

(21) Application No: 0525998.1

(22) Date of Filing: 21.12.2005

(71) Applicant(s):
Mars Incorporated
(Incorporated in USA - Delaware)
6885 Elm Street, McLean, Virginia 22101,
United States of America

(72) Inventor(s):
Fiachra Banim
Alexander V Peskin
Goodwyn C Morgan
Michael H Smith
Nigel J Hargraves
David Wicks

(74) Agent and/or Address for Service:
Carpmaels & Ransford
43 Bloomsbury Square, LONDON,
WC1A 2RA, United Kingdom

(51) INT CL:
B65D 85/804 (2006.01) **B65D 85/816** (2006.01)

(52) UK CL (Edition X):
A4E E100 E134 E138 E162 E164

(56) Documents Cited:
GB 2123685 A **GB 2121762 A**
EP 0247841 A2 **EP 0179641 A2**

(58) Field of Search:
UK CL (Edition X) **A4M**
INT CL **A47J, B65D**
Other:

(54) Abstract Title: **Beverage preparation capsules**

(57) A beverage preparation capsule comprises: a body 1 formed from a filtration sheet material, a liquid injection nozzle 5 for injecting liquid into the body, and a beverage preparation ingredient retained inside the capsule body. The capsule may also incorporate a screen of liquid impermeable material partially or wholly enclosing the capsule body. Also provided is a method of manufacture of the capsule.

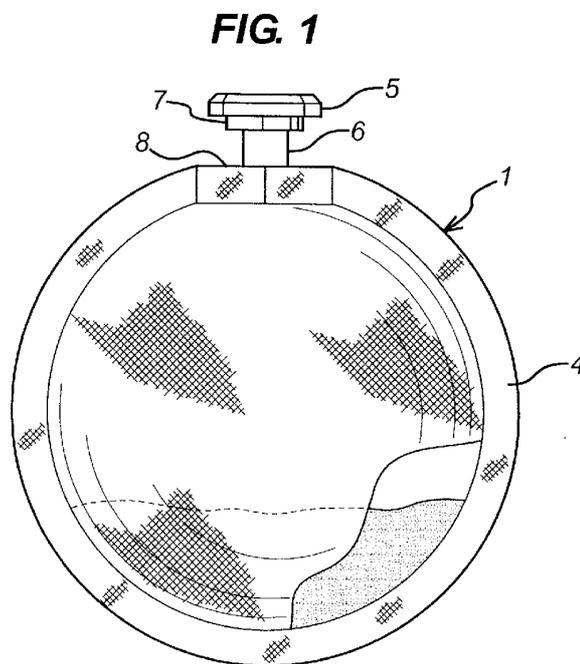


FIG. 1

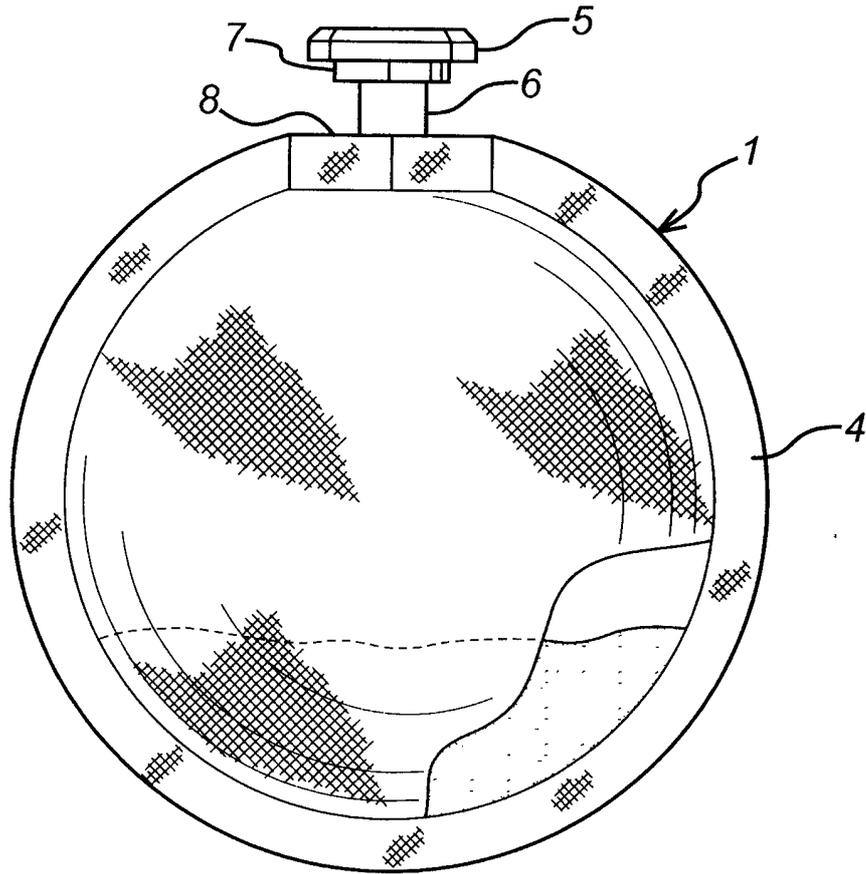


FIG. 2

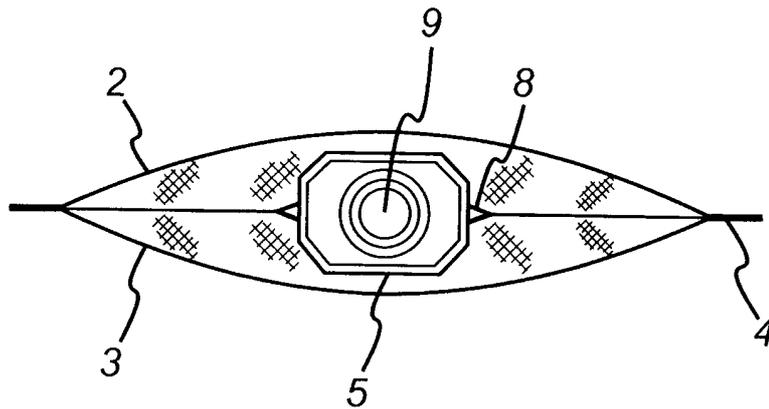


FIG. 3

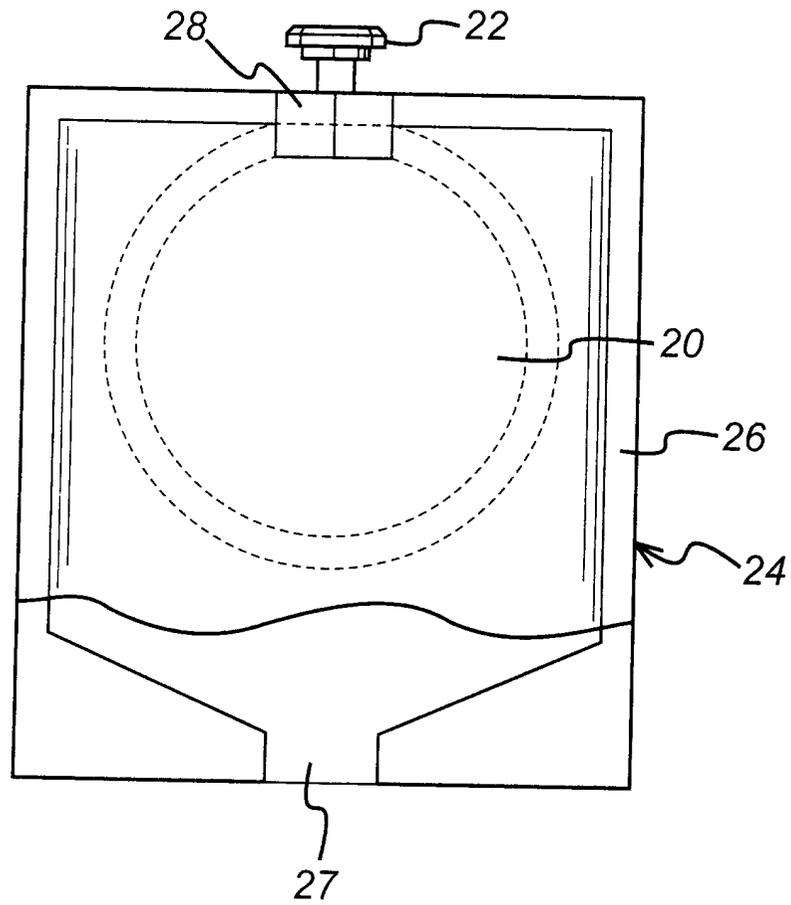
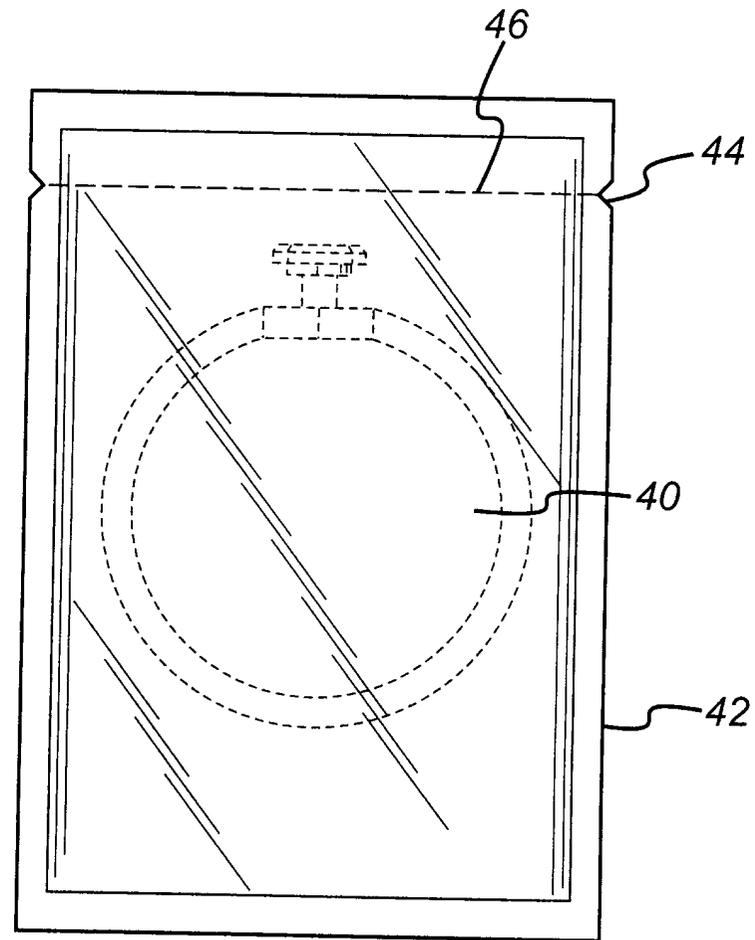


FIG. 4



BEVERAGE PREPARATION CAPSULES

The present invention relates to beverage preparation capsules, in particular for use with beverage making machines, and to methods of manufacture of such capsules.

5

EP-A-0179641 describes sealed beverage capsules for use in automatic beverage making equipment. The capsules are in the form of a sachet of impermeable web material having a water injection nozzle welded into a top edge seam thereof. The bottom edge seam of the sachet may be closed by a heat-or-pressure-sensitive seal that opens when
10 hot water or steam is injected into the sachet through the nozzle. A beverage-making ingredient is retained inside the sachet by a web of filtration sheet material that is welded to the inside surfaces of the impermeable sheet material making up the walls of the sachet. Beverage producing capsules of this type have a number of advantages, and have achieved great commercial success over the last 20 years. Beverage producing capsules
15 of this type are manufactured by Mars, Incorporated under the registered trade mark FLAVIA.

Nevertheless, certain disadvantages can be identified with beverage producing packages of the above type. The packages are formed from a heat-sealable, oxygen-and moisture-
20 impermeable laminated sheet material that is relatively stiff and relatively expensive. This limits the range of package shapes and sizes that can readily and economically be produced. It can be difficult to provide suitable laminated materials that are fully biodegradable (compostable). Furthermore, a relatively high system pressure is needed in the beverage making equipment in order to ensure reliable opening of the base seam
25 of the sachet.

It is desired to address these and related technical problems while retaining the many advantages of the existing capsules of the above type.

30 In a first aspect, the present invention provides a beverage preparation capsule comprising: a body formed substantially from a filtration sheet material, a liquid injection nozzle for injecting liquid into the body, and a beverage preparation ingredient retained inside the capsule body.

Suitably, the body consists essentially of the filtration sheet material. For example, the body may be in the form of a sachet of the filtration sheet material. The sachet may be formed from a single sheet of material in form-fill-seal machinery. In other
5 embodiments, the sachet may be formed by bonding together separate front and back sheets of the filtration sheet material. In either case, two opposed edges of the filtration sheet material may be bonded together to form a sealed edge of the body, and the nozzle may then be secured into the sealed edge by bonding of the nozzle to the said two opposed edges of the filtration sheet material. In other embodiments, the nozzle may be
10 inserted through an aperture in the sheet of filtration material, for example by adhesive or thermal bonding of the sheet around the aperture to a flange on the nozzle.

The body may for example resemble a conventional tea bag or coffee bag. It will be appreciated that the capsule body may be of any suitable shape in plan view, including
15 circular, square, other regular polygons, or trapezoidal. It is also envisaged that the capsule body may be tetrahedral.

The nozzle is suitably a thermoplastic nozzle having a tubular bore for receiving a liquid injector tube from a beverage preparation machine. The nozzle may have a single outlet
20 inside the enclosure, or it may have a plurality of outlets inside the enclosure, for example an outlet manifold for distributing the beverage making liquid within the enclosure. The nozzle outlet or outlets may be located at an edge of the enclosure, or they may be located more centrally within the enclosure. Suitable nozzles are described in EP-A-0179641 and WO-A-9905036, the entire contents of which are incorporated
25 herein by reference.

Suitably, the nozzle is sealed by a frangible barrier to prevent escape of the beverage preparation ingredient prior to preparation of the beverage. The frangible barrier may comprise, or consist essentially of, a thin sheet of film material that can be pierced by a
30 liquid injector tube on a beverage making machine. In other embodiments in which the nozzle is molded from thermoplastics, the frangible barrier may be a thermoplastic barrier molded in one piece with the nozzle, and having at least a peripheral region of

weakness to enable the barrier to be pierced by a liquid injector tube on a beverage making machine.

Typically, the beverage brewing ingredient comprises ground coffee or leaf tea, preferably in an amount suitable to brew a single cup of beverage. For example, from about 2g to about 12g of ground coffee or from about 1g to about 9g of leaf tea.

In certain embodiments the internal volume of the capsule enclosure is from about 25 to about 100 cm³. The internal volume refers to the maximum volume of the capsule enclosure when any flexible parts are fully distended but not stretched.

It has been found that the simple capsules according to the present invention can be used in existing beverage making machines of the FLAVIA type without adaptation of the machines. The resulting beverages are of excellent quality. Surprisingly, the use of a capsule body formed from liquid-permeable material does not result in significant contamination of the machine or loss of beverage. The beverage simply flows through and then down the sides of the capsule, and then drops from the bottom of the capsule into the receptacle.

Nevertheless, in certain embodiments, the capsules according to the present invention further comprise a screen of a liquid-impermeable sheet material at least partially enclosing the capsule body. In certain embodiments the screen comprises an opening in a lower region thereof to allow escape of beverage from the capsule. In other embodiments, the screen comprises a seal in a lower region thereof that can be opened by cutting or tearing, or by the action of heat or pressure of beverage inside the screen, for example as described in relation to conventional FLAVIA capsules. The seal is then opened during, or immediately before, beverage preparation to allow escape of beverage from the capsule.

Suitably, the screen is substantially shaped as a funnel in a lower region thereof to direct the outflow of the beverage to an outlet at the base of the funnel. The funnel shape may be achieved, for example, by forming the screen from front and back faces of liquid-impermeable sheet material that are bonded together around a peripheral margin. The

width of the front and back faces and/or the width of the peripheral margin may be tapered in a lower region of the screen to form the funnel.

It will also be appreciated that the screen may enclose a further beverage making ingredient, for example an ingredient located inside the screen but outside the filter enclosure for deposition into a receptacle during beverage preparation. The further beverage making ingredient may, for example, be selected from the group consisting of whiteners and sweeteners.

10 The whitener is usually at least partially dehydrated for ease of handling and maximum storage stability. Preferably, the water content of the whitener is less than 25% by weight, and most preferably the whitener is a particulate solid. Typically the whitener comprises a partially or completely dehydrated dairy or non-dairy beverage whitener such as milk. Preferably, the whitener consists essentially of a foamable dairy or non-
15 dairy milk concentrate, for example a granulated dried milk or a spray dried milk powder, optionally fat reduced. In certain embodiments the whitener comprises an instantised milk granulate. Various milk powders are suitable, and the fat content and other characteristics of the milk powder can be optimised for each case. The milk powder may form part of a hot chocolate drink or other beverage.

20

The dry weight of the whitener may be from about 1 to about 50g, preferably from about 5 to about 15g. In other words, the amount of the whitener in each capsule is preferably sufficient for one portion of a product, e.g. one cup of a beverage.

25 The capsule according to the present invention is normally disposable after one use. Suitably, the capsule is made substantially or completely from biodegradable (compostable) materials. The term "compostable" signifies that the material is substantially broken down within a few months, preferably within a few weeks, when it is composted. Typically, the sheet material is at least about 90% composted within six
30 months, as determined by the method of ISO14855, as in EN13432. Typically, all components of the sheet material are compostable, but in some embodiments there may be a non-compostable component, for example the nozzle may not be completely compostable. Thermoplastic compostable polymers that could be used for the capsules

include polymers and copolymers of lactic acid, polyhydroxybutyrates, polyvinyl alcohols (PVOH), ethylene vinyl alcohols (EVOH), and mixtures thereof.

It will be appreciated that the screen may function as freshness-preserving barrier
5 package around the filtration enclosure of the capsules according to the present invention, in particular when the screen is closed at the bottom before use as described above. However, it may be desirable to package one or more of the capsules according to the present invention in a suitable freshness-preserving secondary package.

10 Accordingly, in a second aspect, the present invention provides a packaged beverage preparation capsule comprising a beverage preparation capsule according to any preceding claim, and secondary packaging enclosing the capsule, wherein the secondary packaging is substantially impermeable to oxygen and water.

15 Preferably, the package is substantially shelf stable. That is to say, it may be stored at ambient temperature and atmospheric conditions for a period of at least 3 months, preferably at least one year, without significant deterioration of the contents.

It will be appreciated that a further advantage of the present invention is that the capsules
20 can be made by simple modification of existing equipment used to make tea bags and coffee bags.

Accordingly, in a further aspect, the present invention provides a method of manufacture of a beverage preparation capsule comprising the steps of:

25 providing a first web of filtration sheet material in substantially horizontal orientation;

depositing a dose of a beverage making ingredient at a location on the said first web;

30 depositing a liquid injection nozzle on the first web adjacent to the location of the dose of beverage making ingredient

superimposing a second web of filtration sheet material on the first web, the dose of beverage making ingredient and the nozzle;

bonding the first and second webs together along a sealing margin extending around the location of the dose of beverage-making ingredient and including the location of the nozzle, such that the nozzle is sealed between the first and second webs in said margin by said bonding; and

5 cutting the first and second webs around said sealing margin to release said capsule from the webs.

Suitably, the method according to the invention of manufacture of a beverage preparation capsule is adapted for the manufacture of a beverage preparation capsule
10 according to the present invention.

Suitably, the step of bonding is by means of heat, pressure, ultrasound, or a combination thereof. Suitably, the step of providing the first web further comprises providing a depression in the first web at said location for receiving the beverage making ingredient
15 Suitably, the step of cutting the web is performed with knives or with a pocketed roller for example as described in WO90/13487 or WO92/14649, the entire contents of which are incorporated herein by reference.

In a further aspect, the present invention provides a method for the preparation of a
20 beverage comprising the steps of: providing a capsule according to the present invention; providing a receptacle positioned to collect fluid escaping from the capsule; injecting liquid into the capsule through the nozzle to produce a beverage inside the capsule; and allowing the beverage to escape from the capsule into the receptacle.

25 The liquid may be injected into the capsule by a peristaltic or piston pump, preferably at an average rate of from about 250 to about 2000 ml/min and more preferably from about 500 to 1500 ml/min. The liquid may be injected in intermittent or pulsed fashion to optimise the organoleptic properties of the product.

30 Suitably, the liquid is injected into the capsule at pressures of from about 2kPa to about 50kPa gauge (about 0.02 to about 0.05 bar). These low pressures are made possible by the high porosity of the capsule. The ability to produce good quality beverages with low pressure equipment is an advantage of the present invention.

However, the capsules according to the present invention may also be used with higher-pressure processes, for example where a different flavor extraction profile is desired. For example, the liquid may be injected into the capsule containing the beverage
5 brewing ingredient at pressures of from about 200 kPa to about 2 MPa (about 2 to about 20 bar), preferably from about 200 kPa to about 1 Mpa (about 2 to about 10 bar). These pressures are conventionally generated for brewing espresso coffee. In these embodiments, the capsule is preferably held in a clamp, for example a conformable clamp as described in US-B-6805041 (the entire content of which is incorporated herein
10 by reference), to prevent bursting of the capsule under pressure.

For a hot foamed beverage the temperature of the liquid is typically from about 75 to about 100 degrees C.

15 Suitably, the total amount of liquid injected into the capsules according to the present invention is from 100 to 400 ml.

It has surprisingly been found that the simplified capsule design according to the present invention provide equivalent or even improved taste extraction profiles as compared to
20 beverage brewing capsules according to EP-A-0179641. The capsules according to the present invention require lower system pressures in the beverage making apparatus, because of the larger liquid-permeable surface area of the capsules relative to those of EP-A-0179641. Furthermore, the technology of biodegradable filtration webs for use in e.g. biodegradable tea bags is well developed, and therefore it is much more
25 straightforward to make capsules according to the present invention partially or fully degradable. A further technical advantage is that a less expensive laminate film may be used for the enclosure, thereby reducing the overall cost of the capsules. A yet further advantage is that the capsules according to the present invention can be manufactured inexpensively and at high speed by simple modification of the technology used to
30 produce tea bags and coffee bags. Production rates as high as 400-500 capsules per minute are readily achievable.

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

Figure 1 shows a view in side elevation of a beverage making capsule according to the
5 present invention;

Figure 2 shows a top plan view of the capsule of Figure 1;

Figure 3 shows a side elevation view of a second embodiment of the invention
10 incorporating a screen of liquid-impermeable sheet material;

Figure 4 shows a packaged beverage preparation capsule according to the present invention.

15 Referring to Figures 1 and 2, the capsule comprises a body 1 formed from front and back sheets 2,3 of a spunbonded filter fabric of the kind conventionally used for manufacturing tea bags or coffee bags. The filter fabric comprises thermoplastic fiber, and the body 1 is formed by bonding the front and back sheets 2, 3 together using heat and pressure around a peripheral margin 4. An injection molded polypropylene nozzle 5
20 substantially as used in the current generation of FLAVIA capsules is inserted between the sheets 2,3 in the peripheral margin thereof, and is bonded thereto by heat and pressure to form a seal that prevents escape of the capsule contents in the vicinity of the nozzle 5.

25 The nozzle 5 will now be described in more detail. It comprises a central cylinder 6, a top flange 7 and a lozenge-shaped elongated bottom flange 8. A substantially cylindrical bore runs through the nozzle from top to bottom when injection of water into the capsule. A freshness barrier 9 extends across the bore to retain the capsule contents before use. The barrier 9 may be molded integrally with the nozzle 5, in which case it
30 comprises at least peripheral portions that are sufficiently thin to allow the barrier 9 to be pierced or pushed into the capsule by an injector tube inserted into the top of the nozzle from a beverage making apparatus. The top flange 7 enables the nozzle to be gripped in the beverage making apparatus by use of a clamp engaging the tubular section 6. The

bottom flange 8 has an elongated shape to assist continuous bonding of the webs 2, 3 to the nozzle 5.

Referring to Figure 3, the capsule according to this embodiment comprises the capsule body 20 and nozzle 22 substantially as described in relation to Figs. 1 and 2. However, the embodiment of Fig. 3 further comprises the screen 24 of liquid-impermeable sheet material partially enclosing the capsule body 20. The screen 24 is formed from front and back faces of liquid-impermeable sheet material that are thermally bonded together around margin 26. A gap 27 in the bonding between the front and back sheets of liquid-impermeable material provides an outlet for the beverage produced in the capsule body 20. The liquid-impermeable screen in the vicinity of the outlet 27 is shaped as a funnel to direct the beverage to outlet 27, and thereby to deposit the beverage accurately in a receptacle located beneath the capsule. Figure 3 also shows how the screen is attached to the bottom flange of the nozzle 22, for example by thermal or adhesive bonding.

15

In use, the capsules according to the above-described embodiments of the invention are inserted into a beverage making machine, for example of the type described in GB-A-2122881 or GB-A-2123685 or GB-A-2121762, or of the type commercially available under the registered trade mark FLAVIA. The beverage making machine comprises a clamp that grips the nozzle beneath the top flange thereof. A liquid injector tube, for example a hollow tube of stainless steel, is inserted into the tubular bore of the nozzle, and preferably forms a substantially liquid-tight fit therein. A beverage making fluid usually hot water or steam or mixtures thereof is injected through the injector tube into the capsule. The liquid dissolves or extracts beverage components from the beverage making ingredient via the capsule. The beverage then flows out through the walls of the capsule body and falls under gravity into a receptacle positioned underneath the capsule. Water and/or steam and/or air may be injected in pulsed fashion as described in GB-A-2123685. Compressed air may be injected at the end of the beverage preparation cycle to expel residual liquid from the capsule.

25
30

Referring to Figure 4, the packaged beverage preparation capsule according to the present invention comprises a capsule 40 as described in relation to the Figs. 1 and 2 enclosed in a substantially oxygen-impermeable pouch 42 formed by thermally bonding

together front and back faces of suitable sheet material. Nips 44 and a line of weakness 46 are formed in an upper region of the pouch to assist opening.

The above embodiments have been described by way of example only. Many other
5 embodiments falling within the scope of the accompanying claims will be apparent to the skilled reader.

CLAIMS

1. A beverage preparation capsule comprising: a body formed substantially from a filtration sheet material, a liquid injection nozzle for injecting liquid into the body, and a beverage preparation ingredient retained inside the capsule body.
5
2. A capsule according to claim 1, wherein the body consists essentially of said filtration sheet material.
- 10 3. A capsule according to any preceding claim, wherein two opposed edges of said filtration sheet material are bonded together to form a sealed edge of said body, and said nozzle is secured in said sealed edge by bonding of the nozzle to the said two opposed edges of the filtration sheet material.
- 15 4. A beverage preparation capsule according to any preceding claim, wherein the body consists essentially of superimposed front and back sheets of the filtration sheet material that are bonded together around their peripheries.
5. A beverage preparation capsule according to any preceding claim, wherein the
20 nozzle is a thermoplastic nozzle having a tubular bore for receiving a liquid injector tube from a beverage preparation machine.
6. A beverage preparation capsule according to claim 5, wherein the tubular bore is
25 sealed by a frangible barrier to prevent escape of the beverage preparation ingredient prior to preparation of the beverage.
7. A beverage preparation capsule according to any preceding claim, further comprising a screen of a liquid-impermeable sheet material partially enclosing the capsule body, wherein the screen comprises an opening in a lower region thereof to
30 allow escape of beverage from the capsule.

8. A beverage preparation capsule according to claim 7, wherein the screen is substantially shaped as a funnel in a lower region thereof to direct the outflow of said beverage to an outlet at the base of the funnel.
- 5 9. A packaged beverage preparation capsule comprising a beverage preparation capsule according to any preceding claim, and secondary packaging enclosing the capsule, wherein the secondary packaging is substantially impermeable to oxygen and moisture.
- 10 10. A method of manufacture of a beverage preparation capsule comprising the steps of:
- providing a first web of filtration sheet material in substantially horizontal orientation;
 - depositing a dose of a beverage making ingredient at a location on the said first
 - 15 web;
 - depositing a liquid injection nozzle on the first web adjacent to the location of the dose of beverage making ingredient
 - superimposing a second web of filtration sheet material on the first web, the dose of beverage making ingredient and the nozzle;
 - 20 bonding the first and second webs together along a sealing margin extending around the location of the dose of beverage-making ingredient and including the location of the nozzle, such that the nozzle is sealed between the first and second webs in said margin by said bonding; and
 - cutting the first and second webs around said sealing margin to release said
 - 25 capsule from the webs.
11. A method of manufacture of a beverage preparation capsule according to claim 10, for the manufacture of a beverage preparation capsule according to any of claims 1 to 9.
- 30 12. A method of manufacture of a beverage preparation capsule according to claim 10 or 11, wherein the bonding is by means of heat, pressure, ultrasound, or a combination thereof.

13. A method of manufacture of a beverage preparation capsule according to any one of claims 10 to 12, wherein the step of providing the first web further comprises providing a depression in the first web at said location for receiving the beverage making
5 ingredient.



1/4

Application No: GB0525998.1

Examiner: Mr Neil Franklin

Claims searched: 1-13

Date of search: 15 February 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1,5-9 at least	GB2121762 A (MARS) Beverage package; see whole document
X	1,5-7,9 at least	GB2123685 A (MARS) Beverage production; see Figure 1; filter sheet material 104 & p3 lines 51-91
X	1,5-7 at least	EP0179641 A2 (MARS) Acknowledged in the description
X	1,5,7-9 at least	EP0247841 A2 (MARS) Beverage packages; see figure

Categories:

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

Field of Search:

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

A4M

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

A47J; B65D

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

EPODOC; WPI