2014

PATENT ATTORNEYS

EXAMINATION

PAPER E

The New Zealand Law and Practice
relating to Interpretation and Criticism of Patent Specifications

Regulation 158 (1) (e)

Duration: 4 hours (plus 10 minutes for reading)

Facts

You have a meeting with Bob of Handy Packaging Limited ("HPL"), a client who manufactures and sells small plastic sachets, containers and dispensers for condiments, drinks, spreads and other single serve edible items. HPL also have capability in manufacturing food-dispensing machinery. It is a commodity business operating in a competitive market with low margins, and Bob is always looking at ways of expanding HPL's offerings to keep ahead of the game. He's in an aggressive industry, where competitors will actively assert IP rights. Bob sees you periodically with new ideas and always asks your advice about infringement risk. He has a good basic knowledge of IP infringement matters.

Bob says the R&D team at HPL have come up with a great new opportunity revolving around pod-style coffee machines. Pod-style coffee machines are domestic appliances that provide espresso style coffee, similar to that provided by more expensive espresso machines used in cafes, but much more conveniently and cheaply. Ground coffee is provided in a single use aluminium or plastic capsule (pod), which is placed in a capsule holder in the pod-style coffee machine. The coffee machine pierces the capsule and injects hot water/steam into the top of the capsule, which extracts a coffee shot. The extracted (liquid) coffee escapes through the bottom of the capsule through holes that are created by projections in the holder. The coffee is then released into a cup for drinking.

Bob explains that pod-style coffee machines have been around for some time, but they are now becoming all the rage (probably because some hotshot A-lister from Hollywood advertises a particularly famous brand). He wants to catch the wave, and make money from manufacturing and selling coffee capsules and the accompanying machine. As always, Bob is concerned about IP infringement. Bob has researched the market, and he is concerned about one machine of newer design on the market (the "Cofi2000" made by WhizzBang Appliances Limited), which he noted had NZ patent 123456 printed on the bottom and on the capsules that are sold for use with the coffee machine. Bob wants to ensure HPL are sufficiently different with what they

will manufacture and sell to avoid infringement of any patents for the Cofi2000. The HPL R&D team have studied the design of the Cofi2000 machine and capsule and have come up with their own proposed capsule and coffee machine design (with two variations of holder) which they believe are different enough from the Cofi2000 machine/capsules, so should avoid infringement. But, Bob knows it's a complex area, so needs your confirmation that they won't run into any problems.

Bob provides you with a document describing the proposed capsule HPL have designed, and the accompanying coffee machine, with two different proposed variations of capsule holder. A coffee machine with a capsule holder according to variation #2 is the preferred option, but either variation would be commercially and technically viable. Bob believes this is a great opportunity, and because of the aggressive nature of the industry, he is willing to spend what is reasonably required to obtain the advice and take the actions necessary that will give HPL a high level of confidence that they can manufacture and sell a coffee machine and capsule without patent infringement.

You conduct a search of patent records and locate NZ 123456 owned by WhizzBang Appliances Limited. It appears there are no other New Zealand patents owned by the same patentee. You also conduct a general prior art search for pod-style coffee machines and the capsules themselves. There are surprisingly few patents on the subject matter, and most seem very old. You find two interesting items of prior art P1 and P2.

Documents

- D1: Document describing HPL's proposed coffee machine and capsule
- D2: Complete specification (filed in the first instance) of granted New Zealand patent NZ 123456
    - Title: Coffee machine and capsule
    - Patentee: WhizzBang Appliances Limited
    - Priority date/application filing date: 12 December 2012
    - Granted: 12 August 2013

- P1: US 5826492
- P2: US 5656311

Questions

In order to advise Bob, make full notes on the following.

(1) Which, if any, of the following infringe NZ 123456:
    a. the HPL coffee machine (having either of the two variations of capsule holder),
    b. the HPL capsule?

(45 Marks)

(2) Is NZ 123456 valid? **(45 Marks)**

(3) Based on your conclusions in (1), (2), what advice and/or recommendations would you give to Bob? **(5 Marks)**

(4) What other investigations you would make, actions would you take and/or advice would you provide? **(5 Marks)**

Technical description of HPL coffee machine and capsule

Overview

HPL proposes to manufacture a:

- a pod-style coffee machine, and
- a coffee capsule (also called a coffee cartridge or coffee pod) for use with the pod-style coffee machine.

Two variations of the pod-style coffee machine have been designed. Both variations are the same in all respects, except for the coffee capsule holder, which differs slightly in each variation.

One type of coffee capsule has been designed. It can be used with either variation of the pod-style coffee machine.

Coffee capsule

Refer to Figure 1. The proposed coffee capsule 10 comprises an aluminium cylindrical casing with a straight/vertical side-wall 15, and flat top 12 and bottom 13 walls to create a cavity 14. The side-wall 15 is made of thicker aluminium to provide structural rigidity to the capsule 10. The top 12 and bottom 13 walls are made from a thinner aluminium to allow piercing by: a) a steam/water injector (top wall) to allow injection of steam/water, and b) projections (bottom wall) to allow escape of extracted coffee. During manufacture of a capsule, a cylindrical side-wall 15 is formed**,** and a bottom wall 13 attached by a suitable process such as crimping. Ground coffee 11 is placed into the cavity 14 so that the cavity is almost completely filled. The capsule is then sealed off by attaching the top wall 12 by a suitable process such as crimping. The capsule is sealed off under vacuum. This can create a slight concavity in the top and/or bottom wall, but any such concavity is barely perceptible to the naked eye and in no way affects the function of the capsule 10. The bottom wall can be weakened to assist puncturing, the puncturing process being described below. The capsule is less complex to manufacture than typical truncated cone type capsules, which are common. Common

belief is that truncated cone type capsules are easier to insert into a capsule holder. HPL believe that their cylindrical capsule 10 is no more difficult to insert into a capsule holder.

Pod-style coffee machine

Refer to Figure 2 showing a coffee machine schematically. The proposed coffee machine 20 is a pod style-coffee machine predominantly based on a design that has been around for some time and still works well. The only deviation from a standard design is in the capsule holder. The coffee machine has:

- a body 21, with an opening 22 for inserting a coffee capsule 10,
- an internal or external water source 25 that can be heated and pressurised 26 to create heated water/steam,
- a coffee capsule holder 24 (two variations 24a, 24b to be described later with respect to Figures 3A to 4B) in the body 21 (lined up with the opening 22) for holding a capsule 10 during extraction,
- two water/steam injectors 27a, 27b (seen also in Figures 3B, 4B) and associated positioning mechanism (not shown) for injecting water/steam into a coffee capsule 10 in the holder 24 during operation. The injectors 27a, 27b are fluidly coupled to the water source by tubing 28,
- an outlet 29 coupled 31 fluidly to the capsule holder 24 for transferring extracted coffee to a cup 30.

Capsule holder – variation #1

A cross-section of a proposed capsule holder 24a is shown in Figures 3A, 3B, including a capsule 10 inserted therein (partially in Figure 3A and fully in Figure 3B). The capsule holder 24a comprises a cylindrical side-wall 32 formed from aluminium, stainless steel or similar rigid metal. The internal diameter of the side-wall 32 is just greater than the outer diameter of the capsule 10 to allow a snug but not tight fit, for easy entry, retention and expelling of the capsule 10.

The bottom of the receptacle 24a has a circular grille 33, with projections 34 arranged in rows across the grille 33. One row of such projections 34 is shown in Figures 3A, 3B. Between each projection is a channel 35 to allow flow of extracted coffee through the grille 33 and to the outlet 29 in the coffee machine body 21 for collection.

The holder 24a is disposed permanently inside the body 21 of the coffee machine, with the top being aligned with the opening 22 in the coffee machine body. During operation, a capsule 10 is placed into the holder 24a through the opening 22. The capsule 10 rests on the projections 34, but they do not pierce the bottom wall 13 of the capsule 10. The machine 20 is then operated to inject (via the two injectors) heated water/steam into the capsule to extract coffee. The mechanism positions the two injectors 27a, 27b over the capsule and moves them towards the capsule so the injectors pierce the top wall 12 of the capsule 10. The two injectors 27a, 27b are spaced apart to get an even pressure and coverage of steam/water across the coffee in the capsule 10 to produce a better more consistent coffee extraction. The pressure causes the aluminium bottom wall 13 of the capsule to deform slightly (from a flat position) downwards against the projections 34 so they pierce the bottom wall 13 to form holes (see Figure 3B). Extracted coffee can flow through the holes and down between the side of each projection and the remaining portion of pierced bottom wall, more easily seen in the magnification in Figure 3B. The coffee flows through the channels 35 between the projections 34 and through the outlet 29 in the body 21 of the machine. The pierced aluminium creates a quasi-filter, whereby the gap between the pierced aluminium and the projection is small enough to predominantly prevent coffee grounds escaping through the channel and into the cup.

Capsule holder – variation #2 (preferred)

A cross-section of an alternative proposed capsule holder 24b is shown in Figures 4A, 4B, including a capsule 10 inserted therein (partially in Figure 4A and fully in Figure 4B). This capsule holder 24b is predominantly the same as the first variation, except that there are no channels 35 between projections 34. Rather, a channel 45 is formed through each projection 44 – offset from the centre. Each projection 44 pierces the capsule 10 in the same way and coffee escapes through the offset channels 45, as can be seen in the magnified portion of Figure 4B. This design appears to provide a better filter function than the first holder variation – it seems to let even less ground coffee through during extraction.

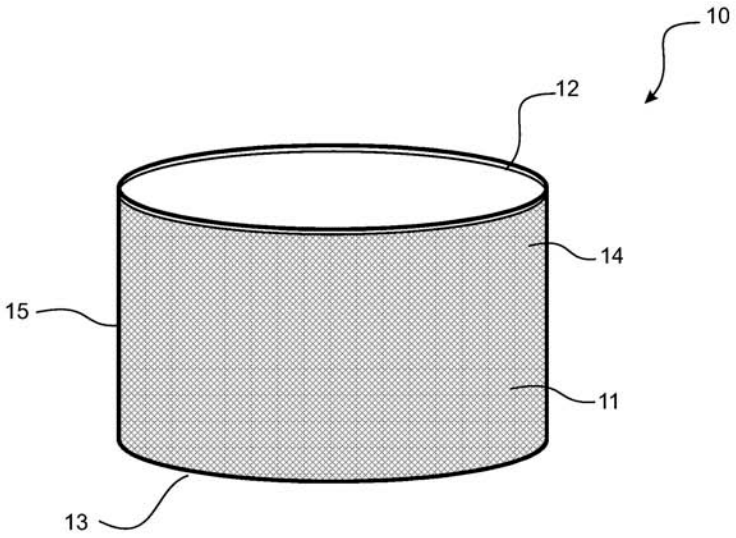


FIGURE 1

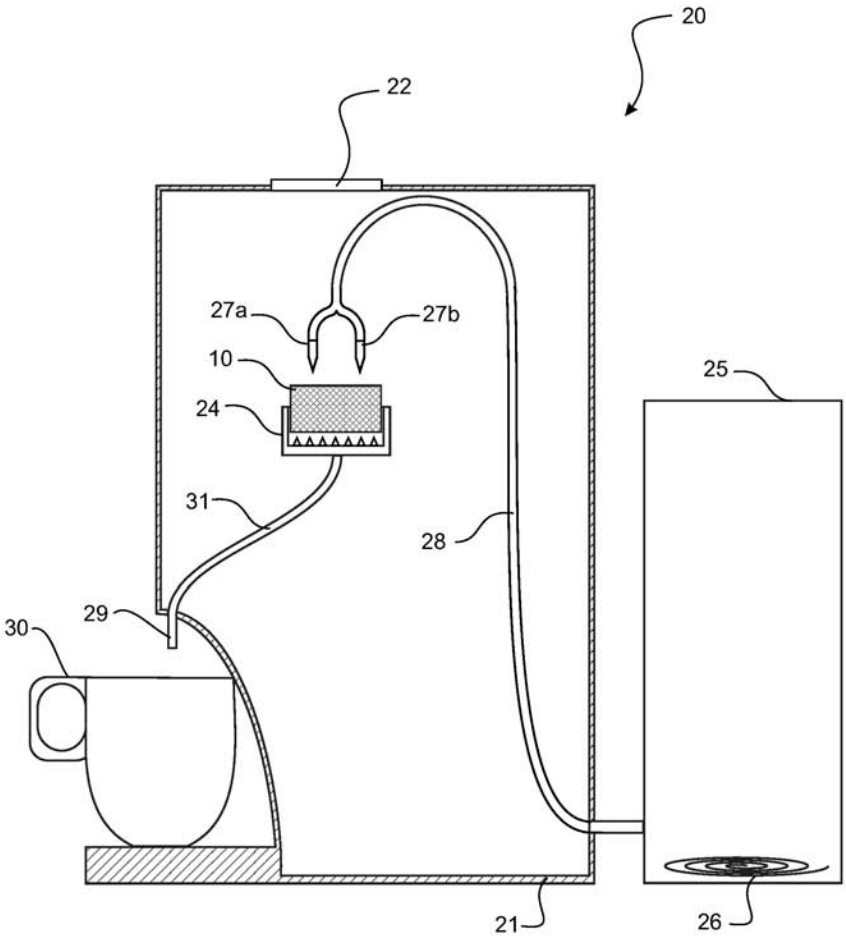


FIGURE 2

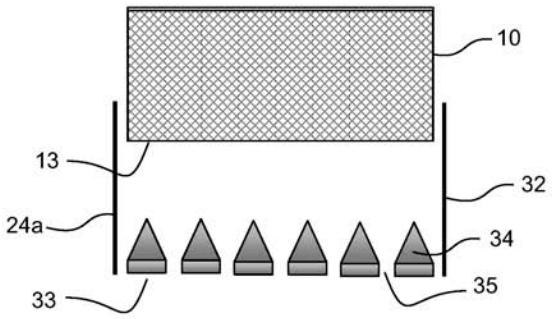


FIGURE 3A

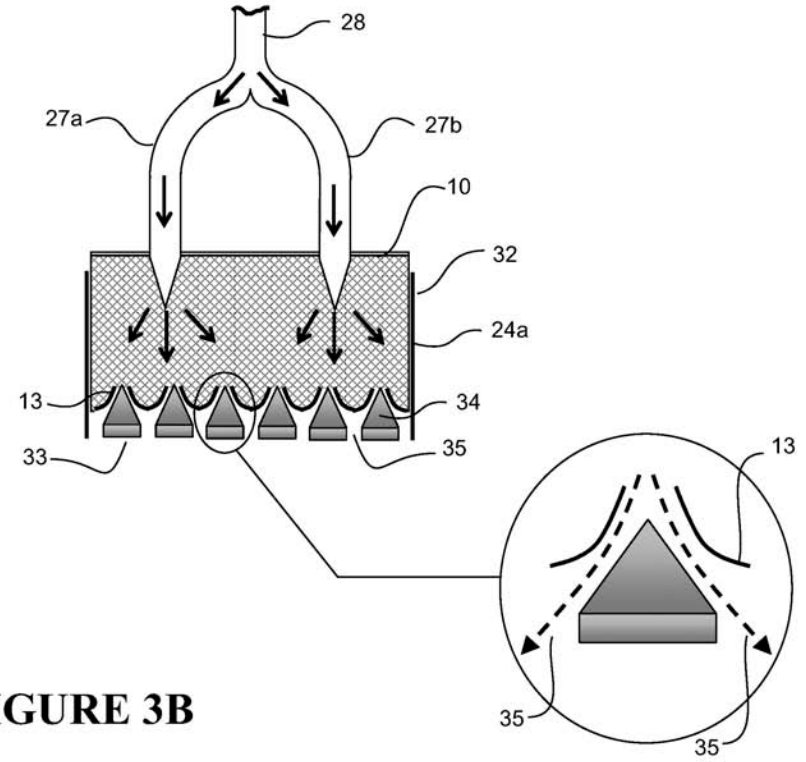


FIGURE 3B

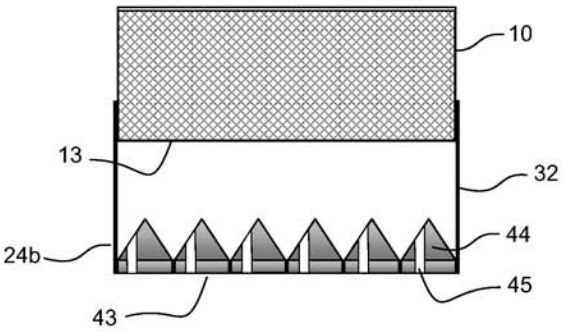


FIGURE 4A

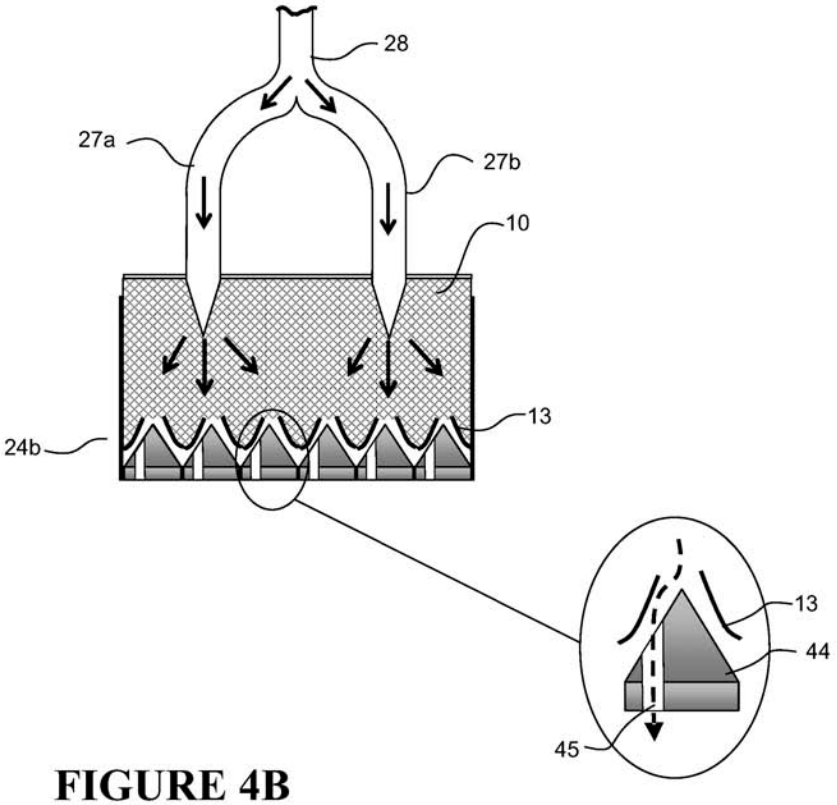


FIGURE 4B

NZ 123456
Complete specification, Filed 12 December 2012, Granted 12 August 2013

COFFEE MACHINE AND CAPSULE

FIELD OF THE INVENTION

The present invention relates to “pod-style” coffee machines, and in particular a coffee machine, coffee capsule and method for extracting coffee to produce espresso-style coffee.

BACKGROUND

Pod-style coffee machines are becoming increasingly popular. They produce espresso-style coffee similar in nature to that produced by commercial and domestic espresso machines, but in a much more convenient fashion.

A typical pod-style coffee machine comprises a coffee extraction receptacle into which is placed a compact coffee capsule (or pod – the terms can be used interchangeably) containing ground coffee. A capsule is typically constructed of aluminium and/or plastic. The pod-style coffee machine has a water source. Upon operation, the water is heated and pressurized and the resulting water/steam is injected into the top of the pod via an injector member. The water/steam is forced into the coffee grounds to extract a coffee shot. The bottom of the pod ruptures under pressure and/or external piercing from projections in the extraction receptacle to release the extracted coffee shot (liquid) into a cup. The used capsule retains the used coffee grounds and can be disposed of conveniently.

There is a desire to improve both the coffee machine apparatus and capsules used so the coffee extracted is as good as quality as possible.

SUMMARY OF THE INVENTION

One drawback of typical coffee machine apparatus and capsules is that the coffee is released from the capsule before full extraction has taken place.

It is therefore an object of the present invention to provide an improved coffee capsule and/or a coffee machine apparatus with an improved coffee extraction receptacle, and/or also an improved method for making coffee using such a capsule and coffee machine. The capsule and extraction receptacle work in cooperation to delay release of liquid from the capsule to allow better extraction of coffee.

In a first aspect the present invention provides an apparatus for the extraction of coffee from a coffee capsule comprising: a housing, a water source with a heating and pressurizing means, a coffee extraction receptacle for receiving a coffee capsule, the receptacle comprising a closed side-wall adapted to retain a coffee capsule and a grille at the bottom of the side-wall with a plurality of projections for piercing a lower wall of a capsule to release extracted coffee, each projection having a flow-through channel for egress of extracted coffee, an injector member fluidly coupled to the water source, wherein the injector member is operable to pierce and inject heated and pressurized water/steam into a coffee capsule when retained in the coffee extraction receptacle to: extract coffee, and deform a lower wall of the capsule against the projections to pierce the lower wall to release extracted coffee from the capsule and through the flow-through channels.

In a second aspect the present invention provides a coffee capsule for use in a pod-style coffee machine comprising: a lower wall with a circular perimeter, a side-wall extending around the perimeter of the lower wall, and an upper wall with a circular perimeter capping the side-wall to create an enclosed space, ground coffee within the space, wherein the lower wall is concave and deformable, such that when retained in a coffee extraction receptacle and under pressure from injected water/steam, coffee is extracted and the lower wall deforms to contact projections in the coffee extraction receptacle that pierce the lower wall to release extracted coffee.

In a third aspect the present invention provides a method of making a beverage comprising: inserting a coffee capsule into the coffee extraction receptacle of the apparatus of the first aspect, operating the apparatus to

inject heated water into the capsule to extract coffee, and collecting extracted coffee egressing from the apparatus.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Embodiments of the invention will be described with reference to the following drawings:

FIG. 1 shows a pod-style coffee machine in schematic form with a coffee extraction receptacle and capsule therein.

FIG. 2 is a cross-sectional view taken axially of an embodiment of the capsule.

FIG. 3 shows the capsule of FIG. 2 placed inside an embodiment of a coffee extraction receptacle and an injector member injecting pressurized and heated steam/water.

FIG. 4 shows the coffee extraction receptacle of FIG. 3 in isolation.

FIG. 5 is an enlarged view of one projection and flow-through channel of the coffee extraction receptacle according to one embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention relates to a “pod-style” coffee machine (apparatus) that has an improved coffee extraction receptacle and an improved coffee capsule for use in a coffee machine with such an improved coffee extraction receptacle.

Details of pod-style coffee machines are known to those skilled in the art. Details of the standard parts of a pod-style coffee machine will only be briefly described with respect to Figure 1, which shows a coffee machine in schematic form. The coffee extraction receptacle and coffee capsule of the present invention will be described in more detail later.

The coffee machine 30 comprises a housing/body 31, an internal or external

water tank 32 with a heating source 33 to heat and pressurize the water to create heated water/steam. An injector member 34 is provided for injecting water/steam into a coffee capsule ("pod") 36 and is fluidly coupled to the water source via a conduit 35. A coffee extraction receptacle 37 (for receiving and retaining a coffee capsule 36) is provided in the housing 31, which fluidly communicates with/couples to an outlet 38 in the body 31 that allows extracted coffee to exit the body into a cup 39 for collecting the extracted coffee.

A coffee capsule 36 according to the invention is shown in FIG. 2. It comprises an impervious outer casing including a lower wall 2 with a circular perimeter, a side-wall 1 extending around the perimeter of the lower wall 2, and an upper wall 4 with a circular perimeter to cap off the side-wall 1 to create an enclosed space 7. Prior to capping, coffee grounds are disposed in the enclosed space 7.

Preferably, the casing is made from a sheet of aluminium having a thickness of 30 to 110 micrometers, a thickness of 50 micrometers being particularly preferred. The general shape of the capsule 36 is preferably a truncated cone (frustoconical) with a sidewall 1 conicity measured relatively to the axis of the capsule ranging from 1° to 10° and preferably being in the order of 3°, an angle particularly well suited for facilitating the introduction and the retrieval of the capsule to/from inside of the coffee extraction receptacle 37. The outer casing of the capsule can alternatively be made of a plastic material. In particular, the outer casing of the capsule can be shaped by thermoforming, using a sheet of synthetic resin.

The lower wall 2 of the capsule is integrally joined along its perimeter to the side-wall 1 and has a concave vaulted shape, its central part being at a distance in the order of 1 to 20 mm from the geometrical base 1a of the capsule, and preferably at a distance of 8 to 10 mm. This vault may have any appropriate shape such as e.g. a rounded (as shown) or a truncated shape. Further, optionally, the lower wall 2 can also have in its upper part a small cavity 6 for example of a generally domed shape. In accordance with a preferred embodiment, the bottom of this cavity 6 is also weakened. Where

there is no cavity 6, the lower wall 2 optionally can be weakened at suitable locations to assist piercing. The concave lower wall is deformable under pressure from injected water/steam to at least a flat position 1a flush with the perimeter of the wall, and in some circumstances to a slight convex position beyond the flat position.

The upper wall 4 of the capsule as shown in FIG. 2 is bonded along its periphery to the side-wall 1 of the capsule along a rim 3. The joining of the upper wall 4 to the side-wall 1 of the capsule can be achieved by any appropriate means, in particular by heat sealing or by crimping. The upper wall 4 preferably has a convex shape extending above the plane of the rim 3 by a distance of 1 to 20 mm, and preferably 7 mm. The central part of the upper wall 4 of the capsule is preferably provided with a small cavity 5, which has, for example, a generally domed shape. Optionally, the bottom of the cavity 5 can be weakened. Alternatively, the wall 4 may also be flat or have a frustoconical shape. In an alternative embodiment shown in FIG. 2, the upper wall is a membrane 4 that can be constructed to be peeled off along the rim 3 and the capsule includes a porous membrane 4a bonded to the rim 3, this membrane being provided for retaining the substance filling the capsule when the upper wall 4 of the capsule is removed.

As shown in FIG. 3, the capsule when used is placed inside the coffee extraction 37 receptacle (which is shown in isolation in FIG. 4). The bottom of the receptacle 37 has a planar extractor grille 10 that forms a lower wall of the receptacle. The grille 10 is circular in shape and commensurate in size with the circular perimeter of the lower wall 2 of the coffee capsule 36. A side-wall 9 extends around the perimeter of the grille/lower wall 10, forming a closed side wall. The dimensions and shape of the grille 10 and closed side-wall 9 are commensurate with the size and shape of the capsule 36 to form an inner space 8 for receiving and retaining the capsule 36. Preferably, the side-wall 9 of the receptacle forms a generally frustoconical shape to match the shape of the side-wall 1 of the capsule, with the side-wall of the coffee extractor receptacle 37 having a conicity corresponding to an angle of 1 to 10°, and preferably of 3°.

The extractor grille 10 is provided with projections for piercing the lower wall 2 of the capsule 36 and openings that form flow–through channels for flow of extracted coffee, the openings having advantageously a surface area amounting to 2 to 20% of the overall surface of the extractor grille 10. According to one preferred embodiment as shown in FIGS. 3, 4, 5, each opening 40 extends through the centre of a frustoconical projection 13 extending from the surface of the grille 10 to a height in the order of 500 micrometers to 5 mm, and preferably 1 mm. The projections 13 are dimensioned so that they do not touch the undeformed concave lower wall 2 of a coffee capsule 36 when retained in the receptacle 37, and only contact the lower wall 2 of the capsule 36 when it deforms sufficiently to the flat position 1a (or beyond flat to a convex position). As shown in FIG. 5, the upper edge 14 of the opening 11 of a projection 13 is sharp so that it can pierce (thus puncturing or tearing open) the lower wall 2 of the capsule, when it makes contact. The flow-through channel/openings 40, of which one is shown in FIG. 5 at an enlarged scale, can advantageously have an inlet diameter of 400 micrometers and an outlet diameter of 500 micrometers.

The flow-through channels 40 allow for unimpeded flow of extracted coffee, but can also allow small quantities of ground coffee to flow-through, which is undesirable. To address this, optionally, the capsule 36 can comprise an inner filter membrane (not shown), which is placed at the bottom of the capsule 36, for example overlying the inner wall 2 in FIG. 2 while being bonded, for example by heat bonding, to the inner surface of the side-wall 1 or of the lower wall 2 of the capsule. The filter membrane is preferably sufficiently flexible and resilient to avoid being itself punctured by the projections 13. This allows for flow of extracted coffee, but prevents coffee grounds reaching the flow-through channels 40. This prevents unwanted coffee grounds clogging the channels 40 and/or reaching the drinking vessel. The filter membrane is made advantageously by assembling in a nonwoven sheet, fibers such as a mixture of synthetic polymeric fibers and cellulose fibers.

An injector member 34 is shown in FIG. 3 for injecting water/steam into the capsule. Preferably, the injector member is a projection 17 having a central

channel 25 for supplying liquid to a plurality of nozzles 18 for projecting the liquid. The channel 25 is coupled to the water source 32 via the conduit 35. The axes of the nozzles 18 are preferably set at an obtuse angle relative to the axis of the sharp tip 17. The nozzles 18 are directed in such a manner as to produce a series of streams 26 of water/steam impinging at several differing angles against the inner surface of the upper wall 4 of the capsule, after the penetration of said projection 17 inside the capsule 36. These streams 26 are directed off the upper wall 4 thus dispersing the streams widely throughout the coffee in the capsule 36. The number of nozzles 18 for projecting the liquid is not limited, but there are preferably at least two and their diameter can range for example from 100 micrometers to 900 micrometers, the preferred value being 500 micrometers. The injector member 34 is mounted on a mechanism (not shown) that can move the projection towards and away from a coffee capsule in the extraction receptacle.

A preferred use of the coffee machine 30 and capsule 36 will now be described with reference to FIG. 3. When in use as shown in FIG. 3, the capsule 36 is placed inside the inner space 8 of the capsule receptacle 37, which in turn is nested inside a housing 21 forming part of a mount within the coffee machine apparatus 30.

When the apparatus is operated, the injector member 34 is moved towards the capsule 36, and the top of the capsule 36 is perforated by the injector member projection 17. Water from the tank 32 is heated and pressurized, and the heated water/steam is injected under pressure through the channel 25 in the projection 17 and the openings 18 into the capsule 36. The streams 26 impinge upon the inner surface of the upper wall 4 of the capsule, to disperse the steam/water widely thus ensuring an even distribution of liquid over the coffee grounds placed inside the capsule as shown by the arrows in FIG. 3. This injection of the water/steam is preferably conducted under a relatively high pressure, which can reach or even exceed 15 bars.

The effect of the high pressure water/steam is to: a) extract coffee from the ground coffee in the capsule, and b) to deform the lower wall 2 of the capsule

and after a period of time, which varies depending on the resistance of the lower wall and the flow of liquid, from the concave position to the flat position 1a (or beyond to a convex position) to press the lower wall 2 against the projections 13 on the grille 10, with the result that the sharp tips 14 pierce the lower wall 2 of the capsule 36 to perforate or tear (pierce) it open to allow a smooth outflow of extracted coffee through the flow-through channels 40. The extracted coffee flows into the mount 21 and out the outlet 38 into the cup 39. The flow-through channels 40 in each projection 13 provide for efficient and unimpeded egress of extracted coffee as the channels line up with the openings pierced in the lower wall 2 of the capsule. The initially concave lower wall 2 increases the distance that the lower wall has to deform before contacting the projections 13, thus increasing the time that the heated water/steam is in contact with the ground coffee before the extracted coffee is released. This improves the quality of the extracted coffee.

When the extracted coffee has entirely flowed away, the capsule 36 is ejected from the extraction receptacle 37.

The capsule 36 according to the invention differs from prior art capsules in that the extent of deformation of the concave lower wall 2 in combination with the dimensions of projections 13 in the grille 10 is such that it delays perforation of the lower wall 2 of the capsule 36 and discharge of extracted coffee. This delay enables an optimization of the preparation/extraction of the coffee, in particular because pre-moistening, aeration, and trapping of volatile aroma can be carried out for an optimized period of time before full deformation, perforation and coffee discharge occurs.

WHAT WE CLAIM IS

1. An apparatus for the extraction of coffee from a coffee capsule comprising:

a housing,

a water source with a heating and pressurizing means,

a coffee extraction receptacle for receiving a coffee capsule, the receptacle comprising a closed side-wall adapted to retain a coffee capsule and a grille at the bottom of the side-wall with a plurality of projections for piercing a lower wall of a capsule to release extracted coffee, each projection having a flow-through channel for egress of extracted coffee,

an injector member fluidly coupled to the water source,

wherein the injector member is operable to pierce and inject heated and pressurized water/steam into a coffee capsule when retained in the coffee extraction receptacle to: extract coffee, and deform a lower wall of the capsule against the projections to pierce the lower wall to release extracted coffee from the capsule and through the flow-through channels.

2. An apparatus according to claim 1 wherein each flow-through channel extends through the centre of a projection.

3. An apparatus according to claim 1 wherein each projection is frustoconical.

4. An apparatus according to claim 1 wherein the side-wall is frustoconical.

5. An apparatus according to claim 1 wherein the injector member comprises a projection with a central channel that fluidly couples to the water source and two or more nozzles to disperse water/steam widely.

6. A coffee capsule for use in a pod-style coffee machine comprising:

a lower wall with a circular perimeter,

a side-wall extending around the perimeter of the lower wall, and

an upper wall with a circular perimeter capping the side-wall to create an enclosed space,

ground coffee within the space,

wherein the lower wall is concave and deformable, such that when retained in a coffee extraction receptacle and under pressure from injected water/steam, coffee is extracted and the lower wall deforms to contact projections in the coffee extraction receptacle that pierce the lower wall to release extracted coffee.

7. A capsule according to claim 6 wherein the upper wall is convex and complementary with the concave lower wall so that multiple capsules can be nested together in a stack.

8. A capsule according to claim 6 wherein the side-wall is frustoconical.

9. A capsule according to claim 6 wherein the lower wall is weakened to assist projections in a coffee extraction receptacle to pierce the lower wall.

10. A method of making a beverage comprising:

inserting a coffee capsule into the coffee extraction receptacle of the apparatus of claim 1,

operating the apparatus to inject heated water into the capsule to extract coffee, and

collecting extracted coffee egressing from the apparatus.

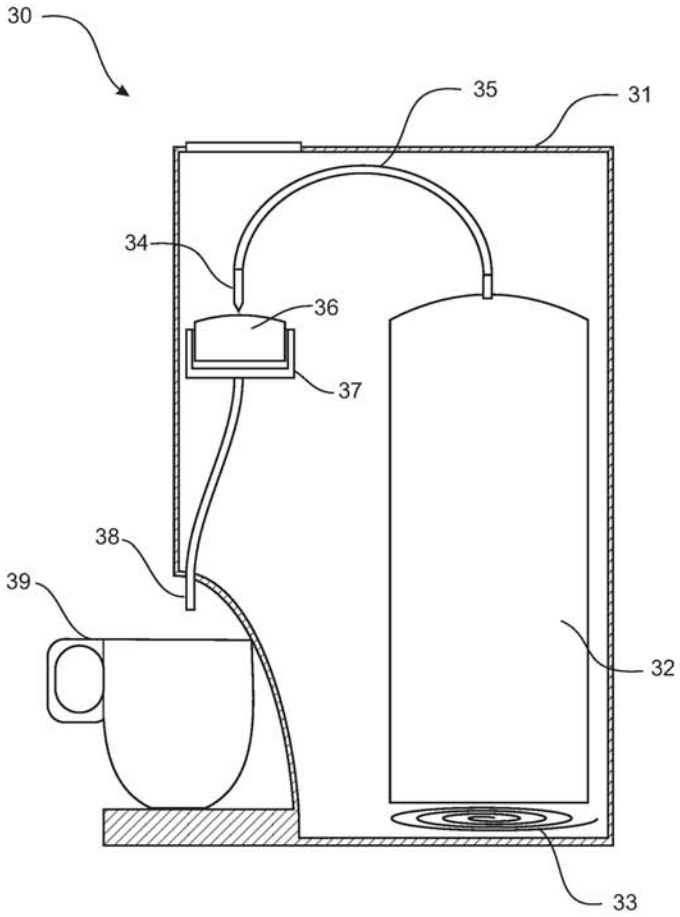


FIGURE 1

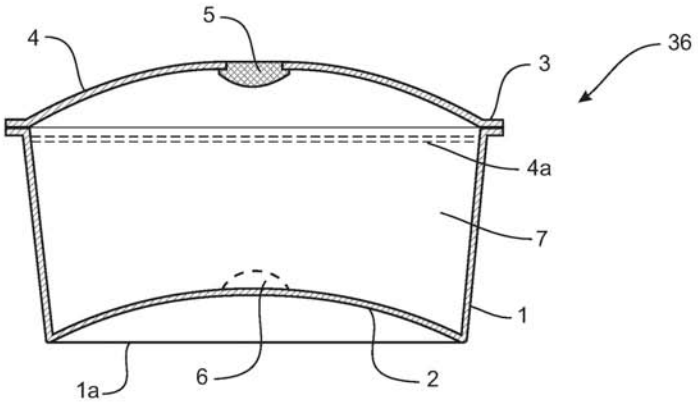


FIGURE 2

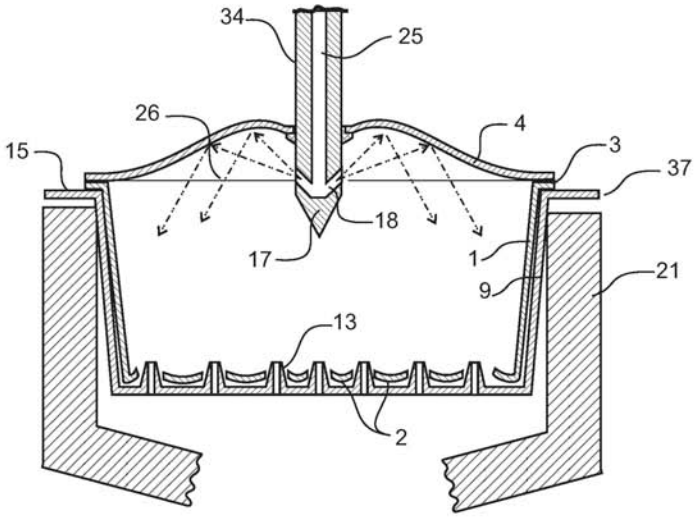


FIGURE 3

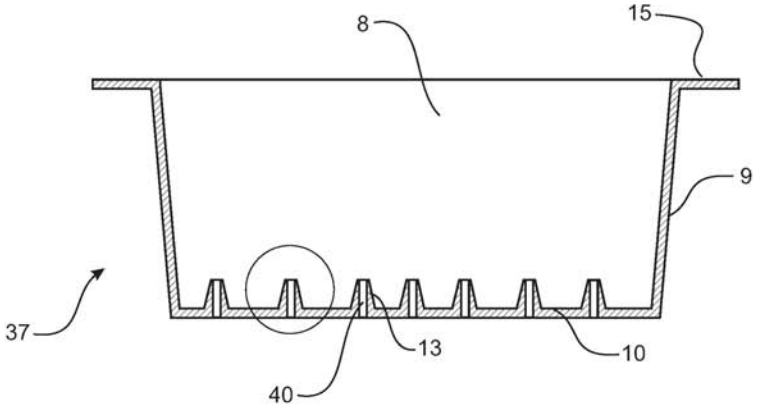


FIGURE 4

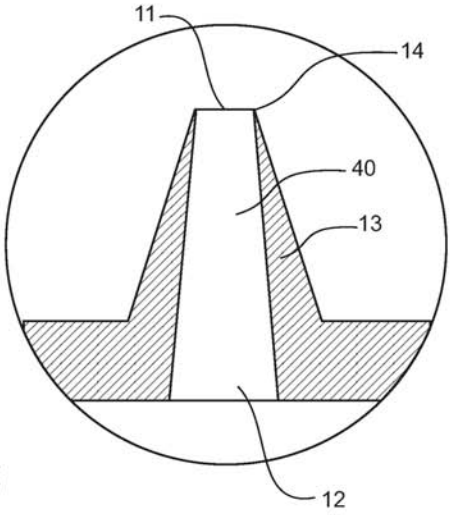


FIGURE 5

P1

US005826492A

United States Patent [19]

Fond et al.

[11] **Patent Number: 5,826,492**

[45] **Date of Patent: *Oct. 27, 1998**

[54] **APPARATUS FOR EXTRACTING A SUBSTANCE CONTAINED IN A SACHET**

[75] Inventors: **Olivier Fond**, Yverdon; **Gérard Lavanchy**, Prilly; **Jean-Pierre Pleisch**; **Jacques Schaeffer**, both of Chardonne; **Alfred Yoakim**, La Tour-de-Peilz, all of Switzerland

[73] Assignee: **Nestec S.A.**, Vevey, Switzerland

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,649,472.

[21] Appl. No.: **608,662**

[22] Filed: **Feb. 29, 1996**

Related U.S. Application Data

[63] Continuation of Ser. No. 178,325, Jan. 11, 1994, Pat. No. 5,649,472.

[30] **Foreign Application Priority Data**

Jul. 20, 1992 [EP] European Pat. Off. 92112364

[51] **Int. Cl.**[6] **A47J 31/00**

[52] **U.S. Cl.** ..... **99/295**; 99/302 R; 99/307; 99/316

[58] **Field of Search** ..... 99/295, 302 R, 99/307, 316

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,209,676	10/1965	Zimmermann et al.	99/295
3,295,998	1/1967	Goros .	
3,403,617	10/1968	Lampe .	
3,407,812	10/1968	Levinson .	
3,607,297	9/1971	Fasano .	
4,429,623	2/1984	Illy .	
4,806,375	2/1989	Favre .	
4,846,052	7/1989	Favre et al. .	
5,012,629	5/1991	Behman et al. .	
5,327,815	7/1994	Fond et al.	99/295
5,343,799	9/1994	Fond .	
5,398,595	3/1995	Fond et al. .	
5,398,596	3/1995	Fond .	
5,472,719	12/1995	Favre	99/295

FOREIGN PATENT DOCUMENTS

6174	1/1980	European Pat. Off. .
0272432	6/1988	European Pat. Off. .
636311	5/1983	Switzerland .

OTHER PUBLICATIONS

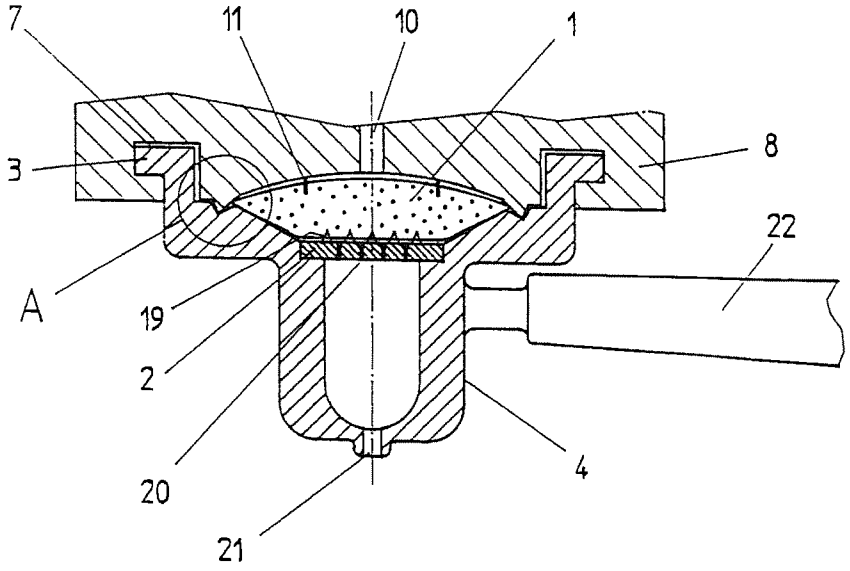
Fond, et al., U.S.S.N. 07/880,173 (effective 1992) to be issued as U.S. Patent No. 5,402,707 on Apr. 4, 1995.

Primary Examiner—Anthony J. Weier

[57] **ABSTRACT**

An apparatus for extracting a substance contained in a sachet for preparation of a beverage has a first member having raised and hollow portions for forming a flow zone and a second member for cooperating with the first member to form a chamber to contain the sachet for extraction of the substance and to grip the edge of the sachet to ensure fluid-tightness upon being tightened, each member being configured for forming substantially half of the chamber for containing and ensuring a specific sachet shape. In one embodiment, the second member has provision for perforating an upper surface of a sachet for introducing water into the sachet. In another embodiment, the first member has an injector member which projects beyond the raised portions for perforating and introducing water into the sachet. The first and second members may be mounted on a chassis so that the members are mounted about an axis so that upon movement about the axis, the members are brought together so that they form the chamber, and a rim of the first member and an edge of the second member cooperate for gripping an edge of a sachet.

17 Claims, 7 Drawing Sheets



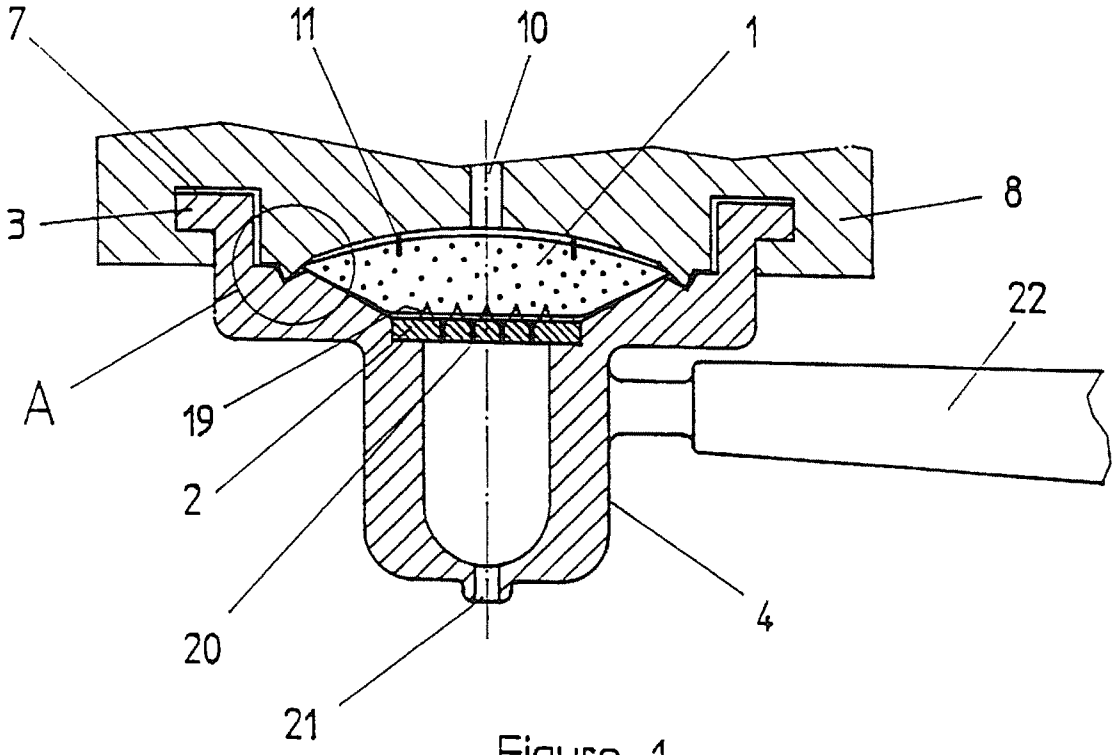


Figure 1

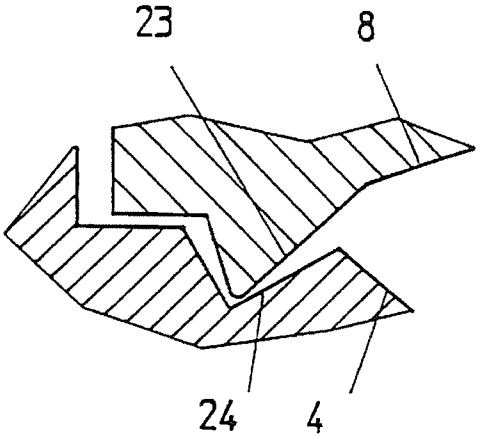


Figure 1a

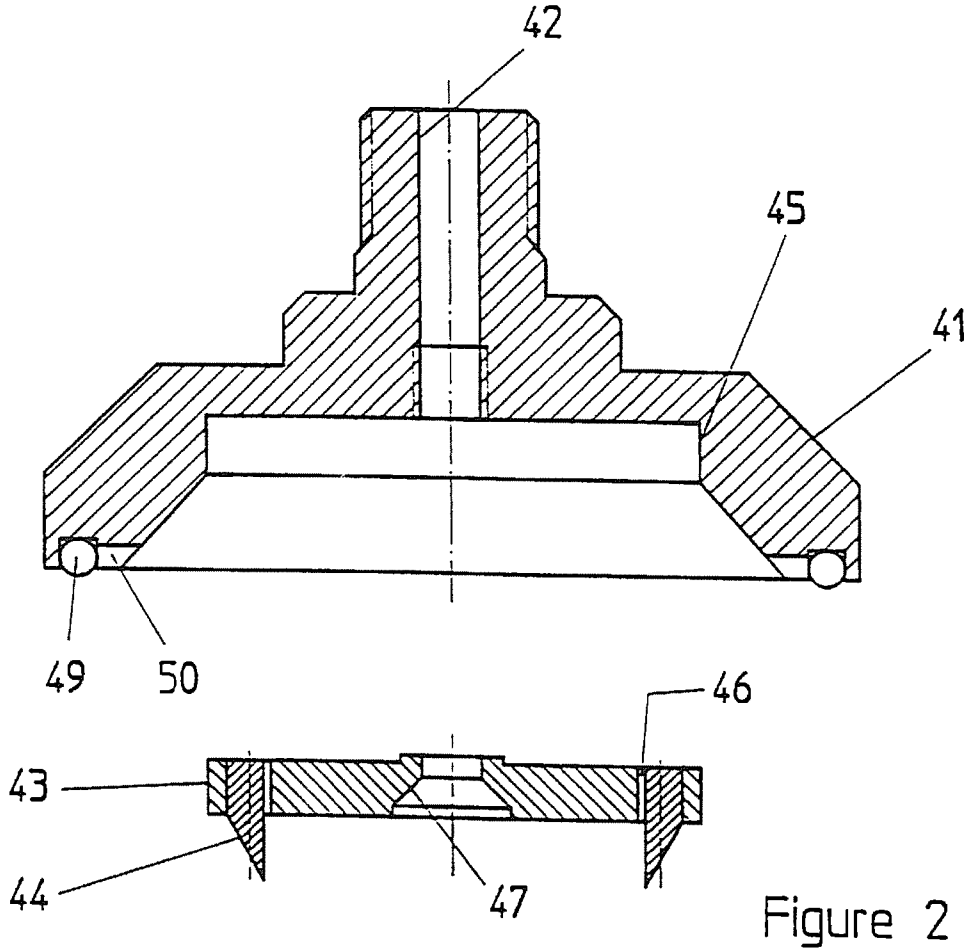


Figure 2

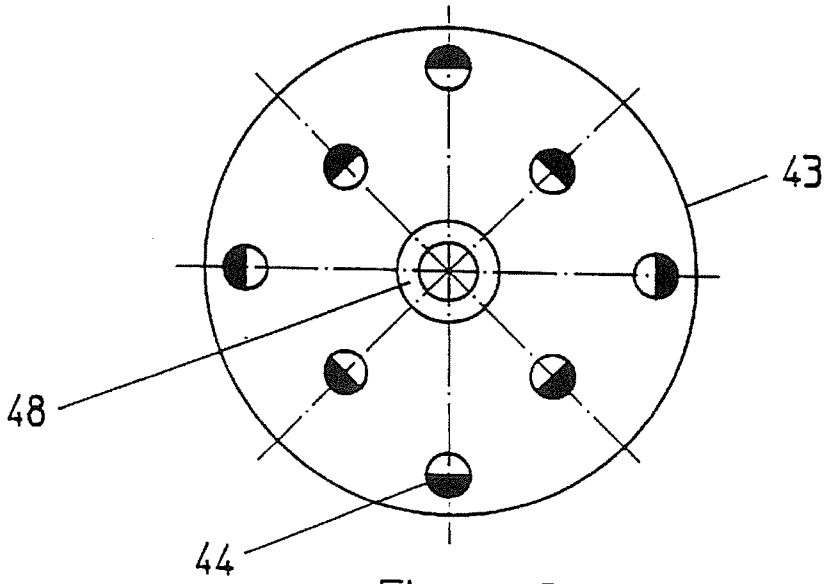


Figure 3

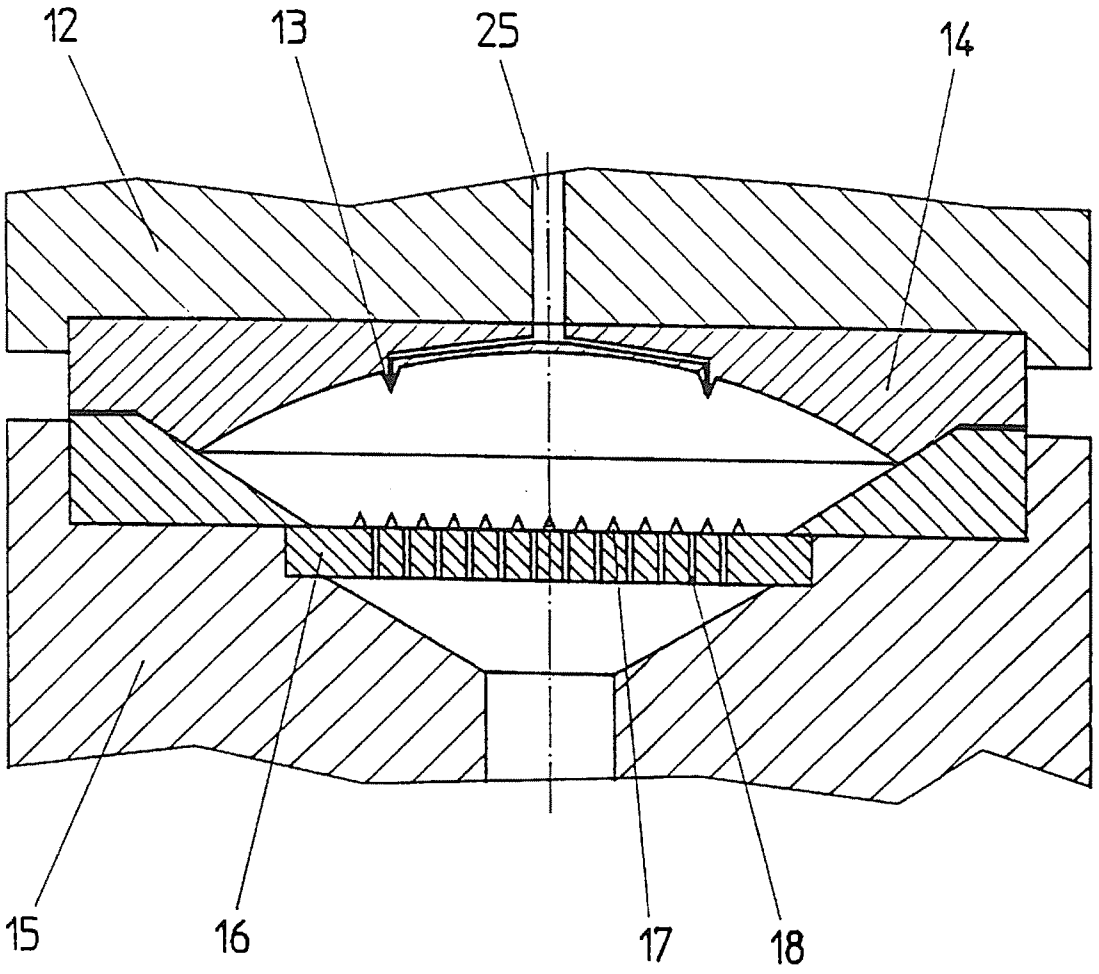


Figure 4

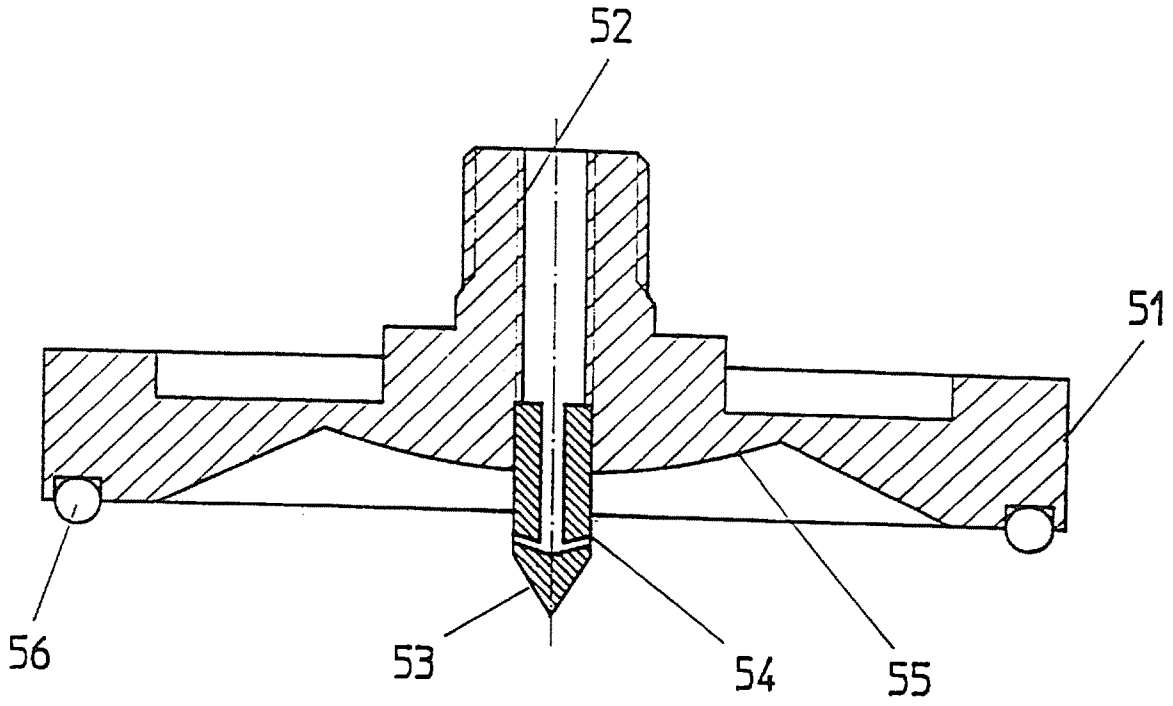
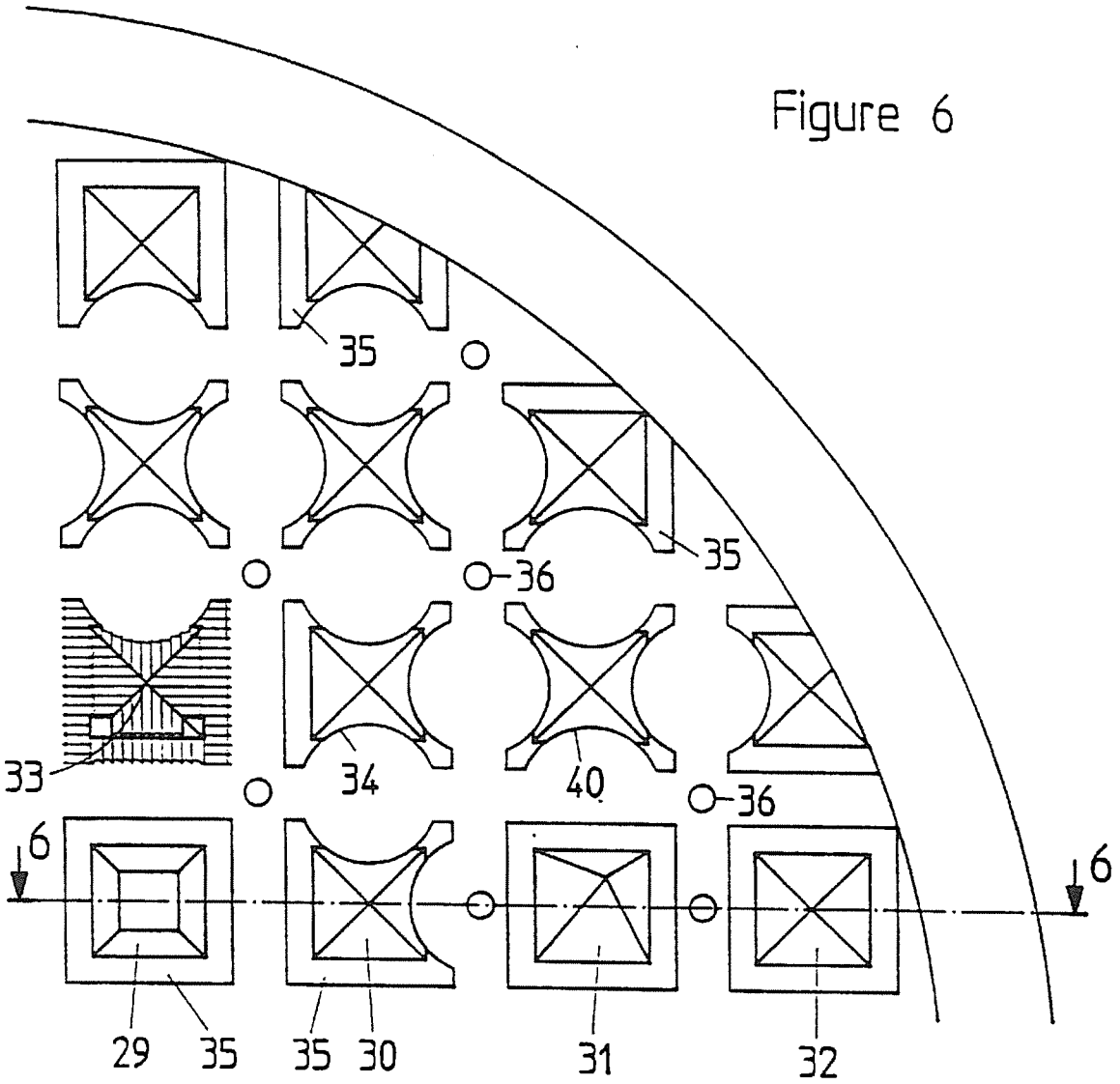


Figure 5

Figure 6



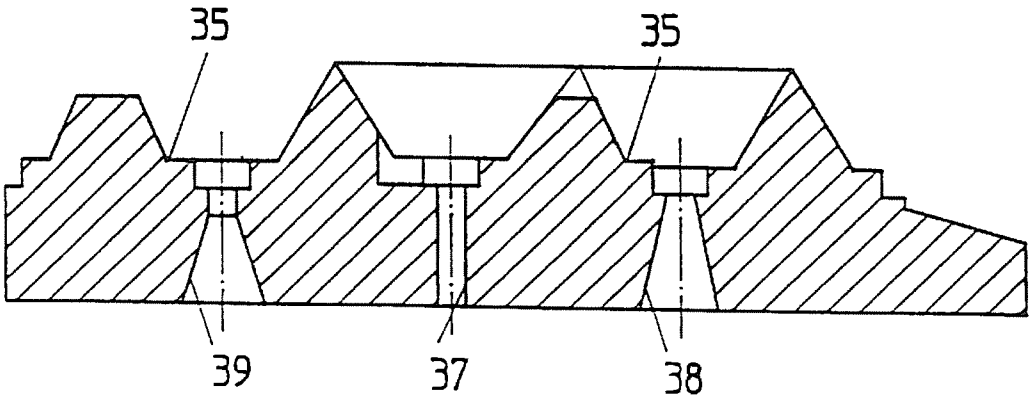


Figure 7

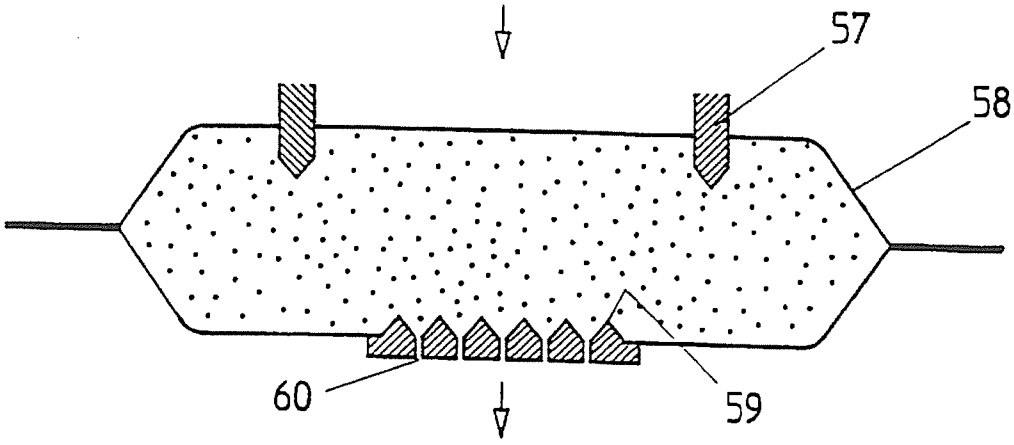


Figure 8

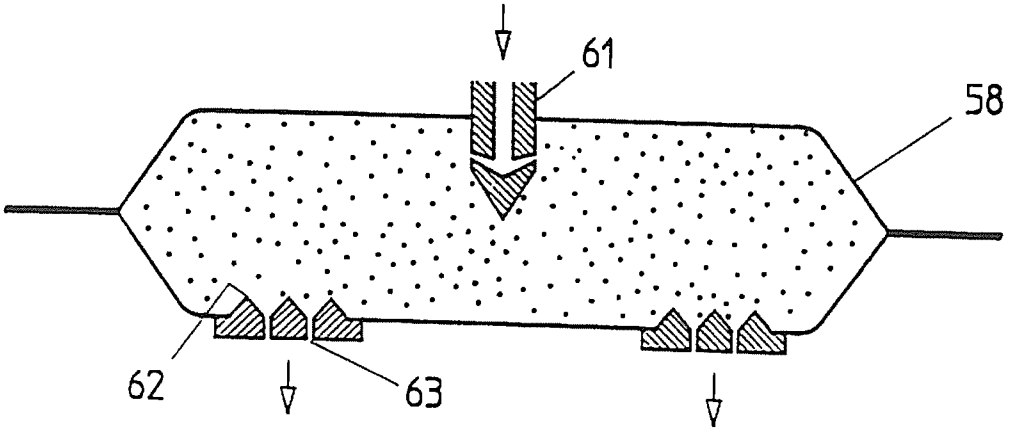


Figure 9

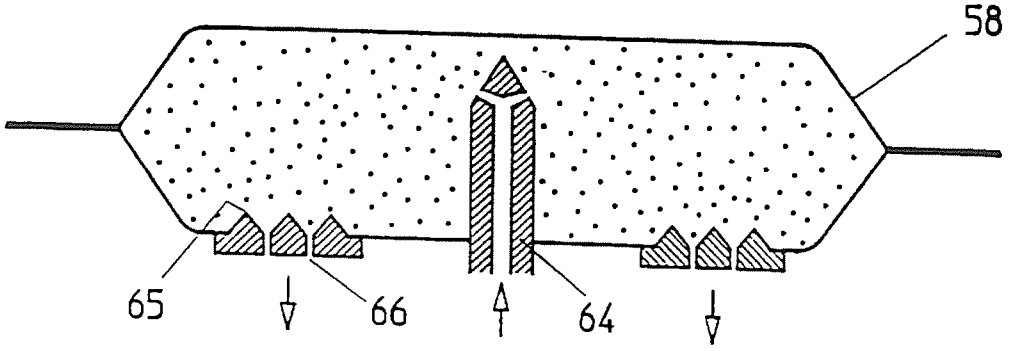


Figure 10

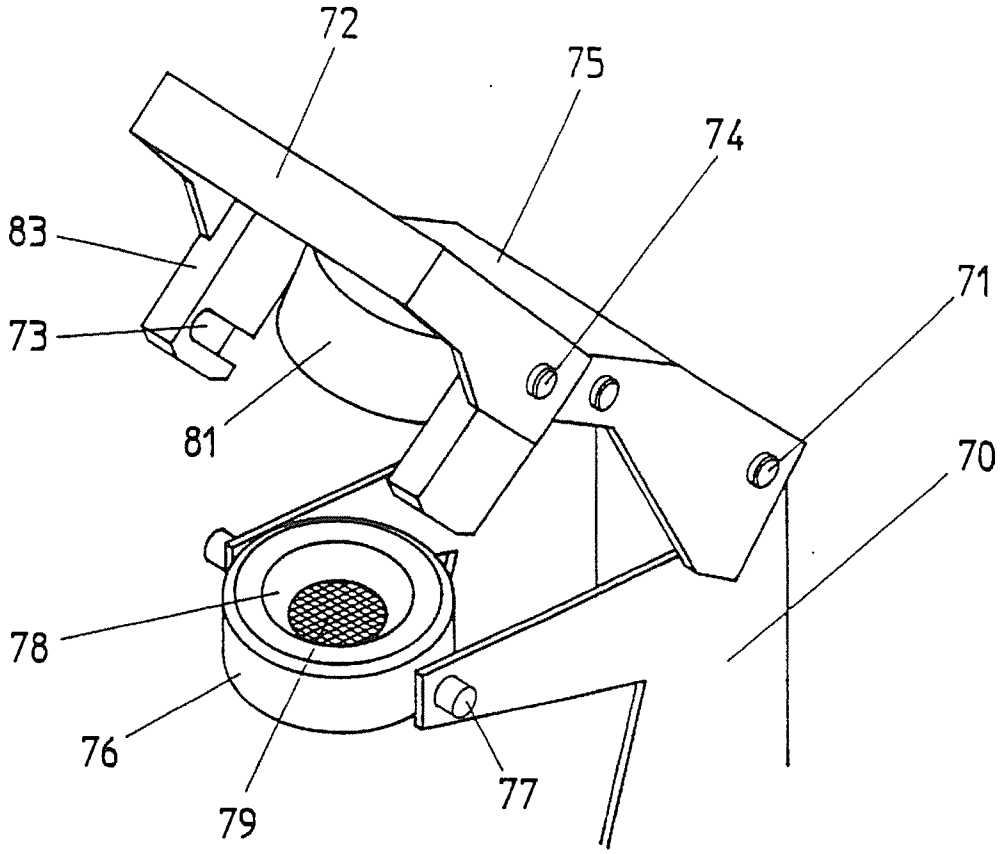


Figure 11

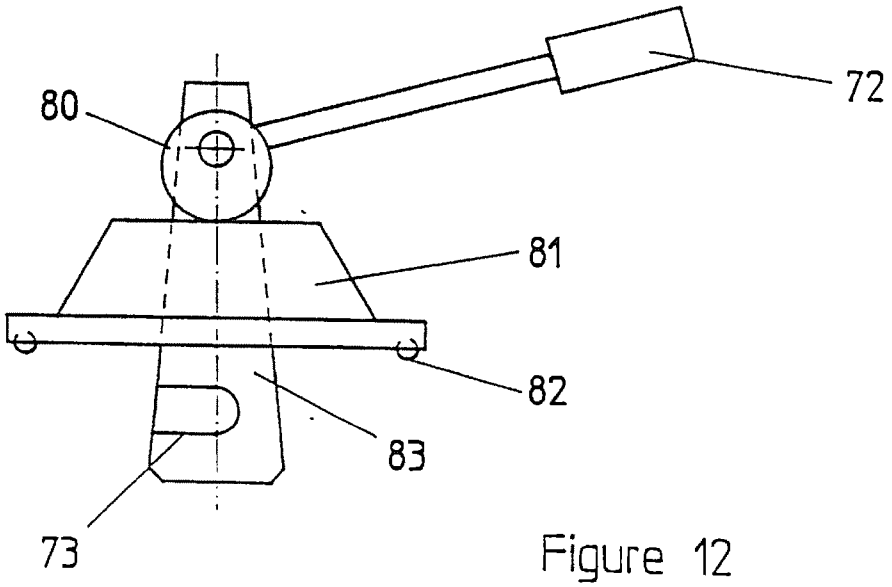


Figure 12

APPARATUS FOR EXTRACTING A SUBSTANCE CONTAINED IN A SACHET

CROSS REFERENCE TO RELATED APPLICATIONS

This is a continuation application of application Ser. No. 08/178,325, filed Jan. 11, 1994, now U.S. Pat. No. 5,649,472, which is a National Stage Application of PCT International Patent Application PCT/CH93/00180 deposited July 12, 1993.

BACKGROUND OF THE INVENTION

The invention relates to apparatus for extraction of sealed flexible sachets containing at least one substance for the preparation of a beverage.

The use of pre-metered and pre-packaged portions of ground coffee in capsules ("pods") for the preparation of expresso-type coffee has the advantage that it facilitates the operations to prepare the coffee while ensuring that the quality of the product is relatively consistent.

These portions are currently provided in two main forms of capsule.

According to a first general form, the portions disclosed in Swiss Patent No.-636 311, U.S. Pat. No. 5,012,629 and European Patent Application Publication No.-0 272 432 are formed by two sheets of filter paper sealed over their periphery and filled with ground coffee. This solution has the drawback that an oxygen-barrier outer packaging is required to prevent the oxidation of the product during storage. This outer packaging entails additional costs and a supplementary operation for the consumer who has to remove it before the desired coffee can be extracted.

According to a second form, disclosed in Application PCT/CH91/00 222, the portion is formed by a leak-tight capsule with a concave base opening into its extraction device by deformation under the action of the introduction of the extraction fluid, then perforation against pointed members. This capsule, formed by a leak-tight envelope forming a lateral wall and two walls, one of which forms the base of the cartridge and the other of which closes the opposite end of the cartridge, has the drawback that it makes simultaneous use of several different packaging materials, at least one of which has to be thick enough to make it semi-rigid. It can be used only in one direction with an extraction device which is completely adapted to the capsule and to its arrangement. Moreover, it is relatively bulky as the coffee is not compacted.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a method and apparatus for allowing extraction of a substance for preparation of a beverage contained in a sealed flexible sachet without prior opening, the method entailing no particular requirements as regards the positioning of the upper and lower surfaces of the sachet.

Accordingly, the present invention provides an apparatus for the extraction which comprises a first, or lower, member having raised and hollow portions forming a flow zone and comprises a second, or upper member, each member forming, for extraction of the substance contained in the sachet, substantially half of a chamber for containing and ensuring a specific shape of the sachet, which is not necessarily identical to its initial shape, and the members cooperate to grip the edge of the sachet to ensure fluid-tightness. Tightening is ensured by auxiliary fastening means which make the first and second members rigid with one another. The second member may include means adapted to perforate the upper surface of the sachet and allow the introduction of water into the sachet. Alternatively, the first member may include a water injector member which projects beyond that of the raised portions for introduction of water into the sachet.

The present invention also provides a method in which the sachet is positioned and held in the extraction apparatus which is formed by a closed chamber comprising a sachet holder, a mixture of air and water at a pressure of between 2 and 20 bar is introduced into the sachet by means of an inlet member in order, progressively and locally, to stretch the extraction surface of the sachet against a raised surface of the sachet holder comprising raised and hollow portions, the extraction surface being torn at multiple locations in accordance with a pattern predetermined by the location of the raised and/or hollow portions, there achieving its breaking tension in order to allow the flow of the liquid after extraction.

A sachet package employed in accordance with the present invention is formed from two thin flexible sheets of the same material sealed over their periphery and substantially symmetrical to one another with respect to the plane of sealing. The substance may be in the form of powder or is compacted into a cake of appropriate shape in one or a plurality of pieces.

The method and use of the apparatus are also characterized by the high value of the extraction pressure, as its maximum value is not necessarily reached during the opening of the sachet, but may be reached later during extraction when the loss of load through the bed of coffee has reached its maximum.

DETAILED DESCRIPTION OF THE INVENTION

The description below, although applied to roast and ground coffee, is not limiting and is given by way of example, as the method can be applied to other products or mixtures of products contained in a flexible sachet such as tea, soluble coffee, chocolate or dehydrated foodstuffs adapted to provide drinks or foodstuffs in the form of infusions.

The method and use of the apparatus of the present invention are described further by description of successive stages of the method, which may be carried out, in the particular case of its use for coffee, using commercially available expresso machines comprising means, whether integral or through the addition of adapters, for perforating one of the surfaces of the sachet, introducing water therein, tearing the other surface in a controlled manner as a result of its deformation under the effect of pressure and collecting the coffee extract. Such machines have water tanks, either internal or external to the body of the machine, and a heating source to heat/pressurize the water.

During a first stage, the sachet is positioned in the sachet holder, the lower surface becoming the extraction surface in this arrangement.

During a second stage, the sachet holder provided with the sachet is placed in the machine and the upper surface of the sachet is then perforated by the cutting or perforating member(s) disposed below the lower surface of the upper portion of the extraction chamber.

During this stage, the shape of the sachet may be modified at will with respect to its initial shape by adaptation to the configuration of the chamber of the extraction apparatus. The shape of the sachet is thus fully defined prior to extraction during its positioning, even after undergoing possible deformations resulting from prior handling, in particular when the sachet contains a product which is only slightly compacted or not compacted at all.

According to a variant of the method, the positioning operation entails a clamping effect which reduces the available inner volume of the sachet in order to limit those locations not filled by the substance to be extracted to a predetermined minimum. Depending on the method of production of the sachet, its initial volume may be greater than that of the substance which it contains if it is desired that this substance should be slightly compacted prior to extraction, as is the case with ground coffee. This adaptation of the available volume makes it possible to facilitate extraction; as the substance is uniformly disposed in the chamber, it is correctly traversed by the extraction fluid and when removed, moreover, the sachet is not impregnated with excess water, which facilitates the cleanliness and practicality of the method.

Moreover, the flexible upper surface of the sachet may, under the effect of the water pressure and the swelling of the coffee, be forced against the upper surface of the chamber, thereby improving the moistening of the coffee and the quality of its extraction.

According to a further variant of the method, auxiliary means provided below the upper surface of the extraction device and/or on the lower surface of this device make it possible to move the coffee in the sachet towards specific and preferred zones in order to facilitate the quality of the extraction by avoiding dead zones.

These means may consist in a particular geometrical shape of these surfaces.

In order to regularize extraction from a bed of substance, it is desirable that this bed is not too thin or of unequal thickness. In the case of a flexible sachet, these drawbacks would occur if the means described above were not used.

According to a variant of sachets containing coffee compacted during production, the volume of the chamber corresponds very closely to the size of the cake and the sachet in order to avoid free zones between the sachet and the cake and undesirable preferential paths during extraction.

During a third stage, the water, possibly mixed with air, is introduced into the sachet at a pressure of between 2 and 20 bar, preferably between 4 and 15 bar. The surfaces of the sachet are forced against the walls of the extraction chamber and the extraction surface is locally deformed by progressive stretching, under the effect of the pressure, against the raised portions of the sachet holder which is provided with discharge apertures for the infusion. This essential stage provides a period of premoistening of the coffee prior to extraction.

The air may be the air present in the ducts of the machine which is mixed with the water during the activation of the extraction process.

In certain conditions, depending on the expresso machines used and the initial heating temperature, the initial fractions of water may be in the form of steam.

According to a variant of the method, a pause, during which no further extraction liquid is introduced, may be provided between the third and fourth stages.

During a fourth stage, the material forming the extraction surface reaches its breaking tension as a

result of being stretched and starts to tear at the location of the projecting raised portions or in the hollow portions formed between these raised portions. Depending on the shape of the raised portions, the tears may also extend into both zones mentioned above. The portions split in this way, without becoming detached from the extraction surface released from its tension, are applied against the raised portions with the result that the apertures formed become larger, facilitating the subsequent flow of the extraction liquid, but in such a way that there is no dispersion of material outside of the sachet. The inner pressure of the sachet drops partially, but this momentaneous decompression is limited, as the flow of fluid escaping from the sachet is laminated both by the small interstices formed by the lips of the torn material of the extraction surface applied against the raised portions and by the flow apertures provided in or in the vicinity of the raised portions. The flow is thus fully controlled, in particular preventing any undesirable movement of the solid phase of the content of the sachet which could obstruct the flow apertures and further impede the regularity and reproducibility of the extraction process.

According to the terminology used in Swiss Patent Specification No.-668 545 relating to a capsule with a pre-weakened cap, this stage of opening of the sachet can be considered as a stage of aeration of the powder material.

According to a variant of the method, a pause, during which no further extraction fluid is introduced, may be provided between the fourth and fifth stages.

During a fifth stage, the coffee is extracted at a pressure of 2 to 20 bar, this pressure being intentionally and essentially linked to the loss of load through the bed of moistened coffee which is compacted for this reason. This is the extraction stage.

Supplementary apertures in the extraction surface may be produced when necessary by raised portions of the sachet holder of decreasing height, provided preferably in its peripheral zone, when the extraction pressure reaches high values.

During a sixth stage, the sachet holder is released and the sachet is removed, for instance simply by upturning the sachet holder.

According to a variant of the system of a flanged type, described below, the sachet is removed manually by means of an insert or automatically into a suitable container at the end of the fifth stage.

According to a first variant of the method, the tears are produced in the central portion of the (hollow) cavities formed between the projecting portions of a raised member when the material reaches its breaking tension following deformation.

According to a second variant of the conduct of the method, the extraction surface of the sachet may start to tear at the raised portions, tearing extending into the centre of the (hollow) cavities formed by these portions.

According to a third variant of the method, the opening of the extraction surface takes place by obtaining the breaking tension at the location of the raised portions possibly associated with supplementary members which are not designed to tear the extraction surface of the sachet but to facilitate the flow, while ensuring the cleanliness of the system.

The coffee extract passes between the torn and deformed portions of the extraction surface of the sachet and reaches the flow apertures, as these torn portions cannot be forced in a completely leak-tight manner against the raised portions because of a certain relative rigidity due to their fairly small dimensions.

Some tens of tears are preferably produced in the extraction surface. In general, the geometry of the raised portions is arranged such that the torn portions are not completely detached but remain rigid with the sachet.

The inner diameter of the sachet is preferably between 25 and 70 mm and the sealed edge has a width of 3 to 15 mm. Once filled, the sachet preferably has a thickness of between 5 and 20 mm at its centre. In the case of coffee, the quantity which it contains may vary between 5 and 20 g of ground coffee possibly compacted into the form of a cake. The general shape of the sachet is circular, oval or polygonal with four to ten sides possibly with rounded edges, or may be a combination of these three elements.

After positioning in the machine, the extraction surface of the sachet is not necessarily disposed in a horizontal plane. Other orientations may be preferred for the ease of processes of use.

According to a particular arrangement of the extraction chamber of the device of the present invention, its inner volume is smaller than the initial volume of the sachet. This arrangement applies in particular to the extraction of non-compacted sachets.

According to a further particular arrangement of the extraction chamber, the upper member and/or the lower member have elements helping to move the substance to be extracted into specific and preferred zones in the interior of the sachet.

These elements may take the form of projections disposed on the lower surface of the upper member

and/or of a particular geometry of the upper surface of the lower member of the extraction device, preferably circular, helical or in the form of portions of straight lines or arcs. This arrangement applies in particular to the extraction of non-compacted sachets.

According to a first variant of the device for introducing water, the means of the upper member adapted to perforate the upper surface of the sachet and introduce water therein may take the form of a water distribution grid provided on its lower surface with members such as projecting points, blades or crosses. The water throughput apertures do not necessarily coincide with these members but may advantageously be located on their periphery.

According to a second variant, one or a plurality of water injection needles may be provided and disposed to project into the chamber of the upper member. A needle of this type makes it possible to perforate the upper surface of the sachet when positioned in the complete device and to inject the fluid within the sachet.

The water injection needle(s) are designed with a tapered shape so that they perforate the material of the sachet with openings which are able to close again at least partially in order to minimize discharges when the sachet is removed. Moreover, they do not prevent the sachet from swelling and being forced against the neighbouring wall. The dimensions and arrangement of these water injection means are selected so as not to create undesirable preferential paths through the bed of coffee, but to wet it uniformly throughout its volume. The shape, dimension and arrangement of the needle(s) are adapted to the shape and dimensions of the sachet.

In the case of an arrangement comprising a plurality of water injection needles, it may be advantageous to mount these needles on a member able to move in rotation so as not to tear the sachet, this movement then being synchronized by entrainment during the insertion of the sachet holder.

According to an embodiment, the raised portions are pyramidal members associated with complementary members which are not designed to tear the extraction surface of the cartridge but to facilitate the flow of the fluid extract while retaining the substance, for instance in the form of terraces with a width of 0.2 to 1 mm surrounding the pyramidal shapes and channels at the base with a width of approximately 0.7 to 2.5 mm and a depth of approximately 0.3 to 1.8 mm. These channels are drilled with a number of flow holes calibrated to a diameter of some tenths of a millimeter.

According to a first variant, the pyramidal shapes are formed by truncated pyramids with sides measuring 1 to 7 mm and a height of 1 to 7 mm, preferably disposed in a grid whose pitch is conventionally between 3 and 10 mm. The surfaces preferably have an angle of 10° to 30. degree. to vertical.

The upper surface of the pyramids acts as a support surface when the sachet is subjected to the effect of pressure. Tearing commences at the peaks of these pyramids.

According to a second variant, the pyramidal shapes are formed by full and/or partial, i.e., asymmetrical, pyramids.

These asymmetrical pyramids may be obtained either with pyramids whose vertical surfaces do not all have the same angle or with pyramids which were originally symmetrical, from which vertical portions have been removed.

In this embodiment, the surfaces of the raised portions and possibly the terraces and channels may have small furrows (channels) facilitating the evacuation of the extract, the material of the extraction surface of the sachet being rigid enough to prevent it from completely matching the shape of the furrow.

Several types of pyramid may co-exist in this embodiment.

According to another embodiment, the height of the pyramids and the adjacent channels is not constant over the entire surface. A part thereof is adapted to cause the opening of the sachet only when a pressure higher than the conventional value is reached, thus correcting the extraction flow by increasing it. This effect is preferably obtained by decreasing the height of the pyramids and increasing the depth of the channels separating the terraces. Its objective is to regularize the flow from different sachets which could otherwise vary depending on the blend of coffee which they contain.

According to a variant of the above-mentioned shapes, the extraction may be limited to a preferably annular zone of the lower surface, in order to force the water to travel a maximum path through the bed of coffee when the water is introduced centrally. Reciprocally, the reverse configuration is possible.

In all the cases described above, the openings of the lower wall of the sachet are the result of deformation to breaking point, but only under the effect of and after pressurization by water or the extraction mixture of water and air.

Instead of disposing the sachet in the sachet holder which is then disposed in the machine, a device may be provided in which the sachet holder is an integral part of the machine in a system known as a jaw system, the

sachet being inserted directly in the machine and the perforation of the upper portion of the sachet being carried out by the cutting or perforating members when the jaw is closed.

In this case, the upper member or the lower member may have either a movement of rotation about a horizontal or vertical axis, or a folding movement, or a drawer movement allowing this insertion. The two members are made integral during extraction by a system of hooks or any other appropriate device. The advantage of this solution is that at the moment of tightening or release, there is no rotary movement of the sachet thereby avoiding the use of rotary showers or pyramids.

A further advantage is that the tightening force prior to extraction may be higher by means of a gear reduction device. Moreover, with this system, it is possible to envisage an automatic ejection of the sachet after extraction into a tank provided for this purpose.

This arrangement also makes it possible to introduce water and extract coffee on the same side of the sachet, the water introduction member(s) and the raised portions preferably being concentric, the former in the centre and the latter on the periphery.

In a simplified version, the sachet is removed by means of a collar which may or may not be an integral part of the sachet holder. This collar may for instance have an annular shape and be inserted around the member comprising the raised portions. It can be moved by a spring for the ejection of the sachet or be withdrawn manually from the lower portion. In the absence of this collar, the use of a sachet provided with a lateral tongue is particularly advantageous.

It is evident to a person skilled in the art that the various variants mentioned above can be adapted to be integrated in an automatic mechanical device which, using known auxiliary means which are not therefore described in detail, carries out the positioning of the sachet, fluid-tightening and after infusion, the release and removal of the used sachet. The arrangement of the respective members may be modified with respect to that described above, the extraction surface being disposed, for instance, in a vertical or oblique plane. In this case, the water injection may or may not be perpendicular thereto.

It will be appreciated that the whole of the above description of the device of the invention relating to the raised portions, the flow member and the fluid-tight device of the sachet holder is also valid for the sachet holder without there being any need to repeat the description relating thereto.

In particular, the sachet holder may be in one or two pieces with raised and hollow portions with asymmetrical pyramids and corrugations on the periphery of the lower member.

The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic representation of an extraction device of a closed flexible sachet.

FIG. 1a is an enlarged view of part A of FIG. 1.

FIG. 2 is an exploded sectional view of the upper member for the injection of water of this device.

FIG. 3 is a plan view of the various water injection points of FIG. 2.

FIG. 4 is a partial diagrammatic view of an extraction device of a closed flexible sachet according to a second embodiment.

FIG. 5 is a diagrammatic view of the upper member for water injection according to a second embodiment.

FIG. 6 is partial plan view of the lower member formed by raised and hollow portions and flow holes.

FIG. 7 is a section along the line 6--6 of FIG. 6.

FIG. 8 is a diagrammatic view of the positioning of the water inlet members provided below the upper surface of the device and the raised members provided on the lower surface for the flow of the coffee extract.

FIG. 9 is a diagrammatic view of the positioning of the water inlet members provided below the upper surface of the device and the raised members provided on the lower surface for the flow of the coffee extract, according to a second embodiment.

FIG. 10 is a diagrammatic view of the positioning of the water inlet and coffee extraction members, both provided on the lower surface of the device, according to a third embodiment.

FIG. 11 is a diagrammatic perspective view of an extraction system of a closed flexible sachet, according to a third embodiment.

FIG. 12 is a diagrammatic view of the upper member of the extraction system of FIG. 11.

DETAILED DESCRIPTION OF THE DRAWINGS

In FIG. 1, a capsule ("pod") in the form of a sachet 1 is disposed on the lower, or first, member having base 2 and support 4 forming a sachet holder. The sachet rests on projecting portions 19. The support 4 has a wall surface which extends laterally from the base 2 to a rim 24 (FIG. 1a) to define a first member cavity, and the support comprises two diametrically opposite tightening lugs 3 adapted to engage on the tightening flanges 7 of the upper member 8.

The upper, or second, member 8 has a wall surface which extends to an edge 23 to define a second member cavity and comprises a water inlet 10 and pointed members 11 in order to perforate the upper surface of the sachet 1. The lower member base 2 has projecting portions 19 and flow holes 20.

In operation the sachet 1 is disposed on the lower member base 2 and by maintaining the support assembly 4, the lower member 2 and the sachet 1 by the handle 22, the tightening lugs 3 are engaged on the tightening flanges 7 of the upper member 8.

Fluid-tightness is ensured at in section "A" of FIG. 1, as further illustrated in FIG. 1a. The lower inner conical edge 23 of the upper member mates with the conical rim 24 of the lower member, thereby gripping the periphery of the sachet 1. The pointed members 11 pierce the sachet 1 and the hot water is supplied via the water inlet duct 10 and penetrates into the sachet 1. The pressure in the sachet increases and the lower surface of the sachet is forced against the projecting portions 19 until it tears on these projecting portions when it reaches its breaking tension. The extraction stage then commences. The coffee flows via the flow holes 20 and is collected under the bore 21 in a container (not shown).

FIGS. 2 and 3 show an upper member for the supply of water which differs from that of FIG. 1. This member is in two pieces. The portion 41 comprises a central water inlet 42, and a disc 43 bearing pointed members 44 is adapted to pierce the upper surface of the sachet to be extracted, this disc being adapted to be housed in the housing 45 of the portion 41. The bore 46 of the disc 43 is partially occupied by the pointed members 44, making it possible to allow the passage of water so that it penetrates into the sachet to be extracted. The disc 43 may rotate in its housing 45 and is held in place by a screw 48 (FIG. 3) disposed in the bore 47 of the disc 43.

An O-ring joint 49 is provided as well as a plurality of water inlet ducts 50 disposed on the periphery of the portion 41 so that during extraction the water pushes the joint downwards thus ensuring that the system is fluid-tight.

In FIG. 4, the extraction device comprises an upper member 12 having injection needles 13 disposed under the vault of the cavity. During clamping, the injection needles perforate the upper surface of the sachet enabling the subsequent introduction of extraction fluid supplied via the duct 25. This upper member has a projecting portion 14 of conical appearance. This projecting portion fits into a complementary cone 26 disposed in the lower support 15. As they fit into one another during the clamping of the members, these portions help to stretch the surfaces of the sachet and centre the powder substance.

The lower member 16 also has projecting portions 17 and flow holes 18 through which the coffee can flow.

FIG. 4 does not show the fastening system using the tightening lugs and flanges. The method of extraction is the same as for the device of FIG. 1.

FIG. 5 shows a further embodiment of the upper water injection member 51 comprising a water inlet 52 and a single pointed member 53 adapted to perforate the sachet, this pointed member comprising a bore 54 supplying water to the sachet. This member 51 comprises a concave zone 55 allowing an improved distribution of the water so that the upper surface of the sachet is forced against the concave zone. It also has an O-ring joint 56 to ensure fluid-tightness.

FIG. 6 shows various types of raised pyramidal portions. These include truncated pyramids 29, pyramids 30 cut away on two sides, asymmetrical pyramids 31, symmetrical pyramids 32, pyramids 33 with corrugations, pyramids 34 cut away on three sides and pyramids 40 cut away on four sides. These pyramids all have terraces 35.

The flow holes 36 may be of three different shapes: cylindrical 37, flared downwards 38 or cylindrical and flared downwards 39.

The presence of terraces 35 makes it possible to control the opening (or tearing) of the lower surface of the sachet, making it possible to provide the sachet with a filter function.

FIG. 8 shows the members 57 for piercing the sachet 58 and the raised and hollow portions 59 disposed about the flow holes 60. This system is equivalent to that of FIGS. 1 and 4.

FIG. 9 shows the extraction of a sachet 58 with a single pointed member 61 and raised and hollow portions 62 and flow holes 63 disposed on the periphery of the sachet.

Finally, FIG. 10 shows a single pointed member 64 for

the upward supply of water and the coffee collection system on the same side comprising raised and hollow portions 65 about the flow holes 66.

FIGS. 11 and 12 show an extraction system comprising a chassis 70 on which there is mounted to rotate along the rod 71 an arm 75 itself comprising a locking lever 72 with hooks 73 mounted on an arm 83, this lever being mounted to rotate along the rod 74. The arm 75 is closed on a lower portion 76 mounted to rotate along the rod 77 and comprising a housing 78 with raised and hollow portions 79 adapted to receive the sachet to be extracted.

In operation the sachet is placed in the housing 78, the arm 75 is lowered by pressing on the locking lever 72 until the hooks 73 are engaged on the rod 77.

A cam 80 makes it possible to clamp the upper water supply member 81 against the lower member 76 in order to ensure good fluid-tightness of the system by correct application on the joint 82. The sachet is extracted and the locking lever 72 is released in order to raise the arm 75. A means making it possible to pivot the lower member 76 so as to eject the sachet to a compartment provided in the chassis 70 is advantageously provided.

We claim:

1. An apparatus for extracting, with water under pressure, a comestible substance contained in a sachet package comprising:

a first member and a second member wherein

the first member comprises a base, a wall surface and a wall rim wherein the wall surface extends laterally from the base to the rim to define a first member cavity and wherein the base contains holes therethrough for flow of an extract from the cavity through the base and comprises a surface and raised portions wherein the raised portions extend from the base surface into the first member cavity for tearing a sachet sheet positioned adjacent and deformed under pressure against the raised portions;

the second member comprises a wall surface and an edge wherein the wall surface defines a second member cavity and extends to the edge; and

the first member and second member are configured so that upon bringing the first member rim and the second member edge together, the first and second member cavities form a chamber confined by the wall surfaces and base and each of the cavities define substantially one-half of the chamber for containing sheets of a sachet which extend to a sachet edge and contain a comestible substance for preparation of a beverage and so that the first member rim and the second member edge are configured to grip the sachet edge and to provide fluid-tightness and so that upon bringing the rim and edge together to grip the sachet edge and to provide fluid-tightness, the rim and edge stretch the sachet;

a chassis and chassis mounting affixed with the first member and second member so that the first and second members are mounted to the chassis about an axis so that movement of one member relative to the other is through a plane transverse to the axis and so that upon movement about the axis one member to the other, the first member rim and the second member edge are brought together to form the chamber, grip the sachet edge, provide fluid-tightness and stretch the sachet;

means which extend from the second member into the second member cavity for, upon the bringing of the first member rim and second member edge together, perforating a sheet of a sachet which contains a comestible substance for preparation of a beverage to obtain a perforated sachet and for introducing water for extracting the substance contained in the perforated sachet; and

fastening means integral with each of the first and second members and comprising a lever which extends from one of the first and second members to the other member for, upon the first and second members being together, rigidly fastening the first and second members together to form the chamber, grip the sachet edge, provide fluid-tightness and stretch the sachet.

2. An apparatus according to claim 1 wherein one of the first member rim and the second member edge has a conical concave form and the other has a conical convex form suitable for mating.

3. An apparatus according to claim 2 wherein an angle of conicity of the convex form is different from an angle of conicity of the concave form to limit contact of the conical forms.

4. An apparatus according to claim 1 wherein the second member comprises two pieces wherein a first piece forms a centrally disposed portion of the second member wall surface and wherein the first piece contains a plurality of bores which extend therethrough and open into the second member cavity and wherein the means for perforating a sheet are a plurality of members which extend from the first piece to pointed ends positioned in the second member cavity so that each pointed end member occupies a portion of each bore and so that another portion of each bore is open to passage of water.

5. An apparatus according to claim 1 or 4 wherein the second member edge has an outer wall portion and a portion recessed from the outer wall portion and further comprising a flexible joint member positioned adjacent

the outer wall portion and the recessed portion.

6. An apparatus according to claim 5 wherein the joint member has a shape selected from the group consisting of a toric shape and a cylindrical shape.

7. An apparatus according to claim 1 wherein the second member edge has two portions which form a recess having an obtuse angle.

8. An apparatus according to claim 1 wherein the first member rim and the second member edge each have a corrugated form.

9. An apparatus according to claim 1 wherein the second member wall surface has a centrally disposed convex portion and an adjacent portion which is concave.

10. An apparatus according to claim 9 wherein the means for perforating a sheet of a sachet for introducing water is an injector member which extends through the centrally disposed convex portion into the second member cavity.

11. An apparatus according to claim 1 wherein a plurality of flow holes are positioned adjacent each raised portion of the base.

12. An apparatus according to claim 1 wherein the raised portions have a shape selected from the group consisting of cylinders, truncated cones, prisms, pyramids, truncated pyramids and asymmetric pyramids.

13. An apparatus according to claim 1 wherein the raised portions have a shape of terraced pyramids.

14. An apparatus according to claim 13 wherein the terraced pyramids extend from a pyramid base to a terrace for a distance of approximately from 0.3 mm to 1.8 mm, the terrace has a width of from 0.2 mm to 1 mm and the pyramid bases are spaced to provide channels having a width of approximately from 0.7 mm to 2.5 mm.

15. An apparatus according to claim 1 wherein the raised portions have a shape of truncated pyramids which have a height of from 1 mm to 7 mm and sides having a width of from 1 mm to 7 mm to provide surfaces having an angle with respect to a pyramid base of from 10° to 30°.

16. An apparatus according to claim 1 wherein the raised portions have a shape of an asymmetric pyramid.

17. An apparatus for extracting, with water under pressure, a comestible substance and comprising:

a first member comprising a base, a wall surface and a wall rim wherein the wall surface extends laterally from the base to the rim to define a first member cavity and comprising a water injector delivery member which extends laterally from the base and into the cavity and terminates in an end suitable for piercing a sheet of material of a package containing a substance for preparation of a beverage and for delivering water under pressure within the package and wherein the base contains holes therethrough for flow of an extract from the cavity through the base and comprises a surface and raised portions wherein the raised portions extend from the base surface into the cavity to a position at a distance from the base surface which is less than a distance of the injector member end from the base surface for, upon introducing water via the injector member under pressure into an injector member pierced package and placing the sheet under pressure so that the sheet deforms, contacting the sheet so that the sheet under pressure deforms against the raised portions for tearing the sheet;

a second member having a wall surface which defines a second member cavity and which extends to an edge suitable for cooperating with the first member rim to grip a package edge and provide fluid-tightness; and

means for rigidly fastening the first and second members together to grip the package edge and provide fluid-tightness.

* * * * *

P2

US005656311A

United States Patent [19]

Fond

[11] Patent Number: 5,656,311

[45] Date of Patent: Aug. 12, 1997

[54] **CARTRIDGES HAVING INTERIORLY POSITIONED ZONES OF REDUCED THICKNESS**

[75] Inventor: **Olivier Fond**, Yverdon, Switzerland

[73] Assignee: **Nestec S.A.**, Vevey, Switzerland

[21] Appl. No.: **428,512**

[22] Filed: **Apr. 25, 1995**

Related U.S. Application Data

[63] Continuation of Ser. No. 899,342, Jun. 16, 1992, abandoned.

[30] **Foreign Application Priority Data**

Jul. 5, 1991 [EP] European Pat. Off. 91111213

[51] **Int. Cl.**[6] **B65D 85/00**; B65D 81/34

[52] **U.S. Cl.** **426/84**; 426/77; 426/112

[58] **Field of Search** 426/77–79, 84, 426/112, 433; 99/295

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,451,195	10/1948	Brown	426/77
2,778,739	1/1957	Rodth	426/77
2,936,695	5/1960	Donot .	
3,292,527	12/1966	Stasse .	
3,589,272	6/1971	Bouladon	426/77
3,607,297	9/1971	Fasano .	
4,136,202	1/1979	Favre	426/115
4,292,332	9/1981	McHam	426/118
4,846,052	7/1989	Favre .	

FOREIGN PATENT DOCUMENTS

0389141A1	9/1990	European Pat. Off. .
1537031	7/1968	France .
2033190	12/1970	France .
2211924	7/1974	France .
2617389	1/1989	France .
314618	2/1934	Italy .
0458099	8/1968	Switzerland .
0605293	9/1978	Switzerland .
2023086	12/1979	United Kingdom .

OTHER PUBLICATIONS

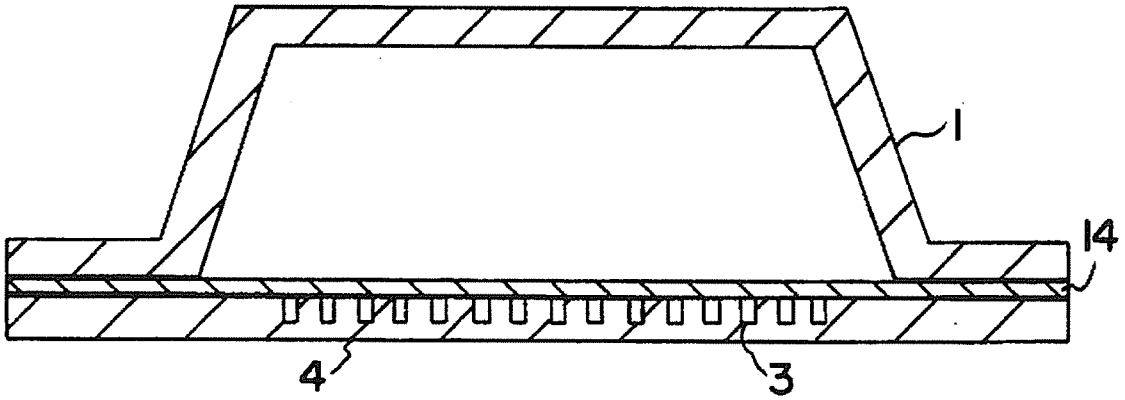
Wiley Encyclopedia of Packaging Technology 1986 (Bakker–Editor) J. Wiley & Sons pp. 48–53, 270–275.

Primary Examiner—Steven Weinstein
Attorney, Agent, or Firm—Vogt & O'Donnell, LLP

[57] **ABSTRACT**

A cartridge which contains a substance for preparation of a beverage has a cover membrane member which covers an opening of a container body for containing the substance within the container interior. The body has a base and a sidewall which extends from the base to define a container interior, and the sidewall defines the opening at a position opposing the base. The membrane is affixed to a rim which extends from the sidewall in a direction away from the sidewall. An interior container surface of either the base or the cover membrane member contains a plurality of perforations which define openings which provide localized absence of a plurality of portions in the base or cover membrane member to provide a plurality of localized portions of reduced thickness so that when a fluid pressure for extraction of the substance for preparation of a beverage is applied, the localized portions of reduced thickness tear and open for beverage passage.

15 Claims, 2 Drawing Sheets



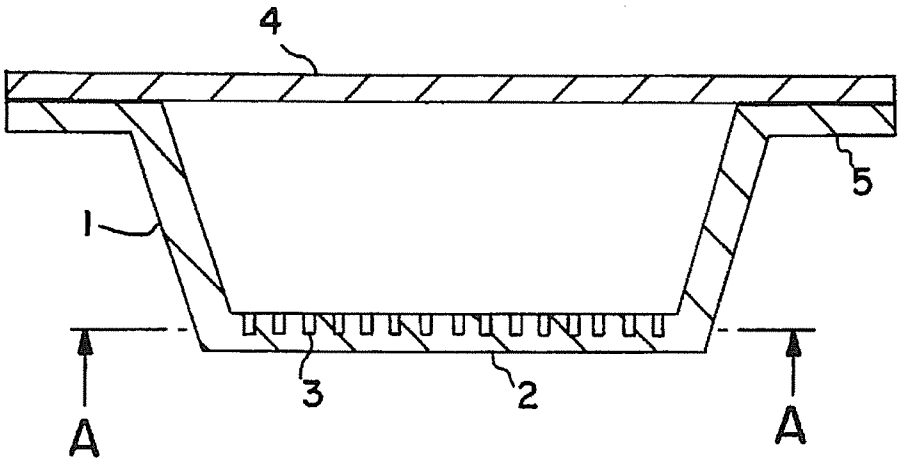


FIG. 1

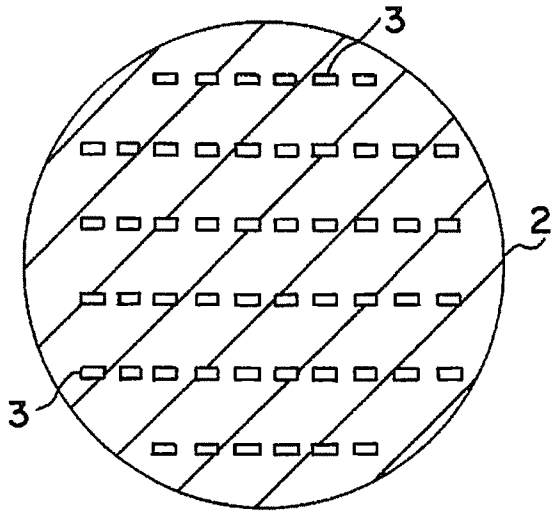


FIG. 2

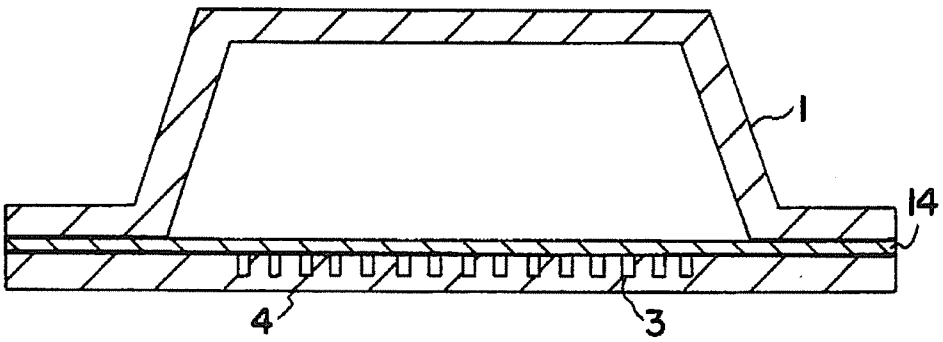


FIG. 3

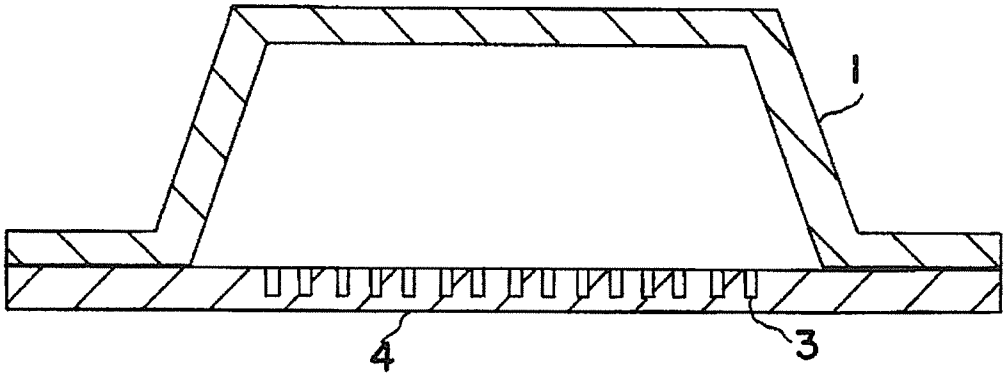


FIG. 4

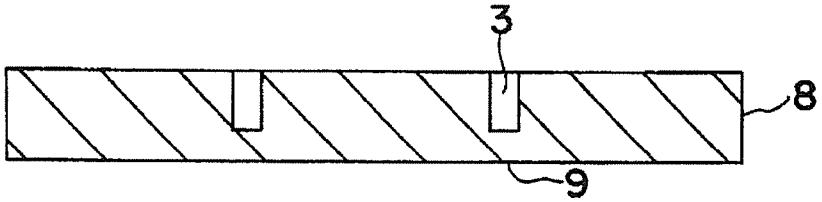


FIG. 5

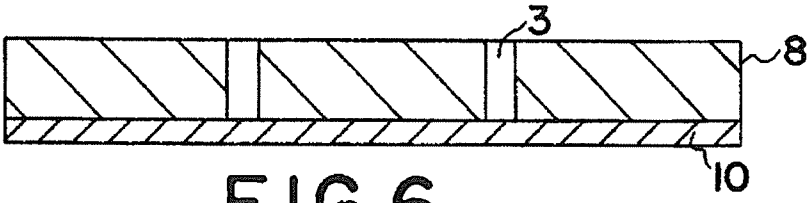


FIG. 6

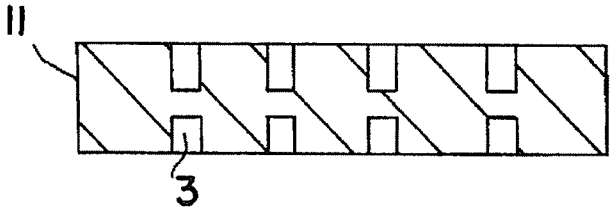


FIG. 7

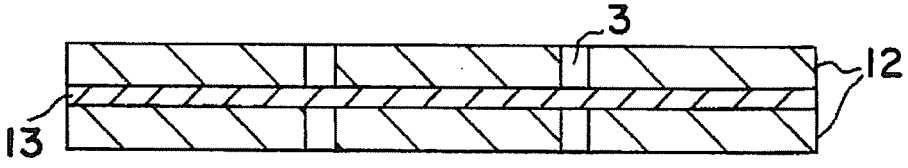


FIG. 8

CARTRDIGES HAVING INTERIORLY POSITIONED ZONES OF REUCED THICKNESS

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation application of application Ser. No. 07/899,342, filed Jun. 16, 1992 and now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a cartridge containing a substance for the preparation of a beverage adapted to extraction machines operating by fluid under pressure.

There are several reasons for the use of cartridges for the preparation of a beverage, above all in the field of espresso-type coffees extracted under pressure, namely, hygiene, optimal keeping of the coffee, ease of use, better control of the quality of the coffee obtained and good reproducibility of the extraction conditions. Among the variety of cartridges available, only closed cartridges which open under the pressure of the injected water satisfy the requirements mentioned above. These cartridges are distinguished by their opening system. In addition, they are substantially impermeable to moisture and preferably to oxygen.

The all-aluminium cartridge according to Swiss Patent No. 605 293 has a base face which is larger in diameter than its upper face, and because it is in the form of an inverted frustum, it is not compatible with conventional espresso-type coffee machines and accordingly requires a specifically designed extraction machine. In addition, the base face has a membrane which contains a line of weakening for tearing preferentially under the effect of pressure, but that has a disadvantage of increasing the complexity and price of the cartridge, because the materials used have to be treated with considerable precision if opening of the cartridge is to be correct and reproducible. Further, the cartridge has a thick filter to retain the coffee grounds.

Another cartridge has been designed to be used in a process in which, in a first step, artificially weakened zones are formed in the lower membrane by mechanical action and, in a second step, the capsule is opened by tearing of the artificially weakened zones under the pressure of the injected water. One such process, which is described in French Patents Nos. 1 536 031 and 2 033 190, has numerous disadvantages.

Swiss patent application No. 458 099 relates to an installation for the preparation of a beverage in which a cartridge is extracted under pressure. The cartridge, which may contain ground coffee, consists of two stiff foils of plastic or aluminium, which are perforated and welded to one another, surrounding a porous envelope, containing the substance to be extracted of which the lower face is covered with a thin film of thermoplastic material which melts in the presence of the hot extraction liquid.

SUMMARY OF THE INVENTION

The problem addressed by the present invention was to provide a closed cartridge in the form of a frustum, inverted frustum or hemisphere which would open under pressure to allow the extract to pass through and which could be extracted in conventional espresso machines by means of a simple adapter.

The package according to the invention has a body and a membrane having an artificially weakened zone which tears preferentially under the effect of fluid pressure and/or projections during preparation of the beverage and which is substantially impermeable to moisture and, in particular, to oxygen.

The cartridge package of the present invention is characterized in that the body is in the form of a frustum, inverted frustum or hemisphere with a rounded cross-section and is provided with a rim, in that the membrane forms the cover of the cartridge fixed to the rim of the body and in that the membrane or the flat face of the body comprises zones of reduced thickness intended to promote opening of the cartridge for the passage of the extract under the effect of the fluid pressure.

Depending on the impermeability of the material to oxygen, the cartridge may be wrapped as such or may optionally be packed in bags which are themselves impermeable to oxygen and which allow storage for 6 to 12 months. In the latter case, the cartridges may be packed in groups, for example of 2 to 10, because--as they are closed--they themselves will keep for a few days, for example for 2 to 15 days, after the bag has been opened.

The present invention also provides a process for the production of the package in which the body of the cartridge is thermoformed or stamped from a first film, the body thus formed is filled with a powder-form beverage preparation composition in a stream of inert gas, after which the membrane, which is formed from a second film, is sealed to the body of the cartridge.

The process is characterized in that zones of reduced thickness are formed in the first film or the second film before filling of the cartridge.

DETAILED DESCRIPTION OF THE INVENTION

The cartridge of the present invention comprises two parts, namely a body and a membrane. The body is frustoconical or hemispherical in shape or in the form of an inverted frustum. The cross-section of the body is rounded, in other words it may be circular, oval or polygonal with rounded edges. The zones of reduced

thickness may be in the membrane or in the flat face of the body.

The cartridge according to the invention may be extracted with a device comprising a grill with projections. The cartridge may also be extracted in a conventional espresso type coffee machine by means of a specific adapter.

The extraction machines according to these patent applications enable this simplified cartridge to be extracted under good conditions. The cartridge opens automatically in the extraction machine and, after use, may be withdrawn easily and integrally with a minimum of waste grounds or packaging material.

During extraction, the lower face (which rests against a perforating tool, for example in the form of projecting elements) deforms and tears in the zones of reduced thickness against the perforating tool; the lower face, which was pretreated during production to form zones of reduced thickness in its constituent material, reaching its breaking stress under the pressure of the fluid, for example air and water. Extraction of the coffee can then proceed. These zones of reduced thickness are formed in the constituent material so that it is capable of reaching the breaking stress in the extraction machine without necessitating excessive elongation despite its plastic nature. There are preferably a large number of these zones of reduced thickness uniformly distributed over the entire face.

The zones of reduced thickness may form straight dotted lines in the form of dashes, for example 2 to 10 mm in length and a few μm to a few mm in width.

The zones of reduced thickness may also form lines in the form of concentric arcs distributed around circles of variable diameter. In this case, the extraction machine intended to use these cartridges may comprise projecting elements on a flow grill in an arrangement corresponding to that of these arcs. Thus, the cartridge and the zones of reduced thickness are perfectly positioned opposite the projecting elements of the grill which are intended to promote their opening.

These zones of reduced thickness can be obtained by the local absence of an upper layer or part of an upper layer of the constituent material of the lower wall of the cartridge.

The cartridge is extracted under pressure which means that the maximum pressure of the extraction fluid is not reached during opening of the cartridge, but later during extraction when the loss of pressure through the layer of coffee has reached its maximum. In addition, the zones of reduced thickness in the lower face, which are formed solely during production of the cartridge, are not obtained by stamping of the material, but instead by separate, more dependable processes, i.e., processes with no tolerance problems.

The treatment of the lower face is even more justified in the case where the cartridge is in the form of an inverted frustum, because in that case, where the lower face is similar in thickness to the frustum, i. e., is sufficiently thick for the part to be stiff, its tearing could not normally be obtained without considerable elongation which is incompatible with the water pressures and temperatures used. In the case of a frustoconical cartridge, the situation is less critical and the membrane, which forms the lower face, can be even more reduced in thickness than the body because the membrane contributes little to the stiffness of the cartridge in this case and the pressure is applied over a larger surface.

The invention is described in more detail with reference to various embodiments of cartridges illustrated by way of example in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a medial diagrammatic section through a cartridge in the form of an inverted frustum.

FIG. 2 is a section on the line A--A of FIG. 1.

FIGS. 3 and 4 are medial diagrammatic sections through various frustoconical cartridges.

FIGS. 5, 6, 7 and 8 are partial sections showing details of the zones of reduced thickness formed in the cartridges.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. 1, the body 1 of the cartridge comprises a flat face 2 having a face interior surface provided with a plurality of zones 3 of reduced thickness. After filling with a powder-form composition for a beverage (not shown), the cartridge is closed by a cover 4, which forms the membrane applied to the rim 5 of the body. The body 1 is thermoformed or injection-moulded, preferably from a 100 to 500 μm thick film of polyester, polyamide, or polyolefin, for example, from a 20 μm thick composite of polyethylene terephthalate bonded to a perforated or woven or nonwoven polypropylene, a perforated or woven or nonwoven polyethylene terephthalate or a perforated polyethylene. Perforation is carried out before lamination of the composite and before forming. The membrane 4 consists of a 10 to 50 μm thick film, preferably of polyester, polyamide, or polyolefin, for example a 12 μm thick silica-filled composite of polyethylene terephthalate with a polypropylene, a polyethylene terephthalate or a polyethylene. The membrane has a surface in contact with the body of the same material or of a material heat-sealable to that of the body.

FIG. 2 shows how the zones 3 of reduced thickness are distributed over the flat face 2 of the body 1.

FIG. 3 shows a variant of the cartridge in the form of an inverted frustum. In this variant, the body is formed by thermoforming of a film of polyester or a polyester/polyolefin or card composite, the card weighing 200 to 300 g/m^2, for example, and being bonded to a layer of polyester.

In a preferred version which provided the powder-form composition for a beverage with complete protection against oxidation, the body is formed from a thin barrier film, preferably 5 to 30 μm in thickness, of polyvinylidene chloride or an ethylene/vinyl alcohol copolymer sandwiched between two layers of polyolefin, for example a multilayer film of polypropylene/ethylene-vinyl alcohol copolymer/polypropylene, polyethylene/ethylene-vinyl alcohol copolymer/polyethylene, for example between 100 and 500 μm in thickness. Alternatively, the thin barrier film may be a thin silica-filled or metallized polyester film, for example between 10 and 20 μm in thickness. The body may also be made of card, for example weighing between 200 and 300 g/m^2, bonded to a composite of ethylene/vinyl alcohol copolymer with a polyolefin or a polyester.

The membrane consists of a complex film, for example of-polyester filled with silica or metallized and, for example, between 10 and 20 μ m in thickness, with a layer of optionally perforated or woven or nonwoven polyolefin or of optionally perforated or woven or nonwoven polyester.

In FIG. 4, the membrane 4 is provided with a plurality of zones 3 of reduced thickness positioned in the membrane surface which faces the cartridge interior.

In FIGS. 5 and 6, the zones 3 of reduced thickness may be formed by perforation or cutting of the wall 8, for example with a tool provided with a plurality of small cutting blades, for example 2 to 10 mm in length, and by corresponding formation of slots throughout the thickness of the material. This operation may take place before forming of the capsule or application of the membrane, but is preferably carried out after forming for perforation of the base of the body. After perforation, a heated tool may be applied to the outer surface of the perforated film to close the slots initially formed over a minimal thickness 9, for example of 5 to 20 μm, as shown in FIG. 5. In a variant of this surface fusion which is shown in FIG. 6, a very thin film of heat-shrinkable plastic material (10, FIG. 6), for example between 5 and 20 μ m in thickness, may be applied around the entire perforated cartridge. In this particular embodiment, the constituent material of the cartridge may be aluminium and the thin film 10 may be aluminized.

In FIG. 7, the body of the cartridge or the membrane is thermoformed in such a way that the lower wall of the cartridge has a grooved lower face of uniform thickness between a die and a cavity block which is grooved to form ribs, after which a blank of the cartridge is placed in an identical cavity block, but with a heated and similarly grooved die and of which the ribs correspond to those of the cavity block. The pressure of the die against the cavity block produces a significant reduction in the thickness of material, such as in the zones 3 where the ribs of the tools correspond. In the grooves between the ribs, the wall 11 retains its initial thickness.

In FIG. 8, the multilayer film comprises thick and resistant structure layers 12 which have been locally torn or cut or which may even be in the form of a cloth or unwoven structure of plastic material. These structure layers are bonded to a thin oxygen-impermeable layer 13.

In all the versions of cartridges described in this specification, the cartridge according to the invention may vary in size according to the desired volume of beverage. For example, the dose of coffee may vary between 5 and 20 g, the diameter of the cartridge is between 2.5 and 7 cm and the thickness of the layer of coffee is between 10 and 25 mm.

The cartridge is filled with a powder-form composition for the preparation of a beverage. This substance is preferably roasted and ground coffee, but may also be tea, soluble coffee, a mixture of ground coffee and soluble coffee or a chocolate-flavoured product.

The cartridge is adapted to the extraction machine comprising a tool for perforating the upper and lower faces of the cartridge during extraction. The zones of reduced thickness are situated in the lower face (for example as shown in FIGS. 1 and 3) which facilitates perforation. In every case, the extraction fluid will be directed in a vertical stream to pass through the entire layer of powder-form composition without any danger of lateral flow paths being created.

In order completely to eliminate the risk of dispersion of grounds after extraction, a layer of filter paper or woven or nonwoven synthetic fibres may be provided between the substance to be extracted and the lower inner wall of the cartridge (as shown in FIG. 3, reference numeral 14). This layer may optionally be bonded to the wall.

I claim:

1. A cartridge container containing a substance for preparation of a beverage comprising:

a body comprising a base, a sidewall and a rim, wherein the sidewall extends from the base to define a container interior, to define a container opening which opposes the base and to define a body shape selected from the

group consisting of a frustum and a hemisphere and wherein the sidewall extends from the base to the rim and the rim extends from the sidewall in a direction away from the sidewall;

a cover membrane member affixed to the rim to cover the opening;

a substance for preparation of a beverage contained within the container interior by the body and cover membrane member; and

wherein the base defines both a container base outer solid surface and a container base interior surface and wherein the container base contains a plurality of perforations which define openings in the base which extend for a distance from the container base interior surface through the base towards the container base outer solid surface to provide localized absence of a plurality of portions of the base so that the base has a plurality of zones which comprise a plurality of localized portions of reduced thickness and so that when a fluid pressure for extraction of the substance for preparation of a beverage is applied, the localized portions of reduced thickness tear and open for beverage passage.

2. A cartridge container containing a substance for preparation of a beverage comprising:

a body comprising a base, a sidewall and a rim, wherein the sidewall extends from the base to define a container interior, to define a container opening which opposes the base and to define a body shape selected from the group consisting of a frustum and a hemisphere and wherein the sidewall extends from the base to the rim and the rim extends from the sidewall in a direction away from the sidewall;

a substance for preparation of a beverage contained within the container interior; and

a cover membrane member affixed to the rim to cover the opening and to contain the substance in the container interior and wherein the cover member defines both a container cover member outer solid surface and a container cover member interior surface and wherein the container cover member contains a plurality of perforations which define openings in the container cover member which extend for a distance from the container cover member interior surface through the container cover member towards the container cover member outer solid surface to provide localized absence of a plurality of portions of the cover membrane member so that the cover membrane member has a plurality of zones which comprise a plurality of localized portions of reduced thickness and so that when a fluid pressure for extraction of the substance for preparation of a beverage is applied, the localized portions of reduced thickness tear and open for beverage passage.

3. A cartridge container according to claim 1 or 2 wherein the body has a shape of a frustum.

4. A cartridge container according to claim 1 or 2 wherein the cartridge container is substantially impermeable to moisture and oxygen.

5. A cartridge container according to claim 1 or 2 wherein the plurality of zones of the localized portions of reduced-thickness are in a form of dashes and are arranged in a plurality of straight lines.

6. A cartridge container according to claim 1 or 2 wherein the plurality of zones of the localized portions of reduced-thickness are arranged in a plurality of concentric arcs.

7. A cartridge container according to claim 1 wherein the base comprises layers of material and wherein a first layer forms the container base outer solid surface, a second layer forms the container base interior surface and the perforations extend through the second layer to provide openings therethrough.

8. A cartridge-container according to claim 7 wherein the second layer comprises a material selected from the group consisting of polyethylene, polypropylene and polyethyl-eneterephthalate.

9. A cartridge container according to claim 1 further comprising a layer of filter paper positioned adjacent the container base interior surface.

10. A cartridge container according to claim 2 wherein the container cover member comprises layers of material and wherein a first layer forms the container cover member outer solid surface, a second layer forms the container cover member interior surface and the perforations extend through the second layer to provide openings therethrough.

11. A cartridge container according to claim 10 wherein the second layer comprises a material selected from the group consisting of polyethylene, polypropylene and polyethyl-eneterephthalate.

12. A cartridge container according to claim 2 further comprising a layer of filter paper positioned adjacent the container cover member interior surface.

13. A cartridge container containing a substance for preparation of a beverage comprising:

a body comprising a base member, a side-wall and a rim, wherein the sidewall extends from the base member to define a container interior, to define a container opening which opposes the base and to define a body shape selected from the group consisting of a frustum and a hemisphere and wherein the sidewall extends from the base to the rim and the rim extends from the sidewall in a direction away from the sidewall;

a cover member affixed to the rim to cover the opening;

a substance for preparation of a beverage contained

within the container interior by the body and cover membrane; and

wherein one of the base member or the cover member defines one container outer surface and one container interior surface and wherein the one member contains a plurality of perforations which define opposing openings in each of the outer and interior surfaces and wherein the openings extend for a distance from each surface through the one member towards a member solid portion positioned between the outer and interior surfaces to provide localized absence of a plurality of portions of the one member and an intermediately positioned member solid portion so that the one member has a plurality of zones which comprise a plurality of localized portions of reduced thickness and so that when a fluid pressure for extraction of the substance for preparation of a beverage is applied, the localized portions of reduced thickness tear and open for beverage passage.

14. A cartridge according to claim 13 wherein the one member comprises layers of material and wherein a first layer forms the outer surface, a second layer forms the interior surface and the perforations extend through the first and second layers to provide openings therethrough and a third layer forms the intermediately positioned solid portion.

15. A cartridge according to claim 13 or 14 wherein the one member is the cover member.

* * * * *