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(71) Applicant(s)

Keurig, Incorporated

(72) Inventor(s)

Rossi, Frederick; Karanikos, Basil

(74) Agent/Attorney

Watermark Patent and Trade Marks Attorneys, Level 2 302 Burwood Road, Hawthorn, VIC, 3122

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(71) Applicant (*for all designated States except US*): **KEURIG, INCORPORATED** [US/US]; 101 Edgewater Drive, Wakefield, MA 01880 (US).

(72) Inventors; and
(75) Inventors/Applicants (*for US only*): **KARANIKOS, Basil** [US/US]; 6 Bellingham Court, Middleton, MA 01949 (US). **ROSSI, Frederick** [US/US]; 29 Alcine Lane, Burlington, MA 01803 (US).

(74) Agents: **GAUTHIER, Maurice, E.** et al.; Gauthier & Connors, LLP, 225 Franklin Street, Suite 3300, Boston, Ma 02110 (US).

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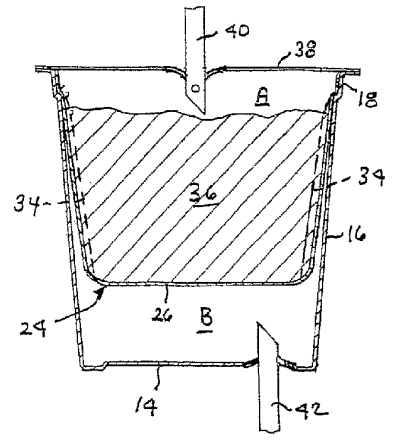
(54) Title: BEVERAGE FILTER CARTRIDGE



(57) Abstract: A beverage filter cartridge has an impermeable cup-shaped out container (12) internally subdivided by a generally cup-shaped filter element (24) into a first chamber inside the filter and a second chamber located between the filter bottom (26) and the container bottom (14) . The upper rim (30) of the filter is joined at a peripheral juncture (32) to the container side wall (16) , and the filter side wall (28) has exterior channels that face the container side wall and lead downwardly from the peripheral juncture to the second chamber.

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BEVERAGE FILTER CARTRIDGE

PRIORITY INFORMATION

This application claims priority to U.S. Serial No. 10/658,925 filed on September 10, 2003, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to single serve beverage brewing systems, and is concerned in particular with an improved filter cartridge for use in such systems.

2. Description of the Prior Art

In a known beverage filter cartridge of the type disclosed in U.S. Patent Nos. 5,325,765 and 5,840,189, the cone-shaped filter element has a somewhat limited storage capacity for the beverage medium. Moreover, the configuration of the filter element encourages rapid liquid penetration to and through the lower end, resulting in less than optimum saturation of the beverage medium at upper regions of the filter element adjacent to the container wall. The combined effect of limited storage capacity and less than optimum saturation is a lowering of the total dissolved solids ("TDS") in the brewed beverage, which translated into reduced flavor.

In an attempt at increasing the TDS of the resulting brew, and as shown in copending commonly owned U.S. Patent Application Serial No. 09/782,622, beverage medium storage capacity was increased by lowering the level of attachment of the filter element to a reconfigured outer container wall. Although this did indeed increase the amount of beverage medium available for brewing, it did so at a cost of also increasing the amount of beverage medium receiving less that optimum saturation, with the net affect being an insignificant increase in TDS of the brewed beverage.

The present invention is directed to overcoming the drawbacks of the prior art by providing an improved combination of cartridge container and internal filter that achieves both increased storage capacity for the beverage medium, and optimized saturation, resulting in significantly increase TDS levels in the resulting brewed beverage.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a beverage filter cartridge including:

a container having a container bottom and a container side wall extending upwardly from said container bottom to a top opening;

a filter element having a filter bottom and a filter side wall extending upwardly from said filter bottom, said filter element being received in said container and directly joined at a peripheral juncture to an interior of said container side wall, the interior of said container thus being subdivided by said filter element into a first chamber accessible via said top opening, and a second chamber below said first chamber, wherein pleats or flutes in said filter side wall form exit channels leading to said second chamber, and said exit channels are located between said container side wall and said filter side wall, and said filter bottom is vertically spaced from said container bottom wall;

a beverage medium received in said first chamber via said top opening; and

a cover closing said top opening, said cover being piercable to admit liquid into said first chamber for contact with said beverage medium to produce a beverage, said filter element being permeable to accommodate the flow therethrough of said beverage for delivery via said exit channels to said second chamber, and said container bottom being piercable to accommodate an outflow of said beverage from said cartridge.

The present invention will now be described in greater detail with reference to the accompanying drawings which show preferred embodiments of the present invention, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a vertical sectional view taken through a beverage filter cartridge in accordance with one preferred embodiment of the present invention;

Figure 2 is an exploded perspective view of the components of the filter cartridge;

Figure 3 is a top plan view of the filter element;

Figure 4 is a sectional view taken along line 4-4 of Figure 1;

Figure 5 is a perspective view of an alternative preferred embodiment of a filter element;

Figure 6 is a sectional view of the filter element shown in Figure 5;

Figure 7 is a top plan view of the filter element shown in Figure 5;

Figure 8 is a view similar to Figure 1 showing the outer container pierced by inlet and outlet probes during a brewing cycle; and

Figure 9 is another view similar to Figure 1 showing a double-walled filter element.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference initially to Figures 1-4, a beverage filter cartridge in accordance with one embodiment of the present invention is shown at 10. The cartridge includes an

impermeable cup-shaped container 12 having a first bottom wall 14 and a first side wall 16 diverging upwardly to a collar 18 having a peripheral lip 20 surrounding a top opening 22.

As herein employed, the term "impermeable" means substantially resistant to the passage therethrough of liquids and gases. The container 12 may be formed of any one of many commercially available materials, e.g., polystyrene, polyethylene, polypropylene, laminated composites thereof, etc. A filter element 24 has a substantially flat second bottom 26 and a second side wall 28 diverging upwardly to an upper rim 30. The filter element is permeable to liquids, and again may be formed from commercially available materials, e.g., paper or polymer materials. The filter element 24 is received in the container 12 with its bottom 26 spaced both inwardly from the container side wall 16 and vertically from the container bottom wall 14. The upper rim 30 of the filter is joined, as by heat sealing at a peripheral juncture 32, to the interior of the container side wall 16 in the vicinity of collar 18. When thus positioned, the filter element subdivides the interior of the container into a first chamber A accessible via the top opening 22 of the container, and a second chamber B

disposed between the filter and container bottoms 26, 14.

The filter side wall 28 is configured to provide exterior channels indicated typically at 34 that face the interior of the container side wall 16 and that lead downwardly from the peripheral juncture 32 to the second chamber B. Preferably, the filter wall 28 is disposed at an angle of less than about 1° with respect to the container wall 16, with angles of between about 0.5 to 0.9° being preferable.

A beverage medium 36 is received in the first chamber A via the container top opening 22 and an impermeable cover 38 is joined as by heat sealing to the peripheral lip 20 of the container side wall 16.

The cover may be formed of a plastic, metallic foil, or any laminated composite thereof. In accordance with conventional practice, oxygen may be purged from the container interior by the introduction of an inert gas, e.g., nitrogen, prior to sealing the cover in place.

The height h_1 of the first chamber A is between about 75 to 80% of the height h_2 of the cartridge interior. This, combined with the substantially flat filter bottom 26, maximizes the storage capacity for the beverage medium 36.

As shown in Figure 8, during a brewing cycle, the cover 38 is pierced by a tubular inlet probe 40 to admit heated liquid into chamber A for infusion with the beverage medium to produce a liquid beverage. The permeability of the filter element 24 accommodates a flow therethrough of the beverage into the second chamber B. The channels 34 provide

critical exit passageways for the beverage permeating through the filter side wall and in so doing encourage full saturation of the beverage medium in areas adjacent to the container side wall.

The container bottom 14 is pierced by a tubular outlet probe 42 to accommodate an outflow of the beverage from the cartridge. The vertical spacing of the filter bottom 26 from the container bottom 14 insures that the filter will be safeguarded from inadvertent puncture by the outlet probe 42.

The channels 34 may be provided by forming the filter side wall with a fluted configuration as shown in Figures 1-4. Alternatively, as shown for example in Figures 5-7, channels 34′ may be formed by pleats 44 in the filter side wall. When thus formed, the channels increase in width from a minimum

at the upper rim of the filter to a maximum at the filter bottom.

While the above described fluted and pleated configurations of the filter side wall are considered to be preferable, any other configuration of the filter side wall and/or the container side wall providing exit channels and the like leading to the second chamber B would be acceptable, provided that they encourage through flow in upper regions of the filter wall.

Infusion of the beverage medium in the upper regions of the filter element may be further enhanced by decreasing the permeability of lower regions of the filter element. As shown in Figure 9, this can be accomplished, for example, by providing the filter element with a complimentary shaped insert 46 of the same or like filter material. This will retard permeation of the beverage in the lower filter regions in favor of enhanced permeation in the upper regions adjacent to the container side wall.

Although the preceding description has been directed to specific embodiments of the invention, it will now be apparent to those skilled in the art that variations and modifications can be made with the attachment of some or all of the advantages of the invention. It is the objective of the appended claims to cover all such variation and modifications as come within the true spirit and scope of the invention.

I claim:

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A beverage filter cartridge including:

a container having a container bottom and a container side wall extending upwardly from said container bottom to a top opening;

a filter element having a filter bottom and a filter side wall extending upwardly from said filter bottom, said filter element being received in said container and directly joined at a peripheral juncture to an interior of said container side wall, the interior of said container thus being subdivided by said filter element into a first chamber accessible via said top opening, and a second chamber below said first chamber, wherein pleats or flutes in said filter side wall form exit channels leading to said second chamber, and said exit channels are located between said container side wall and said filter side wall, and said filter bottom is vertically spaced from said container bottom wall;

a beverage medium received in said first chamber via said top opening; and

a cover closing said top opening, said cover being piercable to admit liquid into said first chamber for contact with said beverage medium to produce a beverage, said filter element being permeable to accommodate the flow therethrough of said beverage for delivery via said exit channels to said second chamber, and said container bottom being piercable to accommodate an outflow of said beverage from said cartridge.

2. The beverage filter cartridge of claim 1 wherein said exit channels are defined by flutes in said filter side wall.

3. The beverage filter cartridge of claim 1 wherein said exit channels are defined by pleats in said filter side wall.

4. The beverage filter cartridge of any of claims 1 to 3 wherein said exit channels increase in width from a minimum adjacent said peripheral juncture to a maximum adjacent said filter bottom.

5. The beverage filter cartridge of any one of claims 1 to 4 wherein said container and filter bottoms are substantially parallel.

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6. The beverage filter cartridge of any one of claims 1 to 5 wherein said filter side wall extends downwardly from said peripheral juncture and away from said container side wall at an angle of less than about 1 degree.

7. The beverage filter cartridge of claim 6 wherein said angle is between about 0.50 to 0.90 degrees.

8. The beverage filter cartridge of any one of claims 1 to 7 wherein a height of said first chamber measured between said filter bottom and said cover is between about 75 to 80% of a height of an interior of said cartridge as measured between said container bottom and said cover.

9. The beverage filter cartridge of any one of claims 1 to 8 wherein a permeability of a lower region of said filter element is reduced in comparison to a permeability of an upper region thereof.

10. The beverage filter cartridge of claim 9 wherein said reduced permeability is achieved by increasing a thickness of said filter element in said lower region.

11. The beverage filter cartridge of claim 10 wherein said increased thickness is achieved by lining the lower region of said filter element with a cup-shaped insert of the same or like filter material.

12. The beverage filter cartridge of any one of claims 1 to 11, wherein a majority of the filter side wall is spaced inwardly from and out of contact with the container side wall.

13. The beverage filter cartridge of any one of claims 1 to 12, wherein said container is impermeable and said cover is impermeable.

KEURIG, INCORPORATED

WATERMARK PATENT AND TRADE MARKS ATTORNEYS

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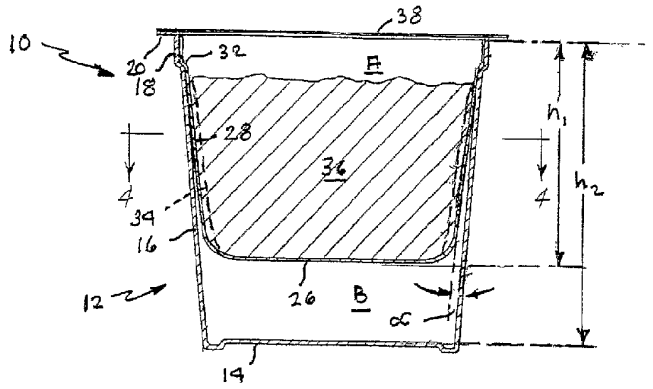

Fig. 1

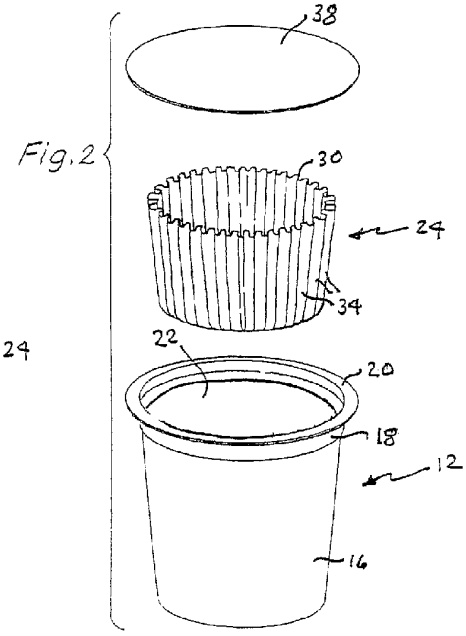

Fig. 2

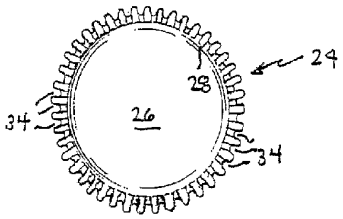

Fig. 3

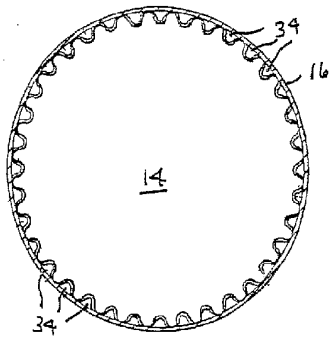

Fig. 4

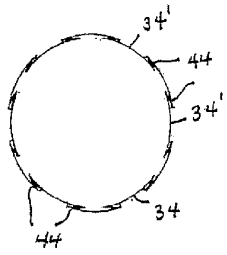

Fig. 6

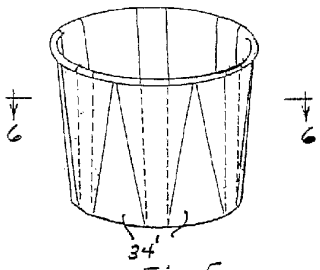

Fig. 5

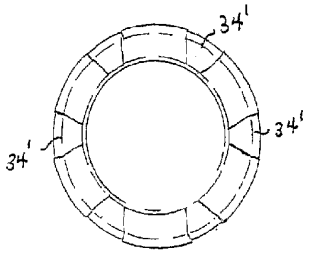

Fig. 7

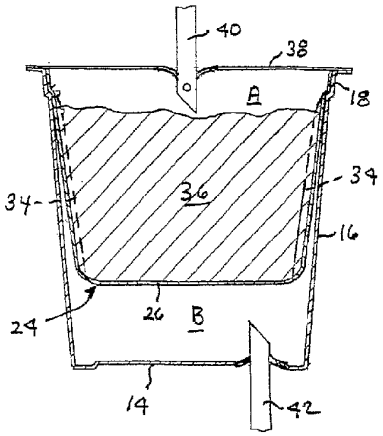

Fig. 8

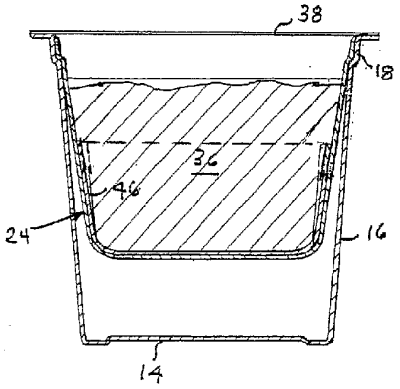

Fig. 9