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(56) Documents Cited:
FR 002714279 A1 **US 5813317 A1**
US 20110081466 A1 **US 20090074930 A1**
US 20030003208 A1
JP H05137653
JP H08336463

(58) Field of Search:
INT CL **A47G, A47J**
Other: **WPI, EPODOC, Patent Fulltext**

(54) Title of the Invention: **Infused beverages**
Abstract Title: **Methods and apparatus for preparing infused beverages**

(57) A method of preparing an infused beverage, for example tea or coffee, comprises introducing both an infusion material 6 and a quantity of fluid 9 to be infused into the infusion chamber 4. The method further comprises drawing at least a portion of infused fluid from the tank after a predetermined time period, whilst simultaneously introducing a further quantity of fluid to be infused to the chamber. Further infused fluid is then drawn from the chamber after a further predetermined infusion time period. Also disclosed is an apparatus for preparing an infused beverage which comprises an infusion chamber having a housing 5 defining a sealed cavity between the housing and the chamber wherein the housing is moveable relative to the chamber. Furthermore, there is a valve member in an outlet 10 of the chamber that is operable by relative movement between the housing and the chamber. Also disclosed is an apparatus for preparing an infused beverage which comprises an infusion chamber that receives infusion material. The chamber has an inlet 8 and an outlet and the apparatus further comprises a pump that lowers the pressure in the chamber during infusion.

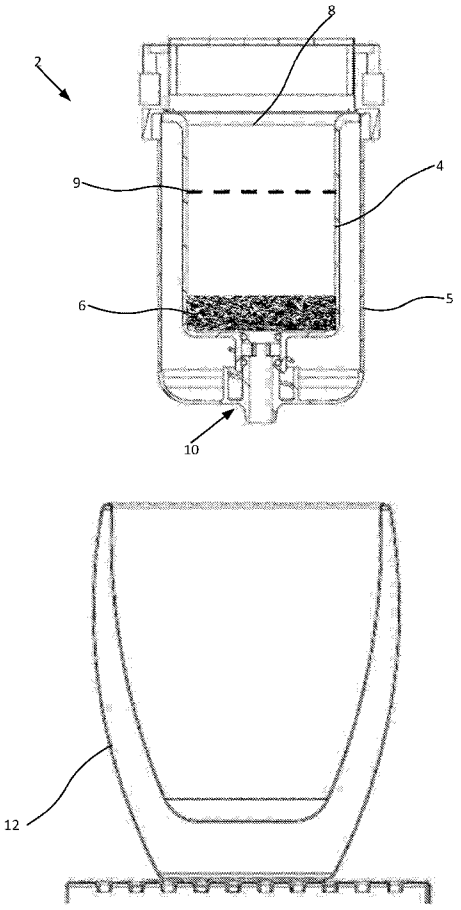

Figure 1

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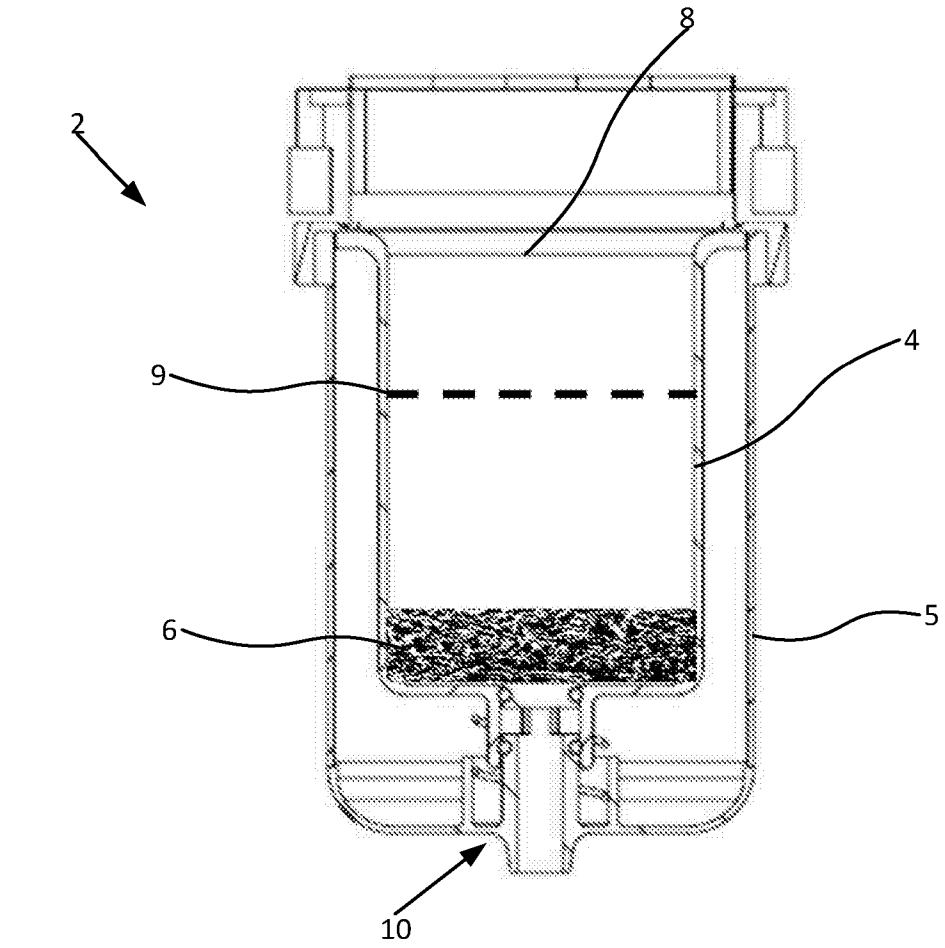
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.



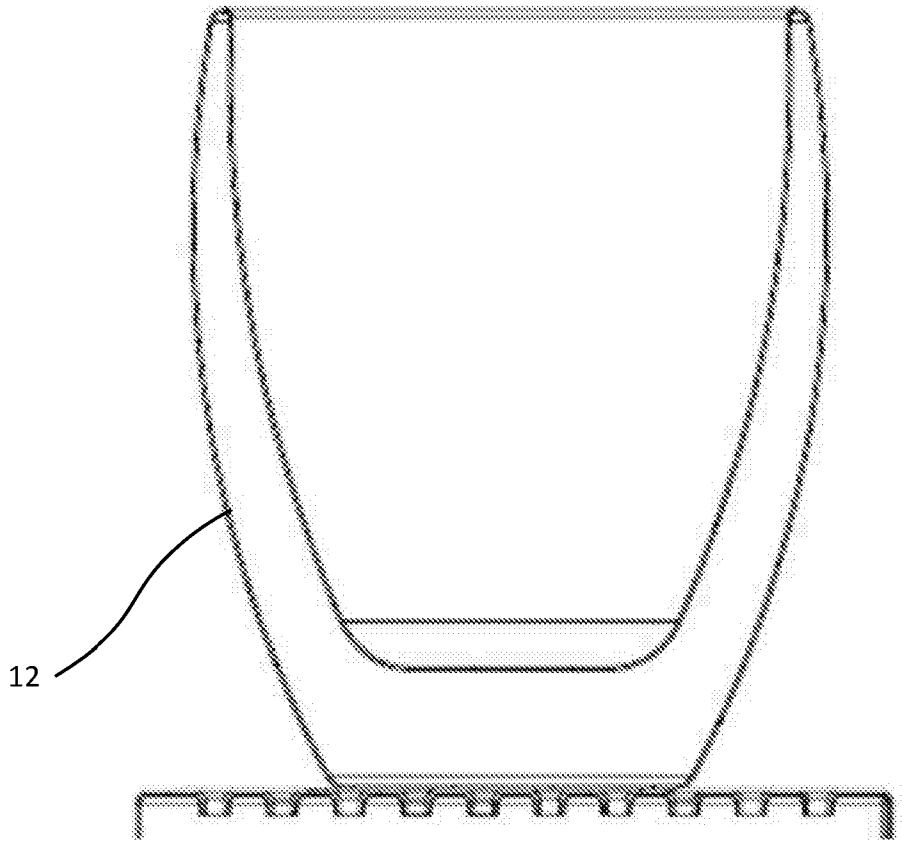


Figure 1

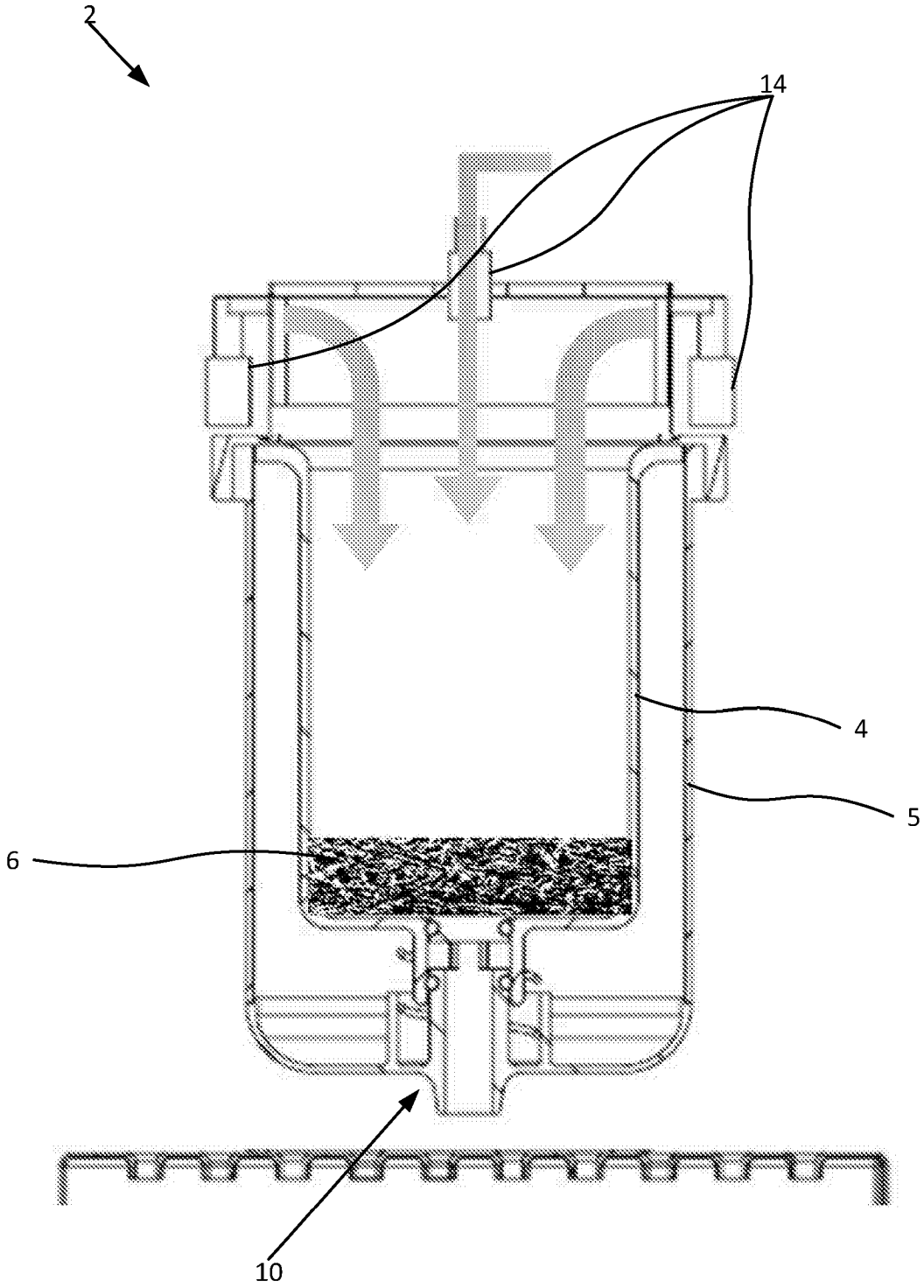


Figure 2

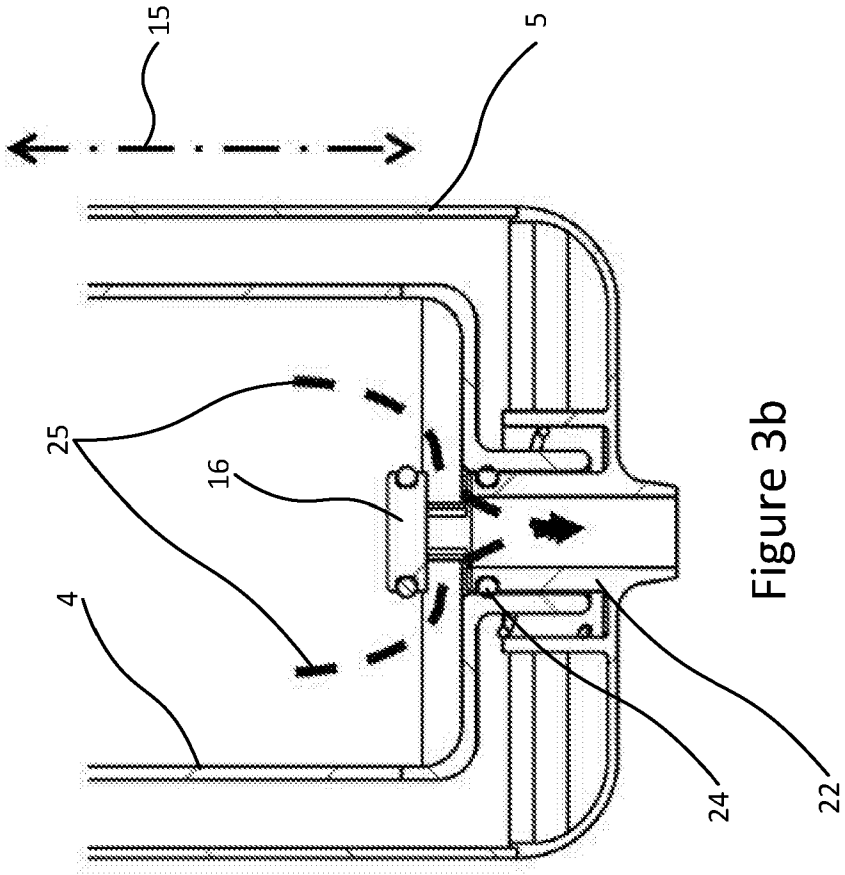


Figure 3b

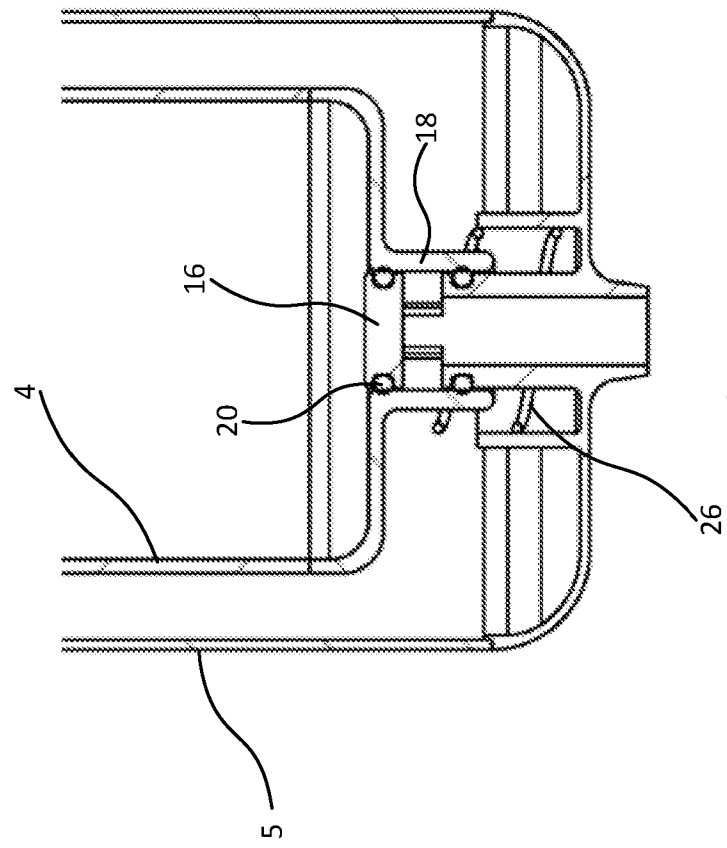


Figure 3a

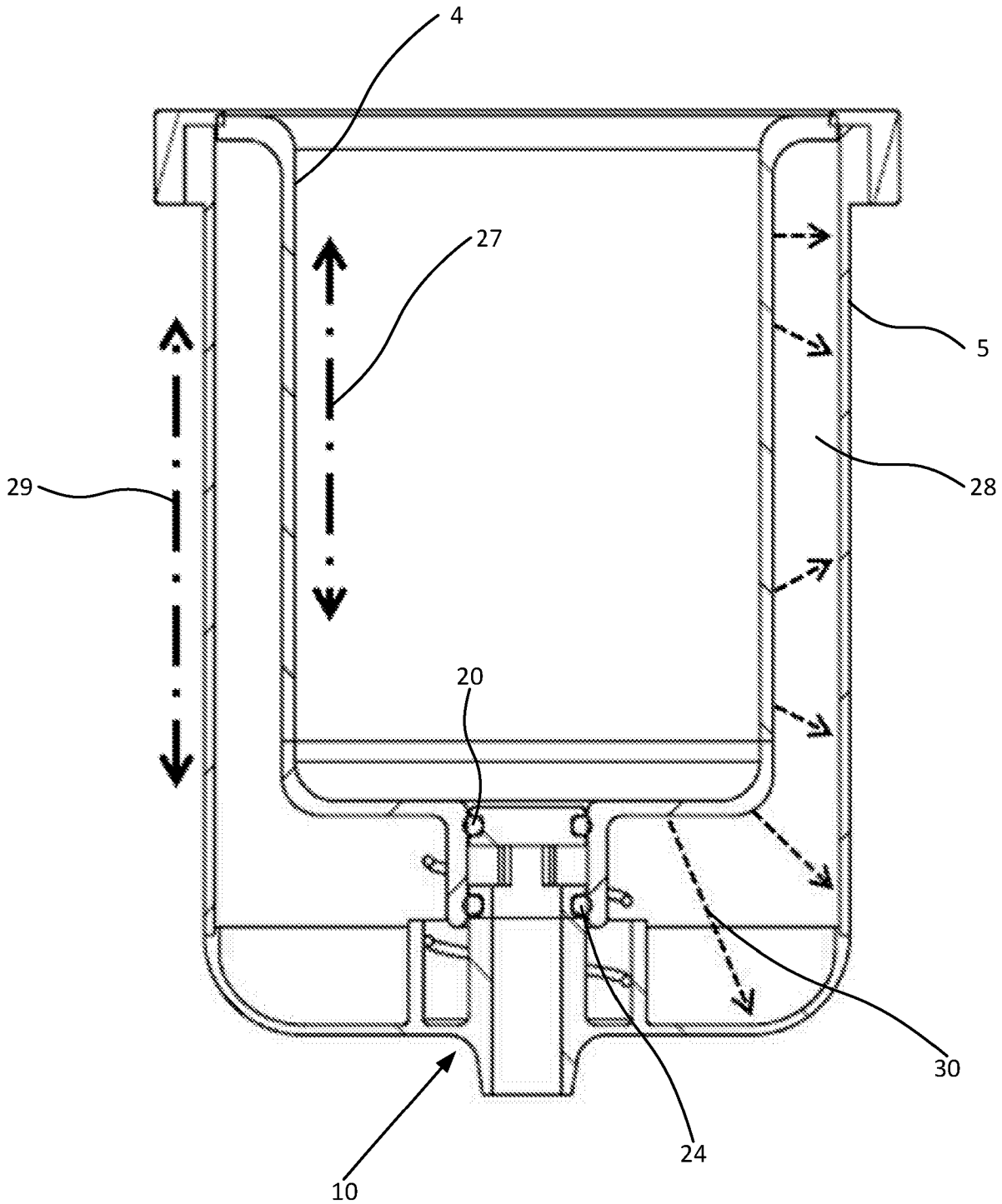


Figure 4

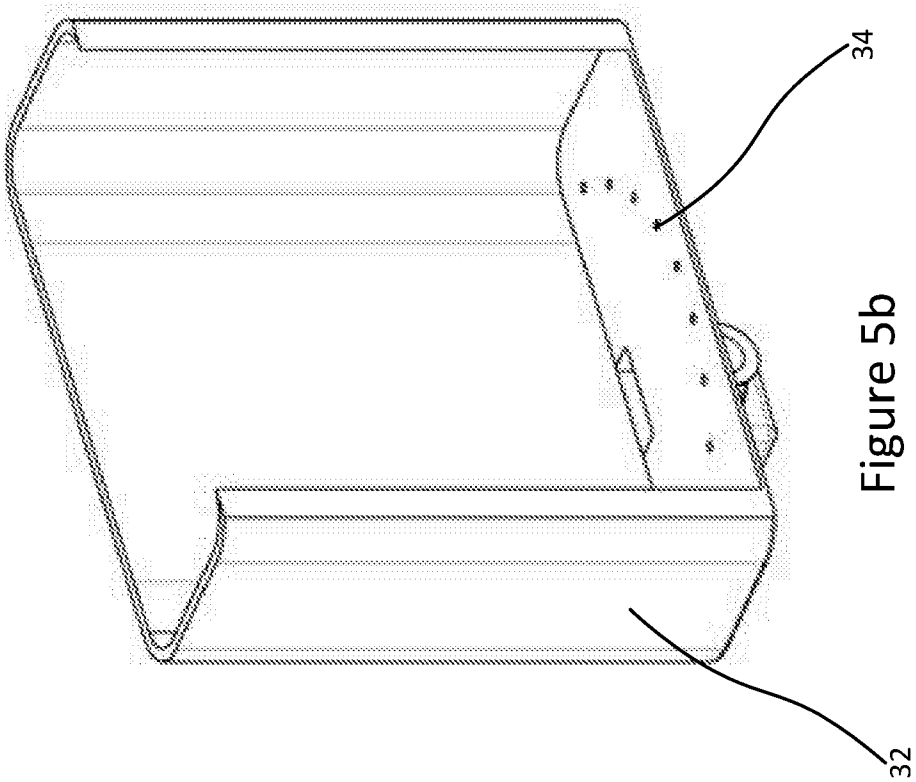


Figure 5b

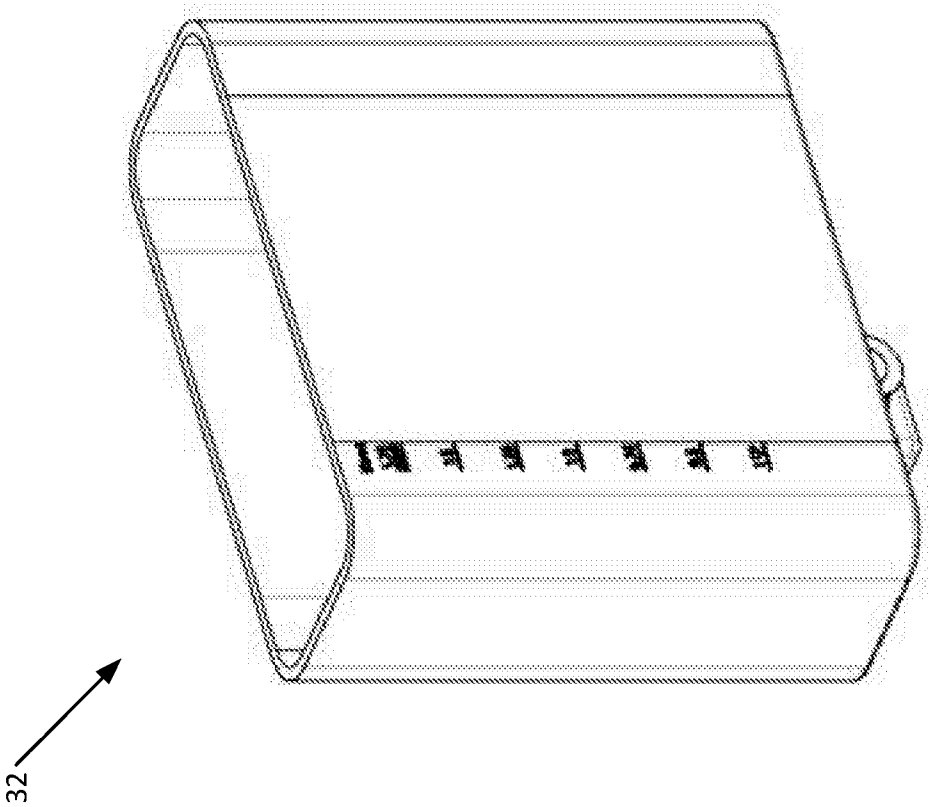


Figure 5a

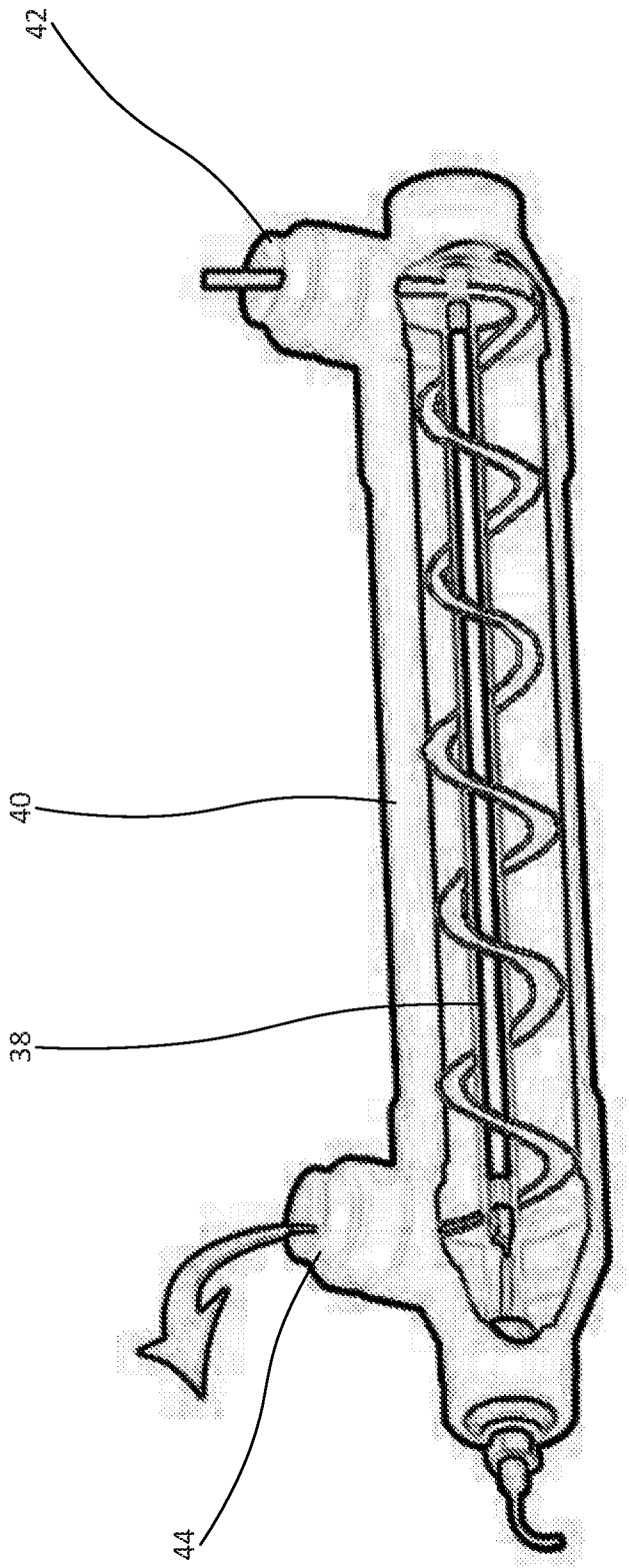


Figure 6

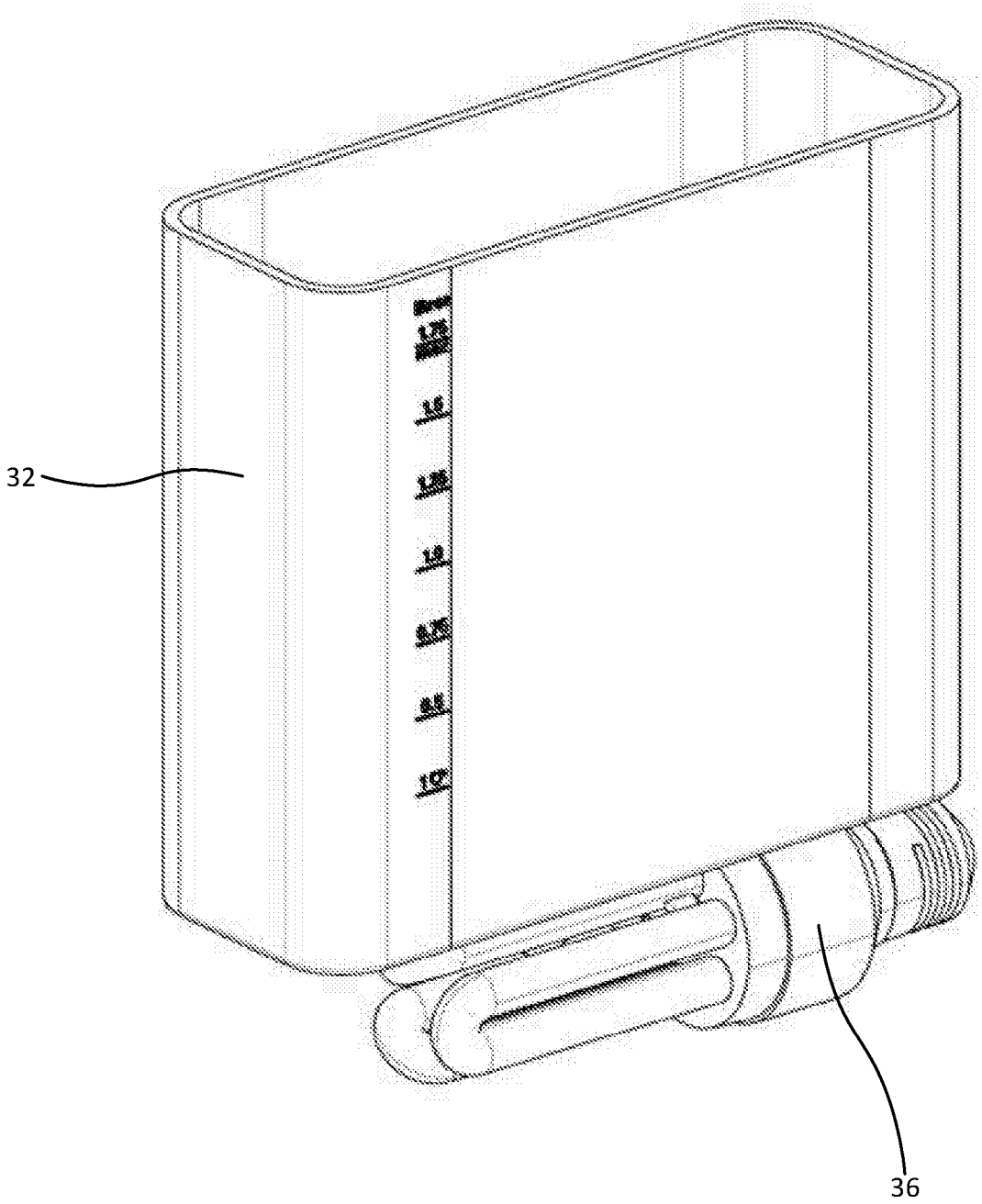


Figure 7

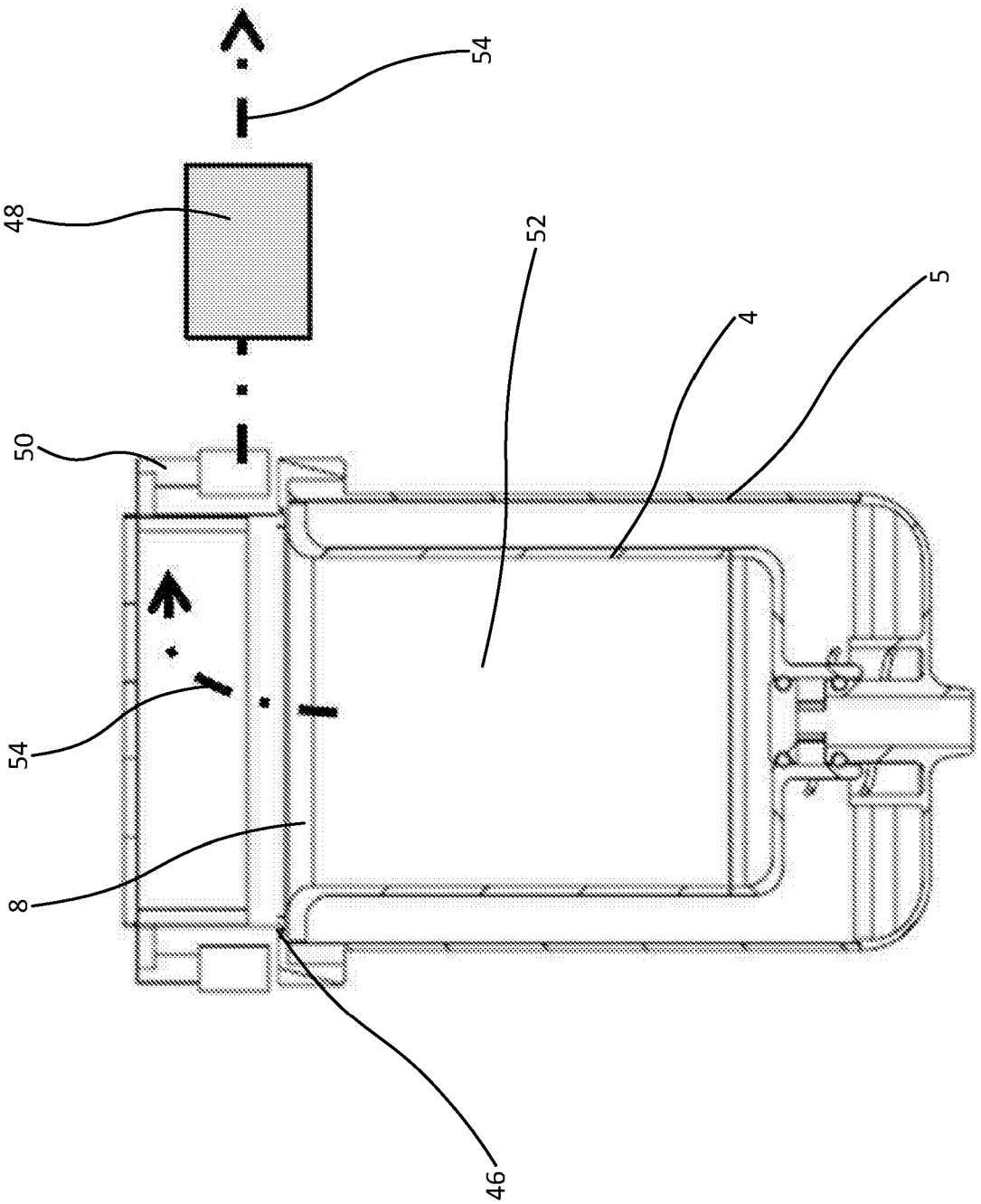


Figure 8

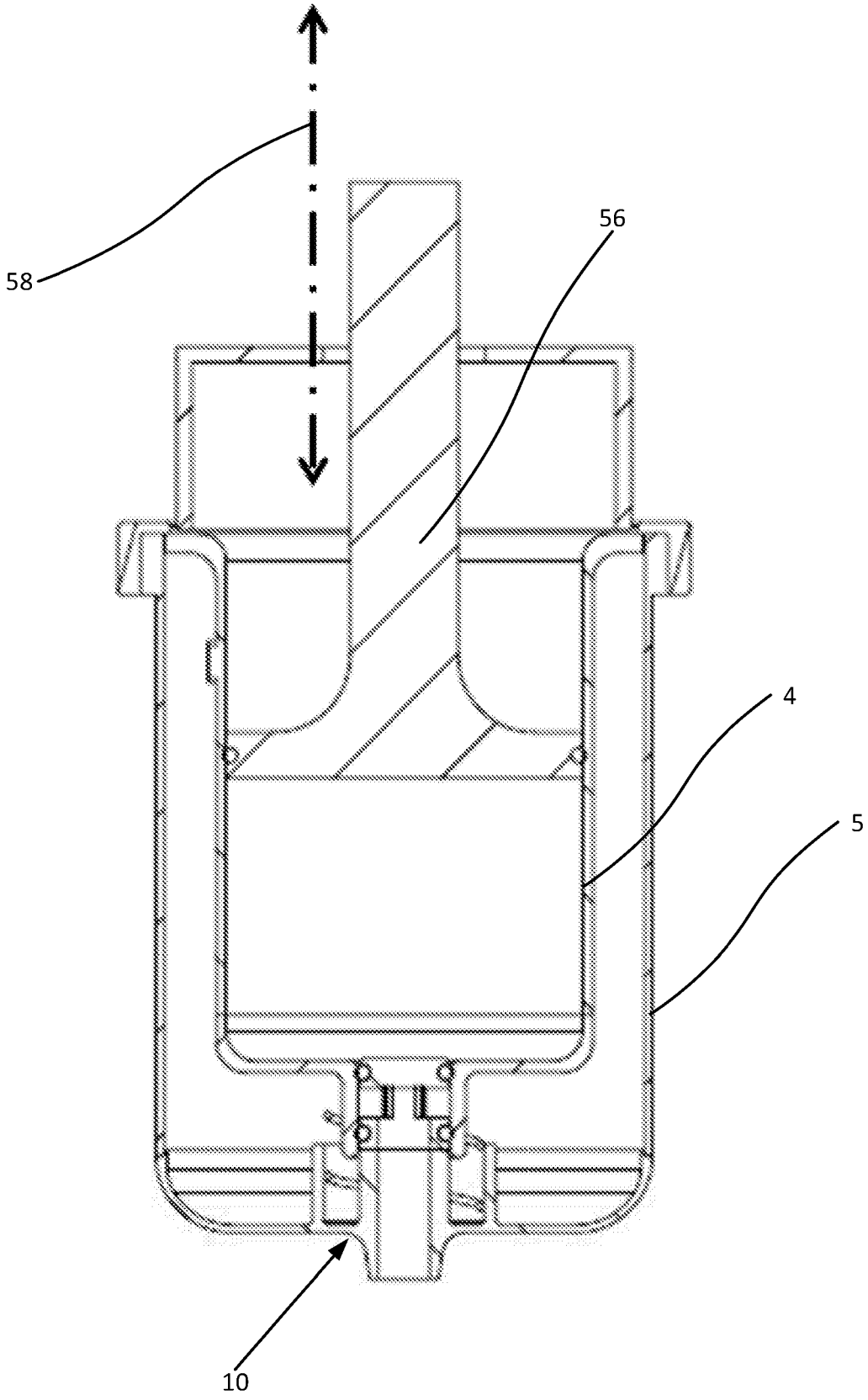


Figure 9

Infused Beverages

The present invention relates to a method and apparatus for preparing infused beverages. In particular, it relates to an automatic infusion beverage maker, and a method of controlling such a beverage maker. Such apparatus generally prepare beverages from loose or packaged materials such as tea leaves or ground coffee.

A problem with such machines is that they are inflexible in that they generally only allow a single infusion period, after which the material is discarded and the beverage dispensed. Furthermore the water must be hot in order to allow infusion to take place, such that cold infused beverages are difficult to produce

The present invention is directed at least partially to ameliorate the above-described problems.

In an aspect of the invention, there is provided a method of preparing an infused beverage, the method comprising the steps of: (a) introducing an infusion material into an infusion chamber; (b) introducing a quantity of fluid to be infused into the infusion chamber; (c) drawing at least a portion of infused fluid from the tank after a predetermined time period, whilst simultaneously introducing a further quantity of fluid to be infused to the chamber; and (d)drawing further infused fluid from the chamber after a further predetermined infusion time period.

Step (c) can be repeated one or more times. This can provide faster infusion, reducing infusion time for example by between 20 and 80%. The addition of fresh fluid whilst the infusion is being drawn also assists mixing of the infusion material. The fluid may for example be water, which may be heated, and the material may be tea leaves. The material may be compressed, for example with a plunger, in order to release infused fluid for drawing. The fluid may be drawn by opening an outlet aperture in a lower portion of the chamber.

The quantity of fluid in step (b) may be less than between about 50% and 80%, and preferably less than 50%, of the total quantity of fluid drawn in steps (c) and (d). Thus the capacity of the chamber may be smaller than the required infused beverage. The time required to fully infuse a serving is decreased by successively infusing smaller portions to make up a larger entire serving, relative to the speed of infusion of an entire serving in one go. This relatively higher speed of infusion is due to Fick's laws of diffusion dictating a higher speed of diffusion over steeper concentration gradients such as occur relatively close to the infusion material at the start of infusion.

In one example, the chamber is sealed during at least a portion of the duration of the infusion time period. Thus the pressure in the chamber may be lowered. This lowers the boiling point of the fluid so as to allow infusion of colder fluids, for example in order to provide a cold infused beverage.

The fluid may be supplied from a storage tank. Air may be passed through the storage tank to oxygenate the fluid before supplying the fluid to the chamber. Additionally or alternatively, the fluid contained within the tank may be exposed to a UV light source before supplying the fluid to the chamber in order to sterilize the fluid.

In another aspect, the invention provides an apparatus for preparing an infused beverage, comprising: an infusion chamber having an opening for receiving infusion material, an inlet for introducing fluid to be infused to the chamber, and an outlet for drawing infused fluid from the chamber, wherein the inlet and the outlet are arranged to be operable together to allow fluid to be drawn at the same time as fluid is introduced.

The invention also provides apparatus for preparing an infused beverage, comprising: an infusion chamber having a housing, the housing defining a sealed cavity between the housing and the chamber and being movable relative to the

chamber, and a valve member in an outlet of the chamber, the valve member being operable by relative movement between the housing and the chamber.

The outlet may comprise a plurality of apertures to reduce splashing.

Preferably, the housing and the chamber are substantially cylindrical, and are relatively movable in a substantially axial direction. Thus the outlet may be provided in a lower face of the chamber, and the housing may substantially surround the lower face and an axially extending side face of the chamber. This provides insulation of the infusion chamber.

Preferably, a substantially airtight seal is provided between the chamber and the housing around the outlet of the chamber and around an upper portion of the axially extending side faces thereof.

In another aspect, the invention provides a method of preparing an infused beverage, the method comprising the steps of: introducing an infusion material into an infusion chamber; introducing a fluid to the chamber; sealing the chamber to form an enclosed volume comprising the fluid; and lowering the pressure of the enclosed volume.

Any apparatus feature as described herein may also be provided as a method feature, and vice versa. As used herein, means plus function features may be expressed alternatively in terms of their corresponding structure, such as a suitably programmed processor and associated memory.

Any feature in one aspect of the invention may be applied to other aspects of the invention, in any appropriate combination. In particular, method aspects may be applied to apparatus aspects, and vice versa. Furthermore, any, some and/or all features in one aspect can be applied to any, some and/or all features in any other aspect, in any appropriate combination.

It should also be appreciated that particular combinations of the various features described and defined in any aspects of the invention can be implemented and/or supplied and/or used independently.

In this specification the word 'or' can be interpreted in the exclusive or inclusive sense unless stated otherwise.

Furthermore, features implemented in hardware may generally be implemented in software, and vice versa. Any reference to software and hardware features herein should be construed accordingly.

Whilst the invention has been described in the field of domestic food processing and preparation machines, it can also be implemented in any field of use where efficient, effective and convenient preparation and/or processing of material is desired, either on an industrial scale and/or in small amounts. The field of use includes the preparation and/or processing of: chemicals; pharmaceuticals; paints; building materials; clothing materials; agricultural and/or veterinary feeds and/or treatments, including fertilisers, grain and other agricultural and/or veterinary products; oils; fuels; dyes; cosmetics; plastics; tars; finishes; waxes; varnishes; beverages; medical and/or biological research materials; solders; alloys; effluent; and/or other substances.

Whilst tea is used as the infusion material for exemplary purposes, other infusion materials may be used. These include coffee, soups, stocks, flavoring, pharmaceuticals, and other materials belonging to the categories listed in the preceding paragraph.

The invention described here may be used in any kitchen appliance and/or as a stand-alone device. It may be implemented in heated and/or cooled machines. It may be used in a machine that is built-in to a work-top or work surface, or in a stand-alone

device. The invention can also be provided as a stand-alone device, whether motor-driven or manually powered.

One or more aspects will now be described, by way of example only and with reference to the accompanying drawings having like-reference numerals, in which:

Figure 1 is a cross sectional side view of an infusion unit;
Figure 2 is a cross sectional side view of the unit showing the inlet paths;
Figures 3a and 3b are cross sectional side views of the unit showing the outlet valve in the open and closed positions;
Figure 4 is a further cross sectional side view of the unit;
Figures 5a and 5b are perspective views of a storage tank for use with the unit;
Figure 6 is a perspective view partly broken away of a UV treatment device for use with the unit;
Figure 7 is a perspective view of a storage tank with UV treatment device for use with the unit
Figure 8 is further cross sectional side view of the unit; and
Figure 9 is a further cross sectional side view of an infusion unit.

Specific Description

The invention employs a micro infusion unit that can provide a concentration of the infusion. The unit has a capacity that is smaller than the finished/ required final infusion by between 20% to 80%. The concentrate is delivered into the drinking vessel/ jug with the use of gravitational force, several further concentrates are made of lessening intensity until the required infused beverage is delivered. The invention provides a quicker infusion time reducing the time of the infusion by between 20 and 80%. The infusion unit can be of any shape from a cylinder to a cube.

Referring to Figure 1, an infusion unit 2 comprises an infusion chamber 4 for receiving infusion material 6. The chamber 4 is open at an upper end 8. The lower

end incorporates an outlet valve or tap 10. The opening 8 can fluted to a size of up to about three times the diameter of the chamber 4 to allow easy access of the infusion material 6 into the chamber 4. The chamber 4 is surrounded by an insulating housing 5.

The outlet tap 10 is mechanically or electrically operated in order to control the drawing of the infused liquid. The tap 10 acts independently from the input of the water. This is to allow the input of water into the chamber 4 and the output of water from the chamber 4 to act independently. After the first concentrate is made, the addition of infusion liquid such as water into the chamber whilst allowing the infused water from the chamber to be drawn simultaneously can increase the agitation of the infusion materials in the chamber and therefore speed up the process of infusion.

The infusion process

The tea leaves or bag or other infusion material 6 is placed into the chamber with the outlet tap 10 closed, the chamber 4 is partly filled with water to a variable level 9 that is for example less than 50% of the final desired beverage. The infusion is left for an infusion period of time, which is for example up to several minutes. The outlet tap 10 is then opened to allow the infused liquid to be released and drawn from the unit 2, into a vessel such as a cup 12 or tea pot placed below the tap 10. Opening of the outlet tap 10 may be carried out by a processor in electronic communication with the outlet tap 10 (which may be electrically actuatable by the processor) based on feedback from a timer or from a sensor (e.g., a light-level sensor receiving light through the fluid from a light source, or any other sensor for detecting concentration of material within a fluid) detecting a concentration of material within the infused liquid and whether a desired concentration has been reached. At the same time the fresh water is added to the chamber (whilst the outlet tap is open) to assist the infusion and the mixing of the tea leaves. During the addition of the fresh water the outlet tap 10 is closed and the chamber replenished. This process is repeated, for example with different volumes of water, until a required infusion is achieved.

Alternatively the outlet tap 10 may be closed before the adding of fresh water. To maintain temperature during infusion, the infusion chamber may be heated or cooled by a dedicated heating and/or cooling element associated with the infusion chamber.

Water Addition to the chamber

Referring also to Figure 2, the water is added to the chamber 4 either from the top, side or bottom of the chamber via at least one of a plurality of inlets 14, dependent upon the desired infusion effect. The water may be added directly from a flow-through heater (not shown), and at the required temperature for the maximising the infused flavour. The hot water heater outlet is placed at a distance from 1mm to 30cm from the chamber to mitigate any loss of temperature.

The water may be added in several ways from the top and from any distance from the centre of the top opening. The water can also be added from the bottom and side of the chamber to create more turbulence of the water to increase the agitation of the infusion material. The speed the water is added to the chamber is dependent upon the efficiency of the heater unit and the pump used but can vary dependent upon the pump used and the temperature of the water required.

The addition of the water into the infusion chamber can be operated with the outlet tap open as well as closed. When the infusion chamber is full with water, extra water can be added as the outlet tap is opened or a specified time after opening whilst water is still in the chamber. This creates an extra turbulence of the liquid within the infusion chamber increasing the efficiency of the infusion process.

Referring also to Figures 3a and 3b, the way the infused liquid such as tea or other beverage is drawn from the chamber may be by employing a “pressure tap” that is activated either by an upward force on the housing 5, or by a downward force on the infusion chamber 4 (indicated by an arrow 15 in the figure). This causes relative movement between the housing and the chamber to open the tap. The housing 5

includes a valve member 16 which is movable within an outlet opening 18 of the chamber 4 between a position blocking the opening 18 (Figure 3a) and a position allowing fluid to flow through an outlet pipe 22 of the housing 5 (see arrows 25). The valve member 16 may include a seal 20. The outlet pipe 22 is also moveable in the opening 18 of the chamber 4, and may also have a further seal 24. The valve member 16 may be biased towards the closed position with a spring 26 acting between the chamber 4 and the housing 5.

The opening of the outlet tap 10 may comprise several separate outlet apertures, such as from 2 to 20. This separates the outlet flow and thus reduces the noise and splashing of the infused beverage being dispensed into the cup. The profile of the outlet can be of several different shapes which can be developed to minimise the noise of the released infusion.

Referring also to Figure 4, the micro infusion chamber 4 and housing 5 can together form a dual lined container, to provide insulation from the heat so that the unit can be handled without the user being exposed to an extreme temperature.

Double lined chamber to assist the operation of the outlet tap

Having a double lining to the micro infusion unit is also utilised to aid the operation of the outlet tap. Both the chamber 4 and the housing 5 are attached to outlet tap 10 in such a way that when the distance between the chambers are decreased the outlet tap opens and contents of the chamber is released (as described above). This movement can be achieved by pressure being applied to either the chamber 4 (causing movement indicated by the arrow 27 in the figure) or the housing 5 (causing movement indicated by the arrow 29) or both.

The air gap 28 between the chamber 4 and the housing 5 is preferably small, such that circulation of air is restricted in order to reduce heat transference.

The trapped air is a poor conductor so reduces the rate of heat loss from the inner chamber 4 via heat transfer (indicated by arrows 30) and protects the user from contacting with any hot surfaces. The seals 20, 24 around the tap 10 are thus preferably air tight.

Referring to Figures 5a and 5b, a water storage tank 32 may be provided with the infusion unit, from which water may be supplied to the chamber (optionally via a heater).

As the infusion machine will have time of inactivity in between the infusion operations, the water in the chamber can be become static and there can be a loss of oxygen from the water as it stands idle. Thus oxygen/air is added to the water. The water tank 32 contains an air inlet pipe communicating with a plurality of air inlet apertures 34 in or near the base of the tank 32 that will create bubbles in the water storage tank via a pump. The pumping of air into the water storage chamber can reactivate the water by reintroducing the oxygen back into the water. The presence of oxygen in the water assists the development of flavour of the infusion.

The air may be produced by several methods, and can be from any number of outlets from a single outlet to many, dependant on the size and shape of the water storage tank 32.

Alternatively, the fluid in the storage tank 32 may be continually or periodically re-circulated through air via, e.g., a water-fall or fountain, as is commonly done in fish tanks to ensure aeration and oxygenation of the fluid.

UV water storage

Referring to Figures 6 and 7, a High UV power density LED may be used to disinfect the water supplied to the unit. This can be achieved either by the use of a UV LED to treat all the water storage tank, or by using the UV LED light to expose some of the water in the pipe that leads from the water storage tank to the heater. For example, a

UV lamp 36 may be mounted adjacent the tank 32 (for example below the tank). Alternatively, a UV lamp 38 may be mounted in a tube 40 connected between an inlet pipe 42 from the water tank 32 to an outlet pipe 44 to the infusion unit.

Referring now to Figure 8, the micro infusion unit can also be used to produce cold infused beverages such as ice teas. The hot water is added as described above; however, the addition of extra water is not undertaken by the flow through heater but via a cooling unit.

Cold infusions with the use of pressure pumps

The water, which may be cold, is placed into the chamber 4, and a vacuum is then created by the removal of the air to produce a pressured environment that reduces the boiling point of the water to assist the infusion. This releases the flavour from the infusion material, by reducing the boiling temperature of the water considerably. The vacuum is then released and the water placed into the drinking vessel or cup, and cold water is then passed through the infusion chamber and either a vacuum pulled again or the infusion is created by the process describe above but with cold water.

In this case, the opening 8 of the chamber 4 can be sealed such that the chamber 4 is made airtight. An airtight seal 46 is provided between the chamber 4 and the housing 5. A compressor 48 may be fitted to a conduit 50 communicating with the chamber (which may optionally also serve as a fluid inlet) in order to draw air out of the interior 52 of the chamber 4 (see the arrows 54 in the figure).

Referring now to Figure 9, a plunger 56 may be provided inside the infusion chamber 4 to press the infusion material after the water has been drawn or released from the chamber, to ensure that all the flavour is released from the flavour materials. The machine will release the infused liquid, by opening of the tap 10, and then the plunger 56 will be pressed down into the chamber from the top (see the arrow 58) so

that it will apply pressure to the leaves or infusion material to encourage the release of the infused liquid.

It will be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

Each feature disclosed in the description, and (where appropriate) the claims and drawings may be provided independently or in any appropriate combination.

Reference numerals appearing in the claims are by way of illustration only and shall have no limiting effect on the scope of the claims.

CLAIMS:

1. A method of preparing an infused beverage, the method comprising the steps of:
   (a) introducing an infusion material into an infusion chamber;
   (b) introducing a quantity of fluid to be infused into the infusion chamber;
   (c) drawing at least a portion of infused fluid from the tank after a predetermined time period, whilst simultaneously introducing a further quantity of fluid to be infused to the chamber; and
   (d) drawing further infused fluid from the chamber after a further predetermined infusion time period.

2. A method as claimed in claim 1, comprising repeating step (c) at least once.

3. A method according to Claim 1 or 2, wherein the fluid is water.

4. A method according to Claims 1, 2 or 3, wherein the infusion material is tea.

5. A method according to any preceding claim, comprising heating the fluid to be infused to a predetermined temperature before introducing the fluid to the chamber and/or heating the chamber to a predetermined temperature.

6. A method according to any preceding claim, comprising compressing the infusion material in order to release infused fluid for drawing.

7. A method according to any preceding claim, in which the step of drawing the fluid comprises opening an outlet aperture in a lower portion of the chamber.

8. A method according to any preceding claim, in which the quantity of fluid introduced in step (b) is less than 80%, and preferably less than 50% of the total quantity of fluid drawn in steps (c) and (d).

9. A method according to any preceding claim, comprising the steps of sealing the chamber during at least a portion of the duration of the infusion time period.

10. A method according to claim 9 comprising lowering the pressure in the chamber for at least a portion of the duration of the infusion time period.

11. A method according to claim 9 or 10, in which the beverage is a cold beverage, and the fluid introduced in step (b) and/or in step (c) is cold fluid.

12. A method according to any preceding claim, comprising supplying the fluid to be infused from a storage tank.

13. A method according to claim 12, comprising the step of oxygenating the fluid in the storage tank before supplying the fluid to the chamber.

14. A method according to claim 12 or 13, comprising the step of exposing the fluid contained within the tank to a UV light source before supplying the fluid to the chamber.

15. Apparatus for preparing an infused beverage, comprising:
an infusion chamber having an opening for receiving infusion material, an inlet for introducing fluid to be infused to the chamber, and an outlet for drawing infused fluid from the chamber, wherein the inlet and the outlet are arranged to be operable together to allow fluid to be drawn at the same time as fluid is introduced.

16. Apparatus for preparing an infused beverage, comprising:
an infusion chamber arranged to receive fluid to be infused, the chamber having a housing defining a sealed cavity between the housing and the chamber and being movable relative to the chamber, and a valve member in an outlet of the chamber, the valve member being operable by relative movement between the housing and the chamber.

17. Apparatus as claimed in claim 16, in which the housing and the chamber are substantially cylindrical, and are relatively movable in a substantially axial direction.

18. Apparatus as claimed in claim 16 or 17, in which the outlet is provided in a lower face of the chamber, and the housing substantially surrounds the lower face and an axially extending side face of the chamber.

19. Apparatus as claimed in claim 18, in which a substantially airtight seal is provided between the chamber and the housing around the outlet of the chamber and around an upper portion of the axially extending side faces thereof.

20. Apparatus as claimed in any of claims 15 to 19, in which the outlet comprises a plurality of apertures.

21. Apparatus as claimed in any of claims 15 to 20, comprising a heater for heating the fluid to be infused to a predetermined temperature.

22. Apparatus as claimed in any of claims 15 to 21, comprising a storage tank for storing fluid to be infused.

23. Apparatus as claimed in claim 22, comprising at least one of: an aerator arranged to aerate the fluid to be infused; and a UV light source arranged to sterilize the fluid to be infused.

24. A method of preparing an infused beverage, the method comprising the steps of:
introducing an infusion material into an infusion chamber;

introducing a fluid to the chamber;
lowering the pressure in the chamber; and
drawing infused fluid from the chamber.

25. Apparatus for preparing an infused beverage comprising an infusion chamber arranged to receive infusion material, the chamber having an inlet arranged to receive fluid to be infused, and an outlet arranged for infused fluid to be drawn from the chamber, the apparatus comprising a pump arranged to lower the pressure in the chamber during infusion.

Intellectual Property Office

Application No:	GB1700323.7	**Examiner:**	Miss Cassandra Fraser
Claims searched:	1-15, 20-23	**Date of search:**	7 June 2017

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	15, 21, 22	JP H05137653 A (TOSHIBA HEATING APPLIANCES CO). See figure 1 and paragraphs [0011], [0012], [0014], [0017]-[0020] and [0024]-[0025] of the translated description.
X	15, 21, 22	US 2011/0081466 A1 (LASSOTA). See figures 1 and 3 and paragraphs [0011], [0035], [0036] [0043], [0044], [0052], [0053].
X	15, 21, 22	JP H08336463 A (MATSUSHITA ELECTRIC IND CO LTD). See figures and paragraphs [0018]-[0021], [0027] and [0028] of the translated description.
A	-	US 2003/0003208 A1 (LASSOTA). See EPODOC abstract, figures 1-3 and paragraphs [0023] and [0024].

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A47G; A47J

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, Patent Fulltext

Intellectual Property Office

International Classification:

Subclass	Subgroup	Valid From
A47J	0031/00	01/01/2006
A47J	0031/06	01/01/2006
A47J	0031/18	01/01/2006

Intellectual Property Office

Application No:	GB1700323.7	**Examiner:**	Miss Cassandra Fraser
Claims searched:	16-23	**Date of search:**	4 January 2018

Patents Act 1977
Further Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	16-18, 20	US 2009/0074930 A1 (HAMMAD). See EPODOC abstract, figures 3-5 and paragraphs [0004]-[0009] and [0026]-[0033].
A	-	FR 2714279 A1 (OSCH SIEMENS HAUSGERAETE). See WPI abstract (AN: 1995-233816) and figure 1.
A	-	US 5813317 A1 (CHANG). See EPODOC abstract, figures 1, 2 and 4 and column 2 line 15 to column 3 line 4.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A47J

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
A47J	0031/00	01/01/2006
A47J	0031/06	01/01/2006
A47J	0031/18	01/01/2006