Apparatus for preparing a beverage is proposed comprising a brew chamber defining a volume for containing at least one container with a solubil or extractable product for preparing said beverage and a pressure generator for providing pressure. The apparatus comprises a sealing member arranged for sealing said brew chamber by means of said pressure.
Apparatus for preparing a beverage

FIELD OF THE INVENTION

In general, the present invention relates to the field of machines for preparing beverages. More specifically, the invention relates to sealing the brewing head unit of a beverage preparation apparatus.

BACKGROUND

This invention relates to an apparatus for preparing a beverage fit for consumption, such as coffee, tea, chocolate and cappuccino. The sealing mechanism used by most existing beverage machines, seal the coffee chamber by mechanical means only. For example, in current beverage machines, coffee is placed on a stainless steel or aluminium filter cup which consists of three bayonet type fittings. The brew head's side has a counter recess which fits to the cup. The user turns a handle on the filter cup to lock in the bayonet fitting to the brew head. A silicone seal ring is fixed on the brew head. Once the filter cup is locked into the brew head, the seal ring seals the top edge of the filter cup to prevent water leaking from it.

Another example of this apparatus is the single serve pod coffee machine. In this design, the locking mechanism is a slider or turning ring which locks on the brew chamber bottom. The slider or turning ring has tabs and corresponding recesses on the support base. This seal ring, which has minor expanding capability, is fixed on the brew head. Both locking mechanisms described use a mechanical method to seal the filter cup /pod holder to the seal ring.

WO 2006/066621 of the applicants discloses an apparatus for preparing a beverage comprising a brew chamber defining a volume for containing at least one container with a soluble or extractable product for preparing said beverage, wherein said apparatus comprises adjustment means for varying the volume of said brew chamber. The apparatus comprises a silicon sealing ring and a connection ring to fixate the closing seal for sealing the brewing chamber.
The drawback of this design is that the silicone sealing ring has limited expanding capability. As such, when the water pressure exceeds the sealing force leaking results from the gap formed between the seal ring and the filter cup/pod holder.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an apparatus for preparing a beverage with an improved sealing. To that end, an apparatus for preparing a beverage is proposed comprising a brew chamber defining a volume for containing at least one container with a soluble or extractable product for preparing said beverage and a pressure generator for providing pressure. The apparatus comprises a sealing member arranged for sealing said brew chamber by means of said pressure.

The greater the pressure generated by the pressure generator, the stronger the seal is for sealing the brew chamber. Sealing is properly achieved at that pressure where the sealing member is expanded so that the sealing member comes into contact and develops an appropriate contact force with the brew chamber.

The embodiment of the invention as defined in claim 2 provides for a hydraulic sealing mechanism wherein the pressure is obtained from the fluid responsible for the preparing the beverage.

The embodiments of the invention as defined in claims 3-5 provide for suitable arrangements for the sealing member.

The embodiment of the invention as defined in claim 6 provides for a sealing mechanism wherein the internal pressure of the boiler is used for sealing the brew chamber.

The embodiment of the invention as defined in claim 7 provides for a controlled supply of fluid into the sealed brew chamber for obtaining the brewed beverage.

The embodiment of the invention as defined in claim 8 has the advantage that the closure of the brew chamber and the sealing thereof are obtained by the action of the flexible member. The sealing member is a portion of the flexible member.

The embodiment of the invention as defined in claim 9 provides for a suitable interaction between the sealing member
and a structure of the brew chamber in order to guarantee a reliable sealing of the brew chamber.

The embodiment of the invention as defined in claim 10 provides for a suitable mechanism for breaking the seal when the brewing process is completed.

The invention will be further illustrated with reference to the attached drawings, which schematically shows a preferred embodiment according to the invention. It will be understood that the invention is not in any way restricted to this specific and preferred embodiment.

SHORT DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a schematic illustration of a beverage brewing apparatus according to an embodiment of the invention;

FIG. 2 is cross sectional view of a portion of the apparatus of FIG. 1;

FIG. 3 is an exploded view of the portion of FIG. 2;

FIG. 4 is a cross-sectional view of the portion of FIG. 2 depicting the flow of water forcing the sealing member to expand downward;

FIG. 5 is an enlarged cross sectional view of the container holder rim as it contacts the sealing member upon sealing;

FIG. 6 is an enlarged cross sectional view of the piston valve assembly with a container as it opens on high pressure, and

FIG. 7 is a cross sectional view depicting the withdrawn direction of the connector and the direction of flow of the excess water through the outlet tube as sealing member is released.

DETAILED DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic illustration of an apparatus 1 for preparing a beverage 2 suitable for consumption in a cup 3 with a fine-bubble froth layer 4. The apparatus 1 is capable of producing beverages 2, such as coffee, tea, chocolate or cappuccino, in a predetermined volume, typically one or two cups. The apparatus comprises a water container 5 for fresh water for the
preparation of the beverage 2, a pressure generator 6 (also referred to as pump), a valve system 7 and a heating device 8, such as a boiler or a thermo block, from which heated water is delivered into a brew chamber 9. The heating device 8 will hereinafter also be referred to as boiler 8. The boiler 8 may e.g. heat the water to a temperature of 96 °C.

The brew chamber 9 involves the volume available for a container 10 with a filter, also referred to as pad, pod or pouch, pre-packed with a soluble or extractable product to obtain the brewed beverage 2 after the pressurized liquid has passed through the product. The brew chamber 9 has a cover member 11 attached to the boiler 9 and a holder 12 enclosing the container 11.

In operation, water from the water container 5 is fed to the pump 6 to inject the water under pressure via the valve system 7 into the boiler 8. The pressure from the pump for the liquid is in the range of 1.2-3 bar, preferably 1.4 - 2.5 bar. In the boiler 8, water is heated till it has a temperature just below the boiling point. Expansion water during heating is guided through the valve system 7 back into the water container 5. Subsequently, heated and pressurized water is provided via the cover member 11 into the brew chamber 9 where it passes through the container 10 to obtain a brewed beverage 2 in the cup 3.

Referring now to FIGS. 2 and 3, the portion of the apparatus 1 containing the boiler 8 and the brew chamber 9 is described in further detail. In particular, these FIGS. 2 and 3 show a boiler assembly, a cover member 11 and a slide drawer assembly operatively linked to sustain pressure up to a sufficient pressure to create a sealing surface between the holder 12 and a sealing member or sealing portion of the cover member 11.

The boiler assembly comprises a boiler top part 20, a boiler mid part 21, a heater element 22, an inlet tube 23, an outlet tube 24, a cold water tube 25 and a metal support bracket 26. The boiler assembly is provided with a heating chamber for heating water. The base of the boiler assembly is open so as to embrace the sealing member 33 which is mounted on the metal support bracket 26 at the base of the boiler assembly.

The cover member 11 provides the interface between the
boiler 8 and the brew chamber 9 and seals the base of the boiler. The cover member is mounted on the metal support bracket 26. The cover member 11 comprises, amongst other parts, a hot water tube 30, a spring support washer 31, a cone spring 32, an expandable seal member 33, and a seal member holder 34, 35. The cover member 11 accommodates a valve assembly contains a piston valve 36, a spring 37, a piston 38 and a water plate 39. The valve 36 is normally closed. The valve assembly is mounted in the cover member 11 with a connector 27. The valve assembly controls the flow of water from the boiler 8 to the brew chamber 9. The valve assembly comprises an overpressure release valve.

The drawer assembly comprises fixed clamps 40, a holder 12 for the container 10, a silicone nozzle 41 for providing a froth layer on the beverage and a container holder sub-drawer 42. The fixed clamps 40 are mounted on the metal support bracket 26 and form a cabinet for the container holder sub-drawer 42.

In operation, the user first puts the container 10 in the container holder 12. The user then places the container holder in the sub-drawer 42 and slides it into the fixed clamps 40.

Second, the user then simply presses a button to initiate the brewing process and to prepare a beverage. In doing so, the pump 6 is activated and water is pumped from the water tank 5 to the boiler 8 via the valve 7. FIG. 4 shows the flow path of water. Pumped water flows to the boiler 8 from inlet tube 23 and is pumped to cold tube 25. A cover member 11 with a valve assembly is mounted on the base of the boiler assembly, so as to make the boiler its own closed system. The pumped water increases the internal pressure of the boiler assembly because the valve assembly blocks the pumped water from flowing out. The seal member 33 is the only expandable element. Increasing pressure forces the sealing member 33 downward until it embraces the edge of the container 12 to provide a sealed brew chamber 9. The greater the internal pressure in the boiler 8, the greater is the force exerted by the sealing portion 33 of the cover member 11 in sealing the pod holder. Accordingly, the boiler system pressure is sufficient where such boiler pressure is capable of deforming the cover member 7 such that the sealing member 33 makes surface contact with the rim of the holder 12 as illus-
The sealing member 33 is ring shaped and capable of expanding by its accordion-like construction. The sealing member 33 is preferably made of silicone material.

The gist of the present embodiment is to use the water in the boiler 8 to seal the brew chamber 9. The sealing force is dependent on the pressure generated by the pump 6 in the boiler 8. The boiler pressure 8 is sufficient of expanding the cover member comprising the sealing member to obtain an effective sealing. This design differs from the current state of the art in that it utilizes a hydraulic mechanism system. There is no lever, handle or any other mechanical part whereby the user manually seals the brew chamber 9.

When hot water is brewed with a container 10 in the holder 12, the cover member 11 with the sealing member 33 and the valve assembly is lowered down to seal the holder 12. In doing so, the water plate 39 contacts the top of the container 10. The hot water tube 30 delivers hot water to the valve assembly. As the valve assembly is lowered, the container 10 pushes up piston valve 36 and prevents further movement of the water plate 39. The piston 36 moves up opening the seal and thus allowing hot water to flow into the brew chamber 9 as illustrated in FIG. 6.

After brewing, the pump 6 stops and the cone spring 32, connector 27, and sealing member 33 return back to their normal positions. Any excess water flows out of the boiler 8 from outlet tube 24 as shown in FIG. 7. The rise of the sealing member 33 causes the holder 12 to be un-sealed/unlocked. In the unlocked/unsealed position, the user needs only slide out the holder sub-drawer 42 and take out the holder 12.
CLAIMS

1. An apparatus for brewing a beverage comprising:
   - a brew chamber defining a volume for containing at least one container with a soluble or extractable product for preparing said beverage, and
   - a pressure generator for providing pressure,
   wherein said apparatus further comprises a sealing member arranged for sealing said brew chamber by means of said pressure.

2. The apparatus according to claim 1, wherein said apparatus further comprises a fluid supply assembly for supplying fluid to said brew chamber for brewing said beverage by pressure of said pressure generator.

3. The apparatus according to claim 1 or 2, wherein said sealing member is an expandable seal.

4. The apparatus according to claim one or more of the preceding claims, wherein said sealing member is accordion-like in shape.

5. The apparatus according to one or more of the preceding claims, wherein said sealing member comprises silicone material.

6. The apparatus according to one or more of the claims 2-5, wherein said fluid supply assembly comprises a boiler and said sealing member is mounted to said boiler.

7. The apparatus according to one or more of the claims 2-6, wherein said apparatus further comprises a valve assembly arranged for controlling the supply of fluid to said brew chamber.

8. The apparatus according to claim 7, wherein said apparatus comprises a flexible member containing said valve assembly and said sealing member.

9. The apparatus according to one or more of the preceding claims, wherein said brew chamber comprises a holder for said container and said container comprises a structure capable of interacting with said sealing member.

10. The apparatus according to one or more of the preceding claims, wherein said apparatus further comprises a spring element arranged for moving said seal member away from said brew chamber.
chamber when said pressure is reduced below a threshold pressure.
INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/051031

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

A. CLASSIFICATION OF SUBJECT MATTER

INVENTION: A47J31/40 A47J31/06

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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D. Further documents are listed in the continuation of Box C

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

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"Y" 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

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Date of the actual completion of the international search: 28 March 2007

Date of mailing of the international search report: 13/04/2007

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