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(54) **Title**: METHOD, DEVICE AND CAPSULE FOR BREWING A BEVERAGE

(57) **Abstract**: A method of preparing a tea beverage in a brewing device is provided, the device comprising an infusion chamber with a bottom rim which defines an opening; a capsule holder for receiving a capsule, the capsule holder comprising a filter and an openable and closable passage; the method comprising: inserting a capsule into the capsule holder; connecting the capsule holder to the infusion chamber; introducing liquid into the capsule so that the liquid and tea material mix and flow into the infusion chamber and brew the beverage; and then opening the passage to allow the beverage to flow from the infusion chamber through the filter and out through the passage. A capsule containing tea material for use in the method is also provided, the capsule comprising a body part, which is a single, impermeable piece which defines a cavity with a volume of from 10 to $24 cm^3$.

METHOD, DEVICE AND CAPSULE FOR BREWING A BEVERAGE

Technical field of the invention

The present invention relates to a method, a device and a capsule for brewing a beverage. In particular, the invention relates to infused tea-based beverages that are brewed in a device having an infusion chamber.

Background to the invention

Beverages such as tea and coffee are usually prepared in the home using ground coffee, tea bags or loose-leaf tea. However, the long brewing time required and the mess that is produced are inconvenient. Therefore brewing devices have been devised which provide a convenient, rapid and consumer-friendly way of brewing such beverages. The beverage material is typically provided in a single use capsule or other container which is disposed of after brewing the beverage. For coffee beverages the capsule itself typically functions as the brewing chamber. The volume of the capsule is normally less than that of the final beverage, so it is necessary for the brewing water to flow through the capsule. This is achieved by having a filter in the capsule so that the brewed beverage can be dispensed whilst the beverage material is retained, and is disposed of together with the capsule.

This method, however, is not well-suited for brewing tea, as tea leaves require a larger volume in which to infuse. Therefore devices for brewing tea have been designed which have a separate, larger infusion chamber. For example, WO 2007 / 042485 discloses a device for preparing an infused beverage, having an infusion container for containing liquid. A cartridge containing tea leaves is introduced into a cavity in the device. The bottom part of the cartridge comprises a liquid-permeable filter. The infusion container and the cavity communicate with each other, so that when liquid is poured into the infusion container it flows to the cartridge. The tea leaves are thus immersed in the liquid and infusion takes place. After infusion has taken place, a passage communicating with the cavity is opened to let the infused liquid flow from the infusion container through the cavity and through the filter of the cartridge to the passage. The spent tea leaves are collected in the cartridge and are removed from the cavity together with the cartridge. Whilst the infusion chamber allows space for tea leaves to infuse, this method has a number of disadvantages. In particular the cartridge must firstly provide sufficient area for the filter to allow the beverage to be dispensed in a short time once brewing has taken place, and secondly have sufficient volume to contain the spent tea leaves which swell during infusion, typically to around four times their dry volume. Thus the cartridge has to be relatively large. It also has to be sufficiently strong to support the weight of the spent tea leaves when it is removed from the device. Thus a substantial amount of material (e.g. plastic) is required to make the capsule. Furthermore, the capsule body and filter are typically made from different materials, so the capsule cannot be easily recycled. These are both undesirable from the point of view of cost and also environmental impact. Hence it is an object of the present invention to overcome these disadvantages.

Brief description of the invention

The present invention solves these problems by locating the filter in the capsule holder rather than in the capsule. Accordingly, in a first aspect, the present invention provides a method of preparing a tea-based beverage in a brewing device, the device comprising:

- an infusion chamber with a bottom rim which defines an opening;
- a capsule holder for receiving a capsule, the capsule holder comprising a sidewall having an upper rim, a filter and an openable and closable passage on the opposite side of the filter from the upper rim;

the method comprising the steps of:

a) inserting a capsule containing tea material into the capsule holder;
b) connecting the upper rim of the capsule holder to the bottom rim of the infusion chamber;

c) introducing liquid into the capsule and releasing the tea material from the capsule so that the liquid and tea material mix and flow into the infusion chamber so as to brew the beverage;

d) after brewing has taken place, opening the passage in the capsule holder to allow the beverage to flow from the infusion chamber through the filter and out through the passage.

In a second aspect the invention provides a brewing device, the device comprising

- an infusion chamber with a bottom rim which defines an opening;
- a capsule holder for receiving a capsule, the capsule holder comprising a sidewall having an upper rim, a filter and an openable and closable passage on the opposite side of the filter from the upper rim;
- means for moving the capsule holder and / or the infusion chamber so that the upper rim of the capsule holder is connected to the bottom rim of the infusion chamber;
- means for introducing liquid into the capsule so that the liquid and tea material can mix and flow into the infusion chamber so as to brew a beverage; and
- a valve for opening the passage in the capsule holder to allow the beverage to flow from the infusion chamber through the filter and out through the passage.

In a third aspect, the invention provides a capsule for use in a brewing device, the capsule comprising:

- a body part, which defines a cavity,
- a lid which is attached to the body part, and
- tea material enclosed within the capsule,

wherein the volume of the cavity is from 10 to 24cm^3 and wherein the body part is a single, impermeable piece.

In a preferred embodiment of the third aspect, the capsule comprises:

- a body part, which defines a cavity and which has a flange,
- a lid which is attached to the flange, and
- tea material enclosed within the capsule,

wherein the volume of the cavity is from 10 to 24cm^3 and wherein the body part is a single, impermeable piece.

In a fourth aspect, the invention provides the use of capsule of the third aspect of the invention for preparing a beverage.

By having the filter in the capsule holder rather than in the capsule, the capsule holder can perform the many of the functions performed in the prior art by the capsule, and thus the functionality required of the capsule is significantly reduced. Firstly, since the beverage is filtered through the capsule holder, there is no need for the capsule to contain a filter or provide sufficient area for the filter; there is also no need to puncture or otherwise open the capsule on two opposite sides. Secondly, there is no need for the capsule to hold the spent tea leaves. Thirdly, the capsule does not need to form a water-tight connection with the infusion chamber. In fact, the capsule is immersed in the brewing liquid. Thus the capsule can be much simpler, smaller and can have thinner walls since it only needs to be large enough and strong enough to contain the dry tea leaves.

Detailed description of the invention

As used herein the term “tea material” refers to tea plant material, herb plant material or a mixture thereof. For the avoidance of doubt, the term “tea material” does not include coffee material. The term “tea plant material” refers to leaf, bud and/or stem material from *Camellia sinensis* var. *sinensis* and/or *Camellia sinensis* var. *assamica*. The tea plant material may be substantially fermented (i.e. black tea), partially fermented (i.e. oolong tea) or substantially unfermented (i.e. green tea or white tea). It may also be a blend of one or more of the aforementioned tea plant materials. Other ingredients which are commonly used to flavour leaf tea products may also be combined with the tea plant material (e.g.

bergamot, citrus peel and the like). The term “herb plant material” refers to material which is commonly used as a precursor for herbal infusions. Preferably the herb plant material is selected from chamomile, cinnamon, elderflower, ginger, hibiscus, jasmine, lavender, lemongrass, mint, rooibos (obtained from *Aspalathus linearis*), rosehip, vanilla and verbena. The tea material may additionally comprise fruit pieces (e.g. apple, blackcurrant, mango, peach, pineapple, raspberry, strawberry etc).

Preferably the tea material is dried and has a moisture content of less than 30 wt %, more preferably less than 20 wt % and most preferably from 0.1 to 10 wt %. Preferably the tea material particles have a size (i.e. longest diameter) of from about 2 to about 10mm, preferably 3 to 7mm.

The term “beverage” refers to a substantially aqueous drinkable composition which is suitable for human consumption. Preferably the beverage comprises at least 85% water by weight of the beverage, more preferably at least 90% and most preferably from 95 to 99.9%. Preferably the beverage comprises from 0.04 to 3%, more preferably from 0.06 to 2%, most preferably from 0.1 to 1% by weight tea solids.

The term “brewing” refers to the addition of a liquid, particularly hot water, to tea material, so that steeping or soaking the tea material in the liquid releases soluble substances into the liquid (e.g. flavour and/or aroma molecules) thereby to form a beverage. Brewing may be carried out at any temperature, but preferably in the range of 80 to 95°C.

The term “infusion chamber” means a vessel in which infusion of tea material takes place, and which is large enough both to allow the tea material to move around in the liquid during infusion, and also to contain a substantial part (i.e. at least 50%) of the volume of the final beverage. The term “infusion chamber” therefore does not refer to capsules inside which brewing takes place, as is typically the case in coffee machines.

The term “capsule” refers to a rigid or semi-rigid container in which tea material is or may be packaged, for example a capsule, cartridge, pod, or the like.

The present invention will now be described with reference to the figures, wherein:

Figure 1 shows a brewing device according to the invention.
Figure 2 is a schematic diagram showing the main functional components of the device.
Figure 3 shows the device of Figure 1 with the capsule holder in its lowered position.
Figure 4 shows the device as in Figure 3, now with a capsule inserted into the capsule holder.
Figure 5 shows a first embodiment of the capsule holder removed from the device.
Figure 6 shows a second embodiment of the capsule holder removed from the device, and containing a capsule.
Figure 7 shows (a) a side view of a capsule, (b) a perspective view of a capsule without a lid and (c) with a lid.
Figure 8 shows views from above of capsules having various generally elliptical shaped flanges.
Figure 9 shows the manifold of the infusion chamber with an opening member for opening the lid of the capsule.

Figure 1 shows one non-limiting embodiment of a brewing device according to the invention. The device **1** has a casing **2** with a front side **3** and a rear side **4**. An infusion chamber **10** and a capsule holder **20** are located at the front side of the device. The infusion chamber **10** has a bottom rim **12** which defines an opening in its lower side. The infusion chamber may have an opening in its top side which is covered with a removable lid **15**, or it may be constructed as a vessel without an opening in its top side. The capsule holder **20** is designed to receive a capsule. It is located in a support **6** and preferably has a handle **22**. The capsule holder is preferably substantially circular when viewed from above, which provides for easy cleaning since there are no corners in which tea leaves could become trapped.

In Figure 1, the capsule holder **20** is shown in position for brewing, i.e. so that the upper rim **23** of the capsule holder is in water-tight contact with the bottom rim **12** of the infusion chamber **10**. The infusion chamber **10** is supported and held in place by a manifold (not shown). A water reservoir, heater, and pump (not shown) are located inside the rear **4** of the casing. At the bottom of the front side **3** of the casing there is a tray **8** on which a cup **9** is placed when the beverage is dispensed. A dispensing spout **7** is positioned beneath the capsule holder.

Figure 2 is a schematic diagram showing the main functional components of the device. Water from the reservoir **50** is fed to the infusion chamber **10** via a water filter **52**, a water pump **54**, a heater **56** and a valve **57**. The heater is preferably a flow-though heater. The valve **57** controls the route the water takes between the heater **56** and the infusion chamber **10**. For example, the water may firstly be pumped to the infusion chamber **10** via the capsule **30** in order to brew a beverage **60**. Subsequently, the valve **57** can re-direct the water such that it enters the brewing chamber **10** via a rinse head **18** in order to rinse and/or clean the brewing chamber **10**. There may also be an air pump **58** which can pump air to the infusion chamber, for example via the capsule **30** which is located in the capsule holder **20**, or via the capsule holder itself. The spout **7**, cup **9** and tray **8** are located beneath the capsule holder **20**.

Figure 3 shows the device of Figure 1 with the capsule holder **20** lowered so that its upper rim **23** is separated from the bottom rim **12** of the infusion chamber. The capsule holder **20** is preferably removable from the support **6** so that a capsule can be easily inserted, and also for ease of cleaning. Figure 4 shows the device with a capsule **30** inserted into the capsule holder **20**, which is in the lowered position.

Figure 5 shows one embodiment of a capsule holder removed from the device: (a) in a perspective view and (b) in cross-section. The capsule holder **20** has a sidewall **24** with an upper rim **23** and a base **26**. For ease of cleaning, it is important that the capsule holder does not have corners or gaps in which tea leaves can become trapped. Therefore the sidewall **24** is preferably circular when viewed from above. A filter **25** is located inside the capsule holder. One or more protrusions **28** on the inside of the sidewall **24** and / or the base **26** support the capsule **30** above the filter **25**. The capsule does not cover the whole of the area inside the upper rim of the capsule holder, so that there is a route for the brewed beverage to pass from the infusion chamber to the filter. Beneath the filter **25** is a passage **29** through which the beverage flows during dispensing and which is closed by a drain valve **21** during brewing. The filter preferably consists of a fine mesh made, for example, of stainless steel, nylon, polyester or PTFE. The mesh size must be sufficiently small to catch small pieces of tea material but large enough to ensure that draining is not too slow. Preferably, the mesh size is from 100 to 500 microns, more preferably 150 to 300 microns. Preferably the filter (when in its normal position in the device) is inclined to the horizontal at an angle of from 5 to 45°, preferably from 10 to 30°, such as about 20°. Having the filter at an angle to the horizontal has two advantages: firstly it presents a larger surface area, and hence increases the speed of draining. Secondly tea material collects at the bottom of the sloped filter while leaving the upper part clear of tea material so that the beverage drains freely through it.

Figure 6 shows perspective views of a second embodiment of the capsule holder **20** which consists of two separable parts, a receptacle **70** and a strainer **72**. Figure 6(a) shows the capsule holder when assembled with a capsule **30** in place, and Figure 6(b) shows the capsule, strainer and receptacle separated.

The receptacle **70** has a sidewall **24** and a base **26**. Again, the sidewall is preferably circular when viewed from above. Located in the base **26** is a passage **29** through which the beverage flows during dispensing and which is closed by a drain valve (not shown) during brewing. The receptacle **70** has a handle **22**.

The strainer **72** has a base **73**, a rim **74** and a handle **75**. One or more protrusions **78**, such as a shelf on the inside of the rim **74,** support the capsule **30** and hold it in place above the base. At least part of the base **73** is made up of a filter **25**. In the preferred embodiment shown, the part of the base **73** which is located underneath the capsule is solid whilst the rest of the base consists of the filter. The solid part may also serve to support the capsule. The filter preferably consists of a fine mesh made, for example, of stainless steel, nylon, polyester or PTFE. The mesh size must be sufficiently small to catch small pieces of tea material but large enough to ensure that draining is not too slow. Preferably, the mesh size is from 100 to 500 microns, more preferably 150 to 300 microns.

As shown in Figure 6(a), in use the strainer **72** rests on the receptacle and is supported by the sidewall **24**. The rim **74** of the strainer forms the upper rim **23** of the capsule holder **20**. The strainer covers the whole of the top of the receptacle **70**, so that liquid cannot pass between the rim **74** of the strainer and the sidewall **24** of the receptacle, and hence can only enter the receptacle **70** by passing through the filter. The filter prevents spent tea leaves from entering the receptacle **70**. Preferably the rim **74** is made from an elastomeric material. Thereby it is in effect a gasket which forms seals both between the receptacle and the strainer, and also between the capsule holder and the infusion chamber.

This embodiment has the advantage that the strainer and receptacle can be easily separated for cleaning. Moreover, in order to empty out spent tea leaves from the capsule holder, it is only necessary to remove the strainer and tip the spent leaves out from it.

Preferably the handle **75** of the strainer is larger than and overlaps the handle **22** of the receptacle. When the strainer is located in the receptacle, the handle **75** of the strainer sits on top of handle **22** of the receptacle, as shown in Figure 6(a). This allows the receptacle and strainer to be picked up together, by gripping them from above and below. Nonetheless, the strainer can be easily removed from the receptacle by gripping the edges of its handle **75** where it extends beyond the handle **22** of the receptacle.

The handle **75** of the strainer may optionally have a projection **77** on its lower side, which rests in a corresponding hollow **79** in the top side of the handle **22** of the receptacle. This helps to locate the strainer correctly with respect to the receptacle. The strainer may optionally have a lip (not shown) on its rim, for example located opposite the handle, which rests in a corresponding notch in the top of the sidewall of the receptacle. This helps to locate the strainer correctly with respect to the receptacle, and also to support it.

Figure 7(a) shows a side view of a capsule **30**. The capsule comprises a body part **31** and a lid **32**. The body part **31** defines a cavity **35** in which the tea material **36** is placed. The lid is attached to the body part so as to enclose the tea material **36** within the capsule. The functionality required of the capsule is significantly reduced compared to known capsules, because the capsule does not contain a filter. The brewing liquid does not need to enter through one side and exit through the other, so there is no need to puncture or otherwise make an opening in the body part of the capsule. Thus the construction of the capsule is greatly simplified. Thus the body part is a single, impermeable piece and does not contain any means (for example a filter, or an openable or weakened area) for allowing liquid to enter or exit the capsule through the body part. The body part is preferably made from plastic or aluminium. It may be formed for example by injection moulding or by thermoforming.

The cavity **35** is preferably generally circular in cross-section, when viewed from above, as shown in Figure 7(b). This shape is convenient from the point of view of manufacture and also for filling tea material into the capsule. It also facilitates release of the tea material from the capsule during brewing, since there are no corners or other areas where the tea material could become trapped. “Generally circular” does not require that the cavity has an exactly circular cross-section; thus for example it could have small indents, provided that there are no narrow recesses in which tea material could become trapped.

The body part preferably comprises a flange **33**, and the lid is preferably attached to the flange, e.g. by heat-sealing, thereby enclosing the tea material. In order to provide sufficient area to attach the lid securely, the flange is preferably at least 3mm wide. The flange **33** preferably also serves to support the capsule in the capsule holder by resting on the protrusions on the inside the capsule holder, described above. Thus the flange is preferably shaped and sized to match its intended location in the capsule holder.

Since the capsule only needs to be large enough to contain a single serving of the dry tea material it can be much smaller than known capsules. Thus the internal volume of the capsule (i.e. the volume of the cavity) is from 10 to 24cm^3, preferably 12 to 19cm^3, most preferably from 14 to 18cm^3. Moreover, the capsule only needs to be strong enough to support dry tea material, and not wet spent tea material. Thus the body part of the capsule can also have relatively thin walls.

The reduced capsule size means that the amount of material (e.g. plastic) needed to make the capsule is significantly reduced. This has environmental and cost advantages. Furthermore, the capsule body part can be more easily recycled because it is made of a single material, unlike typical capsules having a filter. A small capsule also has the advantage of taking up less space during transport and during storage, for example in a consumer’s cupboard.

The cavity must not be so shallow that tea material bounces out of it during filling. Thus the depth of the cavity is preferably at least 10mm, more preferably at least 13mm. On the other hand, the cavity must not be so deep that it is difficult to remove the tea material from the capsule at the start of brewing. Thus the depth of the cavity is preferably at most 20mm, more preferably at most 18mm. It is easier to remove the tea material from a cavity with a depth in the upper part of this range when the volume of the cavity is also towards the upper end of its range (i.e. when the cavity is not both deep and narrow).

The cross-sectional area and diameter of the cavity are related to the required volume and depth. Consequently, the diameter of the cavity is preferably from 30 to 45mm. The lid, which overlaps with or covers the flange as well as covering the cavity, is therefore preferably from about 45 to 60mm in diameter, more preferably 47 to 58 mm. The lid is preferably shaped to generally match the shape of the flange.

The lid is preferably made of a thin film, more preferably metallic foil or a laminated foil, most preferably a laminate of aluminium foil and polyethylene. Preferably the lid has perforations in order to facilitate opening the capsule to inject water and release the tea material, as will be described below. More preferably the lid **32** has a line of perforations **34** in the form of a curve, with sections which extend backwards from the ends of the curve, as shown in Figure 7(c).This configuration produces a well-defined opening when the lid is pushed against a blunt opening member (described below), which allows the tea leaves to be released from the capsule. The cut:tie ratio of the perforations should be such that they do not burst too easily, for example during transport, but nonetheless open without requiring too great a force. For example, for an aluminium foil / polyethylene laminate lid, a cut:tie ratio of around 1:2 is suitable.

Typically the capsules are provided to the consumer in air-tight secondary packaging, for example as multipacks containing a plurality of capsules (e.g. ten).

The multipacks may contain packages of a single type, or a mixture of packages containing different types of tea (e.g. green tea, black tea, herbal tea). Having a perforated lid has a further advantage in that some of the tea aroma is released from the tea material inside the capsule into the space inside the secondary packaging. Thus the consumer obtains the aroma of tea on opening the secondary pack.

In a preferred embodiment, the cavity has a generally circular cross-section, but the flange is elongated, for example it is generally elliptical in shape, or is defined by two intersecting circular arcs. “Generally elliptical” does not require that the flange is exactly elliptical. The flange has a radius of curvature that is similar to the radius of the inside of the sidewall **24** of the capsule holder, so that the shape of the flange generally corresponds to the shelf. Nonetheless, small variations from an elliptical shape can be accommodated whilst there is still sufficient overlap between the flange and the shelf to support the capsule. Some examples of generally elliptical shapes are shown in Figure 8. This shape of flange allows the capsule to be supported by the shelf **78** on the inside of the sidewall of the capsule holder. This avoids the need for supporting ribs or protrusions inside the capsule holder, which could trap tea leaves, and hinder cleaning. The ratio of the longest diameter of the flange to the shortest diameter of the flange is preferably from 1.2:1 to 1.5:1. A minimum ratio of 1.2:1 gives plenty of space for the brewed beverage to pass by the capsule, and a maximum ratio of 1.5:1 means that the capsule can be large enough to contain sufficient tea material, without requiring an excessively large capsule holder. Most preferably the flange of the capsule is defined by two intersecting circular arcs each having a radius of curvature (R) which is substantially half of the internal diameter (D) of the capsule holder, as shown in Figure 8(b). This shape of flange corresponds to the shelf **78** on the inside of the sidewall of the capsule holder. In this embodiment, the shape of the lid is preferably also defined by two intersecting circular arcs, but with truncated ends **38**, as shown in Figure 7(c). The length of the lid between the two truncated ends is from 47 to 58mm, and the maximum width of the lid is from 45 to 50 mm.

The capsule is symmetrical (in particular it has 180° rotational symmetry about a vertical axis). There are preferably two sets of perforations in the lid, arranged symmetrically, as shown in Figure 7(c), so that the capsule can be placed in the capsule holder in either of two orientations.

In a preferred embodiment, the body part of the capsule is transparent, so that the tea material inside the capsule is visible. This is attractive to the consumer, and also has the advantage that the contents can be inspected for quality control purposes after filling using optical means, rather than, for example, by weight.

In use, the device functions as follows. With the capsule holder in its lowered position, the user removes the capsule holder from the support, or in the second embodiment of the capsule holder shown in Figure 6, the user may just remove the strainer from the receptacle. A capsule containing tea material is placed into the capsule holder so that it rests on the protrusions on the inside of the sidewall and / or the base of the capsule holder. The protrusions support the capsule and preferably also locate it in the correct position.

The capsule holder is then replaced on the support. Next the user raises the support, for example by pressing a button on the device which activates an actuator. The capsule holder travels vertically upwards until it connects with the infusion chamber, and forms a water-tight seal. In an alternative embodiment, the infusion chamber could move down towards the capsule holder.

In the context of the present invention, ‘connecting the upper rim of the capsule holder to the bottom rim of the infusion chamber’ and ‘the upper rim is connected to the bottom rim of the infusion chamber’ should be understood to mean that upper rim of the capsule holder and the bottom rim of the infusion chamber form a water-tight contact, so that the capsule holder and infusion chamber form a vessel in which the brewing liquid can be held while brewing takes place. The capsule holder and infusion chamber may be connected by means of an intermediate member such as a gasket (for example a ring made of rubber or other compliant material located on the upper rim of the capsule holder and / or the bottom rim of the infusion chamber) in order to provide a good seal. The infusion chamber and the capsule holder form a space for brewing when connected. Preferably the volume of the space for brewing is at least 75%, more preferably at least 90% of the volume of the final beverage.

The device may have means for recognizing a capsule and / or reading information from a code associated with the capsule or the capsule holder. Different codes may be associated with different types of tea (e.g. green tea, black tea, herbal tea etc.). This allows the capsule to be recognized by the device, so that the device can automatically set the parameters for the brewing operation, such as the brewing time, water temperature etc.. It also allows the device to be programmed so that it only operates if the correct type of capsule is present. Thus a valid code signifies that an expected type of capsule is present, and an invalid code signifies an unexpected type of capsule, a capsule that has already been used or that no capsule is present. The recognition system can be of any suitable type, such as mechanical interlocking between the capsule and the capsule holder; optical recognition (e.g. by means of colour, fluorescence or bar code), electrical, magnetic, radio-frequency identification (RFID) chip etc..

Optionally, the device may also have means for allowing the user to adjust the parameters of the brewing operation, such as the brewing time, the receptacle size etc. The means may suitably consist of buttons or other inputs on the device, together with a control system.

The lid of the capsule needs to be opened or removed in order to release the tea material. Preferably the lid is opened automatically by the device after the capsule has been inserted into the capsule holder, e.g. as the upper rim of the capsule holder is connected to the bottom rim of the infusion chamber. Preferably, two openings are made in the lid, one to introduce liquid into the capsule and the other to release liquid and tea material into the infusion chamber. However, because the capsule does not have a filter, there is no need to puncture or otherwise make an opening in the base of the capsule.

In a preferred embodiment, shown in Figure 9, the lid is opened by pushing it against one or more static opening members when the capsule holder travels upwards to connect with the bottom rim of the infusion chamber. The lid **32** is pushed against a static opening member **40** located on the infusion chamber manifold **16**. The function of the member is to create an opening in the lid in order to release liquid and tea material. This can be achieved by a member with a sharp edge which cuts or punctures the lid. Alternatively, the lid may have pre-formed weaknesses, such as perforations **34** which reduce the force required to open it. In this case, the member **40** can be blunt, for example a wire. Preferably the member is angled or has a sloped part **41** so that as it moves into the capsule, the flap formed by opening the lid is pushed away from the opening and held out of the way whilst the tea material is released from the capsule.

In the preferred embodiment shown in Figure 9, a second opening for introducing liquid into the capsule is made by pushing the lid against a static needle **42** consisting of a tube with a pointed end. The needle **42** pierces the lid. Water is then pumped from the reservoir to the heater, which is preferably a flow-though heater. The resulting hot water (and optionally steam) is then pumped to the capsule and enters it through the needle. The influx of hot water pushes the tea material out from the capsule through the opening made by the opening member **40** and into the infusion chamber **10**.

The heater and pump are controlled so that the target brew temperature (which is typically in the range 80℃ to 95℃) is achieved in the infusion chamber. Typically the water flow rate is in the range of 200 to 400ml/min, and the volume of water is 150 to 300ml, depending on the desired size of the beverage.

Preferably the infusion chamber **10** is made of transparent material such as glass, or transparent plastic, so that the user can see the motion of the tea material (such as tea leaves) whilst the beverage is brewing. Most preferably, the infusion chamber is made of Tritan™ copolyester because this material is transparent and has been found to have good resistance to staining. Air may be pumped into the capsule holder **20** (e.g. via the static needle) or directly into the infusion chamber **10** to create bubbles in the water and thereby agitate the tea material. This not only enhances the visual appearance, but also aids infusion and helps to prevent the tea material from sticking to the sides of the infusion chamber. Moreover, the introduction of air releases aroma which can optionally be vented via a tube, which for example, has an outlet near to the dispensing spout or near the top of the infusion chamber, thereby providing the user with the aroma of tea during brewing. The brewing time, which typically ranges from 10 to 120 seconds, is preferably set by user input and / or information read from the capsule.

Once brewing has taken place for the required time, the drain valve **21** located in the base of the capsule holder **20** is opened, allowing the beverage to drain from the infusion chamber. Preferably the opening of the drain valve is controlled automatically by the machine. The beverage flows from the infusion chamber through the filter **25** located in the capsule holder below the capsule, through the passage **29**, and finally into a cup **9** which the user has already placed onto the tray **8**. Tea material is prevented from entering the cup **9** by the filter **25**.

Optionally, there may be a dispensing spout **7** positioned beneath the capsule holder as shown in Figure 1, so that the beverage is dispensed through the drain valve and out through the spout. Thus, instead of being dispensed vertically downwards into the receptacle, the beverage follows an arc, similar to that of tea poured from the spout of a tea pot. This enhances the “theatre” provided by the machine for the user, and also emphasizes the “tea-ness” of the beverage, as distinct from coffee making machines.

After the beverage has been dispensed, the spent tea material may be rinsed from the wall of the brew chamber with further hot water. Preferably the rinsing water is introduced through rotating rinse jets **18** located near the top of the infusion chamber. Better rinsing is achieved by rotating rinse jets than static ones. In a preferred embodiment, rinsing takes place immediately after the beverage has been dispensed, and the rinse water is also dispensed into the receptacle and becomes part of the beverage. This removes the need for separate disposal of the rinse water. In this case, the rinse water provides around 15 – 30% of the total volume of the beverage, e.g. the volume of rinse water used is around 50ml.

Finally, after the beverage has been dispensed, the capsule holder is lowered, preferably automatically, or alternatively by the user, for example by activating a button. The user then removes the capsule holder from the support, using the handle **22,** or in the second embodiment of the capsule holder shown in Figure 6 the user may just remove the strainer from the receptacle. The used capsule and spent tea leaves are then disposed of, and the capsule holder can be rinsed. Since the capsule holder is removable from the brewing device, it is easy to clean. The capsule holder is then returned to the support, ready for the next use.

The device can be cleaned, for example by running a rinse cycle with no tea material or by running a cycle with a cleaning material, for example sodium percarbonate. The cleaning material can be provided in a capsule, or alternatively as a tablet which is simply placed in the capsule holder.

The various features of the embodiments of the present invention referred to in individual sections above apply, as appropriate, to other sections *mutatis mutandis*. Consequently features specified in one section may be combined with features specified in other sections as appropriate. Various modifications of the described modes for carrying out the invention which are apparent to those skilled in the relevant fields are intended to be within the scope of the following claims.

Claims

1. A method of preparing a tea-based beverage in a brewing device (1), the device comprising:
    - an infusion chamber (10) with a bottom rim (12) which defines an opening;
    - a capsule holder (20) for receiving a capsule (30), the capsule holder comprising a sidewall (24) having an upper rim (23), a filter (25) and an openable and closable passage (29) on the opposite side of the filter from the upper rim;

    the method comprising the steps of:

    a) inserting a capsule (30) containing tea material into the capsule holder (20);
    b) connecting the upper rim (23) of the capsule holder (20) to the bottom rim (12) of the infusion chamber (10);
    c) introducing liquid into the capsule (30) and releasing the tea material from the capsule so that the liquid and tea material mix and flow into the infusion chamber (10) so as to brew the beverage;
    d) after brewing has taken place, opening the passage (29) in the capsule holder (20) to allow the beverage to flow from the infusion chamber (10) through the filter (25) and out through the passage.

2. A method according to claim 1 wherein the liquid is water at a temperature in the range of 80 to 95°C.

3. A method according to claim 1 or claim 2 wherein the capsule has a lid in which two openings are made, one to introduce liquid and the other to release liquid and tea material into the infusion chamber.

4. A method according to claim 3 wherein the openings are made as the upper rim of the capsule holder is connected to the bottom rim of the infusion chamber, wherein:

- the opening to introduce liquid is made by pushing the lid against a static needle (42), so that the static needle pierces the lid and so that the liquid can enter the capsule through the needle and;
- the opening to release liquid and tea material is made by pushing the lid against an opening member (40).

5. A brewing device (1) comprising
    - an infusion chamber (10) with a bottom rim (12) which defines an opening;
    - a capsule holder (20) for receiving a capsule (30), the capsule holder comprising a sidewall (24) having an upper rim (23), a filter (25) and an openable and closable passage (29) on the opposite side of the filter from the upper rim;
    - means for moving the capsule holder and / or the infusion chamber so that the upper rim (23) of the capsule holder is connected to the bottom rim (12) of the infusion chamber;
    - means (42) for introducing liquid into the capsule so that the liquid and tea material can mix and flow into the infusion chamber so as to brew a beverage;
    - a valve (21) for opening the passage in the capsule holder to allow the beverage to flow from the infusion chamber through the filter and out through the passage.

6. A device according to claim 5 wherein the capsule holder comprises a separable receptacle (70) and a strainer (72) in which the filter (25) is situated.

7. A capsule (30) for use in a brewing device, the capsule comprising:
    - a body part (31), which defines a cavity (35),
    - a lid (32) which is attached to the body part (31),
    - tea material (36) enclosed within the capsule,

wherein the volume of the cavity is from 10 to 24cm^3, preferably 12 to 19cm^3, and wherein the body part is a single, impermeable piece.

8. A capsule according to claim 7 wherein the body part (31) has a flange (33) and wherein the lid (32) is attached to the flange (33).

9. A capsule according to claim 7 or claim 8 wherein the cavity (35) has a generally circular cross-section.

10. A capsule according to claim 9 wherein the depth of the cavity is from 10 to 20mm and the diameter of the cavity is from 30 to 45mm.

11. A capsule according to claim 10 wherein the lid is from 45 to 60mm in diameter, preferably 47 to 58 mm.

12. A capsule according to any of claims 7 to 11 wherein the lid comprises metallic foil, preferably a laminate of aluminium foil and polyethylene.

13. A capsule according to any of claims 7 to 12 wherein the lid has perforations.

14. A method according to any of claims 1 to 4 wherein the capsule is a capsule according to any of claims 7 to 13.

15. A device according to claim 5 or claim 6 containing a capsule according to any of claims 7 to 13.

16. Use of a capsule according to any of claims 7 to 13 for preparing a beverage.

17. A multipack containing a plurality of capsules according to any of claims 7 to 13.

Fig. 1

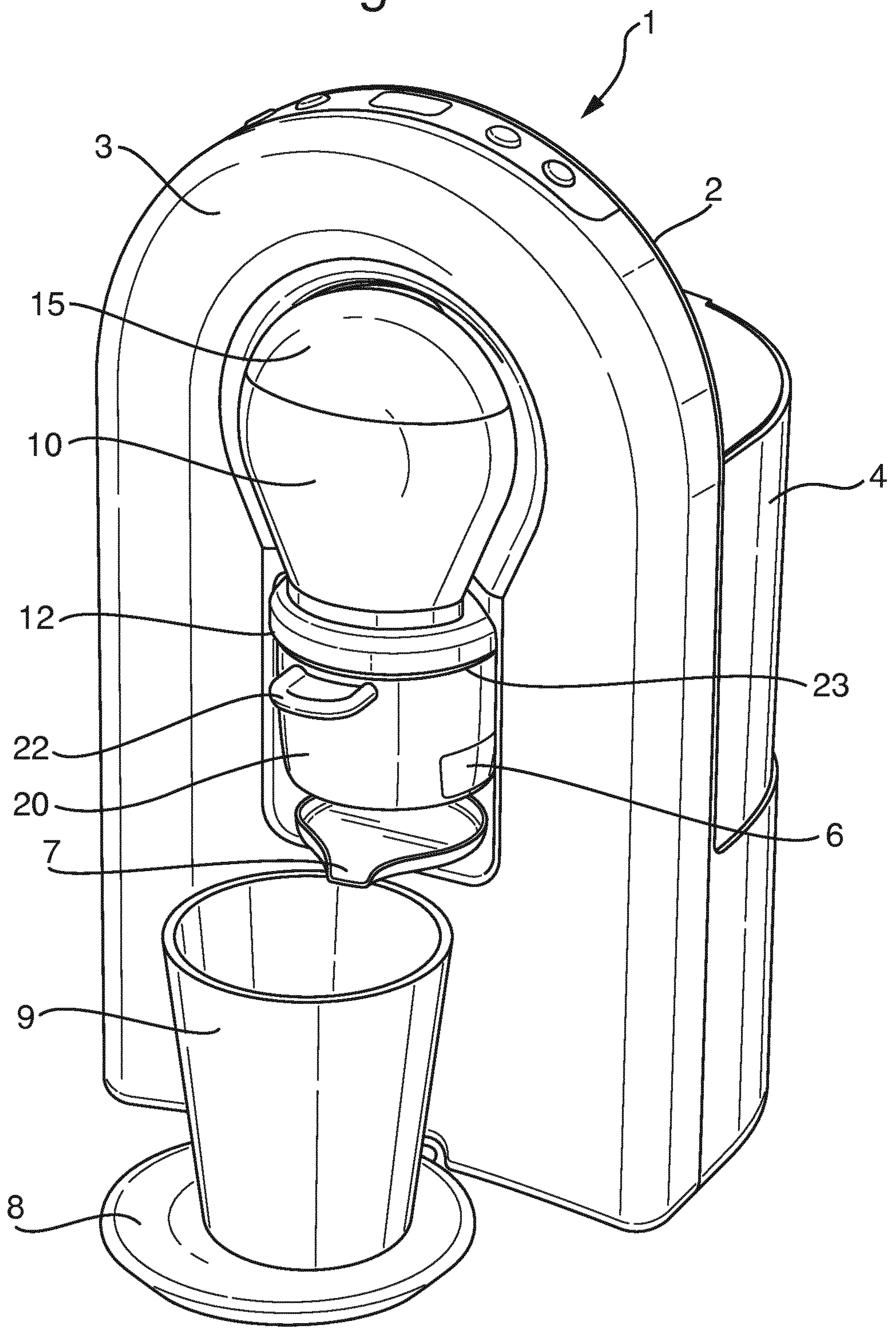

Fig. 2

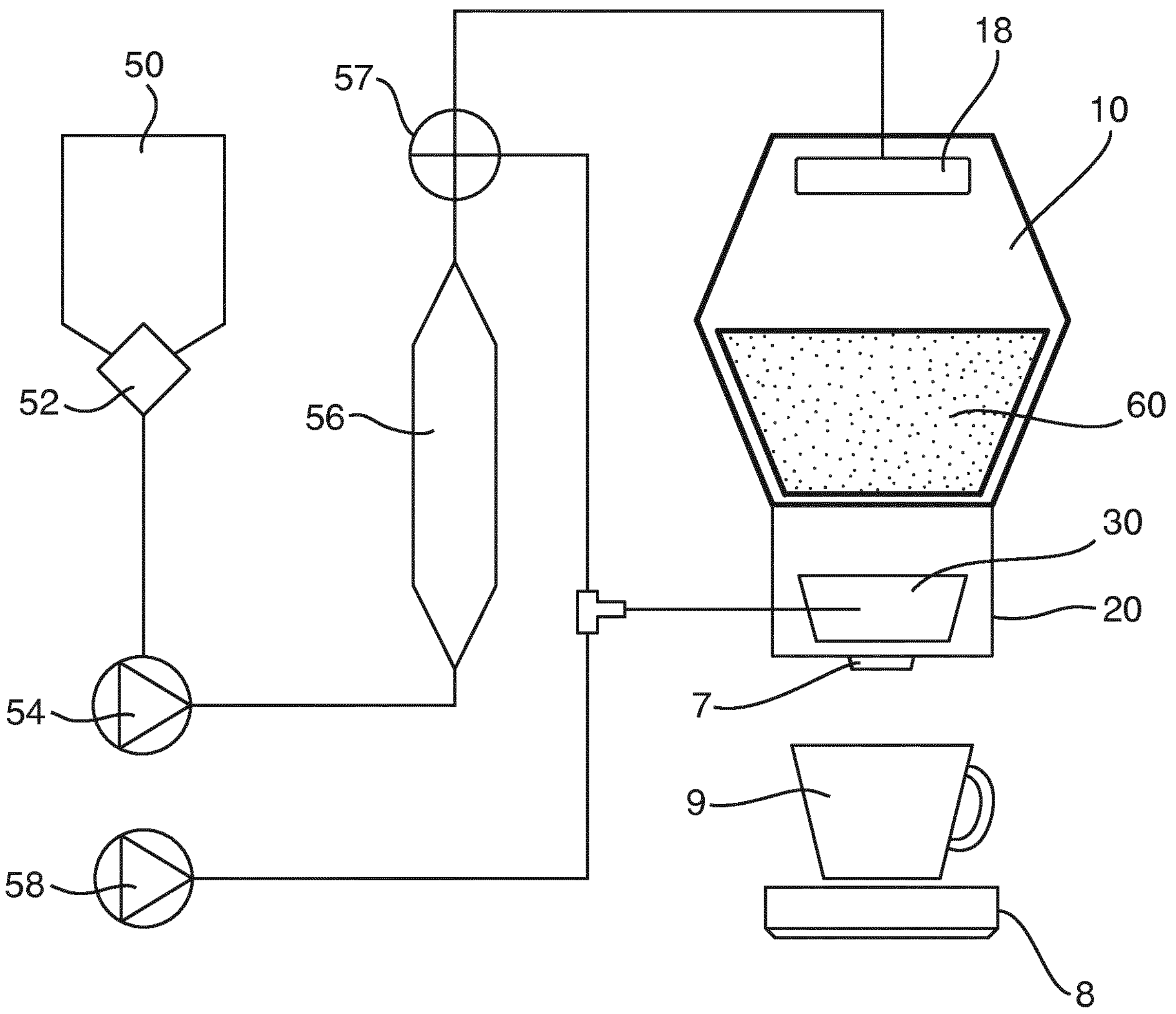

Fig. 3

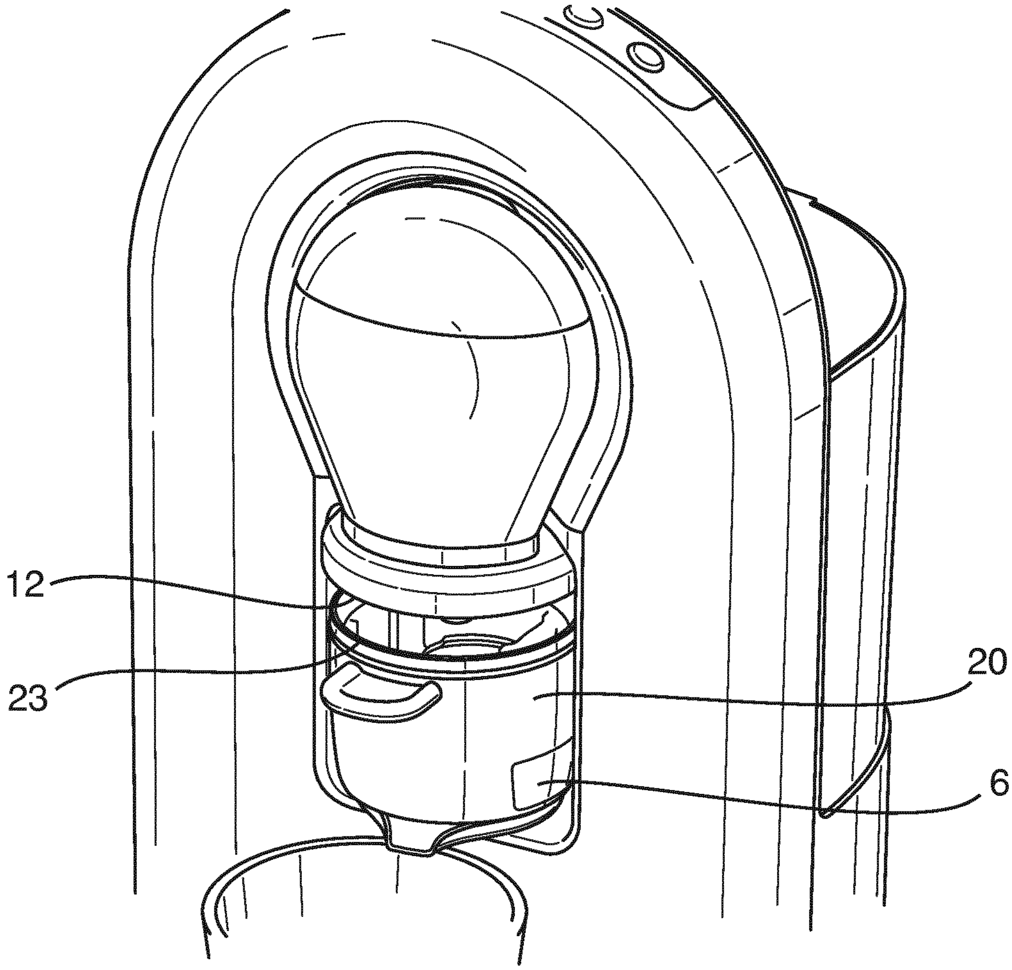

Fig. 4

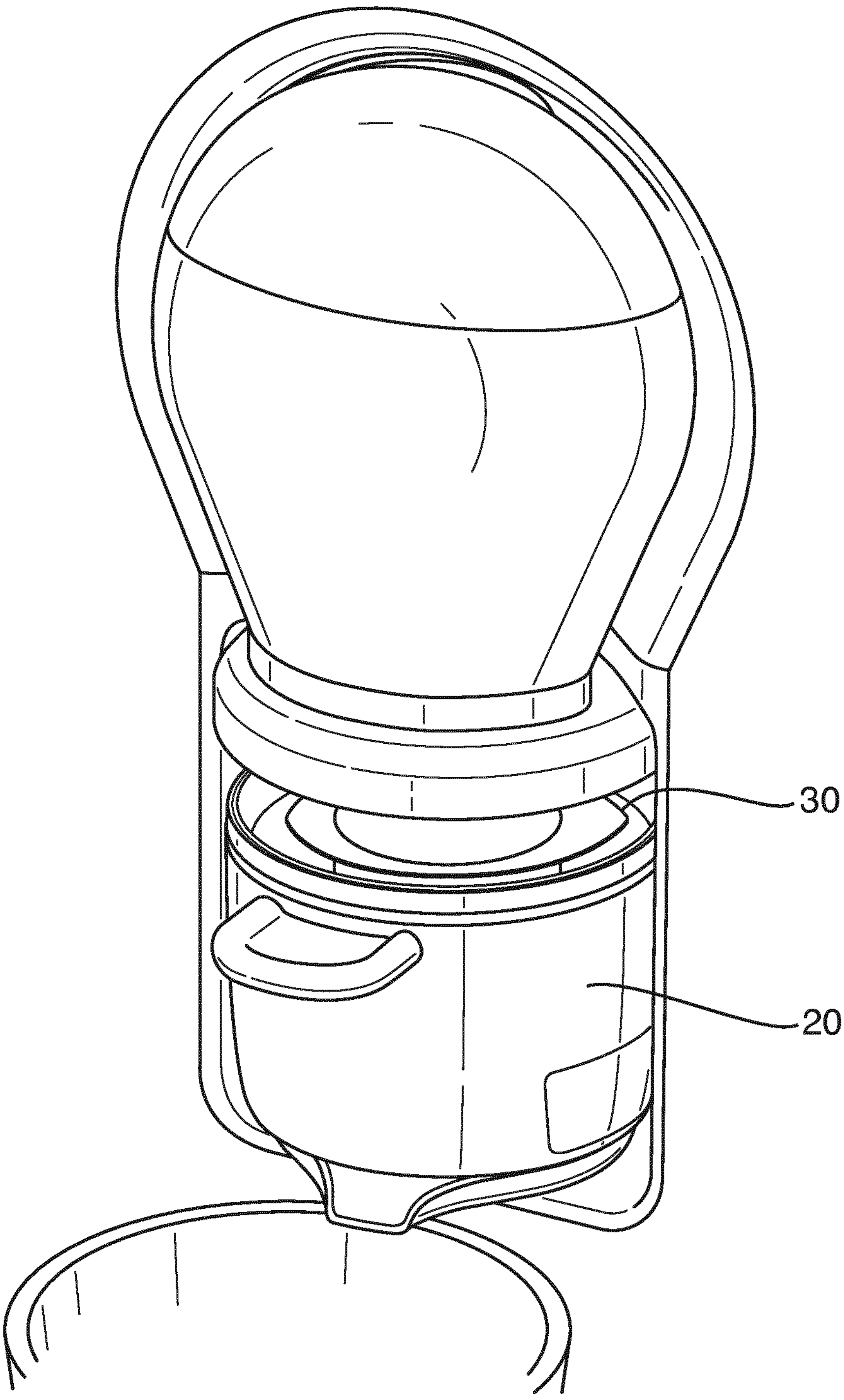

Fig. 5a

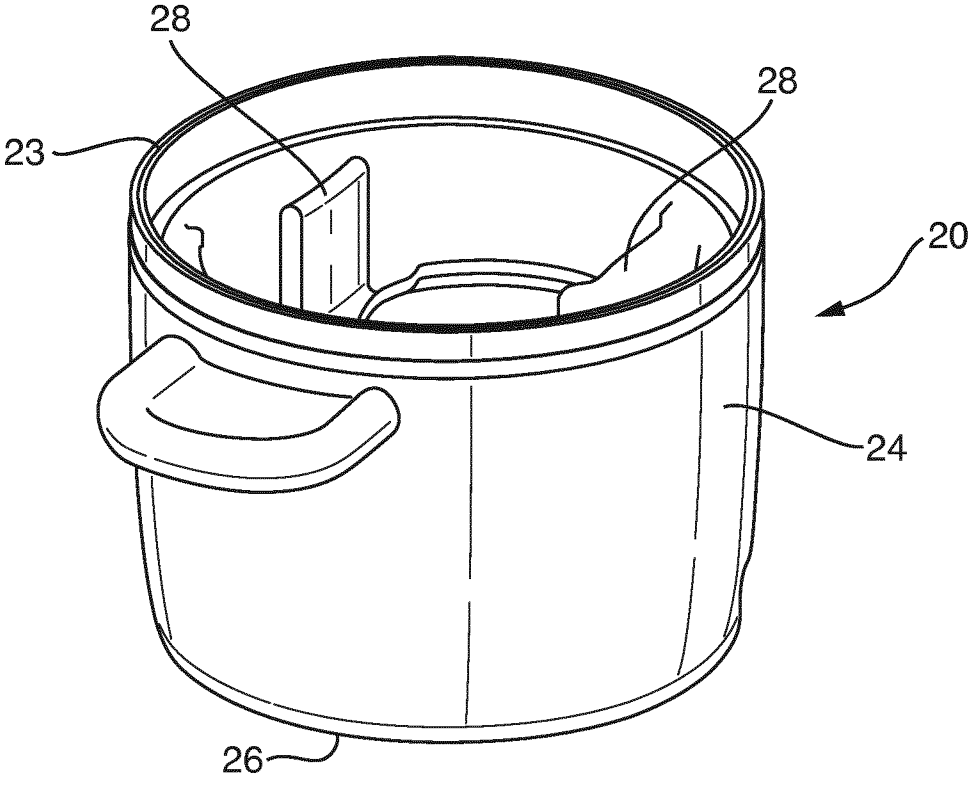

Fig. 5b

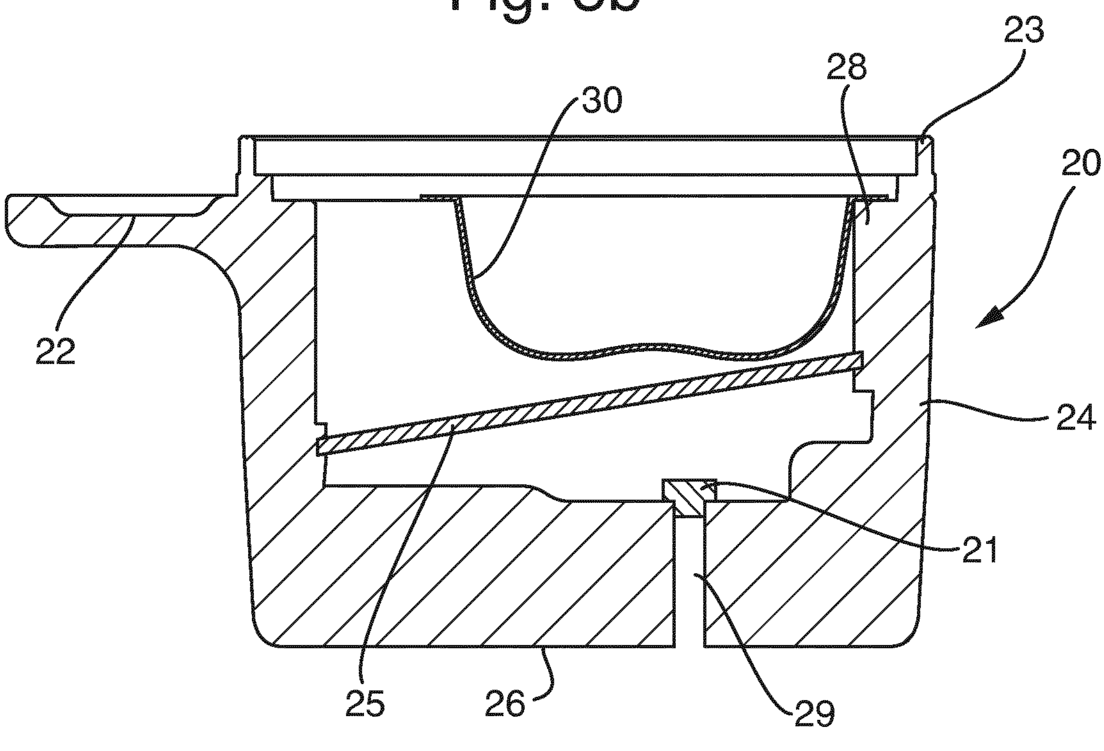

Fig. 6(a)

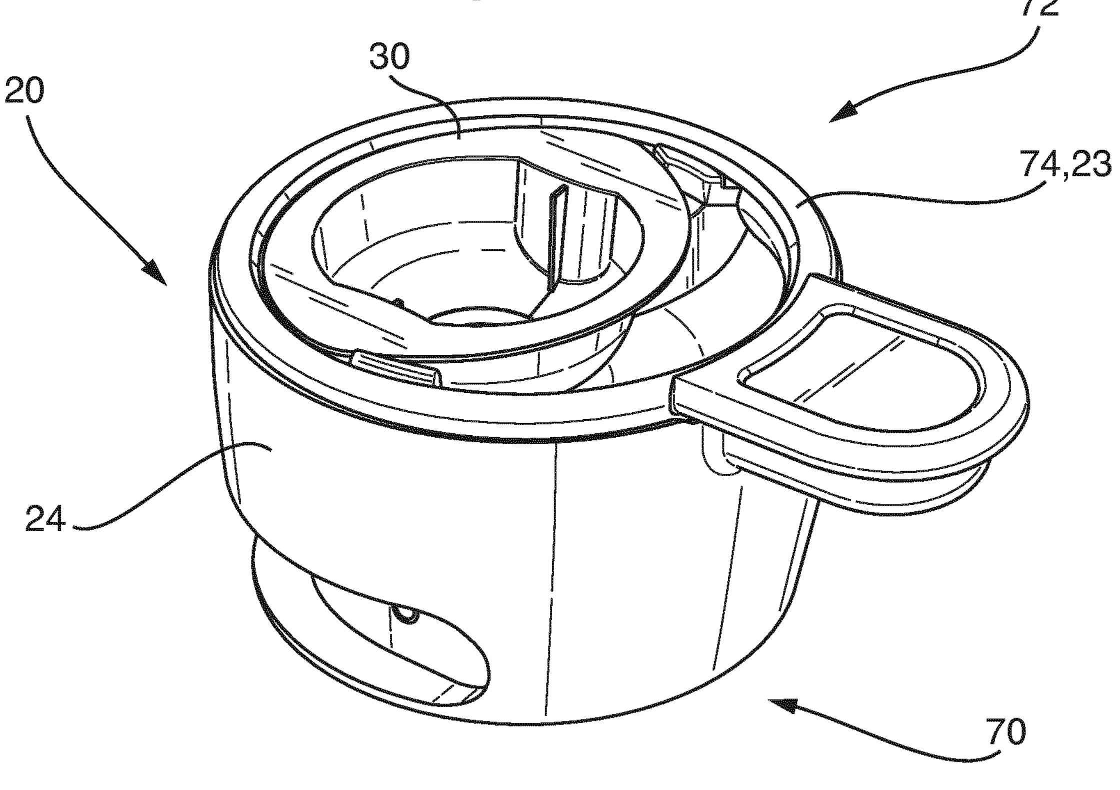

Fig. 6(b)

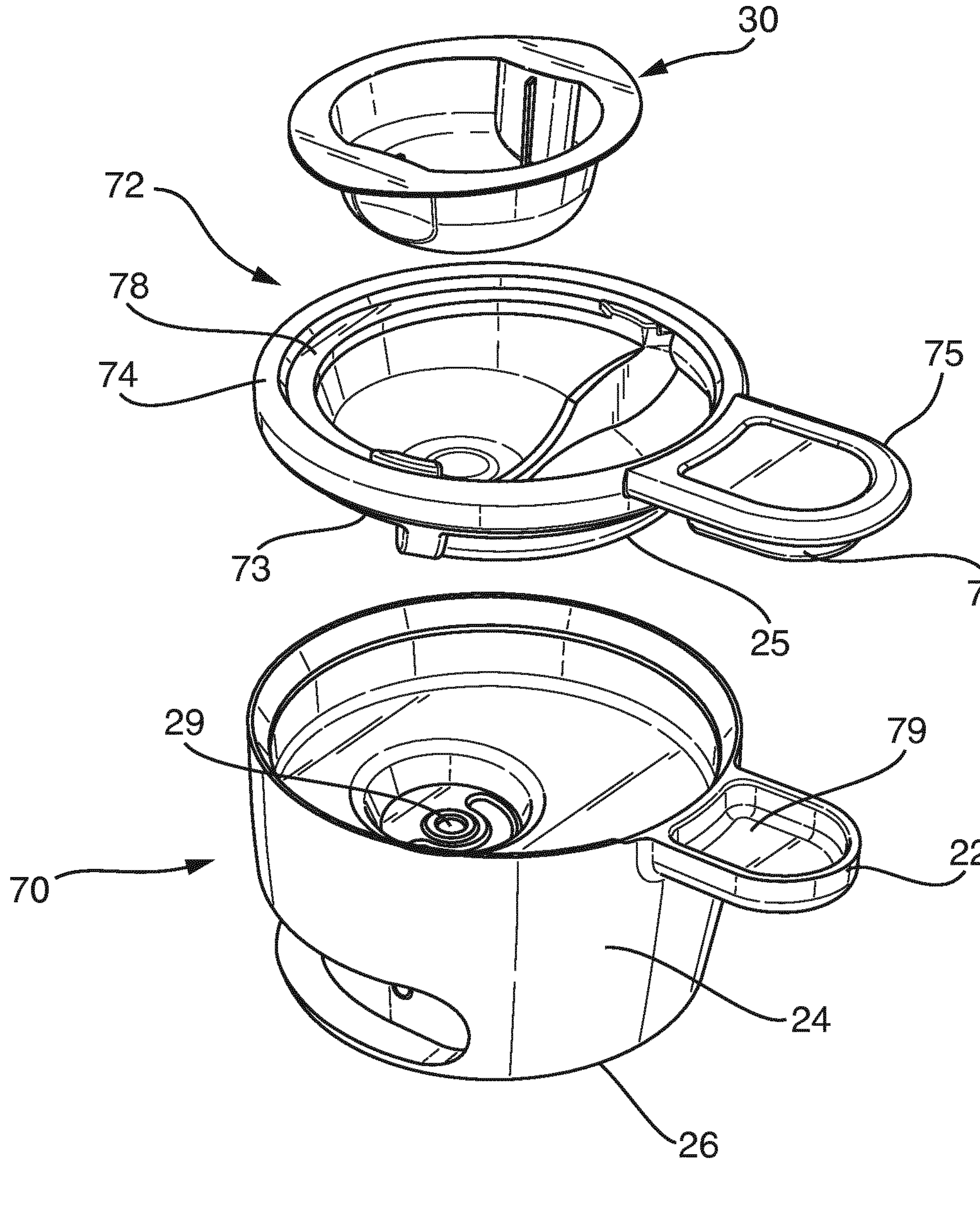

Fig. 7(a)

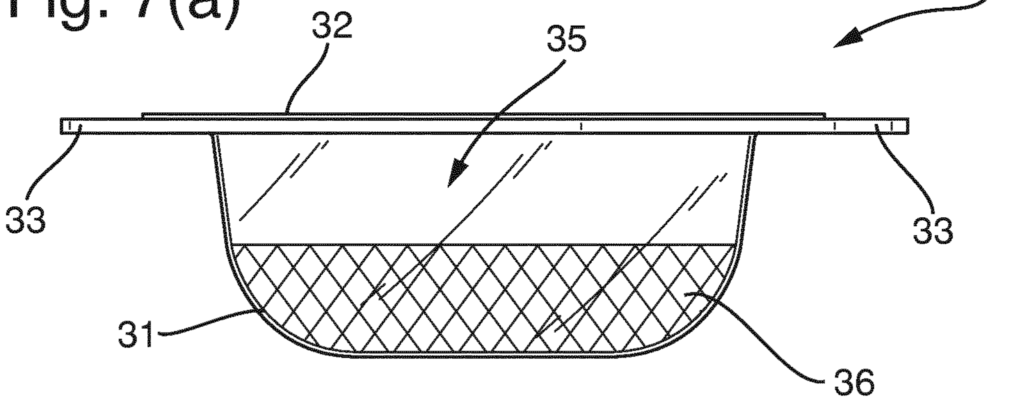

Fig. 7(b)

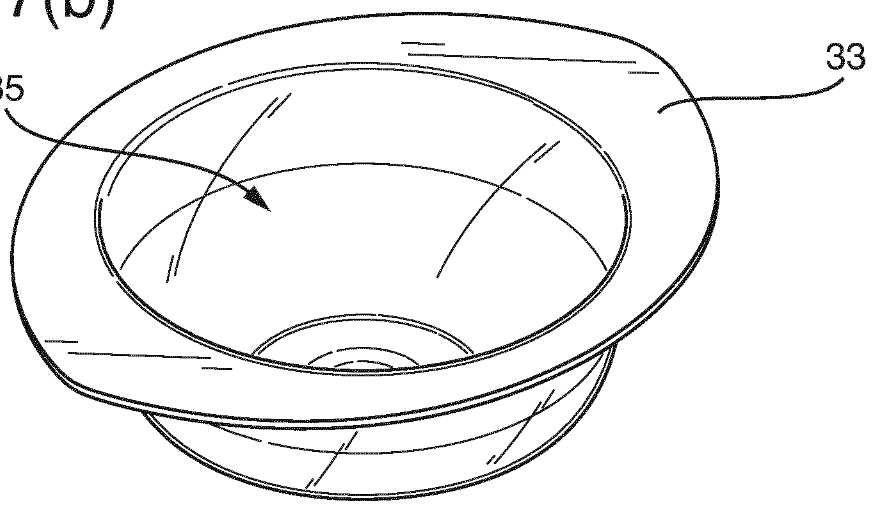

Fig. 7(c)

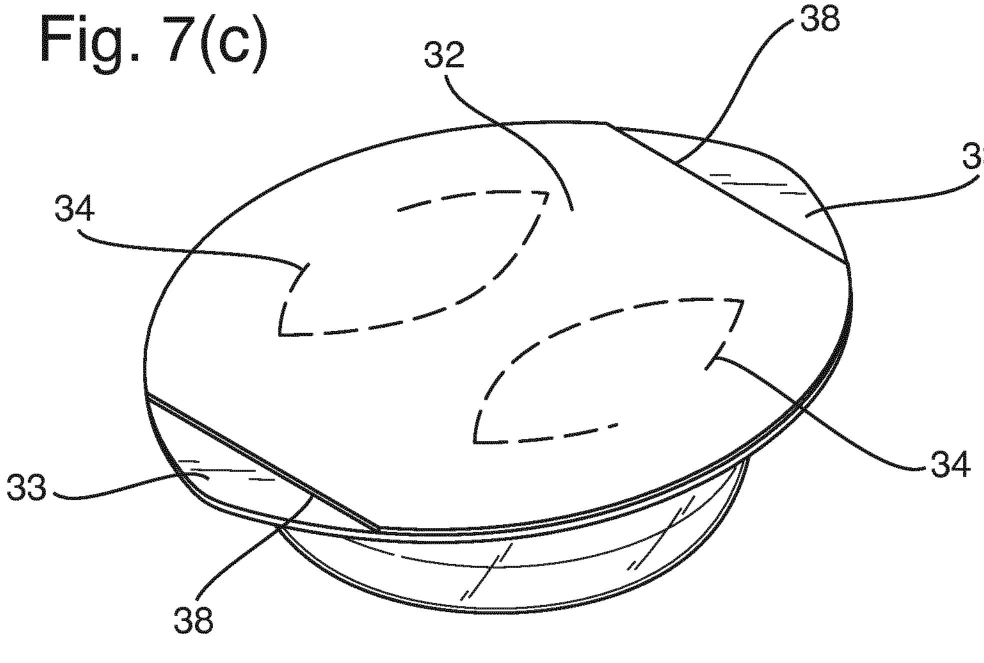

Fig. 8(a)

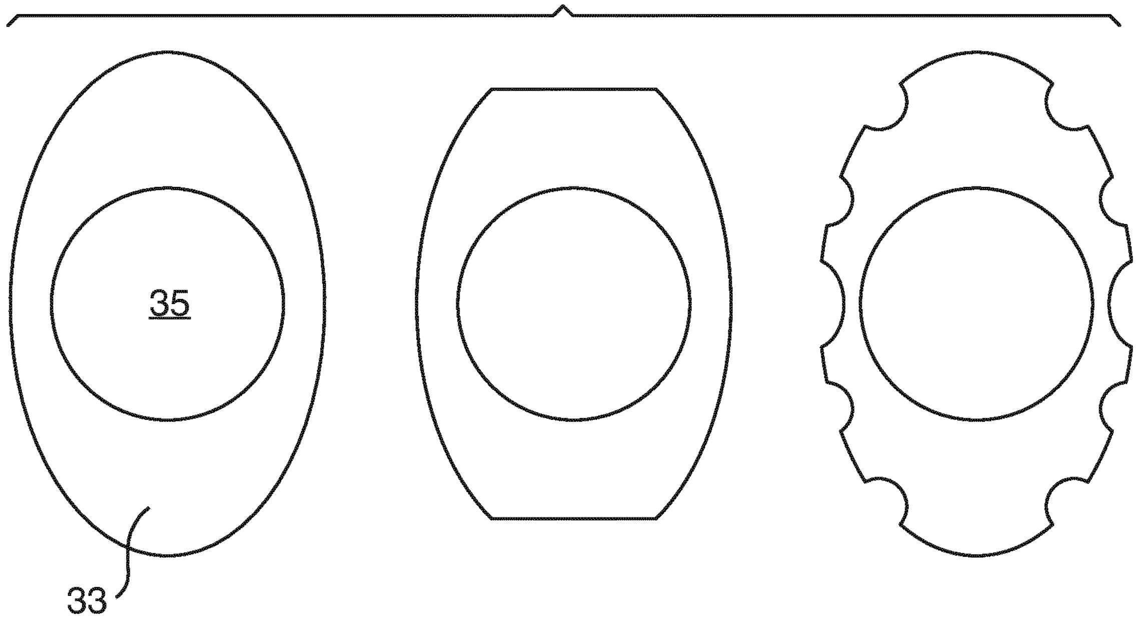

Fig. 8(b)

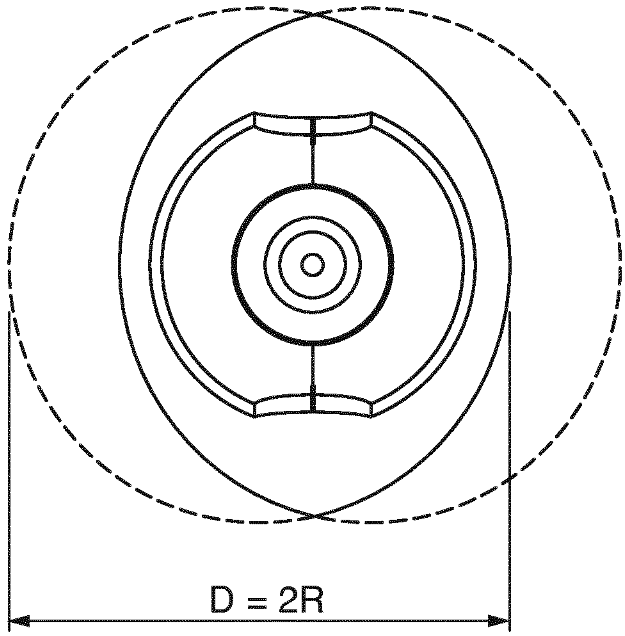

Fig. 9