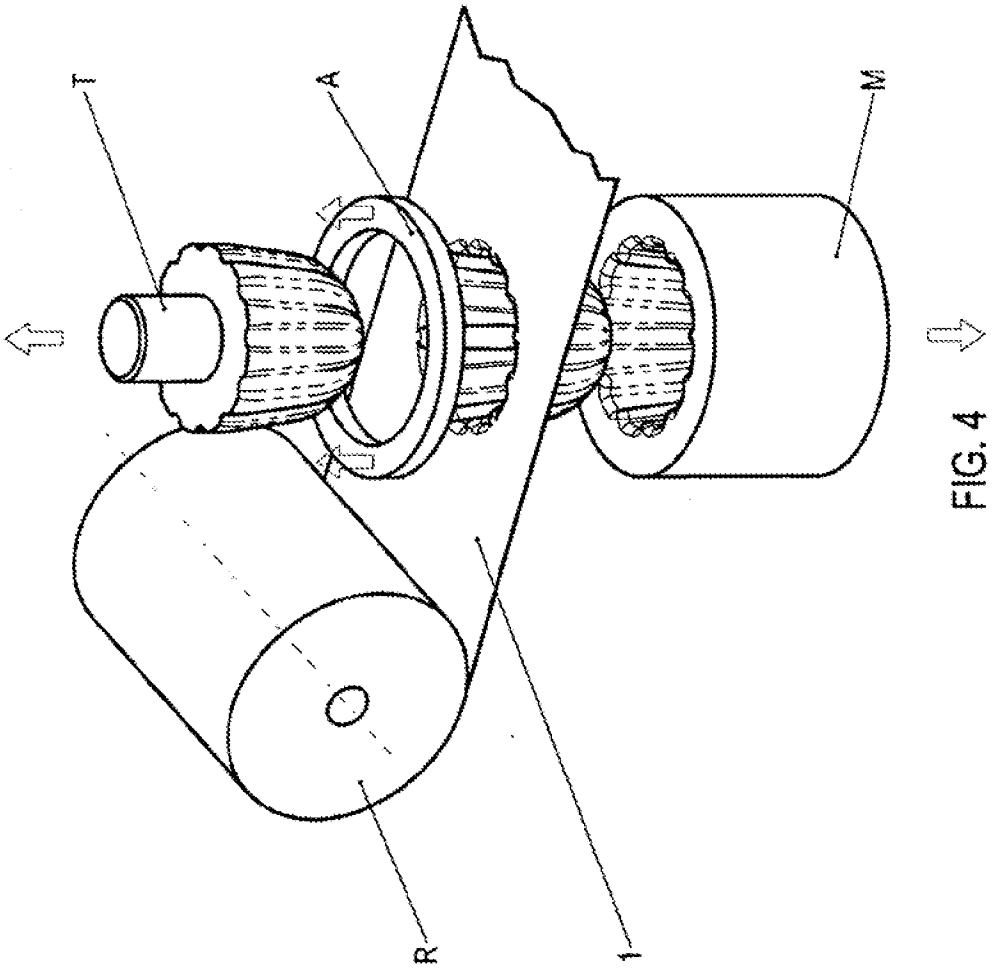


FIG. 4

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 313 of 421

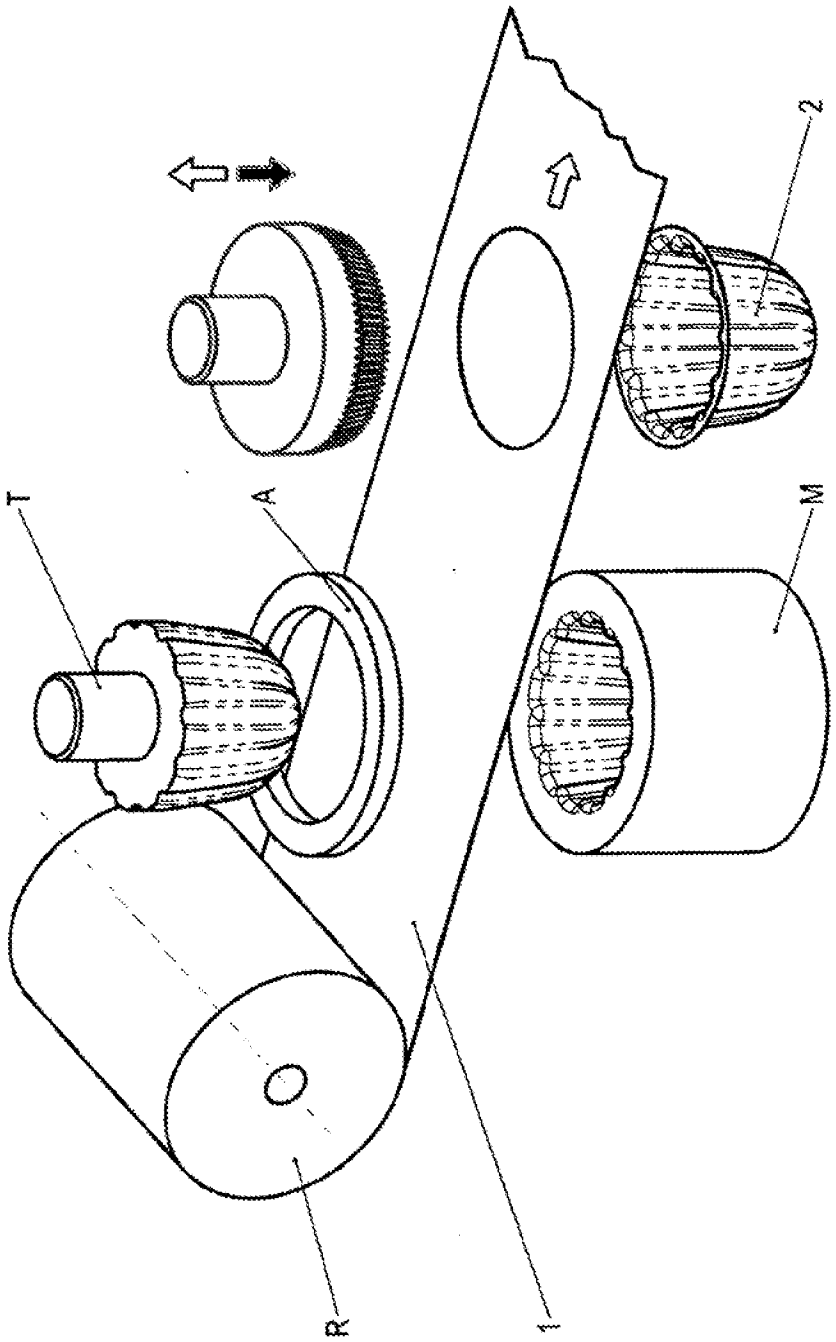


FIG. 5

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 314 of 421

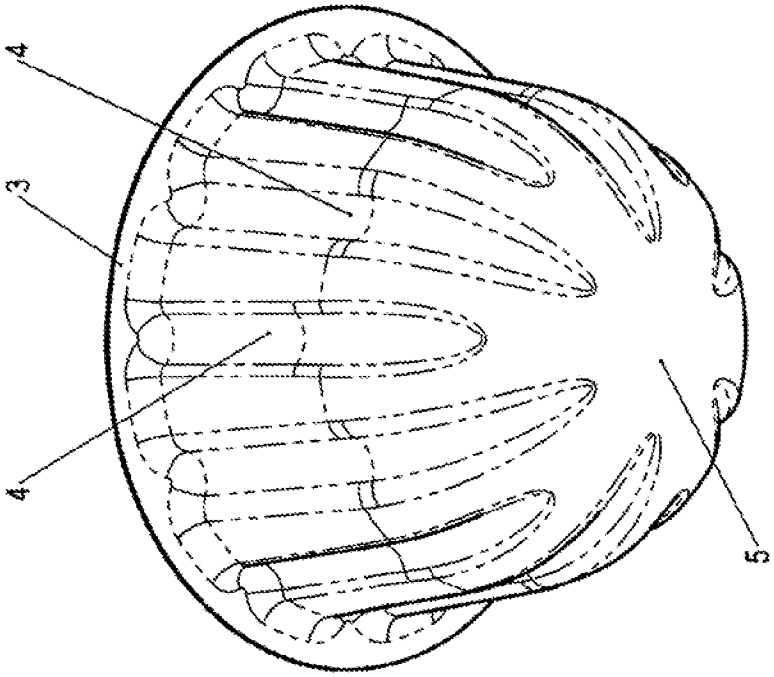


FIG. 6 bis

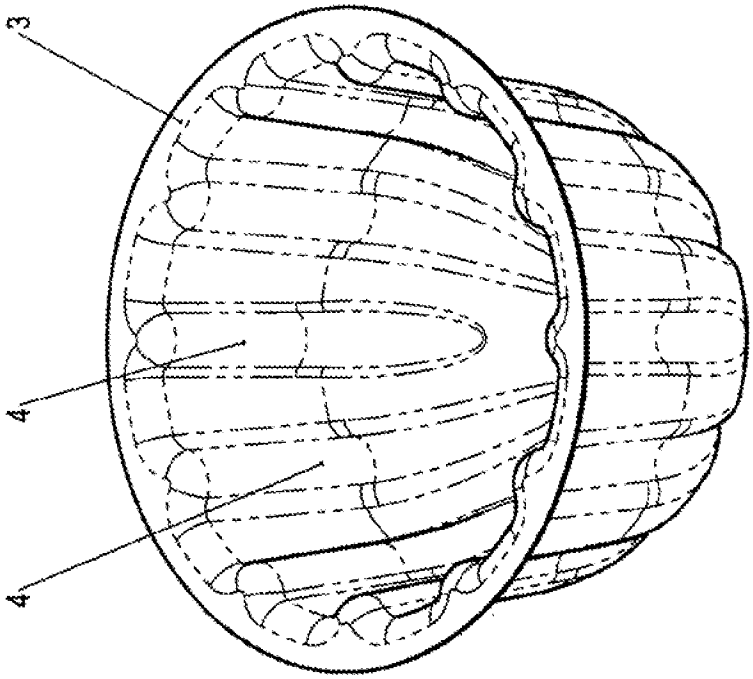


FIG. 6

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 315 of 421

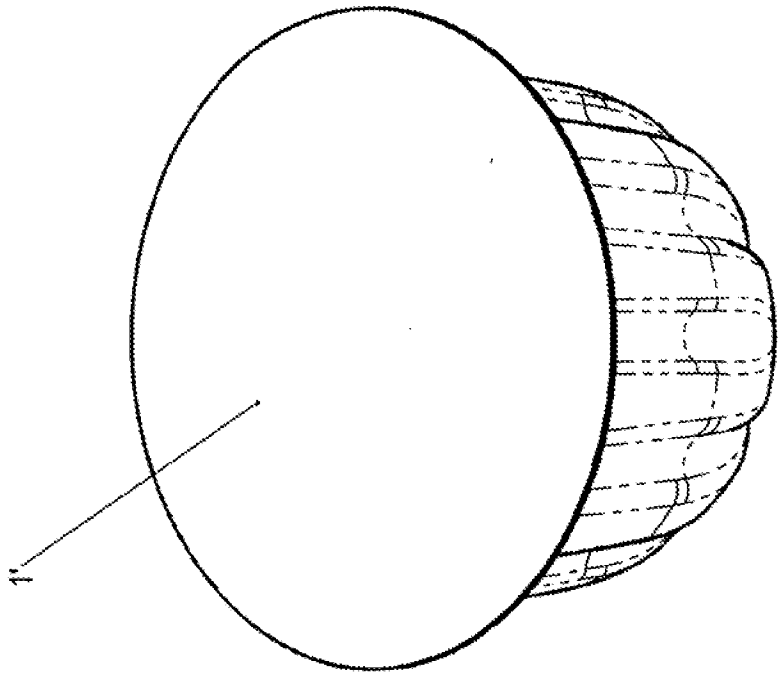


FIG. 8

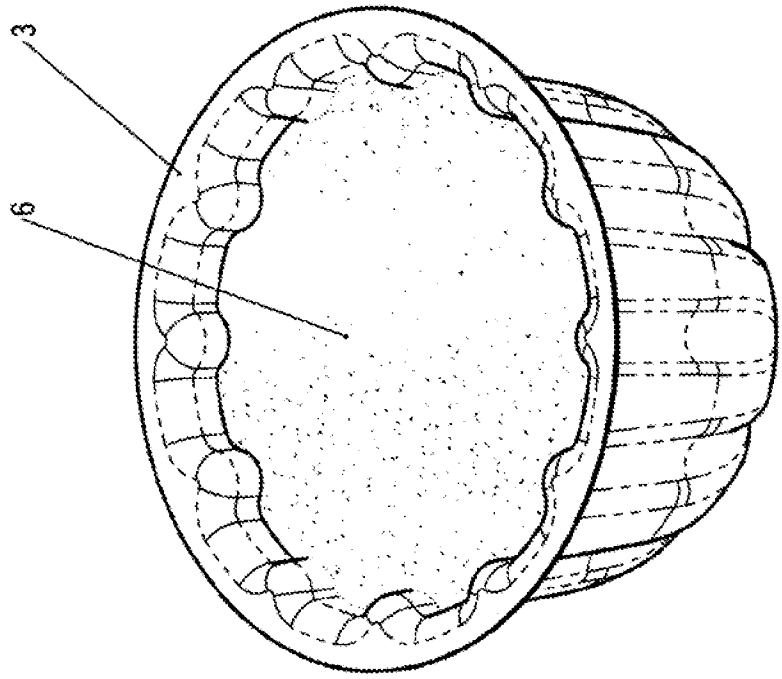


FIG. 7

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 316 of 421

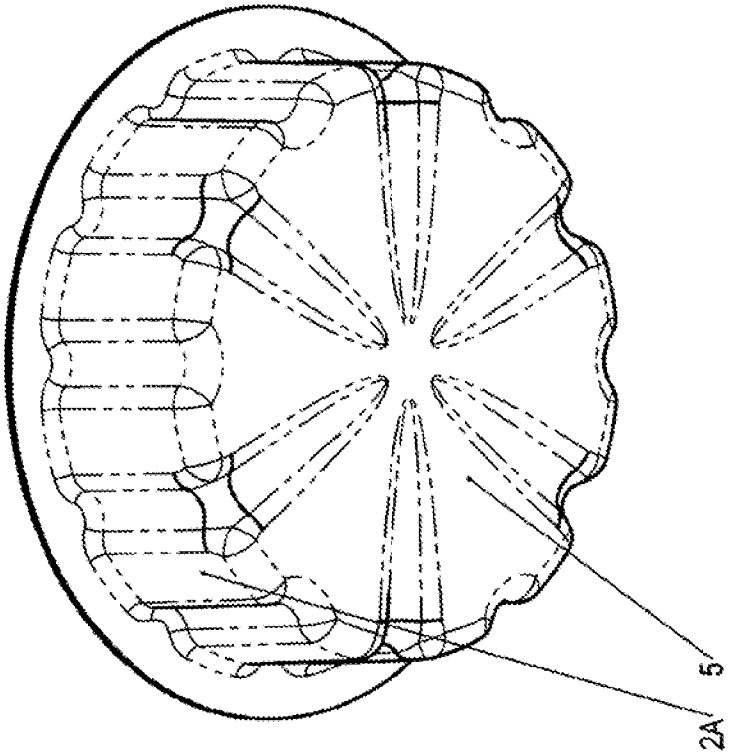


FIG. 10

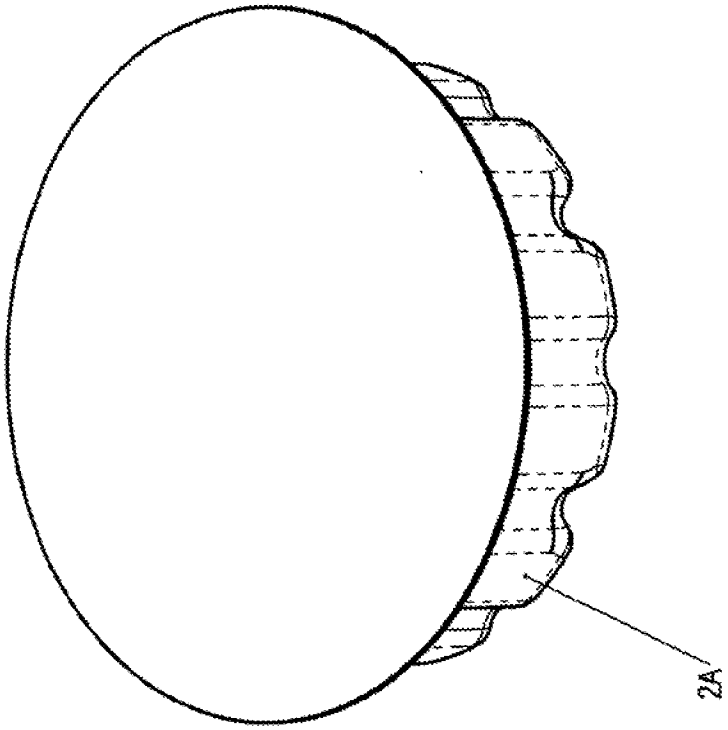


FIG. 9

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 317 of 421

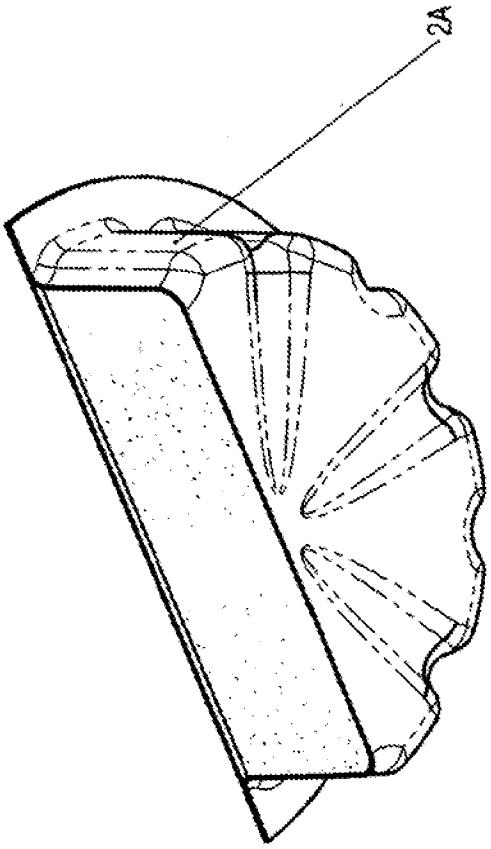
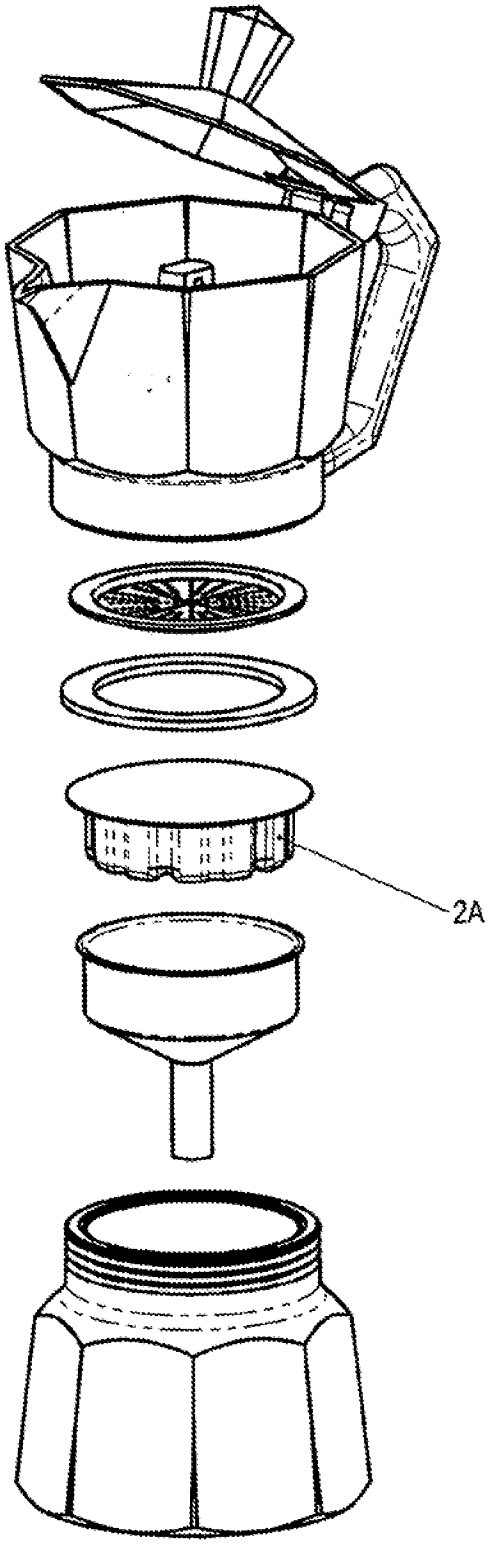


FIG. 11

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 318 of 421

FIG. 12



IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 319 of 421

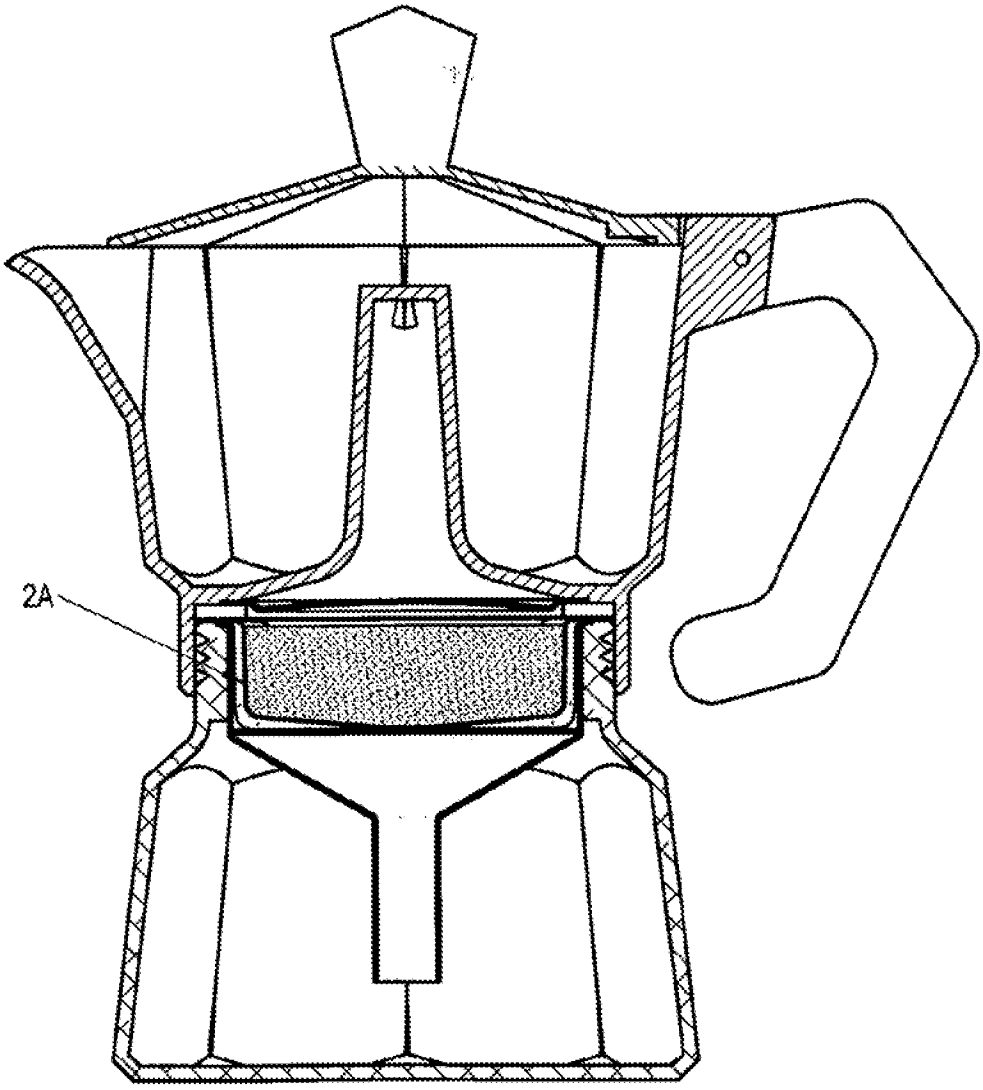


FIG. 13

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 320 of 421

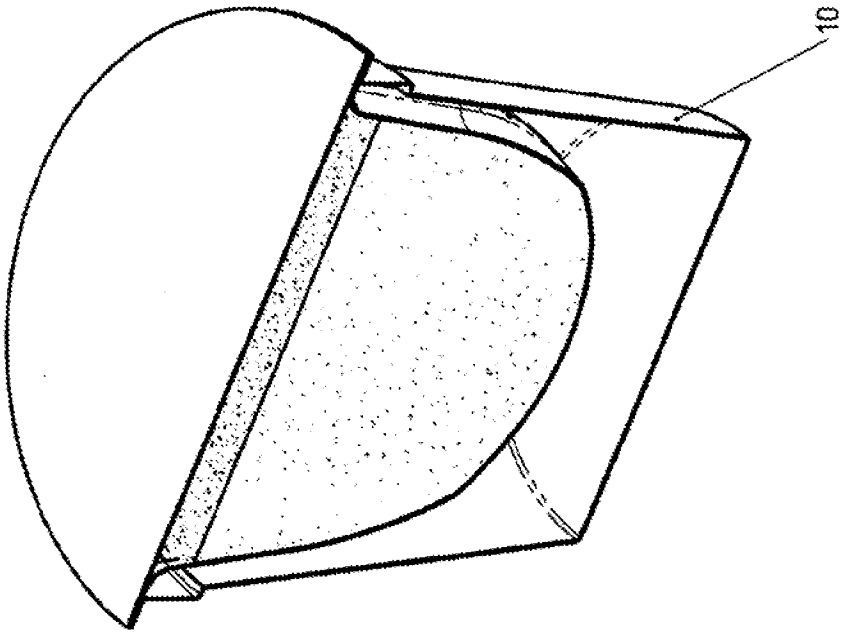


FIG. 15

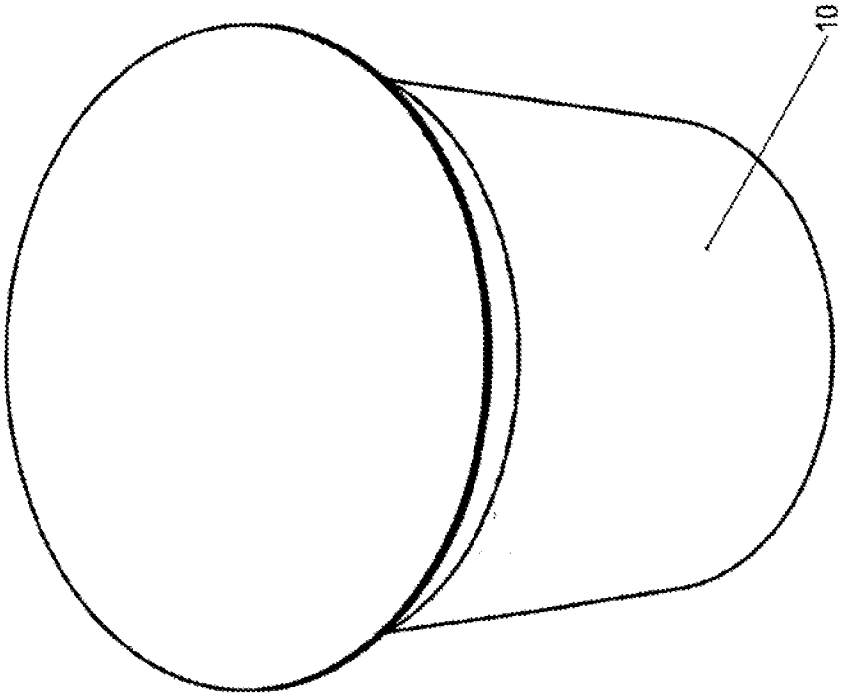


FIG. 14

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 321 of 421

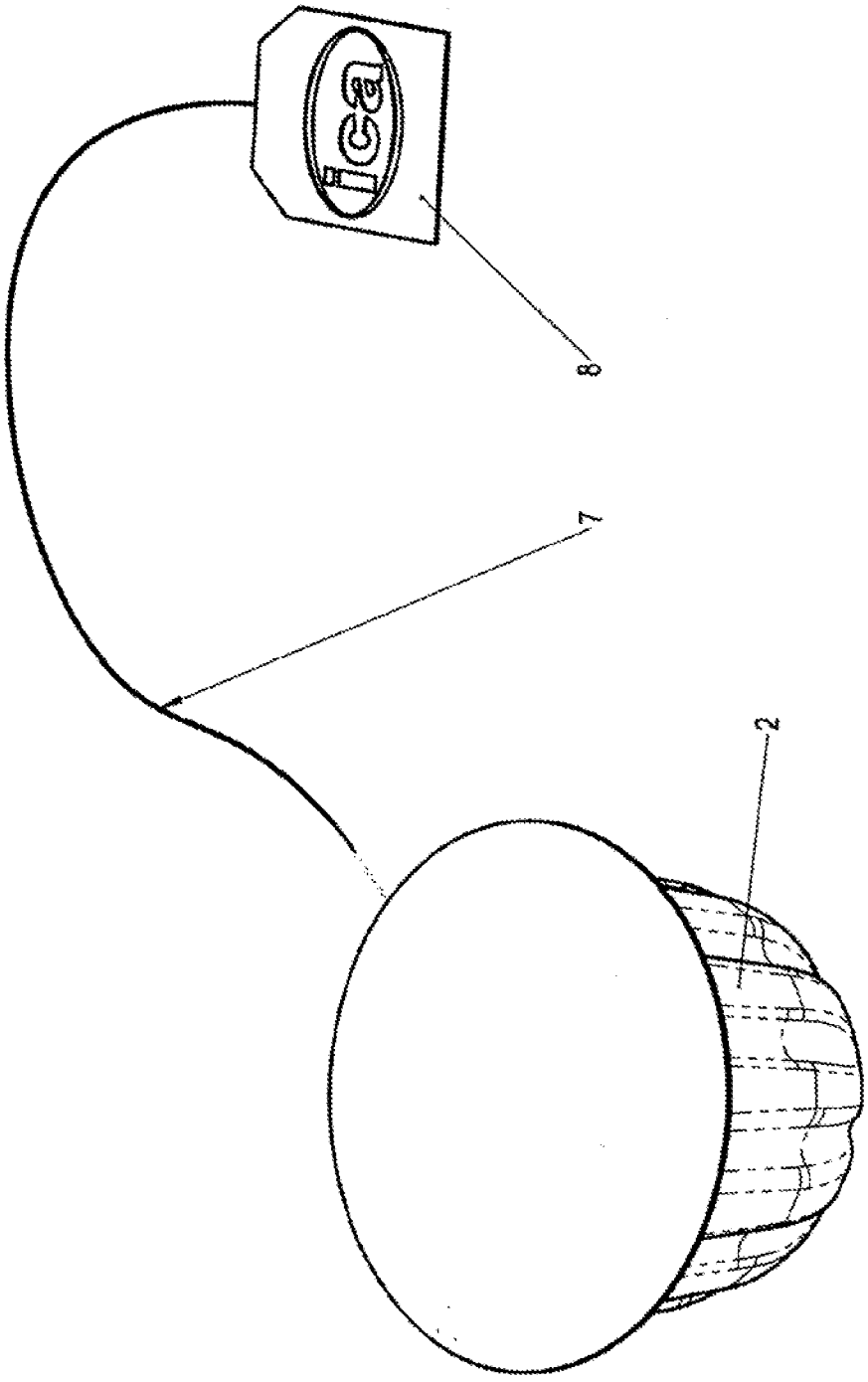


FIG. 16

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 322 of 421

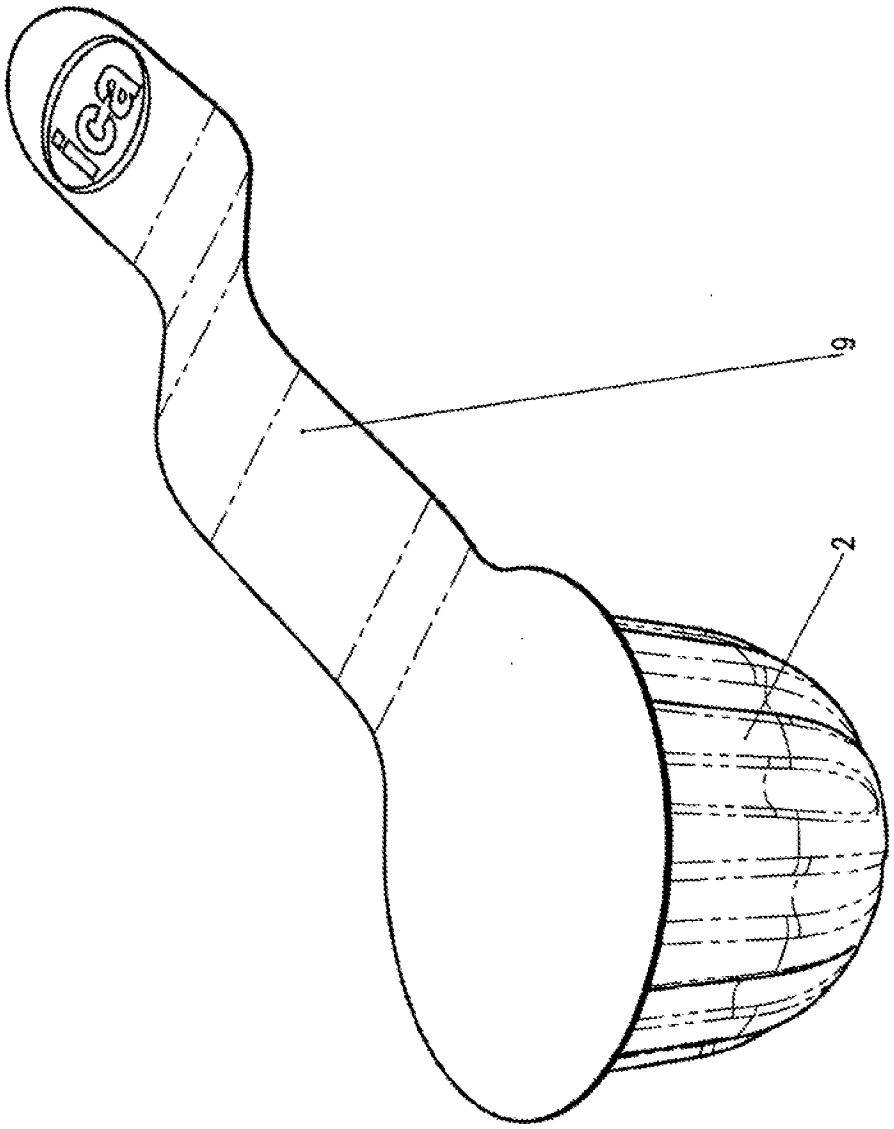


FIG. 17

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 323 of 421

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/006389

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D85/804 B65D85/808 B65D85/812
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 521 186 A1 (NESTLE SA [CH]) 7 January 1993 (1993-01-07) column 2, line 20 - line 31 column 3, line 7 - column 4, line 51 column 5, line 11 - line 18; claim 1; figures	1,8,10, 11,14,15
A	EP 0 631 948 A1 (JACOBS SUCHARD AG [CH]) 4 January 1995 (1995-01-04) column 5, line 16 - column 7, line 31; figures	15
A	US 2005/051478 A1 (KARANIKOS BASIL [US] ET AL) 10 March 2005 (2005-03-10) page 1, paragraph 17 - page 2, paragraph 22; figures 1-4	1,3-5, 10,14

-/--

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2010	28/12/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Newell, Philip

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 253 246 A2 (WOLTERMANN ERICH H) 20 January 1988 (1988-01-20) column 3, line 46 - column 4, line 8; figures	1,6,7,9, 10
A	GB 881 784 A (JOHN HENRIK GUY WELIN BERGER) 8 November 1961 (1961-11-08) page 1, line 67 - page 2, line 15; figures	12
A	EP 0 158 511 A2 (GEN FOODS LTD [GB]) 16 October 1985 (1985-10-16) page 2, line 13 - line 25 claims 1,3-9,16; figures	13

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 325 of 421

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/006389

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0521186 A1	07-01-1993	AT 114576 T	15-12-1994
		AU 658192 B2	06-04-1995
		BR 9202611 A	16-03-1993
		CA 2072317 A1	06-01-1993
		DE 69105494 D1	12-01-1995
		DK 0521186 T3	18-04-1995
		ES 2065583 T3	16-02-1995
		FI 922893 A	06-01-1993
		GR 3015003 T3	31-05-1995
		JP 3244777 B2	07-01-2002
		JP 5261023 A	12-10-1993
		NO 922613 A	06-01-1993
		NZ 243240 A	27-06-1994
		PH 31487 A	03-11-1998
		US 5637335 A	10-06-1997
		ZA 9204488 A	31-03-1993
EP 0631948 A1	04-01-1995	CA 2124600 A1	31-12-1994
US 2005051478 A1	10-03-2005	AU 2004272517 A1	24-03-2005
		CA 2538256 A1	24-03-2005
		CN 1849249 A	18-10-2006
		EP 1663813 A1	07-06-2006
		JP 2007504889 T	08-03-2007
		KR 20060121863 A	29-11-2006
		NZ 545752 A	31-01-2009
		WO 2005026018 A1	24-03-2005
EP 0253246 A2	20-01-1988	AU 7568887 A	21-01-1988
		DE 3623952 A1	28-01-1988
		US 4859337 A	22-08-1989
GB 881784 A	08-11-1961	NONE	
EP 0158511 A2	16-10-1985	GB 2156664 A	16-10-1985
		JP 5049552 B	26-07-1993
		JP 60251054 A	11-12-1985

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 326 of 421

Electronic Acknowledgement Receipt

EFS ID:	37585407
Application Number:	16438818
International Application Number:	
Confirmation Number:	8813
Title of Invention:	PORTION CAPSULE HAVING AN IDENTIFIER
First Named Inventor/Applicant Name:	Marc Krüger
Customer Number:	25215
Filer:	Paul J. Palinski/BECKY BALLARD
Filer Authorized By:	Paul J. Palinski
Attorney Docket Number:	1859.029USC4
Receipt Date:	29-OCT-2019
Filing Date:	12-JUN-2019
Time Stamp:	13:50:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Supplemental_IDS_1859_029USC4.pdf	646474 856f37de3b1da41986f18abac5fb2c7a4528514e	no	4

Warnings:

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 327 of 421

Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	EP0455337A1.pdf	2988102 35dbc79d39b3d7d9463b9ba59bfc1a6d6b7a6b73	no	13
Warnings:					
Information:					
3	Foreign Reference	EP0468864A1.pdf	5268007 9f5a7670fad92a7b802a84007d271c28d08f86fb	no	17
Warnings:					
Information:					
4	Foreign Reference	EP0488452A2.pdf	279820 27b2688af958756f7f51fb041c472ecb7ddf0eab	no	5
Warnings:					
Information:					
5	Foreign Reference	EP0638486A1.pdf	727553 bebdfd2496adf9c0e736566dff035d76769805be	no	14
Warnings:					
Information:					
6	Foreign Reference	EP1588845A1.pdf	2854994 630a157cb90d4a11508c01f89282847e2d8dde28	no	13
Warnings:					
Information:					
7	Foreign Reference	EP1772398A1.pdf	4609973 32643344ef0c31da206832e2ad56d9ffb67b7e64	no	23
Warnings:					
Information:					
8	Foreign Reference	EP1849718A1.pdf	845681 5ab68a5617381d8111a4efe1d47b45a8c47bc212	no	10
Warnings:					
Information:					

9	Foreign Reference	EP2012994A1.pdf	15198 b41aed586645817dcffb5bb8a119fd011bcb5012	no	1
Warnings:					
Information:					
10	Foreign Reference	DE3432339A1.pdf	4981891 714895736e937a76a767916f38dbe4ac9b9768ae	no	20
Warnings:					
Information:					
11	Foreign Reference	JP2003235733A.pdf	6417667 0023f7659f19427685421770698067 1c68949b97	no	18
Warnings:					
Information:					
12	Foreign Reference	JP2015085086A.pdf	3550301 3a36da030681937ddff25e84726f2a3e5948ff4d	no	15
Warnings:					
Information:					
13	Foreign Reference	KR1020050107747.pdf	25101710 df63b987a31cd4cb75ec432e1c700b430ed96b9a	no	55
Warnings:					
Information:					
14	Foreign Reference	WO0160712A1.pdf	3538235 b2c1185e752def29ffe35d2c94a97449d4e4d2a7	no	20
Warnings:					
Information:					
15	Foreign Reference	WO2004065258A2.pdf	18398237 7bca02d64c9ac5b7d6af16463178cfee77e076b1	no	110
Warnings:					
Information:					

16	Foreign Reference	WO2005044067A1.pdf	1160553 d08cc46c587c7d322828a848428fc3818a8ec844	no	29
Warnings:					
Information:					
17	Foreign Reference	WO2005047111A1.pdf	3621584 6b8b692de911817b22f70b22802576edb393a6a9	no	39
Warnings:					
Information:					
18	Foreign Reference	WO2010026053A1.pdf	8996786 dcc748095a7c2f915969778b1573eca5b2c72c2d	no	62
Warnings:					
Information:					
19	Foreign Reference	WO2010041179A2.pdf	3034151 a79304ba5ca1ffe993f807d284957d51912bf3a7	no	19
Warnings:					
Information:					
20	Foreign Reference	WO2011047836A1.pdf	4380763 e05206904550bf3bbc241cabed375fd300d3353a	no	31
Warnings:					
Information:					
21	Non Patent Literature	OppositionRequest_EuropeanPatent_EP3023362.pdf	3496205 aace2a8fc81cf6cc662a2fb2f17e386946f70372	no	23
Warnings:					
Information:					
22	Non Patent Literature	SuggestionForDeclarationOfInterference.pdf	20049683 d07ee7ff558cd00de151ba10e5a13dfb1a8de4b0	no	100
Warnings:					
Information:					
		Total Files Size (in bytes):	124963568		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/438,818	06/12/2019	Marc Krüger	1859.029USC4	8813

25215 7590 04/30/2020

The Dobrusin Law Firm P.C.
29 W. Lawrence Street, Ste. 210
SUITE 210
PONTIAC, MI 48342

EXAMINER	
SMITH, CHAIM A	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
04/30/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dobrusin_PAIR@firsttofile.com
patmail@patentco.com
rmasquelier@patentco.com

Office Action Summary	Application No. 16/438,818	Applicant(s) Krüger, Marc	
	Examiner CHAIM A SMITH	Art Unit 1792	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-9 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-9 is/are rejected.

8) ☑ Claim(s) 1-9 is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☑ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 12 June 2019 is/are: a)☐ accepted or b)☑ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☑ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Election/Restrictions

2. Claim 9 is noted to contain no method steps. At this time, restriction has not been required between the product claims 1 – 8 and the method claim 9 because the method claim does not recite any significant manipulative steps and is therefore considered as part of the product claims. Applicant is advised that if the method claim is amended to contain significant method steps, any such claims will be subject to restriction based on original presentation.

Information Disclosure Statement

3. The Examiner acknowledges receipt of the lengthy information disclosure statement filed 12 June 2019. There is no requirement that applicants explain the materiality of English language references, however the cloaking of a clearly relevant reference in a long list of references may not comply with applicants' duty to disclose, see Penn Yan Boats, Inc. v. Sea Lark Boats, Inc., 359 F. Supp. 948, aff'd 479 F. 2d. 1338. There is no duty for the Examiner to consider these references to a greater extent than those ordinarily looked at during a regular search by the Examiner. Accordingly, the Examiner has considered these references in the same manner as references encountered during a normal search of Office search files.

4. With regard to the numerous IDS submissions, applicants are invited to indicate the relevance of the submissions to the claims. Particularly with regard to the various examination and opposition reports which were submitted. Without claim listings the

examiner is unable to determine how the claims in the reports relate to the claims under examination.

Drawings

5. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the following features must be shown or the features canceled from the claims:

"the identifier is a barcode which is provided on that side of the peripheral region of the basic element which is directed away from the membrane" as recited in claim 1;

the capsule characterized in that "it has an insert element with an identifier" as recited in claim 3;

if the capsule is to have two different identifiers as claim 3 would appear to recite then both identifiers in the same capsule must be shown;

"the outer circumference of a flange has a plurality of channels" as recited in claim 4;

6. No new matter should be entered.

7. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include reference characters associated with the missing features of the drawings listed above. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be

labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action.

8. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

9. Color photographs, in this case grey scale, and color drawings are not accepted in utility applications unless a petition filed under 37 CFR 1.84(a)(2) is granted. Any

10. Applicant has provided figures 19 – 22 as what appear to be black and white photographs. Black and white photographs, including photocopies of photographs, are not ordinarily permitted in utility and design patent applications. The Office will accept photographs in utility and design patent applications, however, if photographs are the

only practicable medium for illustrating the claimed invention which is not the case in the present application therefore applicant is required to submit the figures as drawings.

Specification

11. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: there is no antecedent basis in the specification for "the identifier is a barcode which is provided on that side of the peripheral region of the basic element which is directed away from the membrane" as recited in claim 1, the capsule characterized in that "it has an insert element with an identifier" as recited in claim 3, "the outer circumference of a flange has a plurality of channels" as recited in claim 4.

12. The specification is objected to because it fails to include any reference characters associated with the missing features not found in the drawings, that is "the identifier is a barcode which is provided on that side of the peripheral region of the basic element which is directed away from the membrane" as recited in claim 1; the capsule characterized in that "it has an insert element with an identifier" as recited in claim 3; "the outer circumference of a flange has a plurality of channels" as recited in claim 4.

13. Appropriate correction is required.

14. The claims are objected to because the lines are crowded too closely together, making reading difficult. Substitute claims with lines double spaced on good quality paper are required. See 37 CFR 1.52(b).

Claim Rejections - 35 USC § 101

15. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 9 is rejected under 35 U.S.C. 101 because it is the improper definition of a process as there is no specific process steps in the claim.

Claim Rejections - 35 USC § 112

16. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

17. Claims 3 and 9 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

18. Regarding claim 3 it is unclear how many identifiers are to be present. Claim 1 recites a single serve capsule to have an identifier which is a barcode provided on the side of the peripheral region of the basic element which is directed away from the membrane. Claim 3 further recites the capsule “has an insert element with an identifier”. It is unclear if this to be a completely separate identifier or somehow related to the identifier recited in claim 1. Further it is unknown what type of element or identifier associated therewith would be required to be present in the single serve

capsule. There is no disclosure in applicant's specification of said insert element with an identifier and therefore the ordinarily skilled artisan would not know what is required to practice the invention.

19. Regarding claim 9, claim 9 is indefinite because it merely recites a use without any active, positive steps delimiting how this use is actually practiced. *Ex parte Erlich*, 3 USPQ2d 1011 (Bd. Pat. App. & Inter. 1986).

Claim Rejections - 35 USC § 103

20. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

21. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

22. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

23. Claims 1 and 2 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Ruchonnet WO 2005/044067.

24. Regarding claims 1 and 2, Ruchonnet discloses a single serve capsule (receptacle 3) capable of making a beverage (coffee) (translation, page 3, paragraph 4), having a basic element with a cavity, in which a raw beverage material (coffee) (page 3, paragraph 4) is provided, the capsule has a peripheral region (cylindrical) which is provided on the basic element, and the cavity being closed by a membrane (upper perforable part), which is fastened on the peripheral region of the basic element, wherein the capsule has an identifier (information readable), which makes it possible to individualize the respective single-serve capsule (translation page 1, paragraph 11), characterized in that the identifier is a barcode which is provided on that side of the peripheral region of the basic element which is directed away from the membrane (translation page 2, paragraph 6). Further regarding claim 2, Ruchonnet discloses the sealing surface would be provided on the peripheral region which is the flange (translation page 3, paragraph 11, fig. 6 illustrates).

25. Claim 3 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Ruchonnet WO 2005/044067 in view of Bucher WO 2011/000723.

26. Claim 1 differs from Ruchonnet in the capsule having an insert element with an identifier.

27. Bucher discloses a single serve capsule capable of making a beverage having a basic element with a cavity, in which a raw beverage material (coffee) is provided. The capsule has a peripheral region which is provided on the basic element, and the cavity is closed by a membrane, which is fastened on the peripheral region of the basic

element, wherein the capsule has an identifier, which makes it possible to individualize the respective single-serve capsule. Buchner further discloses the capsule would have an insert with an identifier (element 8) positioned within the capsule (page 19, paragraph 1, fig. 9). Bucher is providing an insert with an identifier for the art recognized function of protecting the identifier from damage when being inserted into the machine which is believed to be applicant's reason for doing so as well. To therefore modify Ruchonnet and provide an insert with an identifier as taught by Buchner would have been obvious to the ordinarily skilled artisan.

28. Claim 9 is seen to be the obvious use of the single serve capsule to make a hot beverage since the capsule would obviously have to be placed into a machine with an identifier reader to read said identifier in order to further make a hot beverage.

29. Claims 4 – 8 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Sweeney et al. US 2002/0020659.

30. Regarding claim 4, Sweeney discloses a single serve capsule capable of making a beverage (coffee) which has an essentially frustoconical or cylindrical basic element with a cavity for accommodating a raw beverage material (coffee). There is a membrane (piercable lid) which closes the cavity (paragraph [0004]), characterized in that the basic element has a wall region, wherein the basic element also has, on that side of the single-serve capsule which is directed away from the membrane, a base region, wherein the wall region, or the outer circumference of a flange has a plurality of channels (flutes) (paragraph [0011] and fig. 1 – 3).

31. Regarding claim 5 and recitations beginning "the channels realize an identifier, which makes it possible to individualize the single-serve capsule" these are seen to be recitations regarding the intended use of the channels.

32. In this regard applicant's attention is invited to MPEP 2114 which states that "an apparatus must be distinguished from the prior art in terms of structure rather than function". That is to say, apparatus claims cover what a device is, not what a device does. If the body of a claim fully and intrinsically sets forth all the limitations of the claimed invention, and then further limitations merely state, for example, the purpose or intended use of the invention, rather than any distinct structural definition of any of the claimed invention's structural limitations, then any limitations regarding the intended use of the device are of no significance to claim construction. A claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim which Sweeney obviously does. Further, if the prior art structure is capable of performing the intended use, then it meets the claim.

33. It is The Office's position that the further limitations do not state any distinct definition of any of the claimed invention's limitations and further that the purpose or intended use, i.e. "the channels realize an identifier, which makes it possible to individualize the single-serve capsule", recited in the present claims does not result in a structural difference between the presently claimed invention and the prior art, that is Sweeney and further that the prior art structure, which is identical and/or obvious in view

of the prior art to that set forth in the present claims is capable of performing the recited purpose or intended use.

34. Regarding claim 6, Sweeney discloses that at least some of the channels, and at least in a sub-region in a plane parallel to the main plane along which the membrane extends, have a gear-wheel-like contour (fig. 1 – 3).

35. Regarding claim 7, Sweeney discloses the channels are designed such that the wall region is stiffened by means of the channels and the channels provide for turbulence of an extraction liquid flowing in the cavity (paragraph [0050] and [0051]).

36. Regarding claim 8, Sweeney discloses the cavity contains a filter element which subdivides the cavity into a first region for accommodating the raw beverage material and into a second region for accommodating a beverage extract (paragraph [0045] fig. 2 and 3).

Conclusion

37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHAIM A SMITH whose telephone number is (571)270-7369. The examiner can normally be reached on Monday-Thursday 09:00-18:00.

38. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to telephone the Examiner.

39. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Erik Kashnikow can be reached on (571) 270-3475. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

40. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C.S./
Chaim Smith
Examiner, Art Unit 1792
13 April 2020

/ERIK KASHNIKOW/
Supervisory Patent Examiner, Art Unit 1792

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/438,818	Krüger, Marc
	Examiner	Art Unit
	CHAIM A SMITH	1792

CPC - Searched*		
Symbol	Date	Examiner
B65D 85/8043, 65/466, 2081/007, 2203/06, 2203/10	04/13/2020	CS
A47J 31/4492	04/13/2020	CS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
East search RS Pat, US PG-Pub EPO, JPO	04/12/2020	CS
Palm search inventor	04/13/2020	CS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/C.S./ Examiner, Art Unit 1792	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/438,818	Krüger, Marc
	Examiner	Art Unit
	CHAIM A SMITH	1792

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/13/2020								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 8813

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
16/438,818	06/12/2019	426	1792	1859.029USC4

APPLICANTS
K-FEE SYSTEM GMBH, Bergisch Gladbach, GERMANY;

INVENTORS
Marc Krüger, Bergisch Gladbach, GERMANY;

**** CONTINUING DATA ***************************
This application is a CON of 15/646,980 07/11/2017
which is a DIV of 15/211,823 07/15/2016
which is a DIV of 13/744,623 01/18/2013 ABN
which is a CON of PCT/EP2011/003677 07/22/2011

**** FOREIGN APPLICATIONS ***************************
GERMANY 10 2011 010 534.4 02/07/2011
GERMANY 10 2010 044 251.8 09/02/2010
GERMANY 10 2010 031 988.0 07/22/2010

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
06/18/2019

Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /CHAIM A SMITH/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		GERMANY	12	9	2

ADDRESS
The Dobrusin Law Firm P.C.
29 W. Lawrence Street, Ste. 210
SUITE 210
PONTIAC, MI 48342
UNITED STATES

TITLE
PORTION CAPSULE HAVING AN IDENTIFIER

FILING FEE RECEIVED		
1720	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Receipt date: 10/29/2019

Filed via EFS @ USPTO.gov on October 29, 2019
Practitioner's Docket No. 1859.029USC4 (KRÜ0022-WO-US-T4)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Marc Krüger	Art Unit: 1792
Application No.: 16/438,818	Examiner: Becker, Drew E.
Filed: June 12, 2019	Conf. No.: 8813

For: PORTION CAPSULE HAVING AN IDENTIFIER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Applicant submits this statement in accordance with its duty of disclosure under 37 C.F.R. §§ 1.56, 1.97, and 1.98. The submission made herewith is in no way intended as an admission that the cited items constitute material prior art or otherwise would render the claims unpatentable in any way. The submission also is in no way intended to substitute for the Examiner's own independent investigation.

Copies of foreign patent documents and non-patent literature together with a listing on form PTO/SB/08a are submitted herewith. Applicant includes English translations from the European Patent Office website and are subject to the caveat expressed on the translations. Applicant respectfully solicits the Examiner's consideration of the cited references and entry thereof into the record of this application.

This Information Disclosure Statement is being submitted prior to the mailing of a first Office Action or Notice of Allowance. No fees are believed to be due; however, if any fee is due with the filing of this paper, please charge the amount to Deposit Account 50-1097.

Date: October 29, 2019

/Paul J. Palinski/

Paul J. Palinski
Reg. No. 71,080
Attorney for Applicant
The Dobrusin Law Firm, P.C.
29 W. Lawrence Street - Suite 210
Pontiac, MI 48342
(248) 292-2920

Customer No. 25215

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

Receipt date: 10/29/2019

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16/438,818
	Filing Date	June 12, 2019
	First Named Inventor	Marc Krüger
	Art Unit	1792
	Examiner Name	Becker, Drew E.
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

U.S. PATENTS

Examiner Initials*	Cite No.	Patent Number	Kind Code	Issue Date	Name of Patentee or Applicant of cited Document
	1.	3,501,896	A	03/24/1970	Stoeser et al.
	2.	5,243,164	A	09/07/1993	Erickson et al.
	3.	5,392,986	A	02/28/1995	Beer et al.
	4.	5,402,707	A	04/04/1995	Fond et al.
	5.	6,202,929	A	03/20/2001	Verschuur et al.
	6.	9,538,876	B2	01/10/2017	Ozanne et al.

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No.	Publication Number	Kind Code	Publication Date	Name of Patentee or Applicant of cited Document
	1.	2001/0048957	A1	12/06/2001	Lazaris et al.
	2.	2002/0048621	A1	04/25/2002	Boyd et al.
	3.	2002/0085164	A1	07/04/2002	Stanford-Clark
	4.	2002/0148356	A1	10/17/2002	Lazaris et al.
	5.	2003/0172813	A1	09/18/2003	Schifferle
	6.	2004/0005384	A1	01/08/2004	Cai
	7.	2004/0089158	A1	05/13/2004	Mahlich
	8.	2004/0118295	A1	06/24/2004	Angeles
	9.	2004/0155113	A1	08/12/2004	Urano et al
	10.	2005/0061478	A1	03/24/2005	Huang
	11.	2006/0010744	A1	01/19/2006	Schumacher
	12.	2006/0032427	A1	02/16/2006	Ishii et al.
	13.	2007/0157821	A1	07/12/2007	Panesar et al.
	14.	2008/0024523	A1	01/31/2008	Tomite et al.
	15.	2010/0007848	A1	01/14/2010	Murata
	16.	2010/0173056	A1	07/08/2010	Yoakim et al.
	17.	2010/0264640	A1	10/21/2010	Lane et al.
	18.	2011/0008913	A1	01/13/2011	Wadhwa et al.
	19.	2012/0031794	A1	02/09/2012	Ozanne et al.
	20.	2012/0207895	A1	08/16/2012	Rivera
	21.	2013/0064929	A1	03/14/2013	Jarisch et al.
	22.	2014/0272018	A1	09/18/2014	Koller et al.
	23.	2015/0297021	A1	10/22/2015	Bugnano et al.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 349 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16/438,818
	Filing Date	June 12, 2019
	First Named Inventor	Marc Krüger
	Art Unit	1792
	Examiner Name	Becker, Drew E.
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No.	Foreign Document Number	Country Code	Kind Code	Publication Date	Name of Patentee or Applicant of cited Document	T[5]
	1.	1942125 (also published as US2007/0157821)	CN	A	04/04/2007	Panesar et al.	
	2.	101588974 (also published as US 9,538,876)	CN	A	11/25/2009	Ozanne et al.	
	3.	0455337	EP	A1	11/06/1991	Bentley et al.	
	4.	0468864	EP	A1	01/29/1992	Rauturier et al.	X
	5.	0488452	EP	A2	06/03/1992	Navarini	
	6.	0514803 (also published as US 5,392,986)	EP	A1	11/25/1992	Beer et al.	
	7.	0638486	EP	B1	10/23/1996	Gibbs et al.	
	8.	1588845	EP	A1	10/26/2005	Jacob et al.	X
	9.	1772398	EP	A1	04/11/2007	Van Belleghem	
	10.	1849718	EP	A1	10/31/2007	Rubino	
	11.	2012994	EP	B1	07/11/2012	Abegglen et al.	
	12.	3432339	DE	A1	03/13/1986	Gesen et al.	X
	13.	2003-235733	JP	A	08/26/2003	Mitsuaki	X
	14.	2003-265320 (also published as US2003/0172813)	JP	A	09/24/2003	Schifferle	
	15.	2004-525829 (also published as US2004/0089158)	JP	A	08/26/2004	Mahlich	
	16.	2015-085086	JP	A	05/07/2015	Hirota et al.	X
	17.	1020050107747	KR	A	11/15/2005	Halliday et al.	X
	18.	01/60712	WO	A1	08/23/2001	Sweeney et al.	
	19.	02/0228241 (also published as US 2002/0048621)	WO	A1	04/11/2002	Boyd et al.	
	20.	2004/065258	WO	A2	08/05/2004	Gomez et al.	
	21.	2005/044067	WO	A1	05/19/2005	Ruchonnet	X
	22.	2005/047111	WO	A1	05/26/2005	Rapparini	
	23.	2010/026053	WO	A1	03/11/2010	Denisart et al.	

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 350 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16/438,818
	Filing Date	June 12, 2019
	First Named Inventor	Marc Krüger
	Art Unit	1792
	Examiner Name	Becker, Drew E.
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	24.	2010/034663 (also published as US2012/0031794)	WO	A1	04/01/2010	Ozanne et al.	
	25.	2010/041179	WO	A2	04/15/2010	Mariller	X
	26.	2011/047836	WO	A1	04/28/2011	Rapparini	
	27.	2011/141532 (also published as US2013/0064929)	WO	A1	11/17/2011	Jarisch et al.	

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initial*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1.	Opposition Request against European Patent No. EP 3 023 362 dated July 01, 2019.	
	2.	Suggestion for Declaration of Interference dated Sept. 30, 2019	

EXAMINER SIGNATURE			
Examiner Signature	/CHAIM A SMITH/	Date Considered	04/13/2020
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	46	B65D65/466.cpc. and (metal screen aluminum aluminium) with filter	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/16 11:43
L3	1109	B65D65/466.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/16 11:45
L4	1106	B65D65/466.cpc.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2020/04/16 11:46
L5	42	B65D2081/007.cpc.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2020/04/16 11:53
L6	398	B65D2203/06.cpc.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2020/04/16 11:54
L7	1355	B65D2203/10.cpc.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2020/04/16 11:57
L8	2329	B65D85/8043.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/16 12:03
L9	2276	B65D85/8043.cpc.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2020/04/16 12:05
S1	282	B65D85/8043.cpc. and (metal screen aluminum aluminium) with filter	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 09:58

S2	257	B65D85/8043.cpc. and (capsule cartridge pad pod) and (metal screen aluminum aluminium) with filter	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 10:08
S3	163	B65D85/8043.cpc. and (capsule cartridge pad pod) same (metal screen aluminum aluminium) with filter	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 10:29
S4	0	B65D85/8043.cpc. and (capsule cartridge pad pod) same (metal screen aluminum aluminium) with filter same (code identif$6)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 10:41
S5	0	B65D85/8043.cpc. and (capsule cartridge pad pod) same (metal screen aluminum aluminium) with filter same (code reader identif$6)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 10:42
S6	2	B65D85/8043.cpc. and insert near1 element same (code identif$6)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 10:44
S7	56	B65D85/8043.cpc. and insert same (code identif$6)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 10:44
S8	70	A47J31/4492.cpc. and insert same (code identif$6)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/04/13 11:12

EAST Search History (Interference)

<This search history is empty>

4/16/2020 12:43:26 PM
C:\Users\csmith4\Documents\EAST\Workspaces\16438818.wsp

Receipt date: 06/12/2019

Filed via EFS @ USPTO.gov on June 12, 2019
Practitioner's Docket No. 1859.029USC4 (KRÜ0022-WO-US-T4)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Marc Krüger	Art Unit: TBA
Application No.: TBA	Examiner: TBA
Filed: Herewith	Conf. No.: TBA

For: PORTION CAPSULE HAVING AN IDENTIFIER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Applicant submits this statement in accordance with its duty of disclosure under 37 C.F.R. §§ 1.56, 1.97, and 1.98. The submission made herewith is in no way intended as an admission that the cited items constitute material prior art or otherwise would render the claims unpatentable in any way. The submission also is in no way intended to substitute for the Examiner's own independent investigation.

Form PTO/SB/08a is submitted herewith. Copies of foreign patent documents and non-patent literature have not been provided due to their presence in the parent application to this application (see MPEP 609.02(A)(2)), and Applicant notes that this section requires the Examiner to consider all of the references previously submitted to the USPTO even if not listed in any Information Disclosure Statement filed in this application. Applicant is resubmitting these references on the attached form PTO/SB/08a so that all of the references are listed on the face of the patent. However, to the extent that any references have been inadvertently overlooked, or otherwise are not resubmitted on this form, Applicant respectfully requests consideration of the previously submitted references as is set forth in MPEP 609.02(A)(2) and inclusion of such references on the face of the patent. Applicant respectfully solicits the Examiner's consideration of the cited references and entry thereof into the record of this application.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

Receipt date: 06/12/2019

This Information Disclosure Statement is being submitted prior to the mailing of a first Office Action or Notice of Allowance. No fees are believed to be due; however, if any fee is due with the filing of this paper, please charge the amount to Deposit Account 50-1097.

Date: June 12, 2019

/Paul J. Palinski/

Paul J. Palinski
Reg. No. 71,080
Attorney for Applicant
The Dobrusin Law Firm, P.C.
29 W. Lawrence Street - Suite 210
Pontiac, MI 48342
(248) 292-2920

Customer No. 25215

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 355 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

U.S. PATENTS					
Examiner Initials*	Cite No.	Patent Number	Kind Code	Issue Date	Name of Patentee or Applicant of cited Document
	1.	923,706		01/11/1909	Richey et al.
	2.	1,036,589		11/10/1911	Eggleston
	3.	1,051,426		02/15/1911	Matheson
	4.	1,329,461		02/03/1920	Frantz
	5.	1,485,200		02/26/1924	Roberts et al.
	6.	1,689,665		10/30/1928	Cramp
	7.	2,732,919		01/31/1956	Johnson
	8.	2,778,739		01/22/1957	Rodth
	9.	2,847,726		08/19/1958	Frick
	10.	3,039,153		06/19/1962	Dusing
	11.	3,183,096		05/11/1965	Hiscock
	12.	3,261,129		07/19/1966	Brydolf et al.
	13.	3,327,428		06/27/1967	Horton et al.
	14.	3,363,588		01/16/1968	Harrington et al.
	15.	3,416,183		12/17/1968	Martin
	16.	3,473,266		10/21/1969	Miller
	17.	3,480,989		12/02/1969	Edeus
	18.	3,611,637		10/12/1971	Saino
	19.	3,631,793		06/23/1969	Bednartz
	20.	3,640,727		02/08/1972	Heusinkveld
	21.	4,081,880		04/04/1978	Edeus
	22.	4,325,204		04/20/1982	Martine
	23.	4,404,770		09/20/1983	Markus
	24.	4,424,605		01/10/1984	Squires et al.
	25.	4,452,014		06/05/1984	Markus
	26.	4,488,387		12/18/1984	Foti
	27.	4,513,535		04/30/1985	Uphoff
	28.	4,534,985		08/13/1985	Gasau
	29.	4,540,595		09/10/1985	Acitelli et al.
	30.	4,633,614		01/06/1987	Van Weelden
	31.	4,644,151	A	05/12/1987	Piet
	32.	4,651,469		03/24/1987	Ngian et al.
	33.	4,676,482	A1	11/04/1987	Marvin et al.
	34.	4,680,828		07/21/1987	Cook et al.
	35.	4,742,645		05/10/1988	Johnston
	36.	4,859,337		08/22/1989	Woltermann
	37.	4,860,645	A	08/29/1989	Van Der Lijn et al.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 356 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	38.	4,867,993		09/19/1989	Nordskog
	39.	4,881,346		11/29/1989	Block
	40.	4,936,049		06/26/1990	Hansen
	41.	4,976,179		12/11/1990	Lacrouts-Cazenave
	42.	5,012,629		05/07/1991	Rehman et al.
	43.	5,028,769	A	07/02/1991	Claypool et al.
	44.	5,079,872		01/14/1992	Short
	45.	5,108,768	A	04/28/1992	So
	46.	5,242,702	A	09/07/1993	Fond
	47.	5,243,164	A	09/07/1993	Erickson et al.
	48.	5,251,758	A	10/12/1993	Kolacek
	49.	5,285,041	A	02/08/1994	Wright
	50.	5,301,468		04/12/1994	Kameaki
	51.	5,325,765	A	07/05/1994	Sylvan et al.
	52.	5,351,442	A	10/04/1994	Gingras
	53.	5,450,693	A	09/19/1995	Tarrega
	54.	5,460,078	A	10/24/1995	Weller
	55.	5,461,829	A	10/31/1995	Lehto et al.
	56.	5,496,573	A	03/05/1996	Tsuji et al.
	57.	5,501,945	A	03/26/1996	Kanakkanatt
	58.	5,535,765	A	07/16/1996	Takashima
	59.	5,566,505	A	10/22/1996	Kameaki
	60.	5,601,716	A	02/11/1997	Heinrich et al.
	61.	5,637,850	A	06/10/1997	Honda
	62.	5,656,311	A	08/12/1997	Fond
	63.	5,677,522	A	10/14/1997	Rice et al.
	64.	5,725,261	A	03/10/1998	Rahn
	65.	5,742,979	A	04/28/1998	Garcia-Hernando
	66.	5,840,189	A	11/24/1998	Sylvan et al.
	67.	5,888,549	A	03/30/1999	Buchholz et al.
	68.	5,895,672	A	04/20/1999	Cooper
	69.	5,917,165	A	06/29/1999	Platt et al.
	70.	5,941,055	A	08/24/1999	Coates
	71.	5,948,455	A	09/07/1999	Schaeffer et al
	72.	5,980,743	A	11/09/1999	Bairischer
	73.	5,994,677	A	11/30/1999	Akerlind
	74.	6,082,499	A	07/04/2000	O'Donnell
	75.	6,153,026	A	11/28/2000	Michotte
	76.	6,199,780	B1	03/13/2001	Görlitz
	77.	6,250,016	B1	06/26/2001	Gravel
	78.	6,289,643	B1	09/18/2001	Bonar

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	79.	6,299,926	B1	10/09/2001	Balakrishnan et al.
	80.	6,440,256	B1	08/27/2002	Gordon et al.
	81.	6,451,332	B1	09/17/2002	Tanaka et al.
	82.	6,589,577	B2	07/08/2003	Lazaris et al.
	83.	6,598,800	A1	07/29/2003	Schmit et al.
	84.	6,607,762	B2	08/19/2003	Lazaris et al.
	85.	6,627,244	B2	09/30/2003	Omura
	86.	6,645,537	B2	11/11/2003	Sweeney et al.
	87.	6,655,260	B2	12/02/2003	Lazaris
	88.	6,861,086	B2	03/01/2005	Buckingham et al.
	89.	6,871,448	B1	03/29/2005	Kline
	90.	6,948,420	B2	09/27/2005	Kirschner et al.
	91.	6,994,879	B2	02/07/2006	Cirigliano et al.
	92.	7,408,094	B2	08/05/2008	Little et al.
	93.	7,444,925	B2	02/07/2006	Cirigli
	94.	7,464,518	B2	12/16/2008	Ansinn
	95.	7,543,527	B2	06/09/2009	Schmed
	96.	7,552,672	B2	06/30/2009	Schmed
	97.	7,595,870	B2	09/29/2009	Ringlien
	98.	7,673,558	B2	03/09/2010	Panesar et al.
	99.	7,685,930	B2	03/30/2010	Mandralis et al.
	100	7,712,258	B2	05/11/2010	Ewing et al
	101	7,743,557	B2	06/29/2010	Liao
	102	7,779,578	B2	08/24/2010	Gray
	103	7,815,953	B2	10/19/2010	Mastropasqua et al.
	104	7,935,646	B2	05/03/2011	Viazmensky et al.
	105	7,946,217	B2	05/24/2011	Favre et al.
	106	7,981,451	B2	07/19/2011	Ozanne
	107	8,039,029	B2	10/18/2011	Ozanne
	108	8,039,034	B2	10/18/2011	Ozanne
	109	8,039,034	B2	10/18/2011	Ozanne
	110	8,088,423	B2	01/03/2012	Ohresser et al.
	111	8,109,200	B2	02/07/2012	Hansen
	112	8,114,461	B2	02/14/2012	Perlman et al.
	113	8,163,318	B2	04/24/2012	Ozanne et al.
	114	8,168,908	B2	05/01/2012	Heimann
	115	8,257,766	B2	09/04/2012	Yoakim et al.
	116	8,276,639	B2	10/02/2012	Binacchi

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	117	8,361,527	B2	01/29/2013	Winkler et al.
	118	8,443,549	B2	05/21/2013	Salvietti et al.
	119	8,474,368	B2	07/02/2013	Kilber et al.
	120	8,491,948	B2	07/23/2013	Ozanne et al.
	121	8,491,976	B2	07/23/2013	Sato et al.
	122	8,505,440	B2	08/13/2013	Kirschner et al.
	123	8,512,886	B2	08/20/2013	Ozanne
	124	8,579,006	B2	11/12/2013	Levin
	125	8,734,881	B2	05/27/2014	Yoakim et al.
	126	8,747,775	B2	06/10/2014	Sandvick
	127	8,794,125	B1	08/05/2014	Rivera
	128	8,906,436	B2	12/09/2014	Nowak
	129	8,916,220	B2	12/23/2014	Mahlich et al.
	130	8,956,672	B2	02/17/2015	Yoakim et al.
	131	9,049,958	B2	06/09/2015	Fischer
	132	9,072,402	B2	07/07/2015	Ryser
	133	9,079,705	B2	07/14/2015	Digiuni
	134	9,145,730	B1	09/29/2015	Santamaria
	135	9,150,347	B2	10/06/2015	Scheiber
	136	9,204,751	B2	12/08/2015	Peterson
	137	9,216,854	B2	12/22/2015	Schreiber
	138	9,227,837	B2	01/05/2016	Reinmuth
	139	9,271,602	B2	03/01/2016	Beaulieu et al.
	140	9,290,317	B2	03/22/2016	Quinn et al.
	141	9,295,278	B2	03/29/2016	Nowak
	142	9,357,791	B2	06/07/2016	Fountain et al.
	143	9,359,126	B2	06/07/2016	Wong et al.
	144	9,359,128	B2	06/07/2016	Mahlich
	145	9,392,902	B2	07/19/2016	Parentes et al.
	146	9,394,101	B2	07/19/2016	Empl
	147	9,409,703	B2	08/09/2016	Krüger et al.
	148	9,409,704	B2	08/09/2016	Digiuni et al.
	149	9,415,931	B2	08/16/2016	Gerbaulet et al.
	150	9,428,328	B2	08/30/2016	Trombetta et al.
	151	9,428,329	B2	08/30/2016	Trombetta et al.
	152	9,434,525	B2	09/06/2016	Fabozzi et al.
	153	9,486,108	B1	11/08/2016	Douglas et al.
	154	9,808,112	B2	11/07/2017	Favero et al.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

U.S. PATENT APPLICATION PUBLICATIONS					
Examiner Initials*	Cite No.	Publication Number	Kind Code	Publication Date	Name of Patentee or Applicant of cited Document
	1.	2001/0038204	A1	11/08/2001	Nojima et al
	2.	2001/0047724	A1	12/06/2001	Lazaris
	3.	2001/0181005	A1	08/09/2007	Kirschner et al.
	4.	2002/0020659	A1	02/21/2002	Sweeney
	5.	2002/0048621	A1	04/25/2002	Boyd et al.
	6.	2002/0088807	A1	07/11/2002	Perkovic et al.
	7.	2002/0104373	A1	08/08/2002	Ishihara et al.
	8.	2002/0110626	A1	08/15/2002	Buckingham et al.
	9.	2003/0005826	A1	01/09/2003	Sargent et al.
	10.	2003/0033938	A1	02/20/2003	Halliday et al.
	11.	2003/0039731	A1	02/27/2003	Dalton et al.
	12.	2003/0121979	A1	07/03/2003	Haens et al.
	13.	2003/0172813	A1	09/18/2003	Schifferle
	14.	2003/0222089	A1	12/04/2003	Hale
	15.	2004/0045443	A1	03/11/2004	Lazaris et al.
	16.	2004/0089158	A1	05/13/2004	Mahlich
	17.	2004/0089602	A1	05/13/2004	Heinrich et al.
	18.	2004/0115310	A1	06/17/2004	Yoakim et al.
	19.	2004/0142070	A1	07/22/2004	Haen
	20.	2004/0182250	A1	09/23/2004	Halliday et al.
	21.	2005/0000164	A1	01/06/2005	Jacobs
	22.	2005/0016383	A1	01/27/2005	Kirschner et al.
	23.	2005/0045566	A1	03/03/2005	Larkin et al.
	24.	2005/0051478	A1	03/10/2005	Karanikos et al.
	25.	2005/0150391	A1	07/14/2005	Schifferle
	26.	2005/0160919	A1	07/28/2005	Balkau
	27.	2005/0183581	A1	08/25/2005	Kirschner et al.
	28.	2005/0235571	A1	10/27/2005	Ewing et al.
	29.	2005/0266122	A1	12/01/2005	Franceschi
	30.	2006/0084344	A1	04/20/2006	Bonneh
	31.	2006/0107841	A1	05/25/2006	Schifferle
	32.	2006/0194004	A1	08/31/2006	Niemoller at al.
	33.	2006/0228447	A1	10/12/2006	Ganesan et al.
	34.	2006/0236871	A1	10/26/2006	Ternite et al.
	35.	2007/0148290	A1	06/28/2007	Ternite et al.
	36.	2007/0157821	A1	07/12/2007	Panesar et al.
	37.	2007/0181005	A1	08/09/2007	Kirschner et al.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	38.	2007/0181412	A1	08/09/2007	Raunig
	39.	2007/0203587	A1	08/30/2007	Erlandsson et al.
	40.	2007/0257118	A1	11/08/2007	Riley et al.
	41.	2007/0283640	A1	12/13/2007	Shivak et al.
	42.	2008/0026121	A1	01/31/2008	Mastropasqua et al.
	43.	2008/0028946	A1	02/07/2008	Kirschner et al.
	44.	2008/0038441	A1	02/14/2008	Kirschner
	45.	2008/0085356	A1	04/10/2008	Colliver et al.
	46.	2008/0148948	A1	06/26/2008	Evers et al.
	47.	2008/0187638	A1	08/07/2008	Hansen
	48.	2008/0245236	A1	10/09/2008	Ternite et al.
	49.	2008/0299262	A1	12/04/2008	Reati
	50.	2008/0302251	A1	12/11/2008	Rijskamp et al.
	51.	2009/0004343	A1	01/01/2009	Xiong et al.
	52.	2009/0007793	A1	01/08/2009	Glucksman et al.
	53.	2009/0007796	A1	01/08/2009	Maddalena Ricotti
	54.	2009/0092711	A1	04/09/2009	Ninh et al.
	55.	2009/0126577	A1	05/21/2009	Ternite
	56.	2009/0126577	A1	05/21/2009	Ternite
	57.	2009/0136626	A1	05/28/2009	Mueller
	58.	2009/0211458	A1	08/27/2009	Denisart et al.
	59.	2009/0211458	A1	08/27/2009	Denisart et al.
	60.	2009/0211713	A1	08/27/2009	Binacchi
	61.	2009/0289121	A1	11/26/2009	Maeda et al.
	62.	2009/0291379	A1	11/26/2009	Masaya Oota, et al.
	63.	2009/0324788	A1	12/31/2009	Roy et al.
	64.	2009/0324791	A1	12/31/2009	Ohresser et al.
	65.	2010/0000667	A1	01/07/2010	Funnell
	66.	2010/0028495	A1	02/04/2010	Novak et al.
	67.	2010/0050880	A1	03/04/2010	Suter et al.
	68.	2010/0051532	A1	03/04/2010	Wawrla et al.
	69.	2010/0054532	A1	03/04/2010	Mitte et al.
	70.	2010/0072272	A1	03/25/2010	Angros
	71.	2010/0078480	A1	04/01/2010	Aker
	72.	2010/0108541	A1	05/06/2010	Roberto
	73.	2010/0132564	A1	06/03/2010	Ozanne et al.
	74.	2010/0147418	A1	06/17/2010	Piana
	75.	2010/0181378	A1	07/22/2010	Hayakawa et al.
	76.	2010/0196545	A1	08/05/2010	Buffet et al.
	77.	2010/0239717	A1	09/23/2010	Yoakim et al.
	78.	2010/0239733	A1	09/23/2010	Yoakim et al.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	79.	2010/0239734	A1	09/23/2010	Yoakim,et al.
	80.	2010/0260915	A1	10/14/2010	Young
	81.	2010/0263329	A1	10/21/2010	Nash
	82.	2010/0288131	A1	11/18/2010	Kilber et al.
	83.	2010/0288133	A1	11/18/2010	Litzka et al.
	84.	2010/0303964	A1	12/02/2010	Beaulieu et al.
	85.	2010/0308061	A1	12/09/2010	Loulourgas
	86.	2011/0005399	A1	01/31/2011	Epars et al.
	87.	2011/0020500	A1	01/27/2011	Eichler et al.
	88.	2011/0033580	A1	02/10/2011	Biesheuvel et al.
	89.	2011/0041702	A1	02/24/2011	Yoakim
	90.	2011/0064852	A1	03/17/2011	Mann
	91.	2011/0064852	A1	03/17/2011	Mann
	92.	2011/0076361	A1	03/31/2011	Peterson et al.
	93.	2011/0089135	A1	04/21/2011	Simon et al.
	94.	2011/0097450	A1	04/28/2011	Krüger
	95.	2011/0142996	A1	06/16/2011	Krüger
	96.	2011/0189350	A1	08/04/2011	Van Belleghem et al.
	97.	2011/0212225	A1	09/01/2011	Mariller
	98.	2011/0250333	A1	10/13/2011	Ozanne
	99.	2011/0250812	A1	10/13/2011	Pourdeyhimi et al.
	100	2011/0303095	A1	12/15/2011	Fu et al.
	101	2011/0308397	A1	12/22/2011	Sinot et al.
	102	2012/0006685	A1	01/12/2012	Van Engelen
	103	2012/0058226	A1	03/08/2012	Winkler et al.
	104	2012/0060697	A1	03/15/2012	Ozanne
	105	2012/0070542	A1	03/22/2012	Camera et al.
	106	2012/0070543	A1	03/22/2012	Mahlich
	107	2012/0070551	A1	03/22/2012	Mahlich
	108	2012/0097041	A1	04/26/2012	Bucher et al.
	109	2012/0097602	A1	04/26/2012	Tedford
	110	2012/0100264	A1	04/26/2012	Bucher et al.
	111	2012/0121765	A1	05/17/2012	Kamerbeek et al.
	112	2012/0123106	A1	05/17/2012	Joos
	113	2012/0126834	A1	05/24/2012	Kleinhans
	114	2012/0183657	A1	07/19/2012	Marina et al.
	115	2012/0195155	A1	08/02/2012	Gennai et al.
	116	2012/0201933	A1	08/09/2012	Dran et al.
	117	2012/0207893	A1	08/16/2012	Krüger
	118	2012/0251668	A1	10/04/2012	Wong, et al.
	119	2012/0251672	A1	10/04/2012	Kamerbeek, et al.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	120	2012/0258210	A1	10/11/2012	Wong et al.
	121	2012/0295234	A1	11/22/2012	Rognon et al.
	122	2012/0308688	A1	12/06/2012	Peterson et al.
	123	2013/0055903	A1	03/07/2013	Deuber
	124	2013/0059039	A1	03/07/2013	Trombetta et al.
	125	2013/0064929	A1	03/14/2013	Jarisch et al.
	126	2013/0064937	A1	03/14/2013	Jarisch et al.
	127	2013/0084363	A1	04/04/2013	Krueger et al.
	128	2013/0084376	A1	04/04/2013	Fischer et al.
	129	2013/0101716	A1	04/25/2013	Beaulieu et al.
	130	2013/0122153	A1	05/16/2013	Ferrier et al.
	131	2013/0125762	A1	05/23/2013	Dogan et al.
	132	2013/0129872	A1	05/23/2013	Krueger et al.
	133	2013/0136828	A1	05/30/2013	Anghileri
	134	2013/0149424	A1	06/13/2013	Fischer
	135	2013/0156897	A1	06/20/2013	Goldstein
	136	2013/0206011	A1	08/15/2013	Ozanne et al.
	137	2013/0209618	A1	08/15/2013	Trombetta et al.
	138	2013/0209619	A1	08/15/2013	Mahlich
	139	2013/0209620	A1	08/15/2013	Ozanne et al.
	140	2013/0209622	A1	08/15/2013	Fountain et al.
	141	2013/0216663	A1	08/22/2013	Dogan et al.
	142	2013/0230627	A1	09/05/2013	Hansen et al.
	143	2013/0243910	A1	09/19/2013	Krueger et al.
	144	2013/0312619	A1	11/28/2013	Spiegel et al.
	145	2013/0327223	A1	12/12/2013	Bartoli et al.
	146	2014/0001563	A1	01/03/2014	Krueger et al.
	147	2014/0004231	A1	01/02/2014	Norton et al.
	148	2014/0017359	A1	01/16/2014	Krueger et al.
	149	2014/0046126	A1	02/13/2014	Gilligan et al.
	150	2014/0127364	A1	05/08/2014	Fu et al.
	151	2014/0141128	A1	05/22/2014	Trombetta et al.
	152	2014/0141129	A1	05/22/2014	Greene
	153	2014/0161936	A1	06/12/2014	Trombetta et al.
	154	2014/0178538	A1	06/26/2014	Husband et al.
	155	2014/0196608	A1	07/17/2014	Amrein et al.
	156	2014/0220191	A1	08/07/2014	Kelly et al.
	157	2014/0224130	A1	08/14/2014	Castellani et al.
	158	2014/0230370	A1	08/21/2014	Bianchi
	159	2014/0263033	A1	09/18/2014	Fu et al.
	160	2014/0287104	A1	09/25/2014	Austin et al.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 363 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	161	2014/0287105	A1	09/25/2014	Husband et al.
	162	2014/0346022	A1	11/27/2014	Keller et al.
	163	2014/0348984	A1	11/27/2014	Zeller et al.
	164	2014/0370181	A1	12/18/2014	Young et al.
	165	2015/0010680	A9	01/08/2015	Mahlich
	166	2015/0020481	A1	01/22/2015	Hodler
	167	2015/0029702	A1	01/29/2015	Foley
	168	2015/0056331	A1	02/26/2015	Rivera
	169	2015/0056340	A1	02/26/2015	Trombetta et al.
	170	2015/0056351	A1	02/26/2015	Deuber
	171	2015/0079241	A1	03/19/2015	Mahlich
	172	2015/0119220	A1	04/30/2015	Rea et al.
	173	2015/0128525	A1	05/14/2015	Bartoli et al.
	174	2015/0132441	A1	05/14/2015	Accursi
	175	2015/0157164	A1	06/11/2015	Digiuni
	176	2015/0158665	A1	06/11/2015	Krueger et al.
	177	2015/0158666	A1	06/11/2015	Krüger et al.
	178	2015/0166204	A1	06/18/2015	Rea et al.
	179	2015/0173558	A1	06/25/2015	Cross et al.
	180	2015/0175347	A1	06/25/2015	Empl
	181	2015/0201790	A1	07/23/2015	Smith et al.
	182	2015/0239652	A1	08/27/2015	Trombetta et al.
	183	2015/0246741	A1	09/03/2015	Hansen et al.
	184	2015/0274411	A1	10/01/2015	Krueger
	185	2015/0297021	A1	10/22/2015	Bugnano et al.
	186	2015/0297023	A1	10/22/2015	Hansen et al.
	187	2015/0314954	A1	11/05/2015	Empl
	188	2015/0329282	A1	11/19/2015	Bartoli et al.
	189	2015/0353275	A1	12/10/2015	Accursi
	190	2015/0375926	A1	12/31/2015	Fischer
	191	2016/0001968	A1	01/07/2016	Krüger et al.
	192	2016/0037961	A1	02/11/2016	Digiuni
	193	2016/0045060	A1	02/18/2016	Flick
	194	2016/0058234	A1	03/03/2016	Eppler et al.
	195	2016/0066591	A1	03/10/2016	Halliday et al.
	196	2016/0075506	A1	03/17/2016	Chapman et al.
	197	2016/0194146	A1	07/07/2016	Schelch et al.
	198	2016/0207696	A9	07/21/2016	Trombetta et al.
	199	2016/0242594	A1	08/25/2016	Empl et al.
	200	2016/0251150	A1	09/01/2016	Macchi et al.
	201	2016/0325921	A1	11/10/2016	Empl

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	202	2016/0332759	A1	11/17/2016	Trombetta et al.
	203	2016/0340110	A1	11/24/2016	Trombetta et al.
	204	2017/0020329	A1	01/26/2017	Douglas et al.
	205	2017/0027374	A1	02/02/2017	Smith et al.

FOREIGN PATENT DOCUMENTS							
Examiner Initial*	Cite No.	Foreign Document Number	Country Code	Kind Code	Publication Date	Name of Patentee or Applicant of cited Document	T[5]
	1.	2327021 (also published as US6440256)	CA	C	01/04/2005	Helmbrecht et al.	
	2.	2399283 (also published as US6589577)	CA	C	05/01/2007	Lazaris et al.	
	3.	2399290 (also published as US6607762)	CA	C	01/10/2006	Lazaris et al.	
	4.	2400033 (also published as US6645537)	CA	C	02/08/2005	Beaulieu et al.	
	5.	2436389 (also published as US6861086)	CA	A1	08/22/2002	Buckingham et al.	
	6.	2531544 (also published as US7946217)	CA	C	05/01/2012	Favre et al.	
	7.	2538256 (also published as US2005/0051478)	CA	C	08/02/2011	Karanikos et al.	
	8.	2661921 (also published as US8512886)	CA	A1	03/06/2008	Ozanne	
	9.	2662069 (also published as US8039029)	CA	C	01/08/2013	Ozanne	
	10.	2662071	CA	C	07/05/2011	Ozanne et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US8491948)					
	11.	2763746 (also published as US8114461)	CA	A1	03/11/2010	Perlman et al.	
	12.	2784752 (also published as US9204751)	CA	C	06/23/2011	Peterson	
	13.	2785843 (also published as US2013/0156897)	CA	A1	02/10/2013	Goldstein	
	14.	2788283 (also published as US9428328)	CA	A1	03/01/2013	Trombetta et al.	
	15.	2810236 (also published as US2013/0209618)	CA	C	07/09/2013	Trombetta et al.	
	16.	2810237 (also published as US8361527)	CA	A1	03/08/2012	Winkler et al.	
	17.	2832794 (also published as US2014/0127364)	CA	C	03/22/2016	Fu et al.	
	18.	2833096 (also published as US2014/0141128)	CA	C	05/31/2016	Fu et al.	
	19.	2839293 (also published as US2012/0308688)	CA	A1	12/20/2012	Peterson et al.	
	20.	2850010 (also published as US2014/0230370)	CA	A1	05/10/2013	Bianchi	
	21.	2866119 (also published as US2015/0020481)	CA	A1	09/19/2013	Hodler	
	22.	2872667 (also published as US2015/0157164)	CA	A1	11/21/2013	Digiuni et al.	
	23.	2874025 (also published as US2015/0119220)	CA	A1	12/27/2013	Rea et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	24.	2874070 (also published as US2015/0166204)	CA	A1	12/27/2013	Rea et al.	
	25.	2877027 (also published as US9394101)	CA	A1	12/27/2013	Empl	
	26.	2877090 (also published as US9409704)	CA	A1	01/09/2014	Digiuni et al.	
	27.	2886299	CA	A1	04/03/2014	Krüger	
	28.	2888129 (also published as US2015/0246741)	CA	A1	04/24/2014	Hansen et al.	
	29.	2888658 (also published as US2014/0161936)	CA	C	06/12/2014	FU et al.	
	30.	2898173 (also published as US2015/0353275)	CA	A1	08/07/2014	Accursi	
	31.	2901582 (also published as US2016/0075506)	CA	A1	11/20/2014	Chapman et al.	
	32.	2901664 (also published as US2016/0066591)	CA	A1	11/20/2014	Halliday et al.	
	33.	2902231	CA	A1	08/28/2014	Trombetta et al.	
	34.	2902412 (also published as US2016/0001968)	CA	A1	09/04/2014	Krüger et al.	
	35.	2905188 (also published as US2014/0263033)	CA	A1	09/18/2014	FU et al.	
	36.	2922822 (also published as US2015/0056340)	CA	A1	02/26/2015	Trombetta et al.	
	37.	2922824 (also published as US2015/0056340)	CA	A1	02/26/2015	Trombetta et al.	
	38.	101014513 (also published as US2009/0211458)	CN	A	08/08/2007	Denisart et al.	

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 367 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	39.	101090657 (also published as US2008/0187638)	CN	A	12/19/2007	Hansen	
	40.	101646613 (also published as US2001/0181005)	CN	A	02/10/2010	Kirschner et al.	
	41.	102741136 (also published as US2011/0064852)	CN	A	10/17/2012	Torsten	
	42.	102791595 (also published as US2015/0079241)	CN	A	11/21/2012	Mahlich	
	43.	102958816 (also published as US2013/0055903)	CN	A	03/06/2013	Deuber	
	44.	103501624 (also published as US2014/0017359)	CN	A	01/08/2014	Krueger et al.	
	45.	104334473 (also published as US2015/0132441)	CN	A	02/04/2015	Accursi	
	46.	102012109186 (also published as US2015/0274411)	DE	A1	03/27/2014	Krüger	
	47.	1207866	DE	B	12/23/1965	Bentz	X
	48.	1221960	DE	B	07/28/1966	Bentz &Sohn Melitta	X
	49.	69615001 (also published as US5948455)	DE	T2	03/21/2002	Yoakim et al.	
	50.	102004056224 (also published as US2009/0126577)	DE	A1	05/24/2006	TCHIBO GMBH	
	51.	102006004329	DE	A1	08/09/2007	Martinez et al.	
	52.	102010027485	DE	A1	01/19/2012	Krueger	X
	53.	102010034206	DE	A1	02/16/2012	Eppler	X
	54.	102011010534	DE	A1	08/09/2012	Krüger et al.	
	55.	102011012881 (also published as US9359128)	DE	A1	03/22/2012	Gotthard Mahlich	
	56.	102011115833	DE	A1	04/18/2013	Krüger et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US9409703)					
	57.	102012105282 (also published as US9394101)	DE	A1	12/19/2013	Empl	
	58.	102012109186 (also published as US2015274411)	DE	A1	03/27/2014	Krüger	
	59.	102012110446	DE	A1	01/02/2014	Krüger et al.	X
	60.	102014018470	DE	A1	06/16/2016	Heimann et al.	X
	61.	202006003115	DE	U1	05/11/2006	Unknown	X
	62.	202009014945 (also published as US 9,072,402)	DE	U1	09/23/2010	Ryser	
	63.	202009014945 (also published as US 9,072,402)	DE	U1	09/23/2010	Ryser	
	64.	202010007919 (also published as US2013/0209619)	DE	U1	11/11/2010	Mahlich	
	65.	0224297 (also published as US4860645)	EP	A1	06/03/1987	Van Der Lijn	
	66.	0244339 (also published as US4676482)	EP	A1	11/04/1987	Reece et al.	
	67.	0468078 (also published as US 5,242,702)	EP	A1	01/29/1992	Fond	
	68.	0468079	EP	A1	01/29/1992	Fond	
	69.	0656224 (also published as US5601716)	EP	A1	06/07/1995	Heinrich et al.	
	70.	0859467 (also published as US5917165)	EP	A1	08/19/1998	Platt et al.	
	71.	0923865 (also published as US6451332)	EP	A2	06/23/1999	Tanaka et al.	
	72.	1129623	EP	A1	09/05/2001	Diaz	
	73.	1221418	EP	A1	07/10/2002	Perkovic et al	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US2002/0088807)					
	74.	1263661 (also published as US6645537)	EP	A1	12/11/2002	Sweeney et al.	
	75.	1344722 (also published as US7543527)	EP	A1	09/17/2003	Schifferle	
	76.	1344724	EP	A1	09/17/2003	Hale	
	77.	1363501 (also published as US2002/0110626)	EP	A2	11/26/2003	Buckingham	
	78.	1471012	EP	A2	10/27/2004	Tuens	
	79.	1500358 (also published as US7685930)	EP	A1	01/26/2005	Mandralis et al.	
	80.	1555219 (also published as US7552672)	EP	A1	07/20/2005	Schifferle	
	81.	1559351 (also published as US2005/0160919)	EP	A2	08/03/2005	Balkau	
	82.	1586534 (also published as US2008/0148948)	EP	A1	10/19/2005	Evers et al.	
	83.	1710173 (also published as US2006/0236871)	EP	A1	10/11/2006	Ternite et al.	
	84.	1774878 (also published as US8039034)	EP	A1	04/18/2007	Ozanne	
	85.	1792850 (also published as US2007/0148290)	EP	B1	06/06/2007	Ternite et al.	
	86.	1796516 (also published as US 8,109,200)	EP	A2	06/20/2007	Hansen	
	87.	1849718	EP	A1	10/31/2007	Rubino	
	88.	1882431 (also published as US8088423)	EP	B1	04/28/2010	Ohresser et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	89.	1882432 (also published as US2009/0324791)	EP	B1	01/30/2008	Ohresser et al	
	90.	1892199	EP	A1	02/27/2008	Ternite	X
	91.	1974638 (also published as US2008/0024536)	EP	A1	10/01/2008	Ternite et al.	
	92.	2158829 (also published as US2010/0050880)	EP	A1	03/03/2010	Suter et al.	
	93.	2218653	EP	A1	08/18/2010	Wons UWE	X
	94.	2230195 (also published as US8734881)	EP	A1	09/22/2010	Yoakim et al.	
	95.	2239211 (also published as US8257766)	EP	A1	10/13/2010	Yoakim et al.	
	96.	2284102	EP	A1	02/16/2011	Schulte et al.	
	97.	2287090 (also published as US2011/0041702)	EP	A1	02/23/2011	Yoakim	
	98.	2345352 (also published as US2012/0295234)	EP	A1	07/20/2011	Rognon et al.	
	99.	2364930 (also published as US8956672)	EP	A2	09/14/2011	Yoakim et al.	
	100	2384133 (also published as US2011/0250333)	EP	B1	11/09/2011	Ozanne	
	101	2384996 (also published as US 2013/0055903)	EP	A1	11/09/2011	Deuber	
	102	2412645	EP	A1	02/01/2012	Hiridjee	X
	103	2412646 (also published as US2013/0125762)	EP	A1	02/01/2012	Dogan et al.	
	104	2444339 (also published as US2013/0216663)	EP	A1	04/25/2012	Dogan, et al.	
	105	2476633	EP	A1	07/18/2012	Amrein et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US2014/0196608)					
	106	2484505 (also published as US2012/0195155)	EP	A2	08/08/2012	Gennai et al.	
	107	2510805 (also published as US2011/0033580)	EP	A2	10/17/2012	Biesheuvel et al.	
	108	2537778	EP	A1	12/26/2012	Pineschi	
	109	2559636 (also published as US9434525)	EP	A1	02/20/2013	Fabozzi	
	110	2647317 (also published as US2015/0056351)	EP	A1	10/09/2013	Deuber	
	111	2720961 (also published as US2012/0308688)	EP	A1	04/23/2014	Peterson et al.	
	112	2750876 (also published as US2013/0209618)	EP	A1	07/09/2014	Trombetta et al.	
	113	2752372 (also published as US2005/0051478)	EP	A1	07/09/2014	Karanikos et al.	
	114	2809006 (also published as US2014/0346022)	EP	A1	12/03/2014	Keller et al.	
	115	2909088 (also published as US2015/0246741)	EP	A1	08/26/2015	Hansen et al.	
	116	2971319 (also published as US2014/0263033)	EP	A1	01/20/2016	Fu et al.	
	117	2996522 (also published as US2016/0066591)	EP	A1	03/23/2016	Halliday et al.	
	118	2963332 (also published as US2013/0122153)	FR	A1	02/03/2012	Ferrier et al.	
	119	2912124	FR	A1	08/08/2008	Blanc et al.	
	120	2556323	FR	A1	06/14/1985	Munier Rene	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	121	1402799	GB	A	08/13/1975	Battelle Memorial Institute	
	122	2482032 (also published as US9357791)	GB	A	01/18/2012	Fountain et al.	
	123	2489409 (also published as US2014/0004231)	GB	A	10/03/2012	Norton et al.	
	124	H04176311	JP	A	06/24/1992	Moji et al.	X
	125	H06510682 (also published as US5,460,078)	JP	A	12/01/1994	Weller	
	126	H0394377	JP	A	04/19/1991	Toshiaki	
	127	2013-538609 (also published as US9,049,958)	JP	A	10/17/2013	Fischer	
	128	2004-533305 (also published as US2004/0115310)	JP	A	11/04/2004	Unknown	
	129	2011-530321 (also published as US2011/0033580)	JP	A	12/22/2011	Unknown	
	130	2014-529527 (also published as US2013/0209618)	JP	A	11/13/2014	Trombetta et al.	
	131	2010-528635 (also published as US9,277,837)	JP	A	08/26/2010	Yoakim et al.	
	132	2007-522856 (also published as US 7,673,558)	JP	A	08/16/2007	Panesar et al.	
	133	2003-522567 (also published as US2003/033938)	JP	A	07/29/2003	Halliday et al.	
	134	2010-516364 (also published as US2013/0206011)	JP	A	05/20/2010	Ozanne et al.	
	135	2009-511143 (also published as US8039034)	JP	A	03/09/2009	Ozanne	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	136	2006-510682 (also published as US7,408,094)	JP	A	03/30/2006	Little et al.	
	137	2010-507418 (also published as US2010/0051532)	JP	A	03/11/2010	Wawrla et al.	
	138	2010-500199 (also published as US 2010/0000667)	JP	A	01/07/2010	Funnell	
	139	2010-500199 (also published as US 2010/0000667)	JP	A	01/07/2010	Funnell	
	140	2002-347852	JP	A	12/04/2002	SHOWA DENKO PLASTIC PROD CO	
	141	2002-274000	JP	A	09/25/2002	DAINIPPON PRINTING CO LTD	
	142	2003-265320 (also published as US2003/0172813)	JP	A	09/24/2003	Schifferle	
	143	2001-250161	JP				
	144	H01-233688	JP	A	09/19/1989	TOKYU CAR CORP	
	145	2005-199070 (also published as US2005/0150391)	JP	A	07/28/2005	Schifferle	
	146	S62-168512	JP	A	07/24/1987	Yoosuto et al.	
	147	S62-130649	JP	A	06/12/1987	Shiengu et al.	X
	148	2004-097015	JP	A	04/02/2004	Matsuura	X
	149	2004-097015	JP	A	04/02/2004	Matsuura	
	150	2001-082699	JP	A	03/30/2001	Suzuki et al	
	151	2002-018213 (also published as US6,440,256)	JP	A	01/22/2002	Gordon et al.	
	152	2001-017094	JP	A	01/23/2001	Toshiyuki et al.	X
	153	1233688	JP	A	09/19/1989	Yasuhiko	
	154	02289207	JP	A	11/29/1990	Ozasa et al.	abs.
	155	1020050107747	KR	A	11/15/2005	Halliday et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	156	596919 (also published as US2010/0303964)	NZ	A	11/29/2013	Beaulieu et al.	
	157	01/99047 (also published as US2003/121979)	WO		12/27/2001	Haens et al.	
	158	02/078498 (also published as US2004/0089158)	WO	A1	10/10/2002	Mahlich	
	159	2001/60712 (also published as US2002/0020659)	WO	A1	08/23/2001	Sweeney et al.	
	160	2004/082390 (also published as US2006/0228447)	WO	A1	09/30/2004	Ganesan et al.	
	161	2005/044067	WO	A1			
	162	2005/044067	WO	A1	05/19/2005	Ruchonnet	
	163	2005/079638 (also published as US2007/0157821)	WO	A1	09/01/2005	Panesar	
	164	2006/014936 (also published as US2008/0187638)	WO	A2	02/09/2006	Hansen	
	165	2006/021405 (also published as US2009/211458)	WO	A2	03/02/2006	Denisart et al.	
	166	2006/021405 (also published as US2009/211458)	WO	A2	03/02/2006	Denisart et al.	
	167	2006/053635 (also published as US2009/0126577)	WO	A1	05/26/2006	Ternite	
	168	2006/121520 (also published as US2005/0183581)	WO	A2	11/16/2006	Kirschner et al.	
	169	2007/042414 (also published as US7981451)	WO	A1	04/19/2007	Ozanne	
	170	2007/042486	WO	A2	04/19/2007	Van Belleghem	
	171	2008/011913 (also published as US2008/0026121)	WO	A1	01/31/2008	Mastropasqua et al.	

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 375 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	172	2008/0132571	WO	A1	11/06/2008	Pineschi	
	173	2008/090122 (also published as US2013/0209620)	WO	A2	07/31/2008	Ozanne et al.	
	174	2008/107645 (also published as US2010/0196545)	WO	A2	09/12/2008	Buffet et al.	
	175	2008/107645 (also published as US2010/0196545)	WO	A2	09/12/2008	Buffet et al.	
	176	2008/121489 (also published as US8505440)	WO	A1	10/09/2008	Kirschner et al.	
	177	2008/126045 (also published as US2010/0108541)	WO	A1	10/23/2008	Degli	
	178	2009/084061	WO	A1	07/09/2009	Nani	
	179	2009/114119 (also published as US2010/0028495)	WO	A1	09/17/2009	Novak et al.	
	180	2009/115475 (also published as US2011/0005399)	WO	A1	09/24/2009	Epars et al.	
	181	2009/130311 (also published as US2011/0189350)	WO	A1	10/29/2009	Van Belleghem et al.	
	182	2009/153161	WO	A1	12/23/2009	Ofenhitzer et al.	X
	183	2010/007633	WO	A1	01/21/2010	Quadrelli	
	184	2010/013146	WO	A3	04/29/2010`	Cometto	
	185	2010/041179 (also published as US2011/212225)	WO	A2	04/15/2010	Mariller	
	186	2010/041179 (also published as US2011/212225)	WO	A2	04/15/2010	Mariller	
	187	2010/085824	WO	A1	08/05/2010	Eder et al.	
	188	2010/118545	WO	A2	10/21/2010	Deuber	X
	189	2010/137952 (also published as US2012/0121765)	WO	A1	12/02/2010	Kamerbeek et al.	
	190	2010/137960	WO	A1	12/02/2010	Wong et al.	

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 376 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US9359126)					
	191	2010/138563 (also published as US2013/0101716)	WO	A1	11/29/2010	Beaulieu et al.	
	192	2011/000723 (also published as US2012/0100264)	WO	A2	01/06/2011	Bucher et al.	
	193	2011/012501 (also published as US2012/0126834)	WO	A1	02/03/2011	Kleinhans	
	194	2011/089049 (also published as US2012/0295234)	WO	A1	07/28/2011	Rognon et al.	
	195	2011/137550 (also published as US2013/0055903)	WO	A1	11/10/2011	Deuber	
	196	2011/147491 (also published as US2013/0084376)	WO	A1	12/01/2011	Fischer et al.	
	197	2011/147553 (also published as US2013/0149424)	WO	A1	12/01/2011	Fischer	
	198	2011/147591 (also published as US2013/0084363)	WO	A1	12/01/2011	Krueger et al.	
	199	2012/000878 (also published as US9392902)	WO	A2	01/05/2015	Parentes et al.	
	200	2012/007257 (also published as US9,290,317)	WO	A1	01/19/2012	Quinn et al.	
	201	2012/009668 (also published as US2013/0209622)	WO	A1	01/19/2012	Fountain et al.	
	202	2012/010317 (also published as US2013/0129872)	WO	A1	01/26/2012	Krueger	
	203	2012/019902 (also published as US9808112)	WO	A1	02/16/2012	Favero et al.	
	204	2012/038063	WO	A1	03/29/2012	Mahlich	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US8916220)					
	205	2012/080501 (also published as US2014/0196608)	WO	A1	06/21/2012	Amrein et al.	
	206	2012/080928 (also published as US2013/0327223)	WO	A1	06/21/2012	Bartoli et al.	
	207	2012/100977 (also published as US9415931)	WO	A1	08/02/2012	Gerbaulet et al.	
	208	2012/104760	WO	A1	08/09/2012	Bartoli et al.	
	209	2012/123106 (also published as US2014/0017359)	WO	A1	09/20/2012	Marc Krueger et al.	
	210	2012/127233 (also published as 2014/0004231)	WO	A2	09/27/2012	Norton et al.	
	211	2012/135204 (also published as US2014/0348984)	WO	A1	10/04/2012	Zeller et al.	
	212	2012/174331 (also published as US2012/0308688)	WO	A1	12/20/2012	Peterson et al.	
	213	2012/175985 (also published as US2014/0287104)	WO	A1	12/27/2012	Peter et al.	
	214	2013/008012 (also published as US2014/0220191)	WO	A2	01/17/2013	Kelly et al.	
	215	2013/029184 (also published as US2013/0209618)	WO	A1	03/07/2013	Trombetta et al.	
	216	2013/032330 (also published as US2014/0178538)	WO	A1	03/07/2013	Husband et al.	
	217	2013/043048 (also published as US2014/0287105)	WO	A1	03/28/2013	Husband et al.	
	218	2013/053757	WO	A1	04/18/2013	Krueger et al.	

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 378 of 421

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US2013/0243910)					
	219	2013/064988 (also published as US2014/0230370)	WO	A1	05/10/2013	Bianchi	
	220	2013/136209 (also published as US2016/0037961)	WO	A1	09/19/2013	Digiuni	
	221	2013/149354 (also published as US2015/0056351)	WO	A2	10/10/2013	Deuber	
	222	2013/171663 (also published as US2015/0128525)	WO	A1	11/21/2013	Bartoli et al.	
	223	2013/189555 (also published as 2015/0166204)	WO	A1	12/27/2013	Rea	
	224	2013/189923 (also published as US2015/0175347)	WO	A1	12/27/2013	Empl	
	225	2013/189923 (also published as US2015/0175347)	WO	A1	12/27/2013	Empl	
	226	2014/001563 (also published as US2015/0158666)	WO	A1	01/03/2014	Krueger et al.	
	227	2014/001564 (also published as US2015/0158665)	WO	A1	01/03/2014	Krueger et al.	
	228	2014/006048 (also published as US2015/0173558)	WO	A2	01/09/2014	Cross et al.	
	229	2014/049143 (also published as US2015/0274411)	WO	A2	04/03/2014	Krueger	
	230	2014/090567 (also published as US20150314954)	WO	A1	06/19/2014	Empl	
	231	2014/102702 (also published as US20150329282)	WO	A1	07/03/2014	Bartoli et al	
	232	2014/127863	WO	A1	08/28/2014	Fischer	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

		(also published as US2015/0375926)					
	233	2014/128205 (also published as US2016/0058234)	WO	A1	08/28/2014	Eppler et al.	
	234	2014/131779 (also published as US2016/0001968)	WO	A1	09/04/2014	Krüger et al.	
	235	2015/028425 (also published as US2016/0194146)	WO	A2	03/05/2015	Schelch et al.	
	236	2015/062703 (also published as US2016/0251150)	WO	A1	05/07/2015	Macchi et al.	
	237	2015/075584	WO	A1	05/28/2015	Accursi	
	238	2015/107484	WO	A1	07/23/2015	Rivola et al.	
	239	2016/077916	WO	A1	05/26/2016	Hanneson et al.	
	240	98/51396	WO	A1	11/19/1998	Timmermann et al.	X
	241	99/58035 (also published as US5,895,672)	WO	A1	11/18/1999	Cooper	

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initial*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1.	Rawle, Alan, "Particle Sizing – An Introduction" 2012; Silver Colloids, Edition or volume on Colloidal Silver	
	2.	Decision on Appeal before the Patent Trial and Appeal Board for Appeal No. 2017-007984 dated May 10, 2019.	
	3.	Notice of Opposition regarding EP3023362 filed July 30, 2018.	
	4.	Search Report for CN201180035944 mailed September 25, 2014.	
	5.	First Office Action for Application No. CN201180035944 mailed October 10, 2014.	
	6.	Second Office Action for Application No. CN201180035944 mailed April 21, 2015.	
	7.	Third Office Action for Application No. CN201180035944 mailed November 12, 2015.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	8.	Notification to Grant Patent for Application No. CN201180035944 mailed May 25, 2016.	
	9.	Search Report for CN201610644043 mailed May 11, 2018	
	10.	First Office Action for CN201610644043 mailed May 28, 2018	
	11.	Search Report and Written Opinion for PCT/EP2011/003677 mailed July 22, 2011.	
	12.	Search Report and Written Opinion for Application No. EP 15174333.3 dated November 3, 2015. (EP2952453)	
	13.	Office Action for Application No. EP 15174333.3 dated August 16, 2016. (EP2952453)	
	14.	Search Report and Written Opinion for Application No. EP 15173071.0 dated November 5, 2015. (EP2957525)	
	15.	Office Action for Application No. EP 15173071.0 dated November 5, 2015. (EP2957525)	
	16.	Third party observation for Application No. EP2957525 dated September 30, 2016.	
	17.	Search Report and Written Opinion for Application No. EP 15197332.8 dated April 12, 2016. (EP3023361)	
	18.	First Office Action for Application No. EP 15197332.8 dated January 19, 2017. (EP3023361)	
	19.	Second Office Action for Application No. EP 15197332.8 dated May 24, 2017. (EP3023361)	
	20.	Third Office Action for Application No. EP 15197332.8 dated November 2, 2017. (EP3023361)	
	21.	Search Report and Written Opinion for Application No. EP 15197336.9 dated April 4, 2016 (EP3023362)	
	22.	Search Report and Written Opinion for Application No. EP 15197338.5 dated April 7, 2016 (EP3023363)	
	23.	Search Report for Application No. JP 2013-520009 dated November 25, 2014. (JP5946828)	
	24.	First Office Action for Application No. JP 2013-520009 dated December 10, 2014. (JP5946828)	
	25.	Second Office Action for Application No. JP 2013-520009 dated August 19, 2015. (JP5946828)	
	26.	Decision to Grant for Application No. JP 2013-520009 dated April 28, 2016. (JP5946828)	
	27.	Search Report for Application No. JP 2016-032427 dated November 21, 2016. (JP2016163691)	
	28.	First Office Action for Application No. JP 2016-032427 dated November 28, 2016. (JP2016163691)	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	TBA
	Filing Date	Herewith
	First Named Inventor	Marc Krüger
	Art Unit	TBA
	Examiner Name	TBA
	Attorney Docket Number	1859.029USC4 (KRÜ0022-WO-US-T4)

	29.	Second Office Action for Application No. JP 2016-032427 dated June 20, 2017. (JP2016163691)	
	30.	Search Report for Application No. JP 2017-034769 dated November 15, 2017. (JP2017148511)	
	31.	Office Action for Application No. JP 2017-034769 dated January 30, 2018. (JP2017148511)	
	32.	Office Action for Application No. KR 10-2013-7004356 dated April 5, 2018. (KR20137004356)	
	33.	Office Action for Application No. 10-2017-7019956 dated April 10, 2018. (KR20170087528)	

EXAMINER SIGNATURE			
Examiner Signature	/CHAIM A SMITH/	Date Considered	04/13/2020
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.A.S/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/438,818	06/12/2019	Marc Krüger	1859.029USC4	8813

25215 7590 07/24/2020

The Dobrusin Law Firm P.C.
29 W. Lawrence Street
Suite 210
Pontiac, MI 48342

EXAMINER
SMITH, CHAIM A

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
07/24/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dobrusin_PAIR@firsttofile.com
patmail@patentco.com
rmasquelier@patentco.com

Applicant-Initiated Interview Summary	**Application No.** 16/438,818	**Applicant(s)** Krüger, Marc	
	Examiner CHAIM A SMITH	**Art Unit** 1792	**AIA (FITF) Status** No

All participants (applicant, applicants representative, PTO personnel):

(1) CHAIM A. SMITH. (3) _____.

(2) PAUL PALINSKI. (4) _____.

Date of Interview: 17 July 2020.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☑Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Mr. Paulinski called to discuss the claims in general and particularly the placement of the barcode on the peripheral region of the peripheral region of the basic element prior to the submission of an amendment..

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/C.S./ Examiner, Art Unit 1792	/VIREN A THAKUR/ Primary Examiner, Art Unit 1792

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Filed Via EFS @ USPTO.Gov on July 28, 2020
Attorney Docket No.: 1859.029USC4 (KRÜ0022-WO-US-T4)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Marc Krüger	Art Unit: 1792
Application No.: 16/438,818	Examiner: Smith, Chaim A.
Filed: June 12, 2019	Conf. No.: 8813

For: PORTION CAPSULE HAVING AN IDENTIFIER

Attorney Docket No.: 1859.029USC4 (KRÜ0022-WO-US-T4)

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE AND AMENDMENT

In response to the Office Action mailed April 30, 2020, please amend the above-identified application as follows and consider the following remarks.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 386 of 421

Amendments to the Specification

Included herewith is a Substitute Specification provided by way of a marked-up copy and a corresponding clean copy. No new matter has been added. Entry of the Substitute Specification is respectfully requested.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 387 of 421

Amendments to the Claims

1. (Currently Amended) Single-serve capsule for making a beverage, having a ~~basic~~ base element made of metal with a cavity that is free of a filter, and in which a raw beverage material is provided, the cavity including radially spaced and vertically oriented ribs, the capsule having a peripheral region which is provided on the ~~basic~~ base element, and the cavity being closed by a ~~membrane~~metal cover, which is fastened on a top side of the peripheral region of the ~~basic~~ base element, the base element comprises a wall region extending between the peripheral region and a bottom region of the base element, the wall region includes radially spaced and vertically oriented grooves that are free from extending entirely to the bottom region,

wherein the capsule has an identifier, which makes it possible to individualize the respective single-serve capsule, ~~characterized in that~~ the identifier is a barcode ~~which is~~ provided on a bottom ~~that~~ side of the peripheral region of the ~~basic element~~ which is directed away from the ~~membrane~~cover.

2. – 8. (Cancelled)

9. (Currently Amended) ~~Use of a~~ Inserting the single-serve capsule according to Claim 1 into a coffee machine to make ~~for making~~ a hot beverage.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 388 of 421

10. (New) The single-serve capsule according to claim 1, wherein the base element comprises a circumferential border adjacent the peripheral region, the border has a larger diameter compared to a diameter of the wall region.

11. (New) The single-serve capsule according to claim 10, wherein the grooves extend into the border.

12. (New) The single-serve capsule according to claim 11, wherein the grooves are free from extending all the way to the peripheral region.

13. (New) The single-serve capsule according to claim 1, wherein the wall region has an electrically conductive section.

14. (New) The single-serve capsule according to claim 1, wherein after the capsule is inserted into a coffee machine, a sensor/detection system of the coffee machine is configured to compare the identifier to a stored reference.

15. (New) The single-serve capsule according to claim 1, wherein the cavity has grooves defined between the ribs, and the grooves in the cavity generate turbulence of water in the

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 389 of 421

cavity.

16. (New) The single-serve capsule according to claim 1, wherein a ratio of a diameter of the wall region of the base element that adjoins the peripheral region to a diameter of the peripheral region is between 0.85 and 0.89.

17. (New) Single-serve capsule for making a beverage, comprising:

a base element with a cavity having radially spaced and vertically oriented ribs and in which a raw beverage material is provided, the capsule having a flange that extends from the base element, the cavity being closed by a cover, which is fastened on a top side of the flange, the base element comprises a wall region extending between the flange and a bottom region of the base element, the wall region includes radially spaced and vertically oriented grooves that are free from extending entirely to the bottom region,

wherein the capsule has a barcode provided on a bottom side of the flange that opposes the top surface of the flange to which the cover is fastened, and

wherein the base element comprises a circumferential border adjacent the flange, the border has a larger diameter compared to a diameter of the wall region.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 390 of 421

18. (New) The single-serve capsule according to claim 17, wherein the base element is made of metal and the cavity is free of a filter.

19. (New) The single-serve capsule according to claim 17, wherein the wall region has an electrically conductive section and the grooves extend into the border.

20. (New) The single-serve capsule according to claim 17, wherein the cover is made of metal and the grooves extend into the border

21. (New) The single-serve capsule according to claim 17, wherein the cavity has grooves defined between the ribs, and the grooves in the cavity generate turbulence of water in the cavity.

22. (New) The single-serve capsule according to claim 17, wherein after the capsule is inserted into a coffee machine, a sensor/detection system of the coffee machine is configured to compare the identifier to a stored reference.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 391 of 421

23. (New) The single-serve capsule according to claim 17, wherein a ratio of a diameter of the wall region of the base element that adjoins the flange to a diameter of the flange is between 0.85 and 0.89.

24. (New) The single-serve capsule according to claim 18, wherein the cover is made of metal and the grooves extend into the border

Amendments to the Drawings

Included herewith are Replacement Sheets. No new matter has been added. Applicant respectfully requests entry of the Replacement Sheets.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 393 of 421

REMARKS

In the Office Action mailed April 30, 2020, the Examiner rejected claims 1-9.

Claim Amendments and New Claims

By way of the foregoing amendments and the markings to show changes Applicant has amended the claims and added new claims. No new matter has been added.

The foregoing amendments are taken in the interest of expediting prosecution and there is no intention of surrendering any range of equivalents to which Applicant would otherwise be entitled in view of the prior art.

Further, by the present amendment, it does not follow that the amended claims have become so perfect in their description that no one could devise an equivalent. After amendment, as before, limitations in the ability to describe the present invention in language in the patent claims naturally prevent the Applicant from capturing every nuance of the invention or describing with complete precision the range of its novelty or every possible equivalent. Accordingly, the foregoing amendments are made specifically in the interest of expediting prosecution and there is no intention of surrendering any range of equivalents to which Applicant would otherwise be entitled.

Election/Restriction

Amended claim 9 is a dependent claim that includes a method step of inserting the capsule according to Claim 1 into a coffee machine to make the beverage. Applicant requests the Examiner examine claim 9 with the product claims and not require a restriction.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 394 of 421

Information Disclosure Statement

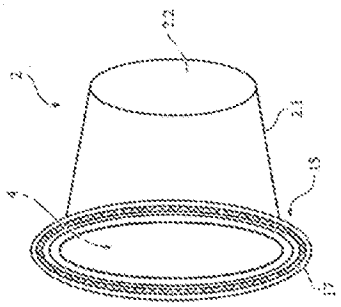
Applicant thanks the Examiner for considering the documents cited by Applicant in the previously filed information disclosure statements.

Drawing Objections

Applicant includes herewith Replacement Drawings that are believed to overcome the objections alleged on pages 3-5 of the office action. No new matter has been added. Entry of the Replacement Sheets is respectfully requested.

Specification Objections

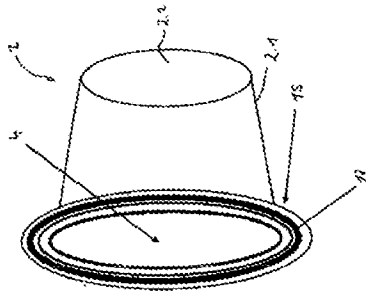
1. On page 5 of the office action, the Examiner alleges "there is no antecedent basis in the specification for the identifier is a barcode which is provided on that side of the peripheral region of the basic element which is directed away from the membrane as recited in claim 1." Applicant respectfully disagrees. Referring to Applicant's originally-filed Figure 2 reproduced below, paragraph [00060] of Applicant's originally-filed specification recites, in relevant part, "As shown by the arrow 15 the bar-code alternatively can be attached to the base element's edge region being averted from the membrane."



Moreover, with continued reference to Applicant's Figure 2 below, on page 7 lines 26-29 of Applicant's priority application no DE 10 2010 031 988.0 dated July 22, 2010, Applicant

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 395 of 421

disclosed "As an alternative, it is possible, as symbolized by the arrow 15, for the barcode to be provided on that side of the peripheral region of the basic element which is directed away from the membrane.



Accordingly, Applicant submits the specification provides sufficient antecedent basis for these features.

2. Claims 3 and 4 are cancelled in the interest of expediting prosecution; thus, the specification objection relating to these claims is now moot.

4. Applicant includes herewith an amendment to the specification and Replacement Sheets with reference characters to the elements of the claims.

5. Applicant has increased spacing between the claims.

Claim Rejections – 35 USC 101

Without conceding the validity of the rejection of claim 9, claim 9 is amended in the interest of expediting prosecution to include a method step of inserting the capsule according to Claim 1 into a coffee machine to make the beverage. Accordingly, Applicant submits this rejection has been overcome and Applicant respectfully requests it be withdrawn.

Claim Rejections – 35 USC 112

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 396 of 421

Without conceding the validity of the rejection of claim 3, claim 3 is now cancelled. Accordingly, the rejection of claim 3 is moot and Applicant respectfully requests it be withdrawn.

Without conceding the validity of the rejection of claim 9, claim 9 is amended in the interest of expediting prosecution to include a method step of inserting the capsule according to Claim 1 into a coffee machine to make the beverage. Accordingly, Applicant submits this rejection has been overcome and Applicant respectfully requests it be withdrawn.

Claim Rejections – 35 USC 103

When determining if a claim is obvious, the Patent Office (hereafter "Office") must make "a searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art." In re Ochiai, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis added). If just one claim limitation is not accounted for, then the Office will be unable to maintain its obviousness rejection, or the Office has failed to present a prima facie case of obviousness. To support an obviousness rejection "[a]ll words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385 (CCPA 1970).

1. Claims 1 and 2 are rejected under 35 USC 103(a) as allegedly being unpatentable over "Ruchonnet" (WO 2005/044067). These rejections are respectfully traversed.

Without conceding the validity of the rejection of claim 1, or the appropriateness of the Examiner relying on Ruchonnet to reject claim 1, claim 1 is amended in the interest of expediting prosecution to clarify that "the identifier is a barcode provided on a bottom side of the peripheral region which is directed away from the cover." Applicant submits the Office Action will be unable to present evidence that Ruchonnet teaches or suggests this clarifying amendment.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 397 of 421

In the interest of expediting prosecution, claim 1 is further amended to clarify that: the base element made of metal; the cavity is free of a filter, the cavity includes radially spaced and vertically oriented ribs; and the base element comprises a wall region extending between the flange and a bottom region of the base element, the wall region includes radially spaced and vertically oriented grooves that are free from extending entirely to the bottom region.

Applicant submits the Office Action will be unable to present evidence that Ruchonnet teaches or suggests any of the clarifying amendments of claim 1. Accordingly, Applicant respectfully requests the Examiner withdrawal the rejection of claim 1 and allow claim 1 and all depending claims.

2. Claim 3 is rejected under 35 USC 103(a) as allegedly being unpatentable over "Ruchonnet" (WO 2005/044067) in view of "Bucher" (WO 2011/000723). These rejections are respectfully traversed.

Without conceding the validity of the rejection of claim 3, or the appropriateness of the Examiner relying on Ruchonnet and Bucher to reject claim 3, claim 3 is now cancelled. The rejection of claim 3 is now moot.

3. Claim 9 is alleged to be obvious for the reasons alleged on page 9 of the office action. Without conceding the validity of this allegation, Applicant submits claim 9 is patentable at least for its dependence on claim 1. Accordingly, Applicant respectfully requests the alleged obviousness rejection of claim 9 be withdrawn and claim 9 be allowed.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 398 of 421

4. Claims 4-8 are rejected under 35 USC 103(a) as allegedly being unpatentable over "Sweeney" (US 2002/0020659). These rejections are respectfully traversed.

Without conceding the validity of the rejection of claims 4-8, or the appropriateness of the Examiner relying on Sweeney to reject claims 4-8, claims 4-8 are now cancelled. The rejection of claims 4-8 is now moot.

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 399 of 421

CONCLUSIONS

In view of Applicant's amendments and remarks, the Examiner's rejections are believed to be rendered moot. Accordingly, Applicant submits that the present application is in condition for allowance and requests that the Examiner pass the case to issue at the earliest convenience. Should the Examiner have any questions or wish to further discuss this application, Applicant requests that the Examiner contact the undersigned at (248) 292-2920.

If for some reason Applicant has not requested a sufficient extension and/or has not paid a sufficient fee for this response and/or for the extension necessary to prevent the abandonment of this application, please consider this as a request for an extension for the required time period and/or authorization to charge our Deposit Account No. 50-1097 for any fee which may be due.

Respectfully submitted,

Date: July 28, 2020

/Paul J. Palinski/
Paul J. Palinski
Reg. No. 71,080
Attorney for Applicant
The Dobrusin Law Firm, P.C.
29 W. Lawrence Street - Suite 210
Pontiac, MI 48342
(248) 292-2920

Customer No. 25215

IPR2023-00502
Nespresso USA, Inc. Ex. 1002 Part 2
Page 400 of 421

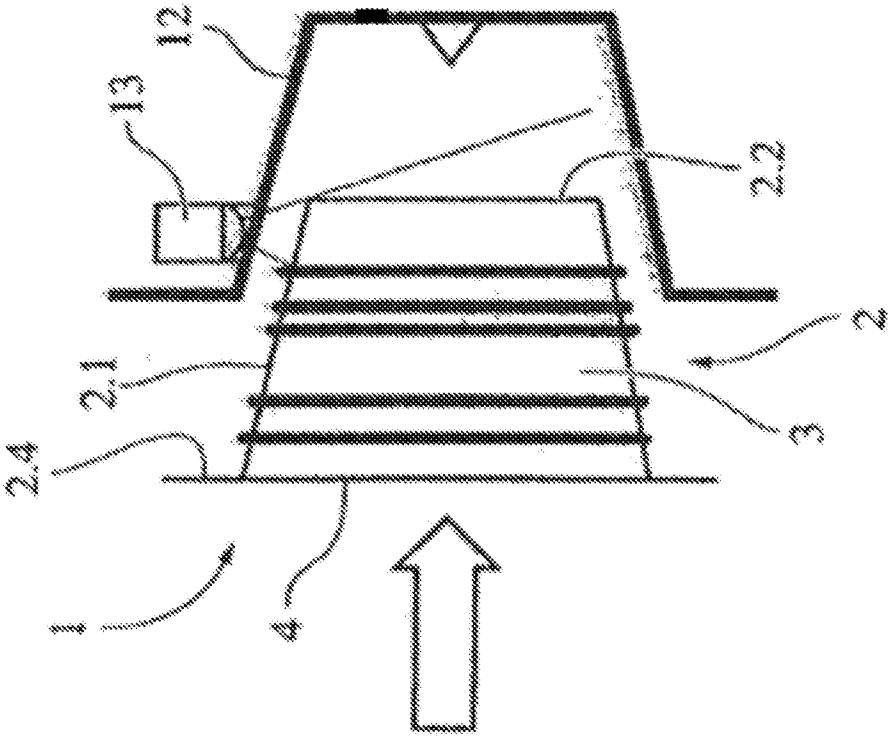


Fig. 1B

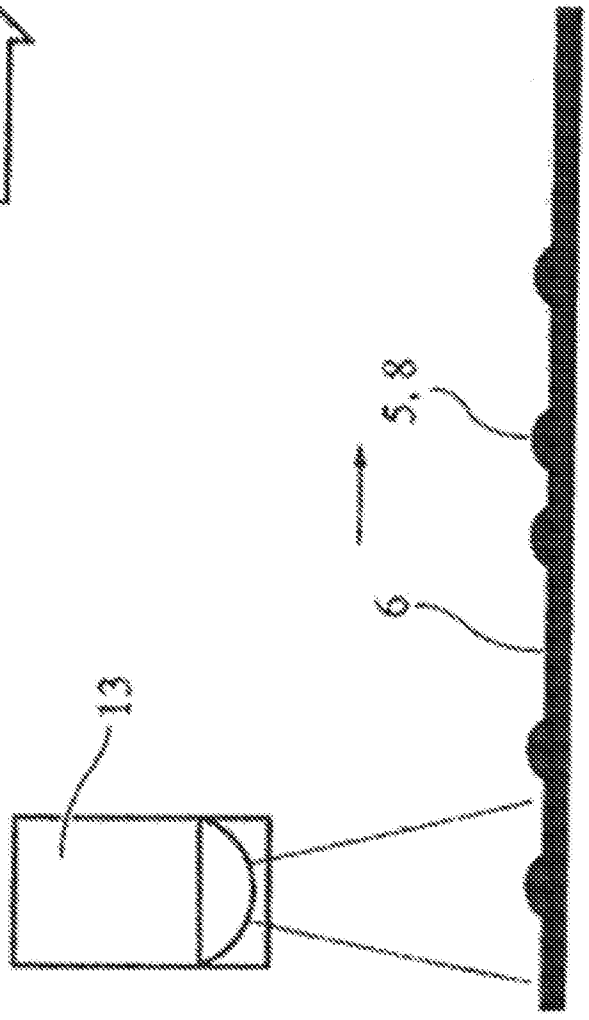


Fig. 1A

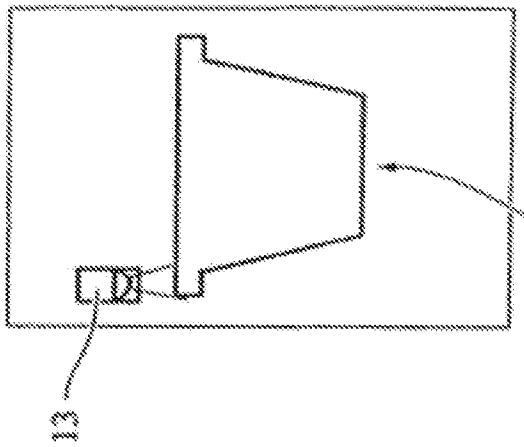


Fig. 2B

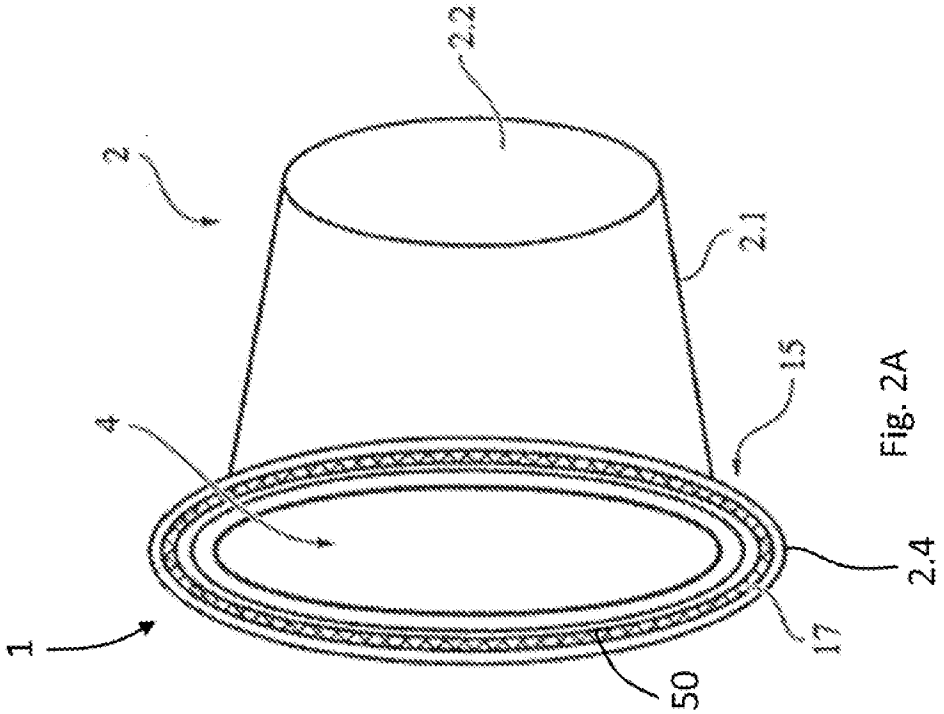


Fig. 2A

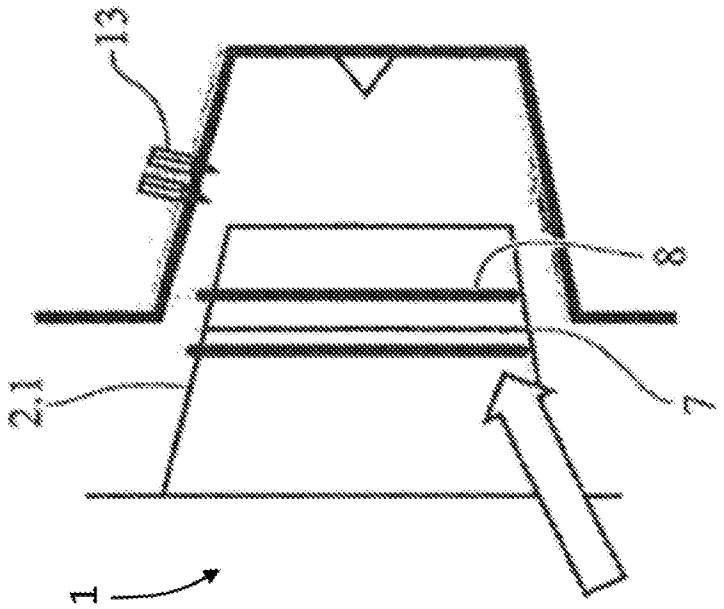


Fig. 3A

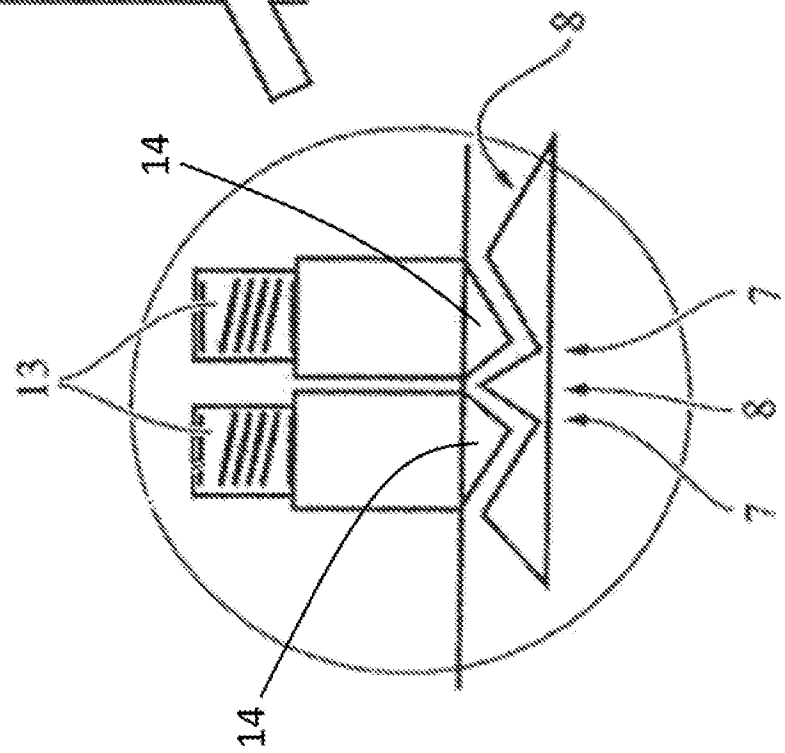


Fig. 3B

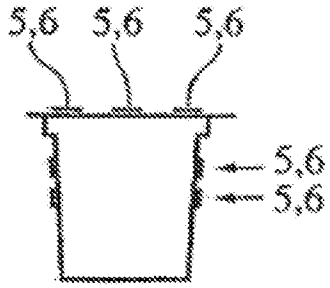


Fig. 4

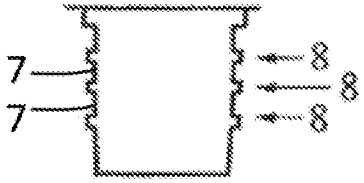


Fig. 5

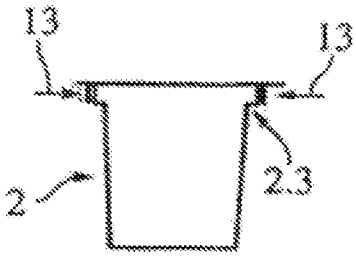


Fig. 6

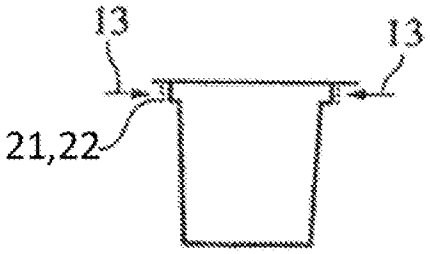


Fig. 7

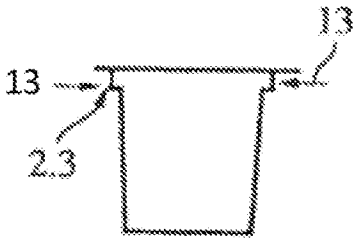


Fig. 8

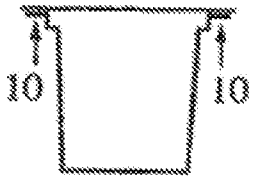


Fig. 9

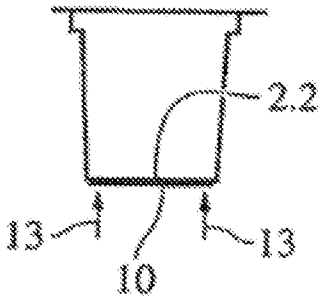


Fig. 10

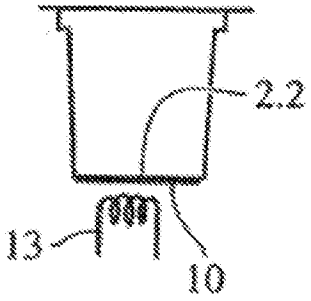


Fig. 11

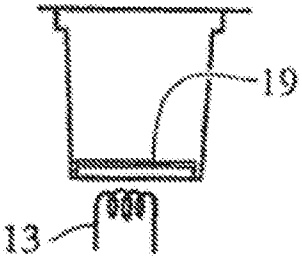


Fig. 12

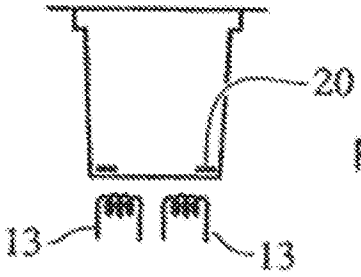


Fig. 13

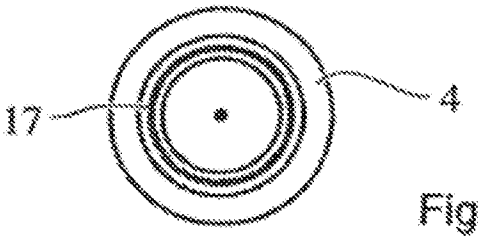


Fig. 14

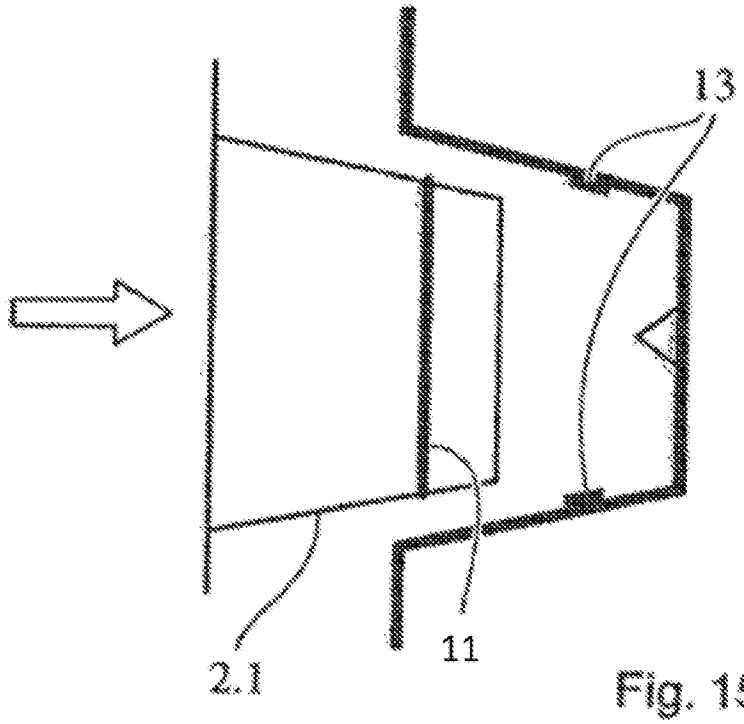


Fig. 15

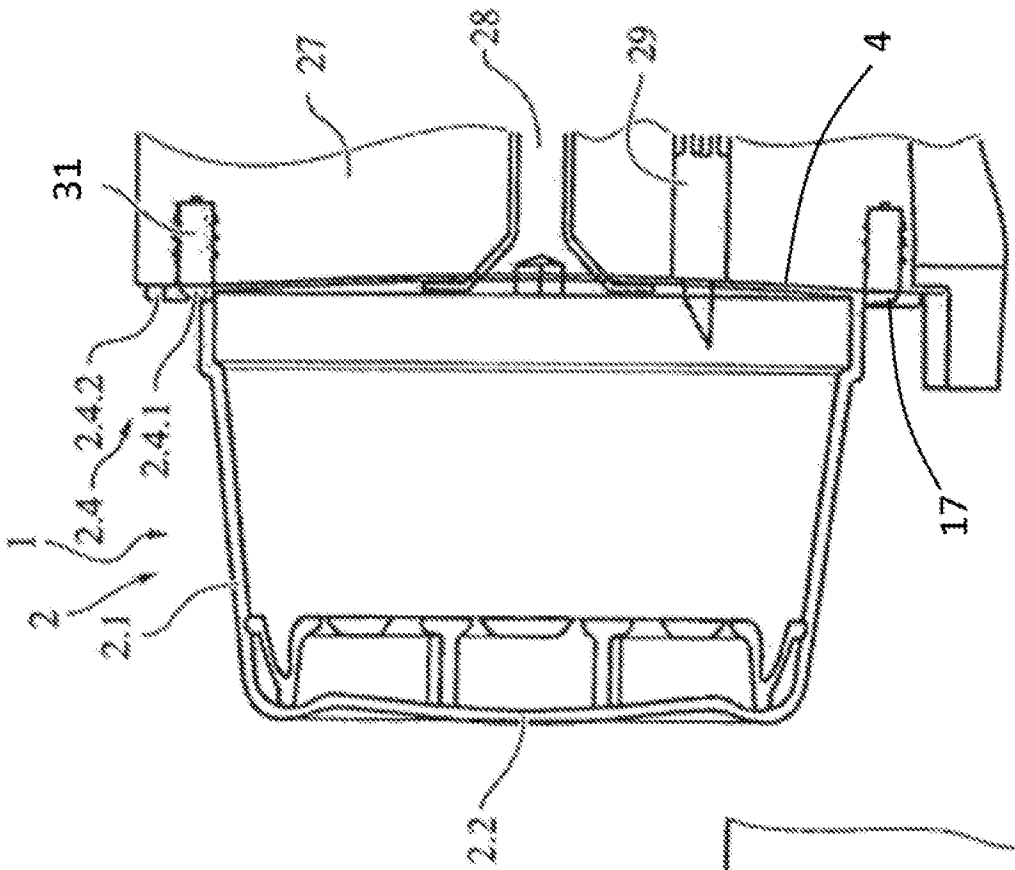


Fig. 16A

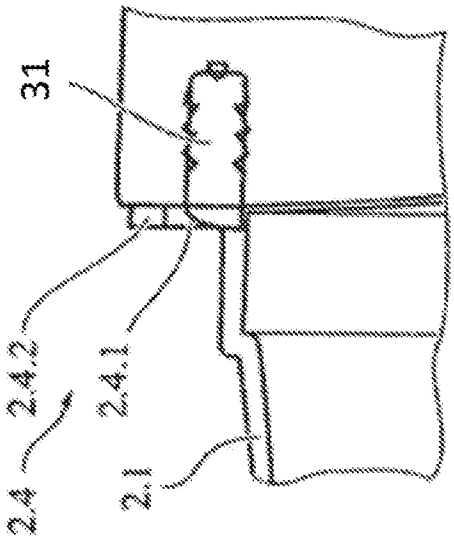


Fig. 16B

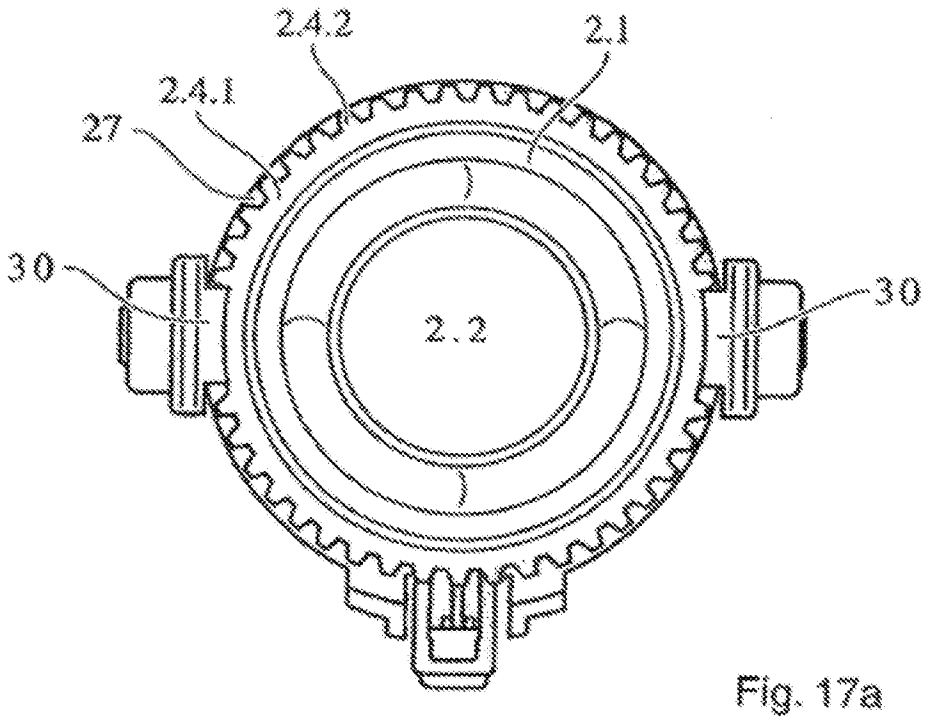


Fig. 17a

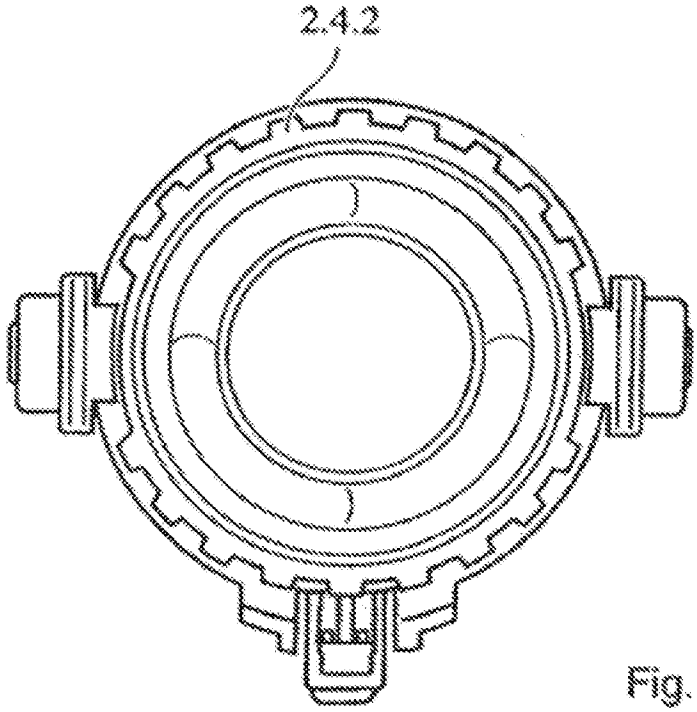


Fig. 17b

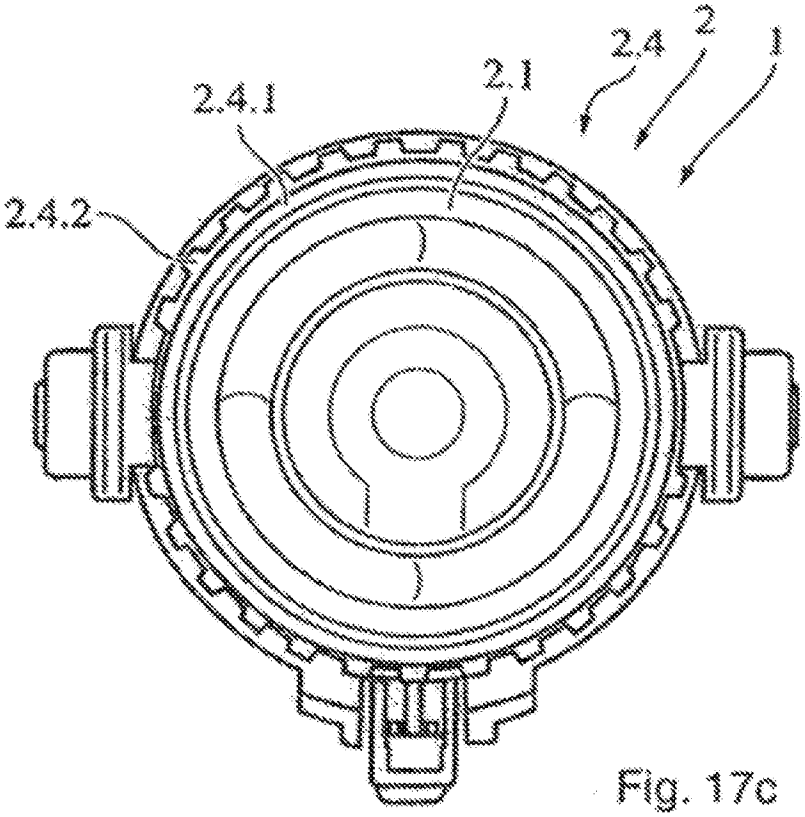


Fig. 17c

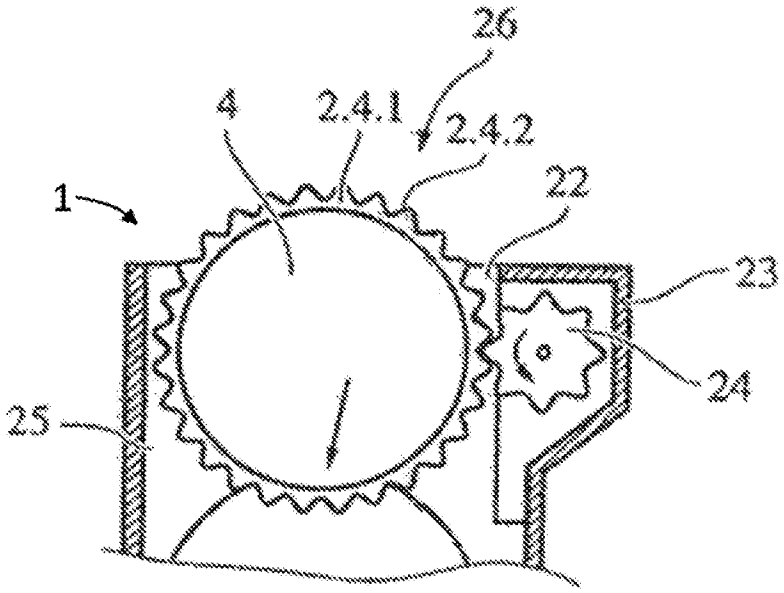


Fig. 18

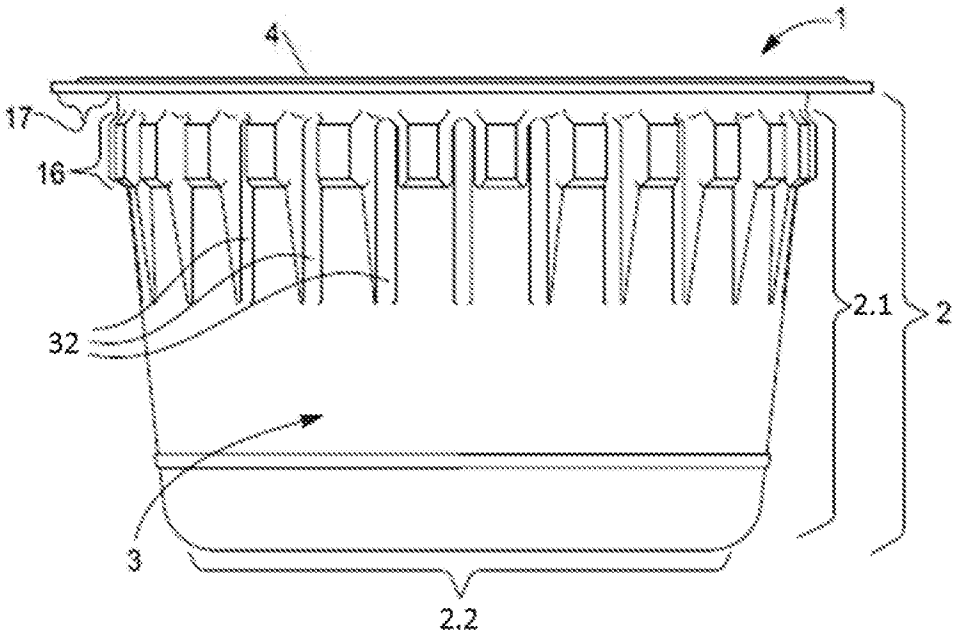


Fig.19

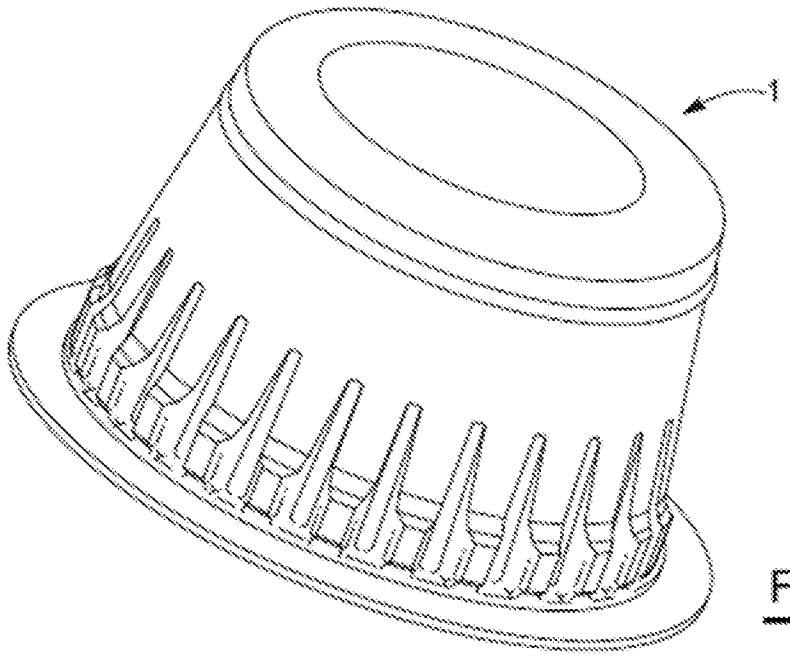


Fig.20

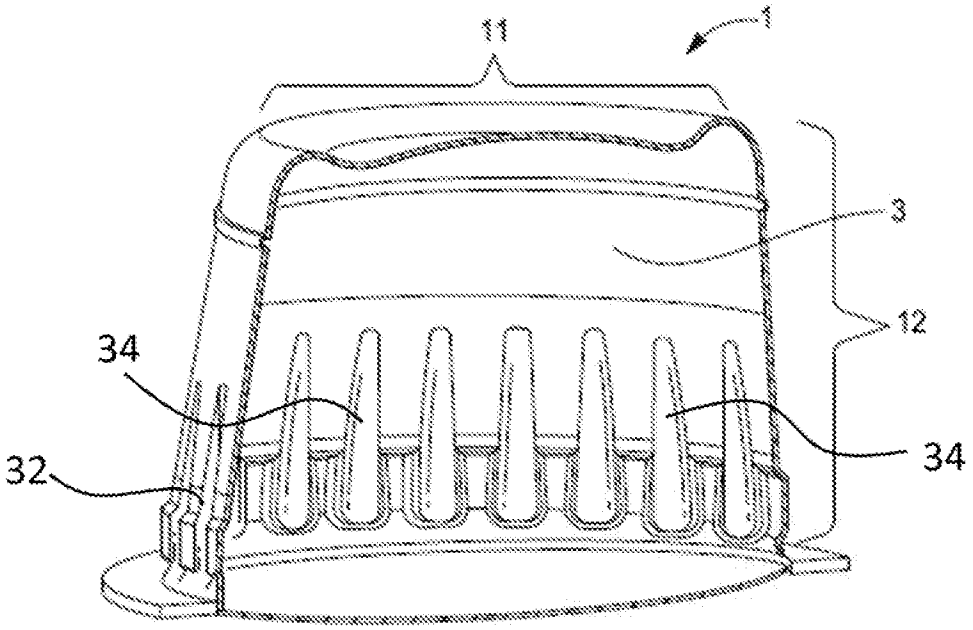


Fig.21

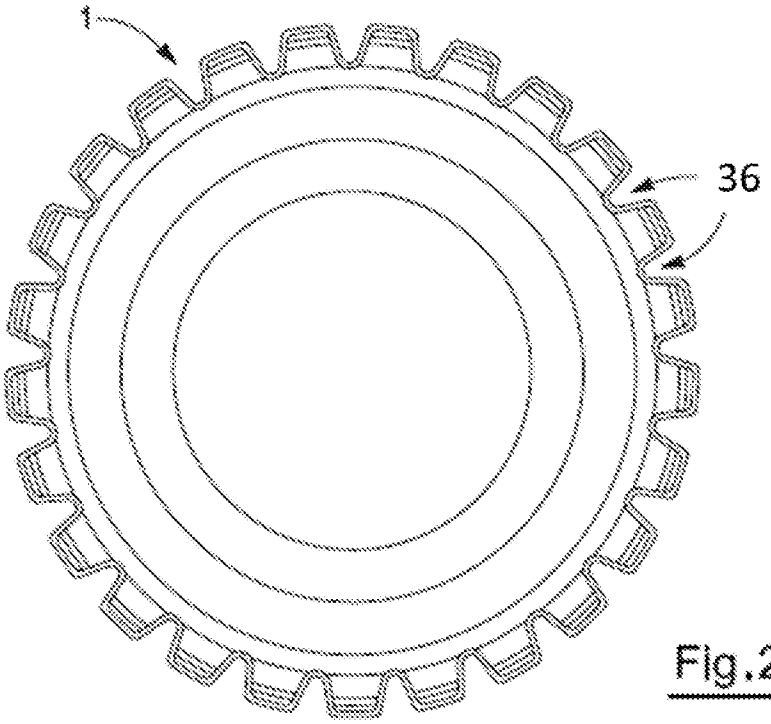


Fig.22

PORTION CAPSULE HAVING AN IDENTIFIER

FIELD

[0001] These teachings relate to a portion capsule and method for producing a beverage.

BACKGROUND

[0002] The present invention relates to a portion capsule for producing a beverage, comprising a base element having a cavity in which a beverage raw material is provided and which is closed by a membrane fastened to the base element.

[0003] Such capsules are well known and are being launched onto the market in abundant variety. Since these capsules are often quite similar, it is possible that the manufacturer's capsules are used in a coffee machine designed by another manufacturer, although they are not suited for it. This may result in significant security issues and/or the coffee machine may be damaged.

[0004] The object of the present invention is therefore to provide a portion capsule which only is suitable for a specific coffee machine.

SUMMARY

[0005] The object is accomplished according to the present invention by a portion capsule for producing a beverage, comprising a base element having a cavity in which a beverage raw material is provided and which is closed by a membrane fastened to the base element, wherein it has an identifier, which allows to individualize the respective portion capsule.

[0006] The present invention relates to a capsule for producing a beverage or foodstuff, comprising a base element having a cavity in which a beverage raw material is provided. Such capsules are, for example made of plastic, natural materials and/or biodegradable materials and substantially have a base element, in particular a deep-drown base element, i.e. it is substantially designed frustoconically or cylindrically. The beverage raw material is arranged within the portion capsule's cavity and is extracted and/or dissolved in a liquid, in particular water. After the beverage raw material has been filled into the cavity the base element is usually sealed by a membrane. In particular the membrane is localized on the opposite side of the base element's bottom. The membrane can be made of the same or different material as the base element and is substantially attached to the base element using a sealing and/or an adhesive bonding. Additionally the cavity could contain one or several built-in elements, such as, for example a filter, a non-woven, a felt, a shut-off device and/or something similar to those. For the case that a non-woven and a felt are arranged within the cavity, they are interconnected preferably. The non-woven and/or the felt can be made of several layers in such a way that the layers may differ in the kind of its starting material and/or its preparation. Moreover the membrane and/or the bottom can be provided with a plurality of recesses (holes).

[0007] According to the present invention, it is provided that the portion capsule has an

identifier that allows to individualize the respective portion capsule. In the context of this invention individualizing means that the respective portion capsule can be assigned to a group of capsules that are suitable for the coffee machine preferably. It is not necessary that the coffee machine is able to specify and/or identify the portion capsule. In fact it is much more important that the coffee machine associates the portion capsule with a group of portion capsules, which is suitable for the coffee machine. In particular, individualizing means that those portion capsules that are not appropriate for the coffee machine cannot be inserted into and/or directly fall through the holder, which is designed for the portion capsules in the coffee machine, and/or the coffee machine operates only with the corresponding portion capsules. Preferably a sensor/detection system handles the identifier and compares it with a stored reference substantially. Preferably, the coffee machine, in particular the water-providing- pressure pump, will be activated if the detected identifier matches with the reference. Otherwise the coffee machine will not start operating. Preferably the detection system is placed in the region of the coffee machine's media chute designed for the portion capsules. According to another preferred embodiment of the invention, the detection system may be placed in the region of the brewing chamber. Another possible embodiment of the invention provides that the identifier prevents portion capsules from inserting into the coffee machine. Alternatively or additionally, means, in particular mechanical means, more preferably, one or more gearwheels, may be added to the media chute in order to guarantee that incorrect portion capsule cannot be inserted into the coffee machines by passing the media chute.

[0008] Preferably the identifier is composed of surface areas having different optical properties, for example reflection. These surfaces may be localized on the membrane, the

side wall and/or the bottom of the portion capsules. Preferably, the portion capsule has at least two areas which differ in their optical properties, for example the reflection characteristics.

[0009] The detection of a recess and/or a bulge is also preferred. Preferably, recess and bulges alternate and/or at least two recesses or bulges are separately placed from each other. Especially it is possible that the recess and/or the bulge form a gearwheel that is attached to the outer border and/or at least partially extends to the wall region of the portion capsule. The recess and/or bulge may be produced by any shaping method, for example by deep drawing, preferably.

[00010] Furthermore, the recess may be realized by removing material. In particular the material's removal can be accomplished by punching or using a laser on condition that this processing does not damage a barrier layer placed in the portion capsule's material, which prevents moisture or aroma from escaping out of the portion capsule and/or water vapor or oxygen enters the capsule. The reading of the identifier, which is encoded in the recess and/or bulge, may be a result from a mechanical and/or optical method, for example. Alternatively or additionally, the identifier can be used to avoid that the portion capsule is inserted into the coffee machine. This applies in particular to the media chute. For example it is possible to design a portion capsule comprising a ring gear that is placed on its circumference and is compatible with another ring gear, which is placed in the media chute. If the media chute's ring gear only revolves for a corresponding ring gear of the portion capsule and its revolving allows the portion capsule to pass, only portion capsules equipped with the proper ring gear will pass the insertion

lock.

[00011] According to a further subject matter of a preferred development of the present invention, the identifier may be included in the membrane. Preferably, the identifier is a layer or partial layer of the membrane. Such identifiers may be an optically detectable material, for example a fluorescent material. Furthermore, the identifier may be designed with layers made of metal or ferrous metal or stripes made of metal or ferrous metal in or on the membrane, respectively.

[00012] Preferably the identifier is a machine-readable imprint. This is realized with a print in food approved color, preferably. Fluorescent materials like paper or print materials, whose optical properties change under the influence of temperature, are favored also. Preferably the print is a barcode, a logo or a repeat pattern.

[00013] According to a further subject matter of a preferred development of the present invention, the identifier is an electrically conductive section, which can be placed all over the portion capsule, but is localized on the side wall, the edge and/ or the floor preferably. The electrically conductive section, which is inserted into the coffee machine, can become part of an electric circuit and causes therefore a measurable change, which leads to the identification of the respective portion capsule. In a further preferred embodiment, the identifier is a section made of a ferromagnetic material.

[00014] Another construction version favors a RFID chip being the identifier.

[00015] If the portion capsule is customized according to the invention, portion capsules that are not in line with the coffee machine will be prevented from inserting into the coffee machine. Furthermore it is possible that the identifier allows to identify the portion capsule located in the brewing chamber in such a way that the production process of beverage or food may be controlled, for example by adjusting the temperature, the pressure and/or the amount of water.

[00016] According to a further subject matter of a preferred development of the present invention, the portion capsule's material is weakened in the bottom area caused by a selective material removal, for example by using a laser. The weakening is provided for piercing the portion capsules using a mandrel. This procedure is needed for the beverage's preparation. Since the material is weakened in the section, which is treated with a laser and is supposed to be pierced using the mandrel, the degree of necessary force for piercing the portion capsule is reduced. The mandrel of such coffee machines is usually equipped with a force limitation that limits the force, which is dedicated for pressing the mandrel against the portion capsule's bottom. This preparation avoids that portion capsules having no appropriate weakening can be used in such a coffee machine. Consequently the weakening represents another kind of identifier.

[00017] According to a further subject matter of a preferred development of the present invention, the portion capsule has an edge region, which is preferably attached to the base element. Preferably, the edge is located opposite of the base element's bottom area. After the raw material has been filled in the portion capsule, a membrane can be attached to this edge region, for instance. Moreover the edge can also designed for guiding

the portion capsule into the chute in order to position the portion capsule in the brewing chamber properly. Simultaneously it is possible to use the surface of the edge for stopping and/or sealing.

[00018] Preferably provision is made for the portion capsule to have means for fit locking, friction locking and/or detection in the edge region. The means for fit locking and/or friction locking may be used to activate a complementary mechanism, which is located in the coffee machine, in order to allow inserting the portion capsule into the coffee machine and/or starting a sensor, like a gearwheel, that transmits a signal to a control unit depending on whether the portion capsule corresponds to the coffee machine or not. Alternatively or additionally, a detector may identify the mean for fit locking, friction locking and/or detection in order to check that the portion capsule is suitable to the respective coffee machine.

[00019] Preferably the means for fit locking, friction locking and/or detection is a gearwheel or a gearwheel' segment, which are located, in particular, in the outer area of the edge region. The teeth of the gearwheel or the gearwheel' segment may be shaped in any commonly used form, which is known, for example, by an expert from gear manufacturing. Preferably it is provided that these teeth are triangular, rectangular, square or wavy.

[00020] Preferably there is a sealing surface, that is arranged on the interior side relative to the gearwheel or the gearwheel' segment.

[00021] Another and preferred state-of-the-art technology is a portion capsule for producing a beverage, comprising a base element substantially designed frustoconically or cylindrically, having a cavity in which a beverage raw material is provided and which is closed by a membrane fastened to the base element with the base element having a wall region and the base element having a bottom area, which is preferably located opposite to the membrane, with the wall region having several grooves and the grooves which are located between membrane and bottom area covering the wall region along its height at least partially. The grooves may be also located in the edge region, in particular on the outer area of the edge region.

[00022] This portion capsule has the advantage over the portion capsule according to the state-of-the-art technology that, for instance, the grooves reinforce the base element's wall region. On the one side these grooves make the portion capsule more stable towards mechanical forces and prevent the portion capsule from deformation and buckling, in particular. The arrangement of the grooves, which are located at the wall region, additionally improves the performance of the portion capsule while the extraction liquid flows through it in the brewing chamber, since the arrangement of the grooves, in particular those partially expending over the wall region between membrane and bottom area, increase quality and reliability of the extraction process significantly. According to the invention another advantage is that the base element's thickness can be reduced, because the use of grooves improves the physical stability. The production of the portion capsule is therefore much less expensive and more environmentally friendly. On the other side the grooves reduce or avoid the contact between the portion capsule's wall region and the wall of the brewing chamber. As a result ejecting or

removing the portion capsule from the brewing chamber is made easier. Another advantage of using a plurality of grooves is that the stream of the extraction liquid, which flows along the base element in the cavity, can be optimized by choosing a grooves' structure that is able, for example, to generate on the one hand a better or stronger turbulence in the extraction liquid or on the other hand a more uniform (laminar) flow of the extraction liquid, in the wall region. The control of the liquid may be obtained by the structure of the grooves itself or by using simple means additionally. A stronger turbulence compared to the one known in the state-of-the-art has the advantage that no unintended and casual main streams are formed in the raw materials. Instead the extraction liquid equally flows through the raw material in all of the volume. Thus the extraction process is much more efficient and can be controlled more precisely and reproducibly.

[00023] In particular the raw material may be coffee powder (especially ground roasted coffee), chocolate powder, milk powder, tea or the like. Alternatively, it is conceivable that the raw material is a beverage's extract, such as instant coffee for example.

[00024] In particular, the grooves are recesses and bulges, which are preferably directed along a main extension and are preferably extended along the wall portion or the periphery of the edge region. More preferably, the grooves are formed as webs and/or notches. A gearwheel, for instance, may be obtained by the grooves. Therefore the grooves are part of the base elements' wall, optionally located on the inner side facing to the cavity and/or on the outside facing away from the cavity.