Nummer: **DE 199 10 226 A1**
Int. Cl.[7]: **G 06 K 19/06**
Offenlegungstag: 21. September 2000

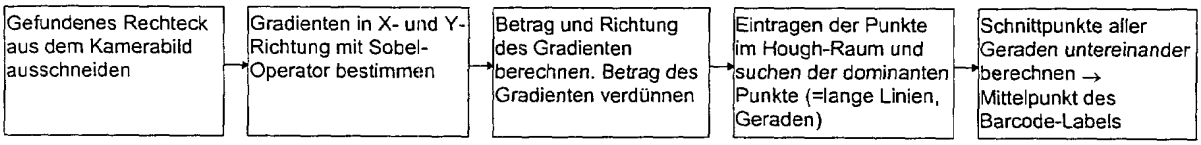


Diagramm 4: Finden des Barcode-Mittelpunkts mittels Hough-Transformation

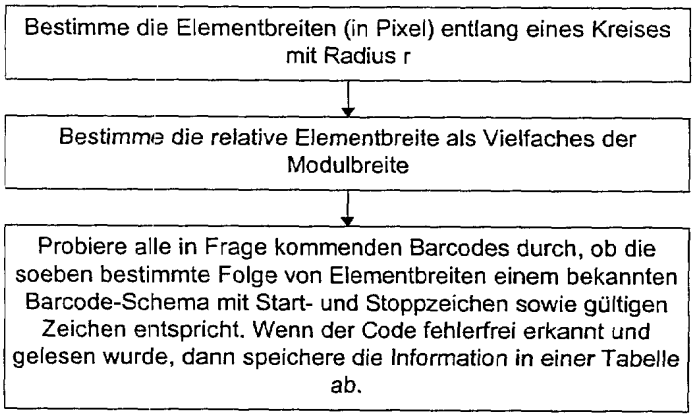
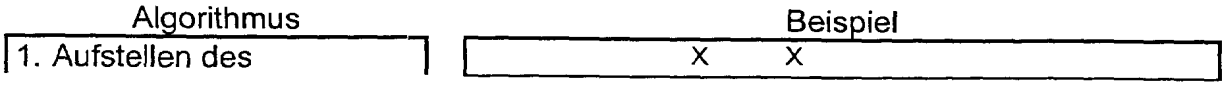


Diagramm 5: Flußdiagramm zum Lesen der extrahierten Barcode-Labels



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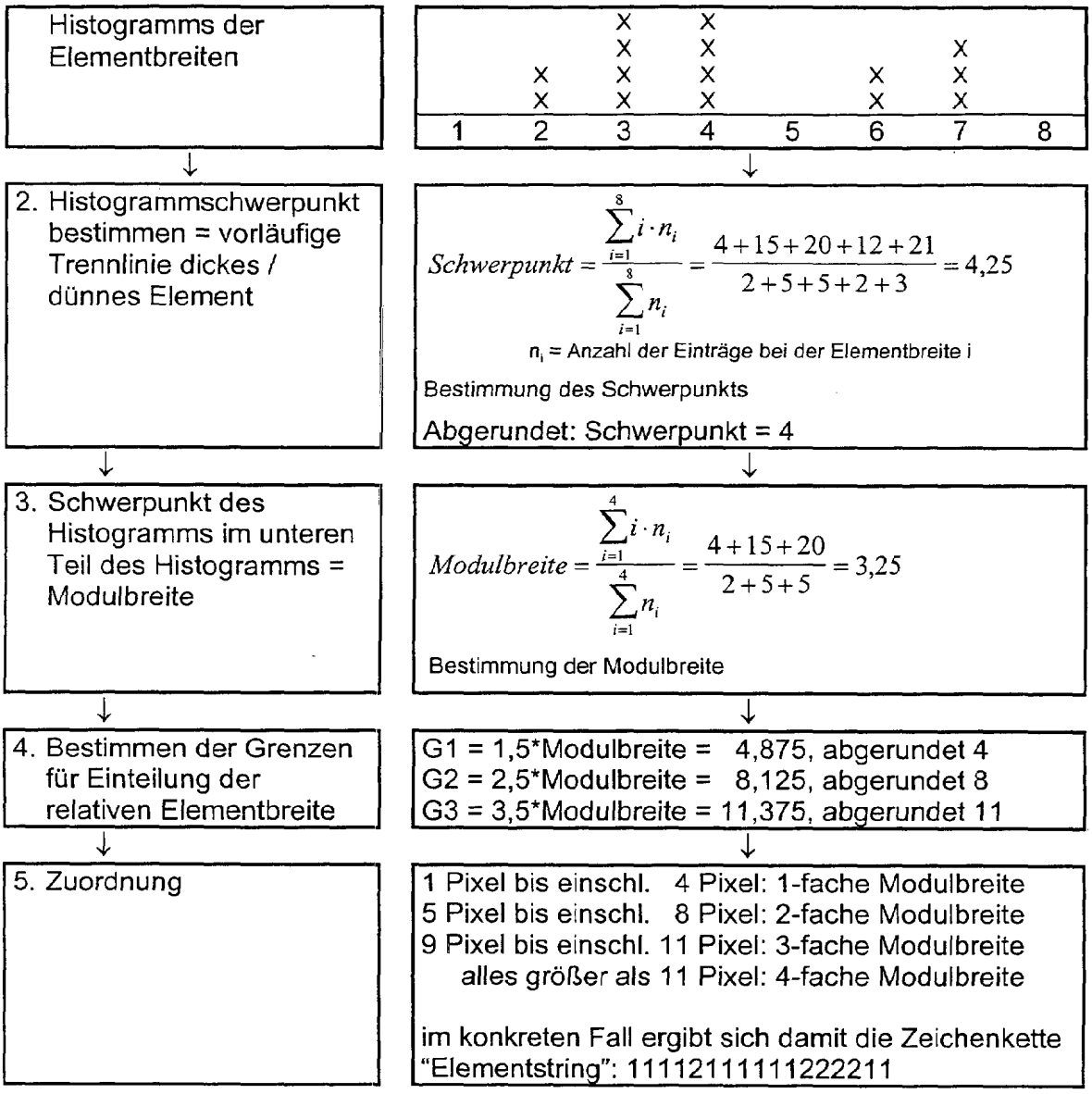


Diagramm 6: Flußdiagramm zum Bestimmen der relativen Elementbreite

Algorithmus	Beispiel
1. Durchsuchen des Elementstring von links nach rechts nach einem Startzeichen. Für den Code 2/5	Elementstring: 11112111111222211 Startzeichen: 111 (Hinweis: Das Startzeichen muß das erste

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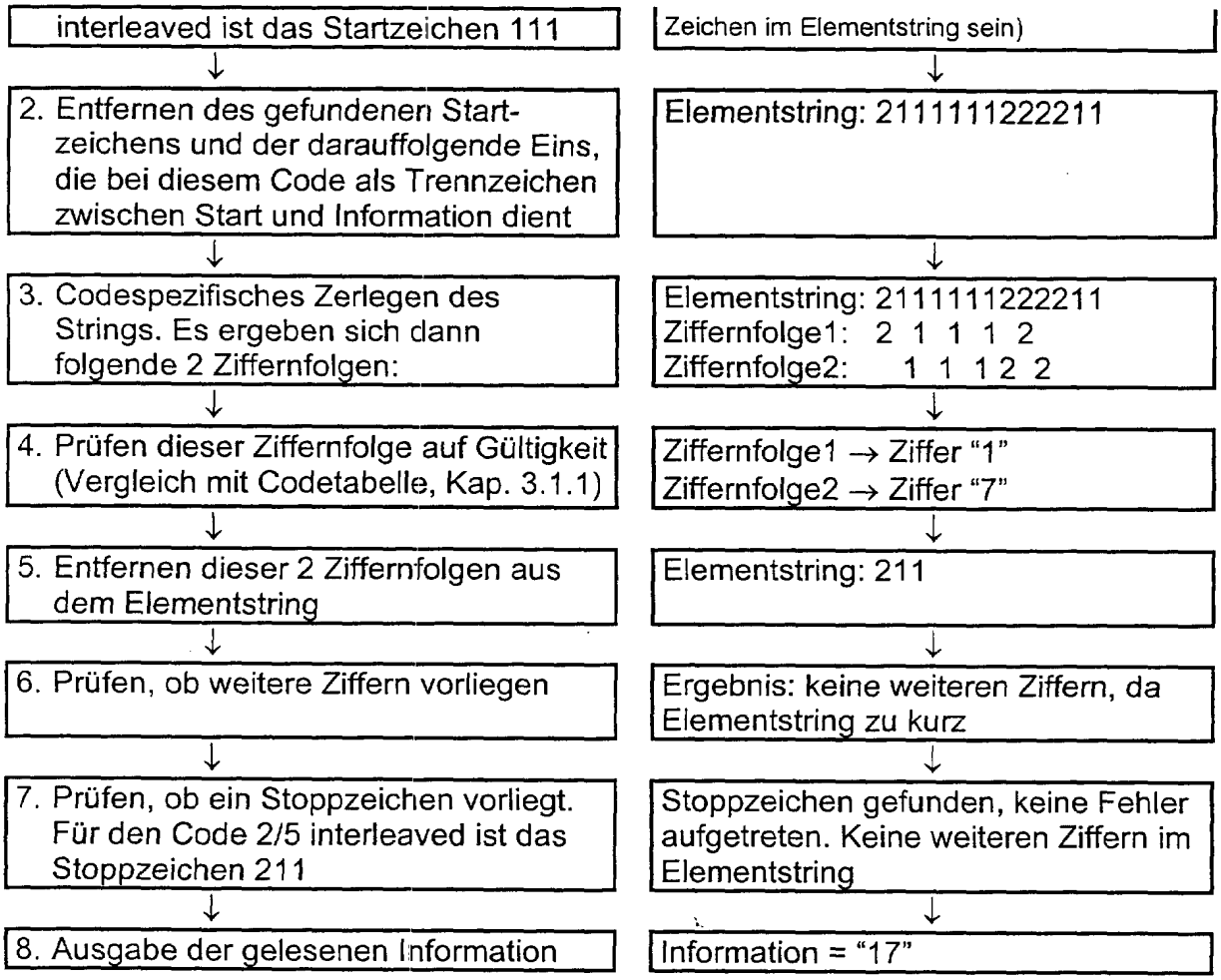


Diagramm 7: Ablauf zur Prüfung der Gültigkeit des Elementstring

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Veröffentlicht:

— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

(54) **Title**: PORTION CAPSULE HAVING AN IDENTIFIER

(54) **Bezeichnung** : PORTIONSKAPSEL MIT KENNUNG

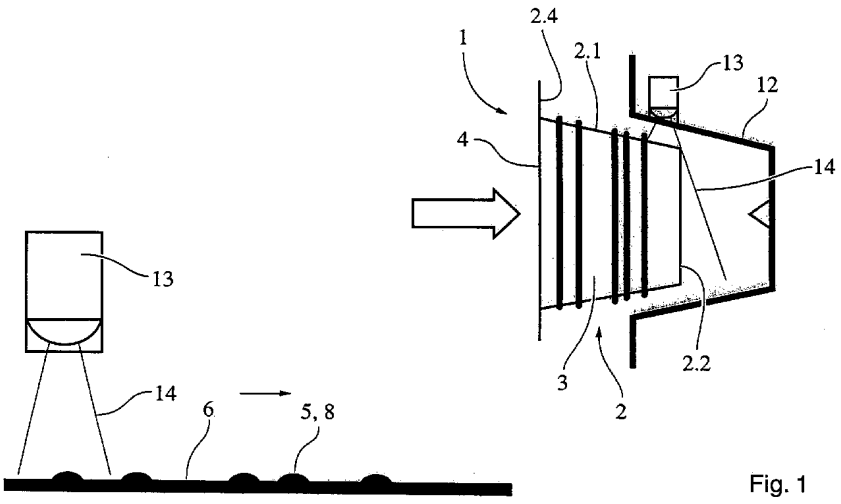


Fig. 1

(57) **Abstract**: The invention relates to a portion capsule for producing a beverage, comprising a base element having a cavity in which a beverage raw material is provided and which is closed by a membrane fastened to the base element.

(57) **Zusammenfassung**: Die vorliegende Erfindung betrifft eine Portionskapsel zur Herstellung eines Getränkes mit einem Basiselement, das einen Hohlraum aufweist, in dem ein Getränkerohmaterial vorgesehen ist und der von einer Membran, die an dem Basiselement befestigt ist, verschlossen wird.

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Portionskapsel mit Kennung

Die vorliegende Erfindung betrifft eine Portionskapsel zur Herstellung eines Getränkes mit einem Basiselement, das einen Hohlraum aufweist, in dem ein Getränkerohmaterial vorgesehen ist und der von einer Membran, die an dem Basiselement befestigt ist, verschlossen wird.

Derartige Portionskapseln sind hinlänglich bekannt und werden in einer Vielzahl von Ausführungsformen am Markt angeboten. Da sich diese Kapseln oftmals relativ ähnlich sind, kann es vorkommen, dass Kapseln eines Herstellers in Kaffeeautomaten eines anderen Herstellers verwendet werden, wofür sie nicht geeignet sind. Dadurch können sich erhebliche Sicherheitsprobleme ergeben und/oder der Kaffeeautomat kann beschädigt werden.

Es war deshalb die Aufgabe der vorliegenden Erfindung, eine Portionskapsel zur Verfügung zu stellen, die nur für einen ganz bestimmten Kaffeeautomaten geeignet ist.

Gelöst wird die Aufgabe mit einer Portionskapsel zur Herstellung eines Getränks mit einem Basiselement , das einen Hohlraum aufweist, in dem ein Getränkerohmaterial vorgesehen ist und der von einer Membran, die an dem Basiselement befestigt ist, verschlossen wird, wobei sie eine Kennung aufweist, die es ermöglicht, die jeweilige Portionskapsel zu individualisieren.

Die vorliegende Erfindung betrifft eine Portionskapsel zur Herstellung eines Getränkes oder Lebensmittels, welches einen Hohlraum aufweist, in dem ein Getränkerohmaterial vorgesehen ist. Eine derartige Portionskapsel wird beispielsweise aus Kunststoff, einem Naturstoff und/oder einem biologisch abbaubaren Werkstoff hergestellt und weist in der Regel ein Basiselement, insbesondere ein tiefgezogenes Basiselement, auf, das vorzugsweise kegelstumpfförmig oder zylindrisch geformt ist. In den Hohlraum der Portionskapsel wird das Getränkerohmaterial eingefüllt, das beispielsweise von einer Flüssigkeit, insbesondere Wasser, extrahiert und/oder aufgelöst wird.. Vorzugsweise wird das Basiselement nach dem Einfüllen des Getränkerohmaterials, insbesondere mit einer Membran verschlossen. Die Membran ist vorzugsweise dem Boden des Basiselementes gegenüberliegend vorgesehen. Die Membran kann aus demselben oder einem unterschiedlichen Werkstoff als das Basiselement gefertigt sein und wird vorzugsweise durch Siegeln und/oder Kleben an dem Basiselement befestigt. Desweiteren können in dem Hohlraum ein oder mehrere Einbauelemente, wie beispielsweise ein Filter, ein Flüssigkeitsverteiler, ein Vlies, ein Filz, eine Absperrfolie und/oder dergleichen vorgesehen

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werden. Für den Fall, dass ein Filz und ein Vlies vorgesehen sind, sind diese vorzugsweise miteinander verbunden. Der Flitz und/oder das Vlies können mehrlagig vorgesehen werden, wobei sich die Lagen in der Art des verwendeten Ausgangsmaterials und/oder dessen Verarbeitung unterscheiden können. Die Membran und/oder der Boden können mit mehreren Ausnehmungen (Löchern) versehen sein.

Erfindungsgemäß ist nun vorgesehen, dass diese Portionskapsel eine Kennung aufweist, die es ermöglicht, die jeweilige Portionskapsel zu individualisieren. Individualisieren im Sinne der Erfindung bedeutet vorzugsweise, dass die jeweilige Portionskapsel einer Gruppe zugeordnet werden kann, die für den jeweiligen Kaffeeautomaten geeignet ist. Es ist nicht nötig, dass der Kaffeeautomat erkennt, um welche Portionskapsel es sich speziell handelt, sondern lediglich erkennt, dass die jeweilige Portionskapsel zu einer Gruppe von Portionskapseln gehört, die für den jeweiligen Kaffeeautomaten geeignet ist. Individualisieren bedeutet insbesondere, dass Portionskapseln, die nicht für den jeweiligen Kaffeeautomaten geeignet, in diesen nicht einführbar sind und/oder direkt wieder herausfallen und/oder dass der Kaffeeautomat nur mit richtigen Kapseln in Betrieb zu nehmen ist. Vorzugsweise erfasst ein an dem Kaffeeautomaten vorgesehener Sensor/Detektionsmittel diese Kennung und vergleicht sie vorzugsweise mit einer abgespeicherten Kennung. Vorzugsweise ist der Kaffeeautomat nur dann in Betrieb zu nehmen, insbesondere seine, das Wasser zur Verfügung stellende Druckpumpe, wenn die ermittelte Kennung mit der Referenzkennung übereinstimmt. Andernfalls ist der Kaffeeautomat nicht in Betrieb zu nehmen. Vorzugsweise ist das Detektionsmittel im Bereich des Einwurfschachtes des Kaffeeautomaten für die Portionskapseln vorgesehen. In einer anderen bevorzugten Ausführungsform ist das Detektionsmittel im Bereich der Brühkammer vorgesehen. Alternativ verhindert die Kennung ein Einführen der Kapsel in den Kaffeeautomat. Alternativ oder zusätzlich sind insbesondere in dem Einwurfschacht Mittel, insbesondere mechanische Mittel, besonders bevorzugt ein oder mehrere Zahnräder vorgesehen, die verhindern, dass eine falsche Portionskapsel in den Kaffeeautomaten, insbesondere den Einwurfschacht, gelangt.

Vorzugsweise handelt es sich bei der Kennung um Flächenbereiche mit unterschiedlichen optischen, beispielsweise Reflexionseigenschaften. Diese Flächen können auf der Membran, der Seitenwand und/oder dem Boden der Portionskapseln vorgesehen werden. Vorzugsweise weist die Portionskapsel mindestens zwei Bereiche auf, die sich in ihren optischen Eigenschaften, beispielsweise den Reflexionseigenschaften unterscheiden.

Weiterhin bevorzugt ist die Erkennung einer Einbuchtung und/oder einer Ausbuchtung. Vorzugsweise liegen Ein- und Ausbuchtungen im Wechsel vor und/oder es liegen mindestens zwei Ein- oder Ausbuchtungen getrennt voneinander vor. Ganz besonders bevorzugt handelt es sich bei den Ein- und/oder Ausbuchtungen um einen Zahnkranz, der an

dem äußeren Umfang des Randes und/oder zumindest abschnittsweise an dem Wandbereich der Portionskapsel vorgesehen ist. Die Ein- und/oder Ausbuchtung kann vorzugsweise durch jedes formgebende Verfahren beispielsweise durch Tiefziehen hergestellt werden. Weiterhin kann die Einbuchtung durch einen Materialabtrag, insbesondere durch Stanzen oder mittels eines Lasers, bewerkstelligt werden, wobei bei dieser bevorzugten Ausführungsform der vorliegenden Erfindung darauf zu achten ist, dass eine eventuelle in dem Portionskapselmaterial vorhandene Sperrschicht, die beispielsweise verhindert, dass Feuchtigkeit oder Aroma aus der Kapsel entweicht und/oder Wasserdampf oder Sauerstoff in die Kapsel eindringt, nicht beschädigt wird. Das Auslesen der Kennung, die in der Ein- und/oder Ausbuchtung verschlüsselt ist, kann beispielsweise durch ein mechanisches und/oder optisches Verfahren erfolgen. Die Kennung kann aber alternativ oder zusätzlich dazu eingesetzt werden zu verhindern, dass die Portionskapsel in den Kaffeeautomaten eingeführt, insbesondere in den Einwurfschacht eingeführt werden kann. Dies kann beispielsweise mit einem Zahnkranz am Umfang der Portionskapsel und/oder deren Rand erzielt werden, indem ein in dem Einwurfschacht vorgesehenes Zahnrad sich nur drehen lässt und damit die Portionskapsel passieren lässt, wenn deren Zahnkranz mit den Zähnen des Zahnrades kompatibel ist, beispielsweise dieselbe Zahnform und/oder Teilung aufweist.

In einer weiteren bevorzugten Ausführungsform der vorliegenden Erfindung ist die Kennung in der Membran vorgesehen. Vorzugsweise ist die Kennung eine Schicht oder Teilschicht der Membran. Bei dieser Art der Kennung kann es sich beispielsweise um ein optisch erkennbares Material, beispielsweise ein fluoreszierendes Material, handeln. Weiterhin kann es sich um eine Kennung in Form einer Metallschicht oder Ferrometallschicht bzw. in Form von Metall- oder Ferrometallstreifen in oder auf der Membran handeln.

Weiterhin bevorzugt ist die Kennung ein maschinenlesbarer Aufdruck. Dieser Aufdruck erfolgt vorzugsweise mit einer im Lebensmittelbereich zugelassenen Farbe. Weiterhin bevorzugt sind fluoreszierende Materialen als Druckmaterial oder Druckmaterialen, deren optische Eigenschaften sich unter Temperatureinfluss verändern. Vorzugsweise ist der Aufdruck ein Barcode, ein Logo oder ein Rapport.

In einer weiteren bevorzugten Ausführungsform ist die Kennung ein elektrisch leitender Bereich, der überall auf der Kapsel, vorzugsweise jedoch in und/oder auf deren Seitenwand, Rand und/oder Boden vorgesehen wird. Durch diesen elektrisch leitenden Bereich wird in einem, wie auch immer gestalteten Stromkreis, eine messbare Veränderung bewirkt, die dann zur Erkennung der jeweiligen Portionskapsel führt.

In einer weiteren bevorzugen Ausführungsform ist die Kennung ein ferromagnetischer Bereich.

Weiterhin bevorzugt ist die Kennung über einen RFID-Chip.

Mit der erfindungsgemäßen Portionskapsel ist es möglich, zu verhindern, dass Portionskapseln, die nicht für einen bestimmten Kaffeeautomaten vorgesehen sind, in diesen eingeführt werden. Weiterhin ist es anhand der Kennung möglich, dass der Kaffeeautomat erkennt, welche Art von Kapsel sich in seiner Brühkammer befindet und den Getränke- oder Lebensmittelherstellungsprozess d. h. beispielsweise die Menge an Wasser, deren Druck und/oder deren Temperatur entsprechend einstellt.

Gemäß einem weiteren Gegenstand der vorliegenden Erfindung ist im Bodenbereich, durch Materialabtrag, beispielsweise mittels eines Lasers, eine Schwächung vorgesehen. Diese Schwächung ist insbesondere in dem Bereich des Bodens der Kapsel vorgesehen, der für die Herstellung des Getränkes von einem Dorn durchstochen wird. Dadurch, dass die Folie im Bereich des Dorns beispielsweise durch Materialabtrag mittels eines Lasers geschwächt ist, ist der Kraftaufwand, der zum Durchstoßen der Folie benötigt wird, geringer. Der Dorn eines entsprechenden Kaffeeautomaten kann eine Kraftbegrenzung beispielsweise in Form einer Feder aufweisen, die die Kraft begrenzt mit der der Dorn gegen den Portionskapselboden drücken kann. Dadurch wird vermieden, dass Kapseln die eine entsprechende Schwächung nicht aufweisen in einem entsprechenden Kaffeeautomaten zum Einsatz kommen können. Die Schwächung stellt folglich ebenfalls eine Kennung dar.

Gemäß einem weiteren oder einem bevorzugten Gegenstand der vorliegenden Erfindung weist die Portionskapsel einen Randbereich auf, der vorzugsweise an dem Basiselement vorgesehen ist. Vorzugsweise ist der Rand an dem dem Boden gegenüberliegenden Bereich des Basiselementes vorgesehen. An diesem Randbereich kann beispielsweise eine Membran zum Verschließen des Basiselementes angeordnet werden, nachdem das Rohmaterial in die Portionskapsel eingefüllt ist. Der Rand kann aber auch dazu dienen, die Kapsel in einem Einwurfschacht so zu führen, dass sie in einer ganz bestimmten Lage in eine Brühkammer fällt. Gleichzeitig kann der Rand als Anschlags- und/oder Dichtungsfläche dienen.

Vorzugsweise weist die Portionskapsel in dem Randbereich, insbesondere an dessen äußerem Umfang, zumindest abschnittsweise ein Formschluss-, Reibschluss- und/oder Detektionsmittel auf. Mit diesem Form- und/oder Reibschlussmittel können beispielsweise komplementäre Mittel, die sich im Bereich des Kaffeeautomaten befinden, angetrieben werden, um zu ermöglich, dass die Portionskapsel in den Kaffeeautomaten eingeführt werden kann und/oder um einen Sensor, beispielsweise ein Zahnrad, anzutreiben, der ein

Signal an eine Maschinensteuerung sendet in Abhängigkeit davon, ob es sich um die richtige oder die falsche Portionskapsel handelt. Alternativ oder zusätzlich können diese Formschluss-, Reibschluss- und/oder Detektionsmittel jedoch auch von einem Detektor erfasst werden, um festzustellen, ob die jeweilige Portionskapsel für den jeweiligen Kaffeeautomaten geeignet ist.

Vorzugsweise handelt es sich bei dem Formschluss-, Reibschluss- und/oder Detektionsmittel um einen Zahnkranz oder Zahnkranzsegment, das insbesondere am äußeren Umfang des Randes vorgesehen ist. Die Zähne dieses Zahnkranzes oder Zahnkranzsegmentes können jede beliebige – dem Fachmann beispielsweise aus dem Getriebebau – geläufige Form aufweisen. Vorzugsweise sind die Zähne jedoch dreiecksförmig, rechteckförmig, quadratisch oder wellenförmig vorgesehen.

Vorzugsweise ist bezogen auf den Zahnkranz bzw. das Zahnkranzsegment innenliegend eine Dichtfläche vorgesehen.

Ein weiterer oder bevorzugter Stand der Technik ist ein Portionskapsel zur Herstellung eines Getränks, aufweisend ein im Wesentlichen kegelstumpfförmiges oder zylindrisches Basiselement, welches einen Hohlraum zur Aufnahme eines Getränkerohmaterials aufweist, und eine den Hohlraum verschließende Membran, wobei das Basiselement einen Wandungsbereich aufweist und das Basiselement ferner auf der der Membran abgewandten Seite der Portionskapsel einen Bodenbereich aufweist, wobei der Wandungsbereich eine Mehrzahl von Rillen aufweist und die Rillen zwischen der Membran und dem Bodenbereich über wenigstens einen Teil der Höhenerstreckung des Wandungsbereichs verlaufend vorgesehen sind. Die Rillen können auch in dem Randbereich der Portionskapsel, insbesondere an dessen äußerem Umfang vorhanden sein.

Diese Portionskapsel hat gegenüber der Portionskapsel gemäß dem Stand der Technik beispielsweise den Vorteil, dass der Wandungsbereich des Basiselements durch die Mehrzahl von Rillen versteift ist. Dies hat zum einen den Vorteil, dass die Portionskapsel eine höhere mechanische Stabilität aufweist und somit eine Deformation und insbesondere ein seitliches Einknicken der Portionskapsel verhindert wird. Ein weiterer Vorteil der erfindungsgemäßen Portionskapsel ist, dass sich durch die Anordnung von Rillen im Wandungsbereich des Basiselements ein verbessertes Verhalten beim Durchströmen der Portionskapsel mit der Extraktionsflüssigkeit in der Brühkammer ergibt, weil es durch die Anordnung der Rillen, insbesondere durch ihren Verlauf zwischen der Membran und dem Bodenbereich über wenigstens einen Teil der Höhenerstreckung des Wandungsbereichs, möglich ist, die Qualität und die Zuverlässigkeit des Extraktionsvorgangs erheblich zu steigern ist. Insbesondere ist es erfindungsgemäß vorteilhaft möglich, dass durch die

Erhöhung der mechanischen Stabilität durch die Verwendung der Mehrzahl von Rillen die Materialstärke des Basiselements insgesamt reduziert werden kann. Die Produktion der Portionskapsel wird somit erheblich kostengünstiger und umweltfreundlicher. Andererseits wird in der Brühkammer durch die Mehrzahl der Rillen eine Anhaftung des Wandungsbereichs an die Brühkammerwandung reduziert bzw. vermieden, wodurch das Auswerfen oder Entnehmen der Portionskapsel aus der Brühkammer begünstigt wird. Ein weiterer Vorteil der Mehrzahl von Rillen ist, dass innerhalb des Hohlraums die Strömung der Extraktionsflüssigkeit entlang des Basisbereichs durch die Rillenstruktur im Wandungsbereich optimiert gestaltet werden kann, so dass sich durch Formgebung der Rillenstruktur beispielsweise eine bessere bzw. stärkere Verwirbelung der Extraktionsflüssigkeit im Hohlraum oder aber eine gleichmäßigere (laminare) Strömung der Extraktionsflüssigkeit ergibt bzw. mit einfachen Mitteln realisiert werden kann. Eine im Vergleich zum Stand der Technik stärkere Verwirbelung der Extraktionsflüssigkeit im Hohlraum hat gegenüber dem Stand der Technik den Vorteil, dass sich keine ungewollten und zufälligen Hauptflüssigkeitsströme durch das Bett des Getränkerohmaterials bilden, sondern stattdessen das Getränkerohmaterial in seinem gesamten Volumen durchströmt wird. Der Extraktionsvorgang wird somit wesentlich effizienter und ist präziser zu steuern bzw. reproduzierbarer.

Das Getränkerohmaterial umfasst insbesondere Kaffeepulver (vorzugsweise gemahlenen Röstkaffee), Schokoladenpulver, Milchpulver, Tee oder dergleichen. Alternativ ist denkbar, dass das Getränkerohmaterial ein Getränkeextrakt, wie beispielsweise Instant-Kaffee umfasst.

Die Rillen sind insbesondere Ausbuchtungen und/oder Einbuchtungen, welche vorzugsweise eine lineare Haupterstreckungsrichtung aufweisen, die sich vorzugsweise entlang dem Wandungsbereich oder des Umfangs des Randes erstrecken. Besonders bevorzugt sind die Rillen als Stege und/oder Nuten oder ausgebildet. Durch die Rillen ergibt sich beispielsweise ein Zahnkranz. Die Rillen sind dabei optional auf einer dem Hohlraum zugewandten Innenseite und/oder auf einer dem Hohlraum abgewandten Außenseite des Basiselements ausgebildet.

Gemäß einer bevorzugten Ausführungsform der vorliegenden Erfindung ist es vorgesehen, dass die Rillen eine Kennung realisieren, die es ermöglicht, die Portionskapsel zu individualisieren. Individualisieren im Sinne der vorliegenden Erfindung bedeutet vorzugsweise, dass die jeweilige Portionskapsel einer Gruppe zugeordnet werden kann, die für den jeweiligen Kaffeeautomaten bzw. für das jeweilige Gerät geeignet ist, mit welchem

ein Getränk hergestellt wird.. Es ist nicht nötig, dass der Kaffeeautomat bzw. die Vorrichtung zur Herstellung eines Getränks unter Verwendung der erfindungsgemäßen Portionskapsel erkennt, um welche Portionskapsel es sich speziell handelt, sondern lediglich, dass die jeweilige Portionskapsel zu einer Gruppe von Portionskapseln gehört, die für die jeweilige Vorrichtung zur Herstellung des Getränks, insbesondere einen Kaffeeautomaten, geeignet ist. Individualisieren bedeutet insbesondere, dass Portionskapseln, die nicht für den jeweiligen Kaffeeautomaten (bzw. die jeweilige Vorrichtung zur Herstellung des Getränks) geeignet sind, in diesen nicht einführbar sind und/oder direkt wieder herausfallen und/oder dass die Vorrichtung zur Herstellung des Getränks bzw. der Kaffeeautomat nur mit erfindungsgemäßen Portionskapseln („richtigen Kapseln") in Betrieb zu nehmen ist und dass ein bestimmungsgemäßer und ordnungsgemäßer Betrieb der Vorrichtung zur Herstellung des Getränks bzw. des Kaffeeautomaten nicht möglich ist, wenn nicht die individualisierbaren bzw. erfindungsgemäßen Portionskapseln verwendet werden. Vorzugsweise ist es erfindungsgemäß vorgesehen, dass ein an dem Kaffeeautomaten bzw. der Vorrichtung zur Herstellung des Getränks vorgesehener Sensor bzw. ein Detektionsmittel, diese Kennung erfasst und mit einer vorzugsweise abgespeicherten Kennung vergleicht. Dieser Erkennungs- bzw. Vergleichsvorgang kann in besonders bevorzugter Weise auch auf einer mechanischen Passung beruhen, insbesondere einer Passung eines Zahnrades bzw. einer zahnradähnlichen Kontur, die sich in der Vorrichtung zur Herstellung des Getränks bzw. in dem Kaffeeautomaten befindet und mit der Portionskapsel zusammenwirkt. Vorzugsweise ist die Vorrichtung zur Herstellung des Getränks bzw. der Kaffeeautomat nur dann in Betrieb zu nehmen, wenn die ermittelte Kennung mit der Referenzkennung übereinstimmt bzw. wenn die mechanische Passung übereinstimmt. Insbesondere ist lediglich in diesem Fall die Vorrichtung zur Herstellung des Getränks in Betrieb zu nehmen, insbesondere eine Druckpumpe bzw. Wasserpumpe zu aktivieren. Andernfalls ist der Kaffeeautomat bzw. die Vorrichtung zur Herstellung des Getränks nicht in Betrieb zu nehmen. Vorzugsweise ist das Detektionsmittel bzw. das Element zur Herstellung einer mechanischen Passung im Bereich des Einwurfschachtes des Kaffeeautomaten bzw. der Vorrichtung zur Herstellung des Getränks für die Portionskapseln vorgesehen. Alternativ kann es auch vorgesehen sein, dass die Kennung bzw. die mechanische Passung verhindert, dass die nicht passende Portionskapsel in die Vorrichtung zur Herstellung des Getränks eingeführt wird. Mit der erfindungsgemäßen Portionskapsel ist es möglich, zu verhindern, dass Portionskapseln, die nicht für eine bestimmte Vorrichtung zur Herstellung eines Getränks vorgesehen sind, in diese eingeführt werden. Weiterhin ist es anhand der Kennung möglich, dass die Vorrichtung zur Herstellung des Getränks, insbesondere der Kaffeeautomat erkennt, welche Art von Portionskapsel sich in seiner Brühkammer befindet und den Getränke- oder Lebensmittelherstellungsprozess, d. h.

beispielsweise die Menge an Wasser, dessen Druck und/oder dessen Temperatur, entsprechend einstellt.

Gemäß einer weiteren bevorzugten Ausführungsform der vorliegenden Erfindung ist vorgesehen, dass zumindest ein Teil der Rillen und zumindest in einem Teilbereich in einer Ebene parallel zur Haupterstreckungsebene der Membran eine zahnradförmige Kontur aufweisen.

Hierdurch ist es erfindungsgemäß in vorteilhafter Weise möglich, dass bei ansonsten gleichen Voraussetzungen wie etwa Materialstärke oder dergleichen beispielsweise der Wandungsbereich der Portionskapsel stabiler ausgeführt werden kann, eine optimalere Verwirbelung der Extraktionsflüssigkeit und damit eine Verbesserung des Extraktionsprozesses herbeigeführt werden kann und ferner auch in einfacher Weise eine mechanische Kennung bzw. eine mechanische Passung der Portionskapsel mit einem Passungselement der Vorrichtung zur Herstellung eines Getränks realisierbar ist. Insbesondere ist es erfindungsgemäß dadurch vorteilhaft möglich, dass beispielsweise ein Zahnrad, welches in der Vorrichtung zur Herstellung eines Getränks angeordnet ist, beispielsweise im Bereich eines Einführschachtes oder dergleichen, mit der Zahnradkontur der Portionskapsel zusammenwirkt und damit eine mechanische Passung realisiert wird, die dazu führt, dass erkannt wird, dass es sich bei der Portionskapsel um eine zulässige Portionskapsel handelt und/oder erkannt wird, um welche Art von Portionskapsel es sich handelt und/oder eine Drehung der Portionskapsel um eine im Wesentlichen senkrecht zur Erstreckungsebene der Membran verlaufende Rotationsachse der Portionskapsel mit Hilfe der Zahnradanordnung herbeizuführen. Insbesondere ist es hierdurch erfindungsgemäß vorteilhaft möglich, dass die Portionskapsel immer in einer definierten Drehposition von der Vorrichtung zur Herstellung eines Getränks geöffnet und damit der Extraktionsprozess immer in gleicher Weise realisiert wird. Weiterhin ist es möglich, dass durch die Rillen ein Einführen der Portionskapsel in den Kaffeeautomaten verhindert wird.

Bevorzugt ist ferner vorgesehen, dass das Basiselement vom Bodenbereich abgewandt einen Flansch/Randbereich zur Befestigung der Membran an dem Basiselement aufweist, wobei der Wandungsbereich zwischen dem Bodenbereich in dem Flansch/Randbereich vorzugsweise einen Absatz aufweist, wobei die Rillen sich vorzugsweise zumindest über einen Teil des Absatzes erstrecken.

Hierdurch ist es erfindungsgemäß in vorteilhafter Weise ferner möglich, dass zum einen der Wandungsbereich besonders stabil und verstärkt ausgeführt wird und zum anderen die

zahnradförmige Kontur der Rillen im Wandungsbereich derart ausgebildet ist, dass eine vergleichsweise hohe mechanische Last aufgenommen werden kann, sodass eine Drehung der Portionskapsel in der Vorrichtung zur Herstellung eines Getränks in einfacher Weise und ohne Beschädigung der Portionskapsel möglich ist.

Vorzugsweise weist das Basiselement im Bereich des Absatzes einen größeren Durchmesser auf als im Wandungsbereich zwischen dem Absatz und dem Bodenbereich.

Hierdurch ergibt sich in vorteilhafter Weise eine besonders einfache und robuste Möglichkeit, eine Stapelbarkeit der Portionskapseln bzw. eine Stapelbarkeit des Basiselements der Portionskapseln herbeizuführen.

Ferner ist es bevorzugt, wenn zumindest ein Teil der Rillen und zumindest in einem Teilbereich in einer Ebene parallel zur Haupterstreckungsebene der Membran eine zahnradförmige Kontur derart aufweisen, dass sich die zahnradförmige Kontur zumindest teilweise im Bereich des Absatzes oder des Flansches/Randbereichs erstreckt.

Weitere bevorzugte Ausführungsformen der vorliegenden Erfindung betreffen Varianten der Portionskapsel, bei denen eines oder mehrere der folgenden Merkmale realisiert ist/sind:

- das Basiselement verjüngt sich im Bereich des Absatzes in Richtung zum Flansch hin,
- die Rillen erstrecken sich über den Bereich des Absatzes in Richtung zum Bodenbereich hin,
- die Rillen erstrecken sich im Wandungsbereich über etwas 20 % - 80 %, bevorzugt über etwa 40 % - 60 %, der Erstreckung zwischen dem Absatz und dem Bodenbereich,
- die Rillen sind derart ausgebildet, dass mittels der Rillen der Wandungsbereich versteift ist und/oder dass durch die Rillen eine Verwirbelung einer in dem Hohlraum strömenden Extraktionsflüssigkeit vorgesehen ist.

Weitere bevorzugte Ausführungsformen der vorliegenden Erfindung betreffen eine Realisierung der Portionskapsel mit einem Verhältnis des Durchmessers des an den Flansch/Randbereich angrenzenden Wandungsbereichs einerseits zum Durchmesser des Flansches andererseits zwischen 0,85 und 0,89, insbesondere im Wesentlichen 0,87.

Ferner ist erfindungsgemäß vorteilhaft vorgesehen, dass der Durchmesser des an den Flansch angrenzenden Wandungsbereichs im Wesentlichen 39 mm und/oder der Durchmesser des Flansches im Wesentlichen 45 mm beträgt. Ferner ist erfindungsgemäß bevorzugt vorgesehen, dass das Basiselement im Bereich des Absatzes eine größere Wandstärke aufweist als im Wandungsbereich zwischen dem Bodenbereich und dem Flansch. Hierdurch ist es aufgrund der verbesserten Stabilität aufgrund der Formgebung der Portionskapsel mit den Rillen im Wandungsbereich möglich, eine erhebliche Materialeinsparung und damit Kosten und Energieaufwand zur Herstellung der Portionskapsel zu reduzieren.

Ferner ist es erfindungsgemäß auch bevorzugt vorgesehen, dass innerhalb des Hohlraums ein Filterelement angeordnet ist, welches den Hohlraum in einen ersten Bereich zur Ordnung des Getränkerohmaterials und in einen zweiten Bereich zur Aufnahme eines Getränkeextrakts unterteilt, wobei es besonders bevorzugt vorgesehen ist, dass das Filterelement ein Vliesmaterial umfasst.

Ein weiterer Gegenstand der vorliegenden Erfindung ist die Verwendung einer erfindungsgemäßen Portionskapsel zur Herstellung eines Heißgetränks.

Im Folgenden wird die Erfindung anhand der Figuren 1 – 22 erläutert. Diese Erläuterungen schränken den allgemeinen Erfindungsgedanken nicht ein.

Figur 1 zeigt eine Portionskapsel mit unterschiedlichen optischen Bereichen.

Figur 2 zeigt eine Portionskapsel mit einem Barcode.

Figur 3 zeigt eine Portionskapsel mit Ein- und Ausbuchtungen.

Figur 4 zeigt eine Portionskapsel mit unterschiedlichen optischen Bereichen.

Figur 5 zeigt einen Kapselkörper mit einer Schlüsselfunktion.

Figur 6 zeigt eine elektrisch leitende Kapselwand.

Figur 7 zeigt eine Portionskapselwand mit unterschiedlichen optischen Eigenschaften.

Figur 8 zeigt einen verbreiterten Topfansatz der Kapselwand.

Figur 9 zeigt einen elektrisch leitenden Randbereich.

Figur 10 zeigt eine Kapsel mit einem elektrisch leitenden Kapselboden.

Figur 11 zeigt eine Ausführungsform mit einer von einem Metalldetektor zu detektierenden Schicht.

Figur 12 zeigt ein metallisches Sieb.

Figur 13 zeigt eine Portionskapsel mit einem ferromagnetischen Bereich.

Figur 14 zeigt eine Portionskapsel mit einem Barcode.

Figur 15 zeigt eine Portionskapsel mit einem elektrisch leitenden Bereich in der Wandung.

Figur 16 zeigt eine Portionskapsel mit einem Zahnkranz in der Brühkammer.

Figuren 17 a – c zeigen unterschiedliche Ausführungsformen der Portionskapsel gemäß Figur 16.

Figur 18 zeigt die Portionskapsel gemäß den Figuren 16 und 17 im Formschluss mit einem Zahnrad.

Figuren 19 und 20 zeigen schematisch Ansichten einer erfindungsgemäßen Portionskapsel gemäß einer Ausführungsform der vorliegenden Erfindung.

Figuren 21 und 22 zeigen schematisch zwei Schnittansichten der erfindungsgemäßen Portionskapsel.

Figur 1 zeigt in der rechten Darstellung eine Portionskapsel 1, die ein Basiselement 2 mit einer Wandung 2.1 und einem Bodenbereich 2.2 aufweist. Die Wandung 2.1 und der Boden 2.2 definieren einen Hohlraum, in den ein Getränkerohmaterial und ggf. ein Einbauelement vorgesehen werden können. Dieser Hohlraum wird nach dessen Befüllung von einer Membran verschlossen, die vorzugsweise mit dem Randbereich 2.4 des Basiselements beispielsweise durch Siegeln oder Kleben verbunden wird. Diese Kaffeekapsel wird in eine hier schematisch dargestellte Brühkammer 12 eingeführt, in der sie von einer Flüssigkeit, beispielsweise Wasser, durchströmt wird. Dabei wird das Getränkerohmaterial extrahiert oder aufgelöst und dadurch das gewünschte Getränk erzeugt. Erfindungsgemäß weist diese Portionskapsel nun eine Kennung auf, mit der feststellbar ist, ob die jeweilige Portionskapsel für die in dem Kaffeeautomaten vorgesehene Brühkammer und die eingestellten Prozeßparameter geeignet ist. Ist dies nicht der Fall, können sich signifikante Sicherheitsprobleme ergeben. Beispielsweise kann durch den Einsatz einer falschen Portionskapsel die Dichtheit der Brühkammer gefährdet werden, so dass beispielsweise

heißes Wasser unter einem hohen Druck aus dem Kaffeeautomaten austritt und dadurch einen Benutzer gefährden kann. Andererseits ist es auch vorstellbar, dass der Kaffeeautomat selbst durch den Einsatz einer falschen Portionskapsel beschädigt wird. In dem vorliegenden Beispiel handelt es sich bei der Kennung um mehrere erhabene Bereiche 8, die andere Reflexionseigenschaften aufweisen, als der dazwischen liegende Bereich. Diese Ausbuchtungen 8 werden, wie durch die Pfeile dargestellt, an einem Detektionsmittel hier einem optischen Detektionsmittel vorbeigeführt, das die erhabenen Bereiche und/oder die unterschiedlichen optischen Eigenschaften, beispielsweise Strahlungsreflexionseigenschaften, der unterschiedlichen Bereiche 5, 6 erkennt. Der Wechsel zwischen diesen unterschiedlichen Bereichen bzw. die Anzahl der Ausbuchtungen 8 ist die Kennung. Nachdem die Kennung erfasst worden ist, wird diese mit einer Referenzkennung verglichen und für den Fall, dass diese gleich sind, die Inbetriebnahme des Kaffeeautomaten zugelassen. Für den Fall, dass diese nicht übereinstimmen, wird insbesondere die Inbetriebnahme der Pumpe verhindert, die beispielsweise heißes Wasser durch die Brühkammer drückt.

Diese Ausführungen betreffend die Kennung gelten für alle weiteren Beispiele.

Figur 2 zeigt eine weitere Ausführungsform der erfindungsgemäßen Portionskapsel. In dem vorliegenden Fall weist diese im Bereich der Oberseite der Membran einen Barcode auf. Dieser Barcode kann aufgedruckt durch einen Materialabtrag oder mit in der Folie vorhandenen optisch erkennbaren Mitteln, beispielsweise Fluoreszenzmitteln, hergestellt werden. Alternativ können entsprechende Metallringe Teil der Folie sein oder auf der Folie angebracht werden. Die Bereiche des Barcodes können auch aus einem ferromagnetischen Material bestehen. Alternativ kann der Barcode wie durch den Pfeil 15 symbolisiert an der der Membran abgewandten Seite des Randbereichs des Basiselementes vorgesehen werden. Dieser Barcode wird von einem Detektor 13 ausgelesen, beispielsweise in einem Einwurfschacht.. Der Barcode stellt die erfindungsgemäße Kennung dar.

Figur 3 zeigt eine weitere Ausführungsform der erfindungsgemäßen Portionskapsel. In dem vorliegenden Fall besteht die Kennung aus Einbuchtungen bzw. Ausbuchtungen die durch Materialabtrag oder durch Umformen in die Portionskapsel, hier in deren Wandung 2.1, eingebracht werden. Diese Ein- oder Ausbuchtungen wirken in dem vorliegenden Fall mit schlüsselartig funktionierenden Detektionsmitteln 13 zusammen, wobei in dem vorliegenden Fall der Kaffeeautomat nur dann in Betrieb zu nehmen ist, wenn alle Elemente 13 in einer entsprechenden Einbuchtung platziert sind. Dadurch wird beispielsweise ein Stromkreis verändert, insbesondere geschlossen.

Figur 4 zeigt im Wesentlichen die Ausführungsform gemäß Figur 1, wobei in dem vorliegenden Fall auch noch die Alternative dargestellt ist, dass die unterschiedlichen optischen Bereiche auf der Deckelfolie angeordnet sind, beispielsweise in Form eines Barcodes.

Figur 5 zeigt eine Alternative zu der Ausführungsform gemäß Figur 3. Auch hier stellen die Ausbuchtungen 8 die Bärte eines Schlüssels dar. Der Kaffeeautomat ist nur dann in Betrieb nehmbar, wenn diese Ausbuchtungen mit entsprechenden Einbuchtungen zusammenwirken und dadurch beispielsweise einen Stromkreis entsprechend verändert wird. Dieses System kann nicht nur in der Brühkammer, sondern beispielsweise auch in dem Einführschacht für die Portionskapsel vorgesehen werden.

Figur 6 zeigt eine Ausführungsform, bei der ein elektrisches Material in einem umlaufenden Ring, der vorzugsweise erhaben sein kann, vorgesehen ist. Das elektrisch leitende Material wird beispielsweise mit in einem Einwurfschacht angeordneten elektrischen Schleifkontakten während des Kapseleinwurfs abgetastet, die elektrische Kontakte eines Steuerstromkreises sind.

Figur 7 zeigt die Ausführungsform gemäß Figur 6, wobei in dem vorliegenden Fall in dem Ringbereich reflektierende oder stumpfe Zonen vorgesehen sind, beispielsweise in Form von Belägen und von in einem Einwurfschacht angeordneten optischen Mitteln während des Kapseleinwurfs ausgelesen, die Teile eines Steuerstromkreises sind.

Figur 8 zeigt einen vergleichsweise breiten erhabenen Ring als Kennung. Der Einwurfschacht ist mit einer entsprechenden Einwurflehre versehen, die erkennt, ob die Portionskapsel die geforderte Kennung aufweist. Der verbreiterte Ring wird beispielsweise von den in einem Einwurfschacht angeordneten mechanischen Fühlern während des Kapseleinwurfs abgetastet, die elektrische Kontakte eines Stromkreises schließen.

Figur 9 zeigt eine weitere Ausführungsform der erfindungsgemäßen Portionskapsel. In dem vorliegenden Fall ist die Rückseite des Randbereichs mit einem elektrisch leitenden Belag versehen und wird während des Kapseleinwurfes von in dem Einwurfschacht angeordneten elektrischen Schleifkontakten abgetastet, die elektrische Kontakte eines Steuerstromkreises sind.

Figur 10 zeigt eine weitere Ausführungsform der erfindungsgemäßen Portionskapsel, die in dem vorliegenden Fall mit einem elektrisch leitenden Belag versehen ist, beispielsweise einem Leitlackbelag oder einer Alufolie. Die Abtastung erfolgt während des Kapseleinwurfes mit elektrischen Schleifkontakten, die elektrische Kontakte eines Steuerstromkreises sind.

Bei der Ausführungsform gemäß **Figur 11** weist die Kapsel hier der Boden ebenfalls einen elektrisch leitenden Belag auf, der während des Kapseleinwurfes eines im Schacht angeordneten, beispielsweise induktiven, Metallsuchsensors erkannt wird.

Bei der Ausführungsform gemäß **Figur 12** ist ein metallisches Einbauelement, hier ein Sieb 19, vorgesehen, das ebenfalls von einem Metalldetektor als Kennung erkannt werden kann.

Bei der Ausführungsform gemäß **Figur 13** ist ein ferromagnetisches Material, hier am Kapselboden vorgesehen. Das Auslesen der Kennung erfolgt beispielsweise während des Einwurfs der Kapsel mittels eines im Einwurfschacht angeordneten Magneten. Das ferromagnetische Material dient hier als Kennung.

Figur 14 zeigt noch einmal eine Ausführungsform, bei der ein Barcode im Bereich der Deckelfolie vorgesehen ist.

Bei der Ausführungsform gemäß **Figur 15** ist ein metallischer Ring in der Wandung vorgesehen und schließt einen im Bereich der Brühkammer vorgesehenen Stromkreis.

Figur 16 zeigt eine weitere Ausführungsform der erfindungsgemäßen Portionskapsel 1. Diese weist ein Basiselement 2 auf, das in dem vorliegenden Fall im Wesentlichen konisch vorgesehen ist und das eine Wandung 2.1 und einen Bodenbereich 2.2 aufweist. In diesem Basiselement werden das Rohmaterial sowie gegebenenfalls Einbauten vorgesehen, hier ein Filter. Der Fachmann versteht, dass in dem Basiselement auch andere Einbauten vorgesehen sein können. An dem dem Bodenbereich 2.2 gegenüberliegenden Ende des Basiselementes ist ein kreisringförmig vorgesehener Randbereich/Flansch 2.4 angeordnet, an den beispielsweise eine Deckelfolie gesiegelt wird. Dieser Randbereich 2.4 weist in seinem Außenbereich (äußerer Umfang) ein Form- und/oder Reibschlussmittel und/oder ein Detektionsmittel 2.4.2 auf. In dem vorliegenden Fall ist dieses Mittel 2.4.2, wie insbesondere den Figuren 17a – 17c entnommen werden kann, ein Zahnkranz 2.4.2, der beispielsweise durch die Anordnung einer Vielzahl von äquidistanten Einbuchtungen/Rillen erhalten wird, die in dem Randbereich vorgesehen werden. Innenliegend von diesem Zahnkranz ist in dem Randbereich 2.4 vorzugsweise eine Dichtungsfläche 2.4.1 vorgesehen, die mit einer Dichtung 21, die an der Brühkammer 27 angeordnet ist, dichtend zusammenwirkt. Diese Dichtung 21 sorgt dafür, dass Wasser, das durch den Wassereinlauf 28 strömt, in eine Öffnung der Kapsel, die durch den Aufstechdorn 29 hergestellt wird, in die Kapsel hinein und nicht um diese herum strömt.

Figuren 17a – 17c zeigen unterschiedliche Ausführungsformen des Mittels 2.4.2. Bei der Ausführungsform gemäß Figur 17a sind an dem Zahnkranz fünfundvierzig Zähne vorgesehen, bei der Ausführungsform gemäß Figur 17b und bei der Ausführungsform gemäß

Figur 17c zweiundzwanzig bzw. neunundzwanzig Zähne. Der Fachmann versteht, dass die resultierenden Zähne jede beliebige Form aufweisen können. Alle Figuren 17a – 17c zeigen wie die Portionskapsel 1 mittels zweier Haltearme 30 an einem Teil der Brühkammer 27 gehalten werden. Diese Haltearme 30 wirken mit dem Mittel 2.4.2 zusammen. Wäre dies nicht vorhanden, könnten die Haltearme die Kapsel nicht halten und die Kapsel könnte nicht in die Brühkammer eingeführt werden sondern würde in einen darunter liegenden Abwurfbehälter durchfallen. Die Haltearme 30 wirken folglich auch als Lehre.

FIgur 18 zeigt das Mittel 2.4.2 im Zusammenspiel mit einem Formschlussmittel 24, hier einem Ritzel, das an dem Kaffeeautomaten vorgesehen ist. Dieses Formschlussmittel 24 ist in dem Einwurfschacht 26 vorgesehen, der eine Einwurfschachtöffnung 22 aufweist, durch die die Portionskapsel in den Kaffeeautomaten eingeworfen wird. Der Abstand zwischen der Kapselinnenwand 25 und dem Ritzel 24 ist so bemessen, dass die Portionskapsel den Einwurfschacht nur dann passieren kann, wenn die Formschlussmittel 2.4.2 komplementär zu den Zähnen des Ritzels 27 sind. Nur dann ist es möglich, dass die Portionskapsel bei ihrer Fallbewegung, die durch den Pfeil dargestellt ist, das Ritzel 24 in Rotation versetzt, wie ebenfalls durch einen Pfeil dargestellt. Erst durch diese Rotation kann die Portionskapsel den Einwurfschacht passieren und in die vorgesehene Position hineinfallen. Weist die Portionskapsel keine oder falsche Formschlussmittel 2.4.2 auf, kann die Kapsel nicht durch den Einwurfschacht in die vorgesehene Position gebracht werden. An dem Ritzel 24 kann zusätzlich oder alternativ ein Geber vorgesehen sein, der dessen Drehbewegung erfasst und an eine Steuerung weiterleitet. Umfasst diese Drehbewegung mindestens ein vorgegebenes Drehsegment schaltet die Steuerung beispielsweise die Brüheinheit frei. Der Fachmann erkennt, dass an dem Kapselrand auch Reibschlussmittel vorgesehen sein können, die reibschlüssig mit einem Mittel, beispielsweise einem Rand, zusammenwirken und dieses antreiben, wobei diese Bewegung wiederum erfasst und dadurch die Brühkammer freigeschaltet wird.

Weiterhin erkennt der Fachmann, dass beispielsweise in dem Einwurfschacht auch ein Sensor, beispielsweise eine Kamera, vorgesehen sein kann, die die Form des Mittels 2.4.2 erfasst. Beispielsweise könnten in dem vorliegenden Fall die Form und/oder der Abstand der Zähne erfasst werden. Dieses Signal wird wiederrum an eine Steuerung geleitet, die beispielsweise die Brühkammer freigibt, wenn es sich um die richtige Kapsel handelt.

In Figur 19 ist schematisch eine Ansicht einer weiteren Ausführungsform einer erfindungsgemäßen Portionskapsel gemäß einer Ausführungsform der vorliegenden Erfindung dargestellt. In Figur 20 ist ebenfalls schematisch eine Ansicht einer solchen Portionskapsel dargestellt, wobei jedoch eine andere perspektivische Ansicht gewählt ist. Hierbei zeigt die Figur 19 eine Ansicht einer Portionskapsel von vorne. Die Figur 20 zeigt

eine Ansicht der Portionskapsel von schräg unten. Die Portionskapsel ist in allen Figuren mit dem Bezugszeichen 1 bezeichnet. Die Portionskapsel 1 weist ein im Wesentlichen kegelstumpfförmiges Basiselement 2 auf, welches topfähnlich ausgeformt ist und einen Hohlraum 3 umschließt. Der Hohlraum 3 wird von einer Membran 4 verschlossen. Die Blickrichtung gemäß der Figur 1 ist im Wesentlichen parallel zur Erstreckungsebene der Membran 4, sodass die Membran 4 lediglich am oberen Rand der Portionskapsel angedeutet ist. Das Basiselement 2 umfasst insbesondere ein weiches, halbstarres oder starres Kunststoffmaterial welches vorzugsweise tiefgezogen wurde. Die Membran 4 umfasst vorzugsweise eine dünne Kunststoff- oder eine Aluminiumfolie. Das Basiselement weist im Bereich der Membran einen bevorzugt umlaufenden Befestigungsflansch 17 auf, wobei die Membran 4 mit dem Befestigungsflansch 17 stoffschlüssig verbunden, insbesondere verschweißt oder verklebt ist. Innerhalb des Basiselements 2 bevorzugt ist ein Filterelement angeordnet, welches jedoch in den Figuren nicht eigens dargestellt ist. Das Filterelement ist beispielsweise aus einem thermoplastischen Kunststoff, beispielsweise Polypropylen, hergestellt. Das Filterelement kann auch in Form eines Vliesmaterials hergestellt sein, beispielsweise aus einem thermoplastischen Kunststoff. Das Filterelement unterteilt den Hohlraum 3 bevorzugt in einen ersten Bereich und in einen zweiten Bereich wobei der erste Bereich zur Aufnahme eines Getränkerohmaterials vorgesehen ist und wobei der zweite Bereich zur Aufnahme und insbesondere zum Sammeln eines nicht abgebildeten Getränkeextrakts während des Extraktionsvorgangs der Portionskapsel 1 vorgesehen ist. Der erste und zweite Bereich ist jedoch in den Figuren nicht einzeln dargestellt.

Die Portionskapsel 1 ist dafür vorgesehen, in eine Brühkammer einer nicht gezeigten Vorrichtung zur Herstellung eines Getränks eingesetzt zu werden. Eine solche Vorrichtung zur Herstellung eines Getränks ist insbesondere eine Kaffeemaschine bzw. ein Kaffeeautomat; es kann sich jedoch bei der Vorrichtung zur Herstellung eines Getränks auch um eine Maschine zur Herstellung eines Teegetränks, eines Schokoladengetränks oder sonstiger Getränke handeln. In einer Brühkammer einer solchen Vorrichtung zur Herstellung eines Getränks wird der Portionskapsel eine Extraktionsflüssigkeit vorzugsweise unter hohem Druck zugeführt, insbesondere Wasser bzw. heißes Wasser. Diese Extraktionsflüssigkeit wechselwirkt mit dem Getränkerohmaterial innerhalb der Portionskapsel so, dass sich ein Getränkeextrakt bzw. ein Getränk bildet. Das Filterelement dient bei diesem Extraktionsvorgang insbesondere als ein Sieb für das Getränkeextrakt.

Das Basiselement 2 weist erfindungsgemäß einen Wandungsbereich 12 und einen Bodenbereich 11 auf. Der Wandungsbereich 12 erstreckt sich im Wesentlichen zwischen dem Flansch 17 und dem Bodenbereich 11. In den Wandungsbereich 12 ist eine Mehrzahl

von Rillen 15 eingebracht, welche insbesondere als in den Wandungsbereich 12 eingebrachte und in Form von dem Hohlraum 3 zugewandte im Wesentlichen längs zwischen dem Flansch 17 und dem Bodenbereich 11 sich erstreckende (d. h. im Wesentlichen in der Darstellung nach Figur 19 senkrecht verlaufende) Nuten ausgebildet sind. Insbesondere ist es erfindungsgemäß vorgesehen, dass die Rillen 15 sich entlang dem Wandungsbereich 12 vertikal erstrecken, d. h. in gerader Richtung vom Flansch 17 aus zum Bodenbereich 11 hin, wobei sich jedoch die Rillen nicht zwingend über die gesamte Länge erstrecken. Die Rillen 15 sind erfindungsgemäß derart ausgebildet, dass der Wandungsbereich 12 durch die Mehrzahl der Rillen 15 verstärkt bzw. versteift wird. Darüber hinaus wird durch die Mehrzahl der Rillen 15, welche insbesondere über den Wandungsbereich 12 verteilt angeordnet sind, eine Anhaftung zwischen dem Wandungsbereich 12 und der Wandung der Brühkammer der Vorrichtung zur Herstellung eines Getränks nach dem Extraktionsvorgang verhindert, wodurch ein automatisches Auswerfen der Portionskapsel 1 aus der Brühkammer erleichtert wird. Die in Figur 19 dargestellte Ausführungsform der Portionskapsel 1 weist ferner einen umlaufenden Absatz 16 auf, welcher in dem Wandungsbereich 12 zwischen dem Flansch 17 und dem Bodenbereich 11 angeordnet ist und zwar an den Flansch 17 anschließend in Richtung zum Bodenbereich 11 hin. Der Absatz 16 weist gegenüber dem restlichen Wandungsbereich 12, der sich zwischen dem Absatz 16 und dem Bodenbereich 11 befindet, einen vergrößerten Durchmesser (parallel zur Membran 4) auf. Die Kontur des Absatzes 16 ist vorzugsweise derart ausgebildet, dass der Durchmesser des Absatzes 16 sich in Richtung des Flansches 7 hin etwas verringert.

Bei der in Figur 19 dargestellten Ausführungsform der erfindungsgemäßen Portionskapsel 1 ist es vorgesehen, dass die Rillen 15 sich in einem ersten Teilbereich der Rillen 15 im Bereich des Absatzes 16 erstrecken und in einem weiteren Teilbereich der Rillen 15 vom Absatz 16 zum Bodenelement 11 hin ein Stück entlang des restlichen Wandungsbereichs 12 erstrecken, dann jedoch enden. Insgesamt erstrecken sich beispielsweise die Rillen 15 über etwa 50 % der Erstreckung des Wandbereichs zwischen dem Flansch 17 und dem Bodenbereich 11, wobei etwa ein Drittel der Erstreckung der Rillen 15 im Bereich des Absatzes 16 verläuft und die restlichen zwei Drittel der Erstreckung der Rillen 15 sich im restlichen Wandungsbereich 12 zwischen dem Absatz 16 und dem Bodenbereich 11 erstreckt.

In Figur 21 ist schematisch eine Schnittansicht der erfindungsgemäßen Portionskapsel 1 entlang der Höhenerstreckung der Portionskapsel, d. h. mit einer Schnittfläche senkrecht zur Erstreckungsebene der Membran 4 dargestellt. In Figur 22 ist ferner eine Schnittansicht der

erfindungsgemäßen Portionskapsel 1 dargestellt, mit einer Schnittebene, die parallel zur Erstreckung der Membranebene verläuft. Erkennbar ist, dass in Figur 21 die Innenseite des Hohlraums der Portionskapsel 1 dargestellt ist. Das Material der Portionskapsel 1 bzw. des Basiselements 2 der Portionskapsel 1 ist derart dünn ausgebildet, dass die Realisierung der Rillen 15 auf der in Figur 19 dargestellten Außenseite entsprechende korrespondierende Ausformungen bzw. Eindellungen auf der Innenseite nach sich ziehen. In Figur 22 ist besonders die Realisierung der zahnradförmigen Kontur 15' sichtbar, die sich durch die Einbringung der Rillen 15 in den Wandungsbereich 12 der Portionskapseln 1 ergibt.

Bezugszeichenliste:

1 Portionskapsel
2 Basiselement
2.1 Wandung
2.2 Bodenbereich
2.3 umlaufender Ring
2.4 Randbereich, Flansch
2.4.1 Dichtungsbereich
2.4.2 Formschlussmittel, Reibschlussmittel und/oder Detektionsmittel
3 Hohlraum
4 Membran
5 glänzende Fläche
6 matte Fläche
7 Einbuchtung
8 Ausbuchtung
9 Aufdruck
10 elektrisch leitender Bereich
11 metallischer Bereich, Bodenbereich
12 Brühkammer, Wandungsbereich
13 Detektionsmittel, Scanner. Fühler
14 Strahl
15 Randbereich, Rillen
16 Federmittel, Absatz
17 Barcode, Befestigungsflansch
18 Dimension der Portionskapsel
19 Einbauelement, Sieb
20 ferromagnetischer Bereich
21 Dichtung
22 Einwurfschachtöffnung
23 Einwurfschachtgehäuse
24 Formschlussmittel, Ritzel
25 Einwurfschachtinnenwand
26 Einwurfschacht
27 Brühkammer
28 Wassereinlauf
29 Aufstechdorn
30 Haltemittel

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Patentansprüche:

1. Portionskapsel (1) zur Herstellung eines Getränks mit einem Basiselement (2) , das einen Hohlraum (3) aufweist, in dem ein Getränkerohmaterial vorgesehen ist und der von einer Membran (4) verschlossen wird, die an dem Basiselement befestigt ist, dadurch gekennzeichnet, dass sie eine Kennung (5) aufweist, die es ermöglicht die jeweilige Portionskapsel zu individualisieren.

2. Portionskapsel (1) nach einem der voranstehenden Ansprüche oder dem Oberbegriff von Patentanspruch 1, dadurch gekennzeichnet, dass sie einen Randbereich und/oder Flansch (2.4) aufweist, der vorzugsweise an dem Basiselement (2) vorgesehen ist.

3. Portionskapsel (1) nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass in dem Randbereich und/oder Flansch (2.4), insbesondere an dessen äußerem Umfang, zumindest abschnittsweise, ein Formschluss-, Reibschlussmittel und/oder Detektionsmittel (2.4.2) vorgesehen ist.

4. Portionskapsel (1) nach Anspruch 3, dadurch gekennzeichnet, dass das Formschluss-, Reibschlussmittel und/oder Detektionsmittel (2.4.2) ein Zahnkranz oder Zahnkranzsegment ist.

5. Portionskapsel (1) nach Anspruch 4, dadurch gekennzeichnet, dass die Zähne des Zahnkranzes oder des Zahnkranzsegmentes im wesentlichen dreiecksförmig, rechteckförmig, quadratisch, oder wellenförmig vorgesehen sind.

6. Portionskapsel nach einem der Ansprüche 2 - 5, dadurch gekennzeichnet, dass an dem Randbereich und/oder Flansch (2.4) eine Dichtfläche (2.4.1) vorgesehen ist.

7. Portionskapsel (1) nach Anspruch 1, dadurch gekennzeichnet, dass die Kennung Flächenbereiche (5, 6) mit unterschiedlichen Reflexionseigenschaften umfasst.

8. Portionskapsel (1) nach Patentanspruch 7, dadurch gekennzeichnet, dass die Kennung eine Einbuchtung (7) und/oder eine Ausbuchtung (8) aufweist.

9. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung in der Membran (4) vorgesehen ist.

10. Portionskapsel (1) nach Anspruch 9, dadurch gekennzeichnet, dass die Kennung eine optisch erkennbare Schicht in der Membran ist oder dass die Membran an ihrem äußeren Umfang zumindest abschnittsweise, ein Formschluss-, Reibschlussmittel und/oder Detektionsmittel (2.4.2) aufweist, insbesondere einen Zahnkranz (2.4.2).

11. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung ein maschinenlesbarer Aufdruck (9) ist.

12. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung ein elektrisch leitender Bereich (10) ist.

13. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung ein metallischer Bereich (11) ist.

14. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung ein ferromagnetischer Bereich (12) ist.

15. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung ein RFID ist.

16. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass die Kennung ein Barcode (17) ist.

17. Portionskapsel (1) nach einem der voranstehenden Patentansprüche, dadurch gekennzeichnet, dass sie ein Einbauelement (19) mit einer Kennung aufweist.

18. Portionskapsel (1) zur Herstellung eines Getränks aufweisend ein im Wesentlichen kegelstumpfförmiges oder zylindrisches Basiselement (2), welches einen Hohlraum (3) zur Aufnahme eines Getränkerohmaterials aufweist, und eine den Hohlraum (3) verschließende Membran (4), dadurch gekennzeichnet, dass das Basiselement (2) einen Wandungsbereich (12) aufweist, wobei das Basiselement (2) ferner auf der der Membran (4) abgewandten Seite der Portionskapsel (1) einen Bodenbereich (11) aufweist, wobei der Wandungsbereich (12) oder der äußere Umfang eines Flansches (17, 2.4) eine Mehrzahl von Rillen (15) aufweist.

19. Portionskapsel (1) nach Anspruch 18, dadurch gekennzeichnet, dass die Rillen (15) eine Kennung realisieren, die es ermöglicht die Portionskapsel (1) zu individualisieren.

20. Portionskapsel (1) nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass zumindest ein Teil der Rillen (15) und zumindest in einem Teilbereich in einer Ebene parallel zur Haupterstreckungsebene der Membran (4) eine zahnradförmige Kontur aufweisen.

21. Portionskapsel (1) nach einem der Ansprüche 18 - 20, dadurch gekennzeichnet, dass das Basiselement (2) vom Bodenbereich (11) abgewandt einen Flansch (17, 2.4) zur Befestigung der Membran (4) an dem Basiselement (2) aufweist, wobei der Wandungsbereich (12) zwischen dem Bodenbereich (11) und dem Flansch (17, 2.4) einen Absatz (16) aufweist, wobei die Rillen (15) sich zumindest über einen Teil des Absatzes (16) erstrecken.

22. Portionskapsel (1) nach Anspruch 21, dadurch gekennzeichnet, dass das Basiselement (2) im Bereich des Absatzes (16) einen größeren Durchmesser aufweist als im Wandungsbereich (12) zwischen dem Absatz (16) und dem Bodenbereich (11).

23. Portionskapsel (1) nach einem der Ansprüche 21 oder 22, dadurch gekennzeichnet, dass zumindest ein Teil der Rillen (15) und zumindest in einem Teilbereich in einer Ebene parallel zur Haupterstreckungsebene der Membran (4) eine zahnradförmige Kontur derart aufweisen, dass sich die zahnradförmige Kontur (15') zumindest teilweise im Bereich des Absatzes (16) erstreckt.

24. Portionskapsel (1) nach einem der Ansprüche 21 bis 23, dadurch gekennzeichnet, dass das Basiselement (2) sich im Bereich des Absatzes (16) in Richtung zum Flansch (17) hin verjüngt.

25. Portionskapsel (1) nach einem der Ansprüche 21 bis 24, dadurch gekennzeichnet, dass sich die Rillen (15) über den Bereich des Absatzes (16) in Richtung zum Bodenbereich (11) hin erstrecken.

26. Portionskapsel (1) nach einem der Ansprüche 21 bis 25, dadurch gekennzeichnet, dass sich die Rillen (15) im Wandungsbereich (12) über etwa 20% bis 80%,

bevorzugt über etwa 40% bis 60%, der Erstreckung zwischen dem Absatz (16) und dem Bodenbereich (11) erstrecken.

27. Portionskapsel (1) nach einem der Ansprüche 21 bis 26, dadurch gekennzeichnet, dass die Rillen (15) derart ausgebildet sind, dass mittels der Rillen (15) der Wandungsbereich (12) versteift ist und/oder dass durch die Rillen (15) eine Verwirbelung einer in dem Hohlraum (3) strömenden Extraktionsflüssigkeit vorgesehen ist.

28. Portionskapsel (1) nach einem der Ansprüche 21 bis 27, dadurch gekennzeichnet, dass ein Verhältnis des Durchmessers des an den Flansch (7) angrenzenden Wandungsbereichs (12), einerseits zum Durchmesser des Flansches (7), andererseits zwischen 0,85 und 0,89 vorgesehen ist, insbesondere im Wesentlichen 0,87 beträgt.

29. Portionskapsel (1) nach einem der Ansprüche 21 bis 28, dadurch gekennzeichnet, dass der Durchmesser des an den Flansch (7) angrenzenden Wandungsbereichs (12) im Wesentlichen 39 Millimeter und/oder der Durchmesser des Flansches (7) im Wesentlichen 45 Millimeter beträgt.

30. Portionskapsel (1) nach einem der Ansprüche 21 bis 29, dadurch gekennzeichnet, dass das Basiselement (2) im Bereich des Absatzes eine größere Wandstärke aufweist als im Wandungsbereich (12) zwischen dem Bodenbereich (12) und dem Flansch (17).

31. Portionskapsel (1) nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass innerhalb des Hohlraums (3) ein Filterelement angeordnet ist, welches den Hohlraum (3) in einen ersten Bereich (8) zur Aufnahme des Getränkerohmaterials und in einen zweiten Bereich (9) zur Aufnahme eines Getränkeextrakts unterteilt.

32. Portionskapsel (1) nach Anspruch 32, dadurch gekennzeichnet, dass das Filterelement (5) ein Vliesmaterial umfasst.

33. Verwendung einer Portionskapsel (1) nach einem der vorhergehenden Ansprüche zur Herstellung eines Heißgetränks.

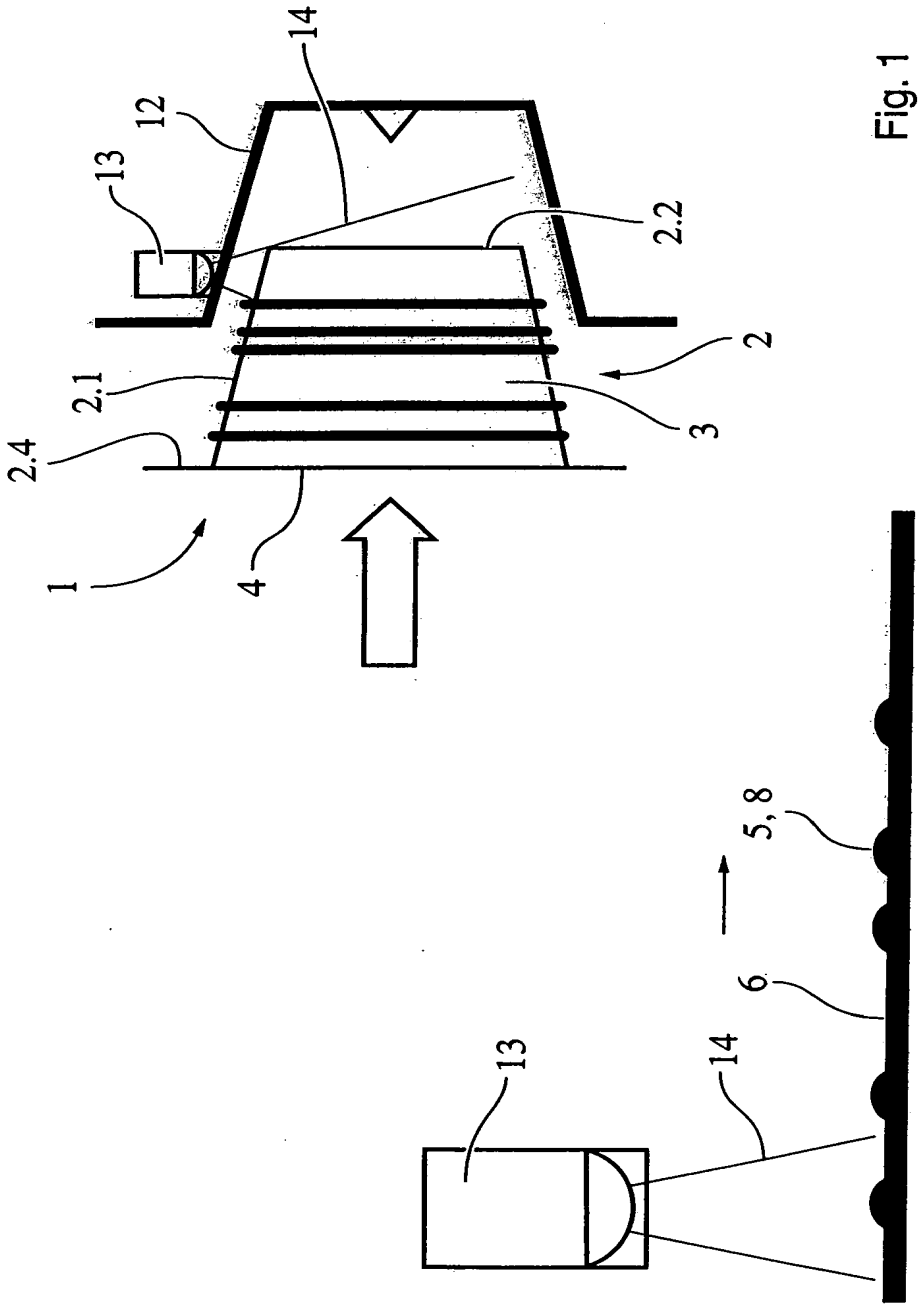


Fig. 1

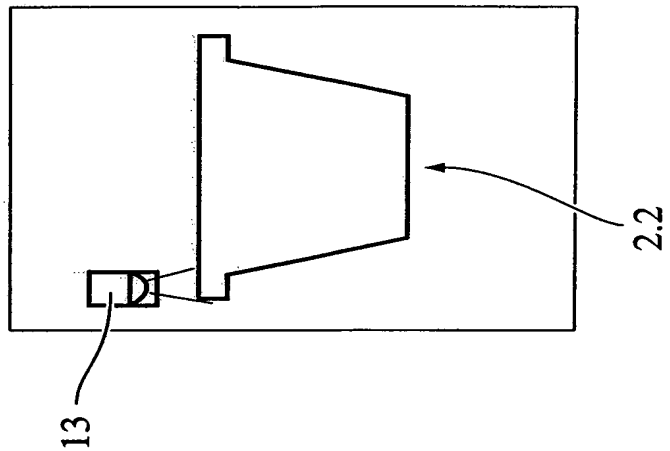
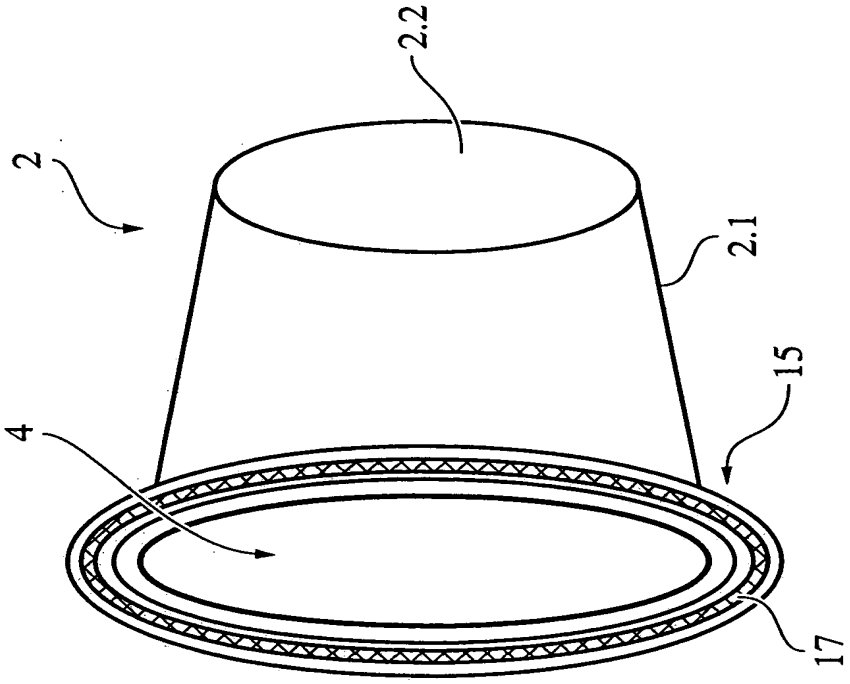


Fig. 2



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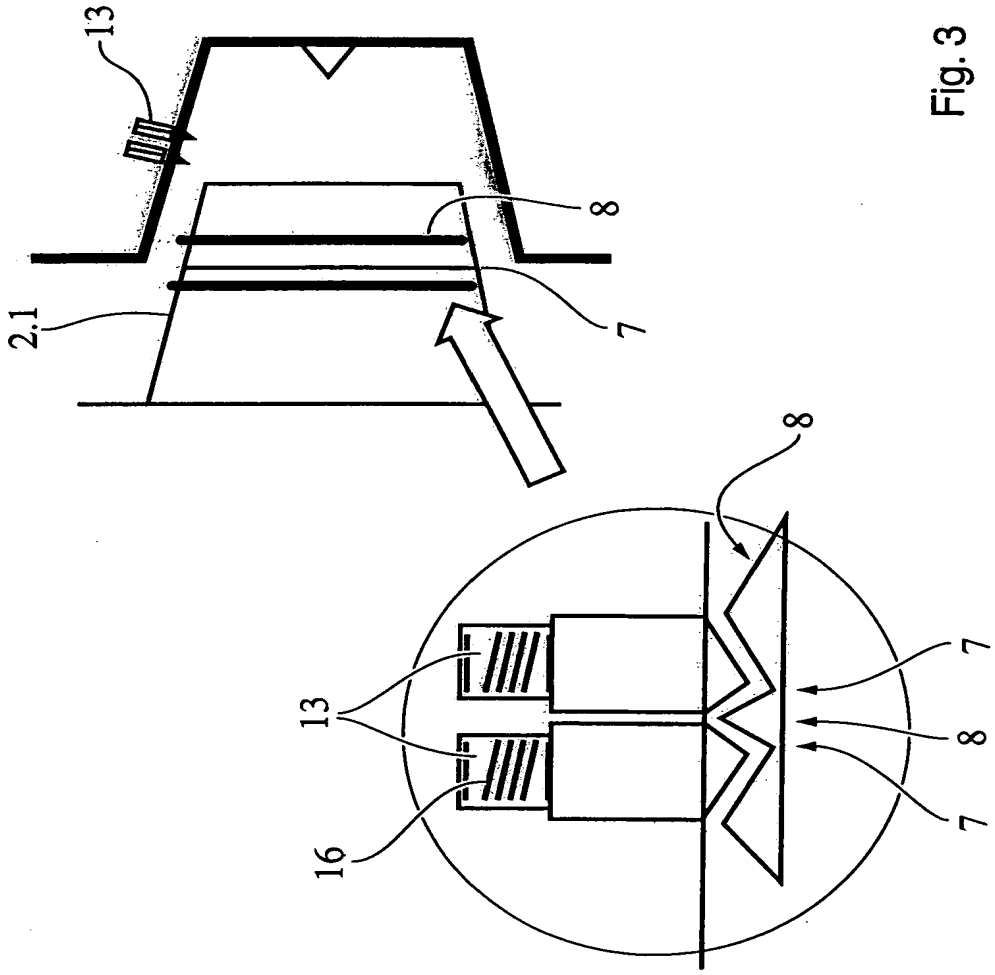


Fig. 3

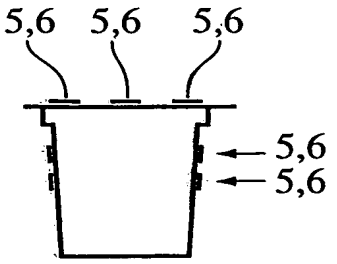


Fig. 4

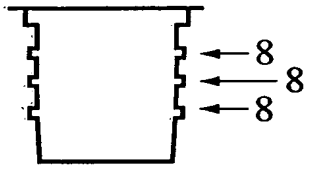


Fig. 5

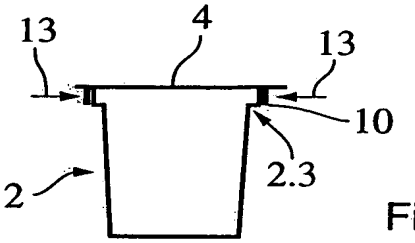


Fig. 6

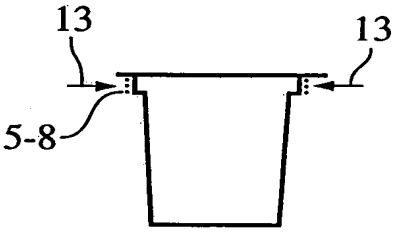


Fig. 7

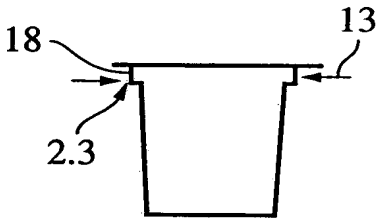


Fig. 8

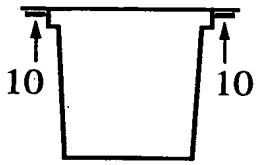


Fig. 9

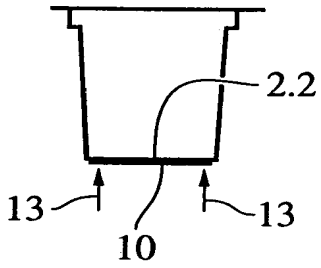


Fig. 10

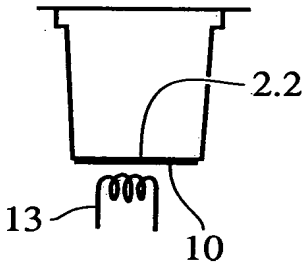


Fig. 11

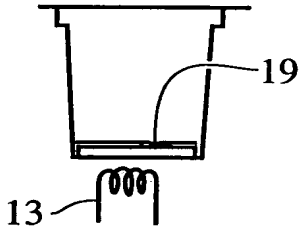


Fig. 12

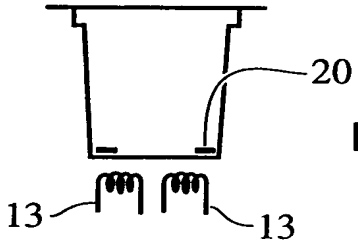


Fig. 13

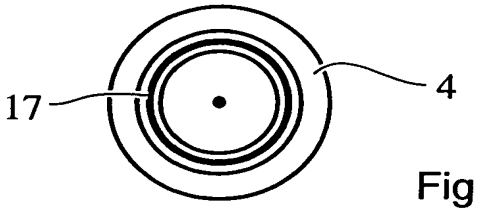


Fig. 14

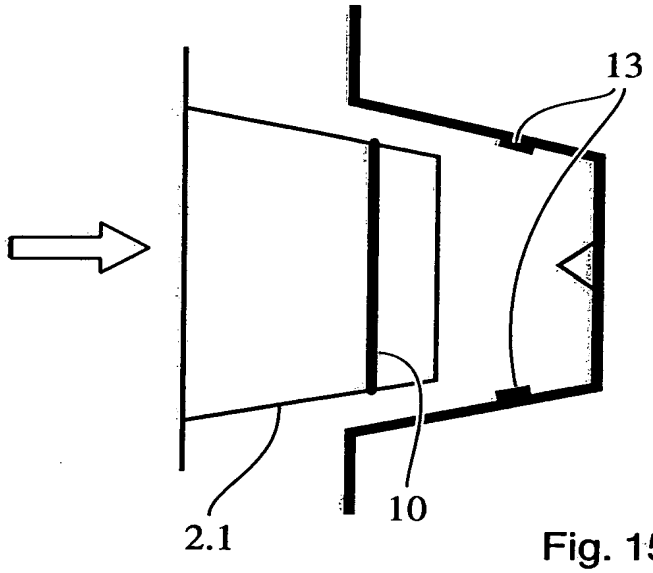


Fig. 15

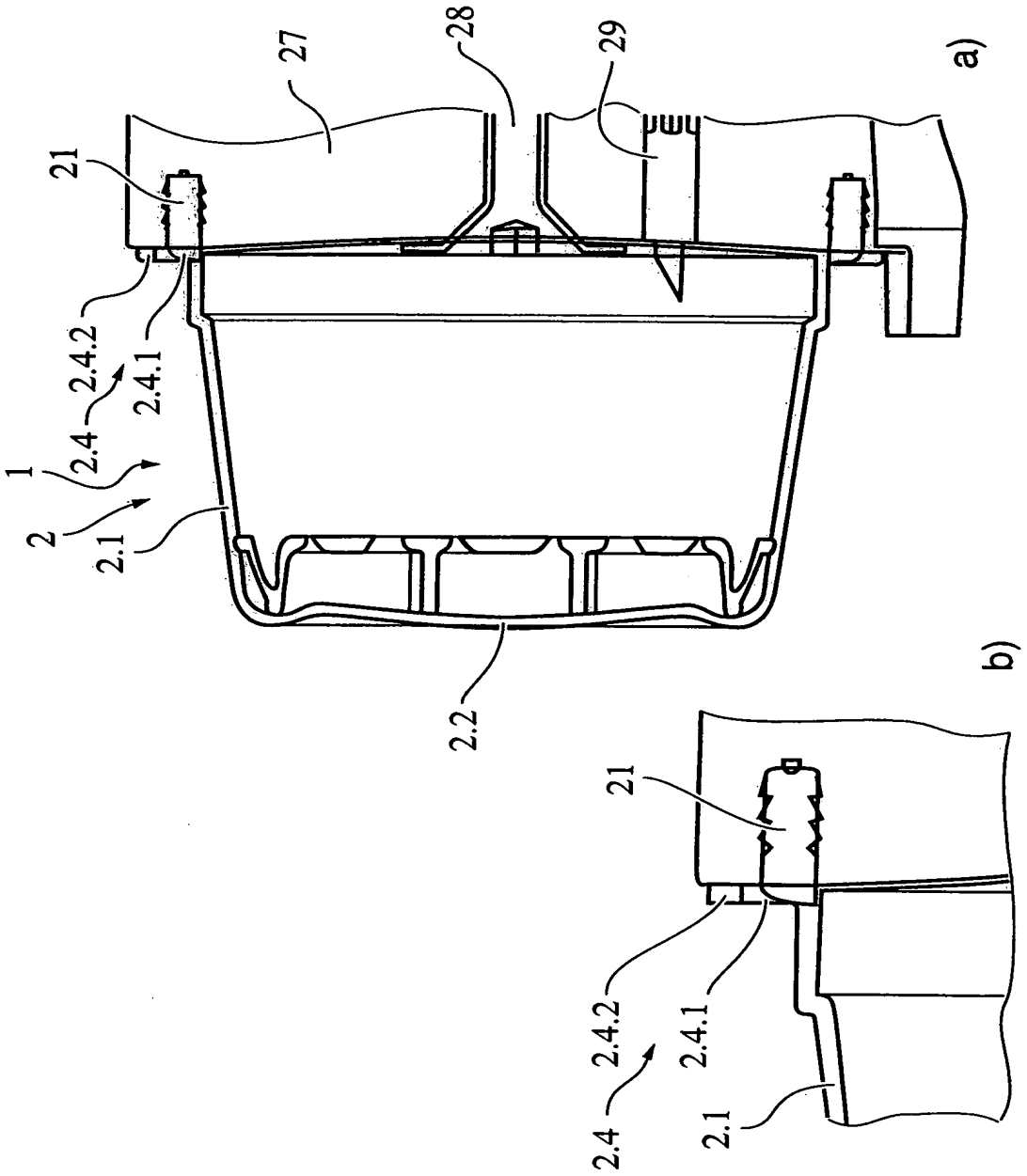


Fig. 16

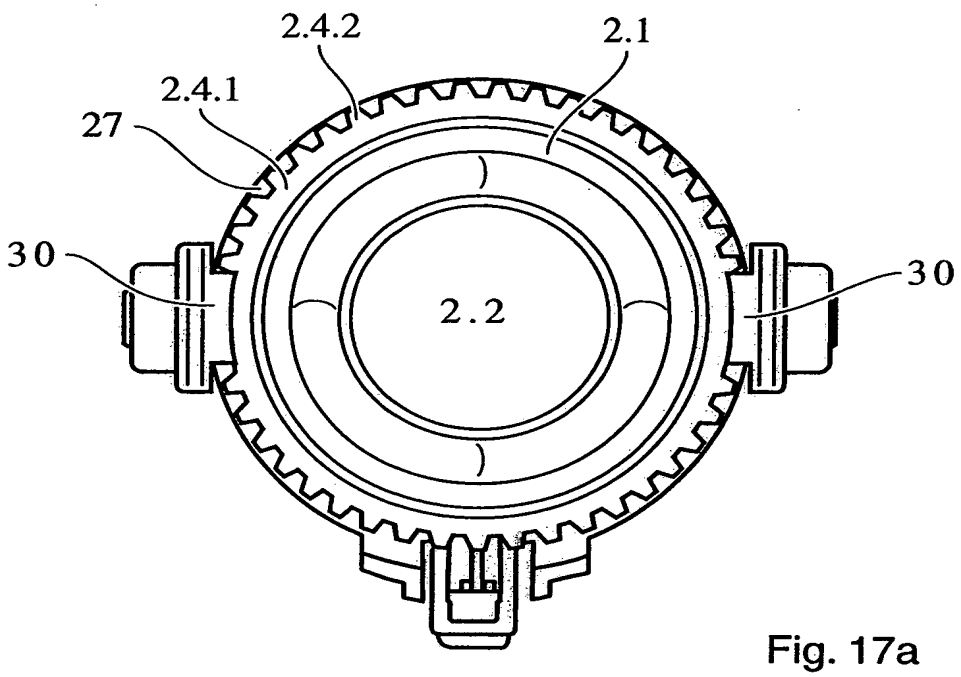


Fig. 17a

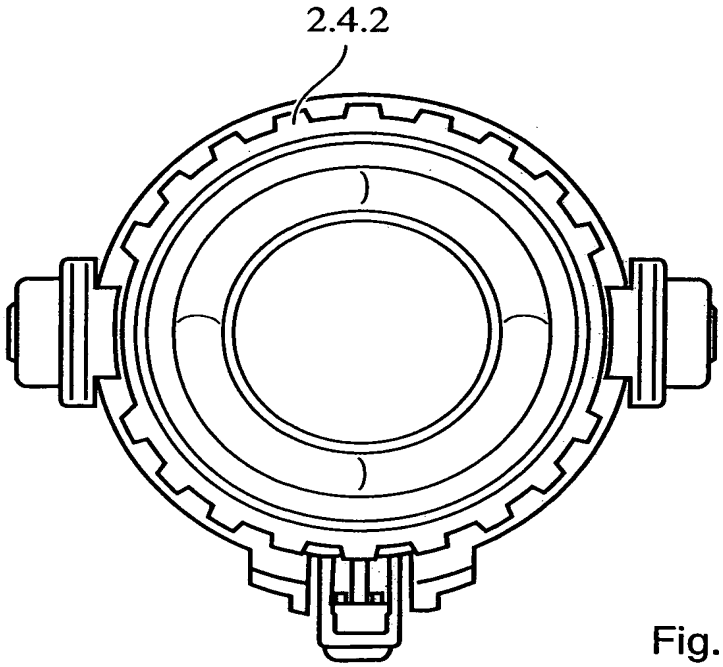


Fig. 17b

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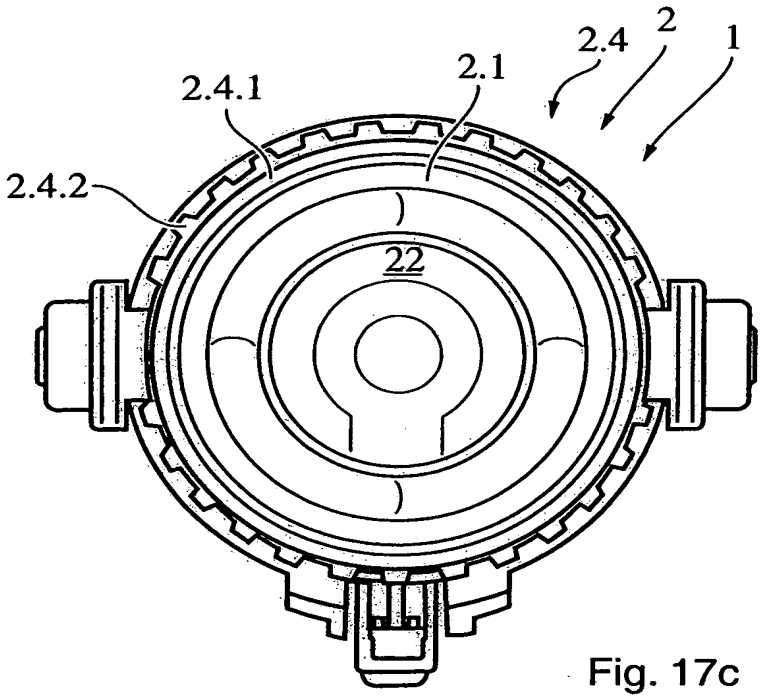


Fig. 17c

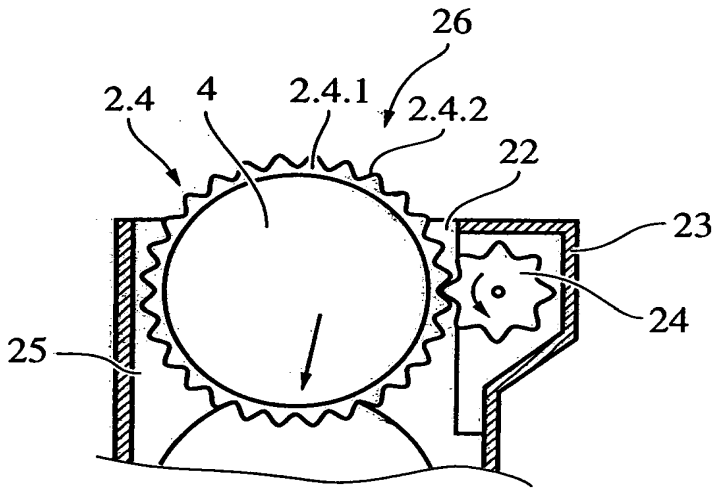


Fig. 18

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IPR2023-00502, U.S. PATENT 10,994,923

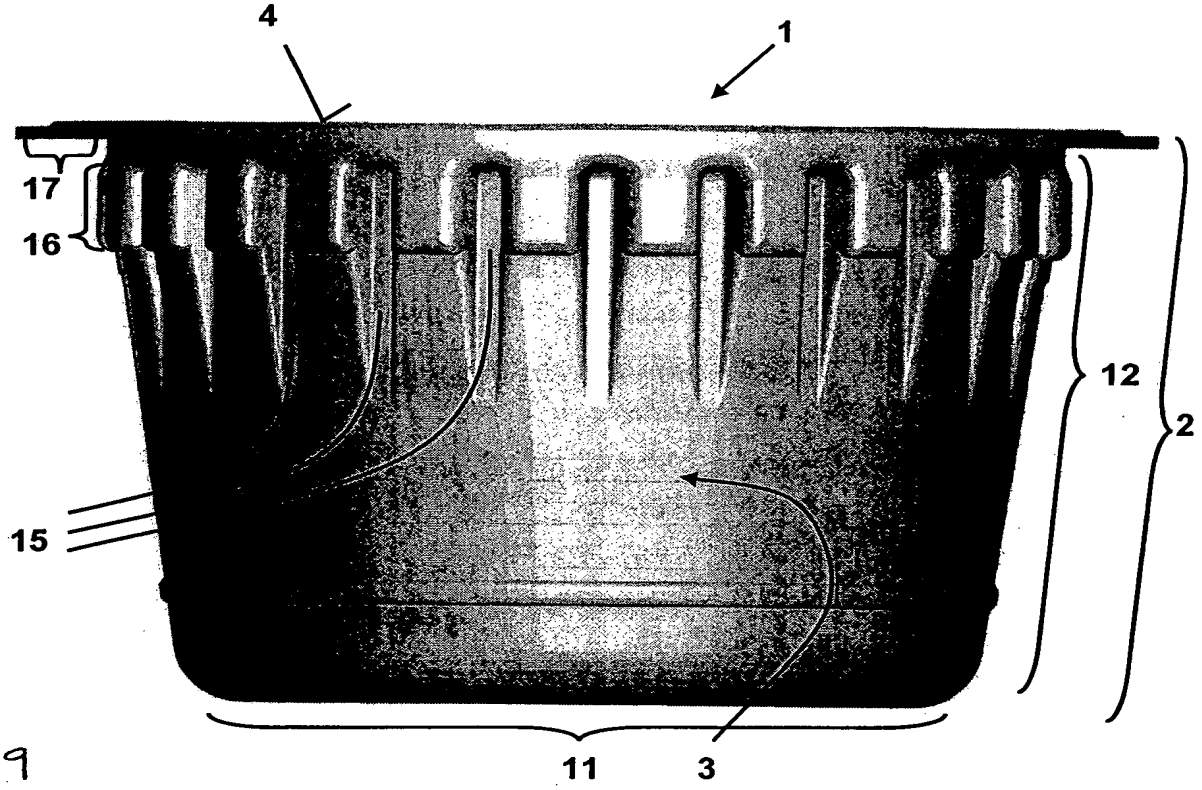


Fig. 19

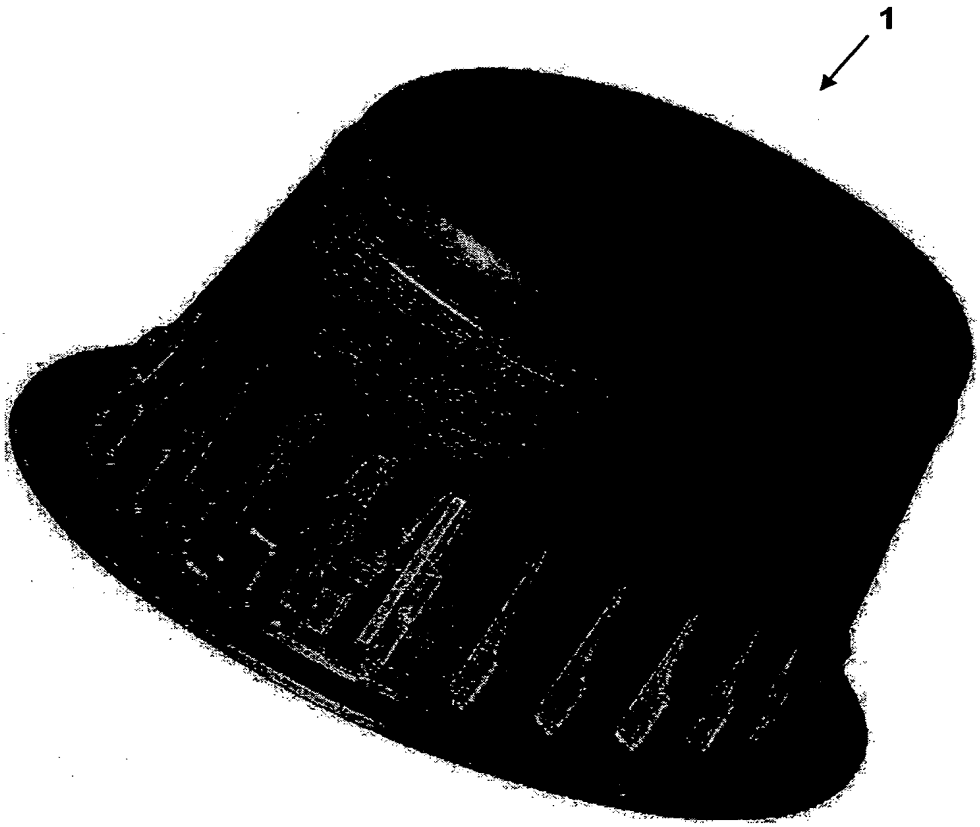


Fig. 20

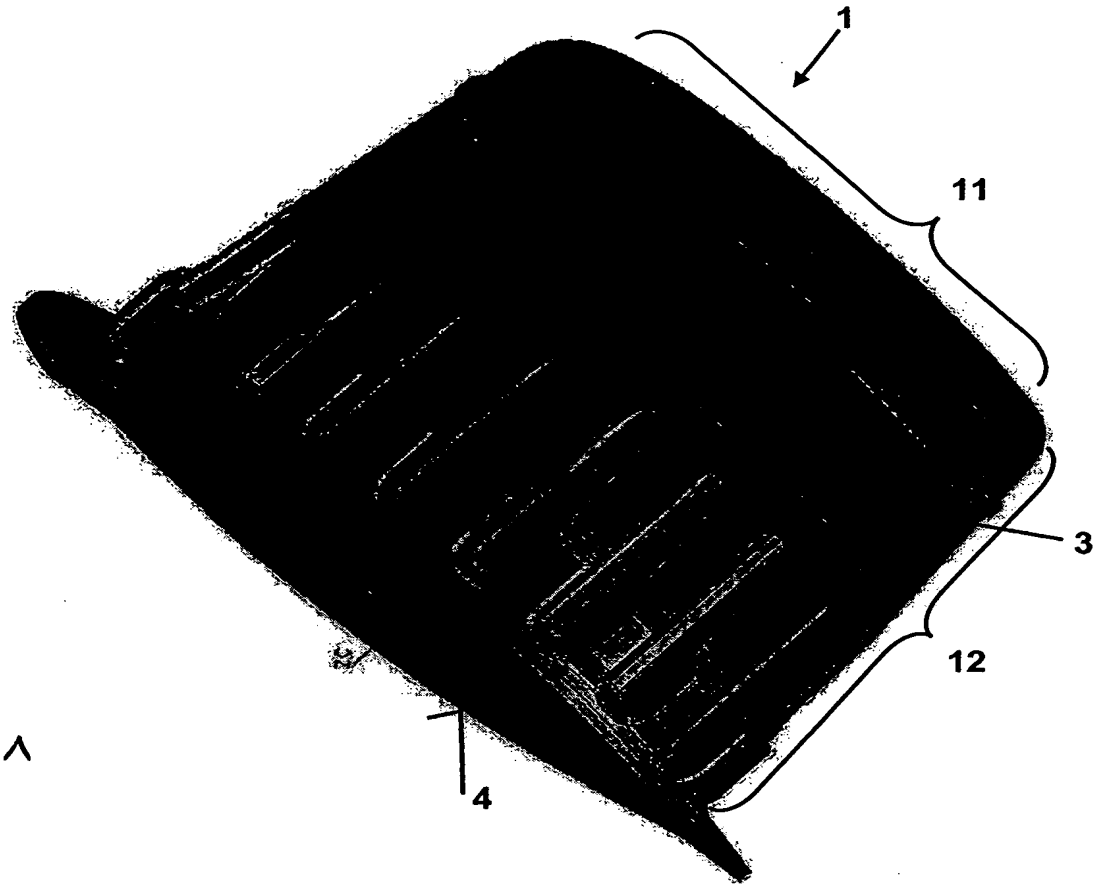


Fig. 21

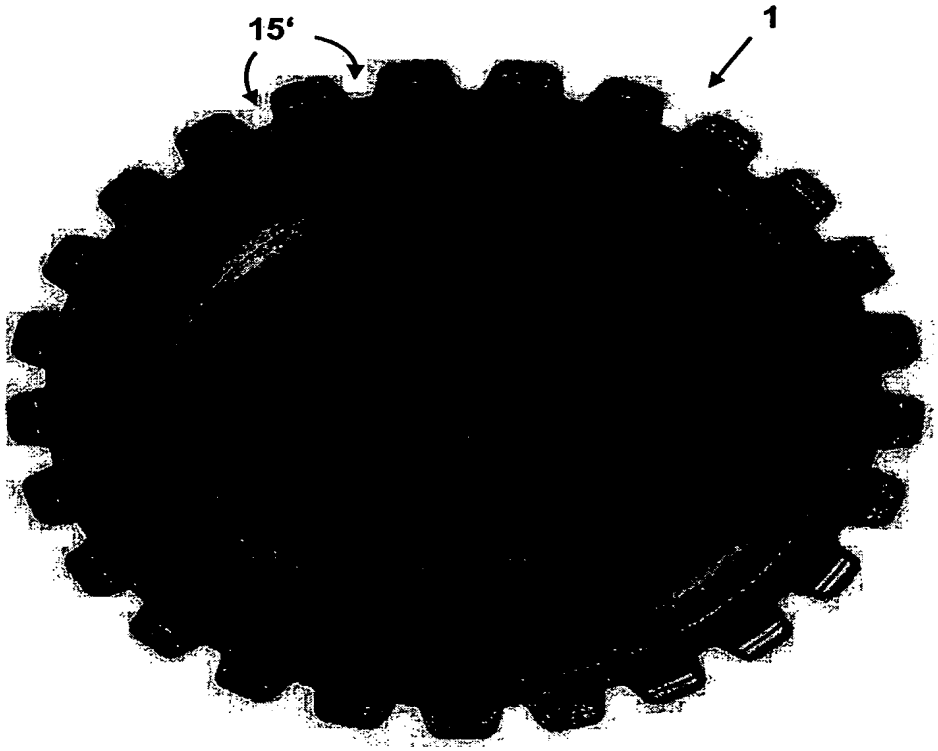


Fig. 22

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/003677

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D85/804
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	WO 02/078498 A1 (EUGSTER FRISMAG AG [CH]; MAHLICH GOTTHARD [DE]) 10 October 2002 (2002-10-10) page 8, lines 5-13; figures 1,1a	1,2,6,8, 10,12, 16,33 15,31,32 3-5,7,9, 11,13, 14,17-30

X Y A	EP 1 974 638 A1 (TCHIBO GMBH [DE]) 1 October 2008 (2008-10-01) paragraphs [0026] - [0027]; figures 1-2	1-3,6-8, 10,12,33 15,31,32 4,5,9, 11,13, 14,16-30

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 October 2011	28/10/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ngo Si Xuyen, G

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/003677

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y A	page 6, line 9 - page 7, line 17; figures 2-7	15,31,32 4,5,7, 11,18-30

X	US 2008/187638 A1 (HANSEN NICK [GB]) 7 August 2008 (2008-08-07)	1-3,6, 8-10,12, 16,33
Y A	paragraph [0094]; figure 10	15,31,32 4,5,7, 11,13, 14,17-30

X	EP 1 471 012 A2 (IDEACORP AG [CH]) 27 October 2004 (2004-10-27)	1-6,8, 10-12, 18-21, 23-33
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Y	EP 0 468 079 A1 (NESTLE SA [CH]) 29 January 1992 (1992-01-29) figures 1-3	31,32

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IPR2023-00502, U.S. PATENT 10,994,923

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Information on patent family members

International application No
PCT/EP2011/003677

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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IPR2023-00502, U.S. PATENT 10,994,923

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen
PCT/EP2011/003677

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
INV. B65D85/804
ADD.

Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
B65D A47J

Recherchierte, aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)
EPO-Internal

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X Y A	WO 02/078498 A1 (EUGSTER FRISMAG AG [CH]; MAHLICH GOTTHARD [DE]) 10. Oktober 2002 (2002-10-10) Seite 8, Zeilen 5-13; Abbildungen 1,1a	1,2,6,8, 10,12, 16,33 15,31,32 3-5,7,9, 11,13, 14,17-30

X Y A	EP 1 974 638 A1 (TCHIBO GMBH [DE]) 1. Oktober 2008 (2008-10-01) Absätze [0026] - [0027]; Abbildungen 1-2	1-3,6-8, 10,12,33 15,31,32 4,5,9, 11,13, 14,16-30

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[X] Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen [X] Siehe Anhang Patentfamilie

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18. Oktober 2011	28/10/2011

Name und Postanschrift der Internationalen Recherchenbehörde	Bevollmächtigter Bediensteter
Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ngo Si Xuyen, G

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K-FEE SYSTEM GMBH, EX2009, page 4870
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

C. (Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	WO 2005/044067 A1 (RUCHONNET JEAN-FRANCOIS [CH]) 19. Mai 2005 (2005-05-19)	1-3,6, 8-10, 12-14, 16,17,33
Y	Seite 6, Zeile 9 - Seite 7, Zeile 17;	15,31,32
A	Abbildungen 2-7	4,5,7, 11,18-30

X	US 2008/187638 A1 (HANSEN NICK [GB]) 7. August 2008 (2008-08-07)	1-3,6, 8-10,12, 16,33
Y	Absatz [0094]; Abbildung 10	15,31,32
A		4,5,7, 11,13, 14,17-30

X	EP 1 471 012 A2 (IDEACORP AG [CH]) 27. Oktober 2004 (2004-10-27)	1-6,8, 10-12, 18-21, 23-33
	Absätze [0046] - [0047]; Abbildung 3	

X	EP 1 849 718 A1 (CAFE DO BRASIL S P A [IT]) 31. Oktober 2007 (2007-10-31)	1-6,8, 10-12, 18-33
	Absätze [0011] - [0013]; Abbildungen 1-2	

A	US 2002/048621 A1 (BOYD DAVID D [US] ET AL) 25. April 2002 (2002-04-25) Abbildungen 2,2a-2h	1-33

Y	FR 2 912 124 A1 (CIE MEDITERRANEENNE DES CAFES [FR]) 8. August 2008 (2008-08-08) Abbildungen 1-3	15

Y	EP 0 468 078 A1 (NESTLE SA [CH]) 29. Januar 1992 (1992-01-29) Abbildung 1	31,32

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Y	EP 0 468 079 A1 (NESTLE SA [CH]) 29. Januar 1992 (1992-01-29) Abbildungen 1-3	31,32

1

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen
PCT/EP2011/003677

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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(19) World Intellectual Property Organization
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(25) Filing Language: English

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(30) Priority Data:
60/238,802 6 October 2000 (06.10.2000) US

(71) Applicant: **BOYD COFFEE COMPANY** [US/US]; 19730 NE Sandy Boulevard, Portland, OR 97220 (US).

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(74) Agents: **KOLISCH, Pierre, J.** et al.; Kolisch, Hartwell, Dickinson, McCormack, & Heuser, 520 S.W. Yamhill Street, Portland, OR 97204 (US).

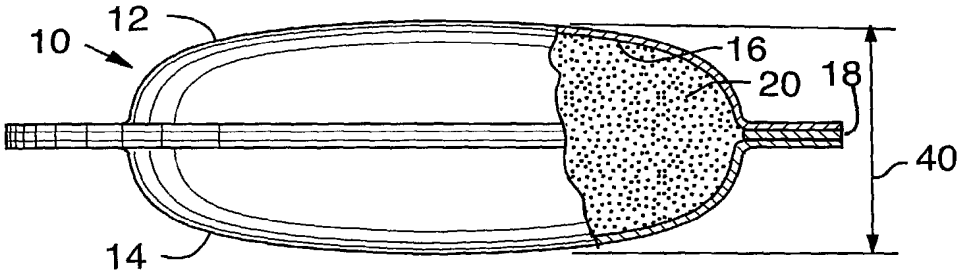
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(54) Title: ENCODED COFFEE PACKET



(57) Abstract: A brewing packet (10) is provided for use in the preparation of hot or cold beverages. The brewing packet envelops a brewing ingredient (20) chosen according to the tastes of a beverage drinker. The packet includes a machine interpretable feature (30) that contains encoded data capable of being read by a beverage producing device (100). Furthermore, the data on the packet is capable of directing the beverage producing device to employ a specific brewing operation suited for the particular brewing packet. This allows for producing the optimal beverage from the brewing ingredient. The packet may be utilized with a variety of brewing ingredients to produce a variety of beverages. Similarly, the packet may be configured to produce single or multiple servings of a beverage.

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ENCODED COFFEE PACKET

Cross Reference to Related Application

This application claims priority from Provisional Patent Application Serial No. 60/238,802, filed October 6, 2000 for ENCODED COFFEE PACKET. The full contents of that provisional patent application are incorporated by reference.

Field of the Invention

The present invention relates generally to coffee machines, and more particularly, to an encoded coffee packet for use in a coffee machine to direct the coffee brewing process.

Background of the Invention

Automated coffee machines have long been used for brewing coffee, both in large-scale commercial settings and in smaller business and home settings. These machines typically operate on the principle of placing a quantity of ground coffee into a filter, and passing hot water through the ground coffee to produce a coffee beverage.

In recent years, such machines have brewed coffee using pre-measured, pre-packaged quantities of ground coffee, typically in the form of packets which may be inserted into the coffee machine at the time of brewing, or selected from an onboard coffee packet supply. These packets, also known as pods or cartridges, simplify the task of cleaning the machine and replacing used coffee grounds, and ensure more consistent coffee quality and taste.

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Despite these advantages, however, coffee machines which employ such pre-measured coffee packets typically do not consider variations in individual taste, or the particular characteristics of the packaged coffee grounds. The use of such packets also has heretofore been reserved for espresso coffee making machines, which typically employ consistent size, shape and grind characteristics. Accordingly, applicants have developed a system whereby coffee packets may be encoded with data for use in directing the coffee brewing process to accommodate individual tastes and the particular characteristics of the ground coffee used.

Summary of the Invention

A brewing packet is provided for use in the preparation of hot or cold beverages. The brewing packet envelops a brewing ingredient chosen according to the tastes of a beverage drinker. The packet includes a machine interpretable feature that contains encoded data capable of being read by a beverage producing device. Furthermore, the data on the packet may be capable of directing the beverage producing device to employ a specific brewing operation suited for the particular brewing packet. This allows for producing the optimal beverage from the brewing ingredient. The packet may be utilized with a variety of brewing ingredients to produce a variety of beverages. Similarly, the packet may be configured to produce single or multiple servings of a beverage.

Brief Description of the Drawings

Fig. 1 is a side view of a packet according to an embodiment of the present invention with a section cut away to reveal the contents of the packet.

Fig. 2 is an isometric view of the packet depicted in Fig. 1.

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Fig. 2a is a fragmentary view of the packet shown in Figs. 1 and 2, illustrating an optical bar code encoding configuration.

Fig. 2b is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of a shape.

Fig. 2c is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of a text string.

Fig. 2d is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of a glyph.

Fig. 2e is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of a digital watermark.

Fig. 2f is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of notches.

Fig. 2g is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of grooves.

Fig. 2h is a fragmentary view of an alternative embodiment packet, illustrating encoded data in the form of holes.

Fig. 3 is a schematic representation of a coffee machine constructed in accordance with an embodiment of the present invention, the coffee machine being configured to receive and decipher an encoded packet.

Fig. 4 is a flowchart of a method according to the present invention.

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Detailed Description of the Invention

Although the present invention may be used in virtually any brewing machine, it is described herein for use in the context of machines such as those disclosed in U.S. Patent No. 5,974,949 to Weber et al. and U.S. Patent No. 6,035,762 to Ruckstuhl. Those patents disclose machines for brewing espresso using espresso espresso packets in the form of filter capsules which are received through a funnel into a brewing chamber where water is passed through the filter capsule to produce an espresso beverage. The subject matter of each of these patents is incorporated herein by this reference.

The invention also may be practiced in connection with espresso machines such as those disclosed in U.S. Patent Nos. 4,253,385, 4,254,694, 4,353,293, 4,429,623, 4,484,515, 4,555,894 and 4,852,333, all to Illy. These patents disclose various aspects of espresso machines which include brewing chambers configured to receive pre-fabricated espresso packets through which water is passed to produce an espresso drink. The subject matter of each of these patents also is incorporated herein by this reference.

While the aforementioned machines generally are described for use in connection with espresso packets which contain a single serving of espresso, it will be appreciated that the present invention considers application of the relevant principles to machines which employ coffee packets for use in brewing multiple cups, which employ coffee packets of various size and shape, which employ various filter media and which contain coffee of various varieties, roasts, and grinds. Furthermore, the packet and methodology described herein may also

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produce other types of beverages such as tea, cider, and/or any beverage which is produced by mixing various ingredients. The packet and methodology is not limited to hot beverages and may be used to produce cold beverages.

As indicated above, a variety of factors beyond the grind of the coffee play a part in the taste of coffee, including factors such as freshness, brew temperature, brew duration, amount of water used, etc. These factors may be dependent on the characteristics of the coffee itself, or may be determined by the tastes of the coffee drinker, even absent an understanding of the effects of changes in the brew operation.

With the foregoing in mind, it will be appreciated that it would be desirable to automatically customize the brew operation based on particular characteristics of the packet, the characteristics of the coffee, and/or the tastes of the user, whether or not the user is aware of what changes in the brew operation will lead to the desired taste. The present invention provides a vehicle for such customization in the form of an encoded packet configured to provide the brewing machine with data useful in directing the brewing operation in accordance with packet or packet content characteristics and/or the user's tastes.

Focusing now particularly on the invented encoded coffee packet, it will be appreciated that such packet typically takes the form of a coffee-filled packet configured for placement in a fluid path of a coffee machine whereby hot water (or steam) flows through the packet to produce a coffee beverage. An exemplary packet is depicted in Figs. 1-3, such packet being indicated generally at 10.

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In accordance with the present invention, packet 10 is of somewhat conventional construction, including a filter with a first filter portion 12 and a second filter portion 14 which collectively define a cavity 16 containing ground coffee 20. The filter is selected to permit flow of water therethrough, but to restrict flow of the ground coffee therethrough, other than in the form of a coffee beverage.

Typically, the filter takes the form of opposing, water-permeable paper sheets, as indicated, but the filter may be formed of stainless steel, or some other filter material configured to define a cavity for containment of coffee grounds while water and brewed coffee beverage pass therethrough. It is desirable, however, that the filter impart no undesirable taste characteristics to the resulting coffee beverage.

As indicated above, opposing filter portions 12 and 14 are secured together about their respective perimeters to form cavity 16. In the depicted embodiment, the filter portions are secured to an orbicular gasket 18. The gasket is deformable to allow for an optimum seal. In an alternative embodiment, the packet may be integrally formed from a continuous filter in which no gasket is required. Although the depicted packet is circular, it will be appreciated that the cavity may take virtually any shape capable of containing coffee grounds. The size and bed depth 40 of the packet is determined by the quantity of coffee grounds, the density of coffee grounds, and the desired coffee beverage taste.

As shown in Fig. 2, packet 10 includes a machine interpretable feature 30 which directs operation of the coffee machine in accordance with predefined brewing directives. In the first depicted embodiment, the machine

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interpretable feature is a barcode 31 as depicted in Fig. 2 and 2a. It will be understood that the machine interpretable feature may be any machine readable feature associated with packet 10.

Examples of alternative embodiments are depicted in Figs. 2b through 2h. In Fig. 2b the feature is geometric shape 32. The shape may be raised or lowered and may, or may not incorporate color, or some other machine-interpretably characteristic. Fig. 2c shows text string 33. The text string may consist of alpha-numeric characters and may be of various lengths including a single character. Fig. 2d shows glyph 34. The glyph may be any symbolic figure including a symbol used as a trademark. A digital watermark 35 is depicted in Fig. 2e. Fig. 2f shows notches 36. The notches may be localized to a particular area of the packet or may span its entire perimeter in singular or repetitive fashion. Grooves 37 are depicted in Fig. 2g. One or more grooves may be incorporated to create a texture. Fig. 2h shows holes. One or more holes may be used, which holes may be, of various shapes and sizes. The above-noted machine interpretable features; or other machine interpretable features, may similarly may be employed in combination or alone, such features being selected for their ability to store brewing directives and packet and/or ingredient-characteristic data, and for their cost of manufacture, aesthetic appearance, and ability to carry machine interpretal features which are capable of being successfully detected, read, and interpreted.

Machine interpretable feature 30, it will be appreciated, is capable of storing a significant amount of data, including specific brewing directives and/or packaging or ingredient characteristics. Examples of the types of brewing directives

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stored in machine interpretable feature 30 may include, for example, contact time, contact pattern, fluid volume, fluid temperature, fluid pressure, and/or fluid pass-through rate. The above brewing directives are all well known in the coffee brewing industry to affect the taste and quality of the coffee beverage. Examples of ingredient characteristics which may be stored in machine interpretable feature 30 include grind, blend, roast, quantity, bed depth, freshness, and expiration date. These examples are meant to be exemplary, not limiting in scope.

Fig. 3 schematically depicts a coffee machine 100 designed to utilize packet 10. In the depicted embodiment, packet 10 is positioned between input fluid path 110 and output fluid path 112. Gasket 18 helps form a seal between chamber 114, defining the input fluid path, and chamber 116, defining the output fluid path. Gasket 18 also helps secure packet 10 in place. In other embodiments, packet 10 is held in place by gravity, water pressure, friction, adhesion, magnetism, or other suitable mechanisms. As depicted, water passes into packet 10 along input fluid path 110, passing through filter portion 12. The water contacts ground coffee within packet 10, producing a coffee beverage. The coffee beverage then flows through packet 10 and out through filter portion 14. Thereafter, the coffee beverage continues along output fluid path 112 and into beverage receptacle 120. In one embodiment, water is stored in a reservoir (not shown) within coffee machine 100 and heated before entering input fluid path 110. Alternatively, water is externally heated before entering input fluid path 110, or not heated at all. Beverage receptacle 120 may be dimensioned to accommodate multiple servings of

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the brewed coffee beverage, or may be dimensioned to receive a single serving of brewed coffee.

Coffee machine 100 includes a sensor 130 designed to read machine interpretable feature 30 of packet 10. Sensor 130 is in turn operatively connected to a processor 140 which controls coffee machine 100. Machine interpretable feature 30 may store data which is read by sensor 130 and passed to processor 140. Processor 140 may then direct the brewing operation in accordance with its interpretation of the data derived from machine interpretable feature 30. For example, processor 140 may direct coffee machine 100 to brew using a pre-selected contact time, contact pattern, fluid quantity, fluid temperature, fluid pressure, and/or fluid pass-through rate expressed in machine interpretable feature 30. Alternatively, the processor may itself make determinations of contact time, contact pattern, fluid quantity, fluid temperature, fluid pressure, and/or fluid pass-through rate based on information contained in machine interpretable feature 30. The processor may also, based on information contained in machine interpretable feature 30, direct the coffee machine to add water, milk, cream, sugar, or any suitable condiment to the coffee beverage.

As alluded to above, machine interpretable feature 30 need not store data specifically including brewing directives and ingredient characteristics. Instead machine interpretable feature 30 may act as an identifier so that brewing directives and ingredient characteristics may be looked up from data storage 150 within (or external to) coffee machine 100. Sensor 130 thus may read machine interpretable feature 30 and processor 140 may match the machine interpretable feature with

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predefined brewing operation instructions stored in such memory. Processor 140 may then direct the brewing operation based on brewing operation instructions. In one embodiment, the brewing operation instructions are matched to a machine interpretable feature using a look-up table in which brewing operation instructions correspond in a one-to-one ratio with each known ingredient variety, packet size, packet construction, user preference, etc. It will be appreciated, however, that other arrangements for matching machine interpretable feature 30 with brewing directives similarly may be used.

Referring now to Fig. 4, a method of operation for the present invention is illustrated at 200. At 202, a brewing packet encoded with packet-characteristic data is placed into a brewing device. At 204, the packet-characteristic data is read by a sensor. At 206, the packet-characteristic data is interpreted by a processor. Finally, at 208, brewing is directed in accordance with the packet-characteristic data read by the sensor and interpreted by the processor.

Because the processor may be employed to effect the aforementioned predefined brewing directives based on the machine interpretable feature associated with each packet. The brewing operation may be made consistent based on consistent machine interpretable features from packet to packet. Similarly, the brewing operation may be altered in accordance with desired brewing characteristics each time the packet is replaced. Particular brew characteristics thus may be controlled simply by selection of a packet with the desired encoded brewing directives (whether or not such directives are known to the coffee machine operator). Control of the brewing process thus may be handed off to the brewing

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professionals who produce the packets, rather than relying on untrained machine operators. This may be done without sacrificing variety in brew operation based on differing characteristics of the packet contents or consumer tastes.

For example, a person desiring weaker coffee may purchase packets designated such in order to direct the machine to add water to the brewed coffee beverage in accordance with proper brewing procedure. This avoids problems associated with ill-advised attempts to dilute coffee by decreasing the quantity of coffee used, a change which may result in a corresponding change in bed depth, and thus in an undesirable change in coffee taste.

The encoded packets also may be used to track brewing information which may be useful in ensuring satisfaction with the brewed coffee beverage. For example, the packet may include an encoded date for use in tracking freshness of the coffee grounds contained within the packet. Upon determining that the packet is stale, the processor may direct the machine to note such staleness, thus avoiding an unsatisfactory beverage. Similarly, the packet may contain encoded data related to the coffee blend contained within the packet, such data being stored in memory to provide a history of coffee blends. The encoded packet also may contain encoded data defining the source of the packet so as to prohibit use of counterfeit packets, or packets from unauthorized suppliers.

While the invention has been disclosed in its preferred form, the specific embodiments thereof as disclosed and illustrated herein are not to be considered in a limiting sense as numerous variations are possible. The subject matter of the invention is regarded to include all novel and non-obvious

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combinations and subcombinations of the various elements, features, functions and/or properties disclosed herein. No single feature, function, element or property of the disclosed embodiments is essential. The following claims define certain combinations and subcombinations which are regarded as novel and non-obvious. Other combinations and subcombinations of features, functions, elements and/or properties may be claimed through amendment of the present claims or presentation of new claims in this or a related application. Such claims are also regarded as included within the subject matter of applicant's invention irrespective of whether they are broader, narrower, or equal in scope to the original claims.

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WE CLAIM:

1. A brewing packet comprising:

a filter defining a cavity;

a brewing ingredient within the cavity; and

a machine-interpretable feature associated with the filter, wherein the feature includes encoded data regarding the brewing packet.

2. The packet of claim 1, wherein the machine-interpretable feature is located on the filter.

3. The packet of claim 1, wherein the filter defines an annular flange, the machine-interpretable feature being located on the annular flange.

4. The packet of claim 1, wherein the filter includes a first filter portion, a second filter portion, and a gasket which seals the first filter portion to the second filter portion.

5. The packet of claim 1, wherein the machine-interpretable feature is optically detectable.

6. The packet of claim 5, wherein the machine-interpretable feature includes one or more of a color, a shape, a glyph, a text string, a barcode, and a digital watermark.

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7. The packet of claim 1, wherein the machine-interpretable feature is electromagnetically detectable.

8. The packet of claim 7, wherein the machine-interpretable feature includes a magnetic data storage medium.

9. The packet of claim 1, wherein the machine-interpretable feature is mechanically detectable.

10. The packet of claim 9, wherein the machine-interpretable feature includes one or more of notches, grooves, holes, bumps, and textures.

11. The packet of claim 1, wherein the encoded data includes at least one predefined brewing directive.

12. The packet of claim 11, wherein the predefined brewing directive is one or more of contact time, contact pattern, fluid quantity, fluid temperature, fluid pressure, or fluid pass-through rate.

13. The packet of claim 1, wherein the encoded data defines at least one characteristic of the brewing ingredient.

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14. The packet of claim 13, wherein the characteristic is one or more of grind, blend, roast, quantity, bed depth, freshness, and expiration date.

15. A beverage producing device comprising:

a fluid path configured to direct fluid through an ingredient enveloping beverage packet into a beverage receptacle;

a sensor configured to detect encoded data stored on the beverage packet; and

a processor configured to interpret the encoded data and to direct production of a beverage according to the encoded data.

16. A method of automatically directing beverage-brewing comprising:

placing a brewing packet encoded with packet-characteristic data into a beverage-brewing device;

reading the packet-characteristic data;

interpreting the packet-characteristic data; and

directing beverage-brewing in accordance with interpreted packet-characteristic data.

17. The method of claim 16, wherein reading the packet-characteristic data includes detecting an optically recognizable feature containing the data.

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18. The method of claim 16, wherein reading the packet-characteristic data includes detecting an electromagnetically recognizable feature containing the data.

19. The method of claim 16, wherein reading the packet-characteristic data includes detecting a mechanically recognizable feature containing the data.

20. The method of claim 16, wherein directing beverage-brewing includes setting at least one predefined brewing directive.

21. The method of claim 16, wherein directing beverage-brewing selectively includes aborting the brewing process.

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22. A multiple beverage coffee-brewing packet comprising:

a first substantially rounded filter portion;

a second substantially rounded filter portion operatively connected to the first substantially rounded filter portion by an orbicular gasket to collectively define a cavity, the first and second substantially rounded filter portions being at least partially constructed of water-permeable material; and

a coffee-brewing ingredient within the cavity, wherein the coffee-brewing ingredient is proportioned to produce multiple servings of drip coffee.

23. The coffee-brewing packet of claim 22, wherein a coffee-brewing operation is directed by a machine interpretable feature associated with the coffee-brewing packet.

24. The coffee-brewing packet of claim 23, wherein the machine interpretable feature is the dimension of the orbicular gasket.

25. The coffee-brewing packet of claim 23, wherein the machine interpretable feature is a barcode located on the coffee-brewing packet.

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FIG. 1

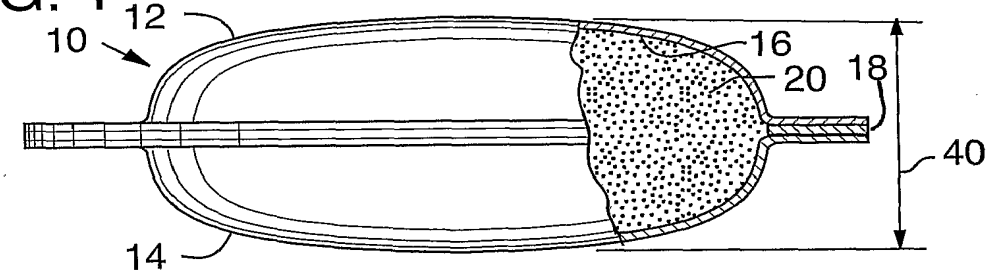


FIG. 2

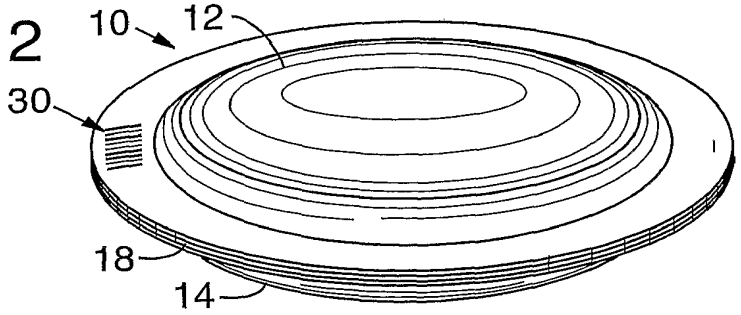


FIG. 2a

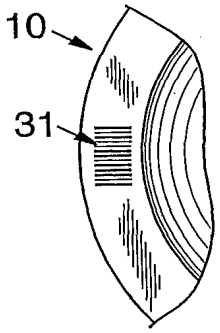


FIG. 2b

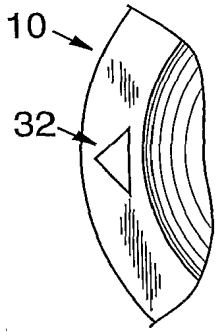


FIG. 2c

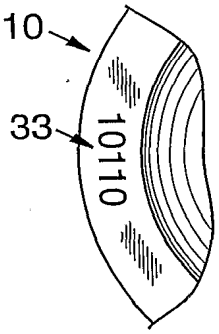


FIG. 2d

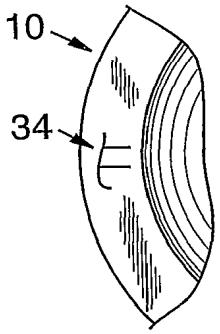


FIG. 2e

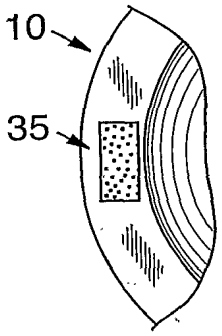


FIG. 2f

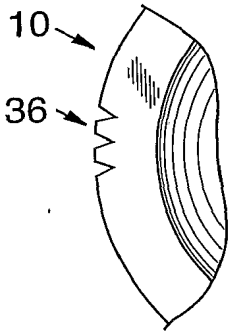


FIG. 2g

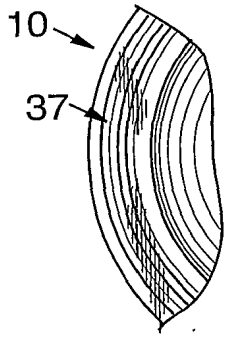


FIG. 2h

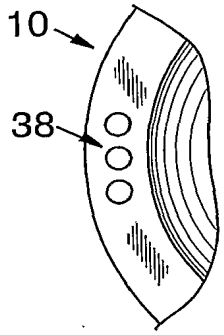
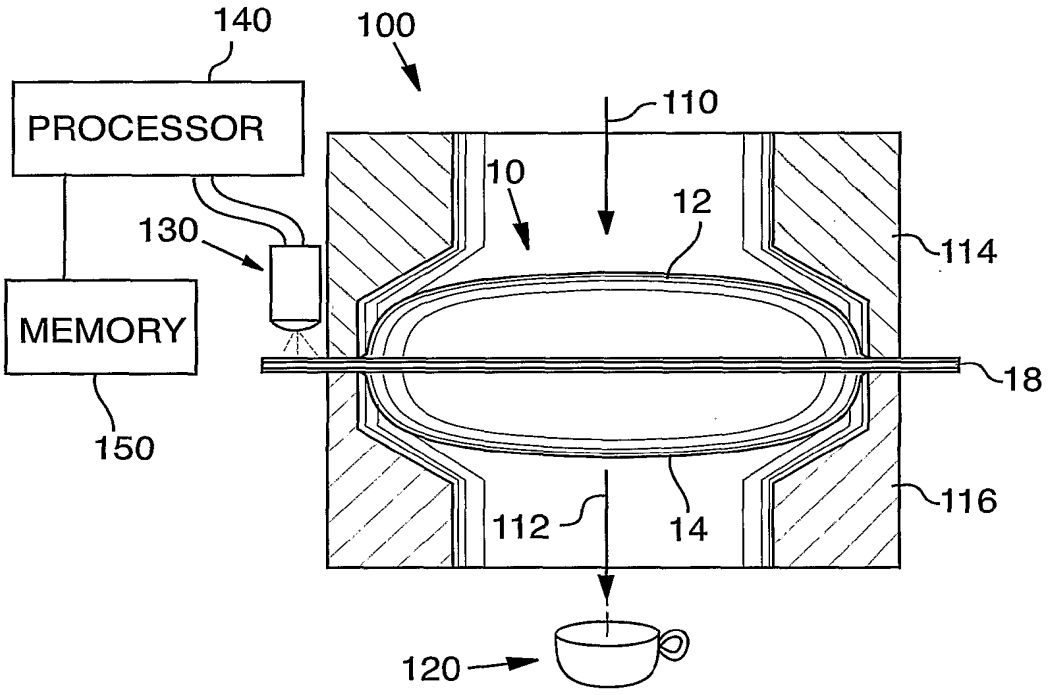


FIG.3



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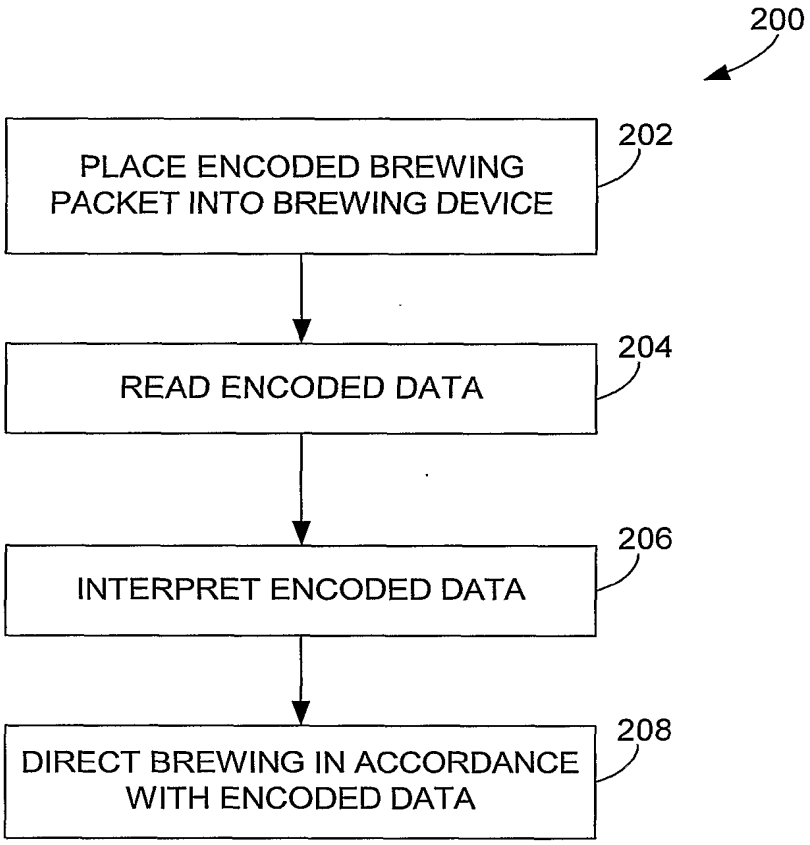

200
PLACE ENCODED BREWING PACKET INTO BREWING DEVICE
202
READ ENCODED DATA
204
INTERPRET ENCODED DATA
206
DIRECT BREWING IN ACCORDANCE WITH ENCODED DATA
208

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/31348

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A47J 31/00; B65B 29/02
US CL :99/295, 285; 426/78, 81
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 99/295, 285, 323, 279; 426/78, 81, 79, 82; 210/85

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 5,974,950 A (KING) 02 November 1999, see entire document.	1-6, 11, 13-17, 20, 21 --- 7-10, 18, 19
A	US 5,798,037 A (PEACOCK) 25 August 1998, see entire document.	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

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Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer REGINALD L. ALEXANDER Telephone No. (703) 308-0651

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(54) **METHOD FOR PRODUCING A CAPSULE FOR PREPARING A BEVERAGE WITH A SEALING MEMBER FOR WATER TIGHTNESS ATTACHED THERETO**

VERFAHREN ZUR HERSTELLUNG EINER KAPSEL ZUR GETRÄNKEZUBEREITUNG MIT EINEM DARAN BEFESTIGTEN DICHTUNGSGLIED FÜR WASSERDICHTHEIT

PROCEDE DE PRODUCTION D'UNE CAPSULE DE PREPARATION D'UNE BOISSON AVEC UN ELEMENT DE SCELLEMENT POUR L'ETANCHEITE A L'EAU FIXE SUR CELLE-CI

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EP-A- 1 654 966
DE-A1- 10 204 505
FR-A- 2 617 389
US-A- 4 351 629
US-A1- 2004 262 322

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Description

[0001] The present invention generally relates to capsules for containing beverage ingredients to a beverage producing system for use in connection with such capsules as well as to a method for producing such capsules.

[0002] The background of the present invention is the field of capsules which contain beverage ingredients (e.g., coffee ground, milk powder) or other comestible ingredients (e.g. dehydrated soup). By means of an interaction of these ingredients with a liquid, a beverage or other comestibles can be produced. The interaction can be for example an extraction, brewing or dissolution process. Such a capsule is particularly adapted to contain ground coffee in order to produce a coffee beverage by having hot water under pressure enter the capsule and draining a coffee beverage from the capsule.

[0003] Systems and methods for obtaining fluid comestibles from substances containing capsules are for example known from EP-A-512470.

[0004] The general principle of this extraction process can be summarized as follows:

- An initially closed capsule is inserted between capsule holder means which are closed in a water tight manner about the capsule;
- Water injection means of the machine inject water in the capsule;
- Water interacts with the ingredients contained in the capsule while traversing the interior of the capsule and is then made to leave the capsule through at least one opening/perforation created in the second wall.

[0005] The ingredients in the capsule constitute the "bottleneck" of the flow path of the water and will therefore cause a pressure drop between the upstream and the downstream side of the liquid flow through the capsule, which pressure drop will even increase during the interaction between the liquid and the ingredients for example due to a swelling of the ingredients. Correspondingly it has to be assured that the only water flow is actually taking place through the interior of the capsule and that no water can flow from the water injector into the interstice between the annular enclosing member and the exterior of the capsule and then to the draining bore of the device. In other words, any water flow exterior to the capsule has to be stopped by a sealing engagement between an annular enclosing member of the holder means and the capsule and in the flow path between the water injector and the beverage-draining bore.

[0006] Such sealing engagement can be achieved at least to a certain degree by the pinching engagement between the capsule holder means (i.e., annular enclosing member and capsule holder) and the flange-like rim of the body in-between.

[0007] In case the sealing engagement is not working properly and water is flowing outside the capsule, no pressure sufficient to cause the tearing of the tear face will be built up inside the capsule or, alternatively, the pressure will be causing no complete tearing of the tear face and therefore a poor extraction of the substance. In such a scenario water will be drained from the beverage production device without having interacted or fully interacted under sufficient pressure conditions, with the ingredients contained in the capsule.

[0008] An improvement could be thought of according to which this sealing engagement is further improved by lining the inner wall of the annular member with a rubber-elastic material. In other words, according to said approach the sealing engagement is assured by structures fixed to or attached with the beverage-producing device. This has disadvantages in that after the use of a substantial number of capsules a wearing off of the fixed sealing means can take place such that the quality of the produced beverage is increasingly deteriorated by water passing the no longer properly efficient sealing. Furthermore, the sealing means can become dirty with organic residues sticking to it which is not very hygienic and may affect the sealing and pressure conditions as well during extraction.

[0009] Any "leak" at the exterior of the capsule reduces the pressure build-up inside the capsule. On the other hand, it is well known that a sufficient extraction pressure is a key factor for the quality of espresso-style coffee. European co-pending patent application No. 04025320.5 entitled "Capsule with sealing means" aims at an improvement of the sealing engagement positioned between the liquid inlet and the beverage draining side of such a beverage production system. The invention aims at transferring a resilient part of the sealing engagement from the beverage production device to the capsule. The advantage is that any resilient sealing member is only used once (i.e. only with the associated capsule) such that a proper functioning of the sealing can be assured and no hygienic problems can occur at the sealing member.

[0010] The present invention aims at another improvement of European co-pending patent application No. 04025320.5 or EP1654966A1 in order to improve the sealing conditions between the capsule and the seal so to ensure water tightness during brewing. Indeed, it is of importance to avoid any potential liquid leakage between the sealing member and the rest of the capsule in particular thanks to a good bond created between the two.

[0011] Furthermore, it is also of importance that the sealing member is integrated to the capsule using a process that can be implemented on a large industrial scale, be highly reliable with minimal defective products and be also cost effective.

EP1247756 relates to a closed capsule for the preparation of a beverage comprising a body with an opening and a flexible tearable membrane closing said opening; the membrane being possibly injected by co-injection on

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the body. However, the membrane is not a sealing member of the capsule.

FR2617389 relates to a filtering cartridge for the preparation of an espresso-type coffee having a body having a portion of rim integrally formed with the body and designed for providing a sealing means to improve the tightness engagement of the cartridge with the water feed member of the coffee machine.

[0012] Document FR-A-2617 389 discloses a method in accordance with the preamble of claim 1. The object is achieved by means of the features of the independent claims. The depending claims further develop the central idea of the present invention.

[0013] For this, the method of the invention is for providing a sealing member on the body of a capsule containing beverage ingredients designed for insertion in a beverage production device in which a liquid under pressure enters the capsule in order to interact with the ingredients in the capsule and to drain a beverage from the capsule,

[0014] characterized in that it comprises providing a body and injecting at least one sealing material by injection-moulding onto at least a portion of the external surface of the body to mould a sealing member sealingly attached to the body.

[0015] More particularly, the injection of a sealing material (or sealant) to form the sealing member offers many advantages. First of all, the adhesion of the sealing member can be very much improved compared to attaching a prefabricated sealing member. As a result, liquid leakage can be prevented between the sealing member and the capsule's body and the conditions of extractions can be better guaranteed and maintained from capsule to capsule (better brewing conditions repeatability). The sealing member being more solidly attached as a part of the capsule, there is less risk for the sealing member to detach or be removed for use in beverage brewing machines which are not intended for receiving capsules without the sealing member and consequently also to reduce the risk of malfunctioning.

[0016] Furthermore, this offers more opportunities for producing the capsule's body with simpler or more varied shapes. The method is also quicker, more cost effective than adding and attaching a sealing member by mechanical, welding and/or adhesive means and can be implemented in effective manner, at high throughput and large industrial scale.

[0017] Preferably, the sealing material is made of a different material from the material of the body. More preferably, the sealing material is softer than the material of the body.

[0018] In a preferred mode, the body is formed with a flange-like rim and the injection step comprises injecting the sealing member onto the flange-like rim. The flange-like rim represents the region at which the capsule is pinched by the enclosing members (e.g., a bell member and a capsule holder hermetically closing about the capsule) of the beverage production device. The injected sealing member being of softer material than the body at the flange-like rim, it can be compressed to compensate for the irregularities, tolerance plays or gaps and so on, to maintain water tightness under the brewing pressure in the enclosure for the capsule.

[0019] The flange-like rim can further comprise an anchoring portion and a support portion. The anchoring portion is arranged so that, during injection, the material of the sealing member can flow in the anchoring portion to improve the connection between the sealing member and the body.

[0020] The anchoring portion can be formed of a partially curled portion. The curled portion can comprise an opening, e.g., an annular opening, for plastic to flow therein during injection. The curled portion can be formed during a deep drawing operation of the body that precedes the injection of the sealing member or alternatively is formed in a separate forming operation of the flange-like rim after deep drawing the cavity of the capsule's body. The operation for injecting the sealing member is preferably a high-pressure plastic injection. The capsule body is clamped both internally, i.e., on the cavity side, and externally, i.e., on the external side of the sidewall of the body, by injection dies and an injecting enclosure is defined by the dies for delimiting the volume to be filled in for the sealing material. The sealing material can be injected at a pressure that exceeds 500 bar, preferably between 500 and 2000 bar, more preferably between 800 and 1500 bar. The injection time is very quick and does typically not exceed more than a second. Just after injection, the sealing material is allowed to cool down for solidifying during a few seconds, in general, between 3 to 8 seconds.

[0021] The material for the seal member should be chosen amongst thermoplastic elastomer having ability to be resilient, heat and pressure resistant and injectable. Preferably, the thermoplastic material is typically a Thermoplastic Elastomer ("TPE"). More preferably, the TPE is a polypropylene based elastomer.

[0022] As mentioned, in a preliminary production step, the capsule body can be preformed by deep drawing of a metal or metal-plastic sheet. The capsule body can be deep drawn during one step or during sequential steps to form a final main open cavity enabling filling of the food ingredients. The flange-like rim, anchoring means in particular the curled end of the rim or other important functional shapes may be formed during the deep drawing operation (s).

[0023] Furthermore, at least one localized deformation of the body sidewall can be carried out to create further anchoring means for the sealing member, in particular, at a collar portion of the sealing member that extends along the sidewall body. The localized deformation(s) can be formed in the sidewall of the body so to create, for instance, one or more arc-shaped protrusions of body's wall rising inside the material of the sealing member. Said localized deformation(s) can be carried out during injection or cooling down of the injected sealing mem-

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ber. In another subsequent step, the body is filled with the food ingredient such as roast and ground coffee.

[0024] The capsule body can comprise aluminium. It can be a single ply of aluminium or a multi-ply of plastic and aluminium such as polypropylene and aluminium.

[0025] The invention also relates to producing a capsule containing beverage ingredients designed for insertion in a beverage production device, i.e., between capsule enclosing members, in which a liquid under pressure enters the capsule in order to interact with the ingredients in the capsule and to drain a beverage from the capsule. The capsule comprises a body with a sealing member attached thereto. The sealing member is intended to provide water tightness between the capsule and at least a pressing surface of the production device, i.e., of one of the enclosing members of the device. The method comprises providing a body, filling the body with food ingredients and imperviously closing the body. The method also comprises injecting at least one sealing material by injection-moulding onto at least a portion of the external surface of the body to form a sealing member sealingly attached to the body.

[0026] In a subsequent step following the food ingredient filling step, a membrane is welded along a portion of the external face of the flange-like rim to close the capsule. The seal membrane can also be aluminium or a laminate of plastic and aluminium.

[0027] Further advantages, features and objects of the present invention will become apparent for the man skilled in the art when reading the following detailed description of embodiments of the present invention taking in conjunction with the figures of the enclosed drawings.

Fig. 1 shows a first embodiment of the capsule system of the present invention in which a capsule is placed on the capsule holder but has not yet reached its closing position in the beverage production device,

Fig. 2 shows an enlarged of Fig. 1,

Fig. 3 the first embodiment in a state, in which a capsule has reached its closing position between the capsule enclosing parts, i.e., a bell member and the capsule holder,

Figs. 4 and 5 show schematically the injection operation of the sealing member on the capsule body,

Figs. 6 to 10 show detail of the male injection die that holds the capsule body and provides a deformation 'in situ' during the injection operation,

Fig. 6 shows the male die without the capsule body being positioned thereon,

Fig. 7 shows the male die with the capsule body being positioned after injection of the sealing member,

Fig. 8 shows the male die with the capsule body being positioned but with the sealing member being removed for showing the localized deformations being formed on the body by the die,

Fig. 9 shows a cross sectional view of the male die without capsule body,

Fig. 10 shows a detail cross sectional view of the male die with the capsule body being positioned and the sealing member being injected,

Figs 11 to 13 show views of the injection device layout at the manufacturing site enabling high throughput of injected capsule parts,

Fig. 14 is a chart illustrating steps according to a mode of the method of the invention,

Fig. 15 is a chart illustrating steps according to a variant of the method of the invention.

[0028] Note that in the following the invention will be explained referring to a certain design of a capsule, i.e. a design according to which the capsule comprises a cup-like base body and a closing foil member. However, it is to be understood than other designs of the capsule are viable, such as e.g. capsules having a lenticular form with two essentially matching and opposing walls (e.g. foils) being sealed at the e.g. ring-shaped edge. Generally a capsule according to the present invention comprises at least two opposing wall members (faces) which are connected to each other at their respective edges to form a sealed flange-like rim area, thus enclosing a sealed interior.

[0029] The embodiment shows a capsule holder 13 having relief elements 12 which are designed to tear and perforate a foil member 5 closing off a cup-like base body 4 of the capsule 1. This tearing of the foil member 5 can occur as soon as the pressure inside the capsule exceeds a threshold value. Note that the relief elements can have any protruding shape able to cause a controlled tearing of the foil member. As an example only pyramids, needles, bumps, cylinders, elongated ribs are cited. The relief element can also be single.

[0030] Fig. 1 shows a state in which such a capsule has been placed on a capsule holder 13, the foil member 5 resting on the relief elements 12 of the capsule holder 13 and the cup-like base body 4 of the capsule 1 being already partly surrounded by the circumferential wall 25 of an enclosing member 9 of the beverage production device. The shown enclosing member can have the shape of a bell.

[0031] Other shapes are viable, wherein the design of the interior contours (recess) of the enclosing member is generally adapted to substantially match the contours of the capsule 1.

[0032] The capsule holder 13 (also representing an enclosing member) and the enclosing member 9 thus can selectively enclose a capsule enclosure space 22 when transferred from an opened position into a capsule-enclosing position.

[0033] Note that the foil member 5 as shown is not necessarily exactly flat due to a defined over pressure inside the capsule, which over pressure is generated by introducing e.g. a protective gas when producing the filled capsule and during delayed degassing of the food ingredients after sealing, for instance, carbon dioxide from coffee.

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[0034] The enclosing (bell) member 9 furthermore comprises an annular pressing surface 18 and a water inlet opening 20 for feeding a liquid such as for example hot water under pressure to a water injection system 14 which is releasable mounted (e.g., screwed) to the bell member 9.

[0035] The water injection system can comprise one or more perforation elements (blades, pins, etc.) 24 designed to produce one or more openings in the top wall 17 of the capsule 1 when the capsule holder 13 and the bell member 9 are moved close together e.g. by a manually operated or an automatic closing mechanism. A channel 19 traverses the injection system and leads to the enclosure 22 of the enclosing member 9 such that water can be fed to the interior of the capsule 1 once the perforation elements 24 protrude into the interior of the capsule 1.

[0036] The capsule 1 comprises said top wall 17, a side wall 7 and a flange-like rim 6, wherein the foil member 5 is sealed to said flange-like rim 6 to close-off hermetically the cup-like base body 4 of the capsule 1. Again, other designs for the capsule are possible as long as the capsule can be sealed and contain the mentioned ingredients.

[0037] According to the present invention the outer surface of the capsule 1 presents a dedicated water tightness sealing member (made of sealing material) 8 thereafter called "sealing member". The sealing member 8 can be compressible, more preferably resilient.

[0038] The material for the sealing member can be an injectable thermoplastic elastomer.

[0039] As more apparent in Fig. 2, the capsule of the invention comprises a flange-like rim 6 with a support portion 60 for the sealing member and a partially curled end portion 61 forming an anchoring portion for the sealing member. The support portion 60 merges with the sidewall 7 of the body 4 at a certain angle (i.e., slightly more than 90 degrees when the body has a truncated form). The flange like rim as well as the base surface 70 of the sidewall receives the annular sealing member 8. In order for the sealing member to be affixed to the flange-like rim in a reliable manner, the sealing member extends toward the partially curled portion 61 by a connection portion 80 which is injected in the partially curled portion 61 of the rim. The curled ends forms a "hook" for the sealing material which so increases the connection and also the water tightness between the sealing member and the rim. Outside the partially curled portion 61, the sealing member 8 extends along the support portion 60 of the flange-like rim by a sealing portion 81 that can extend by collar portion 82 applied against the base surface 70 of the body's sidewall 7. The sealing portion 81 and collar portion 82 can form surfaces of different slopes or can merge in a single continuous concave or flat inclined surface. The form of the sealing member 8 into a wedge profile is chosen to provide a sufficient mass of material for compensating for the irregularities, tolerances, gaps or other interstices (e.g., due to wearing of the mechanical surfaces) between the capsule and the enclosing or bell member. As the watertight sealing may also be obtained dynamically, i.e., by effect of the water under pressure forcing on the sealing member, the shape, dimension and overall mass of the sealing member should be sufficient to deform, thus resiliably "flow" and fill correctly the left openings when the pressure builds up during brewing.

[0040] Fig. 3 shows the state in which the enclosing member 9 and the capsule holder 13 are brought in closing pressure engagement at the rim and due to the water entering the interior of the capsule and building up a pressure there the pyramidal relief members 12 of the capsule holder 13 produce openings in the foil member 5 of the capsule 1. Upon insertion of the capsule the blade elements 24 of the water injector 14 have previously created perforations 16 in the top wall 17 of the capsule 1. When a sufficient pressure of fluid has been built inside the capsule, the beverage produced from the ingredients contained in the capsule can be drained in small interstices or perforations created by tearing of the foil member 5 by the relief elements 12.

[0041] In a first step of the method (not illustrated), the body 4 of the capsule is produced. The body can be produced with a preform of the flange-like rim 6 which remains open for injection of material of the sealing member in the subsequent injection step. The body 4 can be preformed by deep drawing of a metal sheet or an assembly of multiple plies including metal, e.g., aluminium and plastic, e.g., polypropylene and eventually binders and/or lacquers. Depending on the complexity of the shape of the body and the depth of the cavity, the sheet can be deep drawn in more than a single step. Also, the cavity of the body and the flange-like rim can be formed in a same operation or, alternatively, in separate operations.

[0042] Figs. 4 and 5 show the injection operation of the sealing member 8 on the preformed body 7. The body can thus be placed between an injection die assembly 30. The die assembly typically comprises two die members, a female die member 31 and a male die member 32 which are assembled tightly about the capsule body and leave an injection room 35 for the sealing material to be injected in to form the sealing member. The female die member 31 surrounds the external sidewall 7 and top wall 17 of the body, and usually also delimits the volume 35 for the sealing member to be injected on the flange-like rim 6 and further extends to a parting line 34 which can be situated, for instance, substantially at the end of the partially curled portion 61 of the rim therefore to enable easy removal of the body from the die after injection. The male die member 32 is inserted inside the cavity of the body and matches the external form of the flange-like rim (e.g., lower surface of the rim) up to the parting line 34.

[0043] Advantageously, the die assembly 30 extends along the whole side 7 of the body and imposes a relatively high mechanical pressure on the sidewall 7. The advantages are two fold.

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[0044] Firstly, the injection is carried out a relatively high pressure-short time therefore a pressure tight injection seal arrangement must be obtained in particular at the junction line 34 between the external sidewall of the body and the uppermost point of the sealing member.

[0045] Secondly, the pressure can also be effective to smooth the external surface 73 of the body's sidewall. The former deep drawing operation tends to create wrinkles on the surface of the sidewall due to the general truncated form of the body. Therefore, the mechanical pressure exerted by the male and female dies directly at the whole opposed surfaces of the sidewall 7 enables to flatten the wrinkles and eliminate or at least significantly reduces this visual defect.

[0046] The injection takes place through at least one small injection gate 36. The opening of the gate at the entry of the injection room can be in the order of 0.5-1 mm. The injection is carried out at a high pressure, i.e., an average of between 700 to 1500 bar during less than 1.01 second, typically 0.01 second. The plastic is injected in at a temperature above glass transition. Preferred thermoplastic elastomer is a TPE. The sealing member 8 that is obtained is allowed to cool down for at least a few seconds, typically, 5-10 seconds, before the die assembly is reopened and the body is extracted. Cooling can be assisted with a coolant that circulates inside a cooling circuit of the die assembly to diminish the hardening cycle for the sealing member.

[0047] Figs. 6 to 10 show in detail, the injection male die arrangement 40 according to a possible embodiment. The male die arrangement 40 can be mounted in an impervious manner on a frame 41. It comprises a mandrel 42 with an end which substantially matches the internal cavity of the capsule's body as illustrated in Fig. 8. Inside the mandrel is provided a moveable eccentric punching assembly 43 as illustrated by Figs. 9 and 10. The eccentric assembly comprises two punching members 44, 45 mounted slidably along radially oriented slots 37, 38 of the mandrel (Fig. 9). The punching members 44, 45 are activated in extension/retraction through the slots by a longitudinal pusher 46 which is moved back and forth along the longitudinal axis of the mandrel. The central pusher has portions of ramp 47, 48 which activate the punching members 44, 45 in opposed radial sliding motions along the slots.

[0048] As illustrated in Fig. 10, when the central pusher is pushed upwards, the punching members 44, 45 are moved radially against the sidewall 7 of the body 4 and thus cause the sidewall of the capture body to deform outwardly according to arc-shaped indentations 71, 72 (Fig. 8) that protrude inside the sealing member 8 (Fig. 10). The indentations can be formed at any time after the capsule body is inserted on the mandrel and before the injection material has hardened. Preferably, the indentations are created just after the injection, e.g., 0.5-1 sec. after injection stopped.

[0049] The indentations 71, 72 improve the anchoring of the sealing member on the sidewall at a base region which is critical and where the sealing member tends to come unstuck from the body. As a consequence, it also provides to some extent a more water impervious sealing by preventing risk of leakage at the interface between the sealing member and the body.

[0050] It must be noted that the indentation(s) may be formed in many ways a man skilled in the art can think of and that the present invention only refers to an industrial possible way for matter of illustration only. Also, the indentations may have different forms such as pins, bumps, etc.

[0051] Figs. 11 to 14 illustrate a possible layout for the injection station for handling injection cycles at a high throughput. The general principle will now be explained.

[0052] Fig. 11 represents the general injection lay out which can handle two series of injection assemblies running simultaneously on opposed sides. The principle is based on a cubic injection female die member 60 that comprises four injection die sides 61, 62, 63, 64 and can rotate at 90 degrees along a central axis 65 to move the sides of a 90-degree incremental path. Each female side includes a series of injection die cavities 600 for individual insertion of capsule bodies therein. The cavities are usually distributed on the die side according to a predefined pattern, preferably, along a number of lines and columns, for example, in a square pattern, 7 lines times 7 columns giving thus a total of 49 individual injection sites. The pattern and the number of lines and columns in the pattern can vary depending on the required throughput.

[0053] The cubic injection female die 60 is associated to two male dies 66, 67 facing opposite sides 61, 63 of the cubic female die member. The male dies 66, 67 can reciprocate relative to the cubic die 60 to be able to open and close against the cavity sides of the cubic injection die. The male dies 66, 67 further comprise male mandrels 42 in number and according to a distribution matching the number and distribution of the injection sides.

[0054] In the direction orthogonal to the "injection direction I" (i.e., the direction at which the die assemblies are closing simultaneously on the cubic die), are positioned facing the two other opposed sides 62, 63 of the cubic die, stock and transport means 68, 69 for automatically loading/unloading the bodies in the cavities 600 of said sides. This stock and transport means can comprise loading areas 680, 681 arranged for comprising "naked" capsule bodies (bodies without injected sealing members) arranged in square patterns and bodies' stock areas 682, 683 arranged for receiving the "sealed" capsule bodies (i.e., bodies with the injected sealing members thereon). In between are arranged multidirectional robots 684, 685 configured in at least three directions to, respectively: a) unload the sealed bodies of a given pattern at once from the full injection sides, b) transport the sealed bodies of a given pattern to the bodies' stock areas 682, 683, c) take the naked bodies of a given pattern at once from the loading area 680, 681 and d) transport and place them in the empty cavities of the injection sides moved for facing the stock and transport means.

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[0055] The multidirectional robots 684, 685 may comprise individual suction means, for example, vacuum assisted suction means, to take, transport and release the bodies all at once.

[0056] Fig. 12 illustrates, a cycle of injection of two series of patterns J1, J2 being simultaneously injected. The other loading/unloading operations can be run simultaneously during the injection at these sides 61, 63. In step A, the robotic means remove the sealed bodies from the full sides 62, 63. In step B, the robotic means then transport and unload the sealed bodies in the unloading area 682, 683. In step C, the robotic means take a new waiting pattern of naked capsule bodies (e.g., 49 bodies arranged in a 7 X 7 square pattern) from the bodies' stock areas 680, 681. Then in step D in Fig. 13, the robotic means transport and load the captured series of naked bodies in the empty injection sides 62, 64 of the cubic die member 60. The steps A-D can be implemented while two other series of bodies in the two contiguous sides 61, 63 are injected with the sealing members. Therefore, a much higher throughput can be achieved since almost every about 10 seconds, two series of 49 (so 98 bodies in total) can be injected with sealing members.

[0057] The injection layout of Figs 11 to 13 can be simplified to form only one loading/unloading station with only one male injection die.

[0058] As illustrated in Fig. 14, the method encompasses one or more steps 100 of deep drawing the capsule's body, injection-moulding 110 of the sealing member (or "ring"). In a next step 120, the body is filled with food ingredients and finally, in step 130, the membrane 5 is welded. e.g., by heat or ultrasonic welding, on the external face of support portion 60 of the flange-like rim. Additional steps can be envisaged at any suitable time during the production process such as positioning and affixing of filters inside the body and/or the membrane 5 before or after deep drawing of the body.

[0059] The present invention encompasses other possible variants. For example, the sealing member can be formed of two or more injection materials having different hardness. For instance, an inner layer of a first material can be firstly injected on the body. An outer layer of a second material softer than the material of the inner layer can be then overmoulded on the inner layer. The inner layer can be to improve the bonding for the second material. The outer material can be softer for reducing the closing efforts necessary to close the enclosing members of the beverage production device on the capsule.

[0060] In another possible variant illustrated in Fig. 15, the capsule body can be formed of plastic material. The body is also preferably injection-moulded. The body and the sealing member can be so co-injected (step 140). The body can be in plastic of higher Young modulus than the sealing member but the two materials should be compatible to adhere to each other. Example of a suitable material for the body and sealing member is a TPE. The body may also be provided with injected multi-layers comprising one or more gas barrier layer such as EVOH (EthyleneVinyl-Alcohol-Copolymer) which is embedded between an inner and outer layers made of TPE.

Claims

1. Method for providing a sealing member on the body (4) of a capsule (1) containing beverage ingredients designed for insertion in a beverage production device in which a liquid under pressure enters the capsule in order to interact with the ingredients in the capsule and to drain a beverage from the capsule, the sealing member being geometrically arranged to be in sealing engagement with at least a matching surface of the beverage production device; **characterized in that** it comprises providing a body (4) and injecting at least one sealing material by injection-moulding onto at least a portion of the external surface of the body (4) to mould a sealing member (8) sealingly attached to the body and **in that** the body (4) is formed with a flange-like rim (6) and the injection step comprises injecting the sealing member (8) onto the flange-like rim (6).

2. Method according to claim 1, **characterized in that** the injected material for the sealing member (8) is different from the material forming the body.

3. Method according to claim 2, **characterized in that** the injected material for the sealing member (8) is softer than the material forming the body (4).

4. Method according to claim 2, **characterized in that** the flange-like rim (6) comprises an anchoring portion (61) and a support portion (60); wherein the injection step comprises injecting the sealing member (8) both in the anchoring portion (61) and support portion (60).

5. Method according to claim 4, **characterized in that** the anchoring portion is formed of a partially curled portion comprising an opening for plastic to flow therein during injection.

6. Method according to any of the preceding claims, **characterized in that** injection is made under a pressure of about 500 to 2000 bar and during less than or about a second.

7. Method according to any of the preceding claims, **characterized in that** after injection, the body (4) with its injected sealing member (8) is allowed to cool down during a few seconds in the injection dies (31, 32).

8. Method according to any of the preceding claims, **characterized in that** the injected material is a Thermoplastic Elastomer.

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9. Method according to any of the preceding claims, **characterized in that** the capsule body (4) is preformed by deep drawing of a metal or metal-plastic sheet.

10. Method according to claim 9, **characterized in that** the capsule body (4) comprises aluminium.

11. Method according to claims 9 or 10, **characterized in that** at least one localized deformation (71, 72) of the body sidewall (7) is carried out to create anchoring means for the sealing member (8).

12. Method according to claim 11, **characterized in that** the at least one localized deformation (71, 72) is carried out during injection or cooling down of the injection-moulded sealing member (8).

13. Method according to claim 11, **characterized in that** the at least one localized deformation is carried out by the deep drawing operation.

14. Method according to any one of claims 1 to 8, **characterized in that** the body (4) is injection-moulded.

15. Method according to any one of claim 14, **characterized in that** the body (4) is co-injected with the sealing member (8).

16. Method according to any one of the preceding claims, **characterized in that** it comprises welding a membrane (5) to hermetically close the body (4).

Patentansprüche

1. Verfahren zum Vorsehen eines Dichtungsteils auf dem Körper (4) einer Getränkezutaten enthaltenden Kapsel (1), welche zum Einsetzen in eine Getränkeherstellungsvorrichtung ausgelegt ist, in der eine Flüssigkeit unter Druck in die Kapsel eintritt, um mit den Zutaten in der Kapsel zusammenzuwirken und ein Getränk aus der Kapsel herauszuleiten, wobei das Dichtungsteil geometrisch so angeordnet ist, dass es mit mindestens einer passenden Oberfläche der Getränkeherstellungsvorrichtung in Dichteingriff steht;
dadurch gekennzeichnet, dass es das Bereitstellen eines Körpers (4) sowie das Aufspritzen von mindestens einem Dichtmaterial durch Spritzgießverfahren auf mindestens einen Abschnitt der Außenfläche des Körpers (4) umfasst, um ein Dichtungsteil (8) zu formen, welches dichtend an dem Körper angebracht ist, und dass der Körper (4) mit einem flanschartigen Rand (6) ausgebildet ist und der Spritzschritt das Aufspritzen des Dichtungsteils (8) auf den flanschartigen Rand (6) umfasst.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** sich das gespritzte Material für das Dichtungsteil (8) von dem den Körper bildenden Material unterscheidet.

3. Verfahren gemäß Anspruch 2, **dadurch gekennzeichnet, dass** das gespritzte Material für das Dichtungsteil (8) weicher als das den Körper (4) bildende Material ist.

4. Verfahren gemäß Anspruch 2, **dadurch gekennzeichnet, dass** der flanschartige Rand (6) einen Verankerungsabschnitt (61) und einen Trägerabschnitt (60) umfasst; wobei der Spritzschritt das Einspritzen des Dichtungsteils (8) sowohl in den Verankerungsabschnitt (61) als auch in den Trägerabschnitt (60) umfasst.

5. Verfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** der Verankerungsabschnitt aus einem teilweise gewellten Abschnitt mit einer Öffnung besteht, in die während des Spritzens Kunststoff fließt.

6. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Spritzen unter einem Druck von ca. 500 bis 2000 Bar und während weniger als oder ungefähr einer Sekunde erfolgt.

7. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** nach dem Spritzen der Körper (4) mit seinem eingespritzten Dichtungsteil (8) während mehrerer Sekunden in den Spritzformen (31, 32) abkühlen kann.

8. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das eingespritzte Material ein thermoplastisches Elastomer ist.

9. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Kapselkörper (4) durch Tiefziehen eines Metall- oder Metall-Kunststoff-Blechs vorgeformt wird.

10. Verfahren gemäß Anspruch 9, **dadurch gekennzeichnet, dass** der Kapselkörper (4) Aluminium enthält.

11. Verfahren gemäß Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** mindestens eine lokale Verformung (71, 72) der Körperseitenwand (7) erfolgt, um Verankerungseinrichtungen für das Dichtungsteil (8) zu erzeugen.

12. Verfahren gemäß Anspruch 11, **dadurch gekennzeichnet, dass** die mindestens eine lokale Verfor-

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mung (71, 72) während des Spritzens oder Abkühlens des Spritzguss-Dichtungsteils (8) erfolgt.

13. Verfahren gemäß Anspruch 11, **dadurch gekennzeichnet, dass** die mindestens eine lokale Verformung durch den Tiefziehvorgang erfolgt.

14. Verfahren gemäß einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** der Körper (4) durch Spritzgießen hergestellt wird.

15. Verfahren gemäß Anspruch 14, **dadurch gekennzeichnet, dass** der Körper (4) zusammen mit dem Dichtungsteil (8) eingespritzt wird.

16. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es das Anschweißen einer Membran (5) umfasst, um den Körper (4) hermetisch zu verschließen.

Revendications

1. Procédé pour fournir un organe d'étanchéité sur le corps (4) d'une capsule (1) contenant des ingrédients de boisson conçue pour l'insertion dans un dispositif de production de boisson dans lequel un liquide sous pression pénètre dans la capsule pour interagir avec les ingrédients dans la capsule et pour évacuer une boisson de la capsule, l'organe d'étanchéité étant agencé géométriquement pour être en engagement d'étanchéité avec au moins une surface correspondante du dispositif de production de boisson ;
caractérisé en ce qu'il comprend la fourniture d'un corps (4) et l'injection d'au moins un matériau d'étanchéité par moulage par injection sur au moins une partie de la surface externe du corps (4) afin de mouler un organe d'étanchéité (8) fixé de manière étanche sur le corps, et **en ce que** le corps (4) est formé avec un bord de type collet (6) et l'étape d'injection comprend l'injection de l'organe d'étanchéité (8) sur le bord de type collet (6).

2. Procédé selon la revendication 1, **caractérisé en ce que** le matériau injecté pour l'organe d'étanchéité (8) est différent du matériau formant le corps.

3. Procédé selon la revendication 2, **caractérisé en ce que** le matériau injecté pour l'organe d'étanchéité (8) est plus mou que le matériau formant le corps (4).

4. Procédé selon la revendication 2, **caractérisé en ce que** le bord de type collet (6) comprend une partie d'ancrage (61) et une partie de support (60) ; dans lequel l'étape d'injection comprend l'injection de l'organe d'étanchéité (8) à la fois dans la partie d'ancrage (61) et la partie de support (60).

5. Procédé selon la revendication 4, **caractérisé en ce que** la partie d'ancrage est formée par une partie partiellement enroulée comprenant une ouverture pour permettre à du plastique de s'écouler dedans pendant l'injection.

6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'injection est réalisée sous une pression d'environ 500 à 2000 bar et pendant moins d'une seconde ou environ une seconde.

7. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**après injection, le corps (4) avec son organe d'étanchéité (8) injecté est laissé à refroidir pendant quelques secondes dans les matrices d'injection (31, 32).

8. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le matériau injecté est un élastomère thermoplastique.

9. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le corps de capsule (4) est préformé par l'emboutissage profond d'une tôle en métal ou d'une tôle métal-plastique.

10. Procédé selon la revendication 9, **caractérisé en ce que** le corps de capsule (4) comprend de l'aluminium.

11. Procédé selon les revendications 9 et 10, **caractérisé en ce qu'**au moins une déformation localisée (71, 72) de la paroi latérale du corps (7) est réalisée pour créer des moyens d'ancrage pour l'élément d'étanchéité (8).

12. Procédé selon la revendication 11, **caractérisé en ce que** ladite au moins une déformation localisée (71, 72) est réalisée pendant l'injection ou le refroidissement de l'organe d'étanchéité (8) moulé par injection.

13. Procédé selon la revendication 11, **caractérisé en ce que** ladite au moins une déformation localisée est réalisée par l'opération d'emboutissage profond.

14. Procédé selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** le corps (4) est moulé par injection.

15. Procédé selon la revendication 14, **caractérisé en ce que** le corps (4) est co-injecté avec l'organe d'étanchéité (8).

16. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend le soudage d'une membrane (5) pour fermer herméti-

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quement le corps (4).

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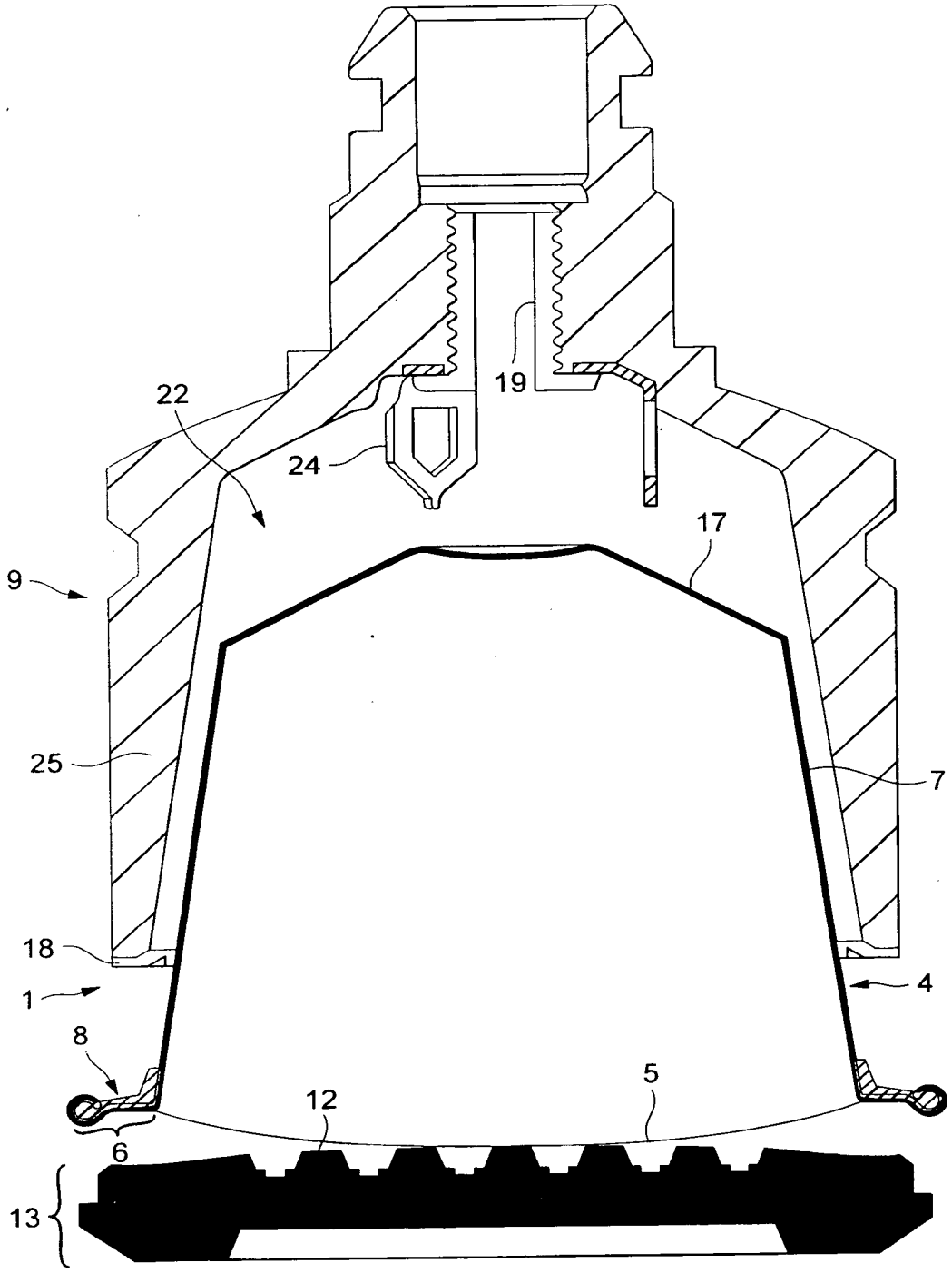


FIG. 1

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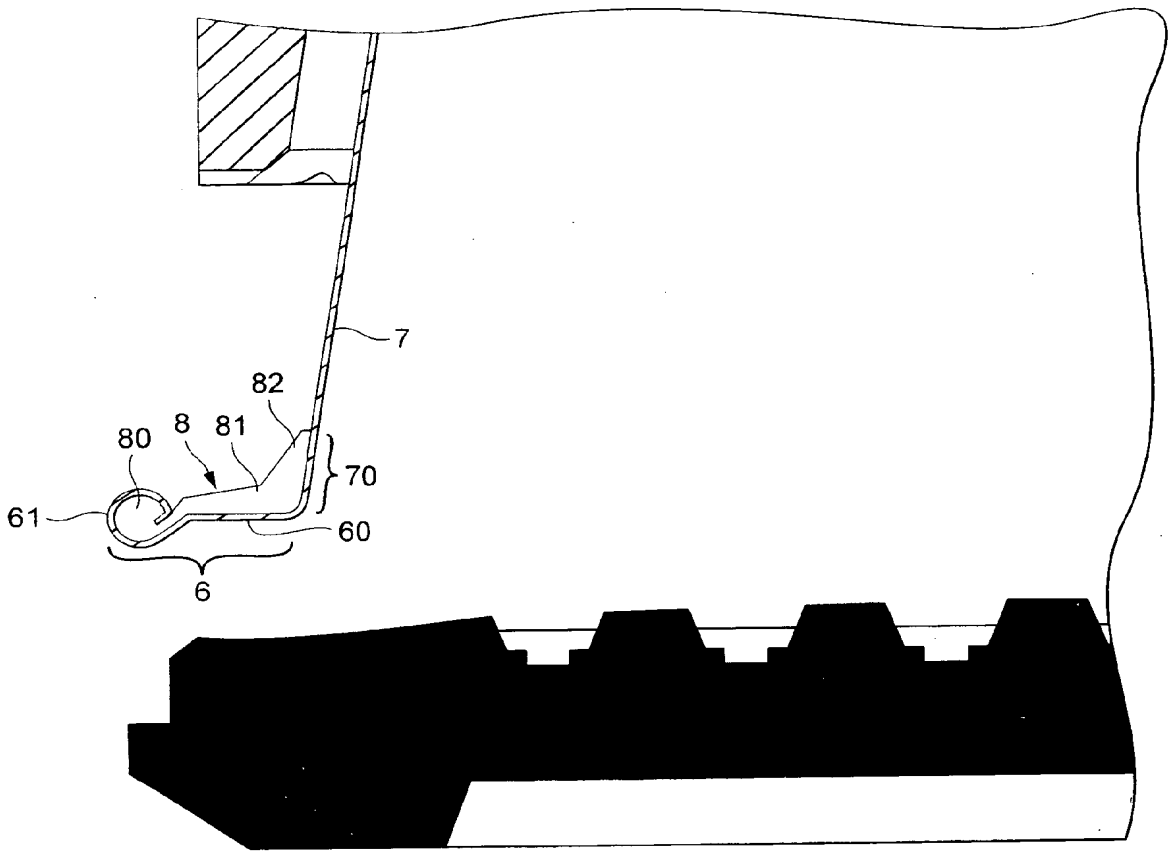


FIG. 2

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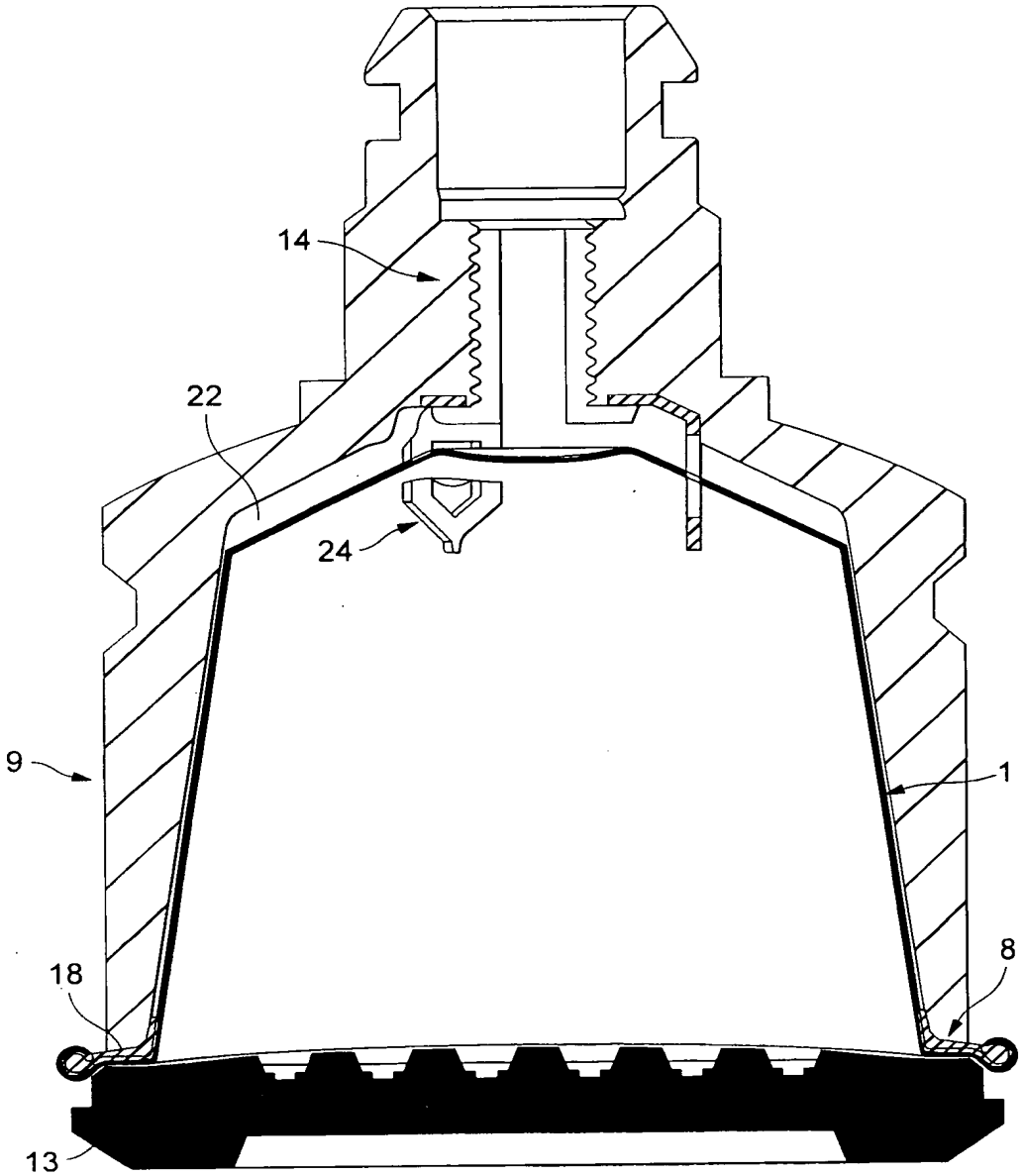


FIG. 3

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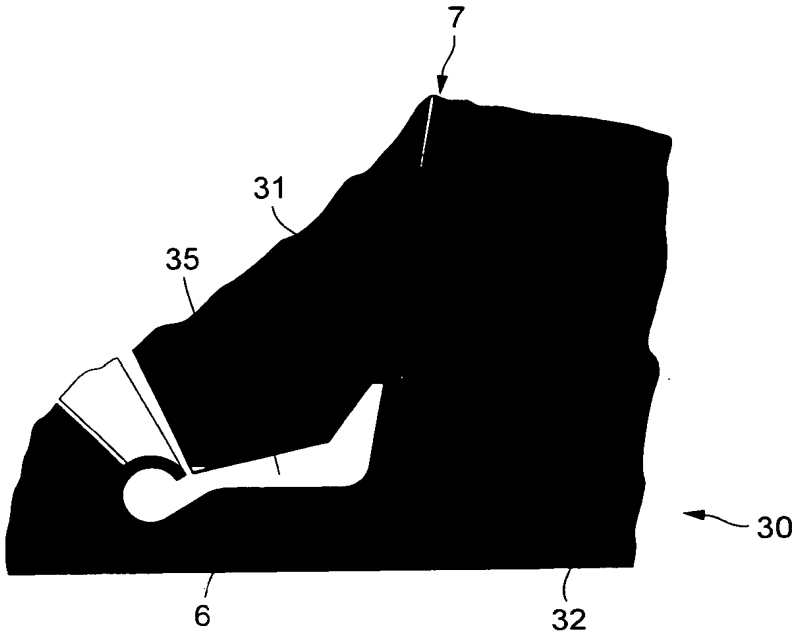


FIG. 4

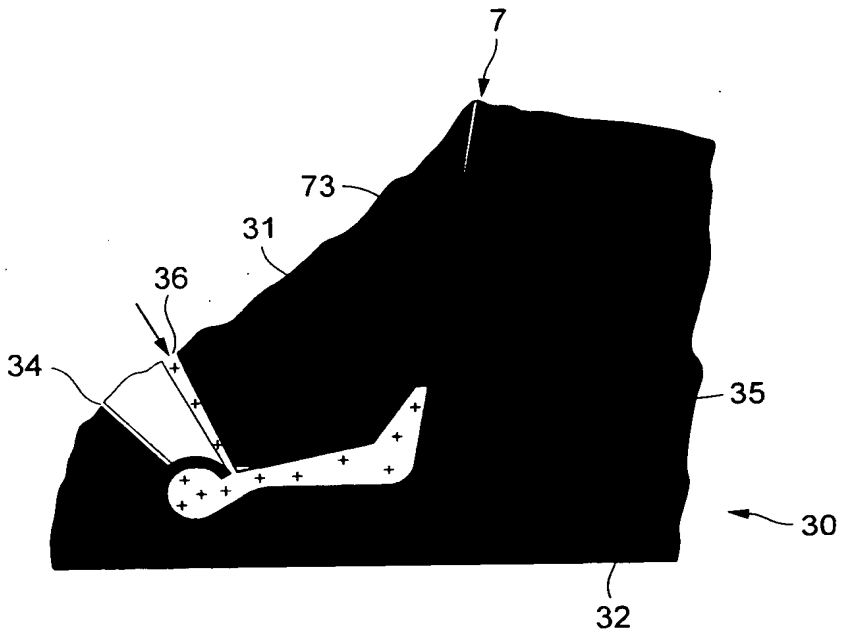


FIG. 5

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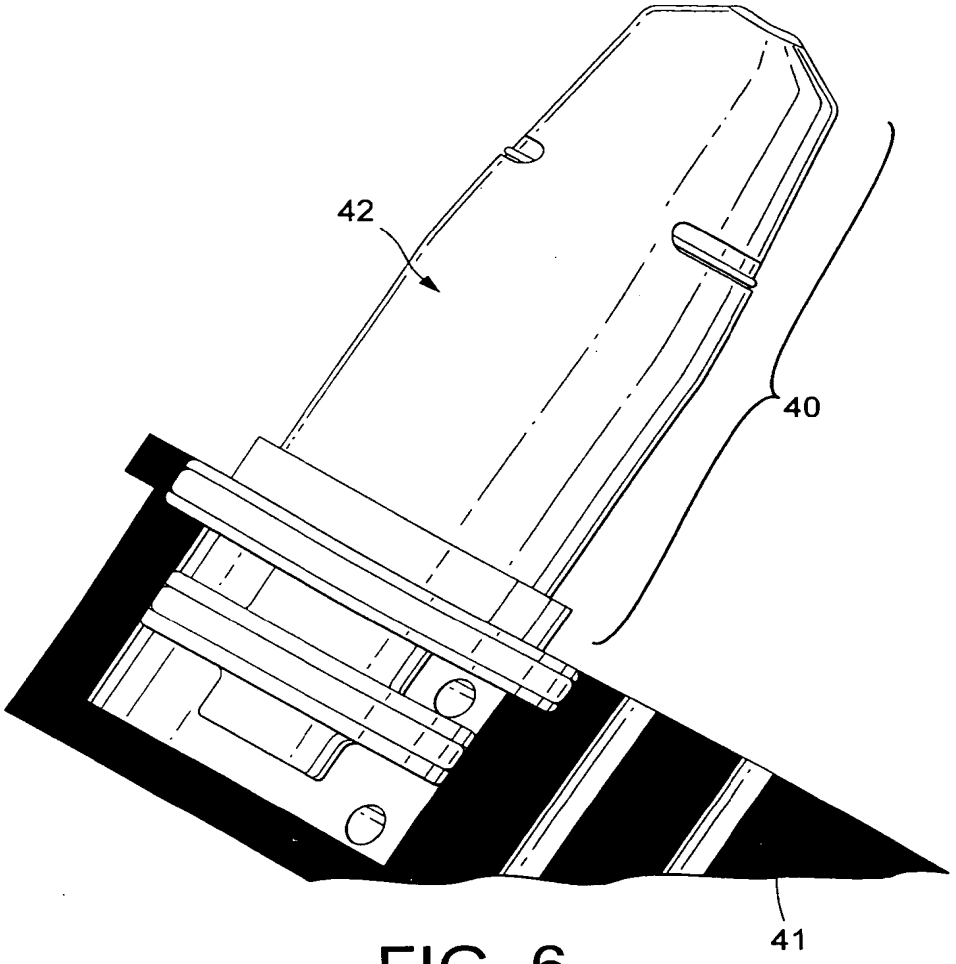


FIG. 6

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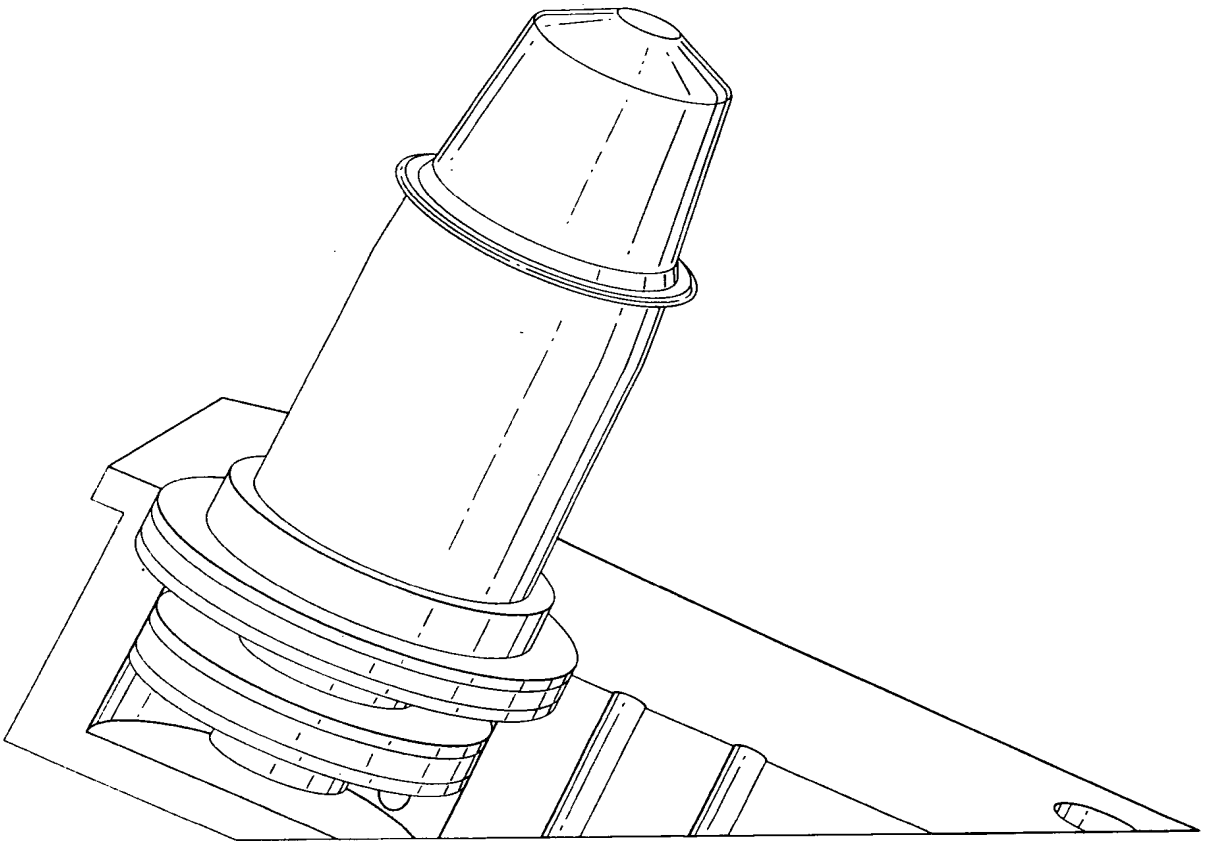


FIG. 7

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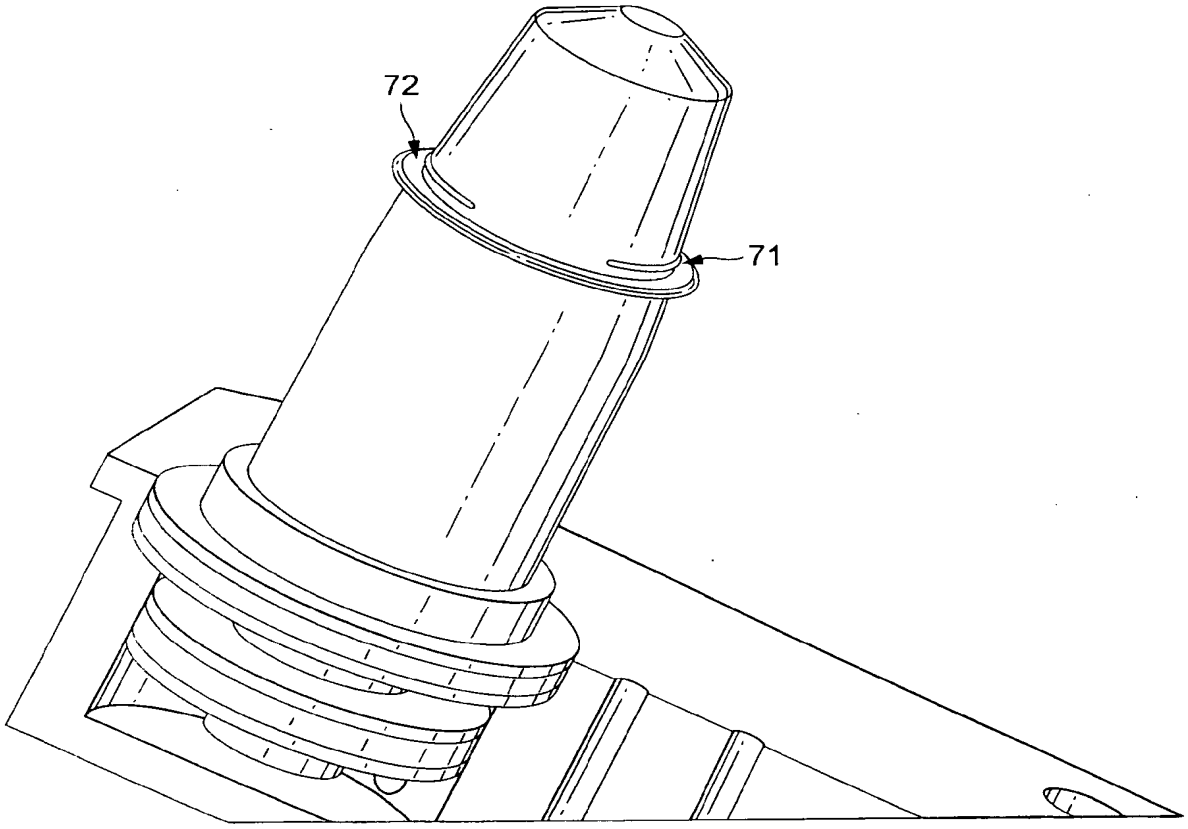


FIG. 8

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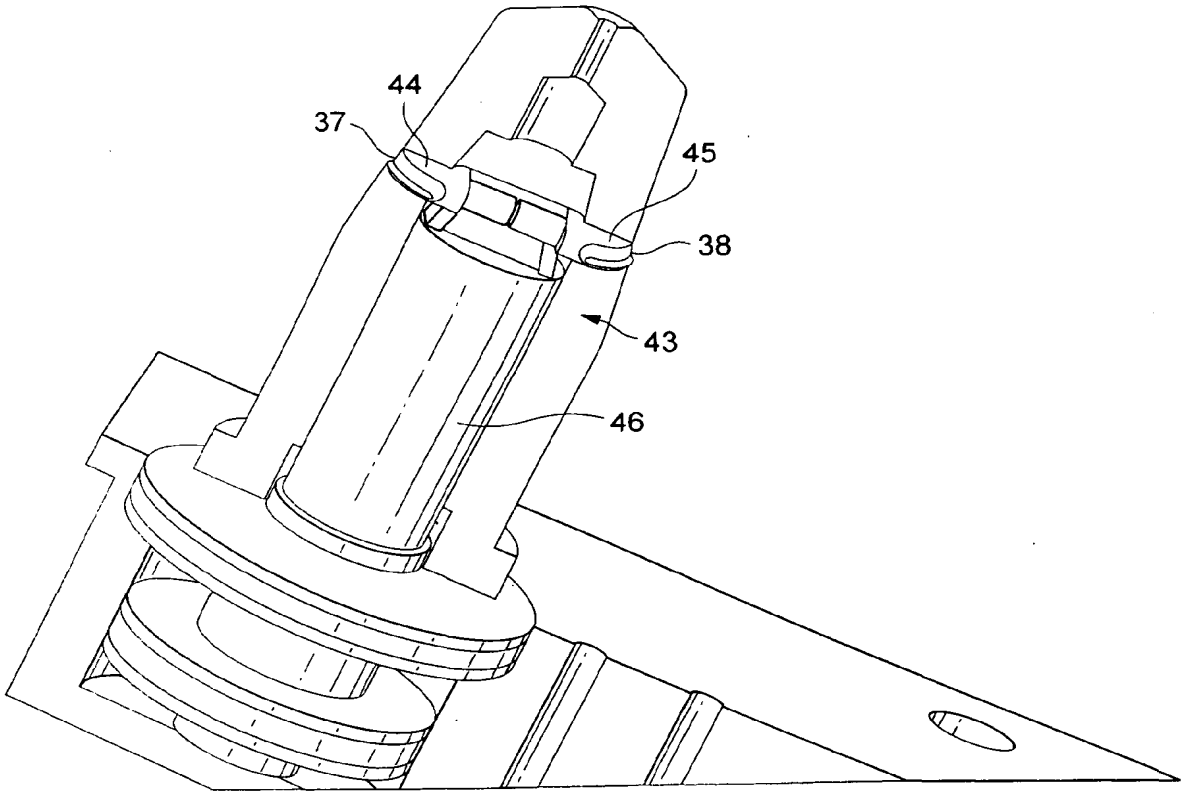


FIG. 9

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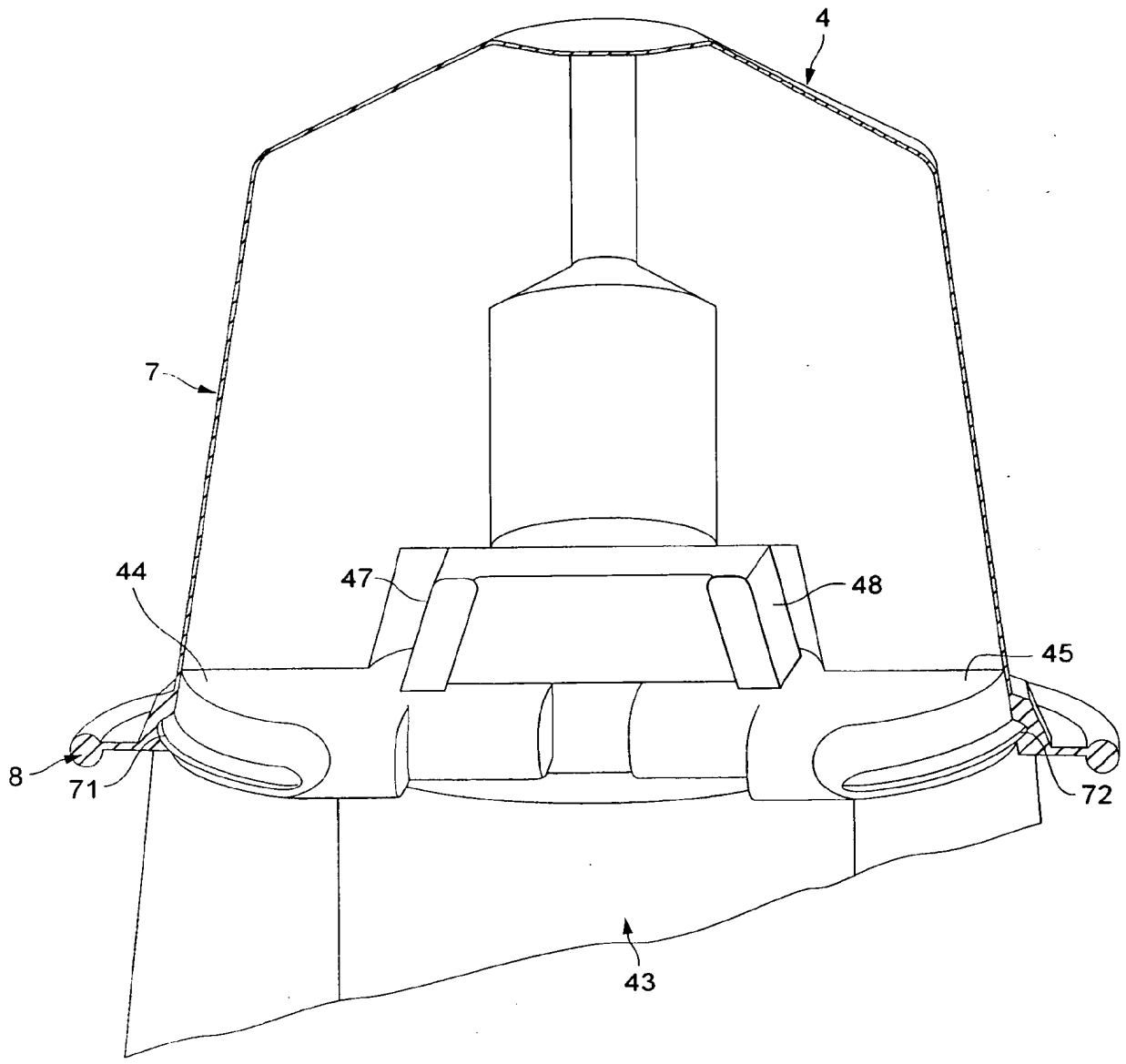


FIG. 10

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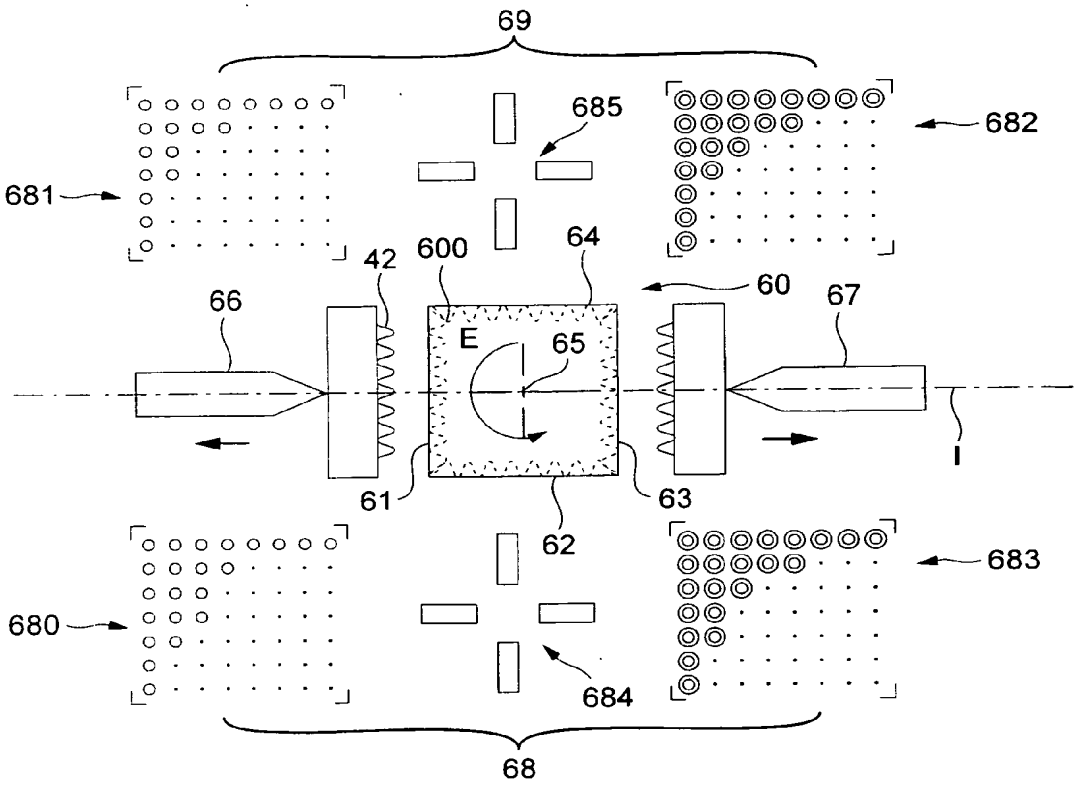


FIG. 11

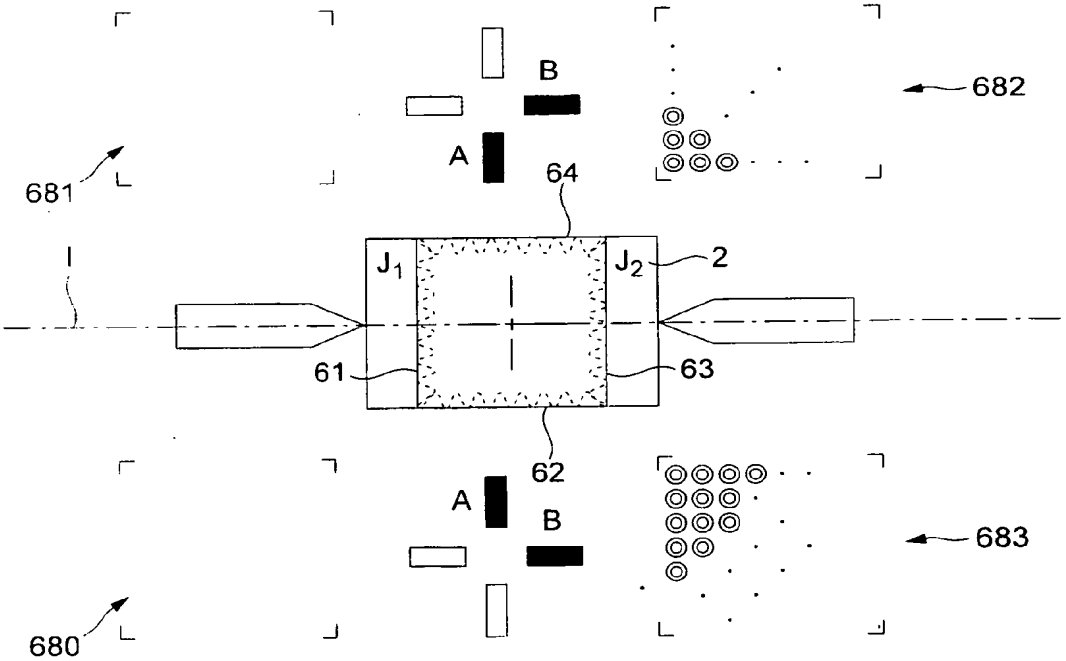


FIG. 12

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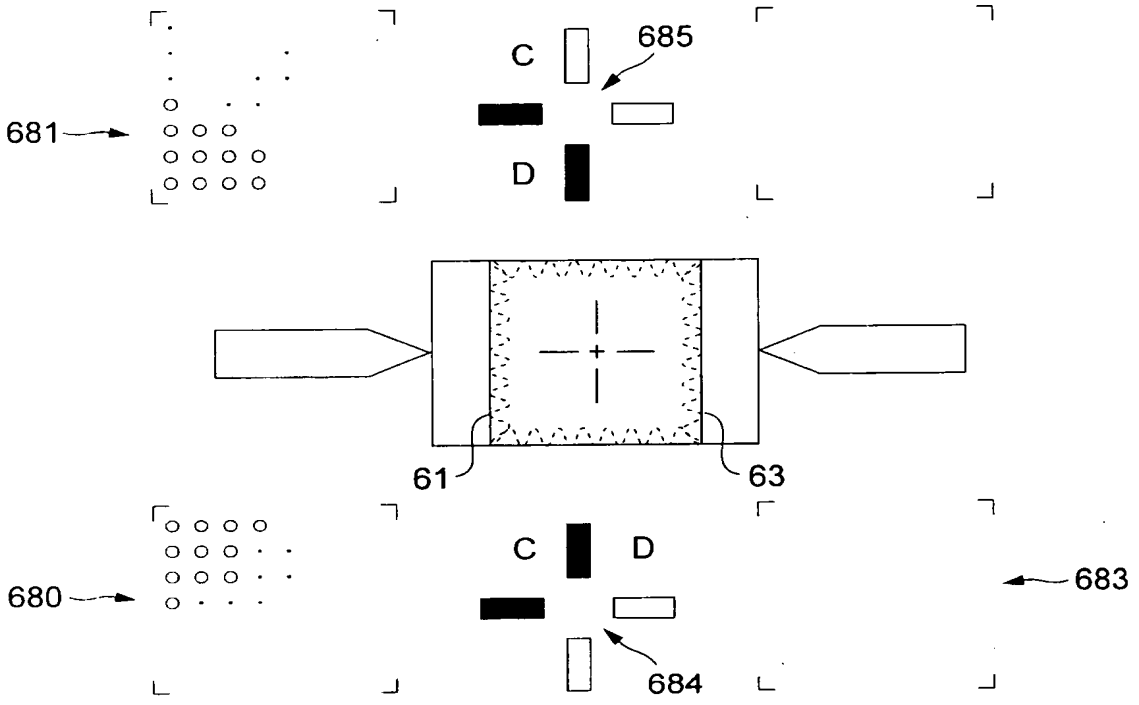


FIG. 13

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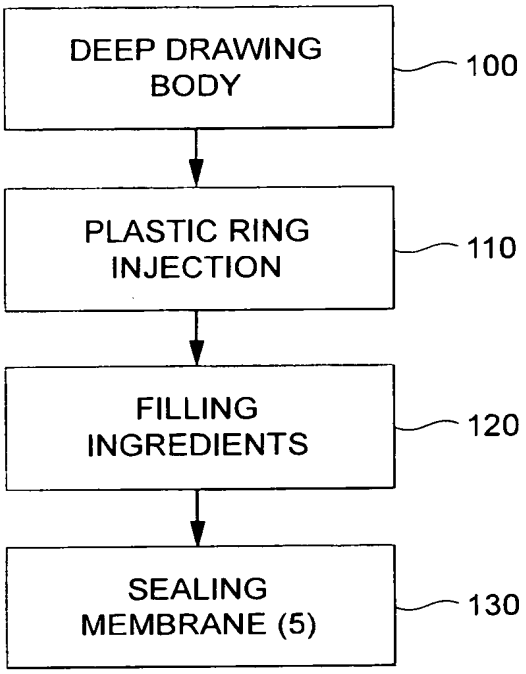


FIG. 14

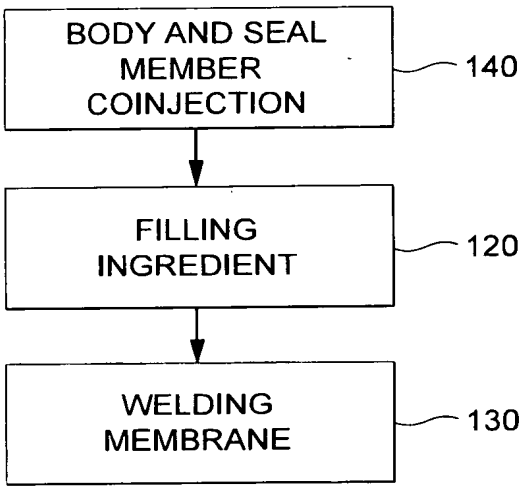


FIG. 15

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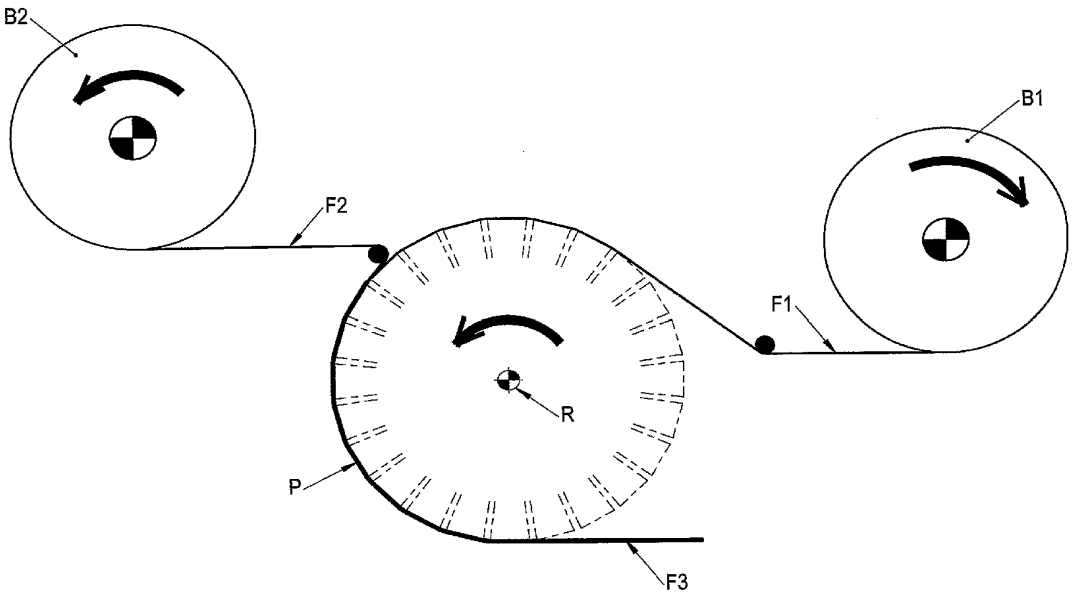
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(54) **Title:** FILTER PAPER POD PACKAGING MACHINE



(57) **Abstract:** A filter paper pod packaging machine characterised by the fact that it comprises a polygonal prismatic wheel (P) with an intermittently rotating horizontal axis (R), each flat face (L) of the prism (P) directly incorporating at least one recess (G) matching the size and shape of the pods to be produced.

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FILTER PAPER POD PACKAGING MACHINE

Field of the art

The present invention refers to the engineering of machines for packaging products in filter paper pods. International reference classification B65b.

State of the art

The use of filter paper pods to package individual portions of ground products is well known in the art. Pods containing ground coffee of varying particle size are widely used. All the machines known up to now pose specific problems, especially as regards control over the degree of compacting. Moreover, the presently available machines do not perform reliably and are incapable of maintaining the high output rates demanded by the market. The problem to be solved, therefore, is to produce economical and reliable pods at a fast rate and with constant precision in terms both of the product weight per packaged dose and its degree of compactness, also where the particle size is not homogeneous.

The pod packaging machine as envisaged in the present invention solves all the above-described problems and is highly economical both to manufacture and to operate in an industrial setting.

Besides occupying a minimal surface area, the machine of the present invention has a highly compact en bloc structure.

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Description

The invention will now be explained referring to the appended drawings, which serve solely illustrative purposes and in no way limit the scope of the invention itself.

Figure 1 is a schematic axonometric representation of a carousel with an intermittently rotating horizontal axis (R) and a circumference shaped as a polygonal prism (P) whose flat faces (L) have recesses which are directly impressed in the surface (G) and geometrically match the shape and size of the pods that will be made. It is possible to note the presence of twin recesses (G) on each face of the prism.

Figure 1bis is a schematic axonometric representation of a carousel with an intermittently rotating horizontal axis (R) and a circumference shaped as a polygonal prism (P) whose flat faces (L) are equipped with interchangeable dies (S) featuring twin recesses (G).

Figure 2 schematically represents the routing of two webs of filter paper (F1, F2), fed out from their respective spools (B1, B2) and wrapped, one overlying the other, around the flat faces of the polygonal carousel (P).

Figure 3 is an axonometric diagram showing the routing of the filter paper on the infeed (F1, F2) and outfeed (F3) side.

Figure 4 illustrates the execution, using means known to the art and hence not shown, of a first series of cuts (t) on the flat section (1) of the

filter paper (F1).

Figure 5 illustrates the execution of a second series of cuts in the second flat section (2) and a depression (G) in the central part of the flat section (1) obtained by means of a forming punch indicated by the arrow (M).

Figure 6 illustrates the feeding of a predetermined dose (I) of product into the zone of the respective depression (C).

Figure 7 illustrates the operation of a flat tamping punch (N') for forming asymmetrical pods.

Figure 7bis, similar to figure 7, illustrates the operation of a concave tamping punch (N) for forming symmetrical pods.

Figure 8 illustrates the arrival of the filter paper (F2), which is applied over the compacted dose.

Figure 9 shows, on a duly enlarged scale, the greater flaring (W) of the cuts (t) during the action of the forming punch (M), which serves to obtain a deeper depression (C). It may be noted that the action of the flat tamping punch (N') has compacted the entire dose flush with the face of the prism so as to create an asymmetrical pod. Figure 9bis, similar to figure 9, shows, on a duly enlarged scale, the lesser flaring (I) of the cuts (t) during the action of a forming punch (M) serving to obtain a shallower depression (C). It may be noted that the action of the concave tamping punch (N) has compacted the coffee so as to create a symmetrical pod.

Figure 10 illustrates the configuration of the operating sequence for asymmetrical compacted pods.

Figure 10bis, similar to figure 10, refers to the operating sequence for producing symmetrical compacted pods.

Figure 11 illustrates the operation of die cutting around the edge of the packaged pods. Figure 12 illustrates the separation of the asymmetrical pods (A) from the double layer of filter paper (F3).

Figure 12 bis illustrates the separation of symmetrical pods (E).

Figure 13 illustrates, on a duly enlarged scale, the separation of a type (A) asymmetrical flat-topped compacted pod.

Figure 13bis illustrates, on a duly enlarged scale, the separation of a type (E) symmetrical compacted pod.

Figure 14 is an axonometric view of a type (A) asymmetrical flat-topped compacted pod.

Figure 14bis is an axonometric view of a symmetrical compacted pod (E).

Figure 15 is a front view of an asymmetrical flat-topped compacted pod (A).

Figure 15b is a front view of a symmetrical compacted pod (E).

Figure 16 shows the distribution, as seen from above, of a series of cuts (t) around the central zone of the flat face (L) of the prism (P).

Figure 17 shows how the cuts are flared (I) to make symmetrical pods.

Figure 18 shows how the cuts are flared to a greater degree (W) to make an asymmetrical flat-topped compacted pod, given the greater depth of the depression formed.

Figure 19 schematically represents, in a cross-section view, the action of a forming punch (M), which is such as to lend the filter paper (F1) the deeper shape (C) required for the bottom half of a flat-topped pod.

Figure 20 illustrates a dose of product being fed for packaging in a type (A) asymmetrical flat-topped pod.

Figure 21 illustrates the action of a flat tamping punch (N'), which is such as to level out the dose of product in the depression (C) formed in the filter paper (F1) to create an asymmetrical pod. Figure 22 illustrates the sealing of a compacted asymmetrical pod with a flat filter paper top (F2).

Figures 19bis, 20bis, 21bis and 22bis are similar to figures 19, 20, 21 and 22 and represent the action of a concave punch (N"), which is such as to increase the degree of compacting of the same dose of product to create a concave asymmetrical pod.

Figures 19ter, 20ter, 21ter and 22ter represent the action of a concave punch (N), which is such as to increase the degree of compacting of the same dose of product to create a symmetrical pod.

In the figures, the individual details are marked as follows:

A is a flat-topped compacted pod.

B1 is the spool of filter paper (F1).

B2 is the spool of filter paper (F2).

C is the depression formed in the filter paper (F1)

E is a compacted pod of standard shape and size.

F1 is the filter paper to be impressed with the forming punch (M).

F2 is the filter paper for creating the pods.

F3 indicates the overlaying of the two filter papers (F1, F2).

G indicates a recess directly impressed in the flat faces of the prism or the interchangeable dies (S).

L indicates the flat faces of the polygonal prism.

N indicates the tamping punch for the standard type of pods (E).

N' indicates the tamping punch for type (A) compacted pods.

N" indicates the convex tamping punch for type (A) pods.

P is the polygonal prism-shaped carousel.

R indicates the axis around which the carousel rotates intermittently.

t indicates the cuts on the filter paper (F1).

T indicates the flaring of the cuts (t).

W indicates a larger flaring of the cuts (t) to enable the formation of deeper recesses (C).

I, II, III, IV indicate the doses fed for packaging in pods.

1, 2, 3, 4 indicate an orderly sequence of sections where the filter paper

will be flat during the pod packaging process.

The figures clearly evidence the compact structural architecture of the packaging machine to which the present invention relates. The invention naturally lends itself to different embodiments as regards both the dimensions and structural proportions of the various parts making up the packaging machine.

It is apparent that the number of sides of polygon may vary, as may the geometric proportions of the prismatic carousel.

It is likewise apparent that the number of recesses (G) and their distribution on the faces (L) of the prism may vary. The choice of cuts (t) will also be adapted to the depth of the depression required.

All the devices that are not illustrated are understood as being made using known systems and actuated with technological components known in the art. Therefore, the scope of the present invention shall encompass all packaging machines featuring the basic, original characteristics described and illustrated herein.

The technological choices that may optimise the functionality of the packaging machine of the present invention are: the number of sides of the polygon, the diameter of the polygonal wheel, the length of each side of the polygon, the width of the prism, the number of recesses (G) and their distribution on the faces of the prism, the distribution and size of the

cuts (t), the proportions of the forming and tamping punches (M; N, N', N"), the devices actuating the intermittent rotation of the wheel with a horizontal axis and the filling device for measuring out and dispensing the pre-established doses.

Now that the original innovative characteristics of the present invention have been made apparent, anyone with average skill in the art may construct filter paper pod packaging machines having the basic characteristics as described and illustrated in the following claims.

Claims

1) A filter paper pod packaging machine **characterised by the fact that** it comprises a polygonal prismatic wheel (P) with an intermittently rotating horizontal axis (R), each flat face (L) of the prism (P) directly incorporating at least one recess (G) matching the size and shape of the pods to be produced.

2) The filter paper pod packaging machine of the previous claim, **characterised by the fact that** each flat face (L) of the prism (P) may be equipped with interchangeable dies (S) featuring recesses (G) that geometrically match the size and shape of the pods to be produced.

3) The filter paper pod packaging machine of claims 1 or 2, **characterised by the fact that** by varying the length of each side of the polygon and by varying the width of each face of the prism it is possible to create a plurality of recesses (G) on each flat face (L) of the prism, either in a radial or axial configuration, in one or more rows.

4) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** a web of filter paper (F1), fed out from its respective spool (B1), and overlaid by a second web of filter paper (F2) fed out from its respective spool, is wrapped

around the flat faces (L) of the polygonal prismatic wheel (P).

5) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** a series of cuts (t) are made in the flat filter paper (F1) in appropriate positions around the central zone corresponding to the recess (G) impressed in the prismatic wheel (P).

6) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** a forming punch (M) is applied on the web (F1) in the central zone surrounded by the cuts (t) to mould the web (F1) to the shape (C) of the recess (G), said moulding of the filter paper being optimised by the presence of cuts which flare out (T) to facilitate the formation of a depression in the filter paper web (F1) by action of the forming punch (M), while the peripheral zone of the filter paper (F1) remains flat and adherent to the face (L) of the prism (P).

7) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the forming punch (M) creates a deeper recess (C) in the web (F1) by flaring the cuts (t) to a greater width (W), while the peripheral zone of the filter paper (F1) remains flat and adherent to the face (L) of the prism (P).

8) The filter paper pod packaging machine of the previous claims,

characterised by the fact that the greater depth of the recess (C) allows the pod to hold the same quantity of compacted product as symmetrical pods (E), the diameter being equal.

9) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the recesses (G) feature holes (f) through which suction is applied to attract the filter paper (F1), thereby facilitating the moulding of the latter to a shape (C) matching that of the recess (G) during the operation of the forming punch (M).

10) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the suction applied through the holes (f) in the recesses (G) remains on even after the forming punch (M) has completed its action in order to assure the adherence of the filter paper (F1) to the recesses (G) during subsequent processing.

11) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the depression (C), obtained by the action of the forming punch (M) on the filter paper (F1), is filled with a pre-measured volume of product that will be compacted by means of a specific concave tamping punch (N) for producing symmetrical pods.

12) The filter paper pod packaging machine of the previous claims, **characterised by the fact that** the deeper depression (C), obtained by the action of the forming punch (M) on the filter paper (F1), is filled with a pre-measured volume of product that will be compacted by means of a specific flat tamping punch (N') for producing asymmetrical pods and subsequently sealed with a flat top made from filter paper (F2) fixed onto the pod along the edges adherent to the faces (L) of the prismatic polygon (P).

13) Filter pod obtained with the packaging machine of the previous claims; **characterised by the fact that** being compacted and having a flat top it may be used to make an espresso of good quality with less coffee or an espresso of better quality with the same quantity of coffee.

FIG. 1

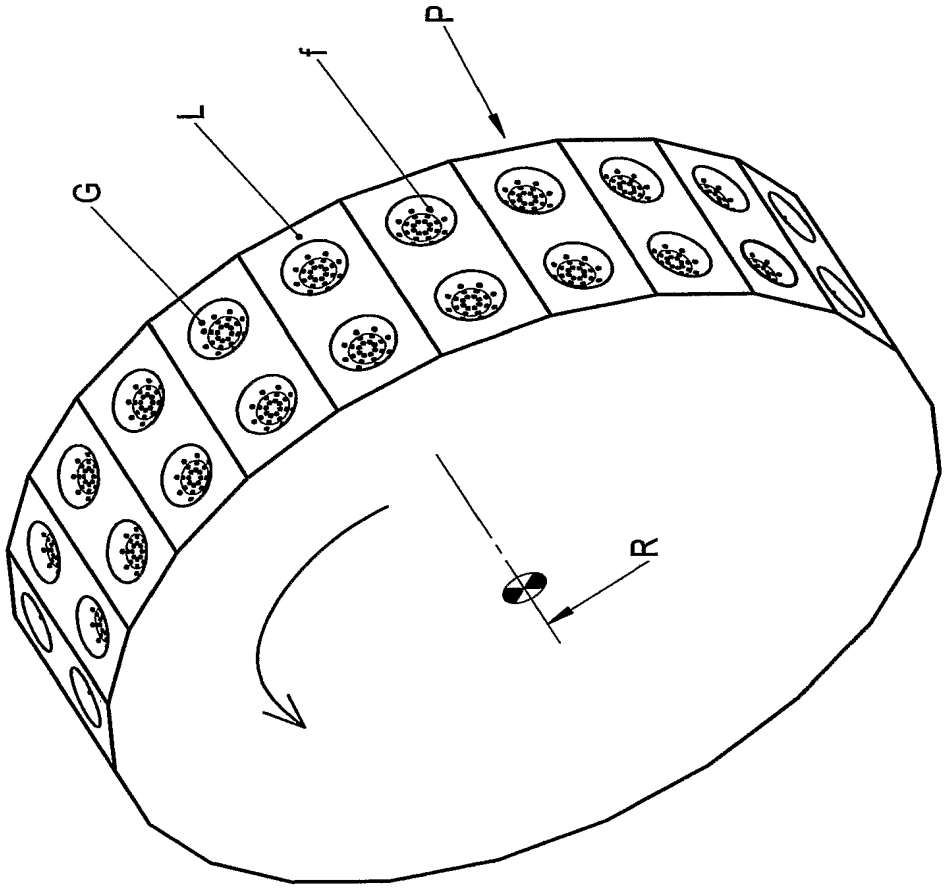
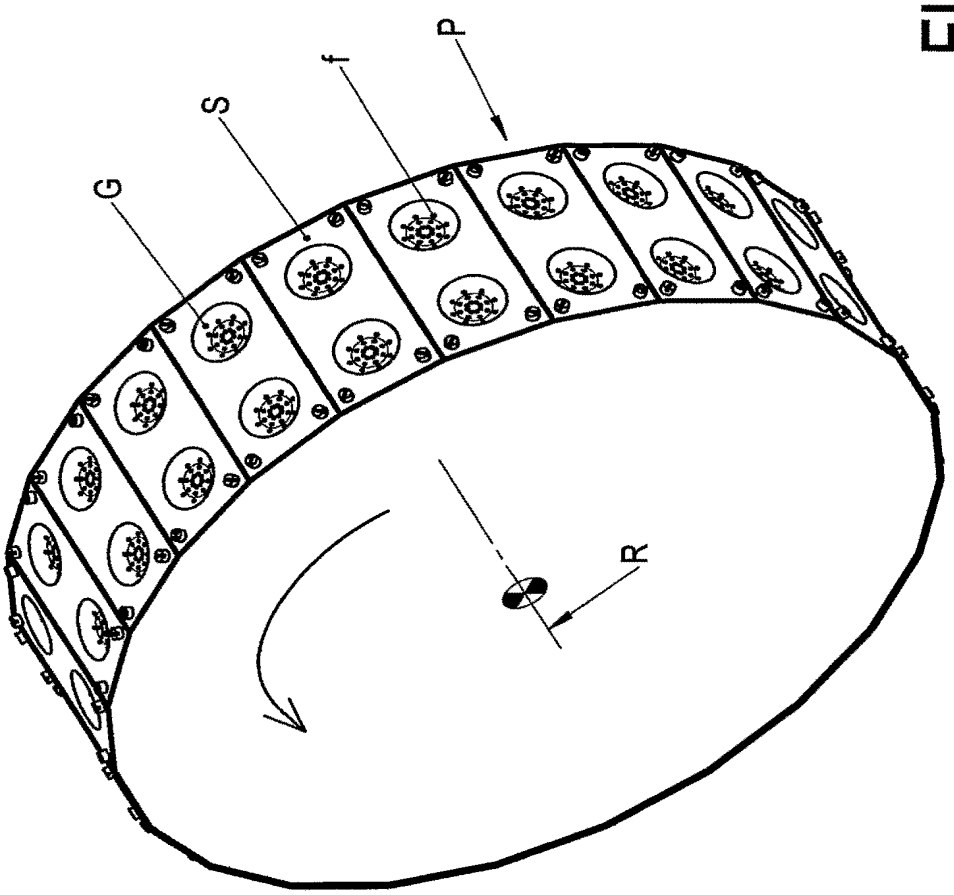
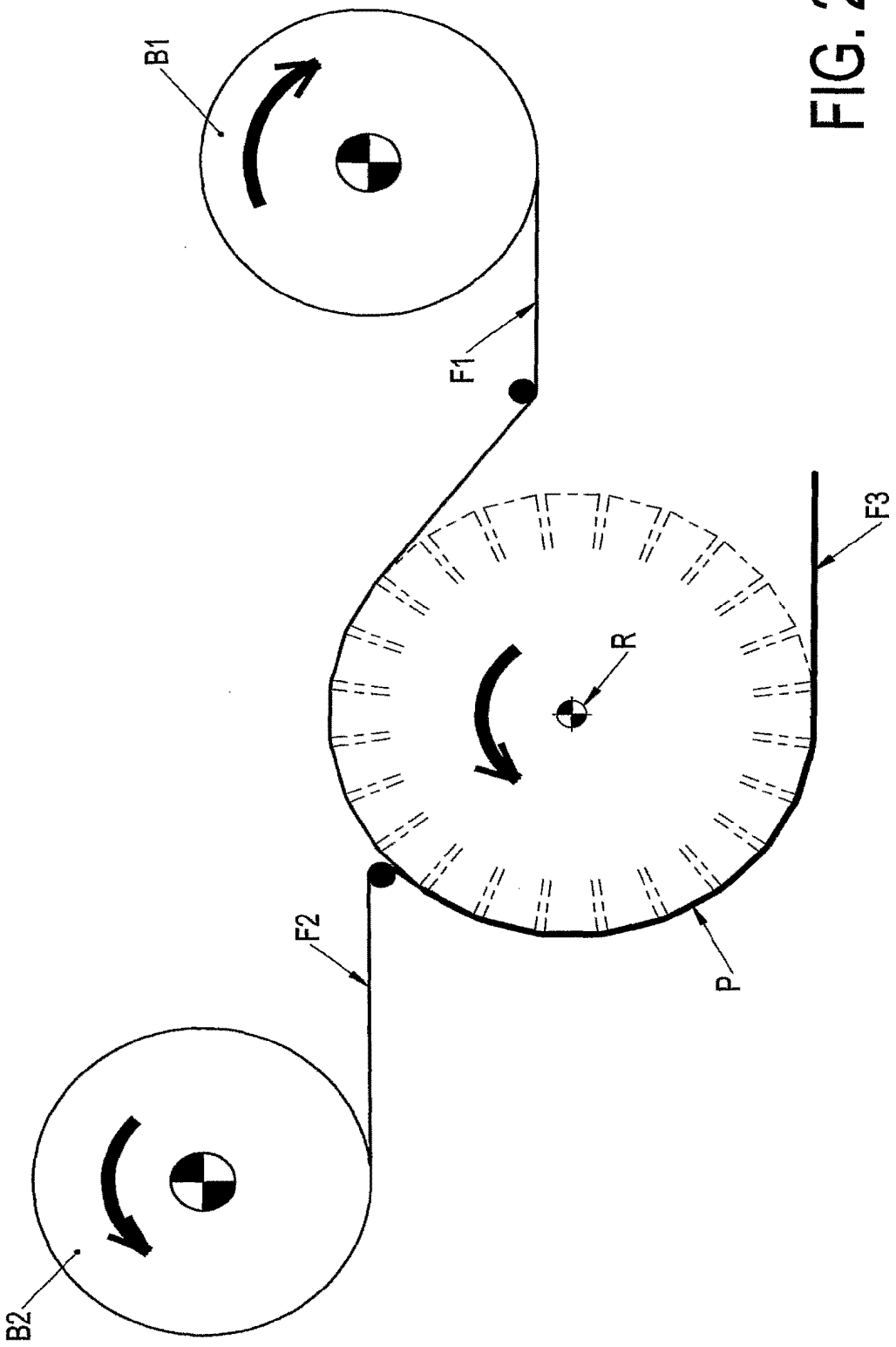


FIG. 1 BIS



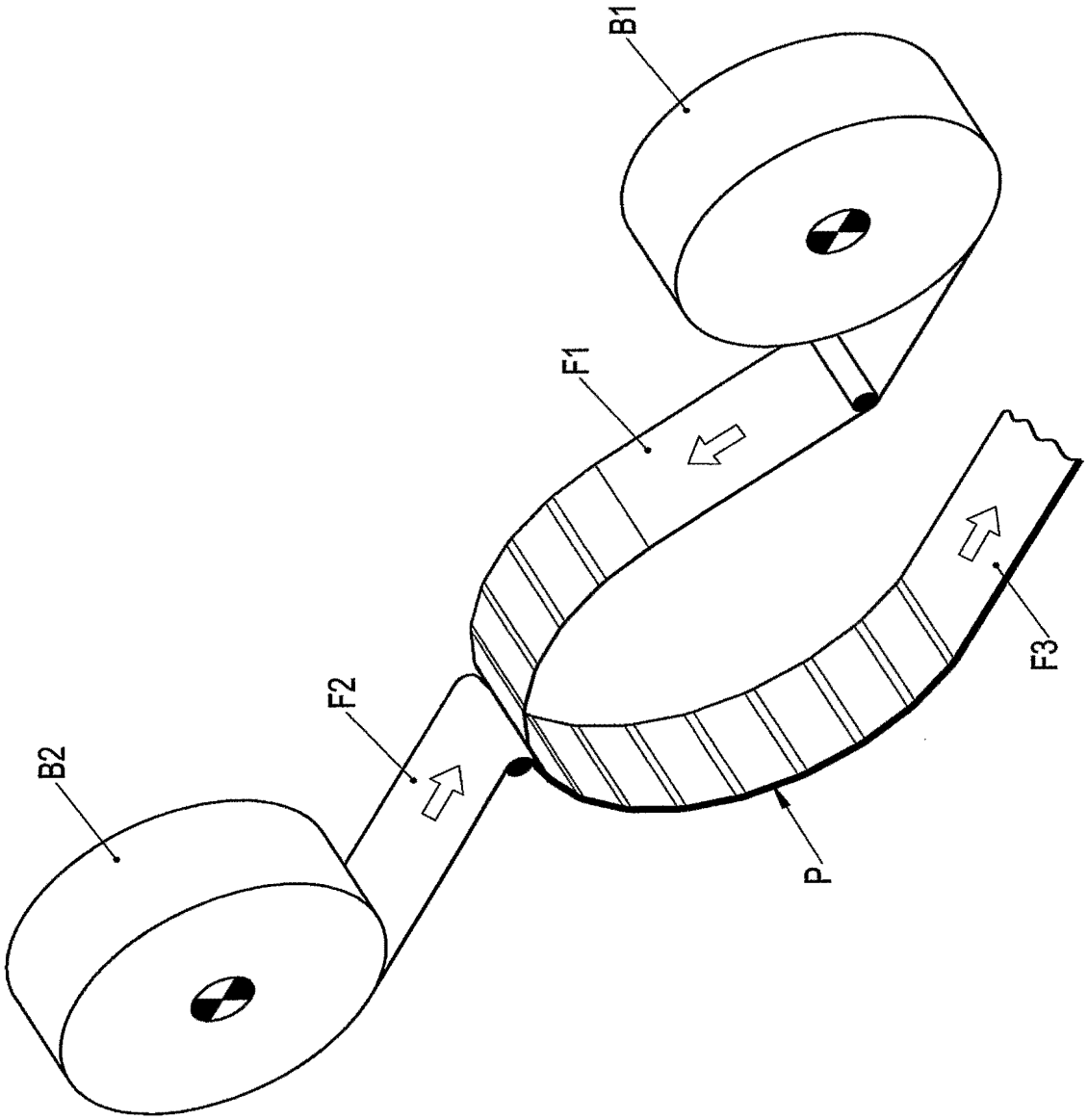
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FIG. 2



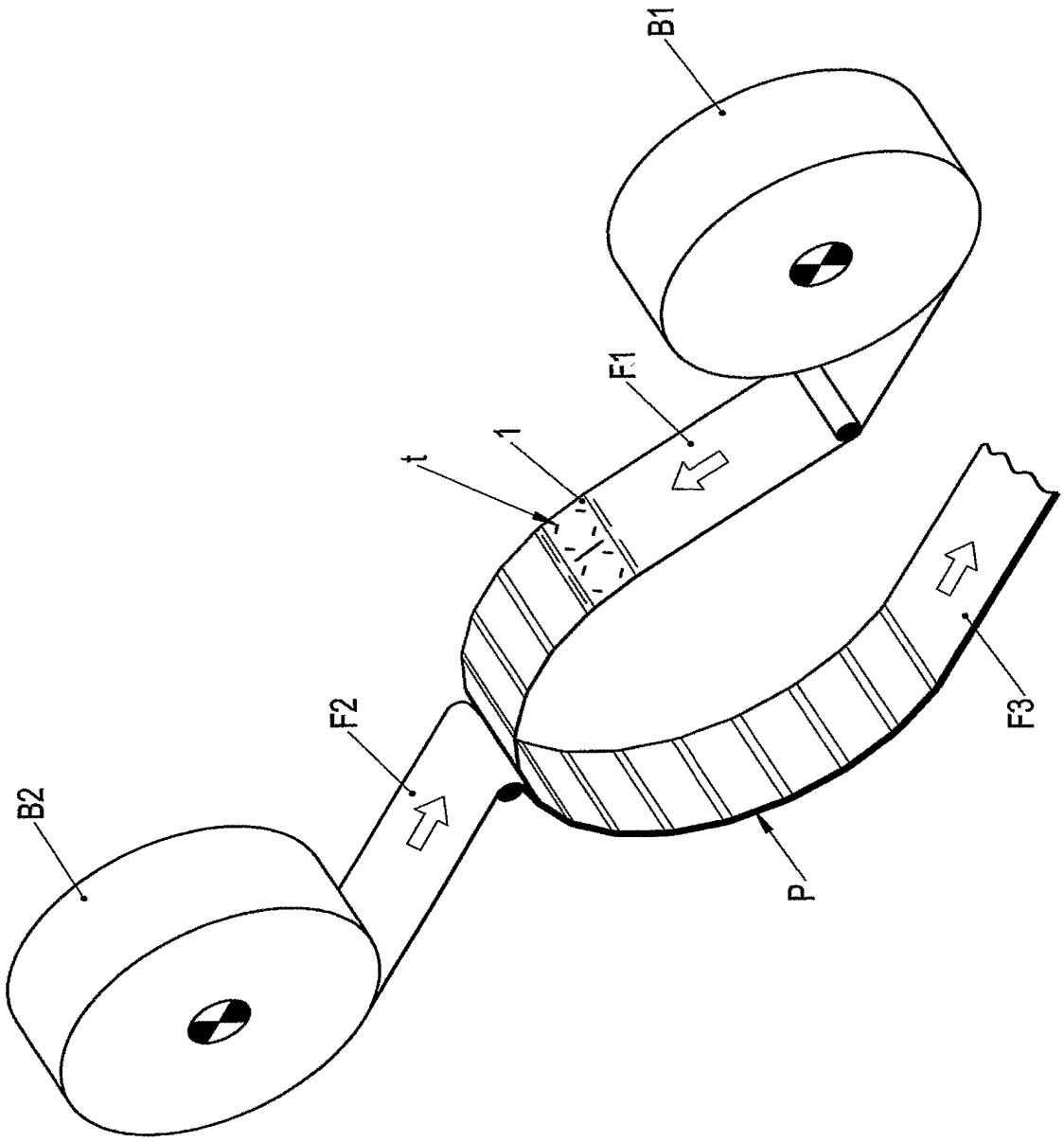
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FIG. 3



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FIG. 4



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FIG. 5

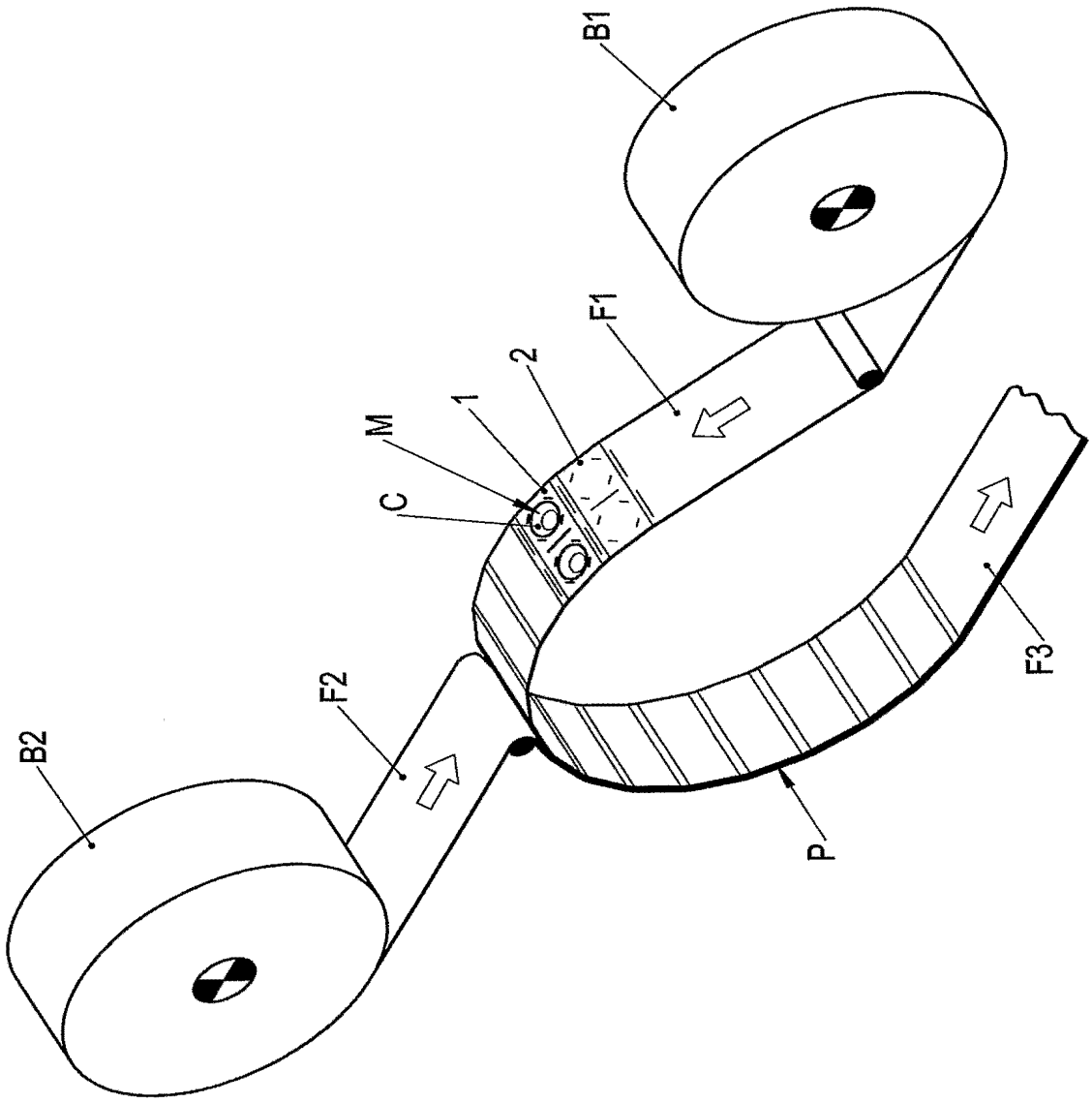


FIG. 6

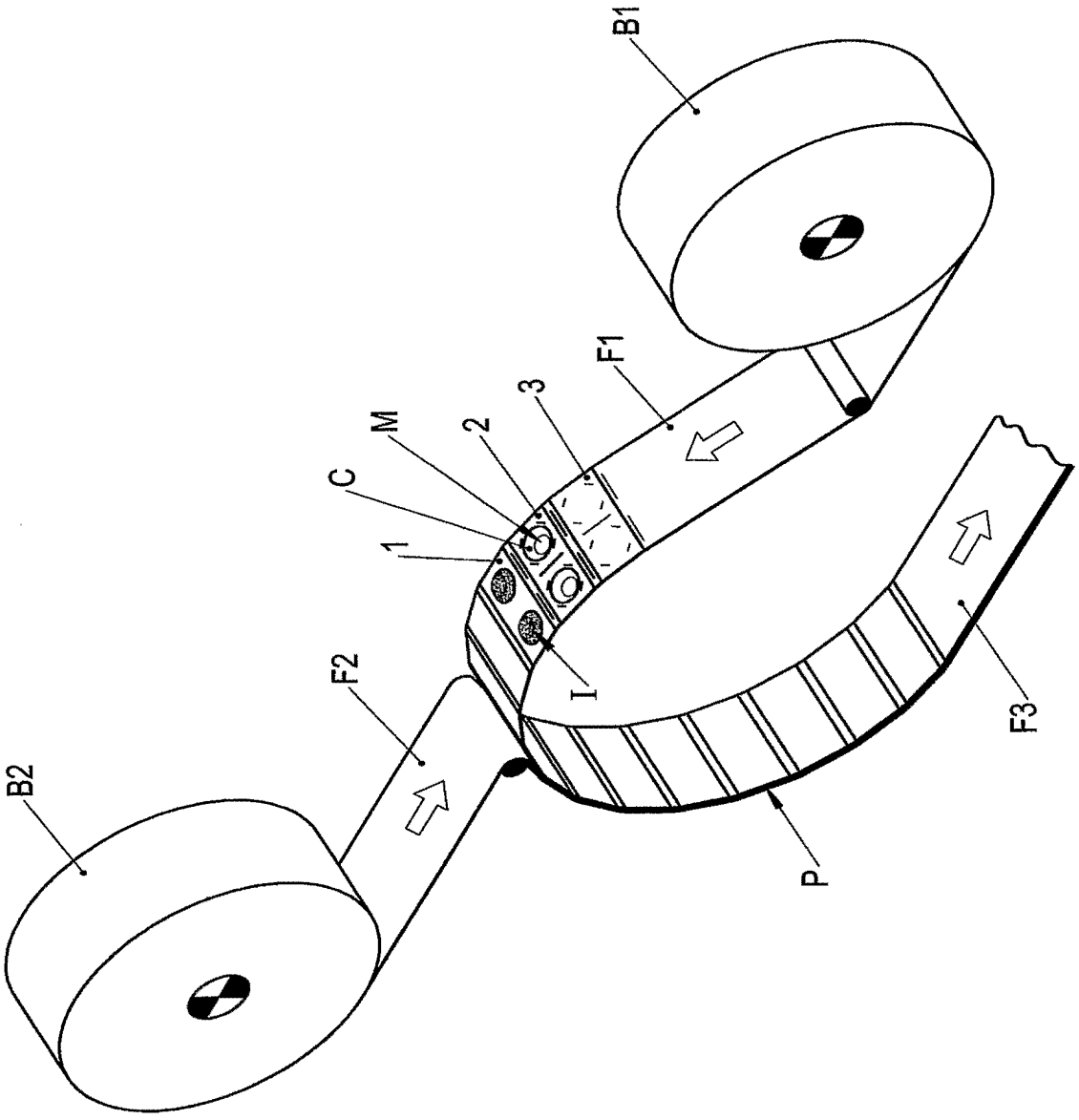


FIG. 7

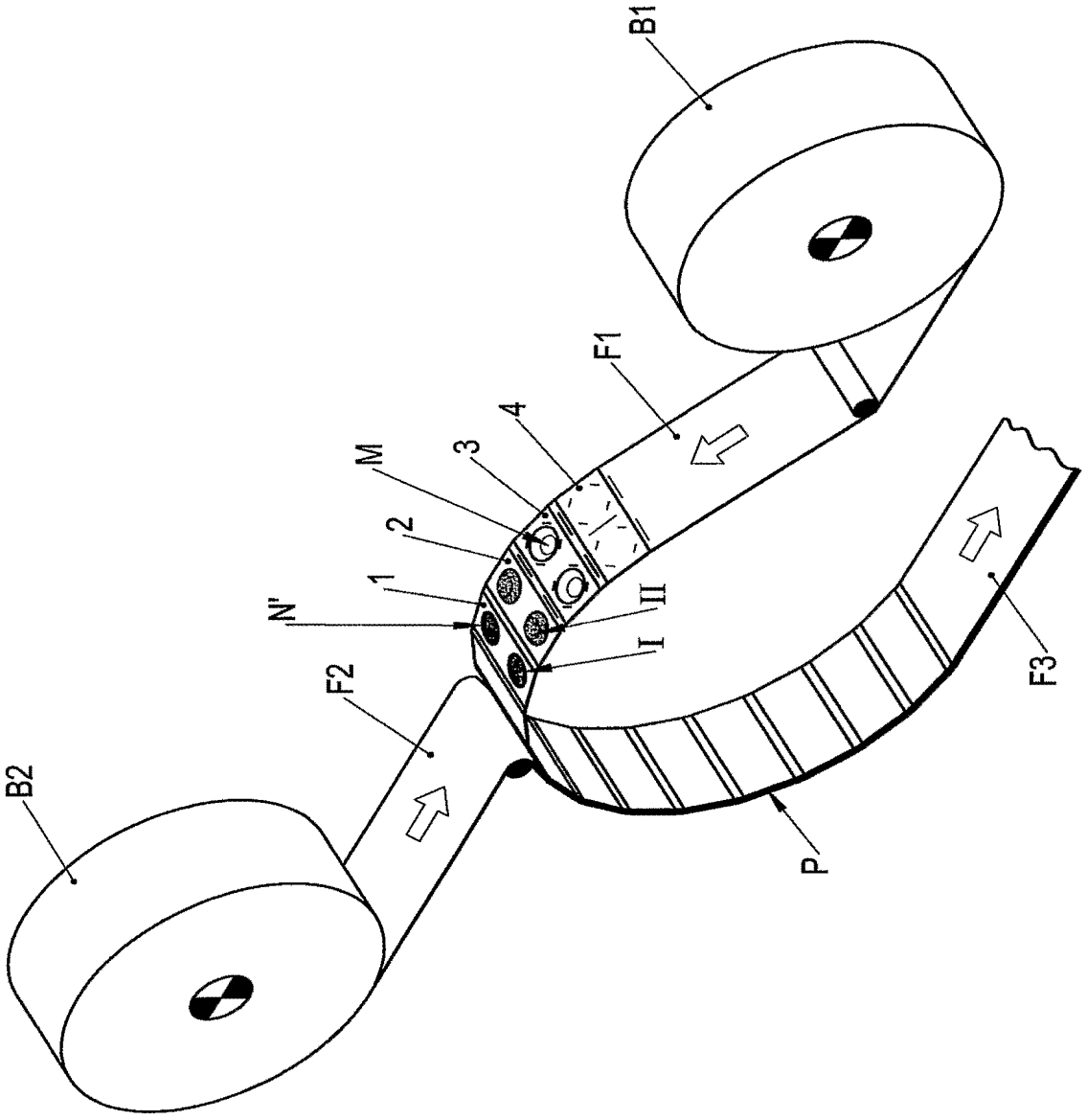


FIG. 7 BIS

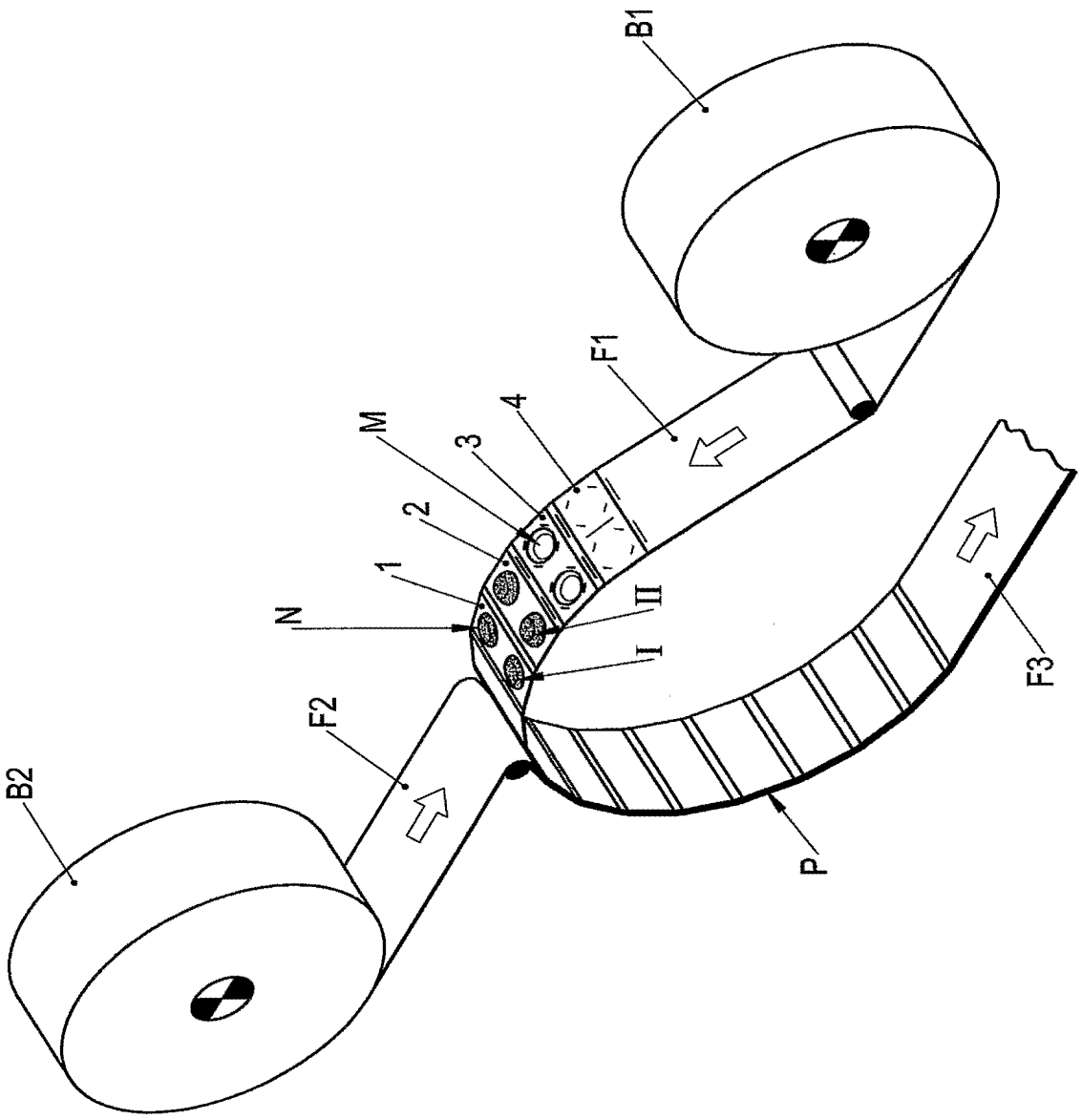


FIG. 8

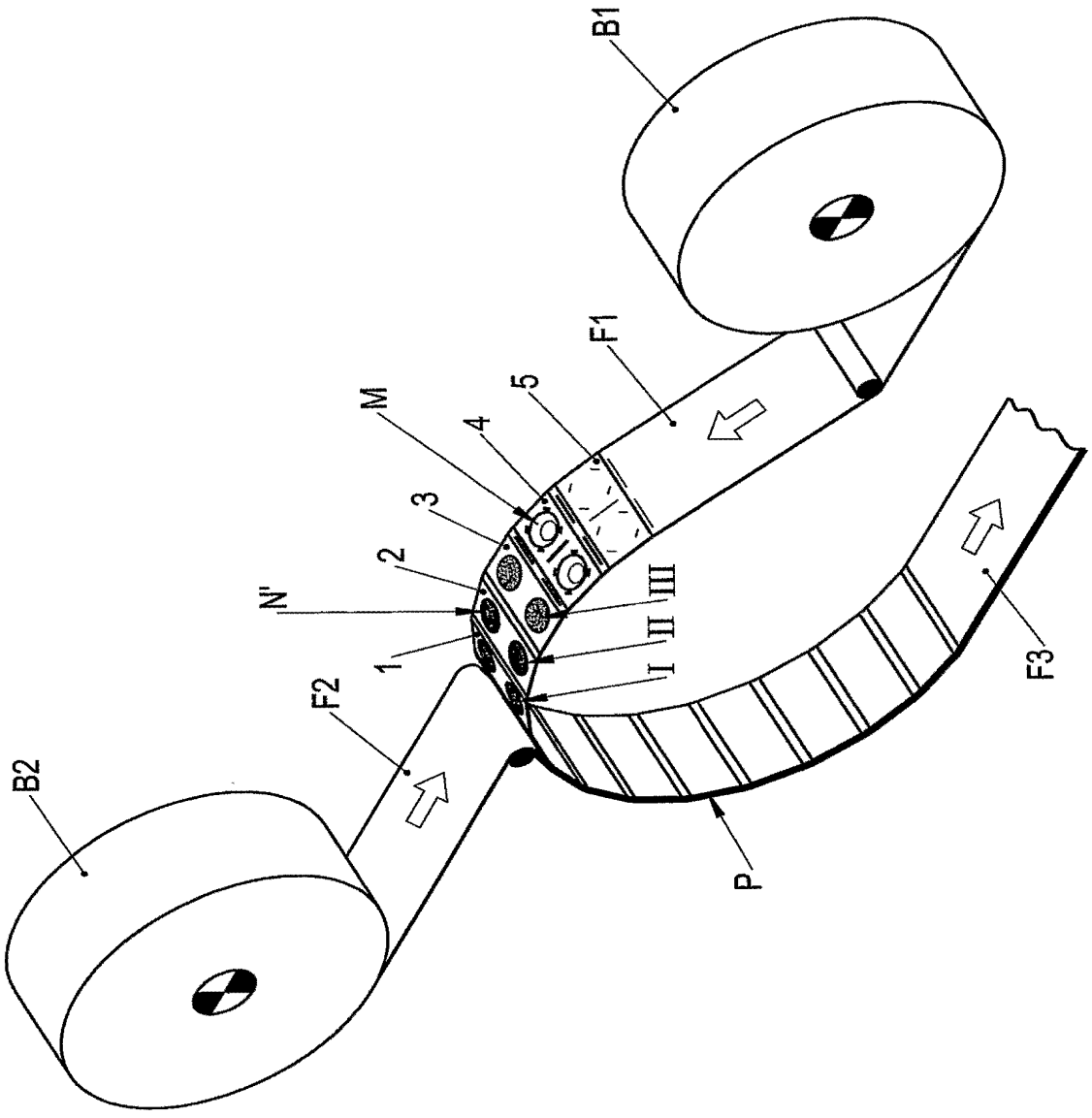


FIG. 9

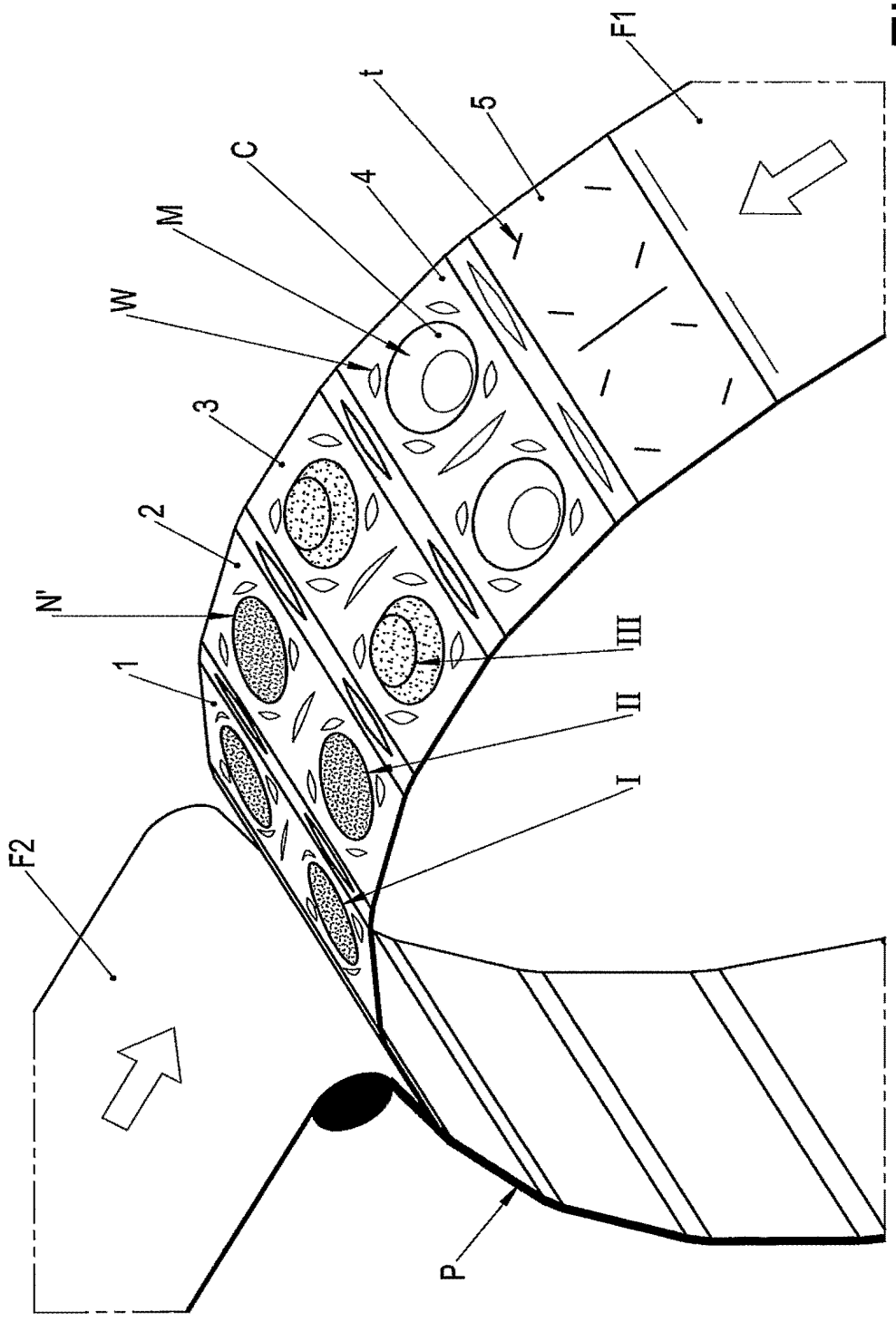


FIG. 9 BIS

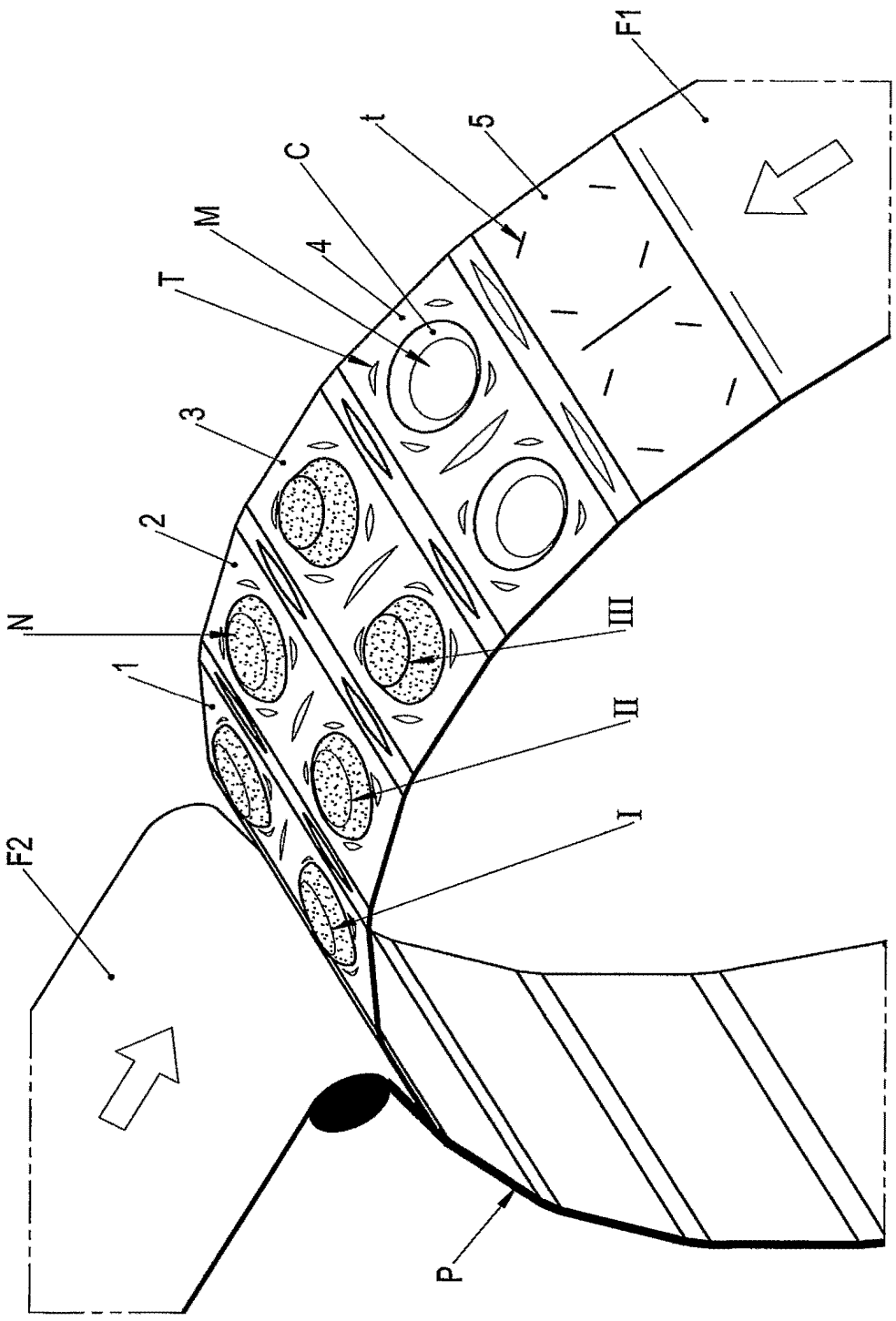


FIG. 10

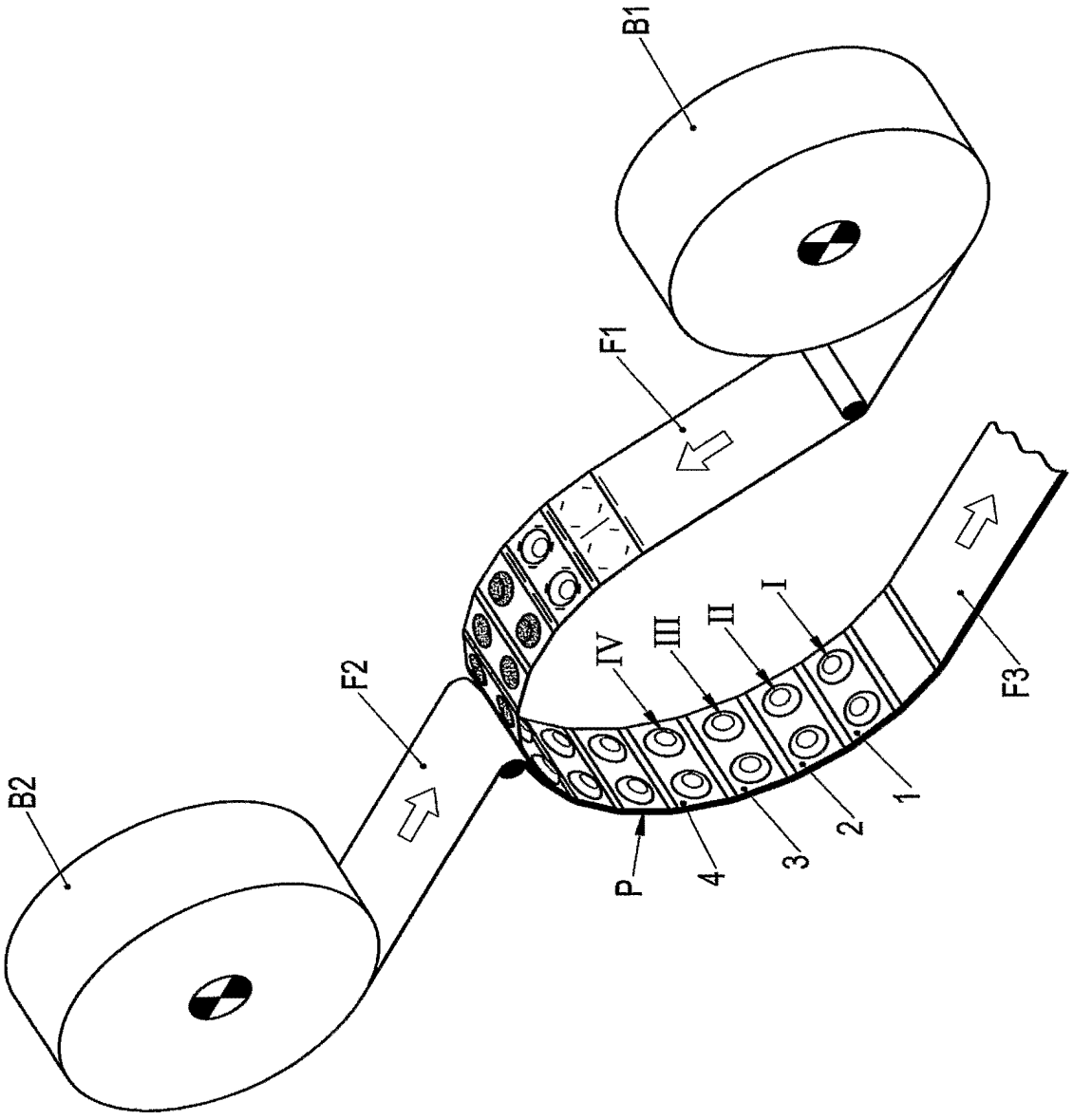


FIG. 10 BIS

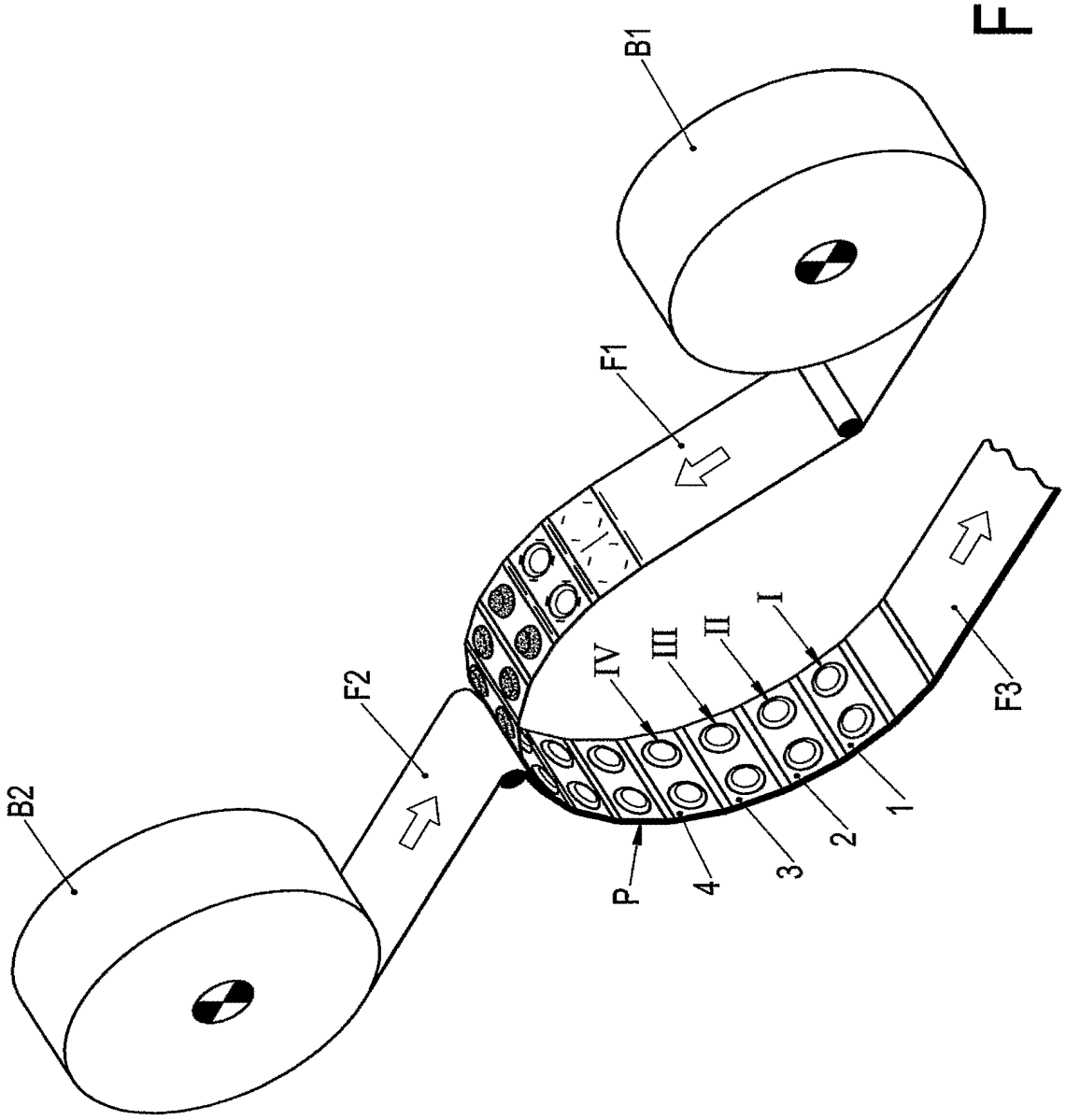


FIG. 11

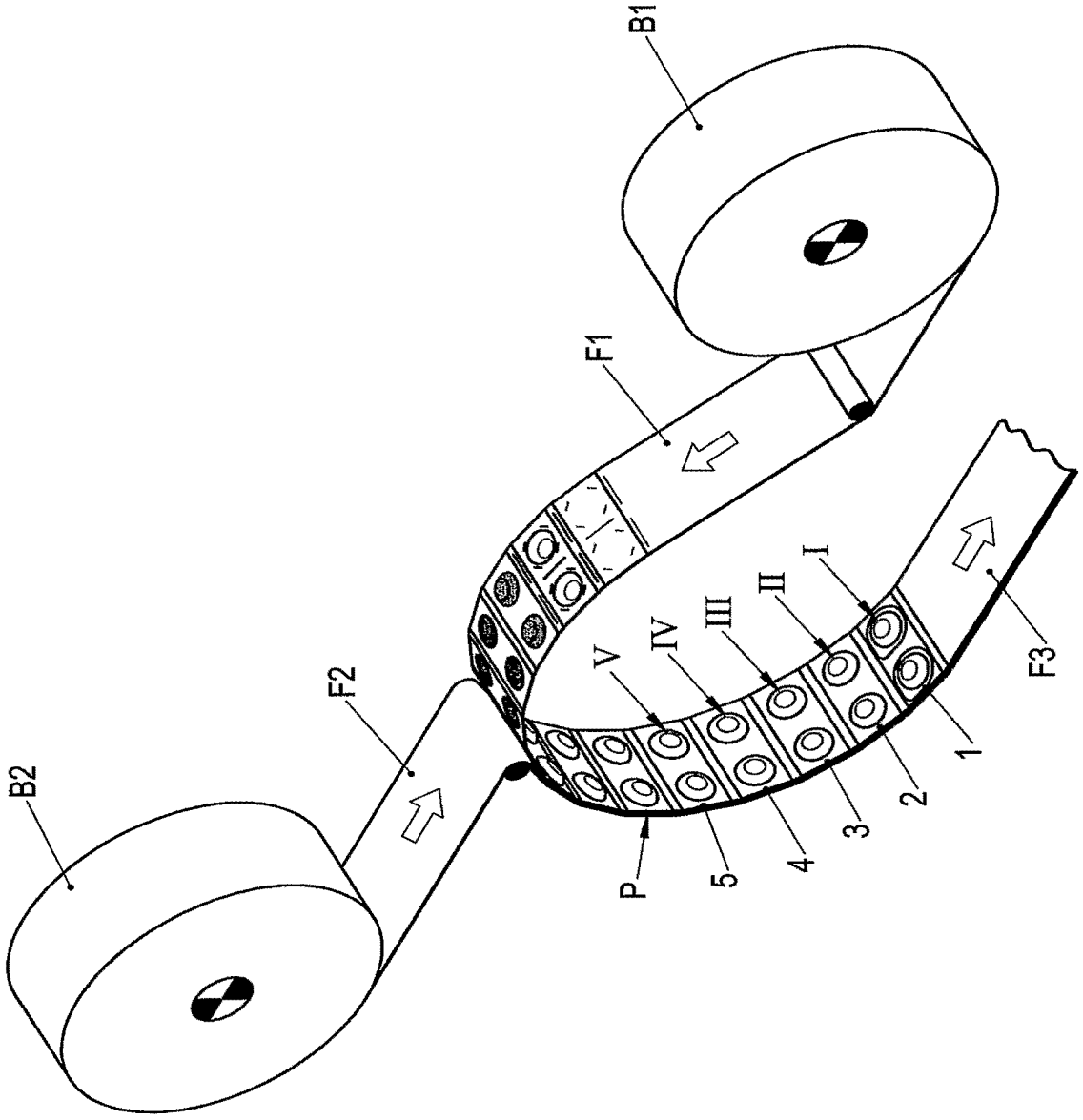


FIG. 12

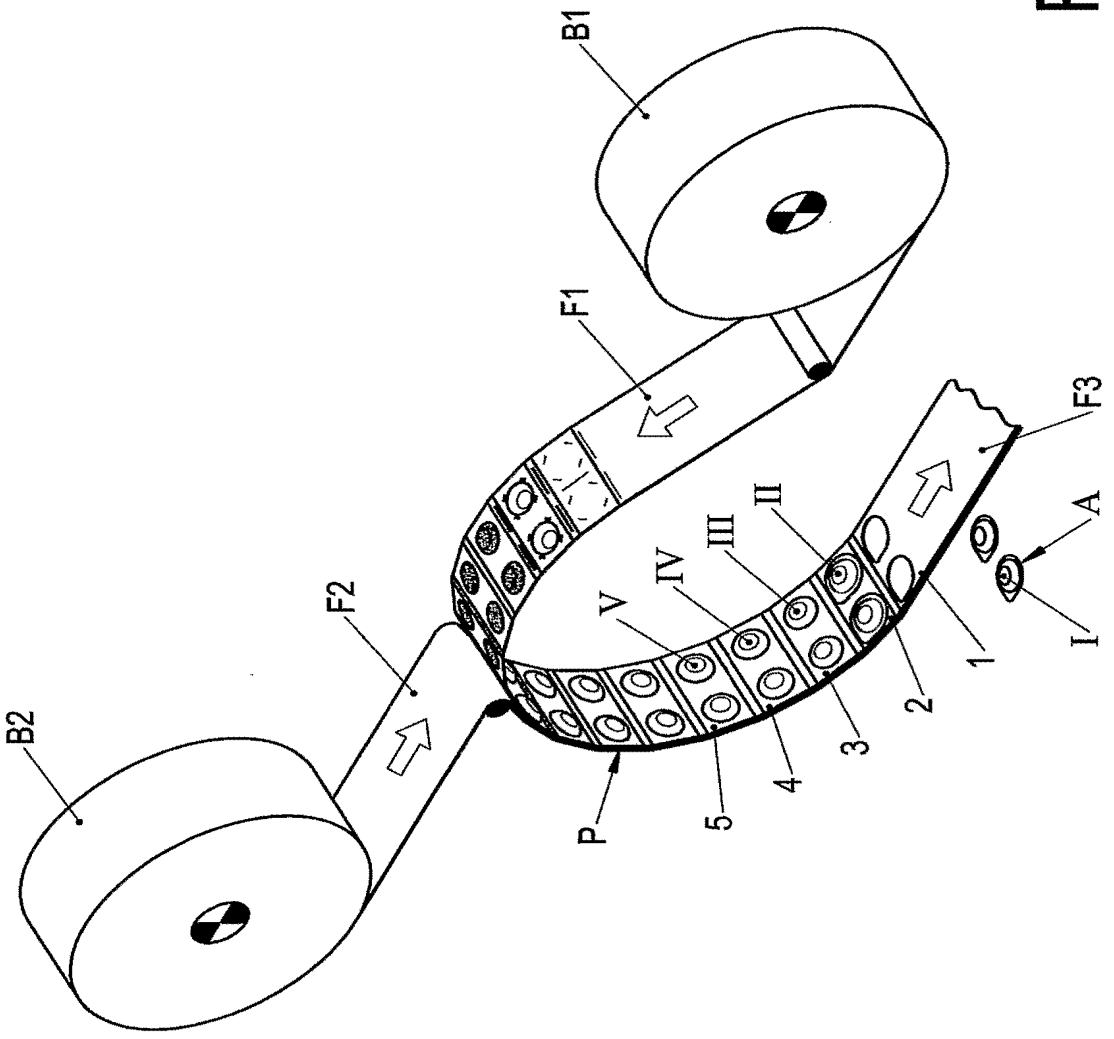


FIG. 12 BIS

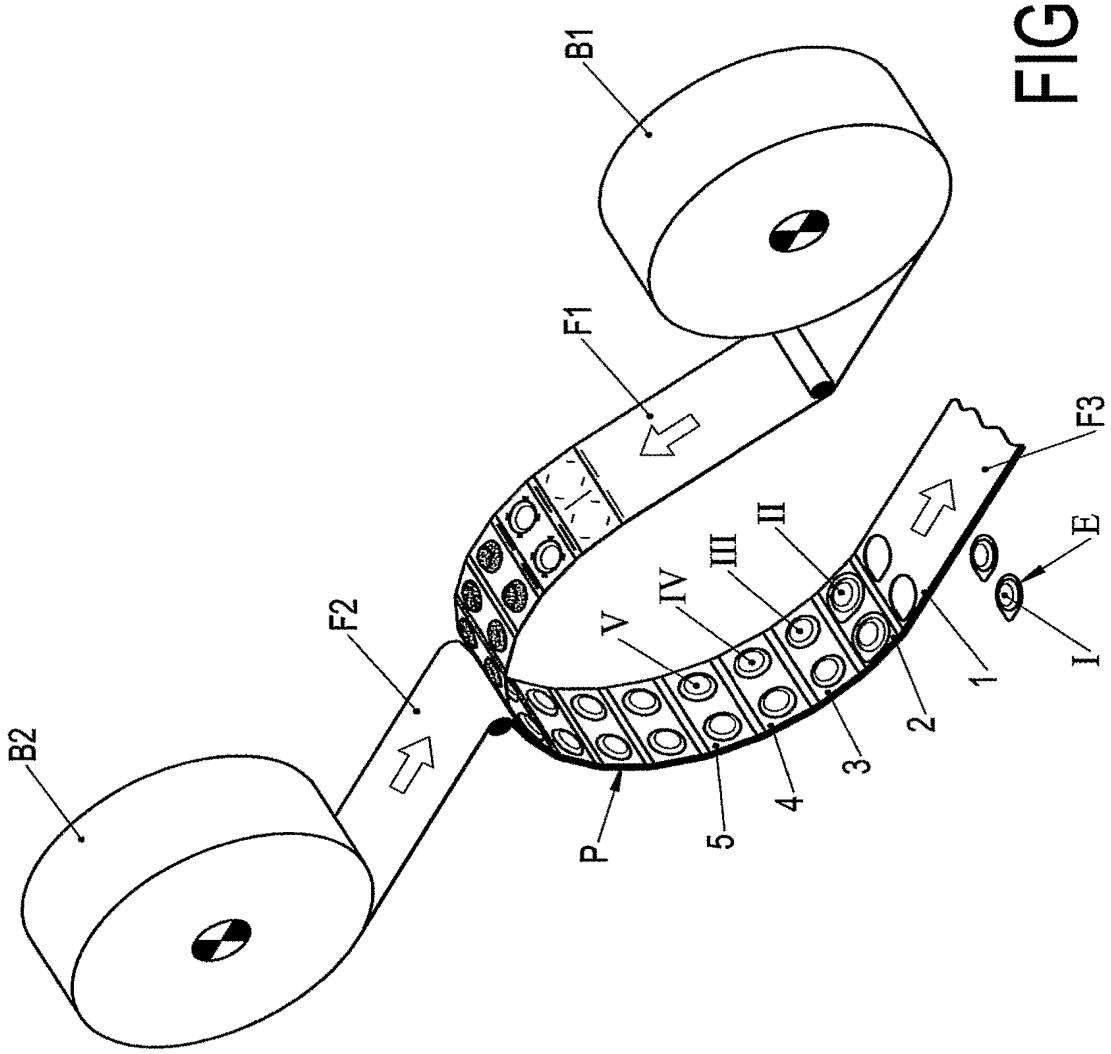
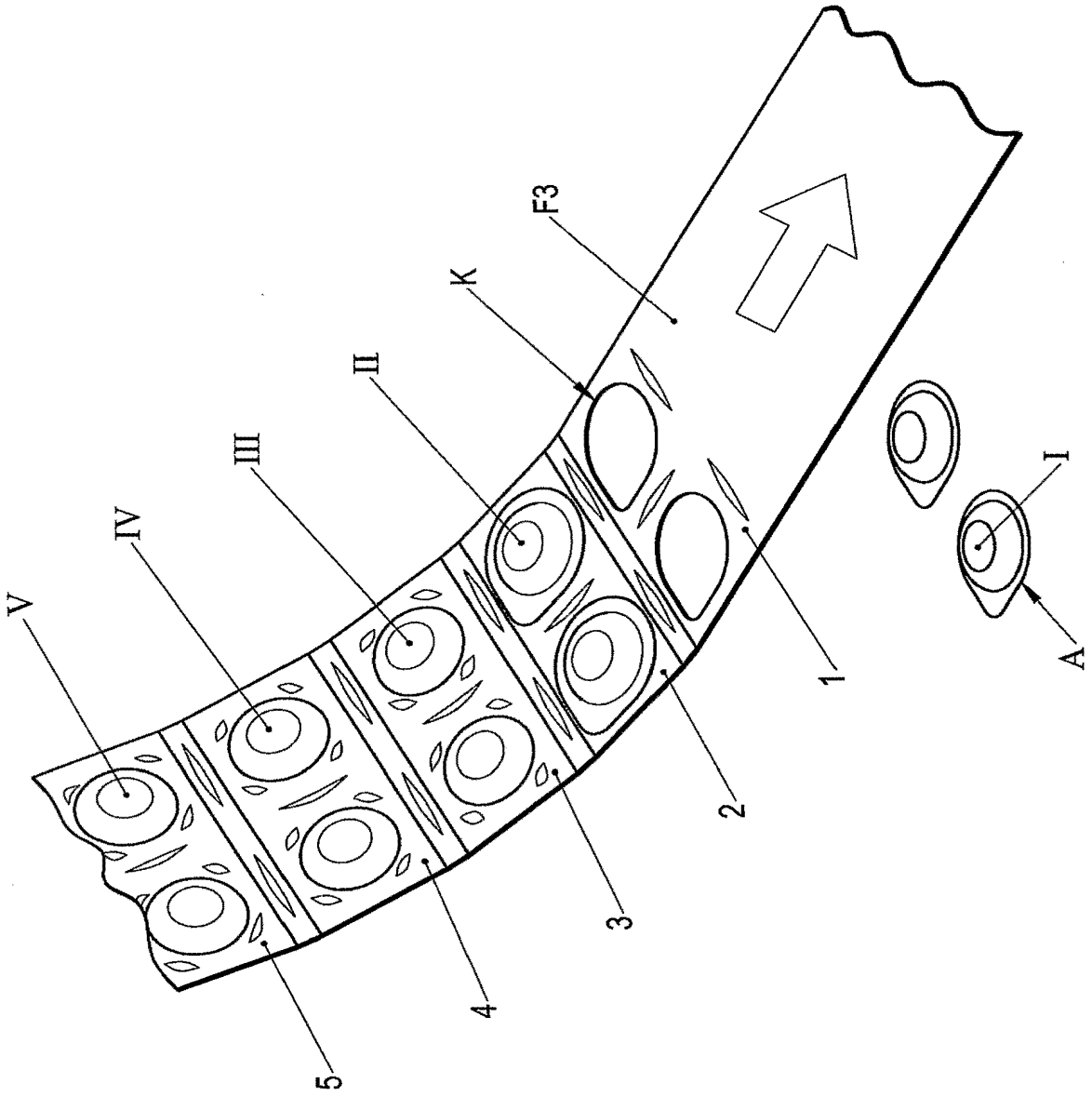
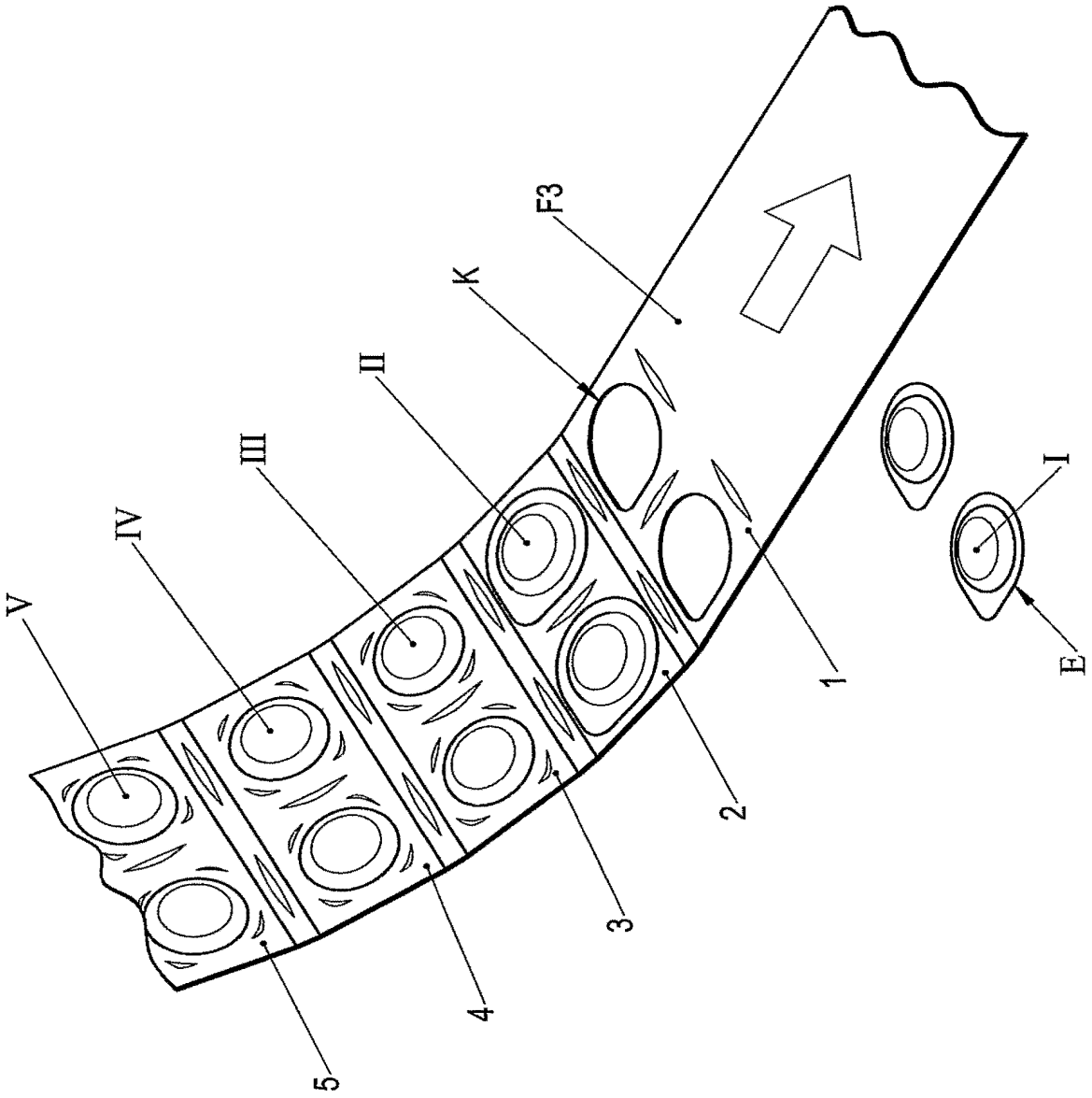


FIG. 13



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FIG. 13 BIS



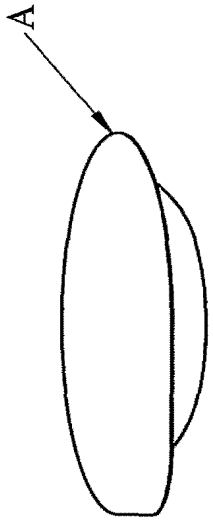


FIG. 14

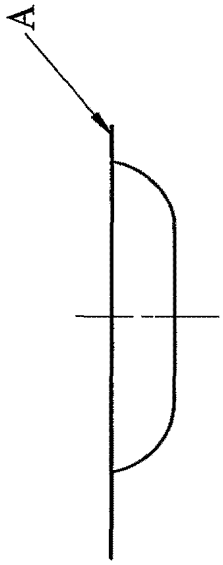


FIG. 15

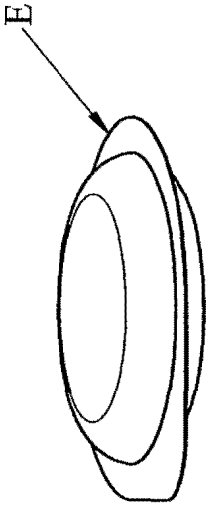


FIG. 14 BIS

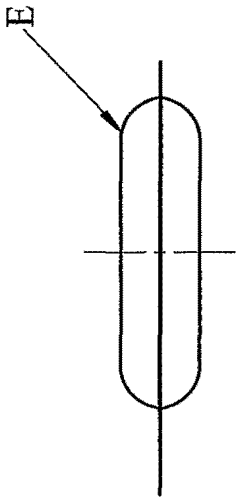


FIG. 15 BIS

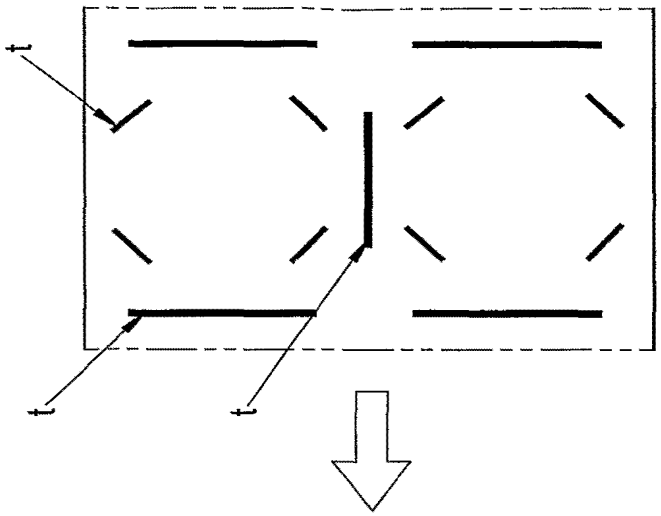


FIG. 16

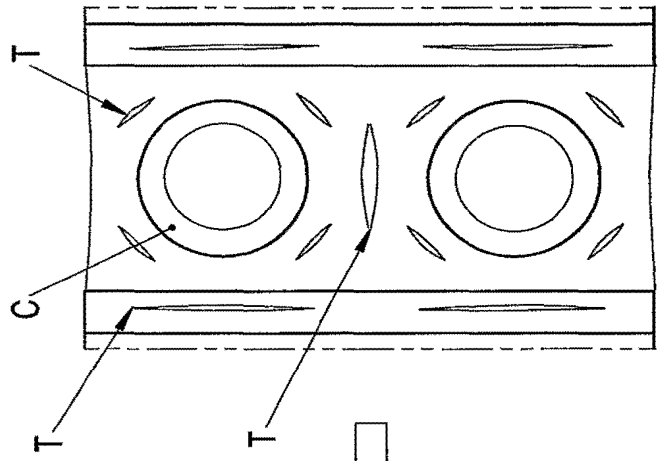


FIG. 17

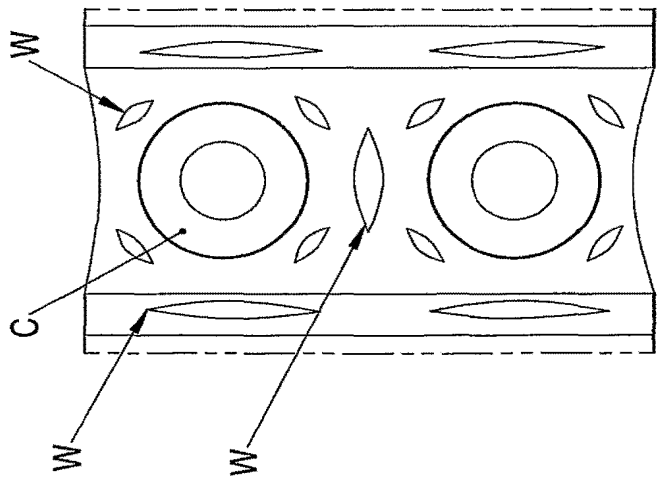


FIG. 18

FIG. 19

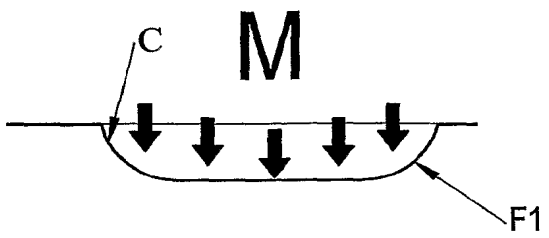


FIG. 20

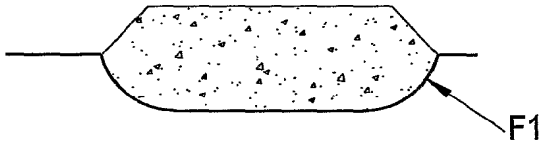


FIG. 21

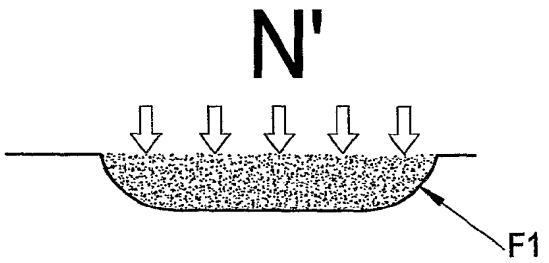
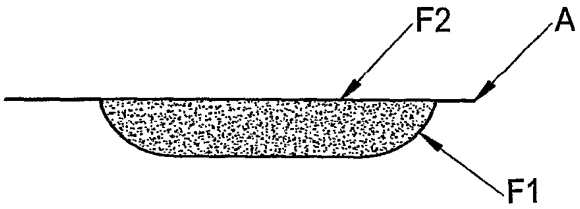


FIG. 22



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FIG. 19 BIS

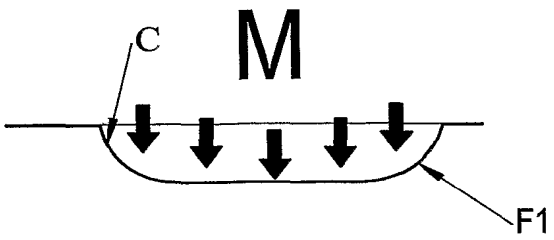


FIG. 20 BIS

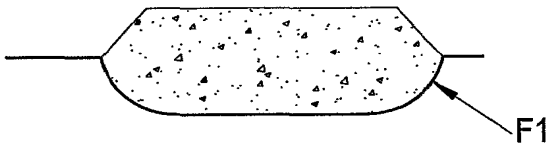


FIG. 21 BIS

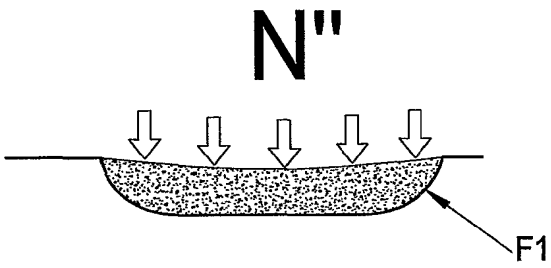


FIG. 22 BIS

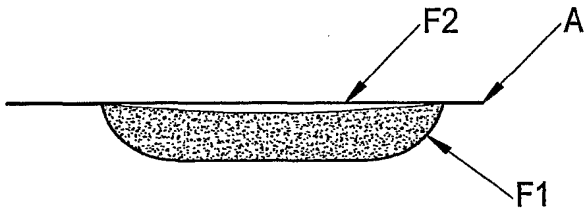


FIG. 19 TER

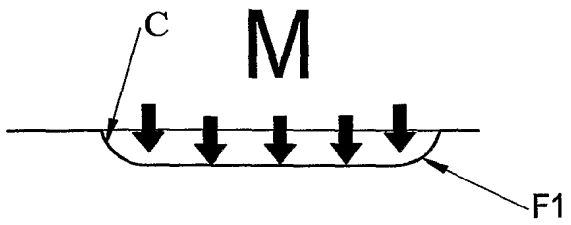


FIG. 20 TER

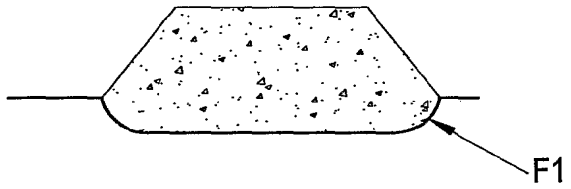


FIG. 21 TER

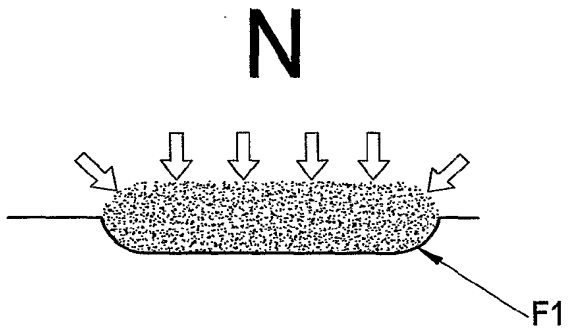
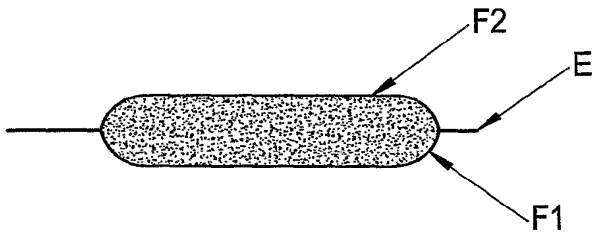


FIG. 22 TER



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INTERNATIONAL SEARCH REPORT

Int[illegible]nal Application No
PCT/IB2004/003589

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 012 629 A (REHMAN ET AL) 7 May 1991 (1991-05-07) column 14, line 24 - column 15, line 35; figures 2-6	1,6,9, 10,13
A	EP 0 943 544 A (DIMA S.R.L) 22 September 1999 (1999-09-22) claim 1; figures 1-9	1,6,11
A	EP 0 432 126 A (CLOUD CORPORATION) 12 June 1991 (1991-06-12) abstract; figures 8-14	1,6,9,13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 February 2005	02/03/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Grentzius, W

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

Int onal Application No
PCT/IB2004/003589

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(74) Agent: **BORNE, Patrice**; Ave Nestlé 55, CH-1800 Vevey (CH).

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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) **Title**: CONTROLLED BEVERAGE PRODUCTION DEVICE USING CENTRIFUGAL FORCES

(57) **Abstract**: The present invention relates to a beverage production device for preparing a liquid comestible from a portioned food substance contained in a sealed capsule (3), comprising a centrifugal unit (2) for receiving the sealed capsule (3), driving means (5) connected to the centrifugal unit (2) for enabling a rotational motion of the centrifugal unit (2), liquid supply means (4,6,7) being connected to the centrifugal unit (2), means (8) for measuring the flow rate or the pressure of the supplied liquid and control means (9) for controlling the rotational speed of the driving means dependent on the measured flow rate or the measured pressure of the liquid.

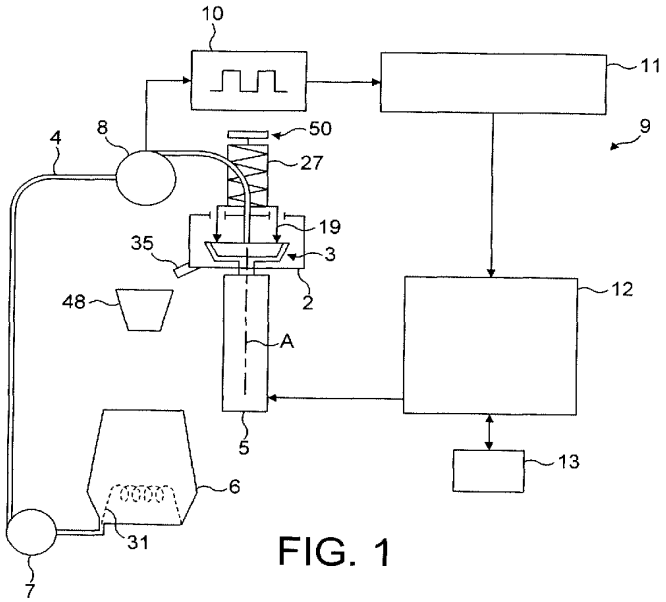


FIG. 1

WO 2010/026053 A1

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Controlled beverage production device using centrifugal forces

Field of the invention

The present invention relates to a device and a capsule system for preparing a liquid comestible from a food substance contained in a receptacle by passing liquid through the food substance using centrifugal forces. In particular, the invention relates to a device and a method for controlling the flow rate of a liquid during the beverage preparation.

Background of the invention

It is known to prepare beverages by separating a mixture consisting of brewed coffee and coffee powder with centrifugal forces. Such a mixture is obtained by the interaction of hot water and coffee powder for a defined time. The water is then forced through a screen, on which screen powder material is present.

The existing centrifugal systems suffer the inconvenience that the strength of coffee cannot be regulated properly.

For instance, GB1506074 relates to a centrifugal device comprising a filter for filtering coffee. However, the contact time between coffee and hot water is not controllable. For example, the coffee granulometry can influence the residence time of liquid in the coffee and so the extraction quality.

On the other hand, solutions are known for increasing the pressure in the cell such as by a fixed or pressure-responsive restriction means.

It is known to increase the pressure in the centrifugal cell by increasing the rotational speed such as in EP651963. In this document, the pressure increase is obtained by a rubber-elastic element interposed at the interface between the lid and the cup of the centrifugal cell. Such an element deforms elastically to leave a filtering passage for the liquid when a certain pressure is attained at the interface.

FR2487661, US4545296 and WO2006/112691 relate to centrifugal systems wherein a fixed restriction is placed downstream of the filter to increase the pressure. However, in these systems, the contact time of the coffee and water is not truly controlled. As in EP651963, the taste of the coffee can be modified by changing the speed consequently the pressure in the cell.

GB2227405 discloses an apparatus for preparing a coffee infusion wherein the speed and/or duration of rotation is set to give a predetermined strength of infusion.

WO2007/041954 relates to a coffee maker with combined milling stage and brewing stage. Different approaches can be used to control the flavours of the brewed coffee. A first approach is to control the grain size of coffee powder during milling stage. A second approach is to control the speed of water penetration through the milled coffee powder. Therefore, different rotational speeds of the brewing basket are set up by the controller. A

disadvantage is that depending on the flow characteristics in the ground coffee taking into account the powder characteristics, coffee compaction, water quality, temperatures, etc., the strength and other quality attributes (e.g., crema) of the coffee can fluctuate a lot.

In PCT/EP08/056310, a solution is proposed into which a flow restriction is placed in or outside the centrifugal cell, e.g., a capsule containing coffee powder. The flow restriction can comprise a regulating valve offering a back-pressure. The valve opens under the effect of pressure in the cell. The valve can be preloaded by a resilient element (rubber or spring). A control unit can be provided in the device for setting the rotational speed according to the nature of the liquid to be brewed and/or the substance of the capsule.

Based on the prior art, the present invention aims at providing a device and a method for allowing an efficient control of the strength of a liquid comestible such as a coffee or tea beverage in a centrifugal beverage production device which takes into account the flow attributes through the ingredients.

The present invention also aims at providing a device and a method for allowing the production of different levels of foam or "crema" of the liquid comestible, in particular for coffee beverages.

In particular, one aspect of the invention, is to ensure that the key quality attributes of the beverage can be controlled properly. In particular, one aspect of the invention is to ensure that the strength or concentration

of the beverage is reproducible, i.e., that this characteristic does not fluctuate much for a same desired beverage. Still an aspect of the invention is to ensure the key quality attributes (i.e., concentration, coffee crema level) as well as the volume of the beverage can be produced and selected in a controllable manner depending on the type of beverages desired.

Object and summary of the invention

In a first aspect, the present invention relates to a beverage production device for preparing a liquid comestible from a portioned food substance contained in a capsule or cell, comprising a centrifugal unit for receiving the capsule or cell, driving means connected to the centrifugal unit for enabling a rotational motion of the capsule or cell in the unit, liquid supply means being connected to the centrifugal unit to supply liquid in the capsule or cell, means for measuring the flow rate, or respectively the pressure, of the liquid, and a control unit for controlling the flow rate of liquid, or respectively the pressure of liquid, to match a flow rate reference, or respectively a pressure reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure, of the liquid.

With a device according to the present invention it is possible to enable a controlled interaction between a preferably portioned food substance provided in a capsule or cell and a liquid such as water. Thereby, the interaction is particularly enabled due to the

centrifugal forces exerted on the capsule or cell during and after liquid has been provided thereto and, the substance:liquid interaction control is particularly obtained by monitoring and adjusting the flow rate of liquid that feeds the capsule or cell.

In a preferred embodiment, the capsule is removably insertable into the centrifugal unit of the device. The centrifugal unit of the device preferably comprises two enclosing members which are movably arranged relatively to each other and which are designed to enclose the capsule within the device.

One enclosing member is preferably equipped with a liquid injection assembly which enables the provision of liquid to the capsule enclosed within the centrifugal unit of the device. Preferably, the injection assembly is arranged centrically with respect to a rotational axis of the centrifugal unit. The injection assembly preferably comprises a tubular member for providing liquid to a central inlet port of the capsule. In a possible embodiment, the injection assembly comprises a piercing member designed to pierce the inlet port in a face of the capsule. The injection assembly is connected to the liquid supply means of the device.

A second enclosing member of the centrifugal unit is preferably a rotary drum which is of complementary shape to the capsule. Hence, a user may insert the capsule into said rotary drum which is held in the drum a stable manner.

The driving means for driving the centrifugal unit is preferably a motor such as an electric motor which is

connected to the control means of the device. Thereby, the driving means are connected to the rotary drum by means of a motor axle which thus enables a rotational movement of the rotary drum and the capsule housed by the rotary drum.

The liquid supply means of the device comprise a reservoir for storing liquid. Preferably, the reservoir is a boiler which comprises heating means in order to heat the liquid therein. However, the liquid supply means may as well comprise a liquid reservoir and an in-line heating element such as a thermoblock or an instant heater placed downstream of the reservoir in the fluid circuit.

Moreover, the liquid supply means preferably comprise a pump for providing liquid from the reservoir to the injection assembly and thus, to the centrifugal unit of the device. The pump is preferably connected to the control means of the device.

The means for measuring the flow rate of the liquid are preferably arranged in the fluid circuit between the liquid supply means and the centrifugal unit of the device.

The control unit preferably comprises an event-triggered state machine connected to the driving means and the means for measuring the flow rate of the liquid provided to the centrifugal unit. Moreover, the control unit is preferably connected to a manual interface which can be operated by a user.

In particular, the flow rate reference can be a flow rate set point which is set as a constant during an extraction phase. The extraction phase is here defined as the main phase during which liquid is supplied by the supply means to the capsule and said liquid passes through the ingredients in the capsule and beverage liquid is thus dispensed from the capsule.

In a possible alternative, the flow rate reference represents a variable profile of flow rate, i.e., set points varying in function of time. Indeed, it might be advantageous in some case to vary the flow rate set point during the extraction phase in order to achieve particular extraction profiles. In this case, the control unit can store a variable profile of flow rate which corresponds to a particular selected beverage. However, for avoiding too much control complexity, preference is given to a constant flow rate set point for a same desired beverage.

In a preferred mode, the control unit is preferably configured for selecting or calculating different preset flow rates corresponding to respectively different beverage (e.g., coffee) strengths. The control unit is preferably connected to a user's interface for a selection of the different beverages by the user.

Therefore, the control unit enables the regulation of the flow rate (as a constant or variable profile) by adjusting the speed of the driving means during at least one essential phase of the beverage preparation in order to set the strength (i.e., the concentration) of the beverage to be prepared. Thereby, the strength can be

selected by a user of the device by means of the manual interface.

Moreover, the control unit is configured for controlling the volume of the beverage by receiving data from the flow measuring means and controlling accordingly the volume of liquid supplied by the liquid supply means, in particular, the pump, to the capsule or cell.

However, it may as well be possible that the strength and/or volume are set by identification means arranged within the device which interact with the capsule provided to the device. Such identifications means may be a barcode scanner for example which reads a barcode provided on an outside face of the capsule and which enables a detection of the type of capsule and/or the nature of ingredients provided within the capsule in order to apply a predefined extraction profile for the beverage to be prepared.

During the beverage extraction phase of a beverage preparation cycle, the speed of the driving means is thus regulated in control loop to correct the flow rate at a substantially constant value or, eventually to follow a predefined flow rate profile. Hence, a preset nominal flow rate is obtained during the extraction phase of the beverage production. Since the flow rate is directly linked to the contact time of the liquid with the ingredient in the capsule, the strength of the beverage is thus essentially determined by maintaining the flow rate to said predefined set point or profile corresponding to the selected strength of the beverage.

During the extraction phase, a centrifugal cell which is placed within the centrifugal unit acts as a centrifugal pump by drawing liquid such as water from the liquid supply. Accordingly, the rotational speed of the motor driving the centrifugal unit in rotation compensates for the flow rate fluctuation to the set point. In particular, when the measured flow rate becomes lower than the set point, the rotational speed is increased by the control unit to raise the flow rate up to the set point and, inversely, when the measured flow rate becomes higher than the set point, the rotational speed is decreased by the control unit to lower the flow rate down to the set point. Obviously, the lowest possible fluctuations of flow rates to the set point are preferred.

The centrifugal cell according to the present invention may be a single-use capsule provided to the centrifugal unit. Furthermore, the centrifugal cell may as well be a refillable filter cell.

The single-use capsule to be used with the present invention can be closed before use in a gas impervious manner to maintain freshness of the food ingredients housed therein. The capsule preferably contains a protective atmosphere for the ingredients such as inert gas. The capsule can be closed by a membrane which is pierced or peeled off during the beverage preparation process. The capsule may comprise coding means such as a barcode for example which is read by the machine. Accordingly, corresponding parameters, such as for example the beverage strength, the beverage volume and/or the beverage crema or foam, can be adjusted by the control means.

In case a refillable filter cell is provided to the centrifugal cell, said filter cell is preferably removably arranged within the device. Furthermore, the filter cell is preferably designed to be accessible from the outside of the device. Therefore, removing and loading of food substance from or to the centrifugal cell is enabled.

The pump of the liquid supply means is set to supply a sufficient quantity of water during the beverage preparation cycle to the centrifugal cell whereas the rotational speed of the centrifugal cell actually regulates the flow rate of the dispensed liquid. The pump is preferably a low pressure pump such as a centrifugal pump or any other suitable low pressure pump.

The contact time between the food ingredients and hot water contained in the capsule varies in inverse proportion to the water flow rate which circulates in the liquid supply circuit and thus, through the centrifugal cell. In general, for obtaining a higher concentration or strength of the beverage to be prepared, the water flow rate can be set at a relatively low value, whereas for obtaining a lighter concentration or strength of the beverage, the water flow rate is set at a relatively higher value.

This is in particular advantageous for preparing a hot beverage such as coffee, tea, hot chocolate or the like with a desired concentration respectively a desired strength.

The flow rate is measured by flow rate sensing means which are placed in the liquid flow path of the device.

Such flow metering means provide continuous indications to the control means which, in response, regulate the speed of the motor.

The flow rate sensing means is preferably a pulse-coded flow-metering turbine placed between the water supply, e.g., a water reservoir and the liquid injection assembly of the centrifugal cell. The turbine thus generates electrical impulses which period is proportional to the velocity of the flow. Accordingly, the control means are designed to calculate the flow rate based on the electrical impulses provided by the pulse coded flow-metering turbine.

Preferably, the control means are also configured to control the volume of the delivered beverage. Accordingly, the volume is set up by receiving information of the flow meter such as by counting the number of impulses generated by the flow meter or by measuring the period of the impulses.

The manual interface of the device preferably comprises a selection means for the user to select the strength of the beverage and preferably also the volume of the beverage. The user may thus select the concentration and/or volume of the beverage to be prepared. For example for a coffee beverage, different strength of coffees can be selected (e.g., light, medium, strong) and different volumes (e.g., 25, 40, 110, 250 mL) corresponding to different cup sizes. For example, for simplifying the selection of the user interface but still meeting the larger possible preference of the users, the choices can be made possible amongst a limited number of selectable combinations relative to coffee strengths and volumes,

for example, under coffee selections which are explicit for the user (e.g., ristretto, espresso light/strong, lungo light/strong, Americano, etc.).

When different kinds of beverage are proposed such as coffee, tea, milk, etc., the selection means may also be used to select the kind of beverage to be prepared in such as coffee, tea, herbal tea, soup or hot chocolate for example. Thereby, the selections means may provide information about different liquid comestibles to be prepared for which different extraction profiles are stored.

In a possible embodiment relating to the preparation of a coffee beverage with the present device, the manual interface may be used for selecting a desired kind of coffee, such as a 'ristretto', an 'espresso', a 'lungo' or an 'Americano' which may express a particular combination of coffee strength and volume. Furthermore, the strength of coffee can eventually be further adjusted selectively for one or more of these kinds of coffees.

Moreover, the desired coffee strength is preferably chosen by selection means such as a potentiometer of the manual interface. Accordingly, the strength of a coffee beverage to be prepared can be varied by a continuous or incremental variation of the flow rate set point which has been set initially by the device. In a possible embodiment, the strength of coffee beverage can be set, for instance, after the selection of coffee volume is carried out.

Considering in particular, coffee preparation from ground coffee contained in the cell, i.e., a single-use capsule,

the extraction profile set by the control means of the device preferably comprises at least a pre-wetting phase, an extraction phase and a dry-spinning phase which differ normally in at least the associated rotational speed of the driving means.

The pre-wetting phase of the extraction profile takes place at the beginning of the beverage preparation cycle. Thereby, liquid such as water is supplied to the centrifugal cell, i.e. the capsule, which is maintained static or is rotated at relatively low speed, preferably lower than 200 rpm, most preferably lower than 100 rpm. Accordingly, the pre-wetting phase enables a homogeneous wetting of the dry food ingredients, i.e., ground coffee, housed within the capsule. Hence, the compacting of dry ingredients and a resulting blockage during the beverage preparation cycle can be effectively prevented.

The amount of liquid provided to the centrifugal cell respectively to the capsule during the pre-wetting phase is preferably chosen such that the cell respectively the capsule is full of liquid and gas is essentially expelled out of the capsule. Accordingly, the food ingredients are completely flooded. During this phase, there is essentially no extracted liquid being dispensed from the capsule as the centrifugal pressure at low speed in the capsule remains too low to enable to overcome the pressure losses created in the capsule and the possible restriction means in the flow path (e.g., valve means).

After the pre-wetting phase, the extraction phase of the extraction profile takes place. It preferably comprises a ramp up of the driving means to the extraction speed level which is a higher rotational speed than during the

pre-wetting phase. Preferably, a predefined extraction speed is set to avoid important fluctuation of the flow rate during the ramp-up phase. Once the predefined extraction speed is reached, the rotational speed of the driving means is controlled by the control means in order to provide a relatively constant flow rate of the liquid.

In order to control the contact time between food ingredients and water during the beverage preparation cycle, the value of the liquid flow rate is calculated by the detection of the period of the impulses generated by the flow meter.

Depending on the type of beverage to be delivered, during the extraction phase, the rotational speed can be comprised between 5,000 and 15,000 rpm, preferably 8,000 and 12,000 rpm. In particular, the speed can be influenced by the flow resistance in the capsule and by the restriction means.

After the extraction phase, the spin-drying phase of the extraction profile takes place. Thereby, the water pump of the liquid supply means is stopped by the control means in order to stop supply of water to the centrifugal cell. Moreover, a second ramp-up phase or acceleration of the rotational speed is carried out followed by a phase where the rotational speed is maintained at a relatively elevated constant value to perform spin-drying of the food ingredients in the centrifugal cell respectively within the capsule. The beverage preparation cycle can be ended up by a deceleration phase where the rotational speed is progressively lowered to the zero value.

Accordingly, any residual liquid present in the centrifugal cell or the capsule is eliminated and discharged via a spout of the device. The rotational speed of the spin-drying phase is set higher than the rotational speed controlled during the extraction phase.

Since the concentration of the residual liquid discharged by the centrifugal cell may have a different concentration than the liquid comestible discharged during the extraction phase, the residual liquid may be discharged by purging means which can be selectively connected to a spout of the device. Therefore, the concentration of the beverage to be prepared is not influenced by the residual liquid discharged during the spin-drying phase.

It should be understood that the spin-drying phase can be carried out for a predetermined time (e.g., a few seconds).

The extraction profile and particularly the rotational speed may vary for each kind of beverage to be prepared in order to influence the concentration or strength of the beverage. Accordingly, different extraction profiles may be chosen by means of the manual interface. The predefined extraction profiles are preferably stored in the control means or memory means connected thereto.

Furthermore, the centrifugal unit of the device preferably comprises flow restriction means at a delivery side of the centrifugal unit.

The flow restriction means at the delivery side of the centrifugal unit may comprise a pressure-responsive valve

which opens under the pressure of the liquid coming out of the unit. Such a valve is for example described in PCT/EP08/056310.

In an embodiment, the restriction means is a fixed Venturi duct (eductor) formed of one or more small outlets. The restriction means can be provided at the delivery outlets of the capsule or downstream of the capsule.

The advantage is that a certain pressure is necessary before the liquid can exit the centrifugal unit and therefore, the contact time of liquid is promoted in the cell by creating a delayed release. Accordingly, an improved interaction between water and the substance contained in the capsule is obtained. For coffee, for example, it may be advantageous to optimize interaction of water and the ground coffee particles contained in the centrifugal cell to obtain a good extraction of the coffee and aroma compounds.

Moreover, the restriction such as the valve provides a relatively high pressure drop which promotes the generation of a nice amount of crema or foam of the beverage.

During the extraction phase, the food ingredients within the centrifugal cell are traversed by liquid provided by the liquid supply means. The beverage resulting from the interaction of liquid and food ingredients, which is discharged from the centrifugal cell due to the centrifugal forces acting thereon, forces the flow restriction valve to open when the pressure of liquid exceeds the preload of the valve. The beverage extract is

thus discharged from the centrifugal cell via the spout with a relatively consistent flow.

In a preferred embodiment, the flow restriction valve can be formed by at least one engaging portion of the device which is adapted to move relatively to an engaged portion of the device or, alternatively, of an engaged portion of the capsule under the effect of the pressurized liquid exiting the capsule, for making a thin annular laminating passage for the liquid.

The preload of the flow restriction valve is preferably adjustable. Thus, the preload of the valve can be increased to force the rotational speed to increase for maintaining the same flow rate. Conversely, the preload can be decreased to lower the rotational speed for maintaining the same flow rate. Thereby, the adjustment of the preload of the valve can impact on the level of crema or foam of the beverage which can be created.

Thereby, it has been found that a higher rotational speed of the driving means during the extraction phase provides a higher amount of crema or foam of the beverage. This is particularly advantageous for coffee beverages for which a distinctive crema or foam is desired.

According to the described embodiment, it can be possible to control both the beverage strength (for example the coffee concentration in the coffee liquid extract in the cup) and the amount of foam or crema on the beverage.

It is thus possible to provide for example a 'ristretto' coffee extract with a relatively high concentration of coffee and a high amount of crema by adjusting,

respectively, the volume of 25mL, a relatively low flow rate and a relatively high preload of the flow restriction valve. On the contrary, it is for example also possible to prepare a relatively light 'lungo' coffee extract with a low amount of crema by adjusting the volume to 110mL, a relatively high flow rate and a relatively low preload of the restriction valve.

In a preferred embodiment, the preload on the flow restriction valve is adjustable by mechanical actuation means driven manually or by a motor controllable by the control unit. Hence, the amount of foam or crema of the beverage to be prepared can be adjusted by the user.

In a possible alternative, the speed of the driving means may be controlled in relation to a detected pressure of liquid in the centrifugal cell respectively in the capsule or of the pressure of liquid reigning in the liquid supplying line before the cell. Thereby, the pressure in the cell or before the cell is preferably measured by a pressure sensor positioned within the cell or upstream of the cell, e.g., in the liquid supplying line between the pump and the water injection point in the cell. It should be noted the present invention can be adapted to a control of the pressure of liquid as an alternative to a control of flow rate or as an additional control means to regulate the rotational speed and, consequently, the strength of the beverage.

In a second aspect, the present invention relates to a system for producing a beverage from portioned ingredients provided within a capsule, the system comprising a beverage producing device having a centrifugal unit comprising at least two enclosing

members for enclosing the capsule by a relative movement of the enclosing members,

driving means connected to the centrifugal unit for enabling a rotational motion of the centrifugal unit,

a liquid injection assembly designed to interact with the capsule provided to the device and connected to liquid supply means,

means for measuring the flow rate, or respectively the pressure, of the liquid,

control means for controlling the flow rate, or respectively the pressure, of liquid to match a flow rate reference, or respectively a pressure reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure,

wherein the capsule is designed to be removably inserted into the centrifugal unit of the device.

The capsule to be used with the device according to the present invention is preferably a single-use capsule sealed in a protective atmosphere before use. The capsule can have a rigid dished body and a lid, wherein the lid of the capsule comprises outlet openings arranged at a peripheral portion of the lid. In a possible alternative, the capsule can be capsule permeable to liquid and gas when inserted in the device such as a filter capsule.

The capsule preferably contains ground coffee, soluble coffee, tea, cocoa, milk and combinations thereof.

For coffee, the amount of coffee can differ in the capsule depending on the type of coffee beverage to be delivered. For instance, a lungo-type coffee can be

prepared from a higher amount of coffee contained in the capsule compared to a ristretto or an espresso-type coffee. The coffee powder may also be prepared from many different blends and origins.

The capsule to be used in the device can be associated to a code containing information relative to one or more of the following parameters: flow rates, beverage volumes, speeds, beverage temperatures, etc.

The injection of the liquid provided by the device preferably takes place at an upper face of the capsule which may already have an inlet port and the injection of liquid can be done by connecting an injection member such as a tube to an inlet port of the capsule. In a possible alternative, a foil of the capsule which covers the lid can be pierced by a piercing member connected to the injection member of the device. The output of the beverage to be prepared takes place at a peripheral section of the lid of the capsule which is provided with a plurality of outlet openings.

It should be understood that the single-use capsule according to the present invention may contain any of a culinary liquid such as soup or sauce, a beverage liquid such as coffee, chocolate, milk, tea, etc., or a nutritional liquid such as an infant formula.

In a third aspect, the present invention relates to a method for preparing a liquid comestible from a portioned food substance contained in a capsule or cell by passing liquid through the substance using centrifugal forces, comprising the steps of

connecting the capsule or cell to a liquid supply,

rotating the capsule or cell about its rotational axis to enable an interaction between the liquid and the portioned ingredients provided within the capsule,

controlling the flow rate, or respectively the pressure, of liquid to match a flow rate reference, or respectively a pressure reference, by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure, of liquid.

In particular, the flow rate is controlled in relation to a selection of strength of the beverage carried out by the user.

Furthermore, the level of crema or foam can also be controlled by adjusting the load on the restriction valve at the exit of the capsule or cell.

In order to avoid unnecessary repetitions, the method can be defined as including all the possible operations as aforementioned described in relation to the operations of the device or system of the invention.

Brief description of the drawings

Further features, advantages and objects of the present invention will become apparent for a skilled person when reading the following detailed description of embodiments of the present invention, when taking in conjunction with the figures of the enclosed drawings.

Fig. 1 is a schematic representation of the centrifugal system;

Fig. 2 is a graphical representation of the speed as a function of time during a typical brewing cycle for a concentrated strong coffee beverage and a comparatively lighter coffee beverage;

Fig. 3 is a cross sectional view of the centrifugal unit according to a non-limiting example;

Fig. 4 is an enlarged view of a detail of figure 3.

Fig. 5 is a sectional side view of a capsule according to the present invention.

Fig. 6 is a perspective side view of a capsule according to figure 5 with its top membrane being removed.

Fig. 7 is a sectional side view of a centrifugal unit according to a variant of the invention.

Fig. 8 is an enlarged view of a detail of figure 7 when centrifuged liquid is delivered.

Fig. 9 shows an example of a user's interface of the device of the invention.

Detailed description of the figures

Figure 1 is a schematic drawing of the centrifugal system according to the present invention.

As can be seen in figure 1, the system comprises a centrifugal unit 2 in which a centrifugal cell 3 can be

placed. The centrifugal cell 3 may be a single-use capsule which contains portioned food ingredients. Before its insertion in the unit, the capsule is preferably sealed in a gastight manner to maintain freshness of the food ingredients contained therein. Alternatively, the centrifugal cell 3 may be a re-fillable filter cell removably connectable to the centrifugal unit 2.

The centrifugal unit 2 is connected to driving means 5 which is preferably an electric motor. The driving means 5 is designed to rotate a rotary drum of the centrifugal unit 2 along an axis of rotation A and thus, the centrifugal cell 3 housed within the rotary drum of the centrifugal unit 2 about the same axis A of the centrifugal cell 3. It should be noted that the cell could be part of or all the rotary drum, in particular, when the cell is not specifically a single-use capsule but a refillable part of the device.

The centrifugal unit 2 further comprises a collecting part and an outlet duct 35 through which the beverage to be prepared is discharged into a provided receptacle 48 such as a cup or mug, for example.

The system further comprises liquid supply means which comprise a water reservoir 6 and a fluid circuit 4. The reservoir 6 preferably comprises water heating means 31 for heating the water contained within the reservoir 6. The heating means 31 may be a heating coil. The heating of the water may as well be obtained by a thermoblock in the fluid circuit 4 and placed downstream relatively to the water reservoir 6.

The liquid supply means further comprise a pump 7 connected to the reservoir 6. The pump 7 is preferably a centrifugal pump. Moreover, the pump 7 is connected to the centrifugal unit 2 by means of the fluid circuit 4.

The pump 7 is preferably a low pressure pump which serves the purpose of providing sufficient liquid to the centrifugal unit 2 at low pressure. In addition, during operation of the centrifugal unit 2, the centrifugal cell 3 acts as a centrifugal pump by drawing water from the liquid supply.

In the centrifugal unit 2, a flow restriction means 19 is provided to create a restriction of the flow of the centrifuged liquid which leaves the cell 3 before it is collected in the collecting part of the unit. The flow restriction means 19 enables to increase the dwell time of liquid in the cell and therefore improves the extraction, in particular, for coffee or tea, between the liquid and the ingredients contained in the cell. Furthermore, due to the high rotational forces necessary for the flow to pass through restriction means, the velocity of the flow is significantly high. As a result, a nice amount of foam or crema can be obtained. Preferably, the flow restriction means 19 is a valve which opens or at least provides an increase of a flow opening(s) by pressure of the centrifuged liquid in the cell. For this, the valve 19 comprises elastic biasing means 27 for counter-acting the pressure of the centrifuged liquid up to a given load. Furthermore, the valve's load acting in restriction or closing on the flow can be made adjustable by means of a load actuating means 50. For instance, the load actuating means 50 acts on the elastic biasing means 27 to vary positively or negatively

the pre-load on the valve 19. Therefore, the higher the elastic means are pre-stressed, e.g., by a compressive constraint of the actuating means 50 on the resilient member, the higher the pressure of liquid is necessary for overcoming the restriction means, i.e., for opening the valve, and maintaining the flow rate, therefore, the higher the rotational speed must be. As a result, the level of foam or crema can be controlled by adjusting the load of the valve means 19.

In the fluid circuit 4 between the liquid supply means and the centrifugal unit 2, metering means 8 for the flow rate of the liquid are situated. The metering means 8 is preferably a pulse-coded flow-metering turbine which generates electrical impulse data 10. Thereby, the period of the generated impulses is preferably proportional to the velocity of the liquid flow within the fluid circuit 4.

The system further comprises control means 9 which comprise a counter 11, a central controller 11 such as a PID (proportional-integral-derivative) controller able to provide control loop feedback mechanism, and a manual user interface 13. The control means 9 are preferably connected to the flow-metering turbine 8 to receive the process variable relative to the flow rate and to the driving means 5 of the rotational motor for input of the manipulated variable to the motor, i.e., the rotational speed. Furthermore, the controller 12 is connected to the pump 7 to start and stop the liquid supply in the circuit.

The counter 11 connected to the flow-metering turbine 8 enables an analysis of the generated impulse data 10. The analysed data is then transferred to the central

controller 12. Accordingly, the exact actual flow rate of the liquid within the fluid circuit 4 can be calculated in real-time.

Therefore, the central controller 12 connected to the driving means 5 may adjust the rotational speed of the driving means depending on the measured flow rate of the liquid.

Moreover, the central controller 12 preferably comprises a memory (not shown) in which certain parameters of the extraction profile can be saved such as rotational speeds of the centrifugal cell, initial extraction speed of the cell, calibration of the flow meter, prewetting time, dry spinning time, acceleration and deceleration speed ramps, etc. In particular, the controller 12 may contain the set points and values of the rotational speed of the driving means 5 at different phases of the beverage preparation cycle. These parameters serve as part of different predetermined beverage preparation profiles in relation to control algorithms for processing the different profiles on demand.

In addition, a manual interface 13 is connected to the central controller 12 which enables a user of the device of the invention to choose at least the strength of the beverage and, preferably also, the dispensing volume of the beverage to be prepared. Thus, the central controller 12 controls the flow rate during the extraction phase which corresponds to the selected beverage strength in response to an input of the manual interface by varying the rotational speed of the driving means accordingly. The manual interface can be any mechanical, interactive or multimedia user: machine interfacing means which is

associated to the device or remote. Thus, the manual interface can be a keyboard, touch screen, cellular phone, personal computer, laptop, palm, etc.

Figure 2 is a graph showing examples of variation of the rotational speeds of the driving means as a function of time during typical beverage preparation cycles for a highly concentrated beverage and for a comparatively lighter beverage.

The characteristic curve 14 of figure 2 may for example represent an extraction profile for a strong short coffee, such as an 'espresso' or ristretto' type coffee. By contrast, the characteristic curve 15 of figure 2 may for example represent an extraction profile for a lighter 'lungo' type coffee.

Next, a beverage preparation cycle according to the present invention will be described with reference to figure 1 and the characteristic curves 14 and 15 of figure 2.

At the beginning of the beverage preparation cycle, and after the user's selection, the centrifugal pump 7 is switched on by the controller 12 and thus, hot water is pumped from the reservoir 6 to the centrifugal cell 3 through the flow-metering turbine 8.

Simultaneously or shortly after, the motor speed is started at a low speed to ensure a pre-wetting of the dry food ingredients, e.g., roast and ground coffee, provided within the centrifugal cell respectively the capsule 3. Preferably, said pre-wetting phase A lasts for a given time t_1 between 3 and 10 seconds. The prewetting time is

preferably a time as determined by a count of impulse data generated by the flow sensing means, which is already stored or storable such as by transfer from a code on the capsule or cell in the memory of the controller 12.

During said pre-wetting phase A, the motor speed S_A is preferably as low as 10-200 rpm (round-per-minute) to ensure a homogeneous distribution of water in the ingredients. Normally, the speed is too low to enable the liquid to overcome the restriction valve 19. Therefore, during this phase, the liquid remains in the cell and simply fills the volume non-occupied by the ingredients.

Thereby, the counter 11 analyses the impulse data 10 generated by the flow-metering turbine 8. For example, the counter 11 counts the amount of impulses for a pre-defined period of time. At a predefined count N_1, the end of the pre-wetting phase A is reached. Thereby, the count N1 can be adjusted by software loaded in the memory of the control means. Moreover, it may be possible to define the time of the pre-wetting phase A and/or the volume to be provided to the centrifugal cell 3 during the pre-wetting phase by means of the manual interface 13.

The parameters regarding the rotational speed S_A, the volume of the provided liquid and the time t_1 of the pre-wetting phase A are preferably equal for all different kinds of beverages to be prepared. For example, for different types of coffee beverages such as e.g. 'ristretto', 'espresso' or 'lungo', N_1 or t_1 may be the same. However, the parameters of the pre-wetting phase A may as well be set different for different kinds of beverages to provide different wetting profiles.

After the pre-wetting phase A, the extraction phase B of the beverage preparation cycle takes place. Hence, when the number N_1 of counted impulses is reached, the control means 12 accelerate the driving means 5 in a ramp-up phase B' to the extraction phase B to reach a predetermined speed set-point S_1 respectively S_2 for the rotational speed of the driving means 5.

It should be understood that the time for the described ramp up B' may differ for different kinds of beverages to be prepared.

The set point S_1,S_2 is the initial speed value for the extraction phase which can be determined in relation to the selection made at the manual interface. The set point S_1,S_2 preferably differs for different beverages such as different coffee beverages for example. As can be seen in figure 2, the set point S_2 of the lighter beverage 15 relates to a higher rotational speed of the driving means 5 than the set point S_1 of the comparatively strong beverage 14, as the contact time between water and the food ingredients within the centrifugal cell 3 is proportionally shorter at a higher rotational speed (at set point S_2).

The increase of the rotational speed from S_A to S_1 or S_2, provides the liquid a sufficient momentum to traverse the ingredients in the cell and forces the valve means 19 to open under the pressure of the centrifuged liquid. Therefore, the ramp-up phase causes the opening of the valve or enlargement of the valve's opening and, thereby, the centrifuged liquid starts being discharged through the duct 35.

At the beginning of the extraction phase B, the distinctive flow rate at the set point S_1,S_2 is calibrated by the impulse data 10 received from the flow meter 8. Accordingly, the flow rate at the beginning of the extraction phase B is linked to a predefined rotational speed of the driving means.

It should be understood that the initial flow rate through the centrifugal cell 3 during the centrifugal beverage preparation process can be affected due to progressive compaction of the food ingredients within the centrifugal cell 3 for example. Accordingly, the pressure drop at the centrifugal cell 3 changes and thus, the flow rate through the centrifugal cell 3 diverges. Therefore, in order to maintain a substantially constant flow rate through the centrifugal cell 3, the rotational speed of the driving means 5 is varied such as being increased or decreased in order to compensate for the changes of the flow rate.

Hence, after the above described calibration of the flow rate at the set point S_1,S_2, the control means 9 may vary the rotational speed of the driving means 5 continuously or at small intervals to maintain a relatively constant nominal flow rate during the extraction phase B. In order to provide a relatively stable flow rate and avoid too much oscillation, the correction of flow rate can be typically controlled by using a PID control algorithm implemented in the controller wherein the process value (PV) is the measured flow rate, the desired flow rate is the set point (ST) and the manipulated variable (MV) is the speed output from the controller to the rotational motor.

More precisely, the counter 11 particularly measures the periods of the impulses generated by the flow meter 8. Hence, if the measured period is higher than a set reference value, which was calibrated before, an acceleration of the speed is necessary and vice versa. The speed can be varied stepwise or continuously. In a stepwise speed control, the flow rate correction can be made by the control unit varying the speed of + or - 200 rpm, for instance.

Accordingly, during the extraction phase B, the rotational speed of the driving means 5 is constantly adjusted by the control means 9 in response to the sensed flow rate data 10.

Accordingly, a substantial constant value of the flow rate which differs only by a certain tolerance of, for instance, +/- 10% can be obtained. The rotational speed of the driving means 5 is adjusted preferably at intervals of less than 1 second, for instance, in the order of a few milliseconds.

After a second count N_2 of the flow-metering means 8 is reached, the water pump 7 is stopped by the control means 9. Thereby, the count N_2 of the flow-metering means 8 determines the total volume of the beverage to be dispensed.

It should be understood that the count N_2, N'_2 may vary for different kinds of beverages.

Preferred volumes of different types of coffee beverages are for example 25mL for a 'ristretto', 40mL for an

'espresso', 110mL for a 'lungo', and 250mL for an 'Americano' type coffee beverage.

Accordingly, the indicated reference numeral N_2 may refer to a short beverage such as a 'ristretto' or 'espresso' type coffee for example, whereas the reference numeral N_2', which relates to a greater number of counted impulses and thus, to a greater liquid volume may refer to a 'lungo' type coffee beverage for example.

After the pump 7 is stopped, a dry-spinning phase C of the beverage preparation cycle takes place in order to empty the cell from residual liquid. The rotational speed of the driving means 5 is preferably higher than during the extraction phase B. Hence, at second count N_2, an acceleration ramp up C' takes place until a predefined set point S_C of rotational speed is reached. Then, spin-drying of the ingredients within the centrifugal cell 3 is carried out for a predefined period of time t_C. Thereby, said predefined time t_C for the spin-drying phase C can be predetermined in the software of the control means, e.g., 5-10 seconds.

After the spin-drying phase C, the rotational speed of the driving means 5 is decelerated as indicated by the deceleration phase D in figure 2. Accordingly, the beverage preparation cycle is finished.

Of course, the spin-drying phase C could be run at the same rotational speed as the extraction phase or at a lower speed.

Before the start of each beverage preparation cycle, the manual interface 13 of the system preferably comprises a

pre-selection for enabling a user to choose preferably two parameters:

- the volume of beverage (e.g., 25, 40, 110, 250 mL) and,
- the coffee concentration (e.g., from light to strong).

The selection is then received by the control means 9 which calculates the corresponding flow rate by measuring the periodicity of the impulses which then serves as a reference for controlling the rotational speed of the driving means 5. Thereby, in order to avoid a too big oscillation of the control loop at the start of the extraction phase B according to the selection made, the system is first set up around the set point value of speed S_1,S_2.

In a preferred embodiment, the following data is saved in the memory of the control means 9 and can be adjusted by means of dedicated software:

- The motor speed S_A at the pre-wetting phase (i.e., a few rpm),
- The calibration of the flow meter in volume unit per impulse (e.g., mL/Impulse),
- The number N of impulsions during prewetting,
- The acceleration ramp up to the extraction phase B',
- The acceleration phase to the spin-drying phase C',
- The spin-drying speed S_C,
- The spin-drying time t_C,
- The deceleration rate D.

Of course, these functions can be assured by an integrated circuit.

Figure 3 is a cross sectional view of an embodiment of the centrifugal unit 2 according to the present invention.

The centrifugal unit 2 of the device comprises an upper enclosing member 20 and a lower enclosing member 32 which can be moved relative to each other.

The capsule 3 to be used with the device or the system according to the present invention may be any of the capsules described in PCT/EP08/056310 (WO 2008/148646).

The capsule 3 as shown in figure 3 is pre-opened before it is inserted in the device, i.e., a sealing foil arranged at an upper face of the capsule is removed by peeling, or a central hole is perforated in the foil of the capsule when the capsule is inserted in the device .

The capsule 3 optionally comprises an inner member forming a lid 17 which is inserted in the dished body of the capsule. The lid 17 and body 42 delimit together an internal enclosure 33 for receiving a portioned food substance. The lid 17 comprises outlet openings 34 (see figure 4) at a peripheral section 47 of the lid 17 for filtering the beverage and maintaining the food (coffee) particles within the capsule 3 during the beverage preparation. Accordingly, only the liquid comestible to be prepared is discharged through the outlet openings 34.

The lower enclosing member 32 of the centrifugal unit 2 is a receiving assembly which comprises a liquid duct 35, for example, protruding on a side of the assembly 32 for guiding the centrifuged liquid coming out of the capsule 3 to a receptacle 48 such as a cup or glass (see figure 1).

The liquid outlet 35 is in communication with a liquid receiver 36 forming a cylindrical wall placed at a short distance about a rotating drum 16 into which the capsule is inserted as illustrated in figure 3. Thereby, the rotary drum 16 is preferably a hollow capsule holder with an internal cavity complementary shaped to receive the capsule. The liquid receiver 36 defines with the drum 16 an intermediate cavity 37 for collecting the liquid.

Below the liquid receiving assembly 32, are placed means for driving the capsule receiving drum 16 in rotation inside the receiving assembly 32. The driving means 5 comprise preferably a rotary motor which can be supplied by electricity or gas power. The drum 16 and the driving means 5 are connected by a motor axle 23 which preferably protrudes through an aperture in the bottom of the liquid receiver 36.

The upper enclosing member of the centrifugal unit 2 is a liquid injection assembly 20 which comprises a water line 22 which is in fluid connection with the pump 7 and the flow meter 8 (see figure 1). Moreover, the water line 22 is connected to a water injector 21 which is arranged co-centrically to the rotational axis A of the capsule 3 within the centrifugal unit 2.

In the shown embodiment, the water injector 21 is designed as a simple water inlet of the capsule. However, the water injector 21 may as well be equipped with puncturing means which are designed to puncture or tear a membrane or foil provided at an upper face of the capsule 3.

About the water injector 21 is mounted a capsule rotary engaging part 39. The engaging part 39 has a central bore 39a for receiving the water injector 21 and rotational guiding means such as a ball or needle bearing 25 inserted between the engaging part 39 and the injector 21.

In order to enable sealing of the water inlet of the capsule, a sealing member 24 is arranged around the water injector 21 at a lower face of the rotary engaging part 39. The sealing member 24 is thus arranged between the rotary engaging part 39 and an upper face of the capsule 3. Thereby, the sealing member 24 applies a certain sealing pressure on the upper lid 17 of the capsule. Hence, water is effectively prevented from leaking along the upper surface of the capsule 3 and from by-passing the capsule to release directly through liquid outlet 35 of the centrifugal unit 2. Furthermore, a venting means (not shown) can be provided through the injection assembly 20 for enabling gas to escape from the capsule as liquid is filled in the capsule.

The liquid receiving assembly 32 and the liquid injection assembly 20 are preferably arranged to encase the capsule or centrifugal cell 3, the receiving drum 16 and the water injector 21. Preferably, the receiving assembly 32 and the injection assembly 20 can be moved relatively to each other such that a user of the device may access the rotary drum 16 in order to exchange the capsule 3 for example. Therefore, a closing mechanism (not shown) may be connected to the receiving and the injection assembly 32,20 in order to enable a relative movement of the receiving and the injection assembly 32,20.

In order to enable a sealing of the receiving assembly 32 and the injection assembly 20 during the operation of the device, sealing means such as an O-ring 49 for example are provided at the contact surfaces of the assemblies.

The water injection assembly 20 further comprises a valve system 19 for controlling the flow of liquid that is discharged from the capsule 3 during operation of the device. The valve system 19 can be arranged on the capsule rotary engaging part 39 in the form of an annular engaging portion 40 which is biased under the force of elastic loading means 27.

As can be seen in figure 4, the annular engaging portion 40 includes a pressing peripheral pinching edge 26 which applies a closing force on the peripheral rim 41 of the capsule 3 to be able to restrict the flow of liquid under the force of the elastic loading means 27.

As can be seen in figure 4, the elastic loading means 27 can be a rubber-elastic ring member which is supported by an upper and a lower annular seat portion 28, 29. Other means such as spring-biased loading means 27 may as well be applied to the device.

It should be understood that the load of the elastic loading means 27 is preferably adjustable. Hence, the pressure of the liquid which has to be exerted on the flow restriction valve 19 in order to enable a discharging of liquid from the capsule 3 to the outlet 35 of the device can be adjusted.

As can be seen in the figure, the pinching edge 26 is preferably 'V'-shaped or cone-shaped. Thus, the sealing

pressure in a localized area is increased. The valve means 19 further comprises an internal base member 30 which is preferably an integral part with the rotary engaging part 39 of the injection assembly 20. The elastic loading means 27 thus are inserted in a space located between the base portion 30 the engaging portion 40.

Therefore, at a rest position, the engaging portion 40 of the valve 19 keeps closing on the rim 41 of the capsule 3 under the compressive effect of the resilient means 27

The operation of the device is described in the following.

The capsule device is opened by moving the two assemblies 20, 32 relatively one another, e.g., by means of a dedicated closing mechanism and separating the two assemblies 20, 32. As a result, a single-use capsule 3 containing a food substance can be inserted in the device, i.e., placed in the cavity of the rotating drum 16. The device is then closed by the assembly 20 being connected back onto the assembly 32 and locked by the closing mechanism. In the locked position, the water injector 21 is connected to a water inlet 44 of the capsule. Water can thus be introduced in the capsule via the central water injector 21. The capsule can be driven in rotation by activating the driving means 5. The centrifugation is carried out by rotating the capsule around the central axis of rotation of the device that is preferably aligned to the central axis Z of the capsule. During the prewetting phase as described, previously, the capsule is filled with water and the ingredients are entirely wetted. The control means control the speed as such a low speed that liquid pressure is insufficient to open the valve 19.

After a sufficient acceleration of the rotational speed is carried out and the extraction phase 'per se' begins, the centrifuged liquid is allowed to pass through the plurality of outlet openings 34 provided in a peripheral portion 47 of the lid 17 of the capsule. Under the effect of high centrifugal forces, the food substance, such as e.g. ground coffee powder, tends to compact itself radially whereas water is forced to flow through the substance. This results in the substance being both compacted and intimately wetted by water. Due to the high rotational movement of the capsule, the centrifugal forces exert themselves uniformly on the mass of the substance. Consequently, the water distribution is also more uniform compared to usual methods using a pressure pump to exert the pressure in the capsule. As a result, there is lower risk of preferential flow path through the substance which could lead to areas which are not properly wetted and so not properly brewed, dispersed or dissolved. As result of the high centrifugal forces during the extraction phase, the valve is forced to open and liquid is so projected as a laminar flow at relatively high velocity in direction of the wall 36.

Figures 5 and 6 relate to a capsule which is preferably used with the device and system according to the present invention. However, it should be understood that the shown embodiment is just an exemplary embodiment and that the capsule according to the invention can take various different embodiments.

The capsule 3 comprises a rigid dished body 42 which comprises an annular rim portion 41. The capsule is preferably design as being rotationally symmetric about

central axis Z. Thereby, it should be noted that the capsule may not necessarily have a circular section around axis Z but may take another form such as a square, rectangle or a polygonal form. Thereby, axis Z is preferably aligned to the axis of rotation A when the capsule is inserted in the device.

Moreover, the capsule 3 comprises a lid 17 which preferably has the form of a disc of plastic comprising a central portion 46 and a peripheral portion 47. The central portion 46 can be substantially flat and may comprise an inlet port 44 for enabling the fitting or introduction of a water injection member 21 of the beverage production device.

It should be noticed that the lid 17 can be a rigid or semi-rigid member made of thermoformed or injected plastic for instance. However, this part could also be made of a flexible membrane which is sealed to the inner surface of the dished body without departing from the scope of the invention.

At the side of the lid 17 which faces the inside of the capsule 3, the inlet port 44 can extend by a tubular inlet portion 43 which serves for ensuring the water is guided toward the direction of the bottom of the body to ensure complete wetting of the substance 38 in the enclosure and so reduced risk of leaving for example "dry powder spots".

The upper surface of the capsule 3 may be equipped with a foil 45 which enables sealing of the capsule 3. The foil preferably covers the lid 17 and is welded or adhesively connected onto the peripheral edge 41 of the body of the

capsule. The foil can be permanently connected to the edge if the foil is intended to be pierced for forming the inlet and outlets or, alternatively, the connection is peelable. Before the capsule is inserted into the rotary drum 16 of the device, said foil 45 needs to be pierced or removed in order to enable a preparation of the beverage.

The lid 17 further comprises a peripheral portion 47 including a collecting recess 18. The collecting recess 18 forms a U-shape in transversal section (figure 6) which opens in the direction of the sealing foil 45. The recess is preferably continuously extending at the periphery of the lid 17 although it can be replaced by several discontinuous recessed portions which may be separated by reinforcing elements or walls, for example.

The collecting recess 18 comprises an inner peripheral portion of wall 47 of the lid 17 into which is provided a series of outlet openings 34 forming a fluid communication between the enclosure 33 and the collecting recess 18.

Furthermore, the outlet openings 34 may be formed by a filter paper, a woven or non-woven portion or another meshed or porous membrane (not shown). Thus, the lid 17 which is inserted in the dished body 42 comprises a circumferential band of a porous material. The porous material provides restriction of the flow, creating a certain pressure drop, e.g., between 0.5 and 4 bar, and leading to a filtering of the solid particles. In particular, the size of the pores of the material can be chosen to retain also the coffee fines, i.e., the particles of particle size as low as 90 microns. The

paper, fabric, meshed or porous material can be formed of a band or bands which can be welded or otherwise combined to the lid.

During operation of the device, the capsule 3 is rotated about its axis Z. Thereby, the liquid which is centrically injected into the capsule 3 will tend to be guided along the inner surface of the side wall of the body, up to the inner side of the lid, and then through the outlet openings 34. Due to the centrifugation of the liquid provided centrically to the capsule 3, the liquid and the ingredients 38 provided within the capsule are made to interact in order to form a liquid comestible.

Figs. 7 and 8 provide a variant of the beverage preparation system of the invention in which the load of the valve means is adjustable for enabling a control of the opening pressure in order to control the foam or crema level. For simplifying the present description and avoid repetitions, the same numerical references have been used to refer to similar technical means as in the previous embodiments. The novel aspects of the present embodiment essentially lie in piercing means of the device for piercing inlet/outlets in the capsule and in a different configuration of the flow restriction valve 19 compared to the other embodiments.

As illustrated, the water injector 21 extends coaxially in the capsule 3 by a hollow piercing member 51. The piercing member extends below the upper surface of the capsule 3, in the cavity 33. The piercing member is formed as a hollow tube to supply liquid in the capsule at its tip. The piercing member can so be used to pierce a sealing membrane 52 of the capsule which closes the lid

in a gastight manner before the capsule is inserted in the device.

The capsule rotary engaging member 39 can further comprise outlet piercing members 53 placed in axial alignment with the liquid collector of the capsule when the member 39 is engaged in closure on the capsule. The outlet piercing members 53 serve to pierce the membrane 52 of the capsule to define a plurality of outlets at the periphery of the capsule from which liquid collected in the collector can leave the capsule. The outlet piercing members are introduced in the collecting recess 18 of the capsule which is sized in such a way that the peripheral portion 47 of the lid cannot be perforated. The centrifuged liquid can thus be discharged from the collecting recess 18 via the holes which are formed in the sealing foil 52 by the piercing members.

The device further comprises a flow restriction means forming a valve assembly 19 which operates in opening when the pressure of centrifuged liquid has reached a certain threshold. For this, the rotary engaging member 39 has a protruding peripheral edge 40 which engages on the peripheral edge 41 of the capsule. The engagement is forced by an elastic biasing mechanism 27 which provides elastic compressive forces onto the rotary engagement member 39. In this particular embodiment, the elastic biasing mechanism 27 comprises a base 54 at one end into which is fitted a compression spring 55 and an abutting member 56 at the opposite end. The base 54, spring 55 and abutting member 56 are housed into a tubular frame 57. The abutting member 56 is further connected to a screw element 58 which protrudes externally from the frame. The screw element and tubular frame 57 form together an

actuating means 50. They comprise a complementary thread 80 assembly enabling to tune the compressive load of the elastic member on the engagement member 39.

As illustrated in Fig. 8, the engagement member 39 which normally applies a closing force onto the edge 41 of the capsule by pressing edge 81, is pushed upwards by the pressure exerted by the centrifuged liquid during the extraction phase, as soon as the rotational speed has reached a sufficient value. The annular gap 59 which is formed between the protruding peripheral edge 41 of the capsule and the pressing edge 81 of the valve determines the laminar flow of liquid. A very thin gap of about 0.1 to 1 mm is maintained opened by the pressure of the centrifuged liquid, thus enabling the liquid to be released at a high velocity in the direction of the impact wall 61 of the receiver. Therefore, as the flow rate of liquid increases during the ramp up phase B', the flow gap 59 increases proportionally. When the flow rate is stabilized during extraction phase B as controlled by the controller, a relatively consistent jet of liquid 60 is projected onto the impact wall 61 of the receiver. This results in a reproducible level of crema, extraction after extraction. When the load of the elastic member is increased by forcing the spring in compression, this results in an increase of the speed by the controller to maintain the flow rate at the set point. For coffee, it is noticed that a higher amount of coffee crema can be obtained accordingly. If a lower amount of crema is desired, the user can reduce the compression on the elastic member by the actuating means, which results in an automatic reduction of the speed for maintaining the same flow rate. Therefore, it is possible to control simply the level of foam of the beverage by adjusting the

load on the flow restriction valve. Of course, the screw element can be actuated manually by the user or by use of a motor. If a motor is utilized, it is also possible to automatically control the actuation by the controller which can send input command to the motor. In such case, it is also offered the possibility to use the valve compressive load as a manipulated variable to control the speed and/or flow rate in a control loop scheme.

It should also be noted that the valve 19 can leave one or more minimal outlets in its closed state and that the opening of the valve by the pressure of liquid causes the enlargement of the one or more outlets. For example, a few radial channels forming minimal oulets can be provided in the edge 81 pressing on the surface of the capsule. Channels forming outlets may also be provided within the surface of the edge 41 of the capsule or both in the edges 81 or 41.

It should also be noted that the flow restriction valve could also be made downstream of the capsule without necessarily engaging a part of the capsule but it could be entirely designed in the device itself.

As illustrated in Fig. 9, a user's manual interface 13 can provide a choice of beverages, such as coffee, regarding a volume selection area 70, a strength selection area 71 and, optionally, a selection area 72 for a "crema" or foam level. The volume selection area 70 can present a plurality of discrete selecting keys 700, 701, 702 such pressure-sensitive switches, each one prompting for a user to select a predetermined volume of the beverage. For instance, key 700 represents the shortest cup, e.g., for a ristretto coffee volume of

about 25 mL; key 701 represents a short espresso coffee cup of about 40 mL and key 702 represents a lungo coffee cup of about 110 mL. The strength selection area 71 can so be actuated independently to set the desired concentration for each desired volume, e.g., amongst low, medium or high strength levels. The actuation of this strength selection key 710, e.g., a potentiometer, will fix the flow rate set point in the controller, as aforementioned, which finally determine the interaction time of the liquid with the ingredients in the capsule. The crema or foam selection area 72 may also comprise a selection key 720, e.g., a potentiometer, for adjusting the level of crema desired. The different levels, e.g., low, medium, high, will be obtained by varying, e.g., continuously or stepwise, the load constraint applied on the restriction valve and, consequently, will have a direct influence on the rotational speed necessary to open the restriction valve during beverage extraction for regulating the flow rate at the set point as fixed by the strength selection. It should be noted that the selection key 720 for crema can be the mechanical actuation means 50 of Fig. 7 if the adjustment system is not automated. Of course the user interface may include a touch screen or an array of membranes or mechanical buttons for receiving input from the user. Additionally, the user interface 112 may include a graphical or character display, such as in the form of a color, monochrome, or LCD display. The user interface may also include a voice prompt interface, wherein the local food waste monitoring device includes a speaker and provides audio instructions, data, and prompts to a user. The user may then press buttons to provide input in response. Alternatively, the user may speak instructions in response to the prompts, and the instructions may be collected via a microphone

and interpreted to commands through voice recognition software installed on the controller or interface.

Although the present invention has been described with reference to preferred embodiments thereof, many modifications and alternations may be made by a person having ordinary skill in the art without departing from the scope of this invention which is defined by the appended claims.

Claims

1. A beverage production device for preparing a liquid comestible from a portioned food substance contained in a capsule or cell, comprising

a centrifugal unit (2) for receiving the capsule or cell (3),

driving means (5) connected to the centrifugal unit (2) for enabling a rotational motion of the capsule or cell in the centrifugal unit,

liquid supply means (4,6,7) being connected to the centrifugal unit to supply liquid in the capsule or cell,

means (8) for measuring the flow rate, or respectively the pressure, of the liquid,

and

a control unit (9) for controlling the flow rate, or respectively the pressure, to match a flow rate reference, or respectively a pressure reference, in a control loop by automatically adjusting the rotational speed of the driving means during an extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure.

2. A beverage production device according to claim 1, wherein the reference flow rate is a constant set point or a variable profile of flow rates stored in or calculated by the control unit (9).

3. A beverage production device according to claim 2,

wherein the control unit is arranged for selecting or calculating different flow rate set points

corresponding to respectively different beverage strengths.

4. A beverage production device according to claim 3,

wherein it comprises a manual interface (13) configured to enable at least a selection of the strength of the beverage during the beverage production process and the volume of the beverage to be prepared.

5. A beverage production device according to claim 3,

wherein it comprises an identification means for receiving information from a capsule code as to the strength and/or volume of the beverage to be prepared.

6. A beverage production device according to any of claims 1 to 5,

wherein the liquid supply means comprise a pump (7) which is designed for supplying fluid to the centrifugal unit (2) and which is operated by the control means (9).

7. A beverage production device according to any of claims 1 to 6,

wherein the centrifugal unit (2) is designed to act as a centrifugal pump by drawing water from the liquid supply means (4,6,7).

8. A beverage production device according to any of claims 1 to 7,

wherein the control means (9) are designed to detect the electrical impulses (10) of the flow meter in order to calculate the flow rate and the dispensing volume during the beverage production.

9. A beverage production device according to claim 8,

wherein the means for measuring the flow rate is a pulse-coded flow metering turbine (8).

10. A beverage production device according to any of claims 1 to 9,

wherein the control unit is arranged to control extraction profile comprises at least a pre-wetting phase (A) and an extraction phase (B) which differ in at least the associated rotational speeds (S_A,S_1,S_2) of the driving means (5).

11. A beverage production device according to any of claims 1 to 10,

wherein device further comprises flow restriction means (19) at a delivery side of the centrifugal unit (2).

12. A beverage production device according to claim 11, wherein the flow restriction means comprises a valve (19).

13. A beverage production device according to claim 12, wherein the valve (19) is adjustable.

14. A system for producing a beverage from portioned ingredients provided within a capsule, the system comprising a beverage producing device having a centrifugal unit (2) comprising at least two enclosing members (20,32) for enclosing the capsule by a relative movement of the enclosing members (20,32),

driving means (5) connected to the centrifugal unit (2) for enabling a rotational motion of the centrifugal unit (2),

a liquid injection assembly (20) designed to interact with the capsule (3) provided to the device and connected to liquid supply means (4,6,7),

means (8) for measuring the flow rate, or respectively the pressure, of the liquid,

control means (9) for controlling the flow rate, or respectively the pressure, to match a flow rate reference, or respectively a pressure of reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure,

wherein the capsule (3) is designed to be removably inserted into the centrifugal unit (2) of the device.

15. A system according to claim 14,

wherein the capsule (3) is a single-use capsule sealed in a protective atmosphere before use.

16. A system according to claims 14 or 15,

wherein the capsule (3) contains ground coffee, soluble coffee, tea, cocoa and/or milk.

17. A method for preparing a liquid comestible from a portioned food substance contained in a capsule or cell (3) by passing liquid through the substance (38) using centrifugal forces, comprising the steps of

connecting the capsule or cell (3) to a liquid supply (4,6,7),

rotating the capsule or cell (3) about its rotational axis (Z) to enable an interaction between the liquid and the portioned ingredients (38) provided within the capsule (3),

controlling the flow rate, or respectively the pressure of supplied liquid, to match a flow rate reference, or respectively a pressure of reference, in a control loop by automatically adjusting the rotational speed of the driving means during the extraction phase of the beverage production depending on the measured flow rate, or respectively the measured pressure.

18. The method according to claim 17,

wherein controlling the flow rate is carried out in relation to a selection of the strength of the beverage.

19. The method according to claims 17 or 18,

wherein the level of crema or foam can be controlled by adjusting the load on a flow restriction valve (19) at the exit of the capsule or cell.

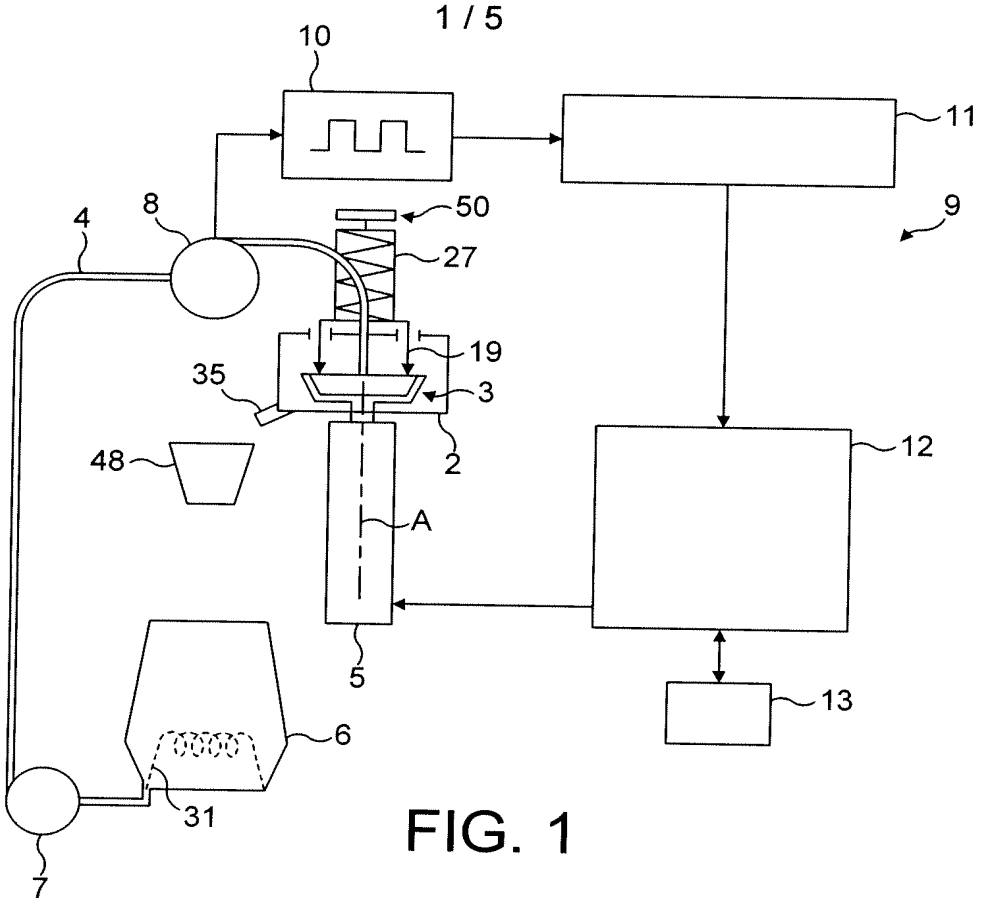

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FIG. 1

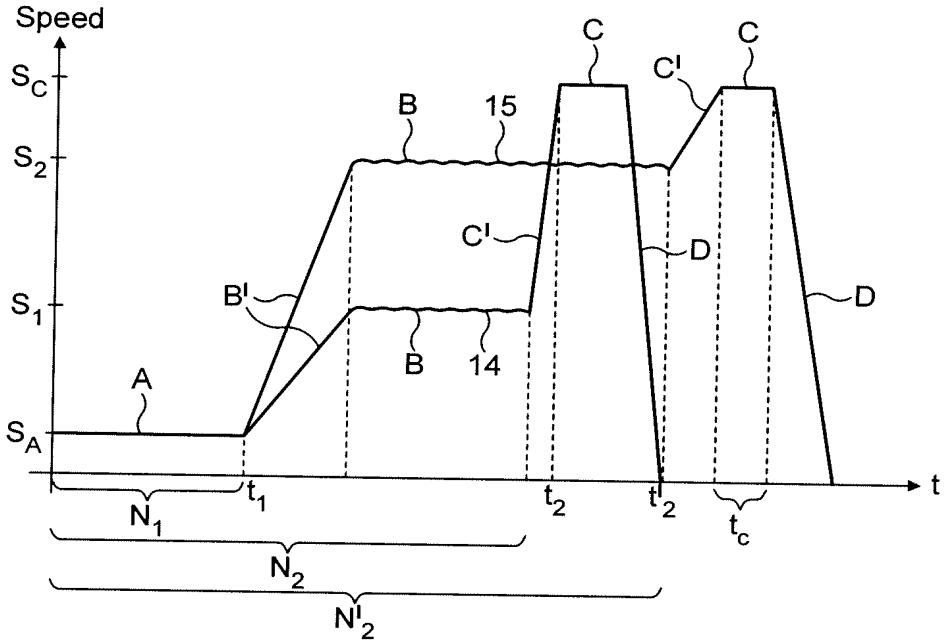

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FIG. 2

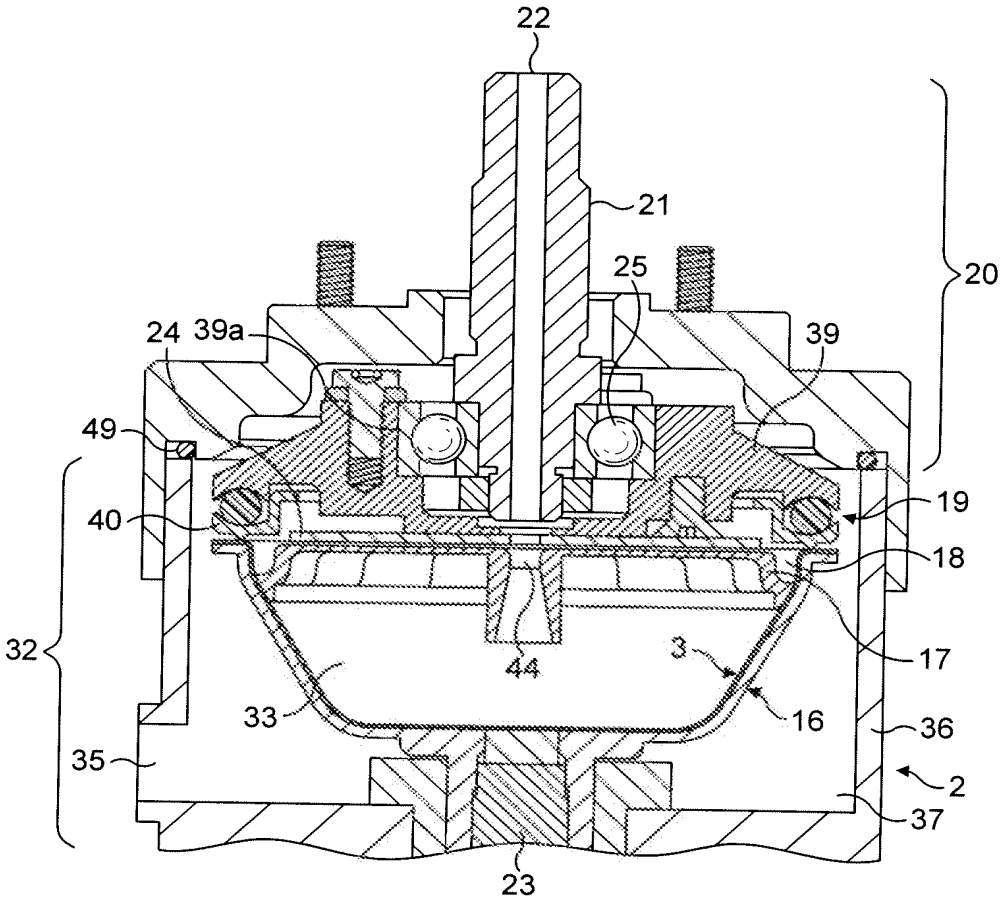

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FIG. 3

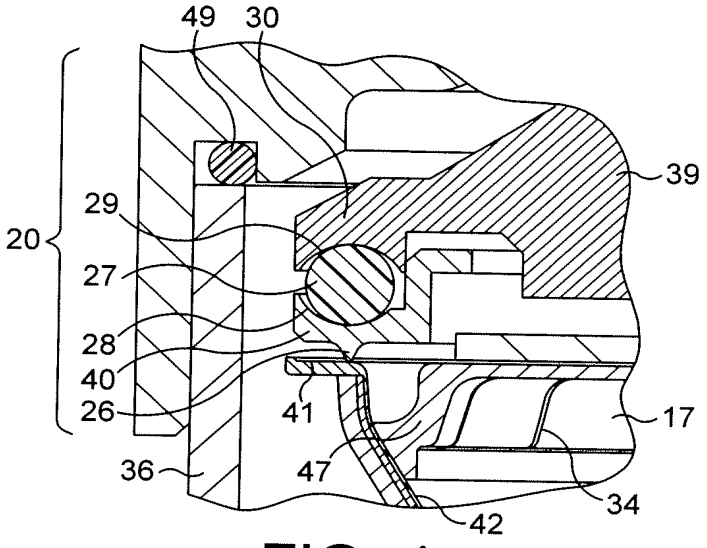

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FIG. 4

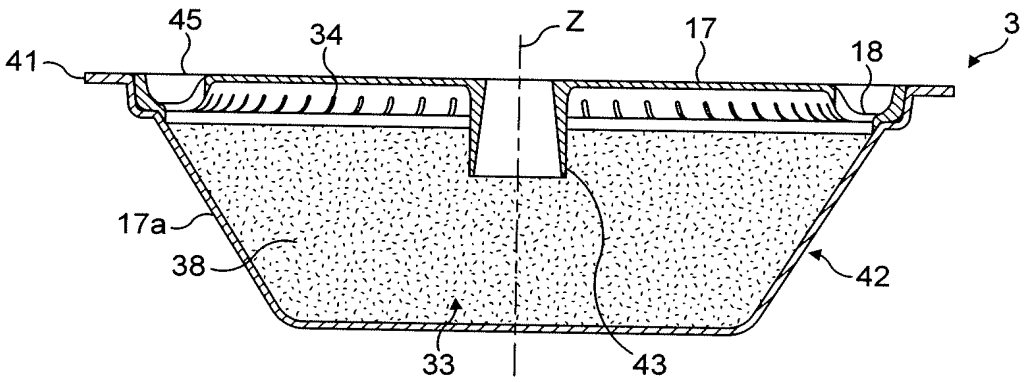


FIG. 5

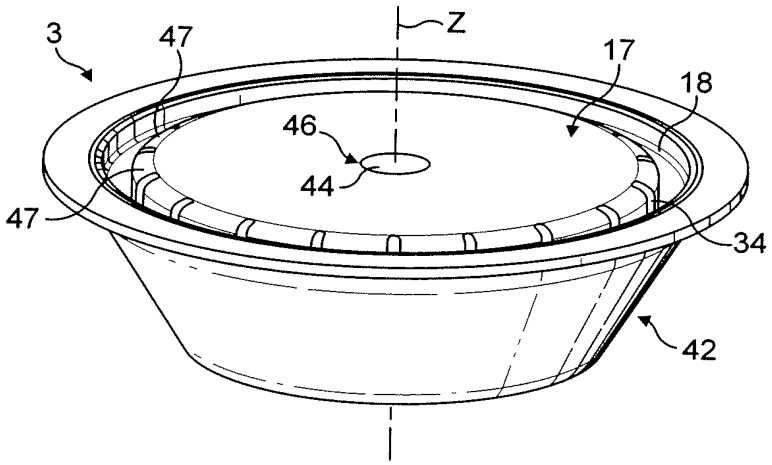


FIG. 6

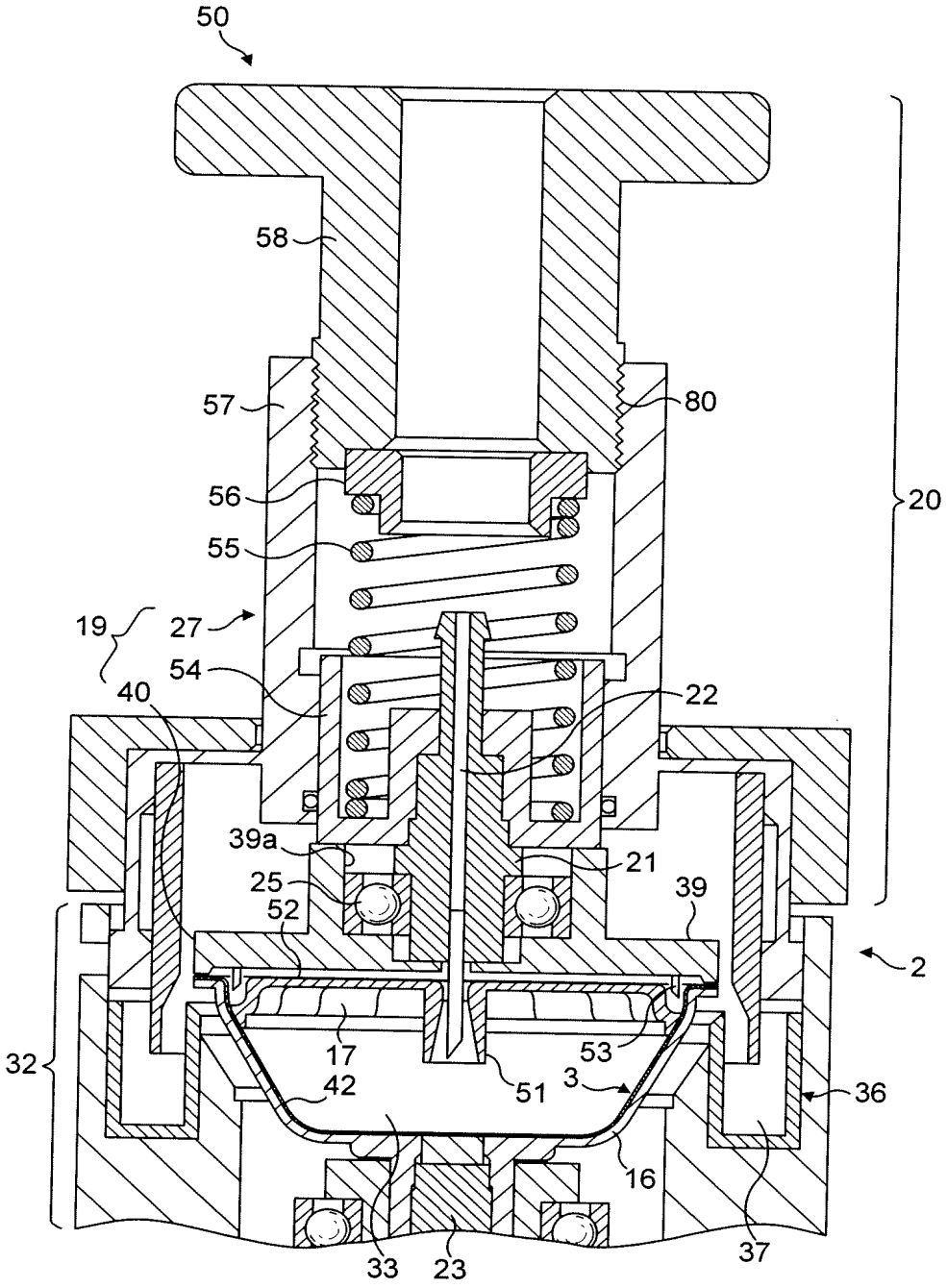

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FIG. 7

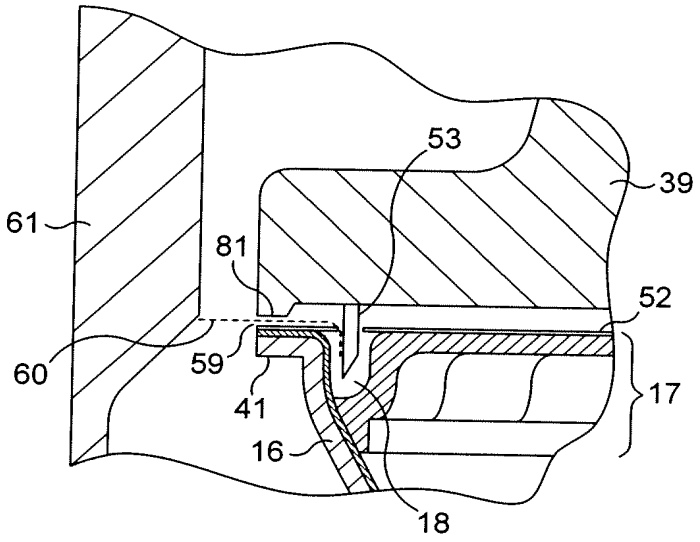

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FIG. 8

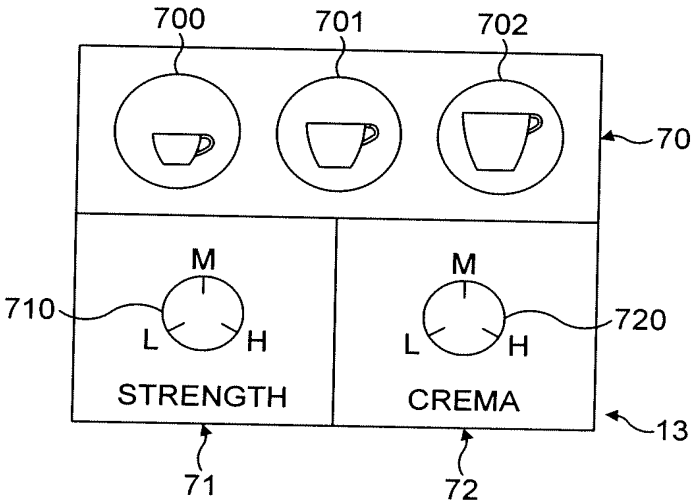

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STRENGTH
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FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/060771

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J31/22

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	BE 894 031 A1 (GUERIN A) 4 February 1983 (1983-02-04) the whole document	14

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 February 2010	08/02/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kempeneers, Johanna

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/060771

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 651 963 A1 (SEB SA [FR]) 10 May 1995 (1995-05-10) column 3, line 52 - column 6, line 53 figures 1,4,5	1,14,17
E	WO 2009/106598 A1 (NESTEC SA [CH]; COLANTONIO JEAN-LUC [CH]; BONACCI ENZO [CH]; DENISART) 3 September 2009 (2009-09-03) page 4, paragraph 3 page 19, line 17, paragraph 2 - page 20, last line, paragraph 2 page 23, paragraph 2 page 24, line 4 - line 10 page 25, line 4 - line 7 figure 1	1-2,6, 8-17,19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2009/060771

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 2009106598 A1	03-09-2009	NONE	

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(43) Date of publication of application: **26.08.03**

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B65D 81/34

(21) Application number: **2002045303**

(22) Date of filing: **21.02.02**

(71) Applicant: **KASHIWAGI MOLD:KK**

(72) Inventor: **JUSO MITSUAKI**

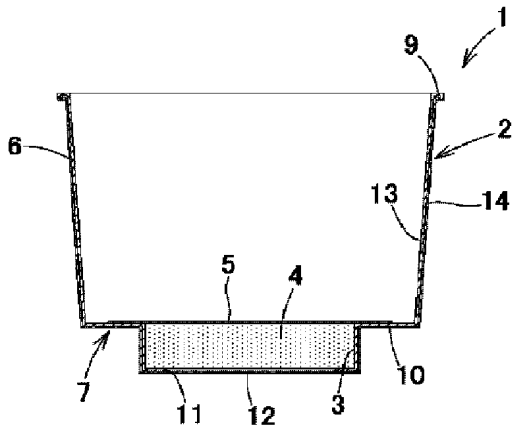
(54) **DRIPPING CARTRIDGE**

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(57) Abstract:

PROBLEM TO BE SOLVED: To provide a dripping cartridge which can be prepared cheaply, is disposable, can reduce its packed volume, can reduce the shipping cost and can improve the portability.

SOLUTION: This dripping cartridge has a cartridge-shaped base material layer 13 which is made of a thermoplastic synthetic resin material and has an extraction hole 11 at the bottom and a nonwoven fabric layer 14 which is made of a thermoplastic synthetic resin material and is laminated wholly on the inside or outside of the base material layer 13 to cover the extraction hole 11 and constitute a filter 12 in the extraction hole 11. This dripping cartridge is prepared by laminating a nonwoven sheet made of a thermoplastic synthetic resin material having a filter function wholly on at least one side of a bored thermoplastic synthetic resin sheet and then subjecting this laminated material sheet to a sheet-forming operation to form it into a cartridge shape having an extraction hole at the bore.



K-FEE SYSTEM GMBH, EX2009, page 5020
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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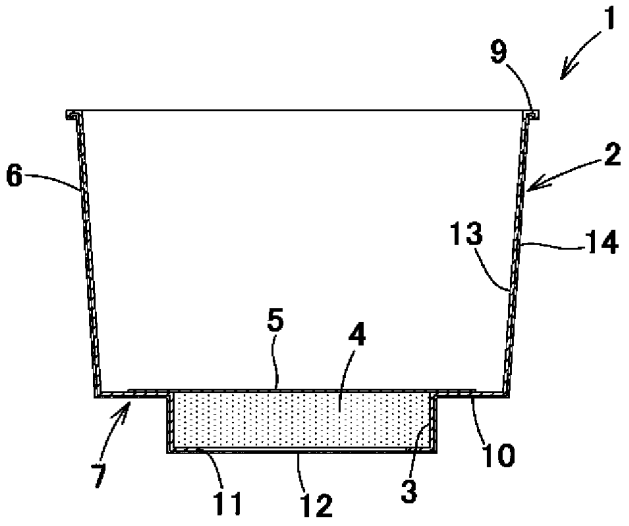
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(54)【発明の名称】　ドリップ用カートリッジ

(57)【要約】
【課題】 安価に製作できて使い捨てが可能で、しかも包装形態の減容化を実現して、流通コストの削減と携行時の利便性を向上し得るドリップ用カートリッジを提供する。
【解決手段】 熱可塑性合成樹脂材料からなり、底面に抽出口１１を形成したカートリッジ形状の基材層１３と、抽出口１１を塞ぐように基材層１３の外面或いは内面の全面にわたってラミネートされ、抽出口１１内においてフィルター１２を構成する熱可塑性合成樹脂材料からなる不織布層１４とを備え、予め抜き穴をあけた熱可塑性合成樹脂シートの少なくとも一方の面に、熱可塑性合成樹脂材料からなるフィルター機能を有する不織布シートを全面にわたってラミネートし、このラミネートしてなる材料シートを抜き穴が抽出口になるようにカートリッジ形状にシート成形した。



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【特許請求の範囲】
【請求項１】 熱可塑性合成樹脂材料からなり、底面に抽出口を形成したカートリッジ形状の基材層と、
前記抽出口を塞ぐように基材層の外面或いは内面の全面にわたってラミネートされ、抽出口内においてフィルターを構成する熱可塑性合成樹脂材料からなる不織布層と、
を備えたドリップ用カートリッジ。
【請求項２】 前記カートリッジの底面の中央部に収容部を凹設し、この収容部に焙煎コーヒー粉末を充填し、カートリッジの底面に焙煎コーヒー粉末を収容部内に封止する、通水性を持つ不織布からなる封止シートを貼着した請求項１記載のドリップ用カートリッジ。
【請求項３】 前記カートリッジを柔軟性を有し屈曲可能な熱可塑性合成樹脂シートで構成し、側壁部の上側壁部又は下側壁部を高さ方向の途中部で折り返して反転させ、上側壁部の内側に下側壁部を配置させて全高を低く設定した請求項１又は２記載のドリップ用カートリッジ。
【請求項４】 前記カートリッジの側壁部の高さ方向の途中部に環状段部を形成し、環状段部と反転させる壁部とを円弧面で滑らかに連設させ、環状段部を中心に上側壁部又は下側壁部を折り返して反転させ、上側壁部の内側に下側壁部を配置させて全高を低く設定した請求項１又は２記載のドリップ用カートリッジ。
【請求項５】 反転させる上側壁部又は下側壁部に伸縮方向に延びる縦リブを円周方向に間隔をあけて形成した請求項３又は４記載のドリップ用カートリッジ。
【請求項６】 予め抜き穴をあけた熱可塑性合成樹脂シートの少なくとも一方の面に、熱可塑性合成樹脂材料からなるフィルター機能を有する不織布シートを全面にわたってラミネートし、このラミネートしてなる材料シートを前記抜き穴が抽出口になるようにカートリッジ形状にシート成形するドリップ用カートリッジの製造方法。

【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、使い捨て可能な簡易コーヒードリップとして好適に利用可能なドリップ用カートリッジ及びその製造方法に関する。
【０００２】
【従来の技術】焙煎コーヒー用のドリップ用フィルターとしては、漏斗状の専用器具に、袋状に作った不織布や紙製のフィルターをセットして用いるものが広く普及している。また、焙煎コーヒー粉末を不織布製容器に封入してなるカートリッジを専用の器具の底面に装着して使用するものや、耐水紙の本体部とフィルターを組み合わせた使い捨ての一体型カートリッジ等が上市されている。これらのうち専用器具を用いるものは、フィルターやカートリッジは使い捨てであるが、専用器具は使用するたびに洗わねばならず、また、専用器具がかさばることもあり、特にアウトドア等の使用には利便性に欠ける点があった。また耐水紙のカートリッジについては構造が複雑で加工工数が多いため、製造コストが高くつくという問題があった。
【０００３】
【発明が解決しようとする課題】一般には、本体部とフィルター部とを一体化させてなる一体型のドリップ用フィルターを作る場合には、底面に抽出口を形成したカップ状の本体部を製作し、この本体部の底面に抽出口を塞ぐようにフィルターとして作用する不織布や濾紙を接着して製作する方法が採用されている。また、焙煎コーヒーを封入したカートリッジにおいても、焙煎コーヒー粉末を入れた、フィルター機能を果たす不織布容器と、お湯を溜めてフィルターに流す本体部とは、前述したように着脱可能な別部材で構成したり、後加工で両者を接着していることが多い。
【０００４】本出願人は、このことがドリップ用カートリッジやフィルターのコストダウンや利便性向上を阻害する要因のひとつであると考え、お湯を溜める本体部と抽出を行うフィルター部分とを一体に成形することにより、利便性及び生産性が高く、安価に製作可能な使い捨てタイプの焙煎コーヒー用のドリップフィルター付きカートリッジを提供できると考えた。
【０００５】また、従来のドリップ用カートリッジにおいては、利便性を高めるため１回分ずつピロー包装等の個包装にすると、１回分の抽出容量のお湯を溜める本体部の占める容量が大きくてかさばり、輸送並びに保管の効率が著しく悪くなるという問題があった。
【０００６】本発明の目的は、安価に製作できて使い捨てが可能で、しかも包装形態の減容化を実現して、流通コストの削減と携行時の利便性を向上し得るドリップ用カートリッジを提供することである。
【０００７】
【課題を解決するための手段及びその作用】本発明に係るドリップ用カートリッジは、熱可塑性合成樹脂材料からなり、底面に抽出口を形成したカートリッジ形状の基材層と、前記抽出口を塞ぐように基材層の外面或いは内面の全面にわたってラミネートされ、抽出口内においてフィルターを構成する熱可塑性合成樹脂材料からなる不織布層とを備えたものである。
【０００８】このカートリッジは、請求項６記載のような製造方法により製作できる。即ち、予め抜き穴をあけた熱可塑性合成樹脂シートの少なくとも一方の面に、熱可塑性合成樹脂材料からなるフィルター機能を有する不織布シートを全面にわたってラミネートし、このラミネートしてなる材料シートを前記抜き穴が抽出口になるようにカートリッジ形状にシート成形することにより製作できる。
【０００９】より具体的には、このカートリッジは、マッチモールド型による熱プレス成形で製造することが可

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能で、ポリプロピレン、ポリエステル等の熱可塑性合成樹脂シートに、成形装置の金型配置に対応させて、ドリップ用カートリッジに成形したときに抽出口として機能する抜き穴を１個または複数個設け、その抜き穴を覆う様に、熱可塑性合成樹脂材料からなる、フィルター機能を持つ不織布シートをラミネートしたものを材料シートとし、成形したときに、前記抜き穴がドリップ用カートリッジの底面に形成される抽出口となるよう、前記抜き穴の位置を検出しつつ、フィルター部と本体部とを同時に、一体に成形加工して製作できる。したがって、このカートリッジにおいては、材料シートを製作する段階で、熱可塑性合成樹脂シートに抜き穴を設け、フィルターの役目を果たす不織布シートをラミネートしておいて一体的にシート成形することにより、別工程で抽出口の抜き加工やフィルターの接着を行う必要が無く、安価に効率良くドリップ用カートリッジ容器を製作することが可能となる。

【００１０】ここで、前記カートリッジの底面の中央部に収容部を凹設し、この収容部に焙煎コーヒー粉末を充填し、カートリッジの底面に、その焙煎コーヒー粉末を収容部内に封止する、通水性を持つ不織布からなる封止シートを貼着してもよい。このように構成することで、焙煎コーヒー入りのドリップ用カートリッジを容易に且つ安価に製作できる。また、このカートリッジにおいては、抽出口の穴を抜いたり、下側のフィルターを接着する等の後加工の必要が無いため、一般の成形機付き自動充填ラインで、最終製品までの一貫加工が可能となる。

【００１１】前記カートリッジを柔軟性を有し屈曲可能な熱可塑性合成樹脂シートで構成し、側壁部の上側壁部又は下側壁部を高さ方向の途中部で折り返して反転させ、上側壁部の内側に下側壁部を配置させて全高を低く設定してもよい。この場合には、収納時等においてカートリッジを折り畳んで側壁部の高さを約半分にし、取り扱い時の減容化を図ることができ、使用時には折り返して反転させた上側壁部又は下側壁部を元の形状に引き延ばして容易に使用できる。また、一回分ずつピロー包装等の個包装を行っても、容積を小さくできるため輸送コストの削減が可能となる。

【００１２】前記カートリッジの側壁部の高さ方向の途中部に環状段部を形成し、環状段部と反転させる壁部とを円弧面で滑らかに連設させ、環状段部を中心に上側壁部又は下側壁部を折り返して反転させ、上側壁部の内側に下側壁部を配置させて全高を低く設定してもよい。このような環状段部を形成すると、環状段部を中心に比較的容易に側壁面を折り返すことが可能となり、折り返したときの外周の歪も小さくできる。また、折り返し部の位置が安定し、同じ高さで折り返すことが可能となる。

【００１３】反転させる上側壁部又は下側壁部に伸縮方向に延びる縦リブを円周方向に間隔をあけて形成してもよい。即ち、反転させる壁部においては、成形時に円周の短い内径側が、反転により円周の大きい外径側に配置されるため、該壁部には反転によりシワが発生し易いが、この発明では、反転させる壁部に伸縮方向に延びる縦リブを設けることで、反転させる壁部に対してその周方向に対して若干の伸縮性を付与させて、反転時に発生するシワを吸収して、壁部を反転させた状態でのカートリッジの外観を向上できる。また、使用時にはより容易に、反転した壁面を元へ戻すことが可能となる。尚、反転させる壁部を円周方向に沿って半径方向に振幅する波形状に形成しても同様の作用が得られる。

【００１４】本発明に係るドリップ用カートリッジの製造方法は、予め抜き穴をあけた熱可塑性合成樹脂シートの少なくとも一方の面に、熱可塑性合成樹脂材料からなるフィルター機能を有する不織布シートを全面にわたってラミネートし、このラミネートしてなる材料シートを前記抜き穴が抽出口になるようにカートリッジ形状にシート成形するものである。

【００１５】この製造方法においては、フィルターを一体に成形できるため、別工程で抽出口の穴抜き加工や底面に対するフィルターの接着加工を行う必要がなく、カートリッジの製作コストを低減できる。特に焙煎コーヒーを充填するカートリッジにおいては、一般の成形装置付き自動充填機を使用することにより、一貫して最終製品まで加工することが可能となる。

【００１６】

【発明の実施の形態】以下、本発明の実施例について図面を参照しながら説明する。図１～図３に示すように、ドリップ用カートリッジ１は、カップ状の本体部２と、本体部２の底部に形成した収容部３に充填した焙煎コーヒー粉末４と、本体部２の底面に貼着されて収容部３内に焙煎コーヒー粉末４を封止する封止シート５とを備えている。

【００１７】本体部２について説明すると、本体部２は上側へ行くにしたがって大径となる側壁部６とその底壁部７とを有し、側壁部６の上端部には補強用のフランジ部９が折り返して形成され、底壁部７の外周部にはコーヒーカップ等に上側にカートリッジ１をセットするための略平坦な環状の載置部１０が形成されている。底壁部７の略中央部には収容部３が凹設され、収容部３の底面には抽出口１１が形成され、抽出口１１にはその開口を塞ぐように不織布シートからなるフィルター１２が張設されている。そして、この本体部２の収容部３内に必要量の焙煎コーヒー粉末４を充填し、収容部３の上面開口を塞ぐように不織布からなる封止シート５を載置部１０の上面にヒートシールなどにより接着して、カートリッジ１を製作することになる。尚、抽出口１１は、円形でもよいし多角形でもよい。また、スリット状や扇状や小孔等の複数の孔で構成してもよい。

【００１８】本体部２は、熱可塑性合成樹脂材料からなるカップ状などのカートリッジ形状の基材層１３と、抽

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出口１１を塞ぐように基材層１３の外面の全面にわたってラミネートされ、抽出口１１内においてはフィルター１２を構成する熱可塑性合成樹脂材料からなる不織布層１４との２層構造に構成され、後述するように、基材層１３を構成する合成樹脂シート５０に抽出口１１に対応させて抜き穴５１を形成し、これに不織布層１４を構成する不織布シート５２をラミネートし、このラミネートしてなる材料シート５４をカートリッジ形状に熱プレス成形して製作されている。但し、不織布層１４は、基材層１３の内面の全面にわたってラミネートしてもよい。また、基材層１３に対応する位置において、不織布層１４に飾り穴等を形成してもよい。

【００１９】基材層１３を構成する熱可塑性合成樹脂としては、ポリプロピレンやポリエチレン等のポリオレフィン系合成樹脂材料や、これらの合成樹脂材料に無機系フィラーを配合したもの及び、ポリエステル、ポリカーボネートなどを好適に利用できる。

【００２０】不織布層１４を構成する不織布としては、長繊維スパンボンド不織布等の成形性を有し、基材層１３に対する熱融着性に優れた素材からなる不織布が好適に利用できる。具体的には、ポリアミド系、ポリアクリロニトリル系、ポリエステル系、ポリビニルアルコール系、ポリプロピレン系、ポリ塩化ビニル系、ポリ塩化ビニリデン系などの熱可塑性合成樹脂材料からなる長繊維スパンボンド不織布を採用できる。また、不織布層１４を構成する不織布（不織布シート５２）の目付は、本体部２内に注いだお湯が適度な速度で焙煎コーヒー粉末４を経てコーヒーカップ内へ供給されるような目付に設定することになる。尚、封止シート５も不織布層１４と同様の素材で構成することになる。

【００２１】本体部２は、カップ状以外の任意の形状に形成することが可能である。また、本体部２の容量は、標準的なコーヒーカップの容量よりもやや大きく設定され、本体部２の設定位置までお湯を注ぐことで、１回分のコーヒーを入れることができるようにしても良いし、本体部２の高さを極力低く設定するため、標準的なコーヒーカップの容量よりも小さな容量に設定して、複数回に分けてお湯を注ぐようにしてもよい。

【００２２】このカートリッジ１は、基本的には使い捨てが可能な簡易のカートリッジで、収容部３内にはコーヒーカップ１杯分のコーヒーを入れることができる分量の焙煎コーヒー粉末４が充填されている。但し、複数杯のコーヒーを入れることができる分量の焙煎コーヒー粉末４を充填することも可能である。

【００２３】このカートリッジ１の使用時には、カートリッジ１をコーヒーカップ等の容器上にセットし、本体部２内にお湯を注ぐだけで、注いだお湯が封止シート５を通って焙煎コーヒー粉末４に供給され、抽出されたコーヒーとともにフィルター１２を通って容器内に供給されることになる。

【００２４】尚、本実施例では、収容部３内に焙煎コーヒー粉末４を充填したが、緑茶や烏龍茶や紅茶などの茶葉を充填して、緑茶や烏龍茶や紅茶などを提供できるように構成することも可能である。

【００２５】また、本実施例では、カートリッジ１に焙煎コーヒー粉末４を備えさせたが、焙煎コーヒー粉末４及び封止シート５を省略して、別途に用意した焙煎コーヒー粉末４を本体部２内に入れて、コーヒーを抽出することも可能である。また、この場合には、図４、図５に示すカートリッジ１Ａのように、前記実施例における本体部２の収容部３に代えて、コーヒーカップに対するカートリッジ１の位置決め用の収容部３よりも深さを浅く設定した位置規制部１５を底壁部７の中央部に凹設したり、収容部３を完全に省略して、底壁部７の中央部に直接的に抽出口１１を形成することになる。

【００２６】前記カートリッジ１は、コーヒーの風味を保持するためにガスバリア性を有するバリアフィルム等で包装して市場に提供される。複数個の集合包装にすると、開封して短期間に使い切れない場合、そのままにすると風味が損なわれるため、残ったものの保存は缶やガラス瓶、またはバリアフィルム製の密閉保存袋等を用いる等の配慮が必要になる。包装形態は、このように特別の配慮を必要としない様に、また、アウトドア等に手軽に携行して利用できるように１回分ずつ個包装にすることが好ましい。しかし、カートリッジ１をピロー包装等で１回分ずつ個包装すると、お湯を溜める本体部２がかさばり、流通コストや販売コストが高くつき、携行にも不便で著しく利便性に欠けるものになってしまう。本出願人は前記問題を解決するため、本体部２の側壁部６をその高さ方向の途中部で折り返して反転させ、カートリッジ１の高さを約半分にすることで、包装形態の減容化を試み、次のような方法を発明した。

【００２７】本体部２の側壁部６の上側壁部又は下側壁部を高さ方向の途中部で折り返して反転できるように、基材層１３として、ポリエチレン、ポリプロピレン、及びそれらポリオレフィン系合成樹脂に無機系フィラーを配合したもの等、比較的柔軟で屈曲可能な特性を持つ熱可塑性合成樹脂シートを採用した。

【００２８】そして、図６（ａ）に示すように、カートリッジ１を倒立状にして略円柱状の受け台２０に装着し、カートリッジ１の下半部に適合するリング状の折り返し治具２１を倒立状にセットしたカートリッジ１に上側から被せ、折り返し治具２１でカートリッジ１の載置部１０を押えつつ、カートリッジ１の口縁部を外側に広げるように引き上げてカートリッジ１の上半部を反転させ、図６（ｂ）に示すように、側壁部６が折り返し治具２１の下端に当たるまで側壁部６を折り返して、カートリッジ１の高さを成形時の約半分に構成し、この状態で個包装することで、包装状態での減容化を可能となした。また、このカートリッジ１の使用時には、折り畳ん

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だカートリッジ１の口縁部の下面側を両手の指先で保持し、載置部１０を内側から親指で押し下げるようにして本体部２を成形時の状態に復元させることになる。但し、前記と同様の手法で機械的に側壁部６を折り返して反転させることも可能である。

【００２９】また、側壁部６の折返しが円滑になされるように、図７～図９に示すカートリッジ１Ｂのように、本体部２Ｂの側壁部６Ｂの高さ方向の途中部に環状段部２５を設け、環状段部２５よりも上側の上側壁部２６の直径を、環状段部２５よりも下側の下側壁部２７の直径より大きく構成すると、環状段部２５を介して上側壁部２６を容易に折曲させることが可能となる。さらに環状段部２５と折り返す側の上側壁部２６とを環状段部２５の幅と略同じ半径の曲面Ｒ１で形成された円弧面状の案内面２８で滑らかに連設させると、上側壁部２６の折り返しがより一層容易になる。

【００３０】また、折り返す側の壁部、即ちカートリッジ１Ｂにおいては上側壁部２６に、折畳状態において外側へ突出する突条からなる縦リブ２９を、伸縮方向としての上下方向の略全長にわたって、円周方向に一定間隔おきに設け、上側壁部２６の内外面を反転させることに起因するシワの発生を縦リブ２９で吸収してもよい。

【００３１】更に、図１０～図１２に示すカートリッジ１Ｃのように、側壁部６Ｃの高さ方向の途中部に環状段部２５Ｃを形成し、側壁部６Ｃのうちの環状壁部２５Ｃよりも上側に上側壁部２６Ｃを形成し、下側に上側壁部２６Ｃよりも小径の下側壁部２７Ｃを形成して、環状段部２５Ｃを中心に下側壁部２７Ｃを上側壁部２６Ｃの内側に折り返して反転させ、カートリッジ１Ｃを折り畳むことも可能である。また、この場合には、環状段部２５Ｃと反転させる下側壁部２７Ｃとを環状段部２５Ｃの幅と略同じ半径の曲面Ｒ２で形成された円弧面状の案内面２８Ｃで滑らかに連設させると、下側壁部２７Ｃの折り返しがより一層容易になる。更に、下側壁部２７Ｃと載置部１０間に折り畳んだ状態で載置部１０の外周部から上方へ突出する高さの低い突出壁部３０を形成し、この突出壁部３０と載置部１０とにわたって断面三角形状のリブ部３１を円周方向に一定間隔おきに形成してもよい。この場合には、カートリッジ１Ｃを使用状態に切り換えたときに、隣接するリブ部３１間が略直角状に残った状態となり、載置部１０の外縁部に角部３２が形成されて、載置部１０が平坦になるので、カートリッジ１Ｃをコーヒーカップ等に対して安定性よく載せることが可能となる。

【００３２】次いで、ドリップ用カートリッジ１の製造方法について説明する。図１に示すドリップ用カートリッジ１は、予め、抽出口１１になる抜き穴５１を設けたポリプロピレン、ポリエステル等の熱可塑性合成樹脂シート５０と、フィルターとしての機能を持った成形性を有する不織布シート５２とをラミネートした材料シート５４をシート成形して製作したものである。

【００３３】先ず、図１３に示すように、帯状の熱可塑性合成樹脂シート５０に対してカートリッジ１の抽出口１１となる抜き穴５１を図１５に示す成形装置６０の成形型６１の型配置に対応させて行列状に形成するとともに、熱可塑性合成樹脂シート５０の側部に１ショット毎に１ヶ所の割合で、成形時の位置検出用の小孔５３を形成する。但し、１つの抽出口１１を複数の抜き穴５１で構成することも可能である。また位置検出用の小孔５３は抜き穴５１と一体で抜き加工しても良いし、小孔５３の代わりに樹脂シート５０に位置検出用マークを印刷し、光電管等で位置合わせをしながら所定の位置に抜き穴５１を抜き加工しても良い。

【００３４】次に、図１３，図１４に示すように、抜き穴５１及び小孔５３を形成した熱可塑性合成樹脂シート５０に対して、熱可塑性合成樹脂材料からなる長繊維スパンボンド不織布等の成形性を有する不織布シート５２を、抜き穴５１を覆うように熱ラミネートして、材料シート５４を製作する。

【００３５】次に、不織布シート５２が下側に位置するように、材料シート５４を成形装置６０へ供給し、抜き穴５１が、成形されたカートリッジ１の底面略中央に位置するように、位置検出用の小孔５３を光電管等の検出手段６２で検出し、材料シート５４を位置調整するとともに、材料シート５４をヒータ６３で加熱してから、マッチモールド型からなる上下の成形型６１間で熱プレス成形する。

【００３６】次に、熱プレス成形した材料シート５４を図外の打ち抜き手段でトリミングして、単体の本体部２を製作する。

【００３７】次に、図示外の充填装置により本体部２の収容部３内に一定量の焙煎コーヒー粉末４を充填してから、収容部３の開口が閉塞されるように通水性を有する不織布シートからなる封止シート５を載置部１０の上面にヒートシールや超音波シールなどで接着し、カートリッジ１を得ることになる。

【００３８】この製造方法では、予め用意した材料シート５４を成形することにより、フィルター機能を持った状態で抽出口１１が一体成形されるため、別工程での抽出口１１の穴抜き加工や、フィルター部材の接着加工を行う必要が無く、前記成形装置６０に焙煎コーヒー粉末４の充填装置を連結し、インラインでコーヒーの充填加工と封止シート５の接着加工が可能となり、大幅に生産性を向上することが可能となる。

【００３９】

【発明の効果】本発明に係るドリップ用カートリッジによれば、お湯を溜める本体部と抽出口のフィルター部材を一体成形できるので、別工程で底面に抽出用の穴をあけたり、フィルター部材を接着したりする必要が無く、低コストで製造できるため、使い捨て仕様として安価に

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提供できる。また、別の成形容器等の他の器具を必要としないため、アウトドア等にも手軽に携行でき利便性が高い。

【００４０】カートリッジの側壁部の上側壁部又は下側壁部を高さ方向の途中部で折り返して反転させ、上側壁部の内側に下側壁部を配置させて全高を低く設定すると、個包装にしたときの容積を半減することができ、流通段階でのコストを大幅に抑制することができる。また、かさばらずアウトドア等への携行もしやすくなって利便性が高まる。

【００４１】カートリッジの側壁部の高さ方向の途中部に環状段部を形成し、環状段部と上側壁部とを円弧面で滑らかに連設させると、この環状段部と上側壁部の連設部分が屈曲し易くなり、側壁部の折り返しが容易になって、作業性を高めることができる。

【００４２】反転させる上側壁部又は下側壁部に伸縮方向に延びる縦リブを円周方向に間隔をあけて形成すると円周方向に若干の伸縮性が生じ、円周の小さい側壁部内面が、円周の大きい側壁部外面と入れ替わることによって生じるシワを効果的に解消することができる。また、壁部の融通がきくため、反転した壁面を使用時に戻す際にも簡単に操作できる。

【００４３】本発明に係るドリップ用カートリッジの製造方法によれば、お湯を溜める本体部とフィルター機能を持つ抽出口を、同時に、一体形成できるため、後加工で抽出口となる穴を抜いたり、フィルター部材を接着する必要が無く、安価にフィルター付きのドリップ用カートリッジを製造できる。また、材料シートの状態から、フィルター機能を持った容器の状態までを一貫して製造できるため、一般の成形装置付き自動充填シール機を用いると、最終製品までインラインで一貫加工が可能になり、生産性の向上ができる。

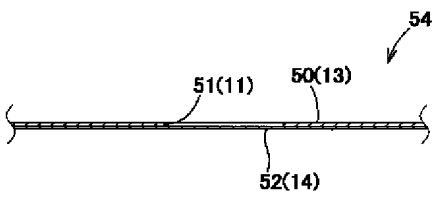
【図面の簡単な説明】

【図１】 ドリップ用カートリッジの斜視図
【図２】 同ドリップ用カートリッジの縦断面図
【図３】 同ドリップ用カートリッジの本体部の平面図
【図４】 他の構成のドリップ用フィルターの斜視図
【図５】 同ドリップ用フィルターの縦断面図
【図６】 （ａ）（ｂ）はカートリッジの折返し方法の説明図
【図７】 他の構成のドリップ用カートリッジの斜視図
【図８】 同ドリップ用カートリッジの使用状態での縦断面図
【図９】 同ドリップ用カートリッジの折畳状態での縦断面図
【図１０】 他の構成のドリップ用カートリッジの焙煎コーヒー粉末及び封止シートを除去した状態での使用状態の縦断面図
【図１１】 同ドリップ用カートリッジの焙煎コーヒー粉末及び封止シートを除去した状態での折畳状態の縦断面図
【図１２】 同ドリップ用カートリッジの焙煎コーヒー粉末及び封止シートを除去した状態での平面図
【図１３】 材料シートの製造方法の説明図
【図１４】 材料シートの縦断面図
【図１５】 製造装置の概略説明図

【符号の説明】

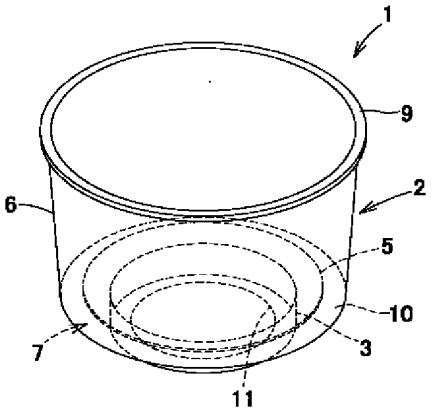
１　ドリップ用カートリッジ
２　本体部　３　収容部
４　焙煎コーヒー粉末　５　封止シート
６　側壁部　７　底壁部
９　フランジ部　１０　載置部
１１　抽出口　１２　フィルター
１３　基材層　１４　不織布層
１Ａ　カートリッジ　１５　位置規制部
２０　受け台　２１　折り返し治具
１Ｂ　カートリッジ　２Ｂ　本体部
６Ｂ　側壁部　２５　環状段部
２６　上側壁部　２７　下側壁部
２８　案内面　２９　縦リブ
１Ｃ　カートリッジ　６Ｃ　側壁部
２５Ｃ　環状段部　２６Ｃ　上側壁部
２７Ｃ　下側壁部　２８Ｃ　案内面
３０　突出壁部　３１　リブ部
３２　角部
５０　熱可塑性合成樹脂シート
５１　抜き穴　５２　不織布シート
５３　小孔　５４　材料シート
６０　成形装置　６１　成形型
６２　検出手段　６３　ヒータ

【図１４】

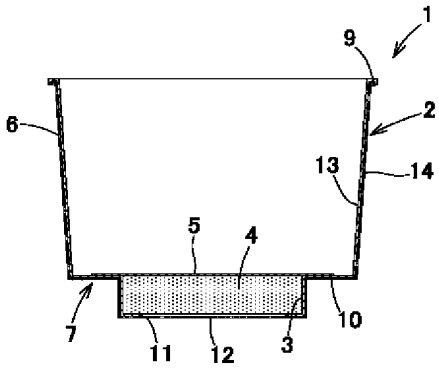


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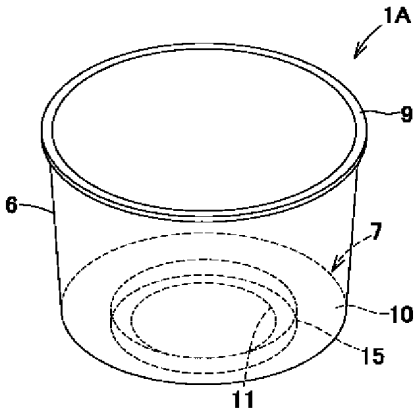
【図１】



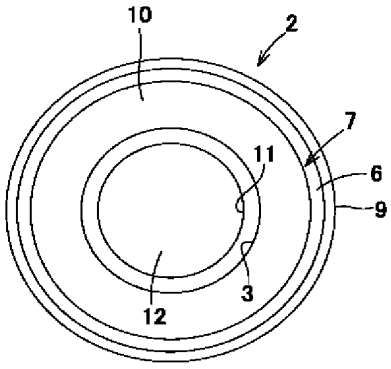
【図２】



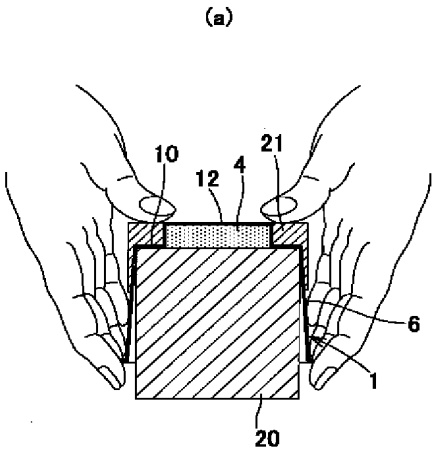
【図４】



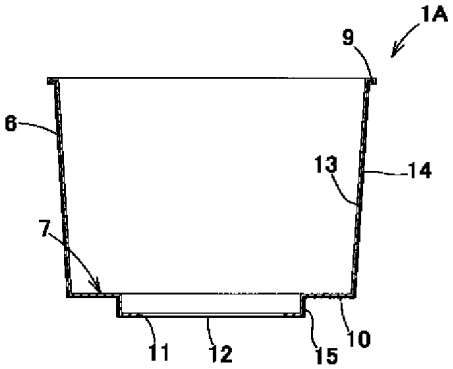
【図３】



【図６】

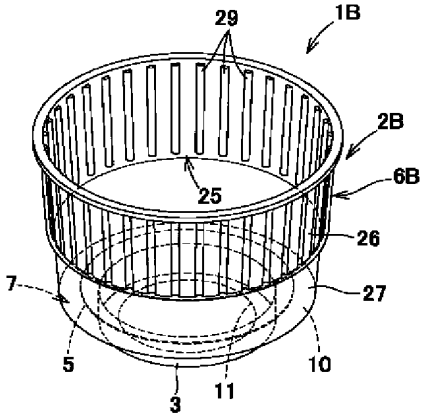


【図５】

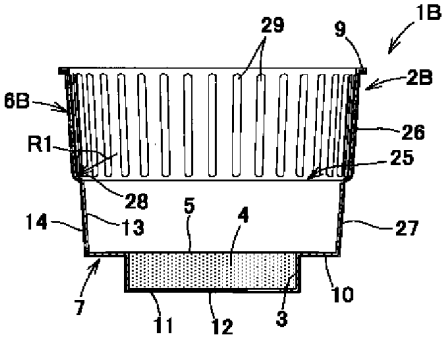


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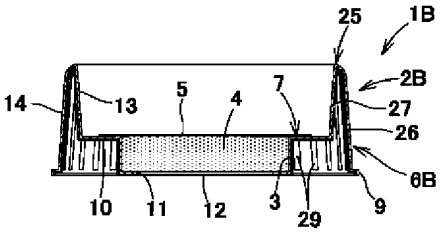
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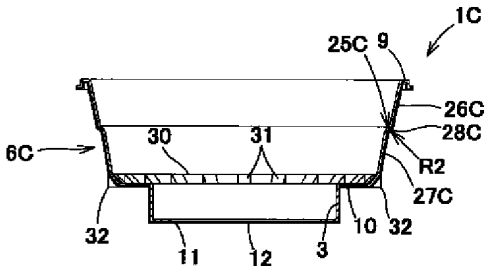
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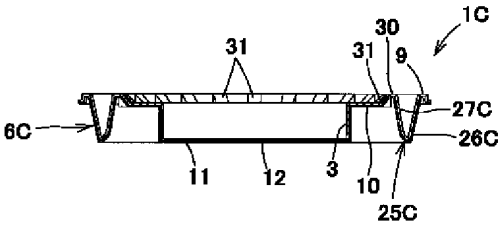
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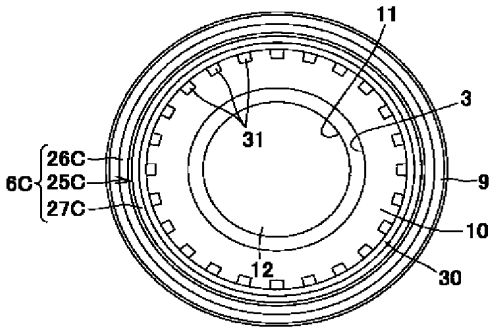
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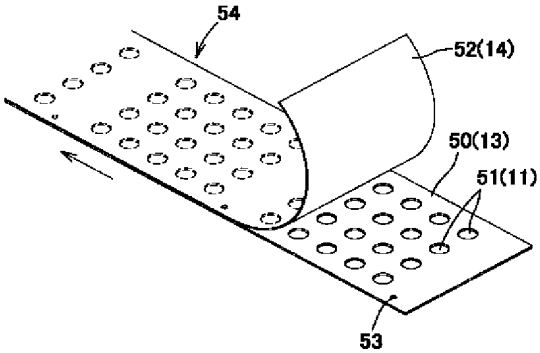
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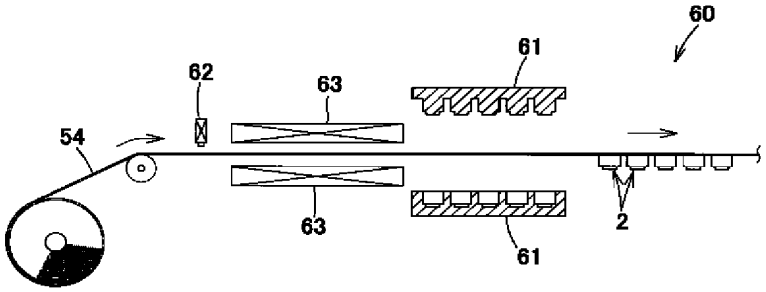
【図１２】



【図１３】



【図１５】



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(54) Title: CAPSULE WITH FLOW CONTROL AND FILTERING MEMBER

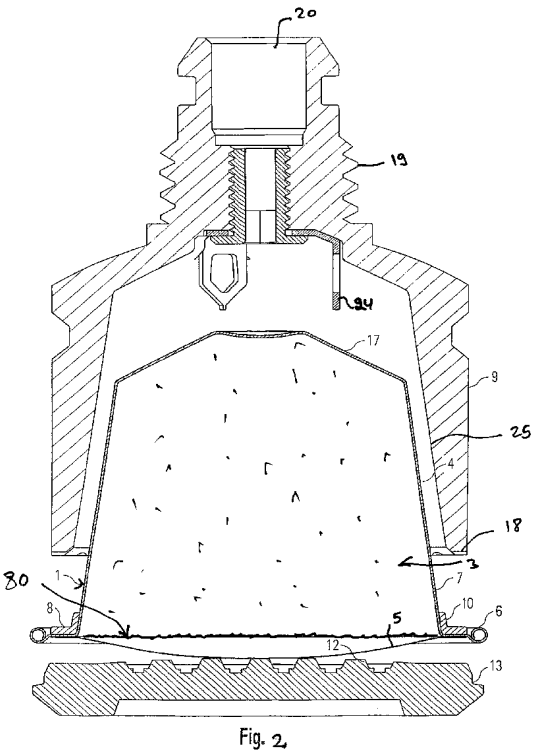


Fig. 2

(57) Abstract: A capsule for use in a beverage production machine comprising: - a first wall member (4), - a second perforable wall member (5) tightly attached to the first wall member (4), - at least one porous layer (80) between the ingredients in the capsule (1) and the second wall member (5); wherein the porous layer forms with the perforable non- porous foil member, a multilayer laminate. The flow control porous member provides a faster and more consistent flow of the liquid extract through the capsule and significantly reduces the resurgence of non- soluble solids.

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Capsule with flow control and filtering member

The present invention generally relates to capsules for containing beverage ingredients, to a beverage producing system for use in connection with such capsules as well as to methods for producing beverages on the basis of ingredients contained in such capsules.

The background of the present invention is the field of capsules which contain beverage or other comestible (e.g. soup) ingredients. By means of an interaction of these ingredients with a liquid, a beverage or other comestibles, such as for example soups, can be produced. The interaction can be for example an extraction, brewing, dissolution, etc. process. Such a capsule is particularly adapted to contain ground coffee in order to produce a coffee beverage by having hot water under pressure enter the capsule and draining a coffee beverage from the capsule.

FR 1537031 does not show separated capsules, but a blister pack containing coffee powder. As two foil members are sealed together at the top foil member in an area between two adjacent compartments, these compartments can not be separated from each other without loosing the tight seal between the foil members. A filter is arranged at the bottom of each compartment and thus opposite of the area where the two foil members are sealed. The outlet side of the compartment is opened by actively moving a perforation

member, via a spring force, against the lower face of the compartment. Due to the blister pack technology the top face of the compartments has to be flat.

Also according to CH605293 a filter is, at its rim portion, sandwiched between the foil member and the capsule base body wall. The foil member is additionally provided with a weakened area and is not designed to be perforated by being thrust against a relief plate. The filter is used as a screen to avoid coffee grains from being delivered in the liquid.

EP0507905B1 relates to an apparatus and cartridge for preparing a liquid product. An internal filtering membrane is placed in the bottom of the cartridge for retaining solid particles in the cartridge and prevent clogging of the flow channels provided in the perforating members.

EP-A-512468 relates to a capsule for the preparation of a beverage wherein a filter paper is welded between the peripheral area of the cup and the tearable membrane. The filter paper is used only to ensure no coffee grains can exit the membrane when torn.

EP-A-0602203 relates to a flexible sachet in the form of an individual portion adapted to be extracted under pressure containing a beverage ingredient; the sachet being symmetrical with respect to its plane of sealing, the material used for the flexible sheets being impermeable to oxygen and water vapour for its storage and the sachet being opened only under the effect of the increase in pressure when the extraction fluid is injected.

US2006/0236871A1 relates to a single portion cartridge which is suitable in particular for brewing a portion of a coffee beverage wherein a distributing and/or supporting structure is provided with at least one opening which is covered by a textile fabric forming a screen between the enclosure and the large outlet. The essential object of this invention is to minimize the escape of particles of the beverage substance from the cartridge during the brewing operation because a large opening is made in the bottom of the capsule body and the particles would be washed out in absence of such distributing structure. The textile fabric has a pore size in the range from 10 to 500 microns, preferably from 30 to 150 microns.

Systems and methods for obtaining fluid comestibles from substances containing isolated capsules are for example known from EP-A-512470 (counterpart of US 5,402,707).

The capsule 200 as shown in Fig. 1 has a frustoconically-shaped cup which may be filled e.g. with roasted and ground coffee 300 and which is closed by a foil-like tear face cover 400 welded and/or crimped to a flange-like rim 140 which extends laterally from the side-wall of cup. A capsule holder 130 comprises a flow grid 120 with relief surface element members.

The capsule holder 130 can be accommodated in a larger support 150 which has a lateral wall 240 and a beverage outlet 270 for the passage of extracted coffee beverage.

As can be seen from Fig. 1 the extraction system further comprises a water injector 700 having water inlet channel(s) 201 and an annular element 800 with an internal recess of which the shape substantially corresponds to the outer shape of the capsule. On its outer part, the annular member 800 comprises a spring 220 holding a ring 230 for releasing the capsule on completion of extraction.

In operation, a capsule 200 is placed on the capsule holder 130. The water injector 700 perforates the upper face of the cup. The lower tear face 400 of the capsule rests on the radially arranged members of the capsule holder 130.

The water is injected through the channel 201 of the water injector 700 and impinges on the bed 300 of coffee. The pressure in the capsule increases and the tear face 400 increasingly follows the shape of the radial opening relief members. Such radial opening relief members could be replaced by pyramid-shaped reliefs or other shapes of relief. When the constituent material of the tear face reaches its breaking stress, the tear face tears along the relief members. The extracted coffee flows through the orifices of the flow grid 120 and is recovered in a container (not shown) beneath the beverage outlet 270.

The principles of this extraction process as far as it can be maintained in connection with the present invention can be summarized as follows:

- An initially gastightly sealed capsule is inserted in capsule holder means.

- The capsule holder means is then introduced associated to the water injection means of the machine such that an annular element surrounds the sealed capsule. In a first wall of the capsule at least one opening is generated.
- Water entering the capsule through the opening in the first wall is interacting with the ingredients contained in the capsule while traversing the interior of the ingredient contained in the capsule and is then made to leave the capsule through at least one opening/perforation created in the second wall under the effect of the pressure building up in the capsule.

The perforations in the second face, especially when cooperating with the relief members, filter the beverage leaving the interior of the capsule so that non-soluble coffee particles remain in the capsule. It has been considered in the prior art that such filtering is sufficient (see e.g. column 4 of EP512470B1).

EP 512468B1 teaches to have a capsule with a flat perforable foil member for delivery of the coffee. A filter paper can be sealed between the foil member and the rim of the base body. The capsule, i.e., the membrane opens under the sole effect of the pressure in the capsule.

Also according to CH605293 a filter is, at its rim portion, sandwiched between the foil member and the capsule base body wall. The foil member is additionally provided with a weakened area and is not designed to be perforated by being thrust against a relief plate.

The invention has found that, according to the teaching of the prior art, when a sealed gastight capsule with a simple perforable foil member is placed against a capsule holder with a multitude of small reliefs, and in particular, small squared or rectangular perforation elements, one may have the following problems:

- The extraction process may be slowed down, in particular for capsules containing a larger dose of coffee designed for delivering coffee beverages,
- The extraction process may flow at inconsistent flow times from one capsule to another,
- The extraction is not clean enough and coffee particles can escape the capsule through the small perforations created through the foil member after extraction, when the capsule is removed from the machine in particular, due to the presence of fine grinding outside the typical range designed for the current system (e.g., below an average grind size of 200 microns).

These problems are targeted at by the present invention and is remedied by means of the features of the independent claims. The dependent claims further develop the central idea of the invention.

According to a first aspect, the invention relates to a capsule for use in a beverage production machine comprising:

- means for perforating an inlet side of the body of the capsule opposed to the foil member and the flange-like rim

and injecting a liquid or a liquid/gas mixture into the capsule,
- a relief plate with a multitude of relief elements which relief plate is arranged in the machine such that the injection pressure thrusts the foil member against the relief plate,
the capsule comprising:
- a base body sealed off by a foil member tightly attached to the flange-like rim of the base body,
the foil member being made from a material which is then perforated by the relief plate to form at least one opening, preferably a multitude of openings, when the pressure of the injected liquid or liquid/gas mixture reaches a value of at least 4 bar, wherein the capsule further comprises a flow control porous member arranged between at least a portion of ingredients in the capsule and the foil member.

The capsule is thus provided with a flow control and filtering member called "flow control porous member" in the rest of the description. The flow control porous member is positioned between at least a portion of ingredients and the foil member.

As a result, the flow was significantly faster and more consistent than for the flow of a capsule of the prior art, i.e., comprising no such flow control porous member.

In particular, it was measured that the flow time could be up to 25% shorter of the mean flow time without significantly changing the quality of the coffee liquid extract. A four

times smaller flow time standard deviation was also surprisingly noticed when comparing the mean flow time of a plurality of capsules. Finally, the ground coffee was successfully retained in the capsule with reduced coffee solid resurgences through the perforated membrane.

The flow control porous member may be positioned between the ingredients and the plane defined by the ring-shaped sealing area between the foil member and the rim of the base body.

The base body of the capsule may comprise a rim onto which the foil member is sealed at an annular sealing area. The rim of the base body may further extend outwardly by a curled end.

The base body and/or the foil member can be made from aluminum or aluminum alloy or a laminate of aluminium or aluminium alloy and polymer.

In the context of the invention, the base body and the foil member can also be made of two foils of flexible material which are sealed at their periphery, e.g., by heat sealing as described in EP0602203A1. Therefore, the two foils can form a symmetrical container when sealed at their periphery and the container may also contain two flow control porous members, each one being placed between the flexible foils and the ingredients. In this case, the ingredient can be a compacted coffee cake placed in sandwich between the two flow control porous members.

The flow control porous member may be connected to the capsule in being sandwiched, in the sealed area, between the rim of the base body and the foil member.

The flow control porous member may have a higher rigidity in flexure than the foil member so that the member deforms less under pressure than the foil member against the relief elements. A lower deformation (or a differential of deformation) provides space between the member and the foil member during extraction allowing the beverage, e.g., liquid coffee extract to better flow between the perforated openings and the relief elements. This results in a faster flow of the liquid through the foil member without affecting significantly the strength of the liquid extract (i.e., total solid content, yield). A higher rigidity can be obtained by a porous member being thicker than the foil member and/or being made of more rigid material.

In particular, the flow control porous member thickness may be between 0.1 microns and 1.5 mm. Preferably, the flow control porous member thickness is between 0.4 microns and 1.0 mm.

The foil member of the capsule is configured to be successfully torn against a multitude of relief elements by a relief plate of the beverage production device. The foil member must be designed to tear in a consistent manner, in particular, when a predetermined threshold of pressure in the capsule is reached. Therefore, the design of the foil member and the design of the relief plate of the device are

determined in such a way that the opening/tearing of the foil member is reliably and consistently carried out.

Therefore, preferably, the foil member has a thickness of between 10 and 100 microns, more preferably between 15 and 45 microns. Most preferably, the foil member thickness is of about 30 microns plus or minus the typical manufacturing tolerances (e.g., +/- 5 microns). Furthermore, the foil member is preferably made of aluminium or aluminium alloy.

Preferably, the ratio of flow control porous member thickness to the foil member thickness is comprised between 1.5:1.0 and 50:1, most preferably between 5:1 and 20:1.

The flow control porous member may be positioned in the capsule in a manner separate from the capsule walls, i.e., disconnected from the walls. For instance, the flow control porous member may be loosely inserted between the ingredients and the foil member.

The flow control porous member can cover at least 62% of the total inner surface of the foil member to ensure that it covers most of the openings created through the foil member when torn under pressure and thus prevents a flow bypass effect and so a reduction of the efficiency of the flow control.

In an advantageous mode, the flow control member has a square or rectangular shape. Hence, the cost of production of the flow control member can be significantly reduced with significantly less material scraps during cutting in the

sheet or laminate.

In another mode, the flow control porous member may be connected to the walls of the base body of the capsule and/or to the foil member. The flow control porous member can be connected to the wall by sealing or other connection modes such as mechanical engagement e.g., clipping.

In certain modes, the flow control member is a thin porous membrane of polymeric material.

In other modes, the porous member comprises essentially polymeric fibre-containing material.

The flow control porous member may be made from a non-woven material. The flow control porous member may also be made from a woven material. The porous member can be formed of food-grade meltable polymeric fibres.

In a preferred mode, the porous member comprises microfibres of diameter of less than 20 microns.

In a mode, the porous member comprises a melt blown (MB) microfibres-containing material.

The porous member can be selected within the group consisting of: polypropylene, polyethylene, polybutyleneterephtalate (PBT), polycarbonate, poly(4-methyl pentene-1), polyurethane, polyethyleneterephtalate (PET), polyethersulfone, polyamide, resin bonded- glass fibres and combinations thereof.

The porous member can also comprise fibres of a diameter higher than 20 microns. For example, blends of microfibres and larger diameter fibres can form the porous member. For example, a porous member can be formed of melt blown (MB) and/or spunbond (SB) material.

In possible modes, the flow control porous member may be a solid injected plastic plate with small flow control openings.

Preferably, the flow control porous member has a pore size (i.e. average opening diameter) comprised between 0.4 and 100 microns. Particularly good results on flow time reduction were obtained with a flow control porous member with a pore size of between 0.4 and 25 microns. The pore size may be lower than 10 microns, even lower than 2 microns, i.e., between 0.4 and 2 microns. Flow time reduction was also obtained with ground coffee having a particle size ($D_{4,3}$) comprised between 190 and 400 microns.

A flow time of less than 40 seconds, with a standard deviation of less than 15 seconds, was successfully obtained, from a capsule containing about 5.5 grams of ground coffee, for delivering a coffee liquid extract of 40 g corresponding to an espresso coffee with a total solid content between 2.7 and 3.8% in weight. Similarly, a flow time of less than 30 seconds, with a standard deviation of less than 5 seconds, was successfully obtained, from a capsule containing about 6 grams of ground coffee, for delivering a coffee liquid extract of 110 g corresponding to a lungo coffee with a total solid content between 1.1 and 1.5% in weight.

It was also observed that the flow time was significantly lowered when the ground coffee particle size is increased.

The flow control porous member may be, at its rim, sandwiched between the foil member and the capsule walls.

The flow control porous member may be distanced from the foil member. In a possible mode, the flow control porous member may transversally separate two portions of ingredients, in particular, two portions of ground coffee.

In a possible mode, the two portions of ground coffee have different brewing characteristics. The brewing properties may refer, in relation to each of said portions, to the mass, the volume, the tap density, the average particle size ($D_{4,3}$), the type of blend, the degree of roasting and combinations thereof. In one mode, the upstream portion of ground coffee portion comprises a mass of ground coffee which has a lower average particle size $D_{4,3}$, than the downstream portion of ground coffee. The upstream portion of ground coffee may be of a higher volume or smaller volume than the downstream portion. In another mode, the upstream portion of ground coffee portion comprises a mass of ground coffee which has a higher average particle size $D_{4,3}$, than the downstream portion of ground coffee. Again, the upstream portion of ground coffee may be of a higher volume or smaller volume than the downstream portion. These variations enable to tune the flow characteristics in the capsule and also to tailor different characteristics (TC, yield, crema) of the delivered coffee extract to the various consumer's preference.

The flow control porous member may be placed adjacent to the foil member in the capsule. A small space may be allowed between the porous member and the foil member due to the deformation differential between the two elements. Indeed, due to its lower rigidity the foil member deforms more to a convex shape under the pressure of gas (e.g., carbon dioxide) inside the sealed capsule and a small gap may form between the foil member and the porous member.

The flow control porous member may be attached to the inner side of the foil member. In particular, the flow control porous member may be welded to the inner surface of the foil member. In another mode, in order to reduce the thickness of the flow control, the porous member may be printed directly on the inner surface of the foil member.

The flow control porous member may be thicker than the foil member, preferably at least 1.5 times thicker than the foil member.

In possible modes, the flow control porous member may be flat or corrugated. The flow control porous member may also comprise, for example, channels and/or protruding zones that promote a collection gap for the beverage between the foil member and the flow porous member.

The foil member may be free of weakened areas before being inserted in a beverage production machine.

The foil member may be a continuous sheet of metal or polymer or a laminate of metal and polymer.

The flow control porous member may be positioned and arranged such that it is not sandwiched between the foil member and the rim of the base body. For instance, the flow control porous member may be placed loosely in the capsule or may be attached in a localized area onto the inner surface of the foil member and with the edge of the flow control porous member being at a distance from the sealing area of the foil member and base body.

The outer edge of the flow control porous member may end at a position radially inwards from the sealing area of the foil member and the rim of the base body.

In another embodiment, the flow control porous member and the tearable foil member form a multilayer laminate.

The multilayer laminate preferably comprises:
- a tearable flexible layer of aluminium or of another metal or of polymer or a multilayer of aluminium and polymer or a multilayer of polymers and,
- at least one porous polymeric layer.

The porous polymeric layer forms the flow control porous member of the capsule. The metal layer preferably forms a gas barrier of the laminate. One or more additional non-porous layers can be associated to the metal layer in order to reduce the thickness of the metal layer and/or form a gas barrier. The gas barrier can also be obtained by a polymer

layer of the tearable foil member such as EVOH when it is made of a multilayer of polymers.

Preferably, the flow control porous member resists to the tearing by the relief member when the foil member is torn by the relief member under the pressurized extraction condition.

Therefore, in the laminate, the porous polymeric layer, e.g., the thin membrane, has preferably greater elastic properties than the tearable layer.

Hence, during extraction, the multilayer laminate has the ability to deform against the relief plate causing tearing of the non-porous layer(s) to form a multitude of small openings and stretching or deforming without tearing of the porous layer(s). As a result, the flow control properties of the non-porous layer(s) are maintained when the liquid is allowed to pass through the delivery foil member of the capsule.

The porous polymeric layer is preferably a thin membrane or a non-woven layer. The layer can be made of a material chosen among the list of: polypropylene, polyethylene, PBT, PET, polyethersulfone and polyamide.

The porous layer has a pore size between 0.4 and 25 microns, more preferably between 0.4 and 2 microns.

The flexible layer for the laminate can be aluminium or another metal depending on the mechanical properties suitable for opening the capsule, on the gas barrier properties of the material and on the laminating technique.

A multilayer laminate facilitates the handling of the membrane during the production of the capsule. In particular, it reduces the risk for the fragile membrane of the porous member, to be damaged during handling, filling and/or sealing the capsule.

The laminate may be produced by any suitable method such as thermal lamination such as multilayer extrusion (co-extrusion), extrusion lamination, lamination moulding using heat rolls or heat press.

In another aspect, the invention relates to a capsule for use in a beverage production machine comprising:
- a first wall member,
- a second foil member tightly attached to the first wall member,
- at least one porous layer between the ingredients in the second foil member;
wherein the porous layer forms with second foil member a multilayer laminate.

The second wall member is preferably made of gas impervious, perforable material made of aluminium, aluminium alloy or a laminate of aluminium or aluminium alloy and polymer or made of only polymer(s). Most preferably, the second wall member is an aluminium foil of between 15 and 45 microns.

However, in an alternative, the second wall member can be made of liquid permeable material that physically supports the porous filter. In this case, the second wall member has

preferably a higher pore size than the porous member so that the porous member remains the flow control member of the capsule.

The tear strength of the porous layer, under the pressure extraction conditions, is preferably higher than the one of the second wall member. The tear strength of the porous layer is such that it should resist tearing during extraction so as to provide the filtering and flow control effect.

The porous layer may exert a significant pressure drop for the flow of beverage which can be controlled by the pore size and/or porosity.

The material for the porous layer is chosen among the list of: polypropylene, polyethylene, PBT, PET, polyethersulfone, and polyamide.

Preferably, the porous layer has a pore size lower than 10 microns, preferably between 0.4 and 2 microns.

Preferably, a second porous layer is placed between the first wall member and the ingredient to form a second multilayer laminate.

Preferably, the tear strength of the second porous layer, under the pressure extraction conditions, is also higher than the one of the first wall member.

Preferably, the second porous layer has also a pore size lower than 10 microns, preferably between 0.4 and 2 microns.

The first and second wall members are preferably made of gas impervious, perforable material.

The first and second wall members are preferably sealed and symmetrical along their periphery rim.

The ingredient is essentially a compacted roast and ground coffee cake.

In a most preferred packaging configuration, the first and second walls are formed of a multi-layer comprising the following layers (from exterior to interior): PET/Colour layer/Adhesive/Aluminium/Adhesive/OPP. The aluminium layer has preferably a thickness between 10 and 80 microns, an OPP (i.e., oriented polypropylene) layer has a thickness of between 5 to 40 microns and PET layer of between 5 and 40 microns.

The multilayer laminate(s) can comprise:
- a layer of aluminium or of another metal or of polymer or a multilayer of aluminium and polymer and,
- at least one porous polymeric layer.

The metal layer preferably forms a gas barrier of the laminate.

One or more additional non-porous layers can be laminated to the metal layer in order to reduce the thickness of the metal layer and/or form a gas barrier. The gas barrier can also be obtained by a polymer layer of the tearable foil member such

as EVOH when it is made of a multilayer of polymers.

Another aspect of the invention relates to a method using a capsule according to any of the aforementioned features.

In particular, the method is for producing a beverage on the basis of an ingredient in a capsule, the method comprising the steps of:
- providing a capsule comprising a preferably frusto-conical base body sealed off by a foil member tightly attached to the flange-like rim of the base body,
- inserting the sealed capsule in a beverage production machine,
- perforating an inlet side of the capsule opposed to the foil member,
- injecting a liquid or a liquid/gas mixture into the capsule causing a pressure to build up in the capsule and the foil member to thrust against a fixed relief member of the beverage production machine,
the foil member being made from a material which is then perforated by a multitude of openings when the pressure of the injected liquid and liquid/gas mixture reaches a value of at least 4 bar,
- draining a beverage from the capsule, wherein the beverage passes between the multitude of openings and the relief member,
comprising the step of:
- filtering the beverage via a flow control porous member arranged between at least a portion of ingredients and the foil member.

In particular, said flow control porous member is effective for reducing the flow time and/or improve the flow time consistency, i.e., by reducing the flow time standard deviation of the mean flow time, when delivering a given volume of coffee extract compared to a capsule without said member. In particular, a standard deviation of less than 10% of the mean flow time can be obtained when delivering a coffee extract of 40 or 110 mL.

In general, the capsule contains a dose of between 5.5 to 6.5 grams of ground coffee. For short coffee, a dose of between 5.5 and 6.0 grams is preferred. For a lungo coffee, a dose of between 6.0 and 8.0 grams of coffee is preferred.

According to the method of the invention, a stronger lungo coffee can be obtained while maintaining an acceptable flow time, i.e., of less than about 40 seconds, more particularly, less than 35 seconds. In particular, a capsule for a stronger lungo contains above 6.0 grams of ground coffee, preferably between 6.2 and 7.0 grams.

Also, the capsule contains ground coffee having a particle size $D_{4,3}$ between 250 and 450 microns. The higher the particle size, the more reduced the flow time can be. Therefore, by tuning the particle size of the ground coffee, it is also possible to reach lower flow time while maintaining substantially the same strength of coffee or, alternatively, to increase the strength of the coffee (e.g., higher TC, Yield) without increasing the flow time.

According to the method of the invention, the flow time for delivering 40 mL of coffee extract is lower than 40 seconds, preferably lower than 30 seconds, most preferably lower than 25 seconds.

According to the method of the invention, the flow time for delivering 110 mL of coffee extract is lower than 40 seconds, more preferably lower than 30 seconds.

Preferably, the flow control porous member has a pore size comprised between 0.4 and 100 microns, preferably between 0.4 and 25 microns, most preferably, between about 0.45 and 2 microns.

Remarkable results have been obtained with a flow control porous member which is a thin porous membrane or a non-woven member. Remarkable results have also been obtained when the tearable foil member has a thickness of 15 and 45 microns, e.g., about 30 microns. The foil member is preferably in aluminium or aluminium alloy.

The fixed relief member of the beverage production device may comprise a tearing structure preferably configured to produce a grid-like perforation of the foil member.

For this, the fixed relief member of the beverage production device may comprise a tearing structure which has exclusively tearing edges forming angles of at least 80 degrees. In other words, the structure is free of sharp shape with angles formed of less than 80 degrees.

Preferably, the tearing structure comprises shapes of truncated pyramids and recesses forming a network of beverage collecting channels; which structure forms, as a result of thrust of the foil member against the fixed relief member, partial rectangular or squared imprints forming small discrete tears in the foil member. It is observed that the foil member tends to intimately deform to tear against the structure whereas the flow control porous member remains less deformed against such a structure and/or has a greater ability to elastically deform without tearing against said structure. The structure is also such (with no sharp edges like needles) that the risk of rupture of the porous member is low and that the porous member can be thin enough while providing its flow control properties.

Another aspect of the invention relates to the combination of a capsule and a beverage production machine according to any of the aforementioned features.

Further features, objects and advantages of the invention will become evident for the skilled person when reading the following detailed explanation of an embodiment of the invention when taken in conjunction with the figures of the enclosed drawings.

Figure 1 shows a known beverage production device encasing a capsule with beverage ingredient,

Figure 2 shows an example of a capsule and a beverage production machine according to the present invention,

Figure 3 shows a capsule according to the present invention with a removed foil member and a removed porous member,

Figure 4 shows a detail of a capsule according to the present invention,

Figure 5 shows a modification of the capsule of claim 4,

Figure 6 illustrates a photographic illustration of the effect of the present invention on a perforated capsule after coffee extraction without flow control porous member,

Figure 7 illustrates a photographic illustration of the effect of the present invention on a perforated capsule after coffee extraction, with flow control porous member (Invention),

Figure 8 illustrates another photographic illustration of the effect of the present invention on a perforated capsule after coffee extraction without flow control porous member,

Figure 9 illustrates another photographic illustration of the effect of the present invention on a perforated capsule after coffee extraction, with flow control porous member (Invention),

Figure 10 shows comparative curves of the cup concentration, in percentage, as a function of the flow time, in seconds, for a cup of espresso-type coffee weighting 40 grams,

Figure 11 shows the evolution of the flow time in seconds as a function of the coffee average particle size ($D_{4,3}$) for a long cup ("lungo") cup of coffee weighting 110 grams with capsules having no flow control porous members,

Figure 12 shows the evolution of the flow time in seconds as a function of the coffee average particle size ($D_{4,3}$) for a long cup ("lungo") cup of coffee weighting 110 grams with capsules having a flow control porous members (Invention),

Figure 13 shows the “crema” value as a function of the flow time for a lungo coffee cup with and without flow control porous member in the capsule and,

Figure 14 and 15 show views of a cut capsule according to variants of the capsule of the present invention,

Figure 16 shows a partial schematic view (Half view along a longitudinal median plane) of a capsule according to another embodiment,

Figure 17 shows a capsule holder of the device according to the system of the invention,

Figure 18 shows a symmetrical capsule of the invention in cross sectional perspective view.

With reference to Fig. 2 now a first detailed embodiment of the capsule of the invention will be explained.

The "total solids" is defined as the weight of extracted solids contained in the extract divided by the total weight of the extract. This value is typically expressed in percentage.

The "extraction yield" refers to the character of the extract and it is defined as the weight of total solids in the liquid extract divided by the total weight of starting coffee ingredients in the cartridge (e.g., roast and ground coffee). This value is typically expressed as a percentage.

The average particle size "$D_{4,3}$" represents the mean volumetric diameter of the coffee grind as obtained by laser diffraction method using a Malvern® optical instrument and butanol as dispersing agent for the particles.

The "crema" is defined as the head of foam created on the coffee extract with a texture of substantially small bubbles. The crema attribute can be measured by an empirical sugar test which consists in arranging a well defined crystal sugar layer (i.e., crystal sugar of $D_{4,3}$ of 660 microns of particle size) on top of a freshly prepared cup of coffee and

measuring the elapsing time between the start of overlaying and the main part of sugar's sinking. The "sugar test value" is thus a number of seconds.

The "pressure of liquid or liquid/gas mixture" is typically a measure of relative pressure above atmospheric pressure taken at the injection site in the capsule.

Typically the pressure of liquid or liquid/gas mixture according to the process of the invention is of at least 4 bar for providing the tearing of the foil member during extraction, preferably of at least 6 bar, most preferably of at least 8 bar.

Note that in the following the invention will be explained referring to a certain design of a capsule, i.e. a design according to which the capsule comprises a cup-like base body and a closing foil member. Generally a capsule according to the present invention comprises at least two opposing wall members which are connected to each other at the edges to form a sealed flange-like rim area, thus enclosing a sealed interior.

Comparable to the prior art also this embodiment shows a capsule holder 13 having relief elements 12 which are designed to tear and perforate a foil member 5 closing off a cup-like base body 4 of the capsule 1. This tearing of the foil member can e.g. occur as soon as the pressure inside the capsule exceeds a threshold value. Note that the relief elements can have any protruding shape able to cause a (partial) tearing of the foil member, preferably of grid-like

design. As an example pyramids, bumps, cylinders, elongated ribs are cited as preferred examples.

Within the capsule 1 ingredients 3 are contained, wherein the ingredients 3 are selected such that a beverage can be produced when having a liquid entering the capsule in the region of the top wall 17 of the capsule 1 and then interact which such ingredients 3. Preferred ingredients are e.g. ground coffee, tea or any other ingredients from which a beverage or other liquid or viscous comestible (e.g. soup) can be produced.

Fig. 2 shows a state in which such a capsule has been placed on a capsule holder 13, the foil member 5 resting on the relief element 12 side of the capsule holder 13 and the cup-like base body 4 of the capsule 1 being already partly surrounded by the circumferential wall 25 of an enclosing member 9 of the beverage production device. The shown enclosing member has the shape of a bell. Other shapes are viable, wherein the design of the interior contours (recess) of the enclosing member is generally adapted to substantially match the contours of the capsule 1.

Note that the foil member 5 as shown may not be exactly flat due to a defined over pressure inside the capsule, which over pressure is generated by introducing e.g. a protective gas when producing the filled capsule and/or by gas being released by the ingredients contained in the capsule. In particular with ground coffee, gas such as carbon dioxide is released after closure of the capsule at the production site

which results in the foil member being deformed to a slightly convex shape.
According to invention, a flow control member 80 is placed between the ingredient 3 and the foil member 5.

The enclosing (bell) member 9 furthermore comprises a pressing surface 18 for applying a closure pressure on the rim area 8 of the capsule, an external thread 19 for mounting the bell member in a beverage production device and a water inlet opening 20 for feeding a liquid such as for example hot water under pressure to a water injector 14 which is releasably mounted (screwed) to the bell member 9.

Note that the thread 19 is just an example for connection means, be it releasable or permanent connection means.

The other components of the beverage production device, such as e.g. the mechanism for displacing the bell member and eventually also the capsule holder are known from the prior art in the field of capsule-based espresso machines.

The water injector comprises perforation element(s) (blade, pin, etc.) 24 designed to produce an opening in the top wall 17 of the capsule 1 when the capsule holder 13 and the bell member 9 are moved close together e.g. by a manually operated or an automatic mechanism. A channel (not shown in the drawings) traverses the perforation element 14 such that water can be fed to the interior of the capsule 1 once the perforation element 14 protrudes into the interior of the capsule 1.

The capsule 1 comprises said top wall 17, a sidewall 7 and a flange-like rim 6, wherein the foil member 5 is sealed to said flange-like rim 6 to close-off hermetically the cup-like base body 4 of the capsule 1. Again, other designs for the capsule are possible as long as the capsule can be sealed and contain the mentioned ingredients.

Fig. 3 shows a capsule 1 where the aluminum or aluminium alloy foil member 5 before it is sealed onto the base body 4, and the flow control porous member 80 inserted between the bed 3 of ingredient and the foil 5.

Also the flange-like rim 6 of the base body of the capsule 1 is visible.

Further on, a flow control porous member 80 is shown. The flow control porous member 80 is an example of a filtering web made out of a non-woven material. It is preferably made of polymer such as polypropylene, polyethylene, polybutyleneterephtalate (PBT), polycarbonate, poly(4-methyl pentene-1), polyurethane, polyethyleneterepthalate (PET), polyethersulfone, polyamide or any other meltable fibrous polymers. Its pore size may range of from 0.4 to 100 microns, more precisely of from 0.4 to 30 microns, more precisely of from 0.4 to 20 microns, even more precisely between 0.4 and 10 microns, even more precisely between 0.4 and 2 microns. The filter disk can be reinforced, e.g. by a non-woven or woven material such as polyester.

Fig. 4 shows a flow control porous member 81 which has been cut into the proper dimensions and which can then be sealed,

together with the aluminum foil member, e.g. via ultrasonic welding, to the flange-like rim 6 of the capsule 1. Since the porous member is made of meltable polymer(s), its welding to the capsule is so made possible. Preferably the flow control porous member dimensions are such that the edge of the flow control porous member overlap the flange-like rim 6 of base body 4 of the capsule 1.

Fig. 5 shows the example of a flow control porous member 82 which has been cut into the proper dimensions, preferably slightly smaller diameter "D0" than the inner diameter "D" of the base body of the capsule. Therefore the edges of the flow control porous member do not reach to the walls of the capsule and the flow control porous member is then simply placed on the ingredients already filled in the capsule beforehand. Finally the foil member 5 is attached, for example heat or ultrasonically sealed, to the flange-like rim 6 of the capsule 1.

The flow control porous member and the tearable member can also form a multilayer laminate to facilitate handling during production of the capsule. In this case, the flow control member is necessarily provided as the innermost layer or multilayer in the capsule relative to the tearable foil member. The flow control member can be formed of a porous mono- or multilayer membrane laminated to a mono- or multilayer non-porous tearable foil. The non-porous tearable foil member is hence chosen in a material which provides controllable and reproducible tearing conditions. A preferred material is aluminium. The thickness of the aluminium layer is preferably of from 20 to 50 microns. The aluminium may

further be laminated with one or more layers of non porous polymer layer such as a thermofusible lacquer. The additional layer may be of lower thickness (e.g., less than 5 microns) and be suitable for sealing to the capsule's body and porous layer.

The flow control member is preferably chosen in a material having a higher tear strength than the one of the tearable foil member when the foil member is opened, i.e., torn by the relief member 12 under the effect of the internal pressure, the porous member stretches sufficiently to resist to tearing under the pressurized extraction conditions. In particular, the flow control member is resilient enough to deform without breaking or forming enlarged passages for the flow of liquid. The liquid is so forced under pressure to pass through the many pores of the flow control member then to the perforations provided through the foil member as this one tears against the relief member.

As aforementioned, the porous member is preferably a mono-layer or a multilayer chosen among: polypropylene, polyethylene, PBT, polycarbonate, poly(4-methyl pentene-1), polyurethane, PET, polyethersulfone, polyamide, resin bonded-glass fibres and combinations thereof.

Fig. 6 and 7 illustrate the filtering effect of the present invention. As can be seen, the invention is particularly adapted to a grid-shaped perforation 205 of the foil member 5 of the capsule, wherein the grid is comprised by small essentially rectangular or squared imprints defining a plurality of perforations of the foil member obtained as a

result of the brewing process. The perforation is provided by the relief elements 12 (Figures 2 or 17) onto which the foil member extends and tears under the effect of the internal pressure during extraction. The tearing structure is formed of surfaces which are free of sharp angles or edges, i.e., angles of less than about 80 degrees.

Figure 6 shows that there is resurgence of coffee particles through the perforation 205 in absence of the flow control member. Figure 7 shows a significant improvement with no resurgence at all of solids with capsules of the invention.

Surprisingly, figures 8 and 9 show also a neater perforation 205 for the capsule of the invention. In other words, the perforations seem to be more consistent and of a more well defined profile. On figure 8, one can notice perforations of different size and depth.

It has been found out that the internal flow control porous member means according to the invention are particularly effective and suited in combination with an aluminium or aluminium alloy foil member 5 to be perforated in such a grid-like structure and with small openings 205.

In particular, the pressure drop during extraction under pressure of the coffee in the capsule is caused in the piping of the coffee machine, in the coffee bed, but primarily across the interface of the foil member and the puncture plate, i.e., the tearing structure.

The resulting time required to extract a certain amount of liquid depends therefore on the phenomena happening between the foil member and the puncture plate (i.e., "pyramid plate"). Without being bound by theory, the inventors think that the pressure drop occurring at the membrane-pyramid plate interface is mainly determined by the width of the gap between the membrane and "pyramid plate". The width of this gap is established at the beginning of extraction, particularly during the phase when the membrane ruptures. Very dynamic and to some extent chaotic phenomena can happen at this moment. Membrane physical strength (e.g. tensile strength, puncture resistance, elongation before rupture), rupture pressure and hydrodynamic behaviour of the water influence on how intense the membrane will be pressed against the pyramid plate and thus the gap width. Without the flow control porous member, these phenomena observed are more chaotic, thus leading to a fairly high variation of pressure drop and consequently to a high standard deviation of flow time. Additionally, very fine particles may be transported to this very narrow gap and obtrude the outlet, thus creating an increase in pressure drop.

The addition of a flow control porous member between the coffee bed and the foil member is supposed to act on the following 3 main phenomena determining the pressure drop:

a) Fine particles (i.e., particles of less than about 90 microns), which can be washed out from the coffee bed and transported to the outlet of the capsule are withhold by the flow control porous member. Therefore, they do not accumulate at the very narrow gap between the foil member and the

puncturing plate. An increase due to obstruction by fine particles is therefore avoided.

b) The flow control porous member reduces the dynamic water pressure acting on the foil member at the moment of rupture at the beginning of extraction. The foil member is pressed against the puncture plate less intensely. Therefore, the gap between membrane and pyramid plate will be wider than without flow control porous member.

c) As the coffee bed creates a pressure drop during extraction, the resulting force is transmitted to the foil member and puncture plate. This force will further reduce the gap width between the foil member and the puncture plate. Through the rigidity of the flow control porous member however, the force will be distributed differently on to the foil member and puncture plate. The force will be higher on the plateau of the puncturing elements of the plate and lower in the grooves or channels of the plate. As the gap width relevant for pressure drop is mainly around the outlet holes located in the grooves, the reduction of the force transmitted by the coffee on the grooves will further reduce the pressure drop

In a mode, the flow control porous member is not sandwiched between the foil member 5 and the rim 6 of the base body 4. The outer edge of the flow control porous member may end at a position radially inwards from the sealing area 209 of the foil member 5 and the rim of the base body.

Fig. 14 and 15 show that the internal flow control porous member means 206 can be distanced from the foil member 5. The

flow control porous member 206 are respectively sealed to the walls 7 of the base body of the capsule. The flow control porous member can thus separate transversally with respect of the brewing direction two portions of ingredients, e.g., two ground coffee portions. The flow control porous member can thus regulate the flow of liquid between the two portions. Also, the portions of ingredient may have different characteristics such as a different granulometry or be different coffee blends.

In the embodiment of Figs. 14 and 15, there are ingredients both above and below the flow control porous member 206.

The reference sign 207 designates the curled outer rim of the capsule. The foil member 5 and the rim flange of the base body can be sealed together in a ring-shaped area 209 inside and adjacent to the curled outer rim 207.

Figure 16 illustrates another possible mode for a capsule of the system of the invention. In this mode, the capsule comprises a cup-like base body 4, a closing foil 5 and a flange-like rim 6 of the body onto which is sealed an annular part of the closing foil. A flow control porous member 301 is placed in the capsule and is spaced from the inner surface of the foil member by a spacing element 302. The spacing element can be a grid with large holes or rigid member with channels and through holes providing significantly no pressure drop.

In view of figure 17, the relief elements of the capsule holder 13 are designed such that no angles of the relief element is below 80 degrees that could form sharp edges.

Turning to figure 17, an example of a suitable capsule holder 13 is represented. The capsule holder 13 comprises a tearing structure 92 comprising a series of truncated pyramids 920 having substantially squared sections. The upper surface of the pyramids is basically a square surface 921 of smaller section than the base section 922 of the pyramids. The square surfaces 921 form the "plateau" of the tearing structure. The pyramid can comprise a lower base 923 of larger section than the base section 922. The number of pyramids can range of from about 25 to 50. The height of the pyramids can be of from about 0.5 to 3 mm. The tearing edges of the structure are mainly situated at the edge 924 of the upper surface 921 and at the edges 925 of the side walls of the pyramid. All the surfaces of the pyramids connect at the tearing edges by forming angles of more than 80 degrees. More preferably the upper tearing edges 924 are delimited by surfaces forming an angle of more than 90 degrees.

In view of figure 18, the capsule 400 of the invention can be symmetrical as well with a first wall member 401 and a second wall member 402 forming the outer walls of the capsule. The first and second walls are connected at their peripheral rim 403, 404 to delimit a closed chamber 405 containing a dose of beverage ingredient, preferably, a roast and ground coffee cake. The cake 406 can be in compacted or loose form. Preferably, the cake is compact for providing a size reduction of the capsule. First and second flow control porous members 407, 408 are further provided in the capsule between the ingredient, i.e., coffee cake, and the first and second walls 401, 402. The flow control porous members may have the same characteristics as already described in the

previous embodiments. In particular, the porous layer is chosen among the list of: polypropylene, polyethylene, PBT, PET, polyethersulfone, and polyamide. Preferably, the porous layer has a pore size lower than 10 microns, preferably between 0.4 and 2 microns.

An additional advantage of such a capsule 400 is that it can be placed in the brewing unit of the beverage preparation device in which any of the first or second walls can form the inlet side or the delivery side. The first and second walls are hence formed of perforable material and preferably gastight. In a preferred packaging configuration, each wall is formed of a multi-layer comprising the following layers (from exterior to interior): PET/Colour layer/Adhesive/Aluminium/Adhesive/OPP. The aluminium layer has preferably a thickness between 10 and 80 microns, an OPP (i.e., oriented polypropylene) layer has a thickness of between 5 to 40 microns and PET layer of between 5 and 40 microns.

EXAMPLES:

Example 1 - Flow time for short coffee (40 grams):

Figure 10 shows comparative curves of the coffee cup concentration as a function of the flow time (in seconds) for delivery of 40 mL of coffee extract, for respectively capsules without flow control porous member and capsules according to the invention with a flow control porous member. The curves show the results on the standard deviation of flow times for different granulometries, respectively, 195, 267,

279 and 399 microns (Coffee ground in a Probat grinder). The capsule contained 5.5 grams of ground coffee and a porous member made of a microfibre-containing web, "Innovatec SAP489" (Specific weight of 50g/m2), made of polyurethane. The porous member of a diameter of about 33 mm was placed adjacent the foil member. The foil member of the capsule had a thickness of 30 microns. The capsules were extracted in a "Nespresso Concept®" machine.

The results show a relatively lower flow time and less standard deviation for the capsule of the invention compared to capsule having no such flow control and filtering member. Surprisingly, it is also possible to create a wider range in coffee concentration in the cup depending on the granulometry, for example, in this specific example, a concentration ranging from about 2.8 to 3.6% in weight.
The numerical results are also provided in the following table.

Flow times to obtain 40ml of coffee extract

		Without flow control porous member			With flow control porous member		
Capsule load (g)	Average particle size (microns)	Average flowtime (s)	Standard deviation (s)	Standard deviation (%)	Average flowtime (s)	Standard deviation (s)	Standard deviation (%)
5.5	195	74	24	32%	34	8	23%
5.5	267	60	18	29%	23	4	18%
5.5	279	43	15	35%	16	1	8%
5.5	399	40	16	40%	12	1	7%

Example 2 - Flow time for long coffee (110 grams):

Figures 11 and 12 show a comparative evolution of the flow time as a function of the particle size $D_{4,3}$ for delivering a

lungo coffee extract of 110 grams from capsules containing about 6 grams of coffee and having a foil member of about 30 microns. The porous member of a diameter of about 33 mm was placed adjacent the foil member. It is surprisingly noticed that the flow time is significantly reduced below 30 seconds for particle size in the range of from 289 to 403 microns (More particularly, for respectively 289, 318, 347, 375 and 403 microns). It is also remarkable to note that the flow time standard deviation is significantly decreased to less than 5 seconds for all particles sizes. The capsules were extracted in a "Nespresso Concept®" machine.

The following table 1 provides results of the tests on capsules with or without flow control porous member (called "filter") corresponding to figures 11 and 12.

Coffee: VIVALTO - 6 g R&G per capsule **Capsule:** NC Al membrane 30 mi
Filter: diameter 33 mm **Extraction machine:** Pelican ref.
Cup: size110 g - 24 extractions (

Filter type	R&G D(4,3) [µm]	Flow type	Flow time [sec]	Flow rate [g/min]	TC extract %	Extraction yield %
no filter	289	slow	50	133	1.4	26.2
		fast	36	185	1.4	25.9
	318	slow	53	124	1.4	25.2
		fast	30	217	1.3	24.4
	347	slow	43	153	1.3	24.2
		fast	26	258	1.2	23.4
	375	slow	61	108	1.3	24.2
		fast	27	243	1.2	22.5
	403	slow	51	131	1.3	22.8
		fast	26	258	1.2	22.3
with filter	289	slow	30	220	1.4	26.1
		fast	28	236	1.4	26.1
	318	slow	28	236	1.3	24.4
		fast	26	252	1.3	24.7
	347	slow	26	259	1.2	23.5
		fast	25	267	1.2	23.4
	375	slow	25	262	1.2	22.7
		fast	25	268	1.2	22.6
	403	slow	25	263	1.2	22.5
		fast	25	269	1.2	22.0

table 1.

Example 3 – Crema results:

Figure 13 shows the results on the results on crema formation using capsules of the invention and comparatively capsules with no flow control porous member. The curves are comparative curves of the "crema" (time in seconds for "sugar test") as a function of the flow time for delivering 110

grams of coffee extract in seconds. The capsule contained 6 grams of ground coffee and a porous member made of microfibrous "Innovatec SAP489" web in polyurethane. The foil member had a thickness of 30 microns. The results clearly show that the flow control porous member does not affect the crema formation whereas the flow time is significantly reduced.

For the example of figure 13, crema is measured according to an empirical test called "sugar test". The procedure for this test is explained below.

Example 4 - Flow time for long coffee (110 grams) and higher mass of ground coffee (6.2 grams):

A comparative test was run for capsules with or without flow control member made of membrane of nylon 6,6, "Ultipor N6,6 Posydine" from PALL Company of 0.65 microns and 33 mm of diameter. The capsules contained 6.2 grams of ground coffee having particle size $D_{4,3}$ of 320 microns. The porous member of a diameter of about 33 mm was placed adjacent the foil member. For capsules with the Nylon membrane, the flow time was comprised between 33 and 37 seconds with an average flow time of 34 seconds. The coffee yield was measured between about 22 and 23%. Comparatively, capsules of the same characteristics but without flow control porous member exhibited a flow time between 24 and 72 seconds with an average flow time of 49 seconds. These results also show that for a higher mass of 6.2 grams, the flow time is reduced in average and the flow consistency is very much improved with capsules of the invention.

Example 5 – Flow time for different flow control porous members:

The following table provides results on flow time for different other porous member tested from PALL Company. The reference was a capsule with no porous member inside. This result shows that the flow time is improved for porous members of between 0.45 to 100 microns. The coffee yield was comprised between about 22 and 23%.

Porous member	Type	Pore size µm]	flow-time in sec/110 ml
HDC II	Polypropylene	0.60	26
HDC II	Polypropylene	20.00	20
Preflow UB	Resin-bonded glass fiber	0.45	28
Ultipor GF Plus	Resin-bonded glass fiber	1.00	29
Ultipor N6,6	Nylon 6,6	0.65	32
Ultipor N6,6 Posidyne	Nylon 6,6	0.65	27
Reference			42

Coffee Blend , D4,3 of 400 microns

Example 6: Sugar test for crema determination:

The mechanised sugar test device is composed of a small sugar-containing silo. The prismatic V-shape of this silo comprising a defined slit (2mm x 40mm) at the bottom edge can create a uniform sugar curtain as long as the slit is free and a minimum of sugar remains in the silo. This silo can be moved horizontally, with controlled speed (~40 mm/s) from one point "A" to a point "B" (distance between A and B is 20 cm). In the end position at both points a baffle prevents the sugar from flowing out if the device is in stand-by mode. When the silo is moved, the sugar curtain is produced all the way between the two points "A" and "B". The crema in a cup that is placed at 60 mm below this path within the two points will be topped with a uniform layer of sugar when the silo passes over it. The chronograph is started when the sugar layer is positioned on the foam's layer. The amount of sugar (a thickness of the layer to obtain a precise weight of 5 g of sugar) deposed in the cup is adjustable by varying the speed of the silo or the dimensions of the slit. The sugar is crystal sugar of $D_{4,3}$ equal to 660 microns. A precise waiting period (20 sec. for small cups) must be observed between the end of extraction and the start of the sugar test. The sugar layer remains some time on top of the crema. Later, when the main part of the sugar sinks suddenly the observing operator must stop the chronograph.

The "sugar test value" is the number of seconds shown by the chronograph. Additional information as to this test can be found in EP1842468B1.

Claims:

1. A capsule for use in a beverage production machine comprising:
- means for perforating an inlet side of the body of the capsule (1) opposed to the foil member (5) and the flange-like rim and injecting a liquid or a liquid/gas mix into the capsule (1),
- a relief plate with a multitude of relief elements which relief plate is arranged in the machine such that the injection pressure thrusts the foil member (5) against the relief plate,
the capsule (1) comprising:
- a base body (4) sealed off by a foil member (5) tightly attached to the flange-like rim (6) of the base body (4),
the foil member (5) being made from a material which is then perforated by the relief plate to form at least one, preferably a multitude of openings, when the pressure of the injected liquid or liquid/gas mixture reaches a value of at least 4 bar,
wherein the capsule further comprises at least one flow control porous member (201, 203, 204, 206, 208) arranged between at least a portion of ingredients in the capsule (1) and the foil member (5).

2. Capsule according to claim 1,
wherein the flow control porous member of the capsule has a pore size comprised between 0.4 and 25 microns.

3. Capsule according to claim 2, wherein the flow control porous member has a pore size lower than 10 microns.

4. Capsule according to claim 3, wherein the porous member (201, 203, 204, 206, 208) is made of at least one thin polymeric membrane.

5. Capsule according to claim 3, wherein the porous member (201, 203, 204, 206, 208) comprises essentially polymeric fibre-containing material(s) and made from a woven and/or non-woven material.

6. Capsule according to claim any of claims 1 to 5, wherein the material for the porous member is chosen among the list of: polypropylene, polyethylene, PBT, Nylon, polycarbonate, poly(4-methyl pentene-1), polyurethane, PET, polyethersulfone, polyamide, resin bonded- glass fibres and combinations thereof.

7. Capsule according to any of the preceding claims, wherein the capsule contains ground coffee having a particle size ($D_{4,3}$) comprised between 190 and 400 microns.

8. Capsule according to any of the preceding claims, wherein the foil member (5) has a thickness of between 15 and 45 microns.

9. Capsule according to any of the preceding claims, wherein the flow control porous member (201, 203, 204, 206, 208) has higher rigidity in flexure than the foil member.

10. Capsule according to any of the preceding claims, wherein the flow control porous member (201, 203, 204, 206, 208) is adjacent to the foil member (5).

11. Capsule according to claim 10, wherein the foil member (5) and the flow control porous member form a multilayer laminate.

12. Capsule according to any of the preceding claims, wherein the flow control porous member comprises microfibres of diameter less than 20 microns.

13. Capsule according to any of the preceding claims, wherein the base body (4) is made from aluminum, aluminium alloy or a laminate of aluminium or aluminium alloy and polymer.

14. Capsule according to any of the preceding claims, wherein the foil member is made from aluminum, aluminium alloy or a laminate of aluminium or aluminium alloy and polymer.

15. Capsule according to any of the preceding claims, wherein the base body and foil member are formed of first and second foils of flexible material which are sealed at their peripheral rim.

16. Capsule according to claim 15, wherein the foils are substantially of same shape and size to form a substantially symmetrical capsule along the rim's plane, are relatively impervious to oxygen.

17. Capsule according to claim 16, wherein a first flow control porous member is placed between the first foil and the ingredient and a second porous member is placed between the second foil and the ingredient.

18. Capsule according to claims 16 and 17, wherein the ingredient is essentially a compacted roast and ground cake.

19. A capsule for use in a beverage production machine comprising:
- a first wall member (4),
- a second perforable wall member (5) tightly attached to the first wall member (4),
- at least one porous layer between the ingredients in the capsule (1) and the second wall member (5);
wherein the porous layer forms with the perforable non-porous foil member, a multilayer laminate.

20. Capsule according to claim 19, wherein the tear strength of the porous layer, under the pressure extraction conditions, is higher than the one of the second wall member.

21. Capsule according to claim 19 or 20, wherein the material for the porous layer is chosen among the list of: polypropylene, polyethylene, PBT, PET, polyethersulfone, and polyamide.

22. Capsule according to claims 20 or 21, wherein the porous layer has a pore size lower than 10 microns, preferably between 0.4 and 2 microns.

23. Capsule according to any of claims 19 to 22, wherein a second porous layer is placed between the first wall member (4) and the ingredient to form a second multilayer laminate.

24. Capsule according to claim 23, wherein the tear strength of the second porous layer, under the pressure extraction conditions, is higher than the one of the first wall member.

25. Capsule according to claims 23 or 24, wherein the second porous layer has a pore size 10 microns, preferably between 0.4 and 2 microns.

26. Capsule according to claims 24 or 25, wherein the first and second wall members are made of gas impervious, perforable material.

27. Capsule according to any of claims 23 to 26, wherein the first and second wall members are sealed and symmetrical along their periphery rim.

28. Capsule according to any of claims 21 to 27, wherein the ingredient is essentially a compacted roast and ground coffee cake.

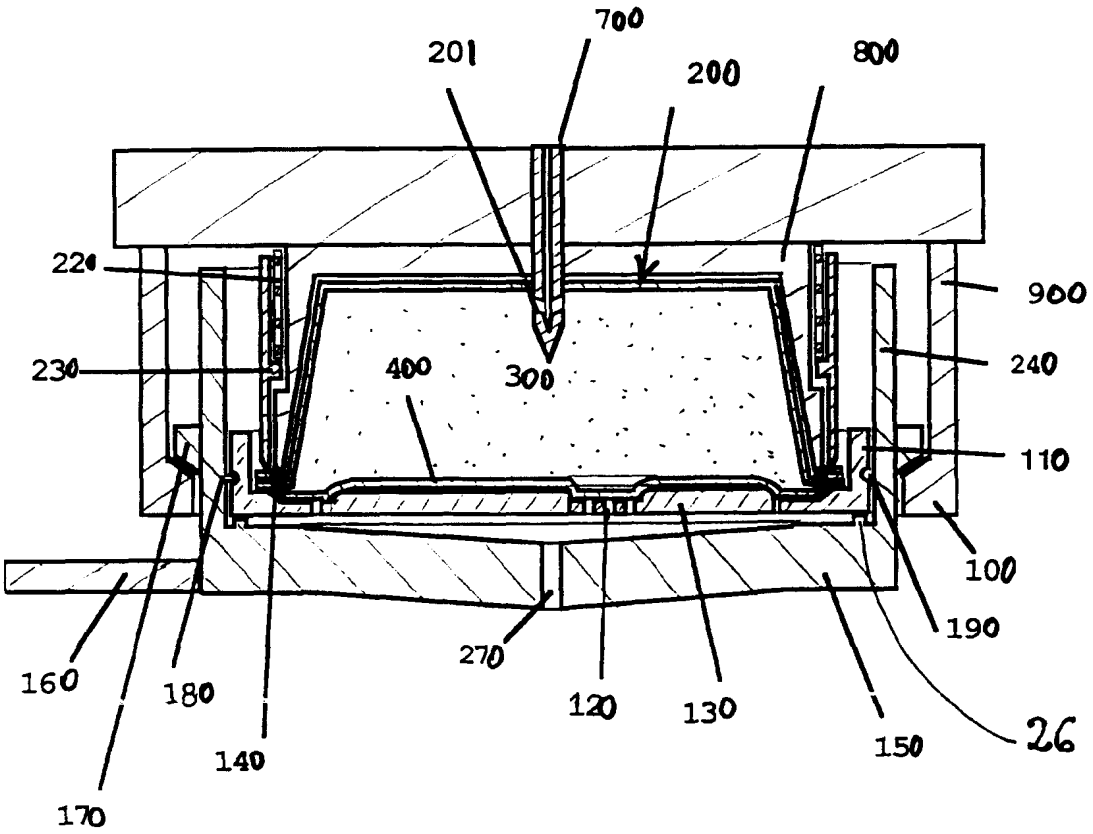

700
201
200
800
220
900
230
400
300
240
110
100
190
270
160
180
120
130
150
26
140
170

FIGURE 1

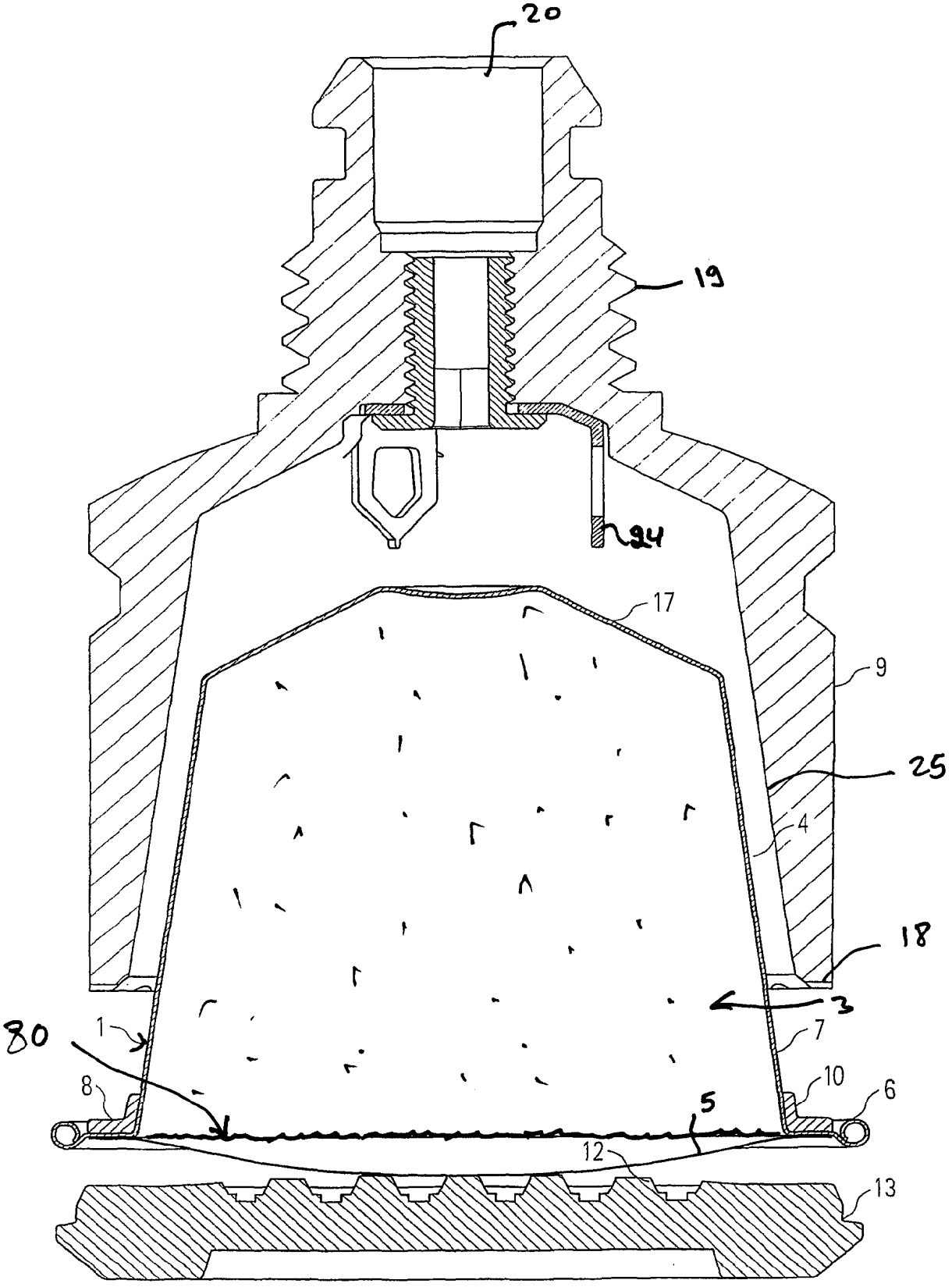


Fig. 2

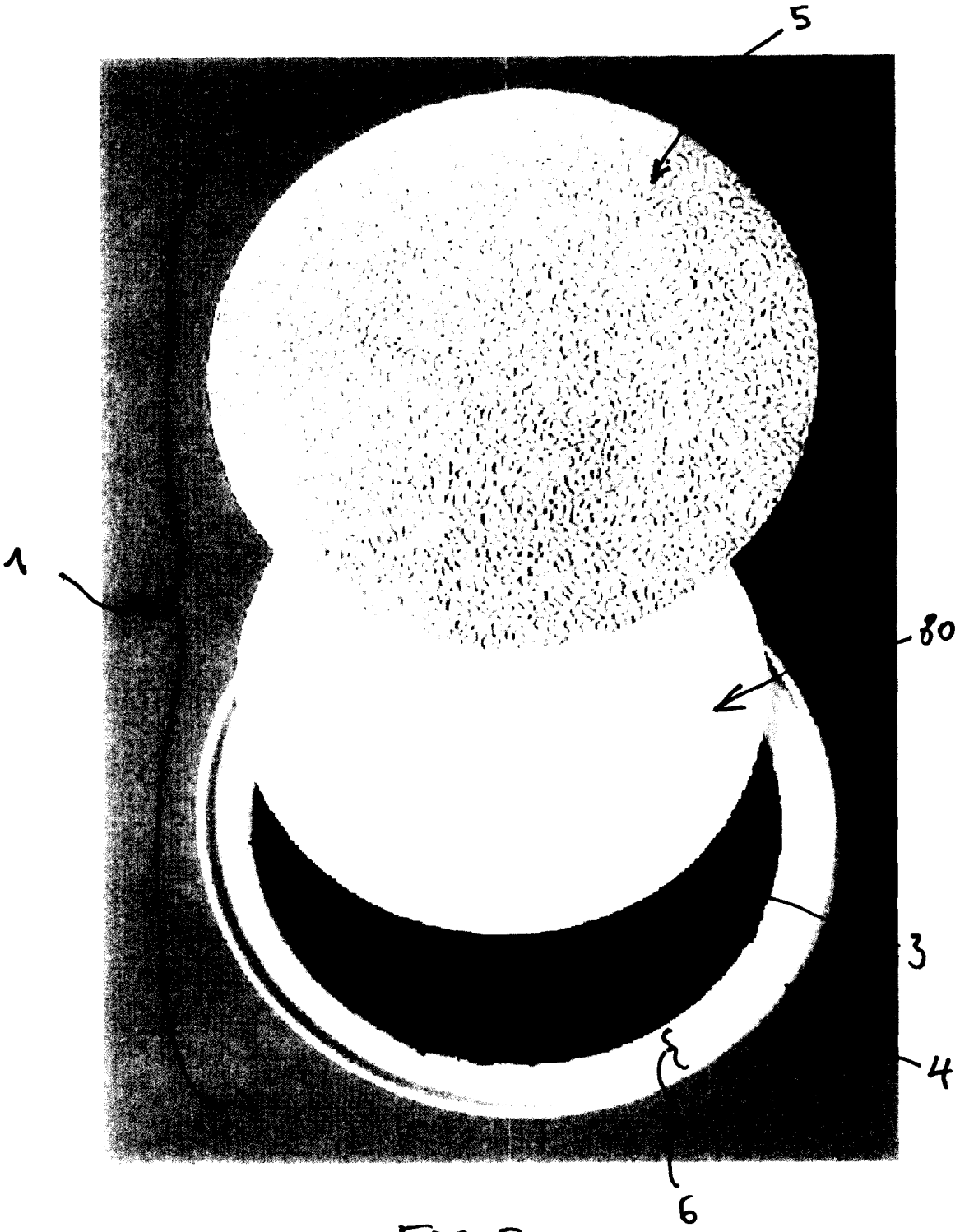


FIG. 3

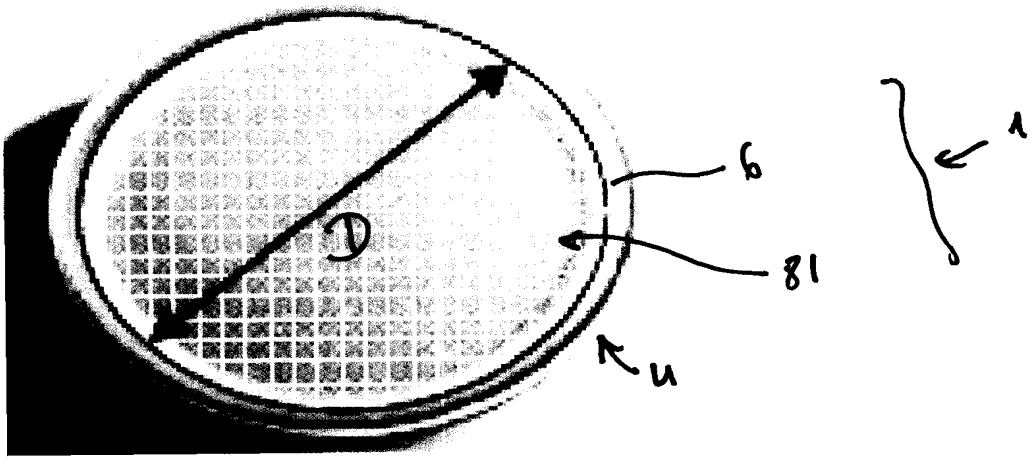


FiG. 4

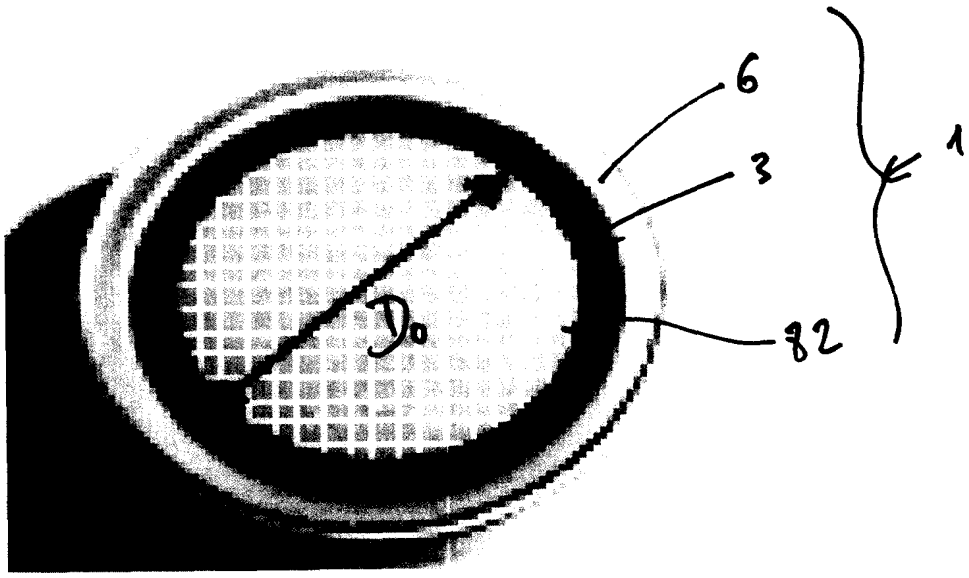


FiG. 5

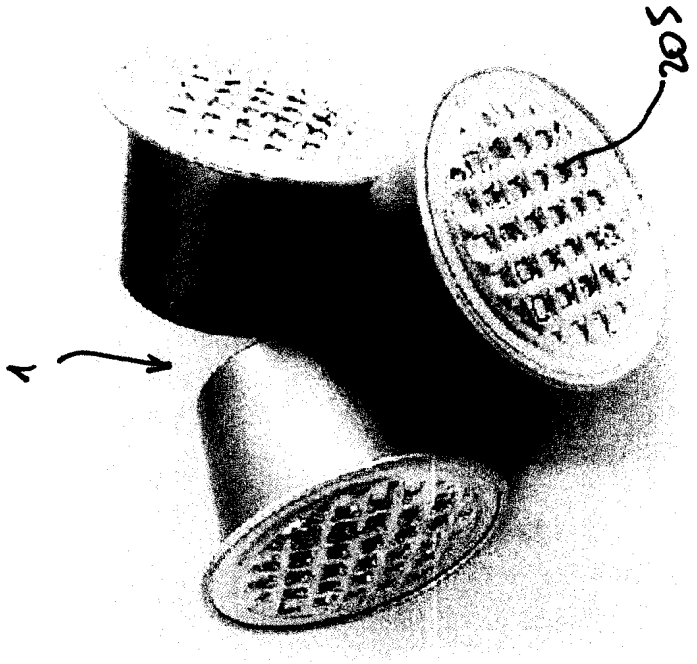


Fig.7

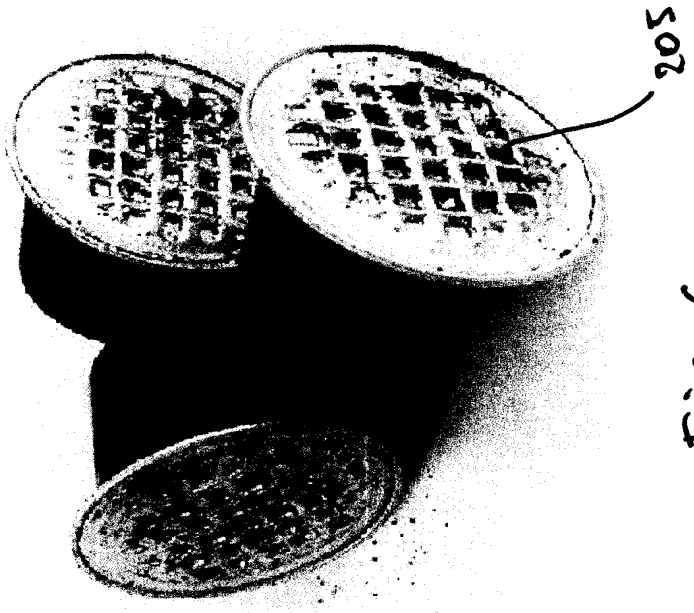


Fig. 6

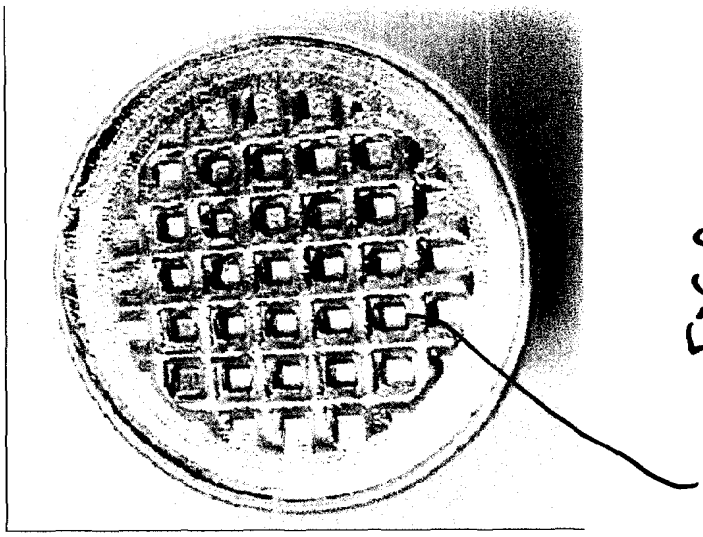


Fig. 9

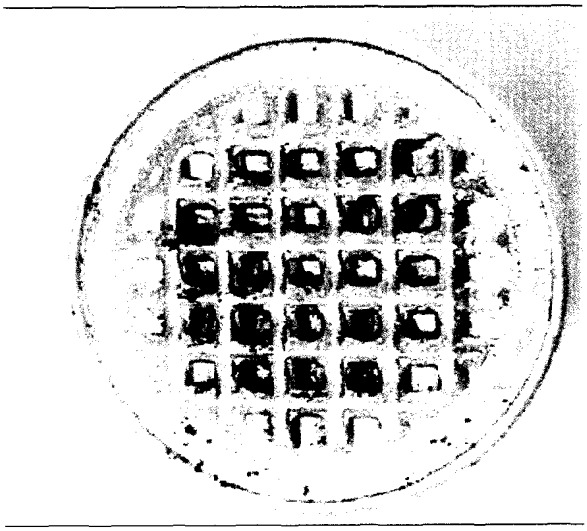


Fig. 8

Fig. 10

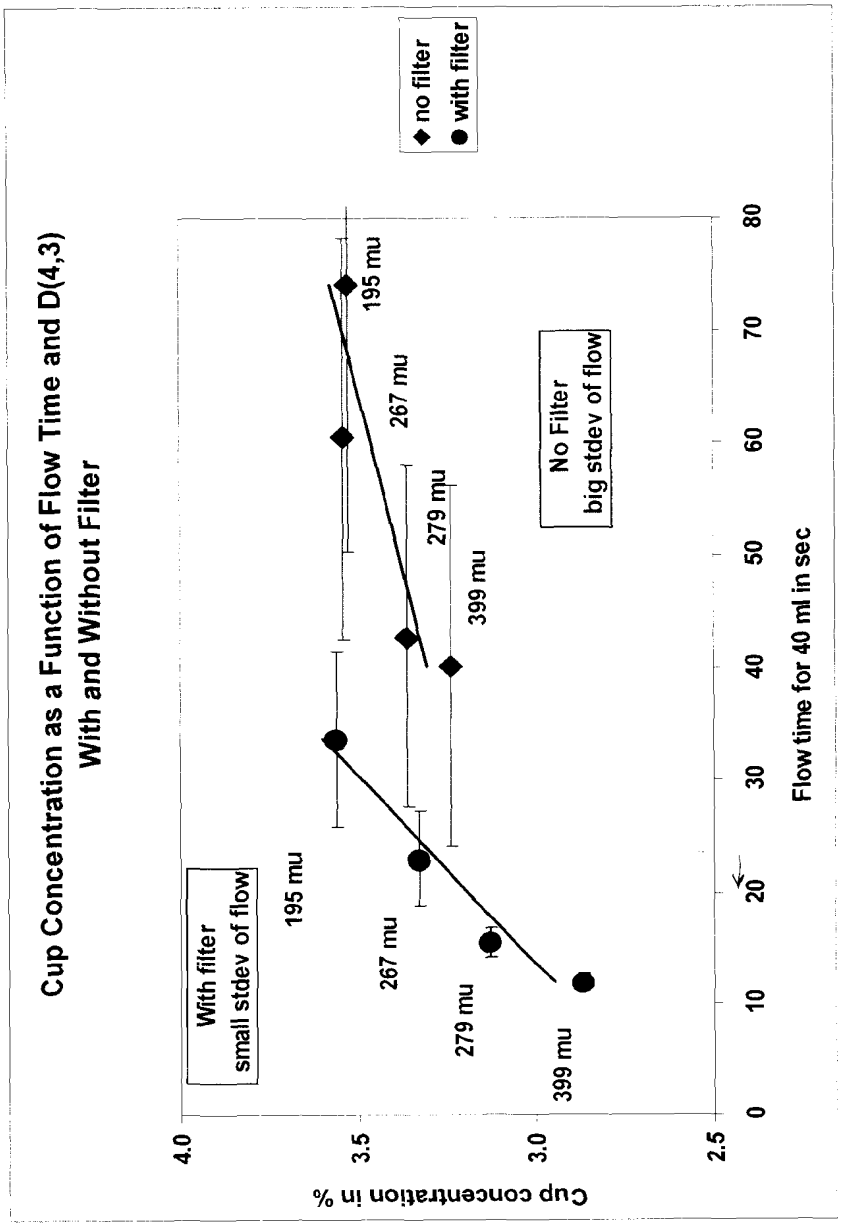

Cup Concentration as a Function of Flow Time and D(4,3)
With and Without Filter
no filter
with filter
With filter
small stdev of flow
No Filter
big stdev of flow
195 mu
267 mu
279 mu
399 mu
195 mu
267 mu
279 mu
399 mu
Cup concentration in %
Flow time for 40 ml in sec
4.0
3.5
3.0
2.5
0
10
20
30
40
50
60
70
80

FIG. 12

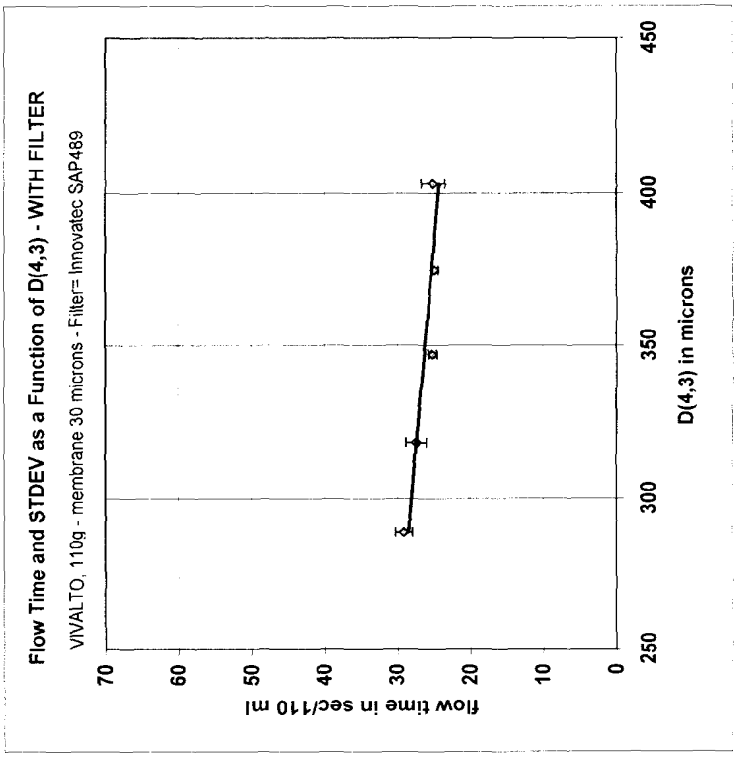

Flow Time and STDEV as a Function of D(4,3) - WITH FILTER
VIVALTO, 110g - membrane 30 microns - Filter= Innovatec SAP489
flow time in sec/110 ml
0
10
20
30
40
50
60
70
D(4,3) in microns
250
300
350
400
450

FIG. 11

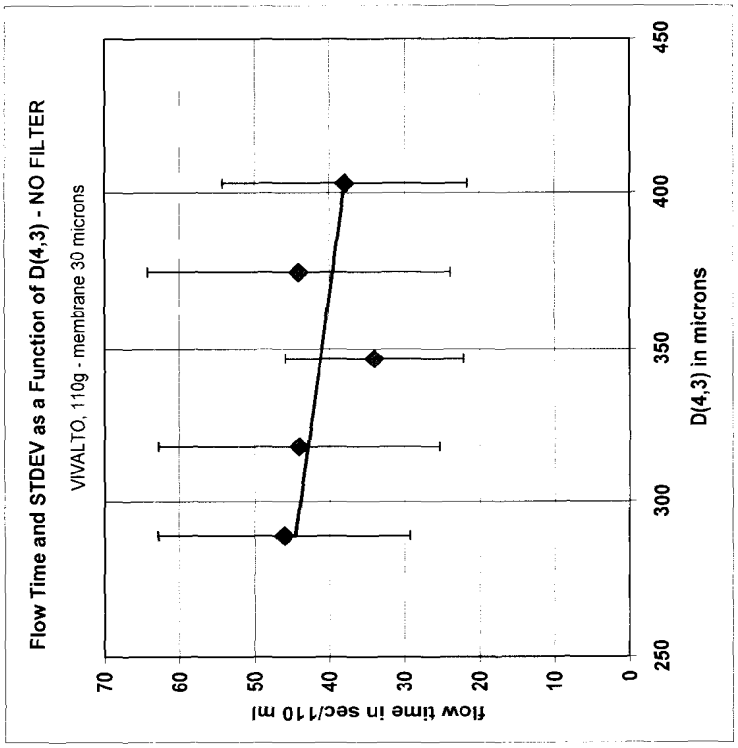
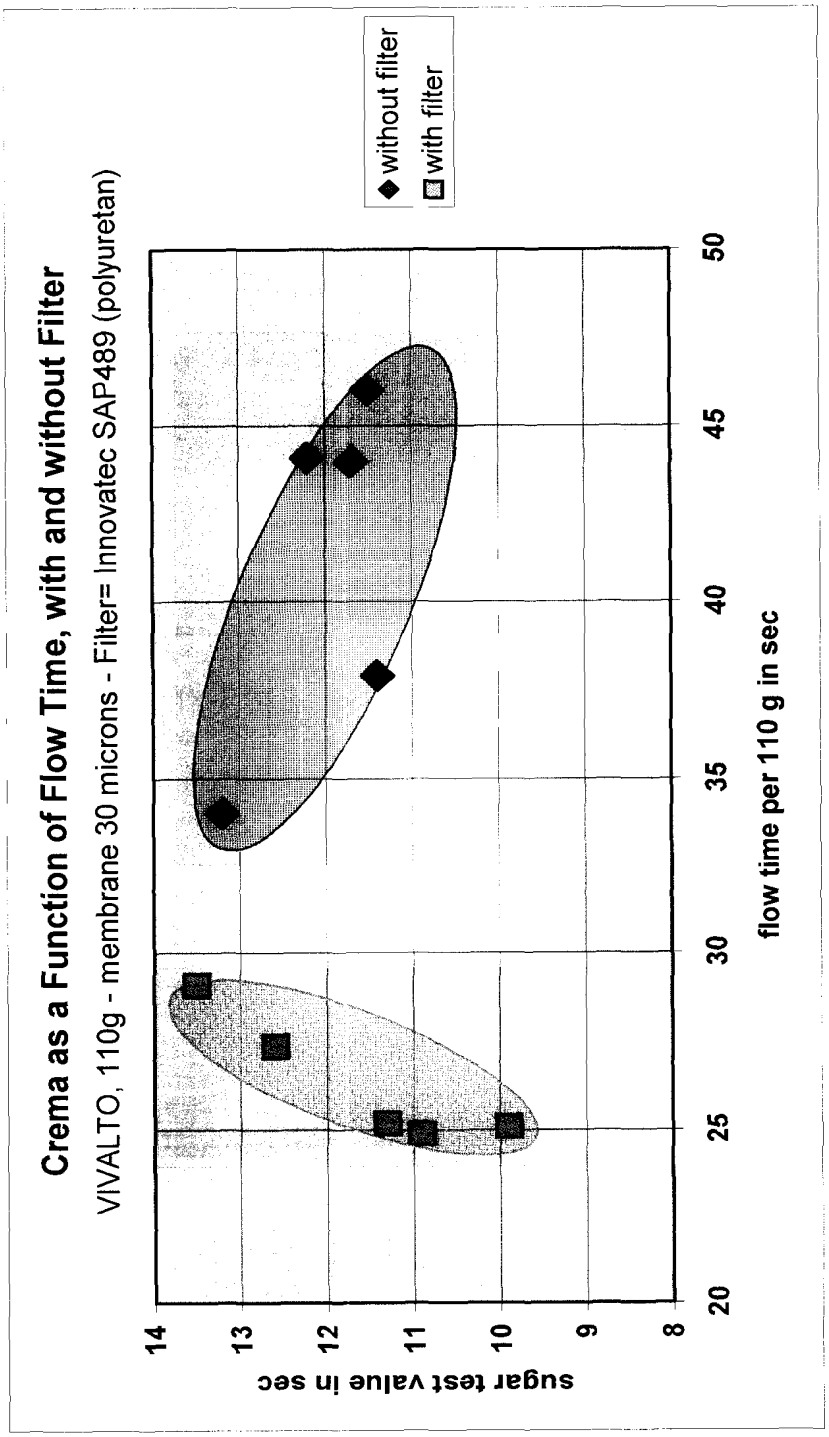

Flow Time and STDEV as a Function of D(4,3) - NO FILTER
VIVALTO, 110g - membrane 30 microns
flow time in sec/110 ml
0
10
20
30
40
50
60
70
D(4,3) in microns
250
300
350
400
450

Fig. 13


Crema as a Function of Flow Time, with and without Filter
VIVALTO, 110g - membrane 30 microns - Filter= Innovatec SAP489 (polyuretan)
without filter
with filter
sugar test value in sec
14
13
12
11
10
9
8
flow time per 110 g in sec
20
25
30
35
40
45
50

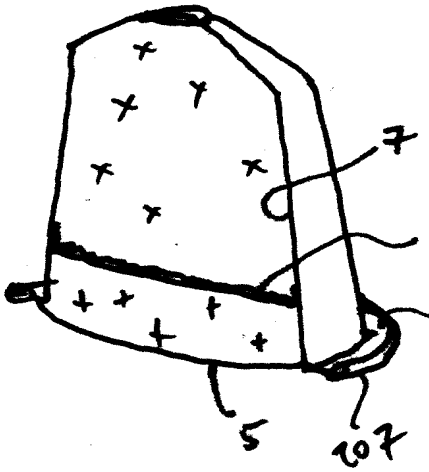


FIG. 14

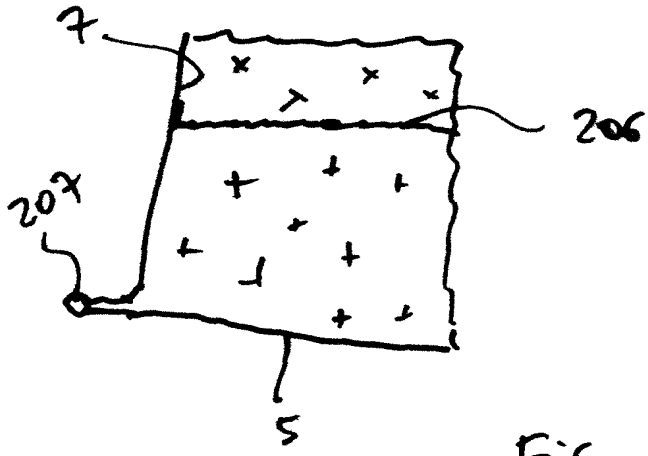


FIG. 15

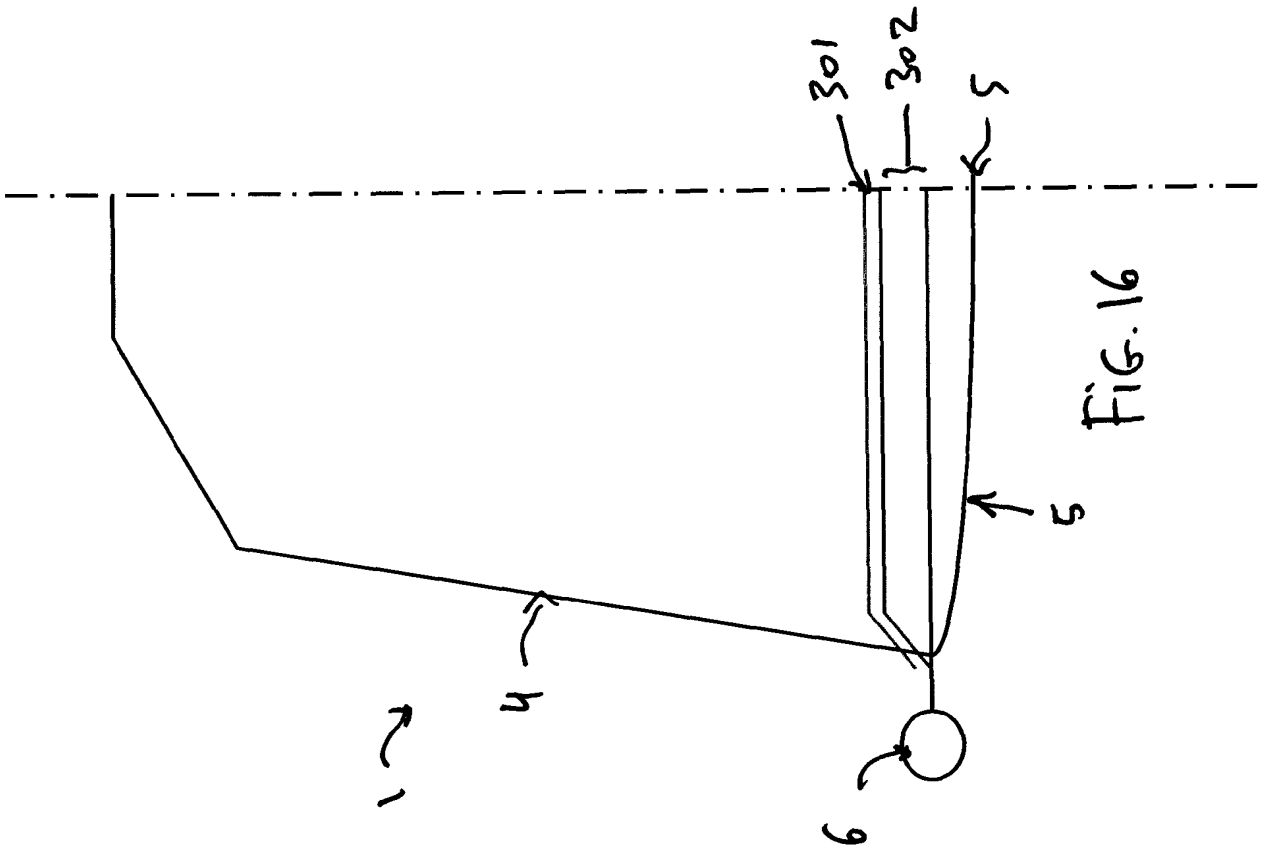


FIG. 16

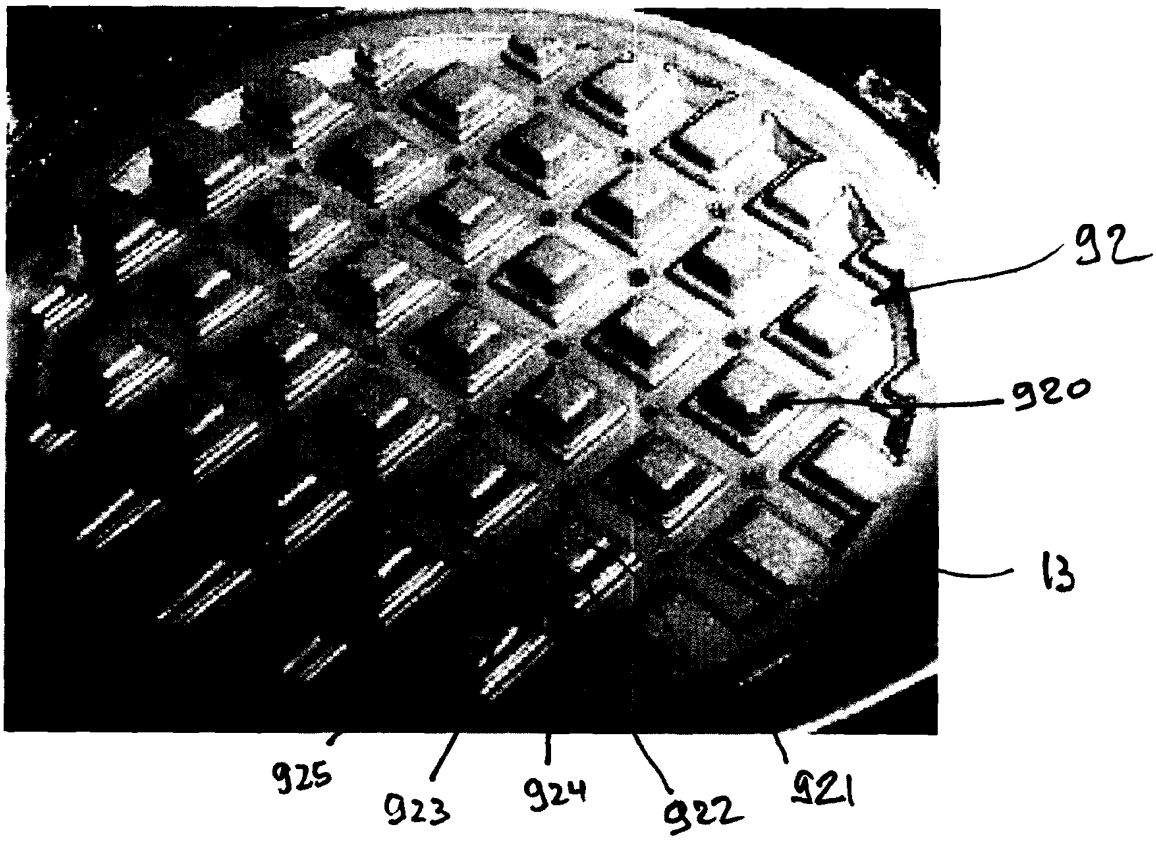


FIG. 17

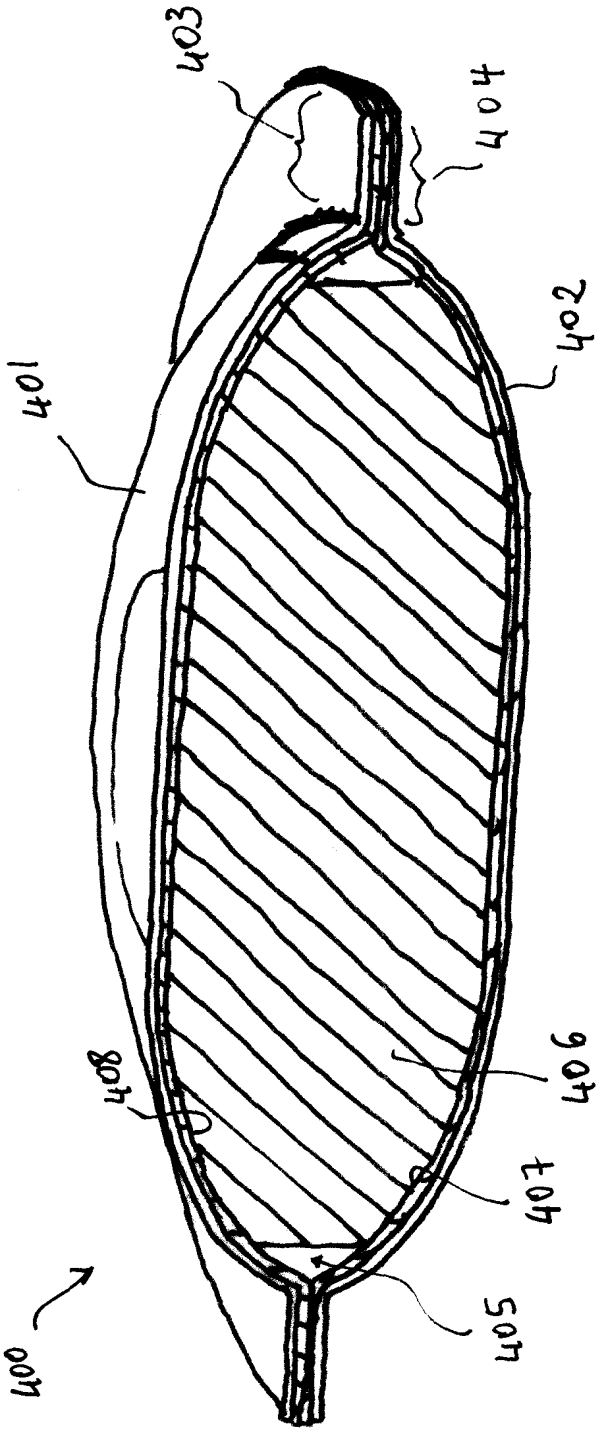


FIG. 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/061844

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D85/804

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 5 242 702 A (FOND OLIVIER [CH]) 7 September 1993 (1993-09-07) column 1 - column 6; figure 5	1,9,10, 13,14 2,6-8, 11,12
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-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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Date of the actual completion of the international search	Date of mailing of the international search report
17 December 2009	29/12/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Mans-Kamerbeek, M

Form PCT/ISA/210 (second sheet) (April 2005)

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IPR2023-00502, U.S. PATENT 10,994,923

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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IPR2023-00502, U.S. PATENT 10,994,923

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PCT/EP2009/061844

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⑲日本国特許庁(JP)　⑪特許出願公開

⑫公開特許公報(A)　平1−233688

⑤1Int. Cl.⁴　識別記号　庁内整理番号　⑬公開　平成1年(1989)9月19日
G 06 K 19/00　A−6711−5B

審査請求　未請求　請求項の数 5　(全4頁)

⑤4発明の名称　バーコード

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明　細　書

1.発明の名称

バーコード

2.特許請求の範囲

1　棒状金属の配列によりデータを記録してなることを特徴とするバーコード。

2　棒状金属が巾の異るものである請求項1記載のバーコード。

3　棒状金属が厚さの異るものである請求項1記載のバーコード。

4　棒状金属の間隔に差異をもたせたものである請求項1記載のバーコード。

5　上面に保護膜を構成した請求項1，2，3または4記載のバーコード。

3.発明の詳細な説明

〔産業上の利用分野〕

本発明は商品等の種類、価格、その他の各種情報をカードや商品等の表面に記録するバーコードに関する。

〔従来の技術〕

従来、本発明のごとき各種情報を記録するバーコードとしては巾及び／あるいは間隔に差異をもたせて着色棒状体を配列したものが提供されている。

〔発明が解決しようとする課題〕

上記バーコードはそこに記録された情報を光学的に読み取るものであるが以下のごとき欠点を有する。

すなわち、バーコードがごみや鉛記具等により汚されると読み取りが困難である。

本発明は上記のごとき汚れによつて影響を受けないバーコードを提供することを目的とする。

また、従来のバーコードは光学的に読み取るものであるため、必ず表面に露見させる必要があり、その結果、そこに記録されている各種情報を光学的な読み取り機によらずに視覚的にも読み取ることが可能であつた。

したがつて、秘密保持が要求される場合等の使用には不向きであつた。

本発明は表面を例えば着色したプラスチック

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シート等で覆つて見えない状態としてもデータの読み取りが可能であるものである。

さらに、本発明は磁気カード等と異り、磁気の影響を受けることがなく、耐久性に優れ、さらにＩＣカード等と異り安価に提供できるバーコードを提供することを目的とするものである。

〔課題を解決するための手段〕

本発明は上記目的を達成するため、棒状金属の配列によりデータを記録したものであり、その配列例としては棒状金属の巾あるいは厚さを異らしめ、あるいはさらにそれらの間隔に差異をもたせたもので、さらにそれらの表面に保護膜を構成したことを特徴とするものである。

〔作　用〕

本発明のバーコードの読み取りは導電率、透磁率等の変化を利用した読み取り装置、例えば金属の探傷機、金属探知機等により行われる。

読み取りの実際を示せば、第６図に示された相互誘導コイル(6)を本発明の棒状金属(1)からなるバーコード(α)に対向させて移動させると、棒状金属(1)の巾あるいは厚さ、あるいはさらにそれらの間隔に対応して外部インピーダンスが変化する。

その結果、二次コイル(9)に流れる相互誘導電流が棒状金属(1)の巾あるいは厚さあるいはさらにそれらの間隔に対応して変化し、振幅と波幅の変化する出力波形が相互誘導検出回路(10)から出力される。

そして、波形整形回路(11)において矩形波に整形されてＡＤ変換器(12)に入力される。ＡＤ変換器(12)では矩形波の山と谷の幅がデジタル信号に変換され、その信号がマイクロコンピュータ(13)の入出力ポート(14)に入力されて、ＣＰＵ(15)でその信号の演算処理が行われ、バーコード(α)の情報が読み取られ、その結果が駆動回路(18)を介して表示部(19)に表示されるものである。

上記のごとく、本発明では棒状金属(1)部とともに、あるいはそれらにかえてその間隔部、さらにそれらを組合せて情報記録部とすることも可能である。

〔実施例〕

以下に本発明の一実施例を図面について詳細に説明する。

第１図には本発明のバーコード(α)の平面図が示されている。

すなわち、本発明のバーコード(α)は棒状金属(1)の配列によりデータが記録される。

本発明の上記棒状金属(1)は従来のごとく着色等の必要がない。

もつとも、後述する基板との関係で従来の着色状態と同様になる場合もあり、さらに着色を施こせば従来のバーコードと同様に光学的に読み取ることも可能であり、共用できるものである。

第２図は第１図の一部拡大縦断面図である。すなわち、棒状金属(1)の巾（W_1，W_2）を異らしめ、あるいはその間隔（W_3，W_4）に差異をもたせ、巾及びそれらの組合せ、あるいは間隔の組合せによりデータを記録したもので、基本的には従来のバーコードとかわらないものである。

詳細に述べると、必要なデータに合せて基板(2)の上面に巾（W_1，W_2）の異る棒状金属(1)を配列し、あるいは間隔（W_3，W_4）に差異をもたせて配列したものであり、基板(2)はプラスチックフイルム（シート）、紙、木、さらには金属でもよいものである。

なお、基板(2)としてはその取付け等、取扱いの関係でフレキシブルな材料が最適である。また、取付け個所に応じて耐熱性、耐薬品性を有するものが使用される。

つぎに、棒状金属(1)について述べると、該棒状金属(1)は文字通り金属であればよいものである。

すなわち、導電率、透磁率等の変化を利用した読み取り装置、例えば金属の探傷機、金属探知機等に反応すればよいもので、アルミニウム、銅、鉄等、その種類を問わないものである。

もつとも、その配列上の取扱い等を考えてフイルム状（シート状）のものが好ましいもので

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ある。

すなわち、それらはフレキシブルであり、基板(2)とともにカード、ラベル等に構成した場合に全体をフレキシブルとすることができるものである。

上記棒状金属(1)の配列は基板(2)上に接着する他、金属性ペーストの塗布あるいは印刷により、さらには箔押し、あるいは基板(2)上全面に予め設けられた金属層の不要部分を除去する方法、その他各種の方法により行うことができる。

図中(3)は接着剤、(4)はセパレータである。

第3図は第1図、第2図実施例の発展型で、棒状金属(1)の配列に際し、異なる巾(W_1, W_2)及び異なる間隔(W_3, W_4)に加うるに、棒状金属(1)の厚さ(T_1, T_2)を異ならしめ、それらの組合せによりデータを記録したものである。

詳細に述べると、この実施例においても基板(2)を用いることも可能であるが、厚さ加工の容易性を考慮して基板(2)と一体にされた状態で棒状金属(1)部が構成されている。

この実施例では厚さ(T_1, T_2)と巾(W_1, W_2)と間隔(W_3, W_4)の組合せにより導電率、透磁率等が変化することが利用される。

第4図は第2図実施例の表面にプラスチック等の保護膜(5)を設けた例であり、第5図は第3図実施例の表面にプラスチック等の保護膜(5)を設けた例である。

この実施例によれば、保護膜(5)上に読み取り装置を直にスライドさせて読み取ることができるものである。

第6図には本発明のバーコードの読み取り装置の一例が示されている。

同図において、(6)は相互誘導コイルであり、コアー(7)、一次コイル(8)、二次コイル(9)で構成されている。

(10)は相互誘導検出回路であり、一次コイル(8)に高周波の交流電流を供給するとともに、二次コイル(9)に生じた相互誘導電流を検出するものである。

(11)は上記相互誘導検出回路(10)からの出力波形を矩形波に整形する波形整形回路、(12)は上記波形整形回路(11)からのアナログ信号出力をデジタル信号に変換するＡＤ変換器、(13)は上記ＡＤ変換器(12)からの出力を演算処理するマイクロコンピュータであり、入出力ポート(14)、中央演算回路(15)、ＲＡＭ(16)、ＲＯＭ(17)で構成されている。

そして、上記入出力ポート(14)の出力端子には駆動回路(18)を介して、例えばデジタル表示器からなる表示部(19)が接続されている。

上記構成の読み取り装置は、一次コイル(8)に高周波の交流電流が供給されるとこれによつて生ずる磁界によつて二次コイル(9)に誘導電流が発生する。

一方、棒状金属(1)からなるバーコード(a)部には渦電流が発生し棒状金属(1)の巾、厚さあるいは間隔の変化によつて渦電流が変化するとその影響で相互誘導コイル(8)のインピーダンスが変化して、二次コイル(9)に発生する誘導電流が変化する。

したがつて、相互誘導コイル(6)をバーコード(a)に対向させて移動させ、二次コイル(9)の誘導電流を解析することによりバーコード(a)のデータを読み取ることができるものである。

〔発明の効果〕

本発明によれば、表面が汚れた場合でも読み取りが可能であり、さらに表面を覆つて秘密保持用としても利用することができる他、磁気の影響を受けることもなく耐久性に優れ、安価に提供できる効果が得られるものである。

4. 図面の簡単な説明

図面は本発明の一実施例を示すもので、第1図は平面図、第2図は第1図の一部拡大縦断面図、第3図は他の実施例を示す一部拡大縦断面図、第4図はさらに他の実施例を示す一部拡大縦断面図、第5図はさらに他の実施例を示す一部拡大縦断面図、第6図はデータ読み取り装置

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の一例を示すブロック図である。

(1)・・・棒状金属、(2)・・・基板、(5)・・・保護膜、(a)・・・バーコード、W_1，W_2・・・巾、W_3，W_4・・・間隔、T_1，T_2・・・厚さ。

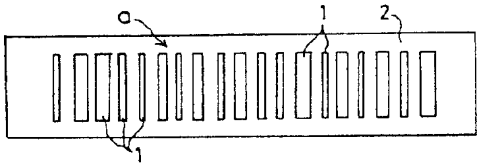
特許出願人

東急車輛製造株式会社

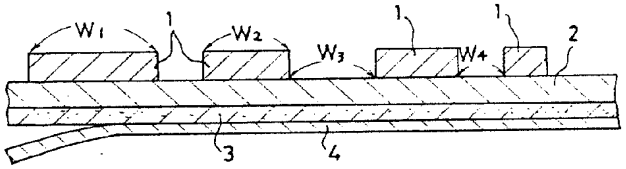
代理人弁理士

山　本　彰　司

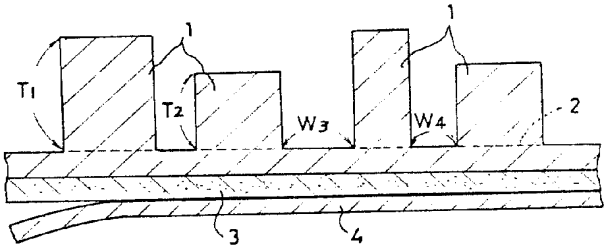
第1図



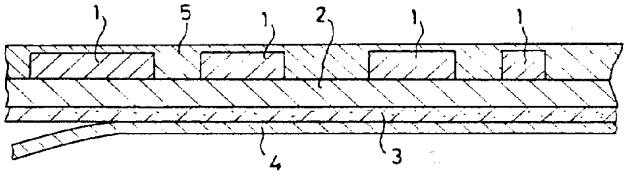
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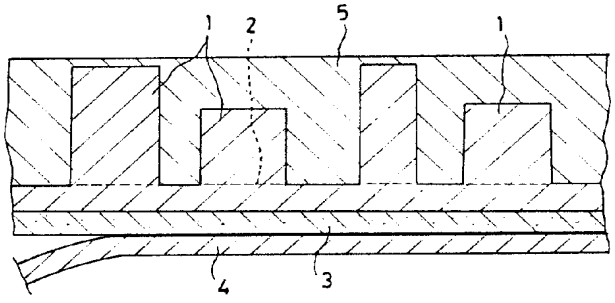
第3図



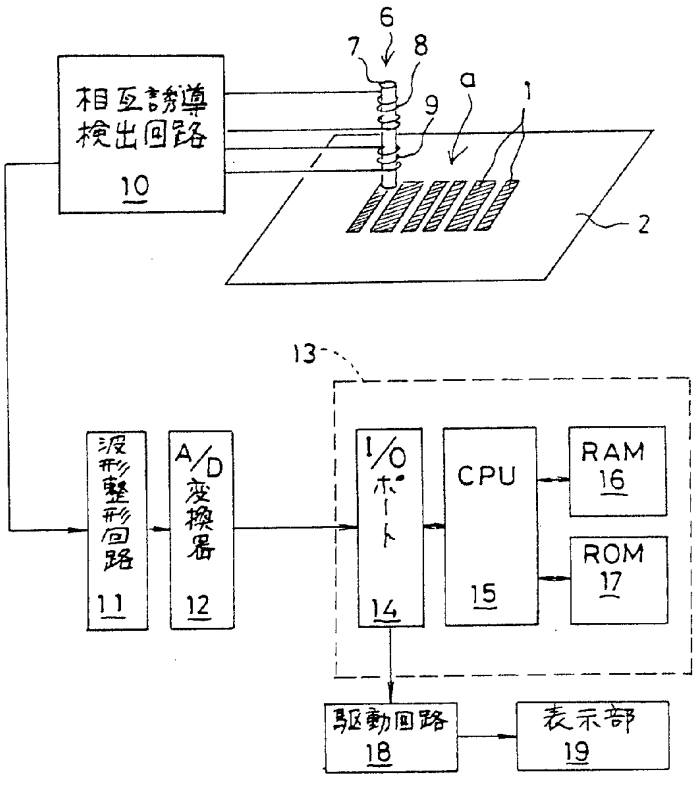
第4図



第5図



第6図



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Electronic Acknowledgement Receipt

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Application Number:	13697297
International Application Number:	
Confirmation Number:	1065
Title of Invention:	CAPSULE, SYSTEM AND METHOD FOR PREPARING A BEVERAGE BY CENTRIFUGATION
First Named Inventor/Applicant Name:	Christian Jarisch
Customer Number:	29157
Filer:	Aaron J. Morrow/US Patent Mail
Filer Authorized By:	Aaron J. Morrow
Attorney Docket Number:	3712036-01693
Receipt Date:	18-JUN-2020
Filing Date:	09-NOV-2012
Time Stamp:	12:12:22
Application Type:	U.S. National Stage under 35 USC 371

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Deposit Account	021818
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37 CFR 1.492(a) (Basic national fee only)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13697297
Filing Date	2012-11-09
First Named Inventor	Jarisch et al.
Art Unit	1792
Examiner Name	Chaim A. Smith
Attorney Docket Number	3712036-01693

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5285041		1994-02-08	Wright	
	2	5243164		1993-09-07	Erickson, et al.	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13697297
	Filing Date	2012-11-09
	First Named Inventor	Jarisch et al.
	Art Unit	1792
	Examiner Name	Chaim A. Smith
	Attorney Docket Number	3712036-01693

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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	Attorney Docket Number	3712036-01693

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	Art Unit	1792
	Examiner Name	Chaim A. Smith
	Attorney Docket Number	3712036-01693

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	2	Oral Letter regarding the opposition Procedure dated March 16, 2020 for EP 3 023 362	☐
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	Art Unit	1792
	Examiner Name	Chaim A. Smith
	Attorney Docket Number	3712036-01693

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	Attorney Docket Number	3712036-01693

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	Art Unit	1792
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	Art Unit	1792
	Examiner Name	Chaim A. Smith
	Attorney Docket Number	3712036-01693

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Examiner Name	Chaim A. Smith
Attorney Docket Number	3712036-01693

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Aaron J. Morrow/	Date (YYYY-MM-DD)	2020-06-18
Name/Print	Aaron J. Morrow	Registration Number	55819

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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(19) BUNDESREPUBLIK DEUTSCHLAND



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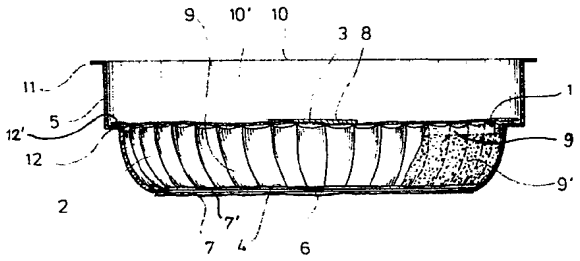
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(72) Erfinder:
gleich Anmelder

Prüfungsantrag gem. § 44 PatG ist gestellt

(54) Kaffee-Kompaktfilter

Kaffee-Kompaktfilter, bestehend aus einem oben und unten offenen Filtergehäuse mit je einer darin fest angebrachten oberen und unteren Filterpapierlage, zwischen denen eine bestimmte Menge gemahlenen Kaffees eingebracht ist, wobei zwischen oberer und unterer Filterpapierlage (1 und 4) randseitig entlang der Innenseite des Filtergehäuses (10') ein Filterpapiereinsatz (2) angeordnet ist, der mit der Innenseite des Gehäuses (10') nicht oder nur teilweise in Berührung steht und mit der unteren Filterpapierlage (4) verbunden oder einstückig ist, und Kaffee-Maschine für die Verwendung des Kaffee-Kompaktfilters (10), die eine bewegbar mit dem Gehäuse der Maschine verbundene Aufnahmevorrichtung mit einer Öffnung zur Aufnahme des Kaffee-Kompaktfilters (10) aufweist.



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BUNDESDRUCKEREI 01. 86 608 011/295 7/60

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Patentansprüche:

1. Kaffee-Kompaktfilter, bestehend aus einem oben und unten offenen Filtergehäuse mit je einer darin fest angebrachten oberen und unteren Filterpapierlage, zwischen denen eine bestimmte Menge gemahlenen Kaffees eingebracht ist,
dadurch gekennzeichnet, daß zwischen oberer und unterer Filterpapierlage (1 und 4) randseitig entlang der Innenseite des Filtergehäuses (10') ein Filterpapiereinsatz (2) angeordnet ist, der mit der Innenseite des Gehäuses (10') nicht oder nur teilweise in Berührung steht und mit der unteren Filterpapierlage (4) verbunden oder einstückig ist.

2. Kaffee-Kompaktfilter nach Anspruch 1, dadurch gekennzeichnet, daß der randseitig angeordnete Filterpapiereinsatz (2) aus geriffeltem, gewelltem, zickzack-förmig gefaltetem oder ähnlich geformtem Filterpapier besteht, so daß zwischen dem randseitig angeordneten Filterpapiereinsatz (2) und der Innenseite des Gehäuses (10') ein Ringkanal bzw. mehrere etwa parallele Kanäle (13) mit einer im wesentlichen vertikalen Achse gebildet werden, die nach unten offen sind.

3. Kaffee-Kompaktfilter nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß die das Kaffeemehl (9') abdeckende obere Filterpapierlage (1) eine automatische Entlüftung (3) aufweist, die sich unter dem Einfluß von heißem Wasser oder Wasserdampf öffnet.

4. Kaffee-Kompaktfilter nach den Ansprüchen 1 bis 3, dadurch gekennzeichnet, daß die automatische Entlüftung (3) durch wenigstens einen Schnitt, eine Perforation oder ähnliches in der oberen Filterpapierlage (1), die mit wenigstens einem Klebestreifen (8) oder

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ähnlichen abgedeckt ist, der sich unter der Einwirkung von heißem Wasser oder Wasserdampf wenigstens teilweise ablöst, gebildet wird.

5. Kaffee-Kompaktfilter nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß das Filtergehäuse 10' einen für die Aufnahme von heißem, zu Einfüllbeginn noch nicht durch die Filterpapierlagen (1 und 4) und den gemahlenen Kaffee (9') gelaufenem Wasser ausreichend hohen Rand (5) oberhalb der oberen Filterpapierlage (1) des Kompaktfilters (10) aufweist.

6. Kaffee-Kompaktfilter nach den Ansprüchen 1 bis 5, dadurch gekennzeichnet, daß die untere Filterpapierlage (4) des Kompaktfilters (10) durch ein darunterliegendes, mit dem Filtergehäuse (10') verbundenes oder einstückiges Trag- und Abstandselement (6) in Form eines Kreuzes, eines Sterns, eines Gitters oder ähnliches unterstützt wird.

7. Kaffee-Kompaktfilter nach den Ansprüchen 1 bis 6, dadurch gekennzeichnet, daß das Filtergehäuse (10') unterhalb des Trag- und Abstandselementes (6) eine weitere Filterlage (7) in Form eines Kunststoffgazefilters, eines Papierfilters oder ähnliches aufweist, die durch das Trag- und Abstandselement (6) von der unteren Filterpapierlage (4) des Kompaktfilters (10) auf Abstand gehalten wird.

8. Kaffee-Maschine für die Verwendung des Kaffee-Kompaktfilters (10) nach den Ansprüchen 1 bis 7, dadurch gekennzeichnet, daß die Maschine (14) eine bewegbar mit dem Gehäuse der Maschine (14) verbundene Aufnahmevorrichtung (15) mit einer Öffnung zur Aufnahme des Kaffee-Kompaktfilters (10) aufweist.

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9. Kaffee-Maschine nach Anspruch 8, dadurch gekennzeichnet, daß die Maschine (14) eine Führung (15') zum Einschieben oder Einlegen des Filters (10) aufweist.

10. Kaffee-Maschine nach Anspruch 9, dadurch gekennzeichnet, daß sie unterhalb der Führung (15') eine mit dieser verbundene oder einstückige, etwa trichterförmige Sammel- und Ableitvorrichtung (16) für den aus dem Kaffee-Kompaktfilter (10) austretenden Kaffeesud aufweist.

11. Kaffee-Maschine nach Anspruch 8, dadurch gekennzeichnet, daß die Aufnahmevorrichtung (15) für die Aufnahme des Kaffee-Kompaktfilters (10) in ihrem unteren Bereich, d. h. bei eingelegtem Kompaktfilter (10) unter diesem, eine etwa trichterförmige Sammel- und Ableitvorrichtung (16) für den austretenden Kaffeesud aufweist, die mit der Aufnahmevorrichtung (15) verbunden oder einstückig ist.

12. Kaffee-Maschine nach den Ansprüchen 8 bis 11, dadurch gekennzeichnet, daß die Aufnahmevorrichtung (15) für die Aufnahme des Kaffee-Kompaktfilters (10) eine nur geringfügig größere Höhe als der Kaffee-Kompaktfilter (10) selbst aufweist.

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Kaffee-Kompaktfilter

Die Erfindung bezieht sich auf ein Kaffee-Kompaktfilter, bestehend aus einem oben und unten offenen Filtergehäuse mit je einer darin fest angebrachten oberen und unteren Filterpapierlage, zwischen denen eine bestimmte Menge gemahlenen Kaffees eingebracht ist, sowie aus einer Kaffee-Maschine für die Aufnahme des Kaffee-Kompaktfilters.

Neben herkömmlichen Filtertüten, die in ein etwa trichterförmiges Filtergefäß eingesetzt und von Hand mit gemahlenem Kaffee gefüllt werden, sind schon seit längerem sogenannte Kaffee-Kompaktfilter gebräuchlich, die aus einem oben und unten offenen Filtergehäuse mit je einer darin fest angebrachten oberen und unteren Filterpapierlage bestehen, zwischen denen eine bestimmte Menge gemahlenen Kaffees eingebracht ist und die als Einsatz in speziellen, dafür geeigneten Kaffeemaschinen verwendet werden und nach einmaligem Gebrauch komplett fortgeworfen werden. Kompaktfilter werden vor allem dort verwendet, wo größere Mengen Kaffeesud in kurzer Zeit erzeugt werden sollen, d. h. vor allem im gastronomischen Bereich.

In der Praxis haben derartige Kompaktfilter jedoch einige Nachteile, sowohl aus der Sicht des Verbrauchers als auch des Herstellers, gezeigt.

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Als wirksame Filterfläche steht nur die untere Filterpapierlage zur Verfügung, was zur Folge hat, daß der Filtriervorgang, vor allem bei feiner gemahlenem Kaffee, relativ lange dauert, obwohl gerade auch eine kurze Zubereitungszeit gefordert ist.

Ein weiteres Problem stellt das ungleichmäßige Eindringen des aufgegebenen heißen Wassers in die Kaffeemehlfüllung dar. Bei Aufgabe des heißen Wassers wird zuerst die obere Filterpapierlage durchfeuchtet und dadurch sehr wenig durchlässig für gasförmige Stoffe. Während des weiteren Eindringens des Heißwassers in die Kaffeemehlfüllung werden die zwischen den Kaffeepartikeln verbliebene Luft und der entstehende Wasserdampf verdrängt und sammeln sich in einer Blase unterhalb der oberen Filterpapierlage. Die Folge ist eine unerwünschte Verringerung der Fläche, durch die das Heißwasser in die Kaffeemehlfüllung eintritt und damit sowohl eine Verlangsamung des Filtriervorganges als auch eine Verschlechterung der Auslaugung der Kaffeemehlfüllung. Im schlimmsten Fall kann es sogar zum Überlaufen von heißem Wasser und dadurch zu einer Verbrühungsgefahr für den Benutzer kommen, wenn das heiße Wasser nicht schnell genug durch den Filter abfließen kann.

Nachteilig aus der Sicht des Herstellers ist, daß solche Kompaktfilter, die für einmaligen Gebrauch gedacht sind, mehrmals verwendet werden können, indem für die untere Filterpapierlage handelsübliche Filterpapiere eingelegt werden und Kaffeemehl von Hand aufgegeben wird. Häufig sind derartige Kaffee-Maschinen Teil eines sogenannten "Service-Paketes", d. h. für die Maschine selbst entstehen dem Verbraucher keine Kosten, er ist jedoch verpflichtet, regelmäßig eine bestimmte Mindestmenge an Kaffee-Kompaktfiltern eines bestimmten Herstellers zu kaufen. Der Bedarf, der über diese Mindestmenge hinausgeht, wird aber oft nicht bei dem Hersteller des Kom-

paktfilters gedeckt, sondern in Form von preiswerterem Fremd-Kaffee in handelsüblichen Verpackungsformen gekauft. Hierdurch entstehen dem Kompaktfilter-Hersteller bzw. Lieferanten des "Service-Paketes" nicht zu unterschätzende Umsatzverluste.

Es stellt sich daher die Aufgabe, ein Kaffee-Kompaktfilter sowie eine Kaffee-Maschine für die Verwendung des Kompaktfilters zu schaffen, die die oben genannten Nachteile vermeiden, und einerseits insbesondere eine schnelle Zubereitung, eine gute Auslaugung des Kaffeemehls und eine sichere Handhabung für den Verbraucher bieten und andererseits eine Mehrfachverwendung des Kompaktfilters ausschließen.

Die Lösung dieser Aufgabe gelingt erfindungsgemäß durch ein Kaffee-Kompaktfilter, bestehend aus einem oben und unten offenen Filtergehäuse mit je einer fest darin angebrachten oberen und unteren Filterpapierlage, zwischen denen eine bestimmte Menge gemahlenen Kaffees angebracht ist, dadurch gekennzeichnet, daß zwischen oberer und unterer Filterpapierlage randseitig entlang der Innenseite des Filtergehäuses ein Filterpapiereinsatz angeordnet ist, der mit der Innenseite des Gehäuses nicht oder nur teilweise in Berührung steht.

Durch einen derartigen zusätzlichen Filterpapiereinsatz wird die Fläche, durch die der Kaffeesud austreten kann, wesentlich vergrößert. Dies gilt insbesondere dann, wenn der Einsatz aus geriffeltem, gewelltem, zick-zack-förmig gefaltetem oder ähnlich geformtem Filterpapier besteht. Zwischen der Innenwand des Filtergehäuses und dem Filterpapiereinsatz wird bei einem z. B. glatten Einsatz ein Ringkanal gebildet, bei z. B. gewelltem Einsatz ergibt sich eine Anzahl von etwa parallelen Kanälen mit im wesentlichen vertikalen Achsen, die nach unten offen sind und den austretenden Kaffeesud ableiten. Der rand-

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seitige Filtereinsatz ist, um ein unerwünschtes Austreten von Kaffeemehl zu verhindern, mit der unteren Filterpapierlage verbunden oder einstückig.

Das Problem der Luft- und Dampfblasenbildung im Inneren des Filters wird dadurch gelöst, daß der erfindungsgemäße Kompaktfilter eine automatische Entlüftung aufweist, die sich erst unter dem Einfluß von heißem Wasser oder Wasserdampf öffnet. Sie besteht beispielsweise aus wenigstens einem Schnitt oder einer Perforation in der oberen Filterpapierlage, die mit einem Klebestreifen oder ähnlichem abgedeckt ist, der sich unter der Einwirkung von heißem Wasser oder Dampf wenigstens teilweise ablöst und so die darunter befindlichen Öffnungen freigibt. Durch diese entweichen zunächst die vom eindringenden Wasser aus dem Kaffeemehl verdrängte Luft und der dort entstehende Wasserdampf. Nach dem Entlüftungsvorgang fließt dann das aufgegebene Heißwasser außer durch die obere Filterpapierlage selbst zum Teil auch durch die darin befindlichen Öffnungen in das Kaffeemehl. Dieser so vergrößerte Durchfluß trägt ebenfalls zu einer kurzen Zubereitungszeit bei, während gleichzeitig durch das vorherige Entlüften das Kaffeemehl gleichmäßiger und intensiver ausgelaugt wird, was nach ersten praktischen Erfahrungen mit dem erfindungsgemäßen Kompaktfilter zu einer Kaffeemehlersparnis von etwa 20 % bei gleichbleibender Qualität des Kaffeesuds führt. Auch das Überlaufen des Filters bei Aufgabe von Heißwasser ist durch den verbesserten Durchfluß praktisch ausgeschlossen, zumal das Kompaktfiltergehäuse nach dieser Erfindung einen für die Aufnahme von heißem, zu Einfüllbeginn noch nicht durch die Filterpapierlagen und den gemahlenen Kaffee gelaufenem Wasser ausreichend hohen Rand oberhalb der oberen Filterpapierlage aufweist.

Die Reißfestigkeit von Filterpapier im feuchten Zustand ist relativ gering. Um die Zugspannungen in der unteren

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Filterpapierlage, die das Gewicht von Kaffeemehl und aufgegebenem Wasser aufnehmen muß, gering zu halten, wird diese durch ein darunterliegendes Tragelement, das beispielsweise die Form eines Kreuzes, eines Sterns oder eines Gitters hat und mit dem Filtergehäuse verbunden oder einstückig ist, unterstützt. Ein Einreißen der unteren Filterpapierlage ist so nicht mehr möglich.

Das Tragelement dient gleichzeitig als Abstandselement, das eine unterhalb dieses Trag- und Abstandselementes befindliche weitere Filterlage in Form eines Kunststoffgazefilters, eines Papierfilters oder ähnliches von der unteren Filterpapierlage des Filters zur Sicherung der vollen Durchlässigkeit auf Abstand hält. Durch diese weitere Filterlage werden über die randseitige Filterpapierlage eventuell übergetretene oder durch Beschädigung der unteren Filterpapierlage ausgetretene Kaffeemehlpartikel zurückgehalten, so daß der Kaffeesud sicher fei bleibt von Kaffeemehlanteilen, was sowohl dem Geschmack als auch der Bekömmlichkeit des Getränkes zugute kommt.

Eine Kaffee-Maschine für die Verwendung des erfindungsgemäßen Kaffee-Kompaktfilters weist eine bewegbar mit dem Gehäuse der Maschine verbundene Aufnahmevorrichtung mit einer Öffnung zur Aufnahme des Kaffee-Kompaktfilters auf. Hierdurch wird sowohl ein einfaches Einlegen und Herausnehmen des Kompaktfilters wie auch eine sichere Handhabung gewährleistet, da keine Manipulationen des Benutzers in unmittelbarer Nähe des Heißwasseraustrittes der Maschine erforderlich sind. Die Öffnung in der Aufnahmevorrichtung ist so bemessen und gelegen, daß der Kompaktfilter beispielsweise auf einem vorstehenden Kragen oder einem Vorsprung seines Gehäuses rundum- bzw. allseitig aufliegt.

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Um den aus dem Kompaktfilter austretenden Kaffeesud zu sammeln und in ein darunter befindliches Auffanggefäß zu leiten, weist die Kaffee-Maschine nach der Erfindung eine etwa trichterförmige Sammel- und Ableitvorrichtung auf, die beispielsweise unterhalb der Führung zum Einschieben oder Einlegen des Filters mit der Führung verbunden oder einstückig ist oder mit der Aufnahmevorrichtung in deren unterem Bereich, d. h. bei eingelegtem Kompaktfilter unter diesem, verbunden oder einstückig ist. Mit dieser Sammel- und Ableitvorrichtung wird erreicht, daß der Kaffeesud auch in Auffanggefäße, wie z. B. Glaskannen, mit relativ kleiner Einfüllöffnung eingeleitet wird, ohne daß ein Teil des Kaffeesuds neben die Einfüllöffnung gerät.

Eine Mehrfachverwendung des Kompaktfilters bzw. Verwendung von Fremdprodukten wird durch folgende Merkmale des erfindungsgemäßen Kompaktfilters und der Kaffee-Maschine weitgehend ausgeschlossen:

Filterpapiereinsätze, bestehend aus einer flachen Filterpapierlage mit einem daran anschließenden randseitigen Filterpapierteil, sind nicht im Handel, d. h. der Filterpapiereinsatz kann nicht durch einen mehr oder weniger ähnlichen handelsüblichen Einsatz ersetzt werden. Wird lediglich die untere Filterpapierlage durch einen z. B. handelsüblichen Papierrundfilter ersetzt, kommt es wegen des verringerten Durchflusses infolge verkleinerter Filterfläche zu einem Überlaufen des aufgegebenen Heißwassers aus dem Filtergehäuse, was, wenn es mehrmals geschieht, den Benutzer von dieser Mehrfachverwendung abbringen wird.

Bekannte, im Handel befindliche Kompaktfilter, wie eingangs beschrieben, scheiden ebenfalls für einen Einsatz in der erfindungsgemäßen Kaffeemaschine aus, da diese Filter keinen erhöhten Rand für noch nicht durch Filter-

papierlagen und Kaffeemehl gelaufenes Wasser aufweisen und auch die Schublade für die Aufnahme des Kompaktfilters keinen entsprechenden Raum für die Wasseraufnahme bietet.

Die Verwendung schließlich von Kompaktfiltern, die eine größere Höhe aufweisen als der erfindungsgemäße Kompaktfilter, ist wegen der begrenzten Höhe der Schublade unterbunden, da die Schublade mit einem solchen höheren Kompaktfilter nicht mehr in die Kaffeemaschine einschiebbar ist.

Die Erfindung wird im folgenden anhand der Zeichnung eines bevorzugten Ausführungsbeispieles des erfindungsgemäßen Kaffee-Kompaktfilters sowie der erfindungsgemäßen Kaffee-Maschine für die Aufnahme des Kompaktfilters näher erläutert. Es zeigen im einzelnen:

Figur 1 einen erfindungsgemäßen Kaffee-Kompaktfilter, teils in Seitenansicht, teils in Vertikalschnitt,

Figur 2 eine Draufsicht auf einen Querschnitt in horizontaler Ebene des Kompaktfilters,

Figur 3 eine Seitenansicht einer Kaffeemaschine für die Aufnahme des Kompaktfilters.

Wie aus den Figuren 1 und 2 zu entnehmen ist, besteht das hier dargestellte Ausführungsbeispiel des Kompaktfilters 10 aus einem Filtergehäuse 10', das einen vorstehenden Kragen 11 im oberen Bereich, einen erhöhten Rand 5 und eine zurückspringende Stufe 12 aufweist. Im Inneren des Filtergehäuses 10' ist auf der durch die zurückspringende Stufe 12 gebildeten Fläche 12' eine obere Filterpapierlage 1 angebracht, was durch Kleben oder Verschweißen oder ähnliches erfolgt. Die obere

Filterpapierlage 1 weist einen Schnitt bzw. eine Perforation 3 auf, die mit einem Klebestreifen 8 abgedeckt ist. Unterhalb der oberen Filterpapierlage 1 befindet sich randseitig angeordnet ein Filterpapiereinsatz 2, der zur Vergrößerung der Filterfläche gewellt oder gefaltet oder ähnlich geformt ist. Unterhalb des Einsatzes 2 liegt die untere Filterpapierlage 4, die mit dem Einsatz 2 verbunden oder einstückig ist. Der Raum 9, der durch obere und untere Filterpapierlage 1 und 4 und den Filterpapiereinsatz 2 gebildet wird, ist wenigstens teilweise mit Kaffeemehl 9' gefüllt. Durch die randseitige Lage des oberflächenvergrößernd geformten Einsatzes 2 in dem Filtergehäuse 10' entstehen Kanäle 13 mit etwa parallelen und vertikalen Achsen. Die untere Filterpapierlage 4 wird von Trag- und Abstandselementen 6 unterstützt, die mit dem Filtergehäuse 10' verbunden oder einstückig sind. Gleichzeitig halten die Trag- und Abstandselemente 6 eine weitere Filterlage 7, vorzugsweise ein Kunststoffgazefilter, von der unteren Filterpapierlage 4 auf Abstand, so daß zwischen beiden ein Raum 7' gebildet wird, in den der durch die Kanäle 13 abgeleitete Kaffeesud vor dem Durchströmen der Filterlage 7 zunächst einströmt und wo eventuell ausgetretene Kaffeemehlpartikel zurückgehalten werden.

Figur 3 zeigt eine Seitenansicht einer Kaffeemaschine 14, die für die Aufnahme des erfindungsgemäßen Kompaktfilters 10 ausgerüstet ist. Eine bewegbare Aufnahmevorrichtung 15, im Ausführungsbeispiel eine Schublade, enthält den Kompaktfilter 10, der eine nur geringfügig kleinere Höhe als die Aufnahmevorrichtung 15 selbst hat. Gestrichelt eingezeichnet ist die Lage der Schublade in herausgezogenem Zustand. Unterhalb des Kompaktfilters 10 bzw. der Aufnahmevorrichtung 15 ist ein trichterförmiges Sammel- und Ableitelement 16 vorhanden, das den aus dem Kompaktfilter 10 austretenden Kaffeesud in ein Auffanggefäß 17 leitet.

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Fig.1

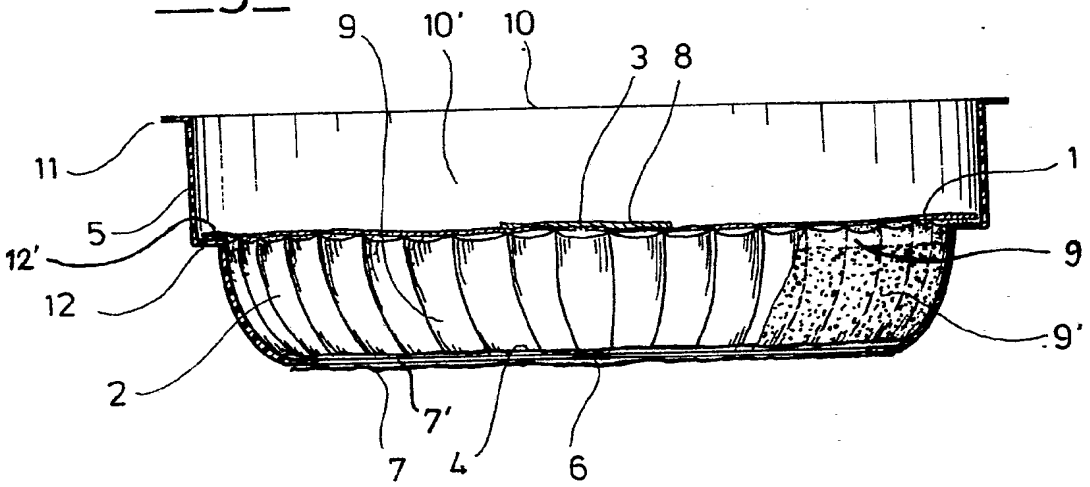
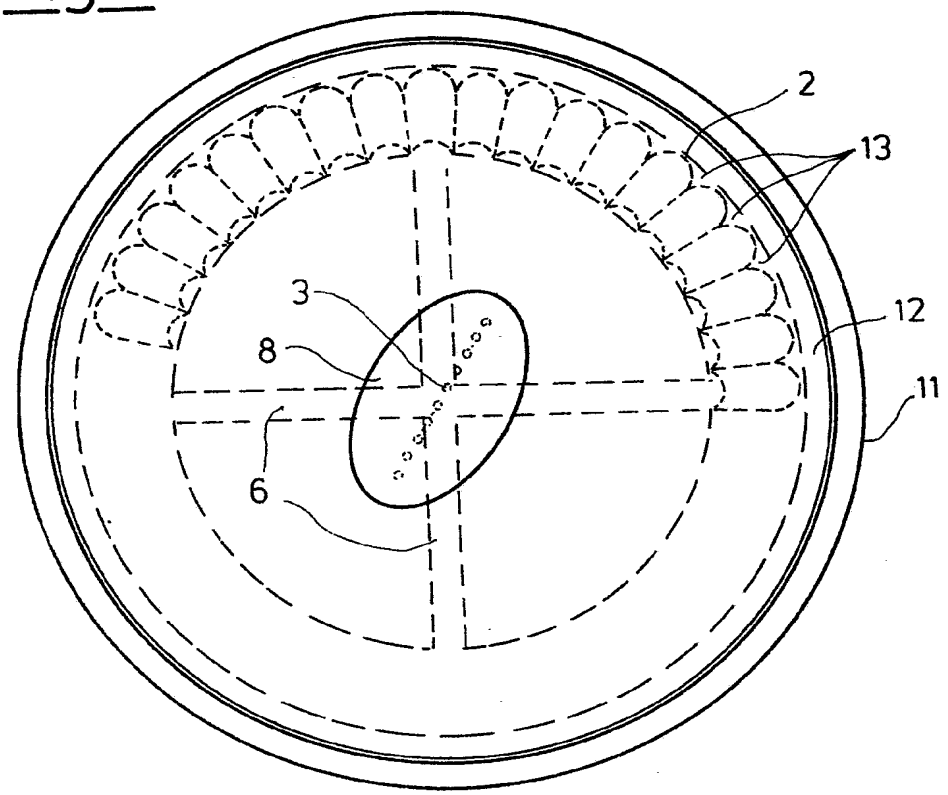


Fig.2



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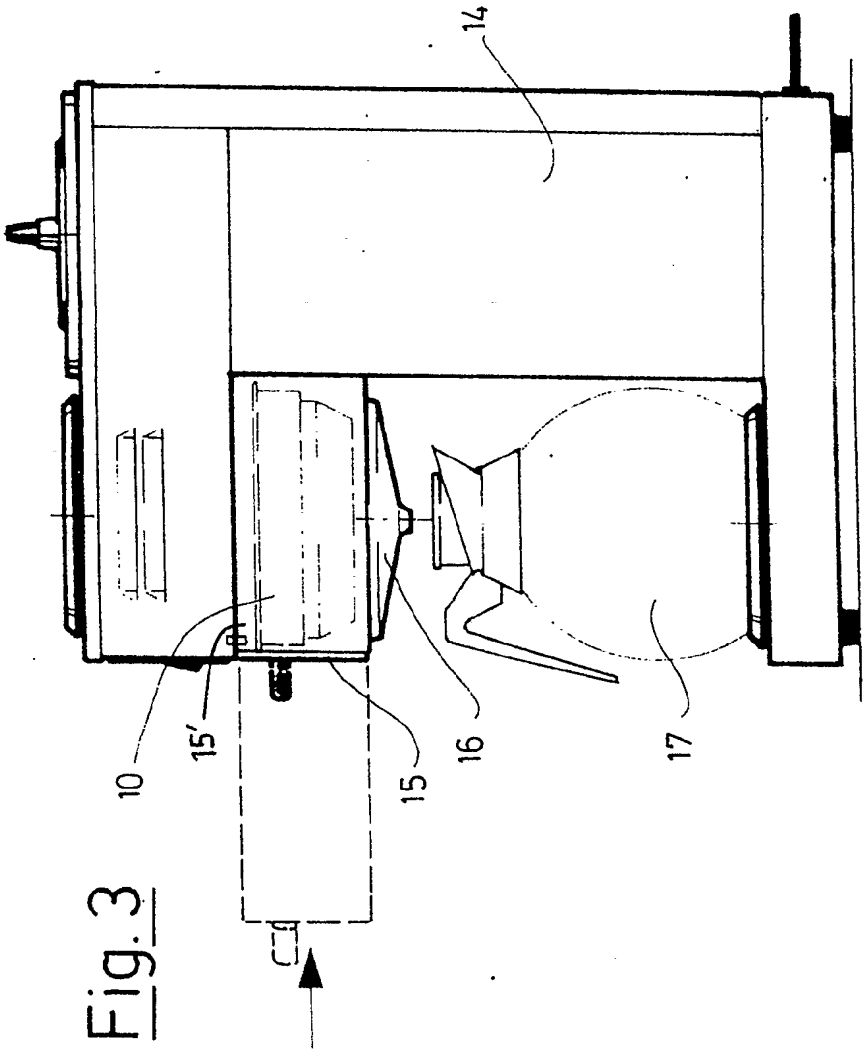


Fig. 3

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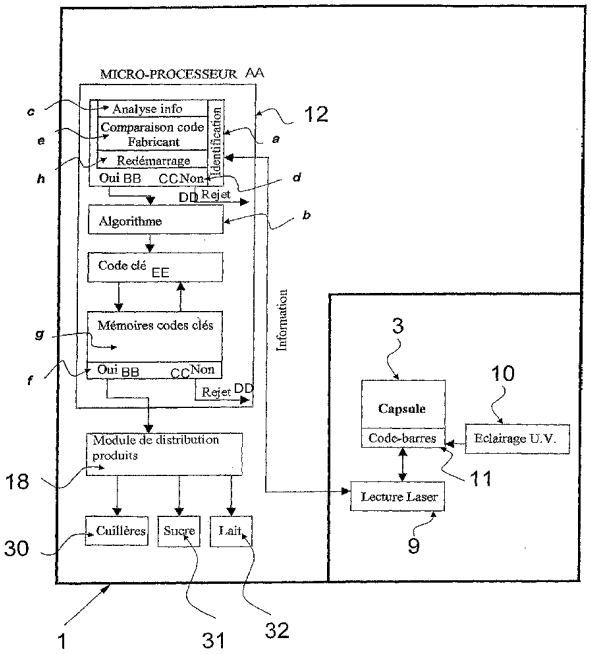
(74) Mandataire : GRIFFES, CONSULTING, SA; Route de Florissant, 81, CH-1206 Genève (CH).

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[Suite sur la page suivante]

(54) Title: APPARATUS FOR DETERMINING THE TRACEABILITY OF THE CONTENTS OF A CONTAINER AND THE ORIGIN THEREOF

(54) Titre : APPAREIL PERMETTANT D'ETABLIR LA TRACABILITE D'UN CONTENU DANS UN RECEPTACLE ET L'ORIGINE DUDIT RECEPTACLE



AA MICROPROCESSOR
C PROCESS INFORMATION
E COMPARE MANUFACTURER CODE
H RESTART
BB YES
CC NO
DD REJECTION
B ALGORITHM
EE KEY CODE
G KEY CODE MEMORIES
18 PRODUCT DISPENSER MODULE
30 SPOONS
31 SUGAR
32 MILK
11 BARCODE
10 UV LIGHT
9 LASER READOUT

(57) Abstract: The aim of the present invention is to provide an apparatus for determining the traceability of the contents of a container (3) as well as the origin of said container (3), wherein information (11) provided on said container can be read out using an optical and/or magnetic reader but is invisible to the naked eye. Said container (3) comprises a pierceable upper portion for injecting a liquid into the container (3), and a pressure-pierceable lower diaphragm for discharging the liquid flavoured by the contents of the container (3). The apparatus includes an optical and/or magnetic reader (9) for reading said information (11) off a container (3) placed inside the apparatus, a microprocessor for encrypting and decrypting, processing, comparing, approving or rejecting and storing the information (11) read off a container (3), and for selectively initiating or not initiating an operative cycle which includes piercing the upper portion of the container (3) and injecting the liquid, as well as for storing (11) said information to ensure readiness for the initiation of a fresh cycle.

(57) Abrégé : Le but de la présente invention est de proposer un appareil permettant d'établir la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle (3) sur lequel figurent des informations (11) lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'ceil nu. Ledit réceptacle (3) est du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle (3) et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle (3). L'appareil comprend un lecteur (9) optique et/ou magnétique pour la lecture desdites informations (11) sur un réceptacle

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PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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Déclarations en vertu de la règle 4.17 :

— *relative au droit du déposant de demander et d'obtenir un brevet (règle 4.17.ii)) pour toutes les désignations*

— *relative au droit du déposant de revendiquer la priorité de la demande antérieure (règle 4.17.iii)) pour toutes les désignations*

— *relative à la qualité d'inventeur (règle 4.17.iv)) pour US seulement*

Publiée :

— *avec rapport de recherche internationale*

En ce qui concerne les codes à deux lettres et autres abréviations, se référer aux "Notes explicatives relatives aux codes et abréviations" figurant au début de chaque numéro ordinaire de la Gazette du PCT.

(3) introduit dans l'appareil, un microprocesseur (12) permettant de crypter/décrypter, analyser, comparer, approuver/refuser et stocker des informations (11) lues sur un réceptacle (3), et agencé pour sélectivement démarrer ou non un cycle d'opérations comprenant le perçage de la partie supérieure du réceptacle (3) et l'injection du liquide, ainsi que pour le stockage des informations (11) lues afin d'être prêt pour démarrer un nouveau cycle.

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APPAREIL PERMETTANT D'ETABLIR LA TRAÇABILITE D'UN CONTENU DANS UN RECEPTACLE ET L'ORIGINE DUDIT RECEPTACLE

La présente invention est relative au domaine des réceptacles, plus particulièrement aux réceptacles permettant l'emmagasinage ou le transport de substances destinées à aromatiser des boissons.

Un réceptacle est un contenant qui reçoit son contenu de diverses provenances.

La traçabilité est la possibilité d'identifier l'origine d'un produit tout en reconstituant son parcours, depuis sa production jusqu'à sa diffusion.

Il est connu d'utiliser des appareils permettant d'obtenir du café par infusion, ce dernier étant conservé dans un réceptacle appelé capsule.

Un tel appareil est décrit dans la publication EP 0607159 A1 qui présente une machine pour produire automatiquement des cafés ou boissons similaires à partir d'une pluralité de réceptacles préformés. Ce type d'appareil n'utilise pas de moyens électroniques de reconnaissance des réceptacles dont la seule fonction est de préserver l'arôme du contenu afin qu'il conserve les meilleures saveurs.

Un procédé pour extraire une substance aromatique contenue dans un réceptacle hermétique est décrit dans le document EP 025810 A1 qui préconise l'injection d'eau chaude dans ledit réceptacle et, une fois des conditions de température/pression obtenues, amener une membrane de celui-ci à s'ouvrir permettant au liquide imprégné de la substance aromatique de s'en échapper. Ce dispositif n'utilise pas des réceptacles sécurisés permettant la traçabilité du contenu desdits réceptacles.

Le document DE20105605U présente un dispositif qui garantit l'hermétisme d'un réceptacle, assurant ainsi la qualité du produit qu'il contient. Il est à noter que ce dispositif est muni d'un transpondeur et permet de détruire un système visible de sécurité porté par les réceptacles qu'il utilise.

Le document WO02078498 présente un identificateur lisible situé sur le sommet de réceptacles utilisés par des machines à café Expresso, ce qui permet de garantir la qualité d'un produit en détruisant des informations d'hermétisme portées par ledit réceptacle. Ce dispositif est visible ce qui permet la reprise des informations contenues dans le dispositif.

Le but de la présente invention est de proposer un appareil permettant de lire la traçabilité d'un contenu dans un réceptacle et de déterminer l'origine des contenants que ledit appareil utilise.

Ce but est atteint par un appareil permettant d'établir la traçabilité d'un contenu dans un réceptacle et l'origine dudit réceptacle sur lequel figurent des informations lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'œil nu, ledit réceptacle étant du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle, l'appareil comprenant un lecteur optique et/ou magnétique pour la lecture desdites informations sur un réceptacle introduit dans l'appareil, et un microprocesseur permettant de crypter/décrypter, analyser, comparer, approuver/refuser et stocker des informations lues sur un réceptacle, et agencé pour sélectivement démarrer ou non un cycle d'opérations comprenant le perçage de la partie supérieure du réceptacle et l'injection du liquide, ainsi que pour le stockage des informations lues afin d'être prêt pour démarrer un nouveau cycle.

On obtient ainsi un système qui identifie un réceptacle, compare l'information que porte celui-ci au code du fabricant contenu dans une mémoire du système, accepte ou refuse l'information, mémorise celle-ci afin de ne pas permettre sa récupération, autorise la distribution de produits et recommence un cycle de travail. Il est à noter que l'information contient les données concernant la traçabilité du produit mais également celles concernant l'origine du réceptacle et sont apposées sur ce dernier par le fabricant au moment de la production de celui-ci.

L'identification est opérée, notamment sur une base magnétique portant les informations de traçabilité et d'origine, par un lecteur à tête magnétique tournante qui lit l'information et la transmet.

L'acceptation/refus sont déterminés par un microprocesseur qui, après avoir crypter les informations d'origine, compare celles-ci aux codes clés du fabricant afin de libérer/refuser la distribution de produits.

La mémorisation est fournie par le fabricant au moyen notamment de puces électroniques qui sont installées sur le dispositif.

En fin de séquence, un redémarrage du cycle est entamé par logiciel incorporé ce qui permet à l'utilisateur de ne pas devoir agir manuellement d'une part et garantit la mise en place automatique des fonctions susmentionnées d'autre part.

Dans une forme d'exécution, l'information sur le réceptacle est indiquée sous forme de code-barre U.V. situé notamment autour de la surface latérale extérieure du réceptacle. Dans ce cas le dispositif comporte avantageusement des moyens de lecture à tête laser tridimensionnels. Le code-barre U.V. est inscrit à l'aide d'encre incolore, visible seulement sous exposition de rayons ultra violets (U.V.).

Dans une autre forme d'exécution, le réceptacle est en matière amagnétique et l'information se trouve sur un ruban circulaire à l'intérieur dudit réceptacle.

Enfin, une autre variante de l'invention présente un réceptacle où le code magnétique est placé entre le couvercle et le corps du réceptacle. Dans ce cas l'information est stockée dans une bande magnétique souple en forme d'anneau.

L'invention sera mieux comprise grâce à la description détaillée qui va suivre en se référant aux dessins annexés dans lesquels :

- La figure 1 représente, à titre d'exemple, un schéma de principe d'un système permettant de déterminer la traçabilité d'un contenu dans un réceptacle et l'origine dudit réceptacle.

- La figure 2 représente schématiquement une vue en perspective d'une information en code-barre visible par exposition aux rayons U.V. et lisible par lecture laser.

- La figure 3 représente une vue en perspective de la disposition du marquage code-barre sur un réceptacle.

- La figure 4 représente, en variante, une vue en perspective d'une bande magnétique contenant les informations de traçabilité/origine perpendiculaire à son support et introduite dans son support.

- La figure 5 représente, en variante, une vue en perspective et partiellement en coupe d'un assemblage du support des informations dans la base duquel s'introduit une bande magnétique contenant les informations.

- La figure 6 représente, en variante, une vue en perspective d'une bande magnétique contenant les informations de traçabilité/origine perpendiculaire à son support et située à l'extérieur dudit support.

- La figure 7 représente une vue en perspective et en coupe d'un fil magnétique entourant la base du support et contenant les informations de traçabilité/origine.

Dans une forme d'exécution, illustrée aux figures 1, 2 et 3, un système permettant la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle comprend :

- un support (1),

- un microprocesseur (12),

- un module de distribution (18) de produits,
- un dispositif de lecture laser (9),
- un dispositif d'émission de rayons U.V. (10), et
- un réceptacle (3) comportant les informations (11) de traçabilité/origine.

Le support (1) est notamment une machine à café permettant l'injection de liquide dans le réceptacle (3).

Le microprocesseur (12) contrôle les fonctions suivantes et tel qu'illustré à la figure 1:

- L'identification (a) de la base portant les informations (11) de traçabilité/origine.
- Cryptage ou décryptage (b) des informations (11) situées sur le réceptacle (3).
- Analyse (c) des informations (11).
- Acceptation ou refus (d) des informations (11).
- Comparaison (e) des informations (11) situées sur le réceptacle (3) avec les données que contient le système.
- Approbation ou refus (f) de la distribution des produits (30, 31, 32).
- Stockage (g) des informations (11) après usage, notamment dans la mémoire.
- Redémarrage (h) automatique d'un cycle.

Le module de distribution de produits (18) comporte une électronique de commande des ouvertures notamment du liquide à injecter dans le réceptacle (3), des matières, telles que du sucre (31) et du lait (32), à insérer dans ledit

liquide aromatisé délivré par le réceptacle (3) et des dispositifs tels que des cuillères (30) permettant le brassage des matières au liquide et par simple numérotation de celle-ci, d'identifier le destinataire.

Le dispositif de lecture laser (9) est équipé notamment d'une tête de lecture (5 – Fig. 2) à travers laquelle les informations (11) sont distribuées au microprocesseur (12). La tête de lecture laser (5) est fixée au support (1) et située de manière à permettre la lecture des informations (11) sur un réceptacle (3) lorsque ce dernier est introduit dans le support (1).

Le réceptacle (3) comporte un support (13) de forme notamment cylindrique ou tronc conique sur lequel, dès son conditionnement, les informations (11) ont été apposées sur son pourtour, d'une base (14) circulaire qui permet de retenir la substance, notamment du café, devant être filtrée. Cette base (14) est perforable sous l'action de la pression du liquide de manière à laisser passer le liquide à filtrer et à aromatiser.

Les informations (11) se présentent sous forme de code-barre (23 – Fig. 2) invisible inscrit à l'aide d'une encre réactive à l'éclairage ultra-violet (U.V.). Le code-barre (23) est visible lorsqu'il est soumis à une source (6 – Fig. 2) de rayonnement ultra-violet (U.V.). Les informations (11) comportent toutes les indications relatives à la traçabilité du produit contenu dans le réceptacle (3) et à l'origine de ce dernier.

Le réceptacle (3), disposant du code-barre (23), est acheminé sous la tête de lecture laser (5). Le code-barre (23) est soumis au rayonnement U.V. émis par la source (6).

Les informations (11) sont lues et transmises au microprocesseur (12) qui déclenche, en cas de reconnaissance positive de celle-ci, les opérations susmentionnées et, en cas de reconnaissance négative, rejette lesdites informations (11) et arrête la procédure de déclenchement du module de distribution (18) pour interrompre la procédure de perçage de la partie supérieure du réceptacle (3) et d'extraction des produits (30, 31, 32).

Il est à noter que le microprocesseur (12) émet une clé, recalculée par algorithme, sous forme de chiffres et de lettres ce qui représente l'indication comparée aux données du fabricant. Toutes les clés, après traitement, sont mémorisées dans la mémoire interne du microprocesseur (12).

Une clé est attribuée avantageusement à un seul code-barre (23) ce qui permet d'utiliser le réceptacle (3) une seule fois. Un réceptacle (3) sans code-barre (23) est automatiquement rejeté de même qu'un code-barre (23) erroné et la réutilisation d'un code-barre (23) usagé sont rejetés par comparaison des clés.

Les figures 4 et 5 illustrent une forme d'exécution où le réceptacle (3) est en matière amagnétique et les informations (11) se trouvent sur un ruban notamment magnétique circulaire (20) à l'intérieur dudit réceptacle (3).

La figure 6 illustre une variante de l'invention qui présente un réceptacle (3) où les informations (11) sont placées entre un couvercle (17) perforable et la base (14) du réceptacle (3), sous la forme d'un anneau (15).

La figure 7 illustre une variante qui consiste à loger un fil métallique (8) dans la base (14) du réceptacle (3) de telle façon que les informations (11) soient enregistrées notamment sous forme magnétique.

REVENDICATIONS

1. Appareil permettant d'établir la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle (3) sur lequel figurent des informations (11) lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'œil nu, ledit réceptacle (3) étant du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle (3) et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle (3), l'appareil comprenant :

   - un lecteur (9) optique et/ou magnétique pour la lecture desdites informations (11) sur un réceptacle (3) introduit dans l'appareil,

   - un microprocesseur (12) permettant de crypter/décrypter, analyser, comparer, approuver/refuser et stocker des informations (11) lues sur un réceptacle (3), et agencé pour sélectivement démarrer ou non un cycle d'opérations comprenant le perçage de la partie supérieure du réceptacle (3) et l'injection du liquide, ainsi que pour le stockage des informations (11) lues afin d'être prêt pour démarrer un nouveau cycle.

2. Appareil selon la revendication 1 caractérisé en ce qu'il comporte un dispositif d'émission de rayons UV permettant la lecture d'un code-barre (23) invisible à l'œil nu situé sur le réceptacle (3).

3. Appareil selon la revendication 1 ou 2 caractérisé en ce qu'il comporte une tête de lecture magnétique qui lit les informations (11) magnétiques portées par le réceptacle (3).

4. Appareil selon l'une des revendications précédentes caractérisé en ce qu'il comporte un module (18) pour distribuer des produits, tels que du sucre (31) et du lait (32) et des dispositifs tels que des cuillères (30) permettant le brassage avec le liquide et permettant l'identification du destinataire, ceci conjointement avec la sortie du liquide aromatisé.

5. Appareil selon l'une des revendications précédentes caractérisé en ce qu'il comporte une tête de lecture laser (5) fixée au support (1).

6. Réceptacle du type comportant une partie supérieure perforable pour l'injection du liquide dans le réceptacle (3) et une membrane inférieure perforable sous pression pour la sortie dudit liquide aromatisé par le contenu du réceptacle (3), utilisable par l'appareil selon l'une quelconque des revendications précédentes caractérisé en ce qu'il comporte des informations (11) lisibles au moyen d'un lecteur optique et/ou magnétique mais invisibles à l'œil nu.

7. Réceptacle utilisable par l'appareil selon la revendication 6 caractérisé en ce qu'il est en matière amagnétique et les informations (11) se trouvent sur un ruban circulaire (20) à l'intérieur dudit réceptacle (3).

8. Réceptacle utilisable par l'appareil selon l'une des revendications 6 ou 7 caractérisé en ce qu'il dispose d'un code magnétique (15) placé entre son couvercle (17) et sa base (14).

9. Réceptacle utilisable par l'appareil selon l'une des revendications 6, 7 ou 8 caractérisé en ce que les informations (11) qu'il porte se présentent sous forme de code-barre (23) invisible inscrit à l'aide d'une encre réactive à l'éclairage ultra-violet (UV).

10. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 9 caractérisé en ce que les informations (11) qu'il porte comportent des indications relatives à la traçabilité.

11. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 10 caractérisé en ce que les informations (11) qu'il porte comportent des indications relatives à l'origine du réceptacle (3).

12. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 11 caractérisé en ce que les informations (11) qu'il porte sont stockées sur une bande magnétique (15) souple.

13. Réceptacle utilisable par l'appareil selon l'une des revendications 6 à 12 caractérisé en ce que les informations (11) qu'il porte sont stockées sur un anneau (8).

14. Système permettant d'établir la traçabilité d'un contenu dans un réceptacle (3) et l'origine dudit réceptacle (3), comportant un appareil selon l'une des revendications 1 à 5 et une pluralité de réceptacles selon l'une des revendications 6 à 13.

15. Procédé d'utilisation d'un appareil selon l'une des revendications 1 à 5 et/ou d'un réceptacle selon l'une des revendications 6 à 13 caractérisé en ce qu'il comporte les étapes suivantes :

- identification (a) de la base portant les informations (11) de traçabilité du contenu dans le réceptacle (3) et d'origine dudit réceptacle (3),
- cryptage/décryptage (b) des informations (11) situées sur le réceptacle (3),
- analyse (c) des informations (11),
- acceptation ou refus (d) des informations (11),
- comparaison (e) des informations (11) situées sur le réceptacle (3) avec les données qu'il contient,
- approbation/refus (f) du perçage de la partie supérieure du réceptacle (3) et l'injection du liquide, éventuellement aussi de la distribution des produits (30, 31, 32) conjointement avec la sortie du liquide aromatisé.
- stockage (g) des informations (11) dans la mémoire interne après usage,
- redémarrage (h) automatique d'un cycle.

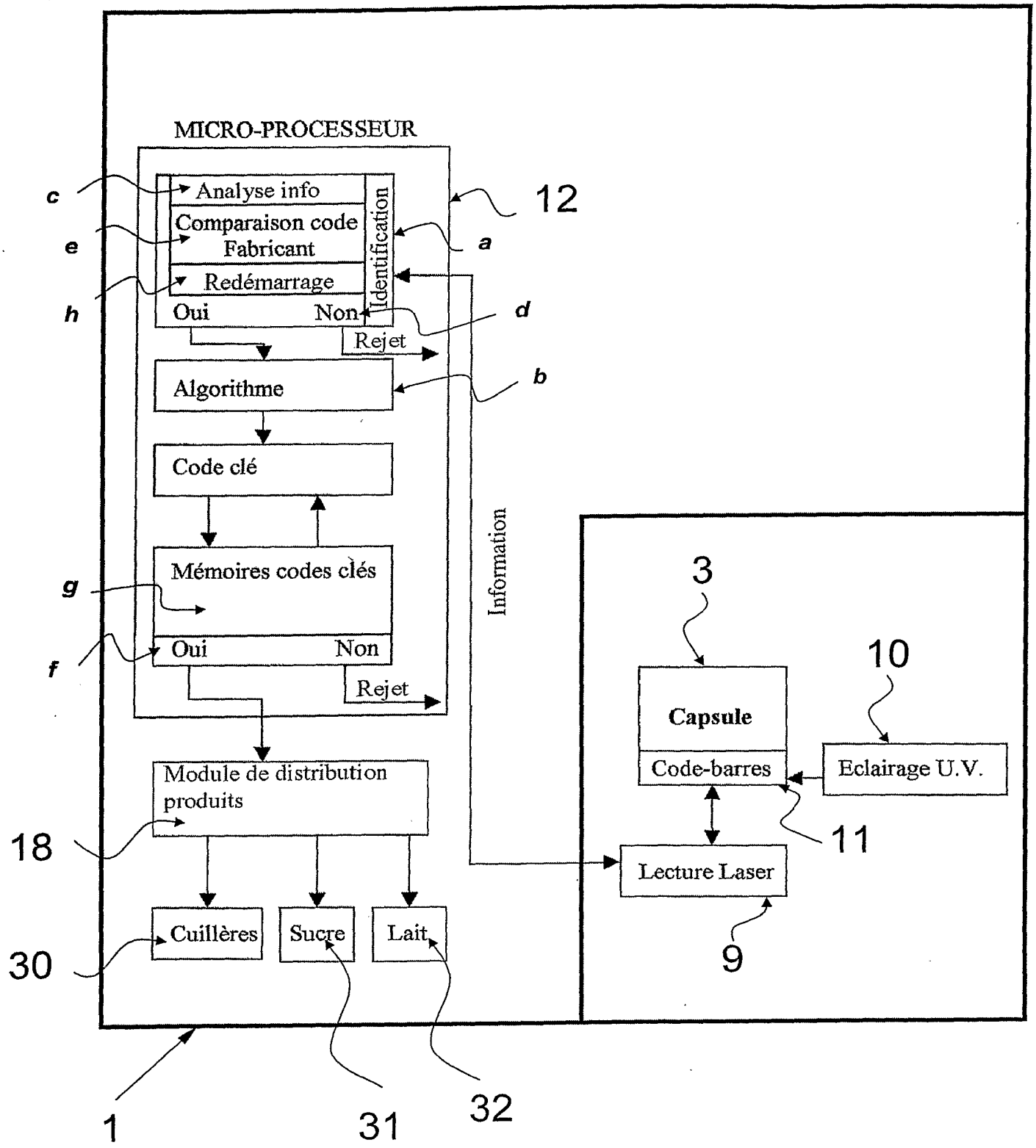

MICRO-PROCESSEUR
Analyse info
Comparaison code Fabricant
Redémarrage
Identification
Oui
Non
Rejet
Algorithme
Code clé
Mémoires codes clés
Oui
Non
Rejet
Module de distribution produits
Cuillères
Sucre
Lait
Information
Capsule
Code-barres
Eclairage U.V.
Lecture Laser
a
b
c
d
e
f
g
h
1
3
9
10
11
12
18
30
31
32

Fig. 1

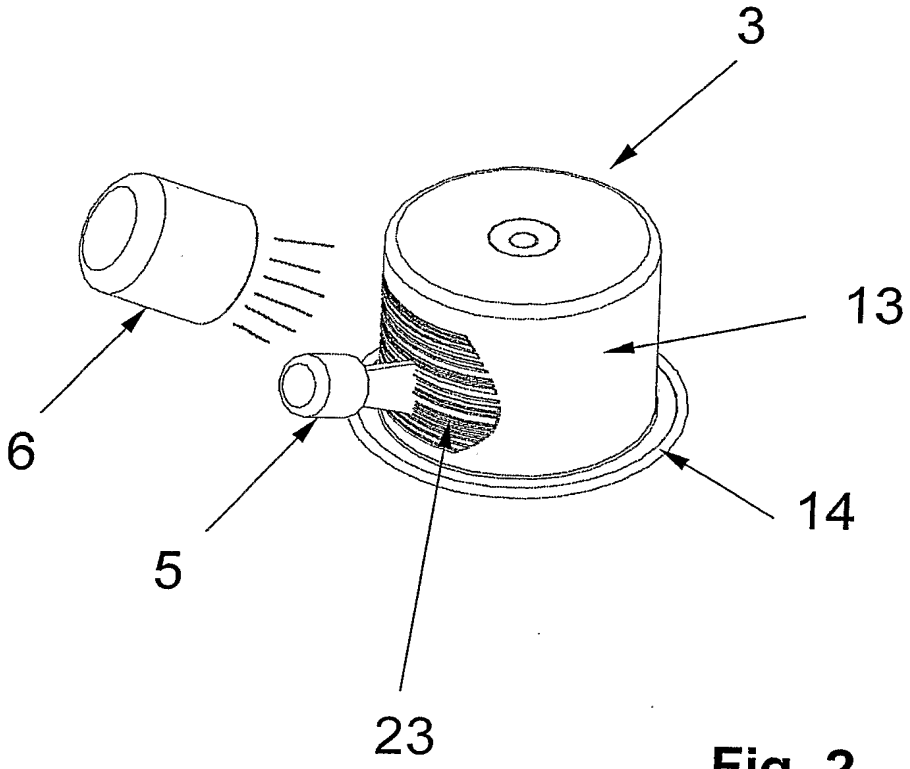


Fig. 2

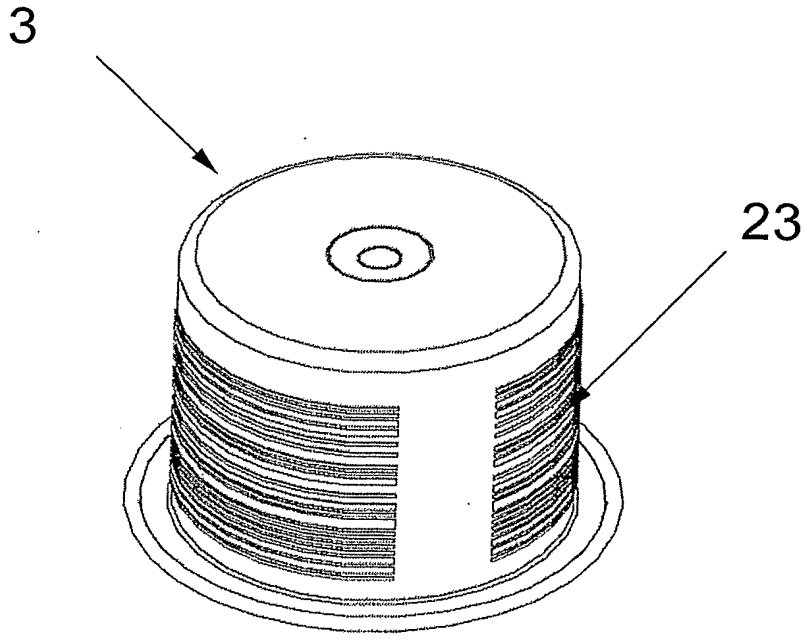


Fig. 3

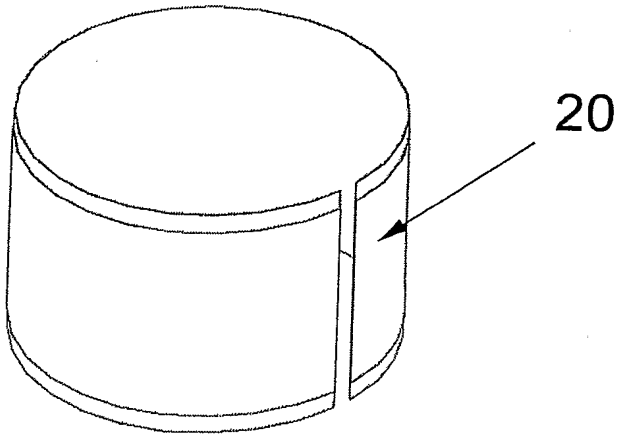


Fig. 4

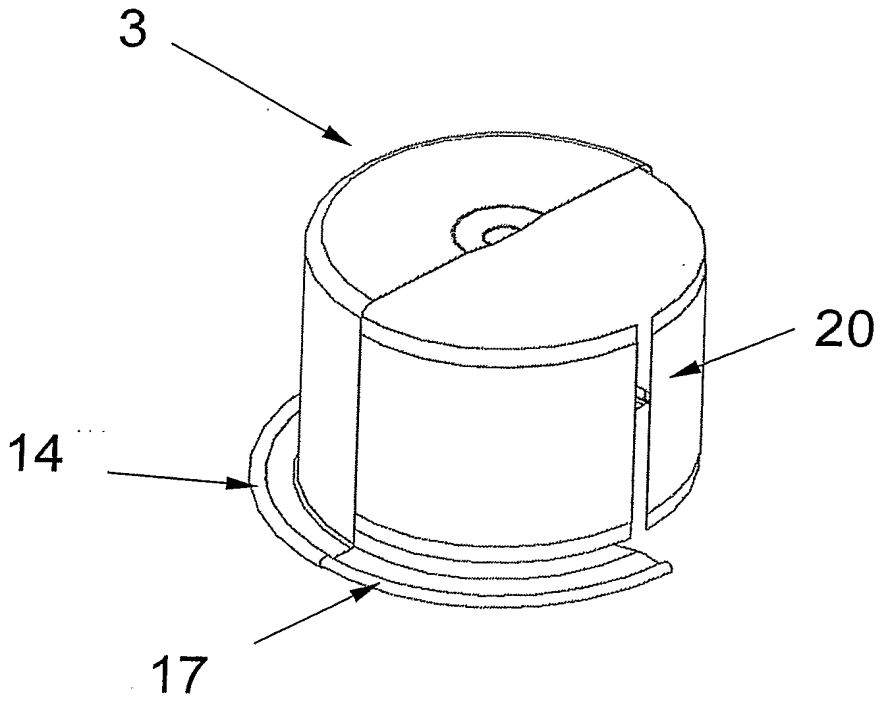


Fig. 5

K-FEE SYSTEM GMBH, EX2009, page 5147
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

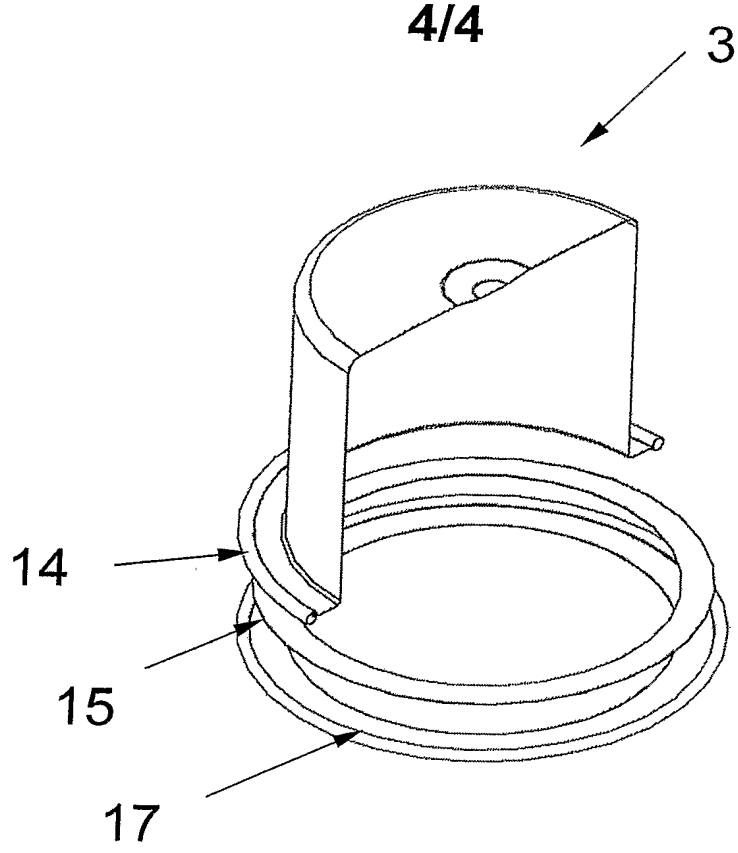


Fig. 6

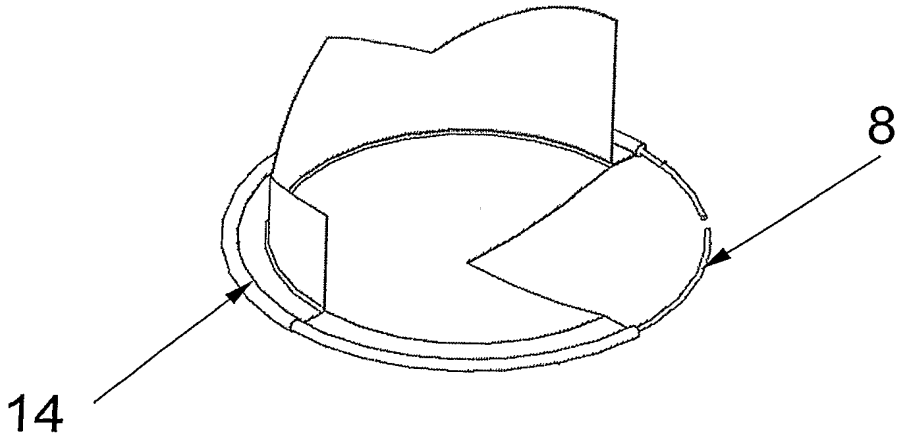


Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No
IB2004/003524

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47J31/40 B65D81/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47J B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/28241 A (BOYD COFFEE CO) 11 April 2002 (2002-04-11) page 5, paragraph 4 - page 11, paragraph 3 page 11, paragraph 3; figures claim 7	1,3,4,6, 8,10-15
A	WO 02/078498 A (EUGSTER FRISMAG AG ; MAHLICH GOTTHARD (DE)) 10 October 2002 (2002-10-10) cited in the application page 8, line 6 - page 10, line 9; figures	6-13
A	US 6 117 471 A (KING ALAN M) 12 September 2000 (2000-09-12) column 3, line 39 - column 5, line 23; figures	1,6,14, 15

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 January 2005	21/01/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Terlizzi, M

Form PCT/ISA/210 (second sheet) (January 2004)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 858 523 A (HELBLING EDWARD) 22 August 1989 (1989-08-22) column 10, lines 25-35; claims 11,12; figure 2	1,6

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

INTERNATIONAL SEARCH REPORT

International Application No
IB2004/003524

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0228241 A	11-04-2002	AU 1148902 A	15-04-2002
		WO 0228241 A1	11-04-2002
		US 2002048621 A1	25-04-2002
WO 02078498 A	10-10-2002	DE 10116239 A1	17-10-2002
		CA 2442389 A1	10-10-2002
		DE 20121494 U1	17-10-2002
		WO 02078498 A1	10-10-2002
		EP 1379153 A1	14-01-2004
		JP 2004525829 T	26-08-2004
		NO 20034325 A	05-11-2003
		US 2004089158 A1	13-05-2004
US 6117471 A	12-09-2000	US 5974950 A	02-11-1999
US 4858523 A	22-08-1989	US 4967648 A	06-11-1990
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		US 5158793 A	27-10-1992

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

RAPPORT DE RECHERCHE INTERNATIONALE

Demande Internationale No
IB2004/003524

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
CIB 7 A47J31/40 B65D81/00

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
CIB 7 A47J B65D

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si réalisable, termes de recherche utilisés)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie °	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
X	WO 02/28241 A (BOYD COFFEE CO) 11 avril 2002 (2002-04-11) page 5, alinéa 4 - page 11, alinéa 3 page 11, alinéa 3; figures revendication 7	1,3,4,6, 8,10-15
A	WO 02/078498 A (EUGSTER FRISMAG AG ; MAHLICH GOTTHARD (DE)) 10 octobre 2002 (2002-10-10) cité dans la demande page 8, ligne 6 - page 10, ligne 9; figures	6-13
A	US 6 117 471 A (KING ALAN M) 12 septembre 2000 (2000-09-12) colonne 3, ligne 39 - colonne 5, ligne 23; figures	1,6,14, 15

-/--

[X] Voir la suite du cadre C pour la fin de la liste des documents

[X] Les documents de familles de brevets sont indiqués en annexe

° Catégories spéciales de documents cités:

"A" document définissant l'état général de la technique, non considéré comme particulièrement pertinent

"E" document antérieur, mais publié à la date de dépôt international ou après cette date

"L" document pouvant jeter un doute sur une revendication de priorité ou cité pour déterminer la date de publication d'une autre citation ou pour une raison spéciale (telle qu'indiquée)

"O" document se référant à une divulgation orale, à un usage, à une exposition ou tous autres moyens

"P" document publié avant la date de dépôt international, mais postérieurement à la date de priorité revendiquée

"T" document ultérieur publié après la date de dépôt international ou la date de priorité et n'appartenenant pas à l'état de la technique pertinent, mais cité pour comprendre le principe ou la théorie constituant la base de l'invention

"X" document particulièrement pertinent; l'inven tion revendiquée ne peut être considérée comme nouvelle ou comme impliquant une activité inventive par rapport au document considéré isolément

"Y" document particulièrement pertinent; l'inven tion revendiquée ne peut être considérée comme impliquant une activité inventive lorsque le document est associé à un ou plusieurs autres documents de même nature, cette combinaison étant évidente pour une personne du métier

"&" document qui fait partie de la même famille de brevets

Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale
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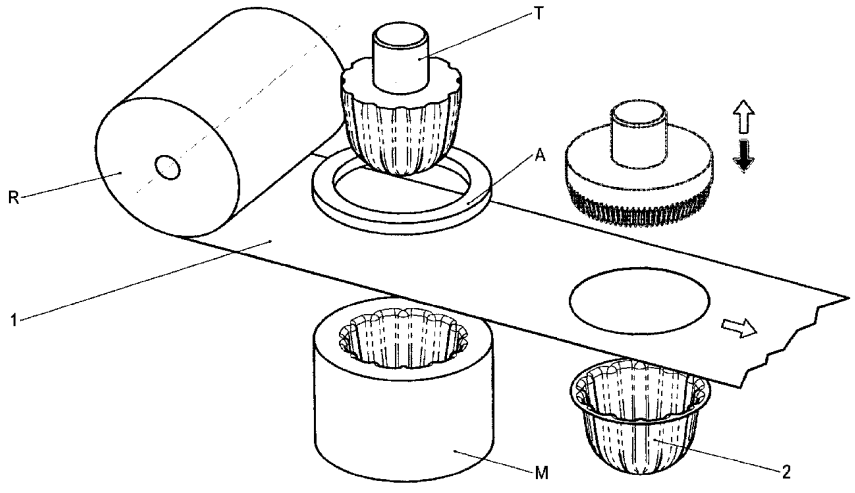


FIG. 5

(57) **Abstract**: Filtering and permeable container for substances (6) suitable for the preparation of beverages, the container being made by means of thermoforming starting from a flat strip (1) of permeable, filtering and thermoformable material, wherein the body (2) of the container comprises longitudinal stiffening ribs (4) wherein the length of the ribs (4) is variable along the surface of the body (2). The container can be adapted to contain water-soluble products or coffee, tea, herbal tea, or similar substances adapted to obtain hot or cold beverages.

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FILTERING AND PERMEABLE CONTAINER FOR SUBSTANCES SUITABLE FOR THE PREPARATION OF BEVERAGES

FIELD OF THE INVENTION

The present invention relates to the field of containers for substances suitable for the preparation of beverages. In particular, the present invention relates to the field of filtering and permeable containers for substances such as water-soluble substances, coffee, tea, herbal tea or the like.

STATE OF THE ART

Several kinds of bags or flexible pads are known in the art for obtaining beverages such as tea, herbal teas, coffee or similar beverages such as water-soluble substances based beverages.

These kinds of bags or pads are easily deformed so that the handling of same is complicated and particularly critical, especially in the case of filling and/or packaging machines working at high production rates.

In order to try to overcome these problems, capsule packages have been provided such as those described for example in EP 0 521 186 A1 and in US 2005/0051478 A1.

EP 0 521 186 A1 describes a capsule package containing roast and ground coffee for the preparation of a coffee beverage. The capsule package described in EP 0 521 186 A1 has body and membrane components. The body has a frusto conical shape with base portion capable of allowing flow of a coffee beverage therethrough, an annular sidewall portion which extends transversely from the base about a package body interior space and defines an opening which opposes the base portion, and a rim portion which extends about the opening and transversely from the sidewall portion in a direction away from the opening. The body and the membrane are made of a permeable flexible plastic material. The stability of the system described in EP 0 521 186 A1 is not optimized. In particular, the capsule packages according to EP 0 521 186 A1 are still easily deformed, especially when they are handled by filling and/or packaging machines working at very high production rates.

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US 2005/0051478 A1 describes a beverage filter cartridge having an impermeable cup-shaped out container internally subdivided by a generally cup-shaped filter element into a first chamber inside the filter and a second chamber located between the filter bottom and the container bottom. The upper rim of the filter is joined at a peripheral juncture to the container side wall, and the filter side wall has exterior channels that face the container side wall and lead downwardly from the peripheral juncture to the second chamber. In particular, the channels are provided by forming the filter side wall with a fluted configuration or by pleats in the filter side wall so that the channels increase in width from a minimum at the upper rim of the filter to a maximum at the filter bottom. The channels formed in the filter sidewall according to US 2005/0051478 A1 are not provided for improving the stability of the structure of the system especially for its handling in filling and/or packaging machines working at very high production rates. Accordingly, the structure of these channels is not optimized for the purpose of improving the stability of the structure but rather for encouraging through flow in upper regions of the filter wall. The cartridges described in US 2005/0051478 A1 still exhibit therefore a low stability and render the handling procedures in packaging and/or filling machines extremely industrious, time consuming and costly.

The present invention allows overcoming the problems and drawbacks of the systems known in the prior art. In particular, the present invention guarantees stability of the structure of filtering and permeable containers so that they can easily be handled in packaging and/or filling machines even when these machines operate at very high rates. Moreover, the present invention provides containers which are easily employed in automatic machines both for domestic and industrial use.

SUMMARY

The present invention relates to filtering and permeable containers for substances suitable for the preparation of beverages, such as water-soluble substances or coffee, tea, herbal tea or the like.

The present invention is based on the idea of providing the body of the container with longitudinal stiffening ribs wherein the length of the ribs is variable along the surface of the body. The presence of ribs having different lengths on the body of the container allows the optimization of the stability of the container. The modulation of the length of the ribs along the surface of the container allows improving the stability and rigidity of the system.

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According to an embodiment of the present invention, a filtering and permeable container for substances suitable for the preparation of beverages is provided, the container being made by means of thermoforming starting from a flat strip of permeable, filtering and thermoformable material, wherein the body of the container comprises longitudinal stiffening ribs, wherein the length of the ribs is variable along the surface of the body.

According to a further embodiment of the present invention, a container is provided, wherein long and short ribs are alternated along the surface of the body. The stability of the container is accordingly optimized by providing for example long ribs extending at least partially in the bottom region of the container alternated to short ribs extending only along the side region of the container.

According to a further embodiment of the present invention, a container is provided, wherein the depth of one or more of the ribs decreases toward the bottom of the container. In particular, since one or more of the ribs have a depth which is decreasing toward the bottom of the container, the stability and handling of the container are optimized.

According to a further embodiment of the present invention, a container is provided, wherein at least along a portion of one or more of the ribs, the width of the ribs decreases toward the bottom of the container, so that said one or more of the ribs have a pointed shape. In this way the stability of the container is further optimized. In particular, the side portion of the body is stiffened by the presence of the stiffening ribs and the bottom portion is minimally altered by the presence of those ribs having a pointed shape pointing toward the bottom of the container.

According to a further embodiment of the present invention, a container is provided, wherein the stiffening ribs increase the filtering surface of the body.

According to a further embodiment of the present invention, a container is provided, further comprising an upper annular rim adapted to stiffen the structure of the body.

According to a further embodiment of the present invention, a container is provided, wherein the rim is substantially flat and has a thickness substantially corresponding to the thickness of the flat strip.

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According to a further embodiment of the present invention, a container is provided, wherein the container is sealed by means of a filtering film after having been filled with a substance suitable for the preparation of beverages.

According to a further embodiment of the present invention, a container is provided, wherein the container is hermetically contained into a hermetic and impermeable capsule so as to guarantee the preservation of the organoleptic properties of the substances contained in the container.

According to a further embodiment of the present invention, a container is provided, wherein the container is adapted to be employed in automatic espresso machines. In particular, the container can be adapted to be employed for example for automatic domestic espresso machines or for industrial espresso machines.

According to a further embodiment of the present invention, a container is provided, wherein the container is adapted to be employed in moka pots. For example, the total height of the container can be adapted to insert the container in the basket of existing moka pots.

According to a further embodiment of the present invention, a container is provided, wherein the container further comprises a suspension wire comprising a label so that the container can be introduced into a pot containing boiling water, such as a tea pot or the like.

According to a further embodiment of the present invention, a container is provided, wherein the container further comprises a suspension tab, the suspension tab being adapted to support writings, signs or the like.

According to a further embodiment of the present invention, a method for the production of a filtering and permeable container for substances suitable for the preparation of beverages is provided, the container being made by means of thermoforming starting from a flat strip of permeable, filtering and thermoformable material, the method comprising the step of the formation of longitudinal stiffening ribs on the body of the container, wherein the length of the ribs is variable along the surface of the body.

According to a further embodiment of the present invention, a method for the production of a filtering and permeable container for substances suitable for the preparation of beverages is provided, wherein the formation of the body of the container is performed

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by means of a thermoforming punch and a matrix, the thermoforming punch comprising longitudinal ribs on its outer surface adapted to shape the longitudinal stiffening ribs of the body of the container, the matrix being adapted to house the thermoforming punch so as to form simultaneously the body and the stiffening ribs starting from the flat strip.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described with reference to the enclosed drawings wherein the same reference numbers refer to the same and/or similar parts of the system. In the drawings:

Figure 1 schematically displays the starting phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 2 schematically displays an operative phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 3 schematically displays a further operative phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 4 schematically displays a further operative phase of the thermoforming process for the formation of a container according to an embodiment of the present invention;

Figure 5 schematically displays a further operative phase of the process for the formation of a container according to an embodiment of the present invention wherein the formed container is cut from the strip of permeable, filtering and thermoformable material;

Figure 6 schematically displays a 3D view of the inner region of the container according to an embodiment of the present invention;

Figure 6bis schematically displays a 3D view of the outer region of the container shown in figure 6;

Figure 7 schematically displays a 3D view of the container according to an embodiment of the present invention filled with a substance suitable for the preparation of beverages;

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Figure 8 schematically displays a 3D view of the container shown in figure 7 sealed by means of a filtering film;

Figure 9 schematically displays a 3D view of the upper region of a container according to an embodiment of the present invention adapted to be employed in a moka pot and sealed by means of a filtering film;

Figure 10 schematically displays a 3D view of the bottom region of the container shown in figure 9;

Figure 11 schematically displays a 3D cut of the bottom region of the container shown in figures 9 and 10;

Figure 12 schematically displays a 3D exploded view of a moka pot employing a container according to an embodiment of the present invention;

Figure 13 schematically displays a vertical cross section of a moka pot employing a container according to an embodiment of the present invention;

Figure 14 schematically displays a 3D view of a hermetic and impermeable capsule containing the container according to an embodiment of the present invention;

Figure 15 schematically displays a 3D view of a cut of the hermetic and impermeable capsule shown in figure 14;

Figure 16 schematically displays a container comprising a suspension wire according to an embodiment of the present invention;

Figure 17 schematically displays a container comprising a suspension tab according to an embodiment of the present invention.

DETAILED DESCRIPTION

In the following, the present invention is described with reference to particular embodiments as shown in the enclosed drawings. Nevertheless, the present invention is not limited to the particular embodiments described in the following detailed description and shown in the figures, but, instead, the embodiments described simply exemplify several aspects of the present invention, the scope of which is defined by the appended claims.

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Further modifications and variations of the present invention will be clear for the person skilled in the art. Therefore, the present description has to be considered as including all the modifications and/or variations of the present invention, the scope of which is defined by the appended claims.

Figure 1 schematically displays the starting phase of the thermoforming process for the formation of a container according to an embodiment of the present invention. The figure displays a reel R of permeable, filtering and thermoformable material. A flat strip 1 of this material is unwound from the roll R. The system for forming the container comprises a thermoforming punch T, a stabilizing ring A and a matrix M.

The outer surface of the apex portion of the punch T comprises ribs adapted to form ribs in the body of the container as described in detail below. The matrix M is adapted to house the punch T. In particular, as can be seen in figure 1, the matrix M comprises an inner cavity with a lateral surface provided with grooves adapted to engage the ribs of the apex portion of the punch T.

As can be seen in figure 2, the stabilizing ring A is employed to press the strip 1 against the upper portion of the matrix M. Accordingly, by means of the stabilizing ring A, the strip 1 is safely kept in place for the formation of the container.

In figure 3, the punch T is lowered through the ring A into the matrix M so as to insert a portion of the strip 1 into the matrix M. The action of the thermoforming punch T in cooperation with the matrix M allows the formation of the body 2 of the container. In other words, both the bottom and the side portion of the container are simultaneously formed in this step. Moreover, since the punch T is provided with ribs and the matrix M is provided with corresponding grooves adapted to engage the ribs of the punch T, the body 2 is formed with stiffening ribs 4 with the optimized stiffening structure as described below. In particular, the body 2 and the stiffening ribs 4 are formed simultaneously.

Figure 4 displays the situation of the system when the punch T and the ring A are lifted. As can be seen, the body 2 of the container is formed with stiffening ribs 4 due to the combined action of the matrix M and of the punch T. Moreover, the region of the strip 1 located below the stabilizing ring A is not deformed. In particular, the portion of the strip 1 located below the stabilizing ring A is substantially flat and has substantially the same thickness as the strip 1.

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Figure 5 schematically displays a further operative phase of the process for the formation of the container wherein the formed body 2 is cut from the strip 1 of permeable, filtering and thermoformable material. In particular, a cutting tool is employed to detach the formed body 2 from the strip 1. By means of the cutting tool, in particular by properly choosing the diameter of the cutting tool or by selecting an appropriate line of cutting, the container is provided with an upper annular rim 3. Since the upper annular rim 3 corresponds to the region of the strip below the stabilizing ring A, the annular rim 3 is substantially flat and has a thickness substantially corresponding to the thickness of the strip 1.

Figures 6 and 6bis schematically display 3D views of the container according to an embodiment of the present invention. The container is provided with longitudinal stiffening ribs 4, and the length L of the stiffening ribs 4 is variable along the surface of the body 2 of the container. In particular, long and short ribs are alternated along the surface of the body 2. The long ribs extends toward the bottom region 5 of the container. In particular, the long ribs occupy a portion of the bottom region 5 of the container. The container has a cup-shaped bottom region 5. The long stiffening ribs occupy, therefore, a portion of the cup-shaped bottom region 5. Each short rib is placed between two long ribs and extends along the lateral region of the container. Accordingly, the stabilization of the structure is optimized and, at the same time, the filtering surface of the container is increased.

Further, as can be seen in figures 6 and 6bis, both the long and short stiffening ribs 4 have a depth which decreases toward the bottom of the container. In particular, the ribs 4 have maximum depth in correspondence to the upper annular rim 3 and minimum depth at their opposed end, i.e. toward the bottom region 5 of the container. This allows improving the stability of the container and, at the same time, increasing the filtering surface of the system. The varying depth of the ribs 4 allows to integrate them in the structure of the container so as to penetrate even in the bottom region of the container. In particular, since toward the bottom of the container the depth of the ribs 4 is minimal, the bottom region can be easily provided with the ribs 4.

Moreover, as can be seen in figures 6 and 6bis, the width of the ribs decreases toward the bottom 5 of the container so that the ribs 4 have a pointed shape. In particular, the pointed end of the ribs 4 points toward the bottom region 5 of the container. This allows inserting a large number of stiffening ribs 4 even if the container is cup-shaped as

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shown in figures 6 and 6bis. In particular, even the narrow bottom region 5 of the cup shaped container can be provided with ribs 4 because the width of the ribs 4 is reduced in this region with respect to the width of the ribs 4 in their upper portion.

As can be further seen in figures 6 and 6bis, the container is provided with an upper annular rim 3 adapted to further stiffen the structure of the body of the container. The annular rim 3 is substantially flat and has substantially the same thickness as the flat strip 1 of permeable, filtering and thermoformable material.

The annular rim 3 and the stiffening ribs 4 guarantee the rigidity of the body 2 of the container so that it can be easily and quickly handled even at very high automated filling and/or production speeds.

Figure 7 schematically displays a 3D view of the container according to an embodiment of the present invention filled with a substance suitable for the preparation of beverages. The substance can be suitable for the preparation of hot or cold beverages. Examples of such substances are water-soluble substances such as milk powder or tea powder for ice tea. Further examples of such substances are infusion substances such as tea or herbal tea. Further examples of such substances are granular substances such as ground coffee or the like.

Figure 8 schematically displays a 3D view of the container shown in figure 7 sealed by means of a filtering film 1'. The filtering film 1' is permeable. Moreover, the filtering film 1' is sealed to the upper annular rim 3 of the container.

Figure 9 schematically displays a 3D view of the upper region of a container 2A according to an embodiment of the present invention adapted to be employed in a moka pot and sealed by means of a filtering film. Figure 10 schematically displays a 3D view of the bottom region of the container 2A shown in figure 9. Figure 11 schematically displays a 3D cut of the bottom region of the container shown in figure 9.

The height of the container shown in figures 9, 10 and 11 is lower than the height of the container shown in figures 6 and 6bis. In particular, the height of the container shown in figures 9, 10 and 11 is adapted to employ the container in the basket of existing moka pots.

As can be seen in figure 10, the alternate length of the stiffening ribs 4 is particularly advantageous in the present case. In particular, in the present case, the container 2A

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has substantially a cylindrical shape with a substantially flat bottom. The short ribs run only along the side wall of the container 2A. In particular, the short ribs run along the entire height of the side wall of the container 2A. The long ribs extend beyond the side wall of the container 2A in the bottom portion of same so as to meet substantially at the centre of the bottom portion of the container 2A. In particular, the pointed endings of the long ribs point toward the centre of the bottom portion of the container 2A. Moreover, the depth of the long ribs decreases toward the centre of the bottom 5 of the container 2A so as to maintain the stability of the central portion. The short ribs have substantially constant depth along their entire length. Moreover, the short ribs have substantially constant width along their entire length and do not exhibit pointed endings.

Figure 12 schematically displays a 3D exploded view of a moka pot employing a container 2A according to an embodiment of the present invention, and figure 13 schematically displays a vertical cross section of the system. As can be seen in the figures, the container 2A is fitted into the basket of the moka pot. Moreover, the moka pot is a traditional existing moka pot, and no modifications are necessary for employing the container 2A according to an embodiment of the present invention.

Figure 14 schematically displays a 3D view of a hermetic and impermeable capsule 10 containing the container according to an embodiment of the present invention. Figure 15 schematically displays a 3D view of a cut of the system shown in figure 14. The container is hermetically contained into the hermetic and impermeable capsule 10 so as to guarantee the preservation of the organoleptic properties of the substances 6 contained in the container.

Figure 16 schematically displays a container 2 comprising a suspension wire 7 according to an embodiment of the present invention. The suspension wire 7 is provided with a label 8. Accordingly, the container according to this embodiment of the present invention can be employed in a similar way to common tea bags. In particular, the container 2 can be easily inserted into pots containing boiling water, such as tea pots or the like. According to the present invention, also the container 2A having reduced height and substantially cylindrical shape can be provided with a suspension wire.

Figure 17 schematically displays a container 2 comprising a suspension tab 9 according to an embodiment of the present invention. The suspension tab 9 is adapted to support

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writings, signs or the like. The suspension tab 9 is formed as an extension of the filtering film 1' sealing the container 2. According to the present invention, also the container 2A having reduced height and substantially cylindrical shape can be provided with a suspension tab.

While the invention has been described with respect to the preferred physical embodiments constructed in accordance therewith, it will be apparent to those skilled in the art that various modifications, variations and improvements of the present invention may be made in the light of the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

For instance, several kinds of materials can be employed for realizing the containers according to the present invention. Moreover, the containers according to the present invention can have several dimensions. For example, the containers can be adapted to be employed for domestic machines such as moka pots or automatic espresso machines. Alternatively, the containers can be adapted to be employed for industrial machines.

In addition, those areas in which it is believed that those of ordinary skill in the art are familiar have not been described herein in order not to unnecessarily obscure the invention described. Accordingly, it has to be understood that the invention is not to be limited by the specific illustrative embodiments, but only by the scope of the appended claims.

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CLAIMS

1. Filtering and permeable container for substances (6) suitable for the preparation of beverages, said container being made by means of thermoforming starting from a flat strip (1) of permeable, filtering and thermoformable material,

characterized in that:

the body (2) of said container comprises longitudinal stiffening ribs (4), wherein the length of said ribs (4) is variable along the surface of said body (2).

2. Container according to claim 1, wherein long and short ribs (4) are alternated along the surface of said body (2).

3. Container according to one of claims 1 or 2, wherein the depth of one or more of said ribs (4) decreases toward the bottom (5) of said container.

4. Container according to one of claims 1 to 3, wherein at least along a portion of one or more of said ribs (4), the width of said ribs (4) decreases toward the bottom (5) of said container, so that said one or more of said ribs (4) have a pointed shape.

5. Container according to one of claims 1 to 4, wherein said stiffening ribs (4) increase the filtering surface of said body (2).

6. Container according to one of claims 1 to 5, further comprising an upper annular rim (3) adapted to stiffen the structure of said body (2).

7. Container according to claim 6, wherein said rim (3) is substantially flat and has a thickness substantially corresponding to the thickness of said flat strip (1).

8. Container according to one of claims 1 to 7, wherein said container is sealed by means of a filtering film (1') after having been filled with a substance (6) suitable for the preparation of beverages.

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9. Container according to one of claims 1 to 8, wherein said container is hermetically contained into a hermetic and impermeable capsule (10) so as to guarantee the preservation of the organoleptic properties of the substances (6) contained in said container.

10. Container according to one of claims 1 to 9, wherein said container is adapted to be employed in automatic espresso machines.

11. Container according to one of claims 1 to 10, wherein said container is adapted to be employed in moka pots.

12. Container according to one of claims 1 to 11, wherein said container further comprises a suspension wire (7) comprising a label (8) so that said container can be introduced into a pot containing boiling water, such as a tea pot or the like.

13. Container according to one of claims 1 to 11, wherein said container further comprises a suspension tab (9), said suspension tab (9) being adapted to support writings, signs or the like.

14. Method for the production of a filtering and permeable container for substances (6) suitable for the preparation of beverages, said container being made by means of thermoforming starting from a flat strip (1) of permeable, filtering and thermoformable material, said method comprising the following steps:

formation of longitudinal stiffening ribs (4) on the body (2) of said container, wherein the length of said ribs (4) is variable along the surface of said body (2).

15. Method according to claim 14, wherein the formation of the body (2) of said container is performed by means of a thermoforming punch (T) and a matrix (M), said thermoforming punch (T) comprising longitudinal ribs on its outer surface adapted to shape said longitudinal stiffening ribs (4), said matrix (M) being adapted to house said thermoforming punch (T) so as to form simultaneously said body (2) and said stiffening ribs (4) starting from said flat strip (1).

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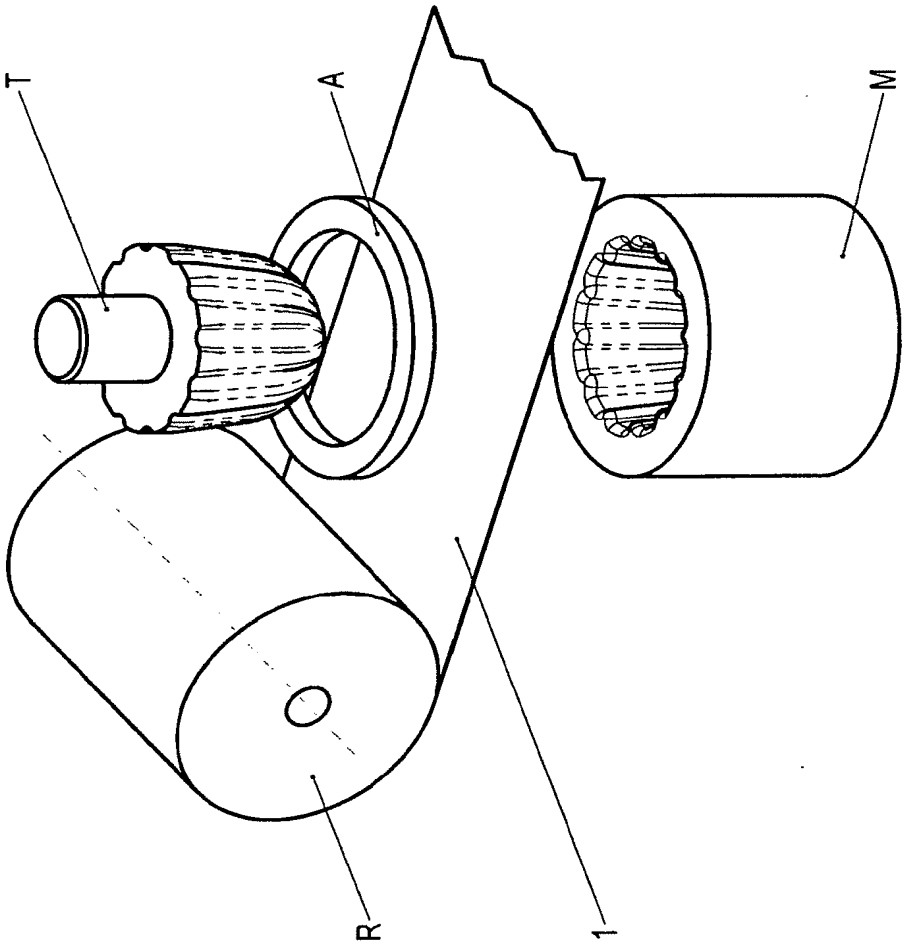


FIG. 1

K-FEE SYSTEM GMBH, EX2009, page 5169
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

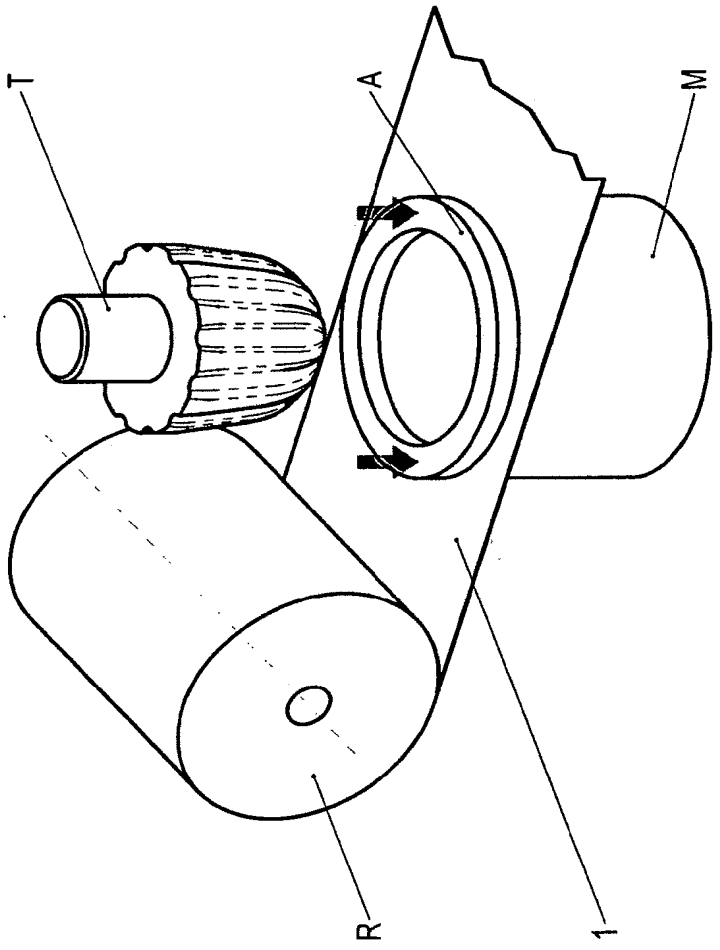


FIG. 2

K-FEE SYSTEM GMBH, EX2009, page 5170
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

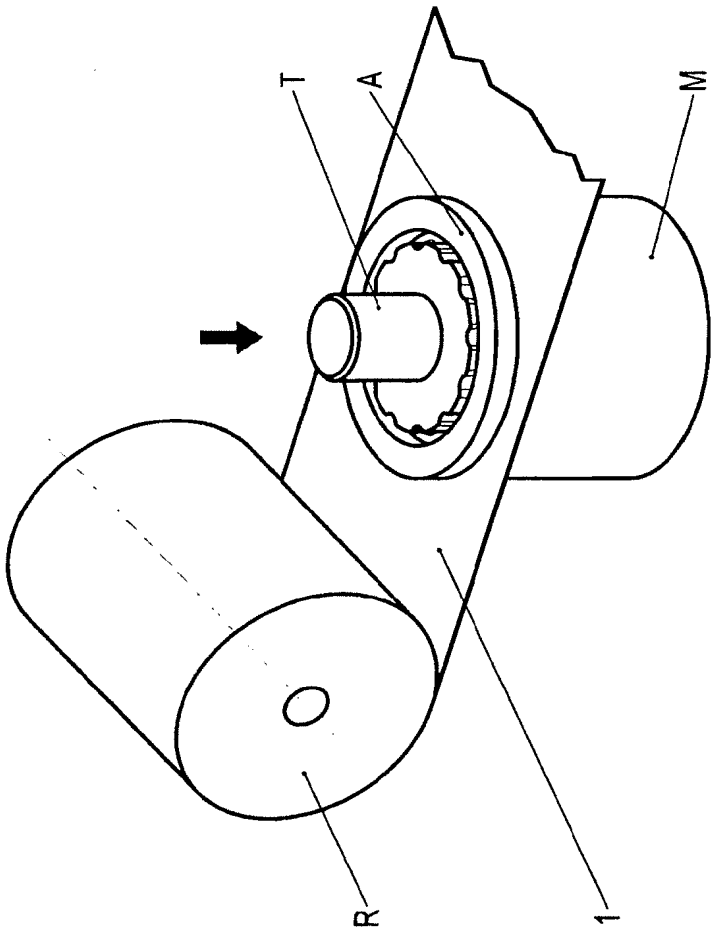


FIG. 3

K-FEE SYSTEM GMBH, EX2009, page 5171
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

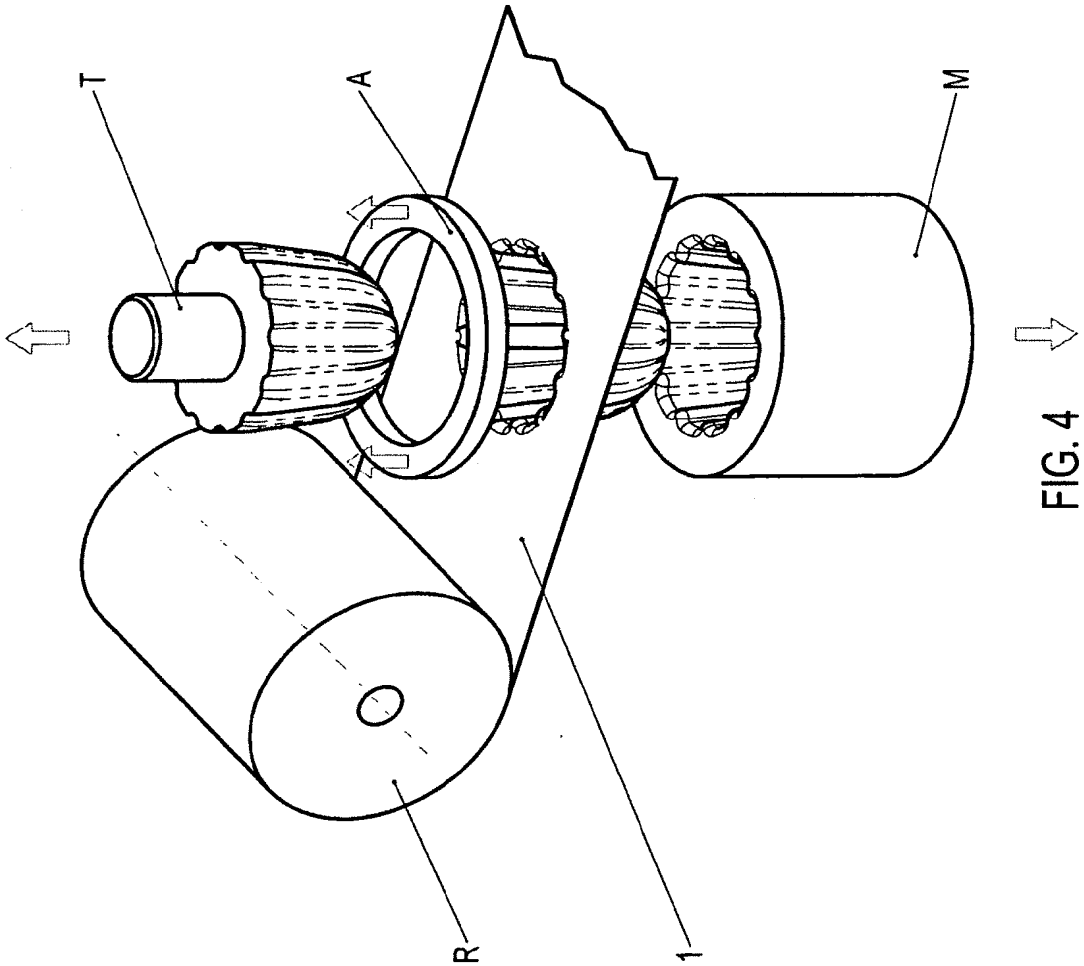


FIG. 4

K-FEE SYSTEM GMBH, EX2009, page 5172
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

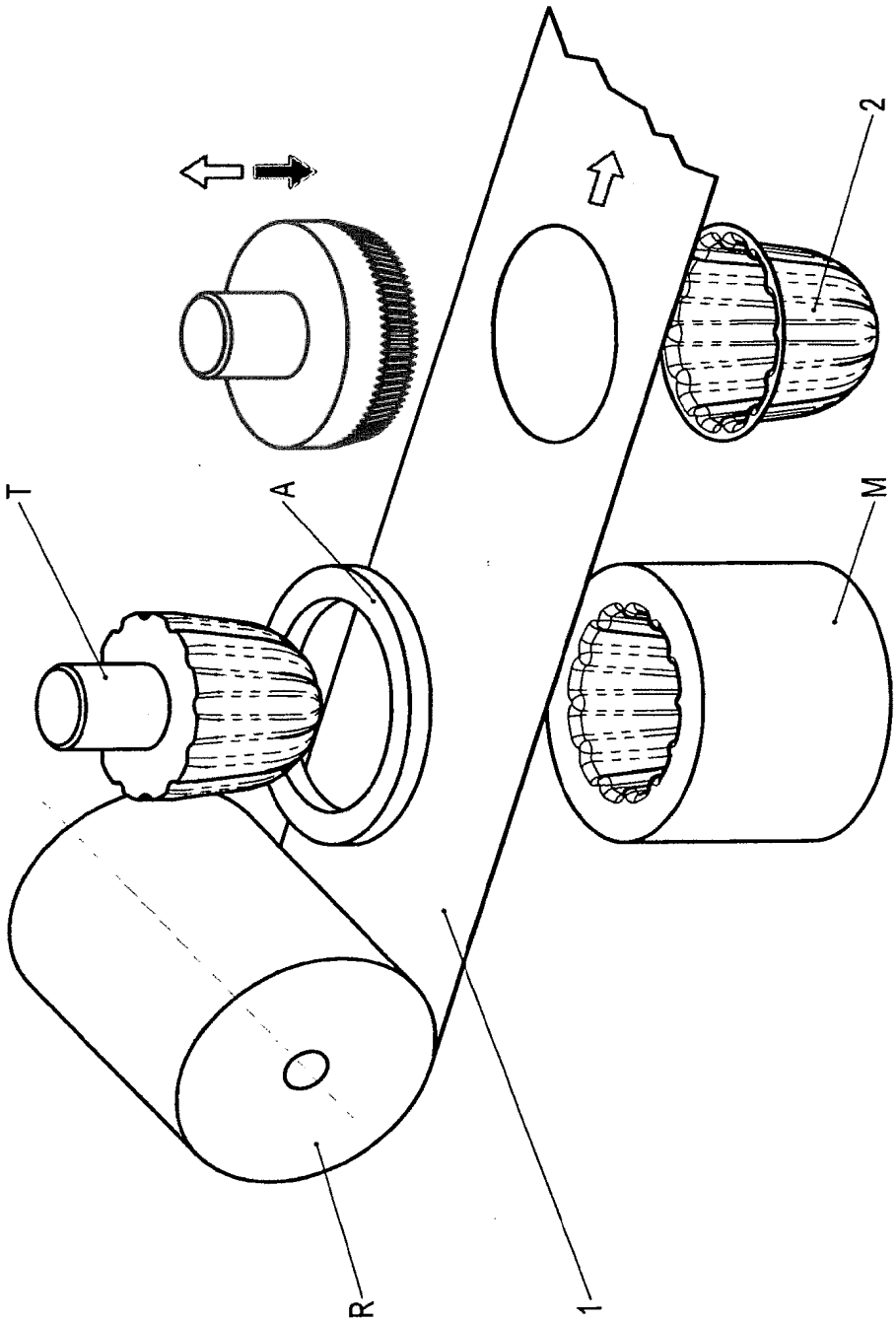


FIG. 5

K-FEE SYSTEM GMBH, EX2009, page 5173
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

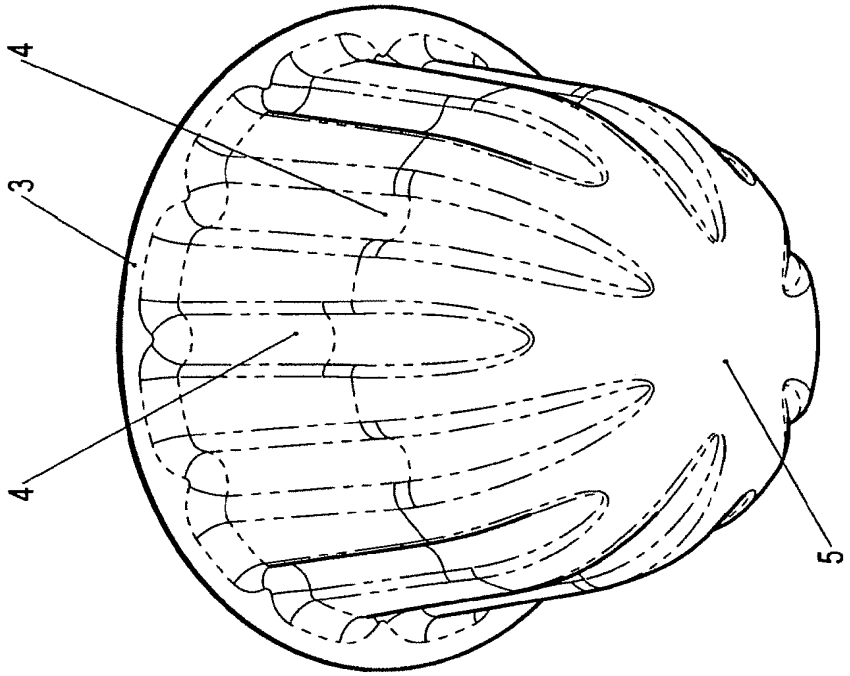


FIG. 6 bis

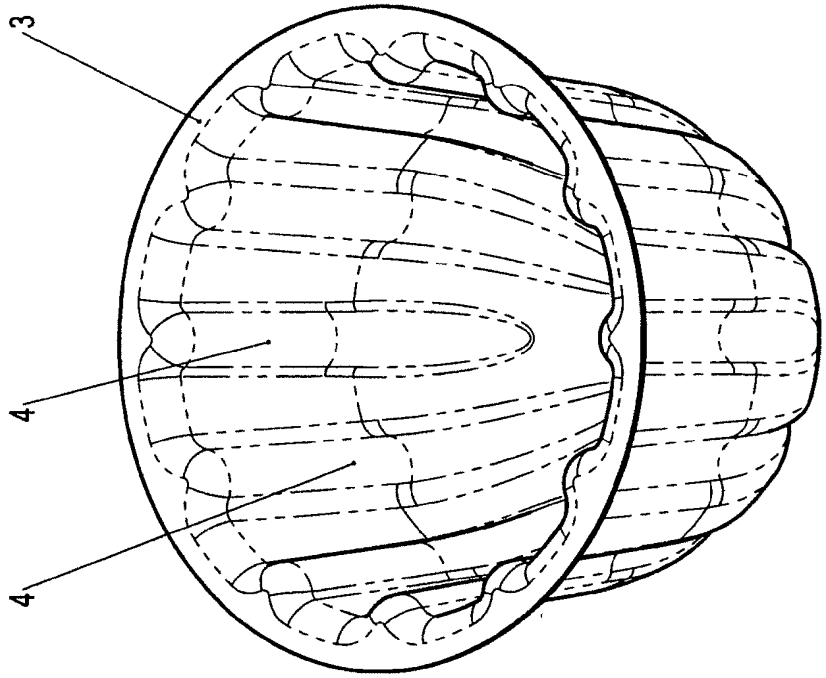


FIG. 6

K-FEE SYSTEM GMBH, EX2009, page 5174
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

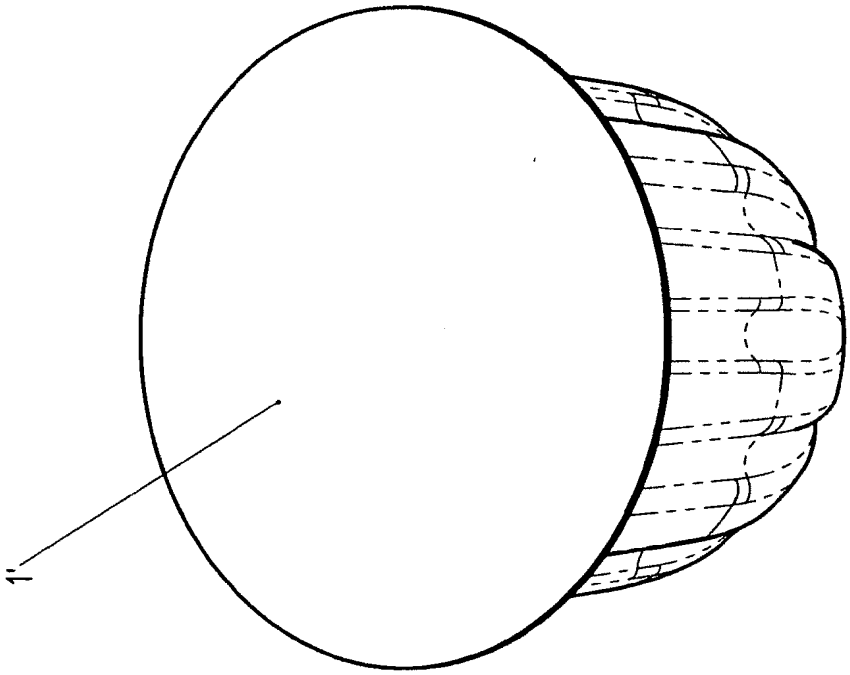


FIG. 8

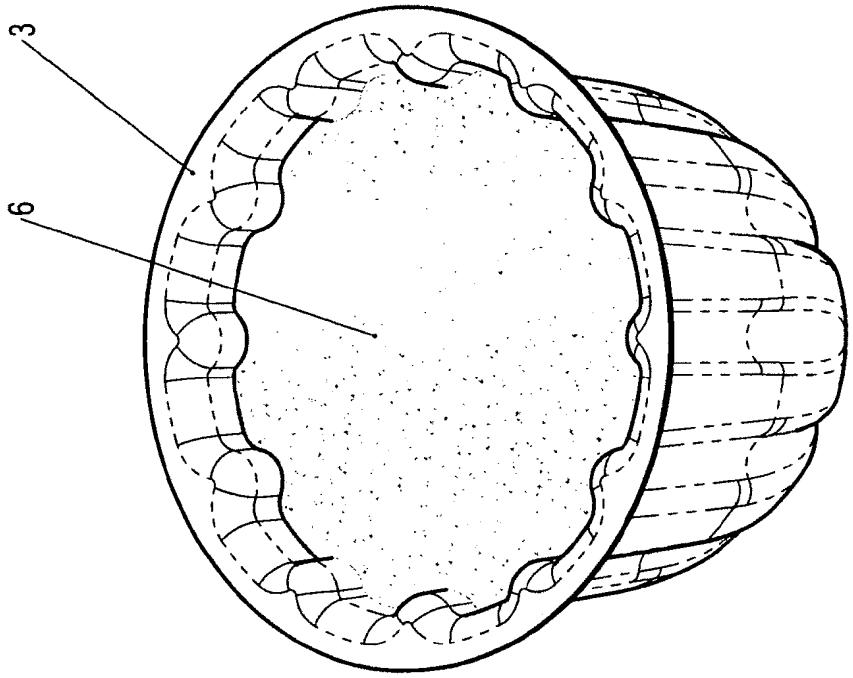


FIG. 7

K-FEE SYSTEM GMBH, EX2009, page 5175
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

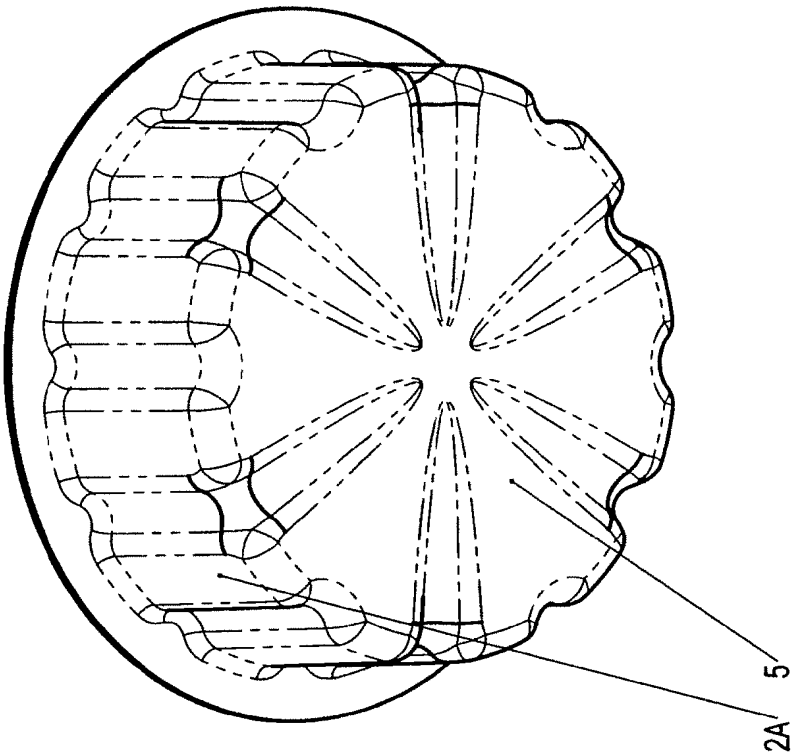


FIG. 10

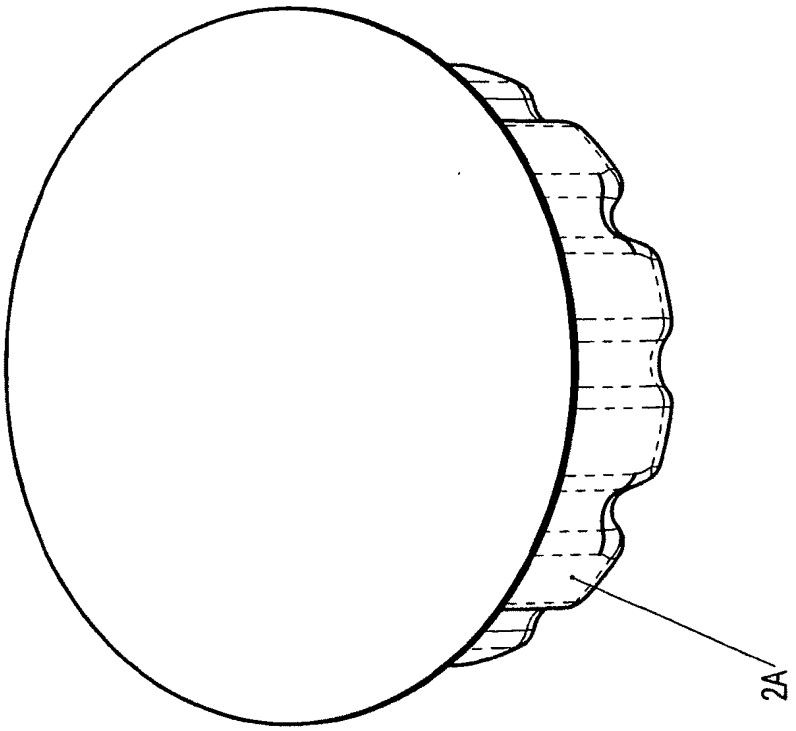


FIG. 9

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

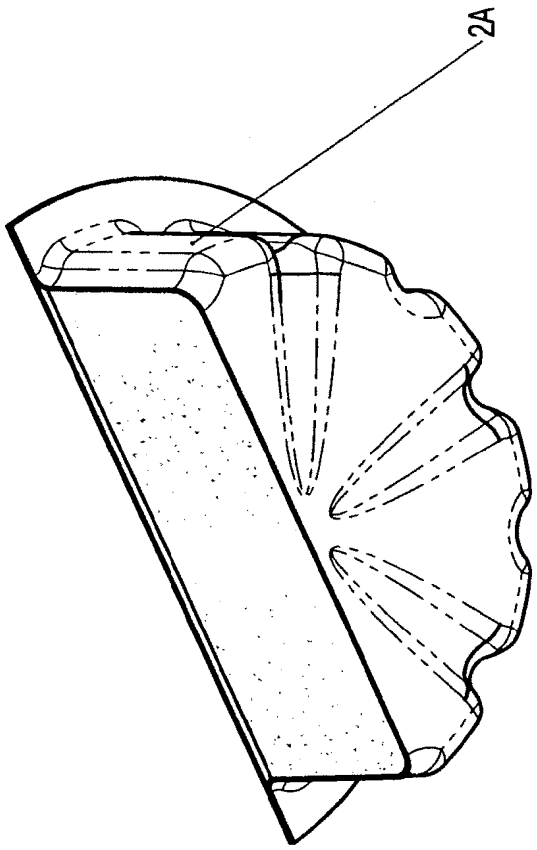
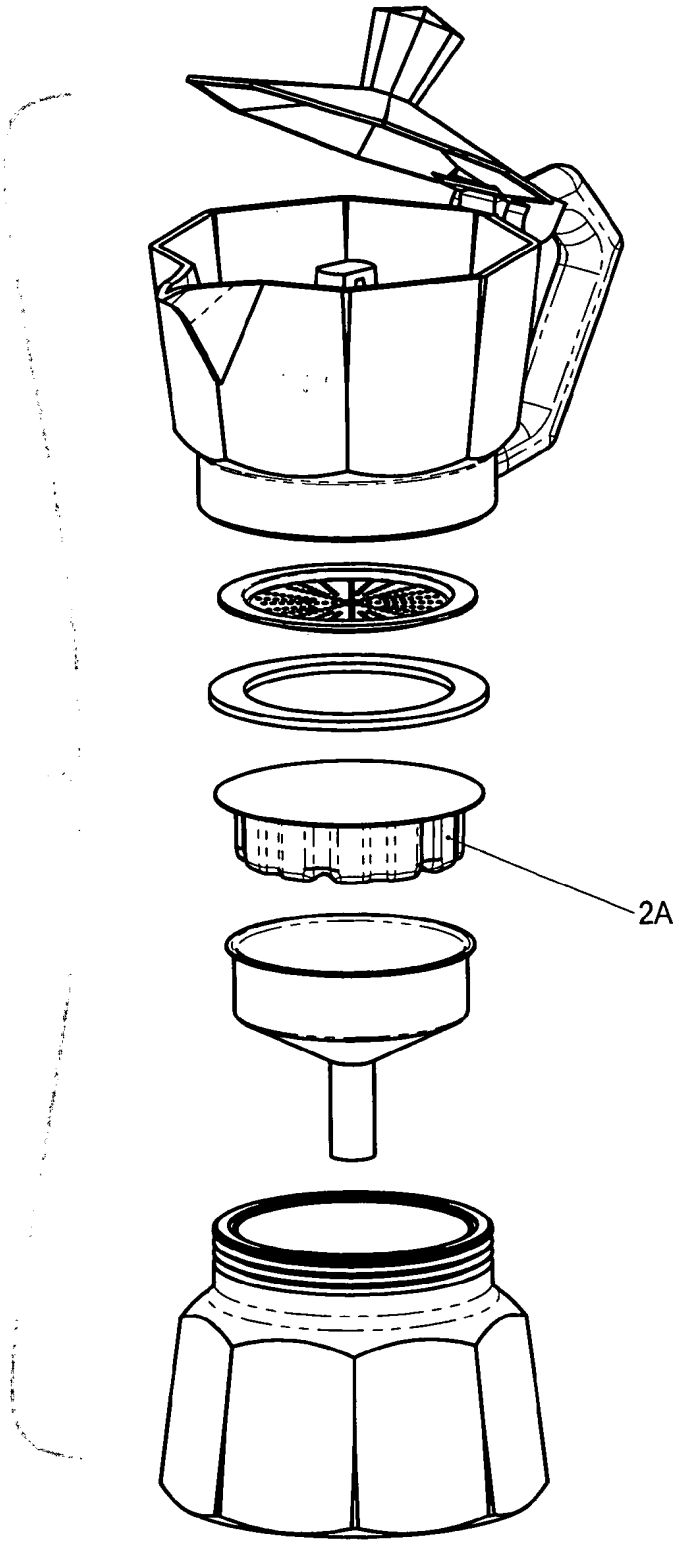


FIG. 11

K-FEE SYSTEM GMBH, EX2009, page 5177
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FIG. 12



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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

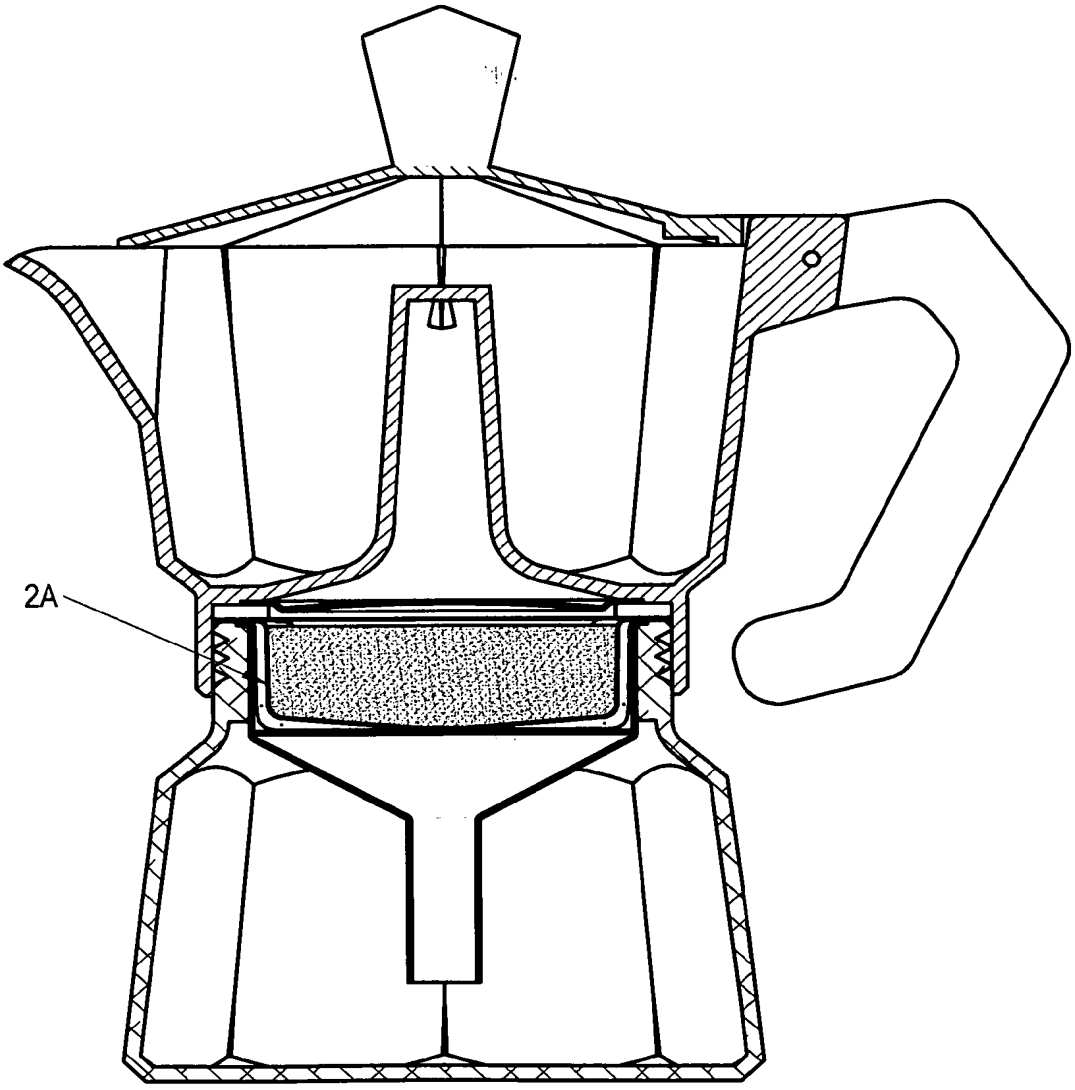


FIG. 13

K-FEE SYSTEM GMBH, EX2009, page 5179
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

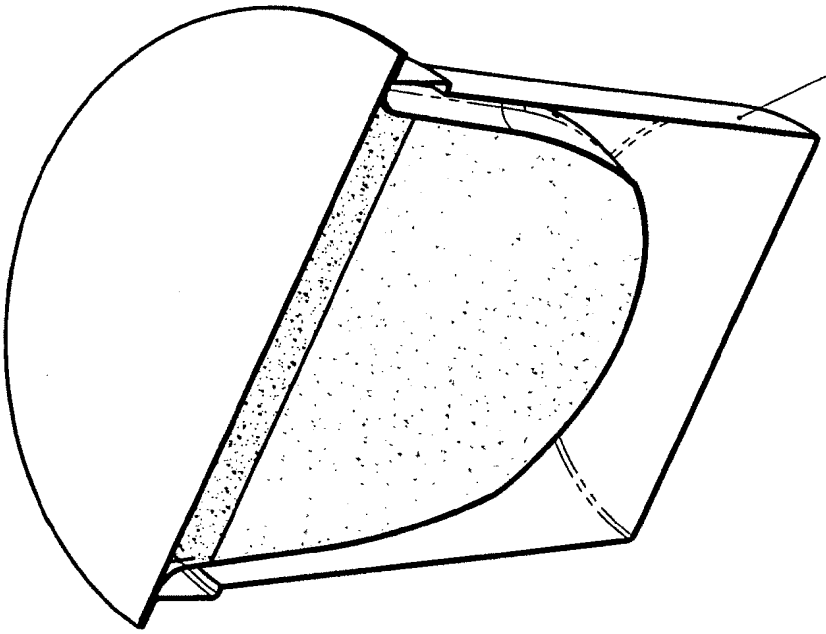


FIG. 15

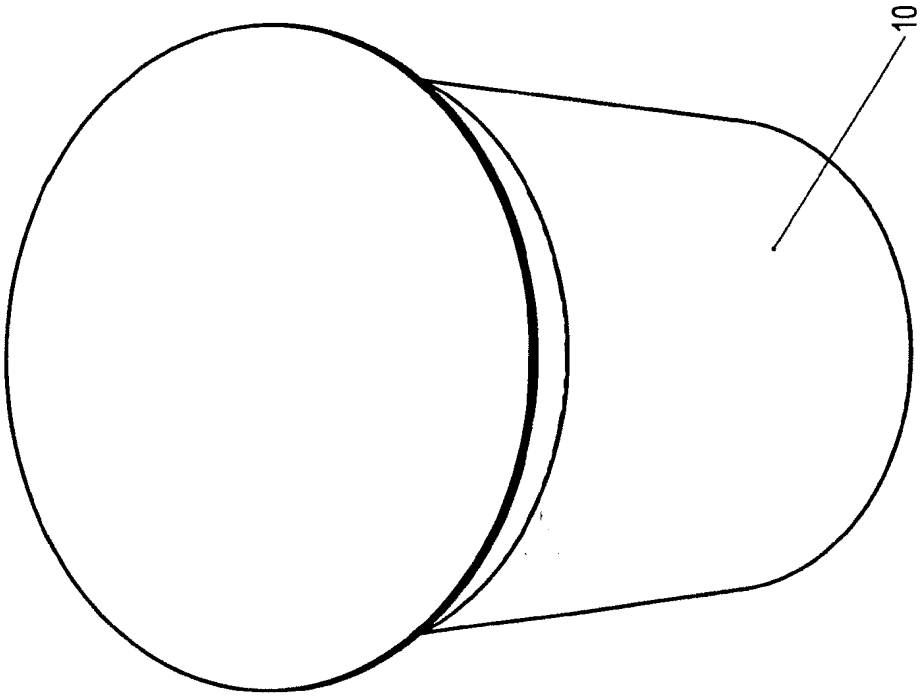


FIG. 14

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

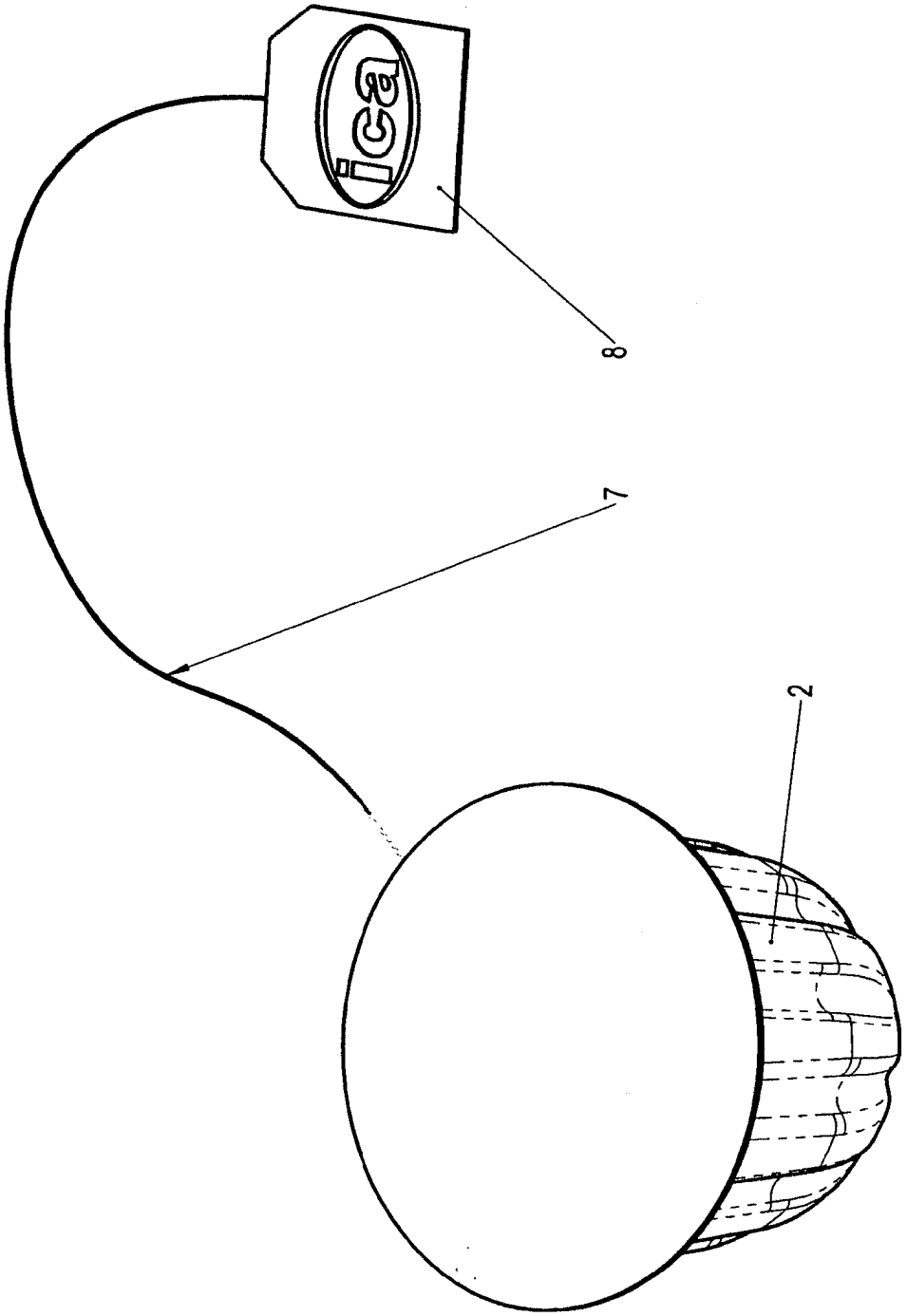


FIG. 16

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

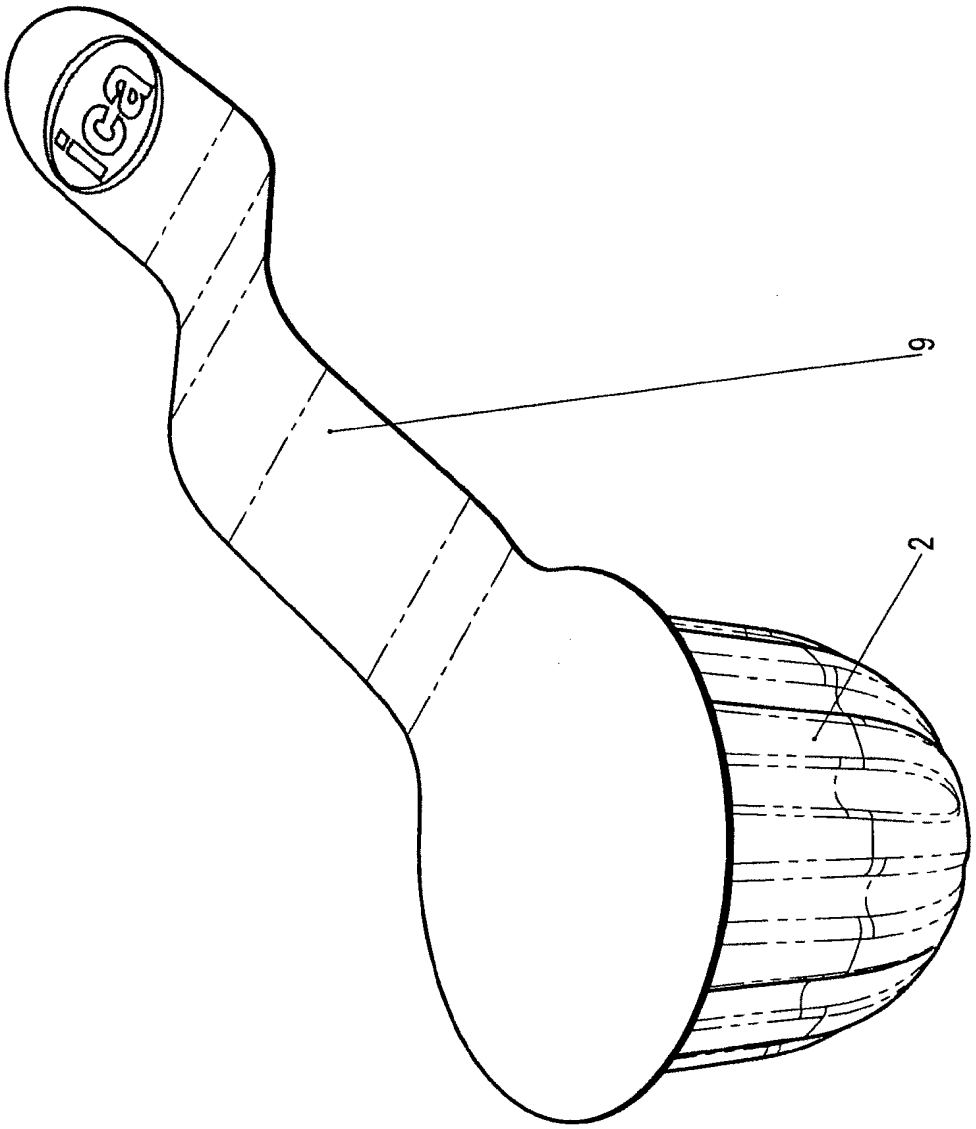


FIG. 17

K-FEE SYSTEM GMBH, EX2009, page 5182
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/006389

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D85/804 B65D85/808 B65D85/812
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 521 186 A1 (NESTLE SA [CH]) 7 January 1993 (1993-01-07) column 2, line 20 - line 31 column 3, line 7 - column 4, line 51 column 5, line 11 - line 18; claim 1; figures	1,8,10, 11,14,15
A	EP 0 631 948 A1 (JACOBS SUCHARD AG [CH]) 4 January 1995 (1995-01-04) column 5, line 16 - column 7, line 31; figures	15
A	US 2005/051478 A1 (KARANIKOS BASIL [US] ET AL) 10 March 2005 (2005-03-10) page 1, paragraph 17 - page 2, paragraph 22; figures 1-4	1,3-5, 10,14

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2010	28/12/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Newell, Philip

Form PCT/ISA/210 (second sheet) (April 2005)

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IPR2023-00502, U.S. PATENT 10,994,923

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/006389

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 253 246 A2 (WOLTERMANN ERICH H) 20 January 1988 (1988-01-20) column 3, line 46 - column 4, line 8; figures	1,6,7,9, 10
A	GB 881 784 A (JOHN HENRIK GUY WELIN BERGER) 8 November 1961 (1961-11-08) page 1, line 67 - page 2, line 15; figures	12
A	EP 0 158 511 A2 (GEN FOODS LTD [GB]) 16 October 1985 (1985-10-16) page 2, line 13 - line 25 claims 1,3-9,16; figures	13

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

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IPR2023-00502, U.S. PATENT 10,994,923

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/006389

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0521186 A1	07-01-1993	AT 114576 T	15-12-1994
		AU 658192 B2	06-04-1995
		BR 9202611 A	16-03-1993
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		JP 60251054 A	11-12-1985

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IPR2023-00502, U.S. PATENT 10,994,923

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	13/697,297	Filing Date	2012-11-09	Docket Number (if applicable)	3712036-01693	Art Unit	1792
First Named Inventor	Jarisch et al.			Examiner Name	Long, Luana Zhang		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☐ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 021818

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Aaron J. Morrow/	Date (YYYY-MM-DD)	2020-06-18
Name	Aaron J. Morrow	Registration Number	55819

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Electronic Acknowledgement Receipt

EFS ID:	39823527
Application Number:	13697297
International Application Number:	
Confirmation Number:	1065
Title of Invention:	CAPSULE, SYSTEM AND METHOD FOR PREPARING A BEVERAGE BY CENTRIFUGATION
First Named Inventor/Applicant Name:	Christian Jarisch
Customer Number:	29157
Filer:	Aaron J. Morrow/US Patent Mail
Filer Authorized By:	Aaron J. Morrow
Attorney Docket Number:	3712036-01693
Receipt Date:	25-JUN-2020
Filing Date:	09-NOV-2012
Time Stamp:	13:07:29
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	NPL5.pdf	513486 324ede6c1944440c72a511a4e0a471d4f0f257cb	no	6

Warnings:

Information:					
2	Non Patent Literature	NPL6.pdf	652658 b11ead24d93a353cf3478aa40bd84fc3bc6acecb	no	4
Warnings:					
Information:					
3	Non Patent Literature	NPL7.pdf	4554796 6d9f847f5920acf34a992efceb3862e19056e7d7	no	77
Warnings:					
Information:					
4	Non Patent Literature	NPL8.pdf	182790 9a0496d6c41bffe224be82340406486abb9255ab	no	7
Warnings:					
Information:					
			Total Files Size (in bytes):	5903730	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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(54) Beverage preparation cartridge.

(57) A beverage package (1) containing one or more beverage preparation ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a compartment (2) containing the beverage preparation ingredient(s), an inlet (12) which communicates with the said compartment and an outlet (3), a filter (9) being disposed between the compartment and at least a part of the under surface (5) of the top of the package, one or more passages (15) being formed between the filter and the top of the package, which passage(s) communicate with the outlet whereby, in use, a liquid medium is passed into the compartment containing the beverage preparation ingredient(s), filtered upwardly through the filter and collected through the outlet.

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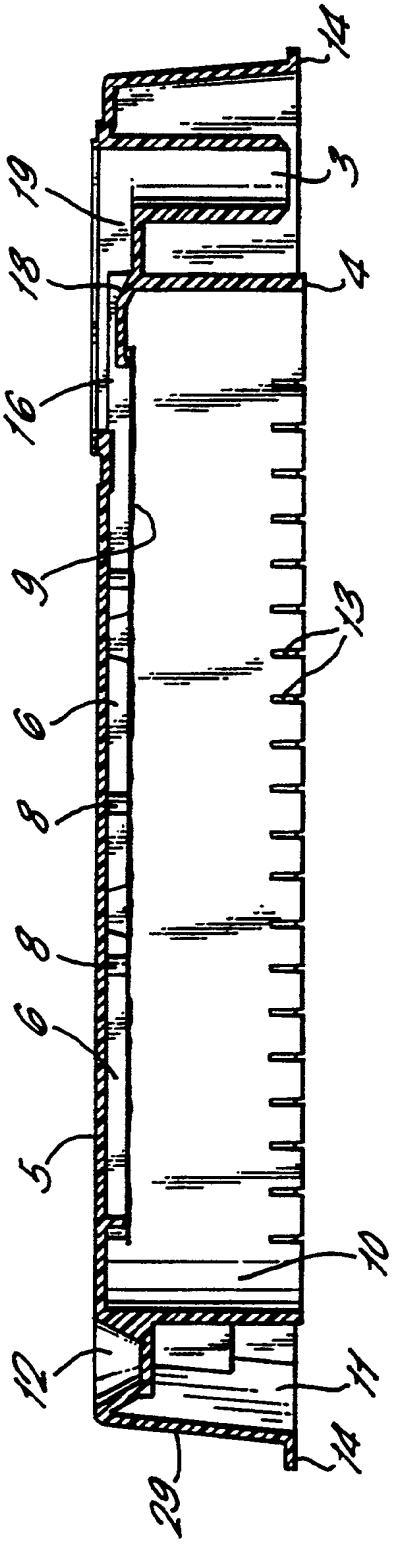


FIG. 5.

The present invention relates to packages containing ingredients for the preparation of beverages and, in particular, to sealed packages which are formed from a substantially air- and water-impermeable material and which contain one or more ingredients for the preparation of beverages.

It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee making machines which are generally termed "espresso" machines. In the production of coffee using these coffee machines the coffee cartridge is placed in a brewing chamber and hot water is generally caused to pass under pressure through the cartridge, thereby extracting the aromatic coffee constituents from the ground coffee and producing a coffee beverage.

Cartridges containing roast and ground coffee in which hot water flows under gravimetric force through the cartridge are also known. A cartridge of this general type is described in British Patent No. 1397116.

In our European Patent Application No. 87311325.2 there is described a package which contains at least one beverage preparation ingredient, e.g. roast and ground coffee. In a preferred embodiment the package is formed from a substantially air- and water-impermeable material and comprises a sealed body portion having a compartment containing the beverage ingredient and an outlet channel, the compartment and the outlet channel co-operating in such a manner that, in use, the beverage is filtered, thereby avoiding the necessity for an external filter.

There is also described in European Patent Application No. 87311325.2, a method for preparing a beverage which comprises positioning a beverage containing package at a brewing station, introducing water through water introduction means into the package, allowing the water to commingle with the beverage ingredient, and collecting the beverage so-formed through an outlet formed in the package.

The beverage packages as described in European Patent Application No. 87311325.2 are primarily intended to be used with a beverage preparation machine which handles the packages automatically or semi-automatically. A machine of this type is described in our European Patent Application No. 89302708.6. The packages may contain roast and ground coffee, leaf tea or one or more powdered beverage preparation ingredients such as powdered chocolate, powdered coffee or powdered soup.

We have now developed a package containing one or more ingredients for the preparation of beverages in which a filter is disposed in such a manner that the beverage so produced is filtered upwardly through the filter.

Accordingly, the present invention provides a beverage package containing one or more beverage preparation ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a compartment containing the beverage preparation ingredient(s), an inlet which communicates with the said compartment and an outlet, a filter being disposed between the compartment and at least a part of the under surface of the top of the package, one or more passages being formed between the filter and the top of the package, which passage(s) communicate with the outlet whereby, in use, a liquid medium is passed into the compartment containing the beverage preparation ingredient(s), filtered upwardly through the filter and collected through the outlet.

The beverage package of the present invention preferably has a body portion which may be formed, for example, from a moulded plastics material. The inlet and/or outlet of the package may be closed by a plug of a plastics material moulded into the inlet and/or outlet nozzle during the moulding of the body portion. Alternatively, the inlet and/or outlet may be covered by a substantially air- and water-impermeable material, for example aluminium foil or a laminated material, such as a laminate of plastic material/metal foil/plastic material, prior to the opening of the inlet and/or outlet. Specific examples of materials which can be used are aluminium foil having a thickness in the range of from 30 to 60 micrometres coated with a layer of polypropylene or a laminate of polypropylene/aluminium foil/polyester.

The outlet in the package may be prepared during the beverage preparation cycle using a cutting and piercing tool for example of the type as described in our European Patent Application No. 89302708.6.

Alternatively, the inlet and/or outlet may be open and the beverage package provided with an outer wrapping or the like. For example, a plurality of packages may be provided with a shrink wrapped outer layer.

In the packages of the present invention, the communication between the inlet and the compartment containing the beverage preparation ingredient(s) is preferably via a channel which is separated from the compartment by a wall which has a plurality of openings formed therein for the entry of a liquid medium into the compartment. The channel preferably extends along at least one side of the compartment, more preferably along three sides of the compartment. The openings in the wall are preferably in the form of elongate slots which are generally arranged in a manner such that an even distribution of the liquid medium through the beverage preparation ingredients is acheived.

The filter is preferably made from a material with a high wet strength, for example a non-woven polyester fibre material or polypropylene. Other materials which may be used include a water-permeable cellulosic material, such as a cellulosic material compris-

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ing woven paper fibres. The woven paper fibres may be admixed with fibres of polypropylene, polyvinylchloride and/or polyethylene. The incorporation of these plastics materials into the cellulosic material renders the cellulosic material heat-sealable. The filter material may also be coated with a material which is activated by heat and/or pressure so that it can readily be sealed to ribs formed in the under surface of the top of the package, thereby forming one or more passages which communicate with the outlet.

The beverage preparation ingredients contained in the packages of the invention are preferably roast and ground coffee, or leaf tea, and according to individual taste, powdered milk or creamer, sugar or artificial sweetner.

It will be understood that it may be convenient for the compartment containing the beverage preparation ingredients to be separated into two or more sections, for example, one section containing roast and ground coffee and another section containing powdered milk or creamer. In such an arrangement the means for the entry of the liquid medium into the separate compartments would be varied to suit the requirements for filtration or dissolution of the particular ingredients.

The package of the present invention, when filled with roast and ground coffee, preferably contains from 2.5 to 10 grams of roast and ground coffee, preferably from 4.5 to 6 grams for the preparation of a single cup. However, packages which are intended to provide multiple servings of coffee will contain an appropriate amount of roast and ground coffee, for example, packages intended to provide say five cups of coffee will contain from 20 to 50 grams of roast and ground coffee, preferably from 25 to 30 grams. The roast and ground coffee is generally compacted when the beverage package is filled in order to aid the distribution and transport of water through the package.

In use of the beverage packages of the present invention a liquid medium is passed via the inlet of the package into the compartment containing the beverage preparation ingredient(s). The filter is disposed at the top of the compartment containing the beverage preparation ingredient(s) and the liquid medium is thereby caused to flow upwardly through the beverage preparation ingredients. The beverage so formed flows upwardly through the filter into the passage or passages which communicate with the outlet.

Filtering the beverage in an upwardly direction has been found to be advantageous in that the smaller and lighter particles of the beverage preparation ingredients settle to the bottom of the compartment and hence the clogging of the filter by these small particles is mitigated. The beverage thus filters more rapidly upwardly through the filter than it would if the filter were placed beneath the beverage ingredients and the liquid medium caused to flow in a downwardly direction. Furthermore, the flow of water in an upwardly direction through the package is advantageous in that the particles of the beverage preparation ingredient(s) float up towards the filter, thereby re-establishing the filter bed. This is of particular advantage if the particles of the beverage preparation ingredient(s) have settled during transport and/or storage and if holes or cracks have formed in the bed. The upward filtration causes the filter bed to re-establish in these situations, thereby providing a more effective filtration of the beverage preparation ingredient(s). With regard to the preparation of a beverage from tea leaves the upward filtration is particularly advantageous because the tea leaves float initially and then sink and the configuration of the beverage packages of the present invention prevents the wetted tea leaves from blinding the filter.

The quality of the filtration of beverage preparation ingredients, in particular roast and ground coffee, is known to affect the flavour of the beverage. The brewing and flavour characteristics for roast and ground coffee charge with the roasting and grinding conditions and are effected by the size and shape of the particles. The beverage packages of the present invention enable efficient filtration to be achieved and thereby give rise to beverages which have little or no turbidity and a good flavour.

Another advantage of the package of the present invention is that with the continuous flow of water in an upwardly direction through the package a more effective wetting of the beverage preparation ingredient(s) is achieved. This is of importance for roast and ground coffee since the wetting of the particles causes the particles to swell and thus assists in preventing fine particles from passing through the filter. It will be appreciated that for the preparation of coffee from roast and ground coffee, or the preparation of tea from leaf tea, the liquid medium is hot water.

The present invention also includes within its scope a method for the preparation of a beverage from a sealed package containing one or more beverage preparation ingredients located in a compartment in the package, which method comprises introducing a liquid medium suitable for the preparation of the beverage under pressure into the package through an inlet formed therein, causing the liquid medium to enter the compartment thereby forming the beverage, filtering the beverage in an upwardly direction through a filter, and collecting the beverage so formed from an outlet formed in the package.

The packages of the present invention are preferably provided with a recognition means whereby, in use, the package is identified by the machine into which it is placed for treatment and the identification of the package thereby causes it to be subjected to the correct treatment steps including the introduction of a liquid medium into the package. For the preparation of beverages from beverage preparation ingredients the liquid medium introduced into the package

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will generally be water or a water/air mixture.

The recognition means may comprise one or more surface features formed in the body of the beverage package. For example, the package body may be provided with one or more indents, cut outs, protrusions or holes which can be identified by a mechanical sensor in the beverage preparation machine, the mechanical sensor registering the presence or absence of the indents, cut outs, protrusions or holes.

The recognition means may, alternatively, comprise a system which can be sensed by a simple optical device, for example a bar code printed onto the body of the package, a pattern of through holes in the package, a pattern of contrasting tones or colours printed onto the package or packages containing different comestibles being of different colours.

The recognition means may also comprise one or more strips of a magnetic material applied to the body of the package which can be read by an appropriate magnetic sensor; one or more shaped or divided areas of metal foil applied to the package body which cause an inductive effect on movement of the package in the machine, which inductive effect can be sensed; or one or more electrically conductive areas formed on the body of the package which can be sensed electrically.

As mentioned above, the package of the present invention contains one or more beverage preparation ingredients, for example, roast and ground coffee or leaf tea and sugar and/or creamer, as desired. One machine which can readily be adapted for the preparation of a beverage from the preferred beverage package of the invention which includes a recognition means is described in our European Patent Application No. 89302708.6. The only modification required to be made to such a beverage preparation machine is to incorporate an appropriate sensor or sensors into it, the sensor or sensors being designed to read the particular coding on the capsule and to send a signal to the controller, which then selects the appropriate beverage preparation cycle.

The recognition system used on the beverage packages of the present invention enables a single beverage preparation machine to prepare from different beverage packages a great number of different beverages which require different beverage preparation conditions.

The packages of the present invention may be treated by a machine which includes therein one or more sensors which are adapted to sense and identify a recognition means provided on a package inserted into the machine.

The sensor may be, for example, a mechanical sensor, an optical sensor, a magnetic sensor, an electrical sensor or an inductive sensor. The machine is preferably adapted so that the package is handled automatically following its insertion into the machine. For example, a machine of the type as described in our European Patent Application No. 89302708.6 can be fitted with an appropriate sensor to sense and identify a recognition means provided on beverage packages intended for use therewith.

The present invention will be further described with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of part of a beverage package of the invention;

Figure 2 is a top plan view of the beverage package of Figure 1;

Figure 3 is a section through the beverage package of Figure 1 along line A-A of Figure 2;

Figure 4 is a section through the beverage package of Figure 1 along line B-B of Figure 2; and

Figure 5 is a section along the line C-C of Figure 2;

Referring to the drawings a beverage package body is shown at 1. The body may be formed, for example, from a moulded plastics material. The body 1 has a compartment 2 in which the beverage preparation ingredient or ingredients are contained. The package body has an outlet nozzle 3 and an inlet 12 formed therein. The compartment 2 is separated from the area of the body in which the nozzle 3 is formed by means of a wall 4. The top 5 of the package 1 has four longitudinal ribs 6 moulded to the underside thereof which are shown as a plurality of dotted lines in Figure 2. The four ribs 6 are joined at either end by transverse ribs 7 which are also shown in dotted outline in Figure 2. The ribs 6 and 7 are strengthened at intervals by posts 8 which are also moulded to the underside of the top 5 of package 1. These posts 8 are also shown in dotted outline in Figure 2. A filter material 9 is heat sealed to ribs 6, ribs 7 and posts 8, the filter material 9 extends across a substantial part of the top of compartment 2.

Compartment 2 is separated from the outlet nozzle by a wall 4 and surrounded on its other three sides by a U-shaped wall 10. The wall 10 has a U-shaped channel 11 surrounding it, the channel 11 communicating with inlet 12. The wall 10 has a plurality of small slots 13 formed in the two longitudinal arms thereof.

In use of the beverage package as shown in the drawings, the bottom of the package 1 is sealed by means of an aluminium foil or a laminated foil which is heat sealed to the lower edges of walls 4 and 10 and to the lower edge 14 of the package. Water enters the package at a pressure of about 10^5Pa via inlet 12 which is opened by piercing or cutting the material covering the said opening. The water enters the channel 11 surrounding three sides of the compartment 2 containing the beverage ingredients. The water, which is under pressure, is forced through the elongate slots 13 formed in the wall 10 which separates channel 11 from compartment 2. The water mixes with the beverage preparation ingredients contained in

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compartment 2 and is forced upwardly through the beverage preparation ingredients. The beverage formed by passage of the water through the beverage preparation ingredients passes through filter material 9 into passages 15 which are formed between the ribs 6. The sealing of the filter material 9 onto ribs 6 and 7 prevents any short circuit and all of the beverage has to pass through the filter. The passages 15 are closed at the end remote from the outlet by transverse rib 7. The beverage formed by the passage of water through the beverage preparation ingredients also passes directly through the filter material 9 into areas 16 which communicate with passages 15. The beverage passes along passages 15, commingles with the beverage collected in areas 16 and is then funnelled by means of angled extensions 17 of the middle two ribs 6 over a weir 18 to a beverage collection area 19 and thence into outlet nozzle 3. The beverage is then collected in a cup or other receptacle placed below the outlet nozzle 3. It may be desirable to support the filter material 9 by means of additional support ribs in the passages 15 in order to prevent the filter material from bowing and sealing the passages.

Additional strengthening of the package of the invention is provided in the area adjacent the outlet nozzle, as best shown in Figure 4, by a hollow post 20 which is attached by ribs 21 arranged in cruciform fashion to the end wall 22, side wall 27 and wall 4.

Using the beverage package as illustrated in Figures 1 to 5 it is possible to prepare 160 ml of coffee from roast and ground coffee contained in compartment 2 in 20 seconds by passing water at a pressure of 10^5Pa through the package.

The beverage package as illustrated in Figures 1 to 5 incorporates the recognition means which is a preferred feature of the invention. The package of the invention 1 containing one or more beverage preparation ingredients has a generally rectangular shape with flat top and bottom surfaces and is thereby suitable for insertion into a beverage preparation machine, for example of the type as described in our European Patent Application No. 89302708.6, longitudinally through a slot.

The package is also provided, as best shown in Figure 2, with teeth 25 moulded along one side wall of compartment 2. The teeth 25 have recesses 26 formed therebetween. These teeth 25 are intended to enable the beverage package to be driven through a beverage preparation machine by the engagement of the teeth 25 with the tooth of a cam (not shown). The side wall 27 of the beverage package has a flange 28 extending at right angles thereto. The flange 28 has an upstanding rib 30 at the end thereof near to the leading end 29 of the package.

As the package is driven into the beverage preparation machine the flange 28 is sensed as the side edge of the package passes beneath a sensing arm (not shown). The flange 28 has a plurality of upstanding pegs 31,32,33,34 located therein and as the package is driven into the machine by the engagement of the teeth 25 with the tooth of a cam, the sensor senses the presence or absence of upstanding pegs 31,32,33,34.

If one or more of pegs 31,32,33,34 is not present the sensing arm will thereby identify a different type of beverage package. The sensing arm operates a switch (not shown) which thereby transmits information concerning the presence or absence of the pegs on the package to the control mechanism for the beverage dispensing machine. The arrangement of pegs 31,32,33,34 on the package thus identifies the type of package to the controller which then selects the appropriate beverage preparation conditions.

The presence or absence of three pegs provides scope for the sensing arm to sense up to 8 different types of beverage packages. Thus, if the presence of a peg at a particular location is coded as 1 and the absence of a peg coded as 0, the following code combinations can be achieved.

000
001
010
100
101
110
011
111

The presence of the additional fourth peg formed in flange 28 provides an even larger number of code combinations.

When the beverage preparation machine has selected the appropriate beverage preparation conditions, the water inlet 12 of the package is pierced or cut, the outlet 3 is uncovered in the package and water caused to flow under pressure through the compartment containing the beverage ingredient(s). The chosen beverage then being collected in a cup or receptacle placed below the outlet 3 of the package.

It will be appreciated that for different types of packages the beverage or other ingredient may require significantly different treatment. Thus, some beverages will be prepared with hot water and some with cold water, whilst others, such as espresso coffee, will require a smaller amount of water for their preparation. Preparation times may require to be varied. Similarly water and/or air may be required either for preparing/dispensing the beverage/content of the package or for the purpose of pre-cleaning an inlet pipe or flushing out a used package. Furthermore, a user may require a particular beverage to be dispensed in combination with one or more ingredients from independent sources, e.g. powdered milk and/or sugar.

The present invention will be further illustrated with reference to the following non-limiting Example.

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EXAMPLE

The following experiments were conducted in respect of the preparation of beverages from coffee capsules, adapted for upward or downward filtration, which had been subject to vibration during transport and distribution. The capsules were each tapped prior to the preparation of the beverages.

Downward Filtration

Sample 1

6.3g of roast and ground coffee contained in a capsule adapted for downward filtration gave 153cc of a coffee beverage at 0.8% solids with a yield of 19.4%.

Sample 2

6.3g of roast and ground coffee contained in a capsule adapted for downward fitration gave 153cc of a coffee beverage at 0.81% solids with a yield of 19.7%.

Upward Filtration

Sample 3

6.3g of roast and ground coffee contained in a capsule adapted for upward filtration, when brewed in the same manner as for samples 1 and 2, gave 156cc of a coffee beverage at 1.04% solids with a yield of 25.7%.

Sample 4

6.3g of roast and ground coffee contained in a capsule adpated for upward filtration, when brewed in the same manner as for samples 1 and 2, gave 158cc of a coffee beverage at 1.02% solids with a yield of 25.6%.

These results indicate an improvement of approximately 20% yield.

Claims

1. A beverage package containing one or more beverage preparation ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a compartment containing the beverage preparation ingredient(s), an inlet which communicates with the said compartment and an outlet, a filter being disposed between the compartment and at least a part of the under surface of the top of the package, one or more passages being formed between the filter and the top of the package, which passage(s) communicate with the outlet whereby, in use, a liquid medium is passed into the compartment containing the beverage preparation ingredient(s), filtered upwardly through the filter and collected through the outlet.

2. A package as claimed in claim 1 wherein the inlet and/or outlet is covered by a substantially air- and water-impermeable material prior to the formation, in use, of an outlet in the package.

3. A package as claimed in claim 1 wherein the inlet and/or outlet is closed by a plug prior to the formation, in use, of an outlet in the package.

4. A package as claimed in any one of the preceding claims wherein a channel communicates with the inlet for the entry of a liquid medium into the package, the channel being separated from the compartment by a wall which has a plurality of openings formed therein for the entry of the liquid medium into the compartment containing the beverage preparation ingredient(s).

5. A package as claimed in claim 4 wherein the channel extends along at least one side of the compartment containing the beverage preparation ingredient(s).

6. A package as claimed in claim 4 or claim 5 wherein the channel extends around three sides of the compartment containing the beverage preparation ingredient(s).

7. A package as claimed in any one of the claims 4 to 6 wherein the openings comprise a plurality of elongate slots.

8. A package as claimed in any one of the preceding claims wherein the filter is made from a water-permeable material.

9. A package as claimed in any one of the preceding claims wherein a plurality of passages are formed between the filter and the top of the package.

10. A package as claimed in any one of the preceding claims wherein the beverage preparation ingredient is leaf tea or roast and ground coffee.

11. A package as claimed in any one of the preceding claims which is provided with a recognition means whereby, in use, the package is identified by the machine into which it is placed for treatment therefrom and the identification of the package thereby causes it to be subjected to the correct treatment steps including the introduction of a fluid medium into the package.

12. A package as claimed in claim 11 wherein the recognition means comprises one or more surface features formed in the body of the package.

13. A package as claimed in claim 11 wherein the rec-

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ognition means comprises a bar code.

14. A package as claimed in claim 11 wherein the recognition means comprises a pattern of holes formed in the body of the package.

15. A package as claimed in claim 11 wherein the recognition means comprises a pattern of contrasting tones or colours.

16. A package as claimed in claim 11 wherein the recognition means comprises one or more strips of a magnetic material.

17. A package as claimed in claim 11 wherein the recognition means comprises an inductive device.

18. A package as claimed in claim 11 wherein the recognition means comprises a plurality of electrically conductive means.

19. A method for the preparation of a beverage from a sealed package containing one or more beverage preparation ingredients located in a compartment in the package, which method comprises introducing a liquid medium suitable for the preparation of the beverage under pressure into the package through an inlet formed therein, causing the liquid medium to enter the compartment thereby forming the beverage, filtering the beverage in an upwardly direction through a filter, and collecting the beverage so formed from an outlet formed in the package.

20. A method as claimed in claim 19 wherein the inlet and/or outlet in the package is/are formed by means of a piercing and cutting tool.

21. A method as claimed in claim 19 or claim 20 wherein the liquid medium is water.

22. A method as claimed in any one of claims 19 to 21 wherein the flow of the liquid medium into the compartment containing the beverage preparation ingredients is achieved by causing the liquid to flow through one or more restricted openings into the said compartment.

23. A method as claimed in claim 22 wherein the restricted openings are elongate slots.

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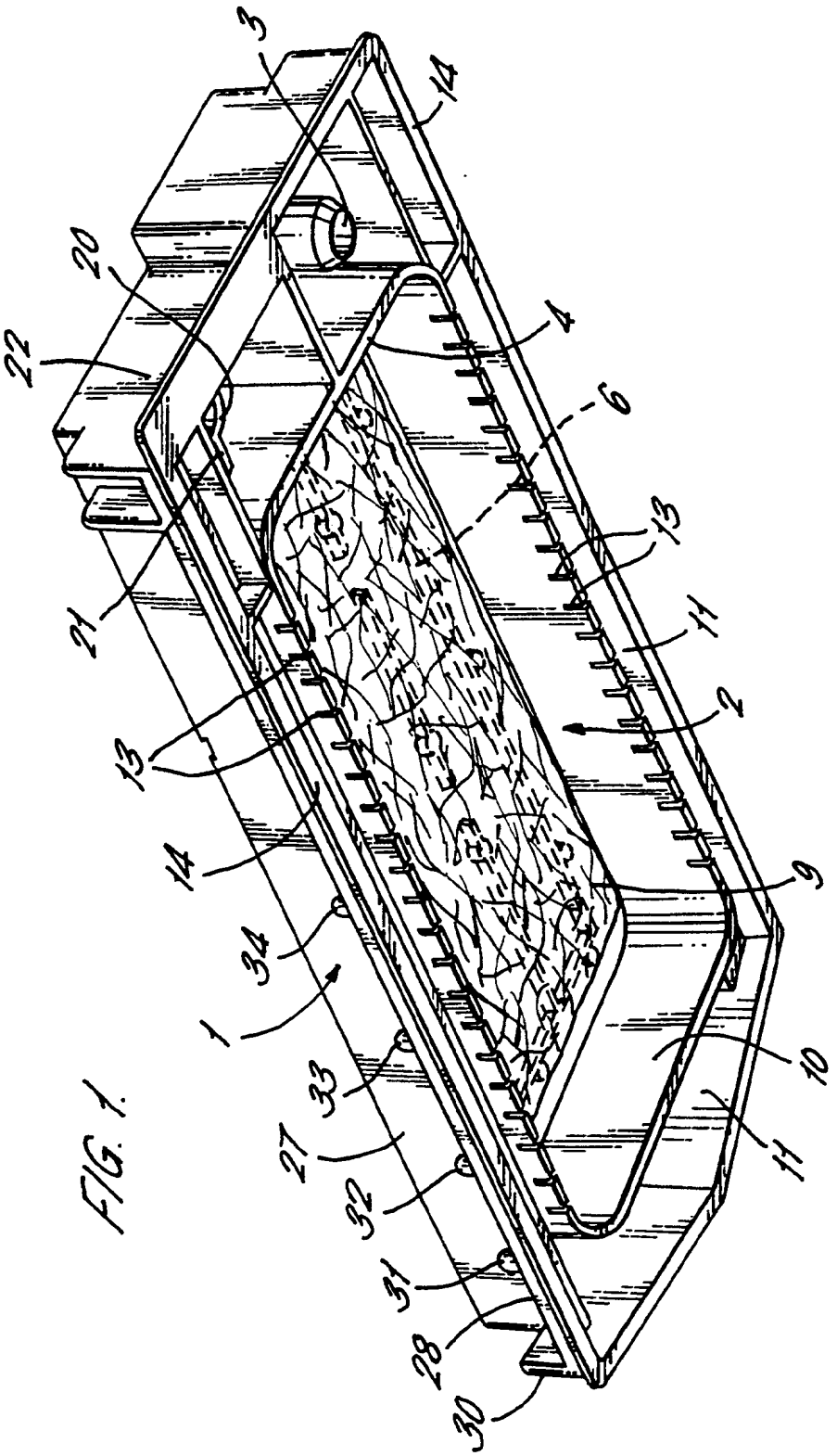


FIG. 1.

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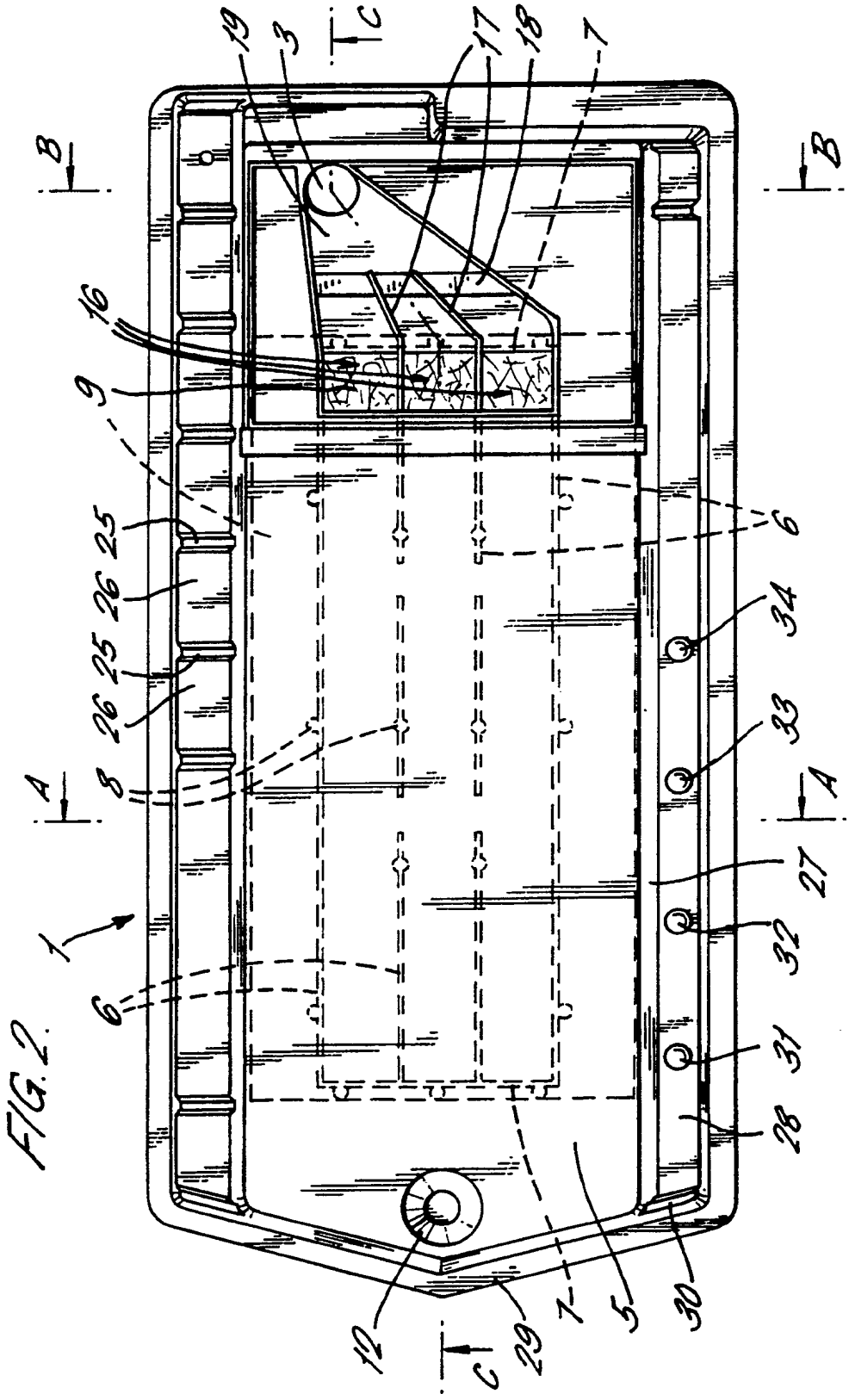


FIG. 2.

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FIG. 3.

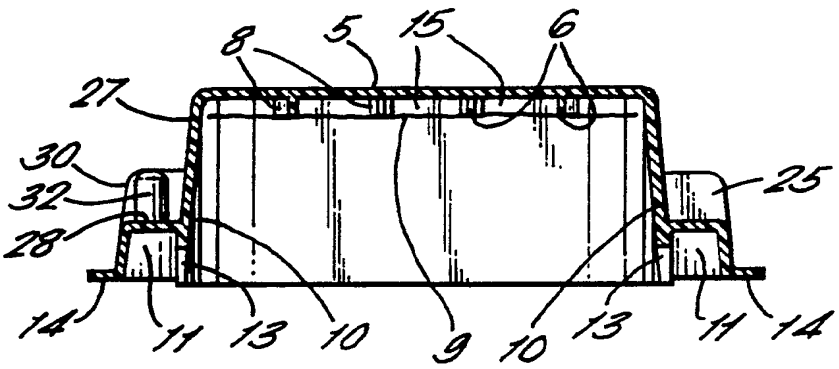
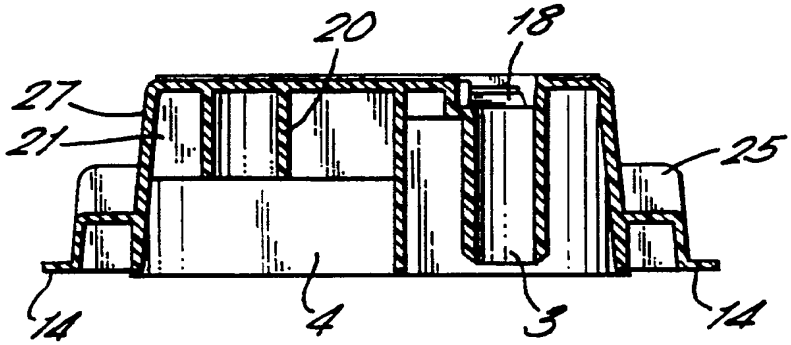


FIG. 4.



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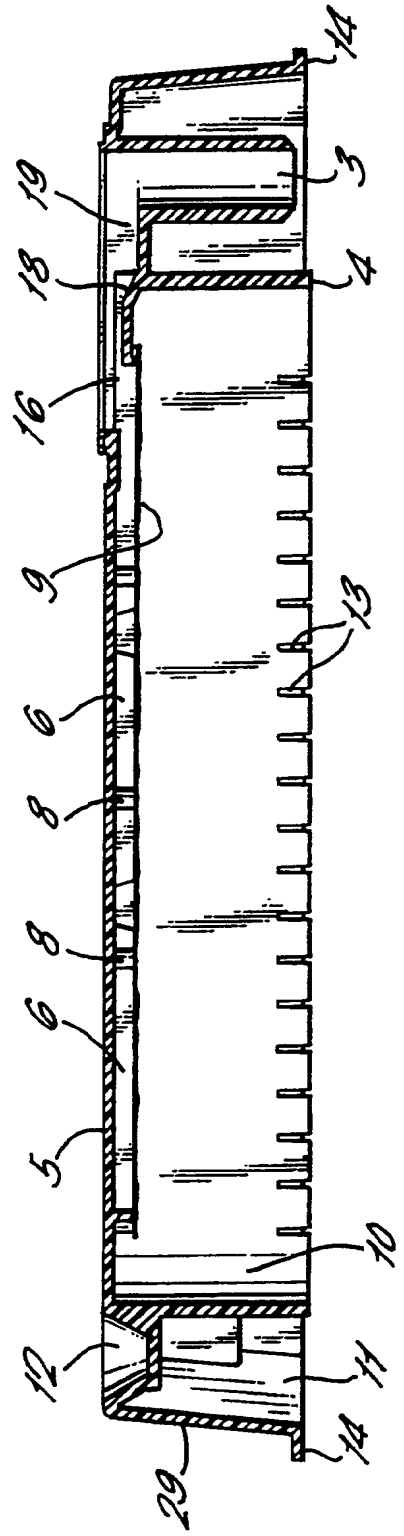


FIG. 5.

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2538

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-334 573 (GENERAL FOOD LIMITED) * abstract; figure 4 *	1,4,11, 19	B65D81/00

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 JUNE 1991	ZANGHI AMEDEO

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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(54) Cartridge for use with a device for preparing an infused beverage

(57) The invention relates to a cartridge containing infusible substance for use in a device for preparing infused beverage. The cartridge comprises a bottom part provided with a filter adapted to let liquid pass through and a top part (38) provided with an opening. Side walls are joining the bottom and top parts. The bottom part forms a recess arranged toward the inside of the cartridge, the surface of the recess comprising an actuating surface for actuating a mechanism of the device.

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Description

Field of the invention

[0001] The invention relates to a cartridge containing infusible substances for use in a device for preparing infused beverage. The cartridge comprises a bottom part provided with a filter adapted to let liquid pass through and a top part provided with an opening. Side walls are joining the bottom and top parts.

[0002] As a matter of example, the infusible substance can alternatively be tea leaves, various different herbs and spices, herbal tea, flower petals, leaves, seeds, roots, powder, coffee or other materials capable of being infused.

Description of prior art

[0003] Such cartridges are known in the art.

[0004] For instance, Japanese patent application JP 2001-120436 discloses a tea preparation device comprising an infusion tank which can be filled with hot water, and a holder which can communicate with the tank through a communication aperture. A passage communicates with the tank for pouring out the infused tea. A cartridge is used and contains tea leaves. The cartridge has a removable top seal.

[0005] In use, the tea leaf cartridge is inserted in the holder. The cartridge top seal is removed when the holder is inserted in the device. The opened cartridge in the holder is moved under the tank. Then, while the opening is turned toward the interior of the tank, the tea leaves contained in the cartridge are able to move and float freely into the infusion tank, once water is introduced in the tank and holder. The infusion then takes place. A stirring mechanism comprising a rod partially immerged in the infusion tank can be operated to stir the water while infusing.

[0006] A drainage hole in the holder and the passage are arranged to discharge the infused tea from the tank to a discharge container and the cartridge is entirely or partially formed as a filter. That is, once the infusion is completed, the tank is emptied and the tea leaves return in the cartridge and settle there.

[0007] The disclosed device provides easy setting up and preparation of a liquid infusion in a traditional way during which tea leaves are allowed to float freely in the liquid, and it also provides easy handling of the used infusible substance, such as tea leaves, in the cartridge itself forming a filter.

[0008] The device disclosed in the prior art presents a security problem in the sense that a user may start the device, even if no cartridge has been introduced in the machine. If it is the case, the infusion container must be emptied. Either the infusion container needs to be removed and emptied manually. Or water needs to be evacuated in the discharge container. In that case, infusion already contained in the discharge container is diluted, impairing its taste and flavour.

[0009] Another drawback of the device comes from the fact that the liquid infusion is stored in a discharge container. Because the liquid infusion stored in the discharge container continues infusing, its taste and flavour is impaired.

[0010] It has also been found that not all tea leaves contained in the cartridge are able to move and float freely into the infusion tank. Some leaves tend to remain within the cartridge preventing the liquid from infusing properly.

Summary of the invention

[0011] It is an object of the invention to provide a cartridge for infusible substances for use in a device for preparing infused beverage according to which the functioning of the device is safe.

[0012] To this end, the bottom part of the cartridge forms a recess arranged toward the inside of the cartridge, the surface of the recess comprising an actuating surface for actuating a mechanism of the device.

[0013] The cartridge is mainly but not necessarily adapted for being slot in the following device for preparing infusion beverage. The device includes an infusion container for containing liquid and comprising an opening to allow liquid to flow out of the container. The device includes a receptacle defining a cavity for receiving a cartridge containing infusible substances. The infusion container and the receptacle are operable in relation to each other to be arranged in a position wherein the infusion container and the cavity communicate through the opening. Infusible substances contained in the cartridge are immersed once liquid is poured into the infusion container to the cavity; the infusible substances are able to move and float freely in the infusion chamber. The infusion takes place.

[0014] The device further comprises an openable and closable passage communicating with the cavity. Once the infusion is completed, the passage is opened and the infused liquid flows from the infusion container to the passage through the cavity and the filter of the cartridge. The infused liquid may be poured directly in a cup.

If no cartridge is inserted in the device, at least one mechanism of the device is not actuated. The functioning of the device may be paused or stopped. Such security mechanism prevents a user to operate the device when no cartridge is introduced.

[0015] It is an object of the invention to provide a cartridge for infusible substances for use in a device for preparing infused beverage according to which all substances contained in the cartridge are efficiently used for preparing the beverage.

[0016] To this end, the recess is provided with at least an opening for letting gas pass through.

[0017] The device for preparing infused beverage may comprise an injecting means for injecting gas in the infusion container. The recess of the cartridge constitutes a space or compartment into which the means for inject-

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ing gas, such as an injection nozzle, may be located. The injecting means injects gas in the cartridge through the opening of the recess.

[0018] In use, when the cartridge is slot within a device for preparing infused beverage, the injection means is inserted in the recess. Gas is injected in the infusion container through the cartridge. The infusible substances are pushed out of the cartridge to float within the infusion container. The infusible substances are prevented from remaining within the cartridge while the infusion takes place.

[0019] Preferably, the opening is disposed in the recess to face an opening of the injection means through which gas is injected. The size of the opening of the recess is substantially equal to that of the injection opening. The gas is properly injected in the infusion container through the cartridge. It avoids gas pockets from developing in the device around the cartridge; such gas pockets could damage the cartridge or create tensions within the device.

[0020] It is known to the skilled person that tea infusion takes place in three stages. Firstly the caffeine contained in tea leaves is diffused to the liquid, then all aromas giving the infusion its flavour and finally the tea leaves release their acid tannins. If the tea leaves are infused too long or at a wrong temperature, the effect of either the first or the second stage are annihilated, the tannins destroying either the caffeine or the aromas.

[0021] The infusion takes place around the tea leaves and water located immediately around the leaves becomes rapidly saturated. The infusion process slows down and the three stages of the process are partially or not properly performed; Water around the leaves is highly concentrated in caffeine and poorly concentrated in aromas.

[0022] To prevent such an effect, gas may be injected within the infusion container through the cartridge, while the infusion takes place to stir the liquid and homogenize the infusion.

[0023] The introduction of oxygen further provides the advantage of improving the quality of infused tea beverage. It is known that water when heated up looses oxygen, which has effect on the taste of the tea. Oxygenating the liquid while it infuses restores a normal oxygen concentration to water and ensures a high quality taste for the infused tea.

[0024] In another embodiment, openings for letting a gas pass through, arranged in the side walls of the cartridge may be used as well. Openings in the recess have been found to be more efficient for pushing infusible substances out of the cartridge and for uniformly agitating and oxygenating the liquid during infusion.

[0025] In one embodiment, the recess has a substantially cylindrical or frustroconical form defining recess side walls and a recess top. The at least one opening of the recess is provided through the recess side walls, or/and through the recess top.

[0026] Preferably, the recess has a circular bottom section with a diameter comprised between 2 and 15 millimetres, or more particularly between 2 and 6 millimetres. Such a range consists of an optimal compromise between a recess large enough to provide sufficient space for the injection means of the device and a recess small enough to provide a sufficient surface for liquid to flow out of the cartridge through the filter.

[0027] It is an object of the invention to provide a cartridge for infusible substances for use in a device for preparing infused beverage which may be firmly maintain in the device. To this end, the top part of the cartridge comprises a lip surrounding the opening of the top part. The lip may be trapped in a gripping mechanism of the device. It is important that the cartridge is correctly and firmly hold within the cavity to insure that the actuating surface of the recess the injection means of the device remains located in the recess of the cartridge. Failure to do so could result to gas pockets developing and creating unnecessary tensions within the device.

Preferably, the cartridge has a substantially cylindrical or frustroconical form. A cartridge of such a form can easily be slot and steadily maintained within a cavity of a complementary shape. Cartridge of different forms, for instance semi-spherical forms may not fit so properly within a cavity and may slide in one direction or another.

A cartridge of such a form is also easy to manufacture, whether the cartridge is made of plastic material and moulded or made of metal and stamped by application of a mould, form, or die. Preferably, the angle formed by the side walls and the bottom part is comprised between 90 degrees and 100 degrees, or more particularly between 93 degrees and 97 degrees.

[0028] In one embodiment, the filter consists of a sheet made of aluminium perforated. Food contact approved aluminium may be used. Alternatively, the inner surface of the filter may be covered with a food contact approved coating layer able to resist to temperatures at least up to 100°C during several minutes. Alternatively, the filter consists of at least a sheet made of wool or of any natural or synthetic material adapted to infusion and filtering.

[0029] Preferably the cartridge is made of aluminium. Food contact approved aluminium may be used. Alternatively, the inner surface of the cartridge may be covered with a food contact approved coating layer able to resist to temperatures at least up to 100°C during several minutes.

[0030] It is a further object of the invention to provide a cartridge containing infusible substances which may be easily manipulated. To this end, the opening of the top part of the cartridge is provided with and closed by a sheet, arranged toward the outside of the cartridge with respect of the opening.

The opening of the cartridge is closed, its content being securely enclosed. The sheet may be automatically cut in the device for preparing infused beverage.

[0031] It is a further object of the invention to provide a cartridge which contents is protected from humidity, air and light. To this end, the bottom part of the cartridge is

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further provided with and closed by a removable sheet, arranged toward the outside of the cartridge with respect of the filter.

The content of the cartridge is protected from air, light and humidity. The removable sheet may be removed manually just before the cartridge is to be used; the flavour and aromas of the infusible substance may be preserved until then. The infusible substance may also be vacuum-packed.

[0032] According to one embodiment, the cartridge includes automatic readable means adapted to be read or detect by a detecting or reading means. The readable means may comprise and/or inform on preparation parameters for indicating how to infuse the infusible substance of the cartridge at best.

[0033] Advantageously, the preparation parameters may consist of the infusion temperature and/or the infusion duration and/or when the gas injection takes place, how long it lasts, etc.

Short description of the drawings

[0034] These and further aspects of the invention will be explained in greater detail by way of example only and with reference to the accompanying drawings in which:

Fig.1a shows a perspective top view of a cartridge according to one embodiment for use in a device for preparing infused beverages;

Fig.1b shows a perspective bottom view of a cartridge according to one embodiment;

Fig.1c shows a perspective side view of a cartridge according to one embodiment;

Fig.1d shows a perspective side view of the bottom part of a cartridge according to one embodiment;

Fig.1e shows a cross-sectional side view of the cartridge according to one embodiment;

Fig.1f shows a cross-sectional side view of the cartridge according to another embodiment;

Fig.2 shows a perspective front view of a device for preparing infused beverages in which a cartridge according to the invention is used;

Fig.3 shows a detailed perspective side view of the device;

Fig.4 shows a perspective front view of the inside of the device for preparing infused beverages;

Fig.5 shows a perspective back view of the inside of the device for preparing infused;

Fig.6 shows a perspective side view of the inside of the device for preparing infused;

Fig.7 shows a perspective top view of a receptacle of the device for receiving cartridge;

Fig.8 shows a schematic section of a receptacle of another device for receiving a cartridge;

Fig.9a-e shows a mechanism for opening a cartridge located inside the device.

Fig.10a-c shows a mechanism for withdrawing a cartridge according to the invention from a device for preparing infused beverage;

[0035] The figures are not drawn to scale. Generally, identical components are denoted by the same reference numerals in the figures.

Detailed description of preferred embodiments

[0036] A cartridge 12 according to the invention is explained in respect with **figures 1a, 1b, 1c, 1d, 1e.** The cartridge 12 comprises a bottom part 42 provided with a filter 44 adapted to let liquid pass through, a top part 38 provided with an opening 35 and side walls 45 joining the bottom and top parts 42, 38 . It defines an inner volume 40 to contain infusible substances 12. The volume 40 is calculated so to receive enough infusible substances 12 for preparing a standard cup of infused beverages. Infusible substances when soaked tend to swell. The volume 40 is also calculated to contain all the swollen infusible substances once infused.

[0037] The cartridge 12 is cone-shaped, truncated at the level of the bottom part 42. In one embodiment, the section of the top and bottom part 38, 42 is circular or oval. The section of the opening 35 is circular or oval. The angle α formed by the side walls 45 and the bottom part 42 is between 90 and 100 degrees and preferably comprised between 93 and 97 degrees. In another embodiment, the cartridge 12 is cylindrical.

[0038] Such a shape allows creating an inner volume 40 big enough to contain enough infusible substances for preparing a standard cup of beverage. Such shape allows the cartridge 12 to be steadily inserted within the cavity 16. It is also perfectly suitable to ensure a perfect fit between the cartridge 12 and the cavity 16.

[0039] The side walls of the cartridge 12 are air- and waterproof and opaque to be impermeable to water, air and light. The cartridge 12 is preferably made of aluminium. Food contact approved aluminium may be used. Alternatively, the inner surface of the cartridge 12 may be covered with a food contact approved coating layer able to resist to temperatures at least up to 100°C during several minutes.

[0040] Preferably, the filter 44 is as part of the cartridge 12 and consists of a perforated sheet made of aluminium. Food contact approved aluminium may be used. Alternatively, the inner surface of the filter 44 may be covered with a food contact approved coating layer.

[0041] Alternatively, the filter 44 may consist of at least a sheet made of wool or of any natural or synthetic material adapted to infusion and filtering. It is attached in a conventional manner to the bottom part 42, preferably on the inner walls of the cartridge 12.

[0042] The top part 38 comprises a lip 39 surrounding the opening 35 at least partly. The lip 39 rests upon the

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rim of the receptacle 10. The opening 35 is closed and covered by a sheet 50 (not represented) arranged towards the outside of the cartridge. Preferably the sheet 50 is made of aluminium and is heat-sealed to the lip 39 in a conventional manner.

[0043] In one embodiment, the top part 38 may be covered by a filter (not represented) arranged towards the outside of the cartridge 12. The sheet 50 covers the filter. The filter consists of an extensible or deformable sheet made of wool or of any natural or synthetic material adapted to infusion and filtering. When a cartridge 12 comprising such filter is immersed in water, the filter spreads in water out of the cartridge; the filter creates a space in water where infusible substances 14 contained in the cartridge 12 are able to float. Such filter prevents from infusible substances 14 from scattering everywhere in the infusion container 6 in particular and in the device in general.

[0044] The bottom part 42 is recovered by a removable sheet 36, arranged towards the outside of the cartridge 12 with respect to the filter 44. The removable sheet 36 may be heat-sealed or glued to the cartridge 12 in a conventional manner. It is made of aluminium or of any other food approved material. The removable sheet 36 comprises a prehension means (not shown), so a user can grasp and remove it from the cartridge 12.

[0045] The sheets 36 and 50 hermetically close and vacuum-pack the inner contents 40 of the cartridge 12. The infusible substances 12 are protected from air and humidity. Both sheets 36, 50 and cartridge 12 are preferably made of an opaque material to protect its contents 14 for light as well.

[0046] The cartridge 12 may comprise marks or any automatic readable means comprising or indicating infusion parameters. The marks or readable means may be located either on the outside surface of the side walls 45 or on the lip 39 or on the sheet 50.

[0047] In one embodiment, the bottom part 42 includes a recess 46 arranged toward the inside of the cartridge 12. The recess 46 is frustrocone-shaped, the larger section of the recess 46 being at the level of the bottom part 42. The larger section of the recess 46 has a diameter comprised between 2 and 15 millimetres, or more particularly between 2 and 6 millimetres.

[0048] The recess 46 comprises openings 48 for letting gas pass through. In one embodiment, four openings 48 are located on the side walls 52 and one on the top part 54 of the recess 46. As a matter of example, the four openings 48 on the side walls are arranged symmetrically with respect of the axis of the recess 48.

[0049] **Figure 2** shows a perspective front view of a device for preparing infused beverages which uses cartridges according to the invention.

[0050] The device 2 comprises a removal reservoir 66 containing liquid and two infusion containers 6 for containing liquid 4. The infusion container 6 is designed to simultaneously contain air and enough water for a normal cup of beverage. Alternatively, the infusion container 6 is designed to contain several cups of beverage.

[0051] The infusion container 6 is disposed on a platform 68 connected to the device 2 via a supporting arm 69. A removable holding cap 70 is clipped on top of the container 6. An opening (not represented) is located on top of the container 6 and is closed by the holding cap 70. A pair of arc-shaped arms 71 connects the holding cap 70 to the platform 68. The container 6 is securely held between the platform 68 and the holding cap 70. The supporting arm 69, the holding cap 70, the pair of arms 71 enclose various conduits for gas and liquid to flow between the infusion container 6 and other internal elements of the device 2.

[0052] An opening 8 (not represented) is provided at the bottom of the container 6 to allow liquid 4 to flow out of the container 6.

[0053] The platform 68 comprises a spout 19, through which the infused beverage is poured out of the device 2. The spout 19 opens above a cup support 64. The cup support 64 is adapted to hold a cup or any similar container to collect the infused beverage poured from the spout 19 directly.

[0054] The device 2 may be adapted to prepare simultaneously one, two or more infused beverages at a time. The device 2 comprises a corresponding number of infusion containers 6 and accompanying parts.

[0055] Referring now to **figure 3**, the platform 68 comprises a receptacle 10 for receiving a cartridge 12 containing infusible substances 14. In this particular embodiment, the receptacle 10 consists of a drawer. The drawer 10 is operable between at least a first position and a second position. The drawer 10 slides from a closed position in the platform 68 to an opened position out of the platform 68. The drawer comprises a cavity 16 into which a cartridge 12 (not represented) containing infusible substances may be inserted. The drawer 10 may slide either automatically or manually. When the drawer 10 is closed in the platform 68, the cavity 16 of the drawer 10 communicates with the bottom opening 8 of the infusion container 6, so that the infusion container 6 and the cavity 16 form an infusion chamber.

[0056] The cavity 16 of the drawer 10 is connected to a passage 18 (not represented) located in the platform 68. An actuated valve allows closing and opening the passage 18. When the passage 18 is opened, liquid flows out of the infusion container 6 through the cavity 16 to the passage 18. When the passage 18 is closed, the infusion chamber formed by the cavity 16 and the infusion container 6 is closed. The passage 18 is connected to the spout 19 as well as to a conduit for waste water described below through actuated valves. Liquid flowing into the passage may be directed either to the conduit for waste water or to the spout 19.

[0057] The device 2 for preparing infused beverage is now described in respect with **figures 4, 5, 6**.

[0058] The device 2 comprises a support 72 for the reservoir 66. The support 72 comprises an opening where the valve-cap of the reservoir 66 is plugged, giving

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access to the water contained in the reservoir 66.

[0059] The support 72 is connected to a conduit 65a, creating a flow path for water from the reservoir 66. The conduit 65a is connected to a series of conduits 65b, via a system of actuated valves, to transfer water to respective infusion container 6. The conduit 65b is located within one of the pair of arms 71. A sprinkler 63 with several outlets 61 is disposed at one extremity of the conduit 65b. The sprinkler 63 is located within the holding cap 70 and is plugged into an opening located at the top of the infusion container 6. A pump 67 is used for the transfer of water from the conduit 65a to the conduits 65b.

[0060] The device 2 further comprises a heating chamber 59 to heat water. The device comprises an air or gas inlet pipe 28 located within the arm 69 and the platform 68. The gas inlet pipe 28 is adapted to deliver pressurised gas. The pump 67 is used for ejecting pressurised gas into one of the inlet pipe extremity. The pump 67 is actuated to control the pressure of the gas at the inlet.

[0061] The device 2 further comprises a conduit 23 to collect waste water from the infusion container 6. The conduit 23, connected at one extremity to a waste container (not represented) located within the device 2 and travels within the arm 69 and the platform 68. Its other extremity is located within the platform 68.

[0062] The device 2 further comprises a conduit 24 to collect used cartridges from the receptacle 10. The conduit 24 is located in the arm 70 and opens above the waste container.

[0063] In a manner known, the device 2 further comprises a sensor to detect the presence of a cup on one of the cup holder 64, a set of control knobs 3 for the user to operate the device 2, an operating means comprising a processing means to electronically control and operate all mechanisms of the device 2. The processing means includes a printed circuitry 25 and memory to store data for use by the processing means.

[0064] The receptacle 10 of the device 2 is now explained in respect with **figure 7**.

[0065] The receptacle 10 consist of a drawer comprising a front panel 105, a tray 107. The drawer 10 slides along two side panels 104a and 104b located inside the platform 68. A multiple runner mechanism 101,102,103 is disposed on the top edge of both side panels 104a, 104b.

[0066] The tray 107, removably linked to the side panels 104a, 104b through the multiple runner mechanism, slides along the side panels 103, 104. A mechanism located in the platform 68 is provided to rise up and support the tray 107 away from the side panels 104a, 104b. The tray 107 is formed by two panels 107a and 107b hinged to each other through a hinge 108. The hinge 108 is disposed perpendicular to the sliding direction of the tray 107.

[0067] The tray 107 comprises a cavity 16 adapted to receive a cartridge 12. The cavity 16 comprises partial side walls 110 connected to the first panel 107a of the tray 107 and a partial bottom part 111 connected to the side walls 110. The partial side walls and bottom part 110 and 111 are disposed towards the front panel 105 and underneath the first panel 107a only. The partial side walls 110 and the partial bottom part 111 form a partial cone or cylinder, truncated at the level of the bottom part 111. The dimensions of said partial cone are slightly larger than those of the cartridge 12, so that the cartridge 12 perfectly fit into the cavity 16.

[0068] A protruding nozzle 112, preferably cylindrical or frustrocone-shaped, is located on the bottom part 111 towards the inside of the cavity 16. The dimensions of protruding nozzle 112 are such that the recess 46 of a cartridge 12 inserted in the cavity 16 perfectly fits the protruding nozzle 112. The protruding nozzle 112 comprises openings 113 injecting gas towards the inside of the cavity 12. The openings 113 are disposed in the protruding nozzle 112 in such way that the openings in the recess of a cartridge 12 inserted in the cavity face the injection opening 113. In one embodiment, four openings 113 are located on the side walls of the nozzle 112 and one on its top part 54.

[0069] The protruding nozzle 112 is connected to a conduit 29 (not represented) located within the bottom part 111 of the cavity 16. Alternatively, the conduit 29 may be located on the surface of the bottom part 111 either towards the inside of the cavity 16 or the outside of the cavity 16. The conduit 29 is connected to gas inlet pipe 28.

[0070] In another embodiment, the protruding nozzle 112 may be located on the partial side walls 110 of the cavity 16.

[0071] A recess 109 is disposed on the top surface of the tray 107 around the top edges of cavity 16. The section of the recess 109 is slightly larger than that of the lip 39 of cartridges 12 so that the lip 39 of a cartridge 12 received in the cavity 16 perfectly slots the recess 109.

[0072] A mechanism to automatically open a cartridge according to the invention, while the drawer 10 slides into the platform 68, is now described with reference to **figures 9a to 9e**.

[0073] The device 2 comprises a pair of parallel arc-shaped bars 33 between which a flat blade 31 is attached. The blade 31 is fixely attached tangent to the cylindrical surface formed between the arc-shaped bars 33. The blade 31 is preferably a semi-circular or semi-oval blade, its straight side being connected to the arc-shaped bars 33 through rods 31a. The small and long diameters of the blade 31 are slightly smaller than these of the opening 35 of the cartridge 12.

[0074] The arc-shaped bars 33 rotate around the infusion container 6 through the platform 68 and within the pair of arc-shaped arms 71. The sliding movement of the drawer 10 in the platform 68 is linked to the movement of the arc-shaped bars 33.

[0075] The arc-shaped bars 33 are positioned tangent to the sliding direction of the receptacle 10. The arc-shaped bars 33 are located tangent to the tray 107 of the drawer 10 and on each side of the top part of cavity 16

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of the drawer 10.

[0076] Figure 9a shows the position of the blade 31 in relation to the cartridge 12, when the drawer 10 starts sliding into the platform 68. The arc-shaped bars 33 rotate and soon the lip 29 of the cartridge 12 is trapped between the arc-shaped bars 33 and the recess 109 of the tray 107. The edge of the blade 31 touches and pierces the first sheet 50 inside the opening 35 of the cartridge 12 close to the opening edge. Figure 9b to 9d shows the position of the blade 31 in relation to the cartridge 12, while the drawer 10 keeps on sliding into the platform 68. The arc-shaped bars 33 keep on rotating; the blade 31 follows a circular movement in and out of the cartridge 12 cutting the sheet 50 close to the edge of the opening 35. It is important that the cartridge 12 is remained blocked in the cavity 12 between the arc-shaped bars 33 and the recess 109 of the tray 107, so that the blade 31 may perform a proper and efficient cut of the sheet 50.

[0077] Figure 9e shows the position of the blade 31 in relation to the cartridge 12, when the drawer 10 reaches its final position in the platform 68. When the blade 31 moves out of the cartridge 12, it pushes away of the cartridge 12 the part of the sheet 31 it just cut out. The cut out part remains partially attached to the sheet 31. The whole opening 35 is accessible.

[0078] In another embodiment, the cut out part of the sheet 50 is entirely separated from the sheet 50 and is dragged away by the blade 31, when the blade 31 moves out of the cartridge 12. The cut out part falls by gravity onto the ejection chute 106 and is collected within the second waste container 78.

[0079] The blade 31 could be of any shape adapted to the section of the opening 35. The dimensions of the blade need to be smaller than these of the opening 35, to allow the blade 31 to slide in and out of the cartridge 12 via the opening 35 and to cut the sheet 50.

[0080] Once the drawer 10 is closed within the platform 68 and once the top sheet 50 of the cartridge 12 has been cut out, the tray 107 is raised up away from the side panels 104a, 104b. The lip 39 of the cartridge 12 located in the recess 109 of the tray 107 is brought into contact with the bottom opening 8 of the infusion container 6. A gasket 84 disposed on the edge of the bottom opening 8 ensures a hermetic connection between the infusion container 6 and the lip 39. The cartridge 12 is firmly maintained blocked within the cavity 16.

[0081] The dimensions of the opening 8 of the infusion container 6 are equal or larger than those of the section of the cavity 16 on the tray 107 to surround the opening 35 of the cartridge 12. The dimensions of the opening 8 of the infusion container 6 are smaller than those of the section of the recess 109 of the tray 107.

[0082] The device 2 further comprises a movable snapping insert 81 (not represented) located in the platform 68. The movement of the insert 81 is controlled by the operating means of the device 2. The insert 81 is operated to be brought to contact with the cavity 16 of the tray 107. The insert 81 is adapted to fit exactly together with the edge of the side walls 110 of the cavity 16 and with the bottom part 111 of the cavity 16. The insert 81 is also adapted to fit together with the bottom surface of the tray 107. A gasket 83 (not represented) may be disposed on each part of the insert 81 adapted to contact the cavity 16. The insert 81 is connected to the passage 18.

Once the drawer 10 is closed within the platform 68 and once the tray 107 has been brought to contact with the bottom opening 8 of the infusion container 6, the insert 81 is operated and brought to contact with the cavity 16, so the cavity 6 and the insert 81 fit exactly together. The gasket 83 ensures that the surfaces of contact between the insert 81, the cavity 16 and the tray 107 are hermetic. The infusion container 6, the tray 107 the cavity 16 and the insert 81 form a hermetic infusion chamber closed by the passage 18.

[0083] A mechanism for ejecting from the cavity of the drawer 10 a cartridge according to the invention is now explained in respect with **figures 10a to 10c.**

[0084] Figure 10a shows the drawer 10 closed within the platform 68 in the first position. Fig. 10b shows the tray 107 in an intermediate position, sliding on the side panel 104a, 104b towards the inside of the platform 68. Fig. 10c shows the tray 107 sliding further towards the inside of the platform 68 in a third position, where the tray 107 folds up around the hinge 108. The second panel 107b slides out of the third runner 103 and falls on the ejection chute 106. The cavity 16 comprising partial side walls 110 along the first panel 107a only, the cartridge 12 is not held within the cavity 16 anymore. The cartridge 12 is released from the cavity 16; it falls on the ejection chute 106 and slides down toward the ejection conduit 24 in the arm 69. While the cartridge 12 falls down on the ejection chute 106, the cut out part of the sheet 50 is pushed back toward the sheet 50 and partially closes the opening 35 of the cartridge 12. The infusible substances 14 are maintained within the cartridge 12.

[0085] The ejection mechanism to withdrawn the cartridge 12 allows to eject the cartridge smoothly. It prevents the infused substances 14 contained in the cartridge 12 from falling out of the cartridge 12. Some infused substances may still fall out of the cartridge 12 when it is dropped onto the ejection chute 108. They are collected on the ejection chute 108 in any case.

[0086] The drawer 10 and the insert 81 of another device in which the cartridge 12 according to the invention is used are now explained in respect with **figure 8**. A mechanism for detecting a cartridge 12 in the cavity 16 is also presented.

[0087] The drawer 10 comprises a tray 107 with a cavity 16 adapted to receive a cartridge 12. The cavity 16 comprises side walls 110 connected to the tray 107. The side walls 110 form a partial cone or cylinder, truncated at the bottom part. When a cartridge 12 is inserted in the cavity 16b, it is maintained in the cavity 16 through its lip resting upon the upper surface of tray 107; the side walls 45 of the cartridge 12 lay upon the side walls 110 of the

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cavity 16.

[0088] The device 2 further comprises a movable insert 81 located in the platform 68. The movement of the insert 81 is controlled by the operating means of the device 2. The insert 81 is operated to be brought to contact with the cavity of the tray 107. The insert 81 adapted to fit exactly together with the edges 114 of the side walls 110 of the cavity 16. A gasket 83 may be disposed either on the insert 81 or on the edges 114 of the side walls 110 to ensure a hermetic contact between the cavity 16 and the insert 81. The insert 81 is connected to the passage 18.

[0089] A protruding nozzle 112, preferably cylindrical or frustrocone-shaped, is located in the insert 81 towards the inside of the cavity 16. The protruding nozzle 112, provided with openings 113 for the ejection of gas, is connected to a conduit 29 located within the insert 81; the conduit 29 is connected to the inlet pipe 28.

[0090] The insert 81 comprises a detector to detect whether a cartridge 12 is slot in the cavity 16 or not. The detector comprises an actuating push-button 82, located around the protruding nozzle 112 and connected to the circuitry 25 of the device 2. The push-button 82 is able to slide up and down along the protruding nozzle 112. When pushed down, it actuates part of the functioning of the device 2. The push-button 82 is cone-shaped, truncated at the level of its top part. The diameter of the bottom section (at the level of the bottom part 42) of the recess 46 of a cartridge 12 is larger than that of the top section of the push-button 82. Preferably the angle of the cone of the recess 46 is substantially identical to that of the cone of the push-button 82.

[0091] Once the drawer 10 is closed within the platform 68 and once the tray 107 has been brought to contact with the bottom opening 8 of the infusion container 6, the insert 81 is operated to be brought to contact with the cavity 16, so the cavity 6 and the insert 81 fit exactly together. The cartridge 12 is firmly maintained in the cavity 16, its lip 39 between grasped between the upper surface of the tray 107 and the edge of the opening 8 of the infusion container 6. While the insert 81 is raised up, the protruding nozzle 112 and the push-button 82 move into the recess 46 of the cartridge 12. The outside side surface of the push-button 82 is brought into contact with the side surface of the recess 46.

[0092] The push-button 82 keeps on moving into the recess 46, sliding along the surface of the recess 46 until the push-button 82 is blocked between the surface of the recess 46 and the protruding nozzle 112. As the insert 81 keeps on sliding up, the push-button 82 is pressed down by the surface of the recess 46 of the cartridge 12; the push-button creates a new connection in the circuitry 25 for the actuation of a process in the device 2. Once the insert 81 is brought into contact to the edges 114 of the cavity 16, the protruding nozzle 112 is located inside the recess 46 of the cartridge 12, so that the openings 113 of the protruding nozzle 112 face the openings 48 of the recess 46.

[0093] Once the cartridge 12 is removed from the cavity 12 whether automatically or manually, it releases the push-button 82. Similarly, the release of the push-button 82 may control at least a step in the functioning of the device 2.

[0094] A cartridge according to another embodiment of the invention is now explained with respect to **figure 7F**. The bottom part 42 of the cartridge comprises a recess 46a towards the inside of the cartridge 12. The recess 46a consists of a first truncated cone 46a1, its larger section being at the level of the bottom part 42 of the cartridge 12 and of a second truncated cone or cylinder 46a2 "stacked" upon the first cone 46a1. The intersection between the first and second cone 46a1 and 46a2 constitutes an actuating surface 46b. The recess 46a2 comprises openings 48 for letting gas pass through.

[0095] The diameter of the bottom section of the recess 46a1 is larger than that of the top section of the push-button 82. Preferably the angle of the cone of the recess 46a1 is substantially identical to that of the cone of the push-button 82.

[0096] In use, when the insert 81 is raised up, the protruding nozzle 112 and the push-button 82 of the insert 81 move into the recess 46a1 of the cartridge 12. The outside side surface of the push-button 82 is brought into contact with the side surface of the recess 46a1. The push-button 82 slides along the surface of the recess 46a1 until being blocked by the actuating surface 46b. As the insert 81 keeps on sliding up, the push-button 82 is pressed down by the surface 46b; the push-button creates a new connection in the circuitry 25 for the actuation of a process in the device 2. Once the insert 81 is brought into contact to the edges 114 of the cavity 16, the protruding nozzle 112 is located inside the recess 46a2 of the cartridge 12, so that the openings 113 of the protruding nozzle 112 face the openings 48 of the recess 46a.

[0097] While various embodiments of the present invention have been described in detail, it is apparent that modifications and adaptations of those embodiments will occur to those skilled in the art. It is to be expressly understood, however, that such modifications and adaptations are within the scope of the present invention.

Claims

1. Cartridge (12) for containing infusible substance (14) for use in a device for preparing an infused beverage (4), including:

   a bottom part (42) provided with a filter (44) adapted to let liquid (4) pass through;
   a top part (38) provided with an opening (35);
   side walls (45) joining the bottom (42) and top (38) parts;

   characterized in that
   the bottom part (42) forms a recess (46) arranged

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toward the inside of the cartridge (12), the surface of the recess (46) comprising an actuating surface for actuating a mechanism of the device.

2. Cartridge (12) according to claim 1, wherein the recess (46) is provided with at least an opening (48) for letting gas pass through.

3. Cartridge (12) according to any of the preceding claims, wherein the opening of the top part (38) is provided with and closed by a extendable and/or deformable filter arranged toward the outside of the cartridge (12) with respect of the opening (35).

4. Cartridge (12) according to any of the preceding claims, wherein the opening of the top part (38) is provided with and closed by a sheet (36), arranged toward the outside of the cartridge (12) with respect of the opening (35).

5. Cartridge (12) according to any of the preceding claims, wherein the bottom part (42) is provided with and closed by a removable sheet (50), arranged toward the outside of the cartridge (12) with respect of the filter (44).

6. Cartridge (12) according to any of the preceding claims, wherein the recess (46) has a substantially cylindrical or frustroconical form defining recess side walls (52) and a recess top (54), and wherein the at least one opening (48) of the recess (46) is provided through the recess side walls (52), or/and through the recess top (54).

7. Cartridge (12) according to claim 6, wherein the bottom section of the recess (46) has a diameter comprised between 2 and 15 millimetres, or more particularly between 2 and 6 millimetres.

8. Cartridge (12) according to anyone of the preceding claims, having a substantially cylindrical or frustroconical form.

9. Cartridge (12) according to claim 8, wherein the angle (α) formed by the side walls (45) and the bottom part is comprised between 90 degrees and 100 degrees, or more particularly between 93 degrees and 97 degrees.

10. Cartridge (12) according to any of the claims 1 to 9, made of food contact approved aluminium or aluminium having its inner surface covered with a food contact approved coating and able to resist to temperatures at least up to 100°C during several minutes.

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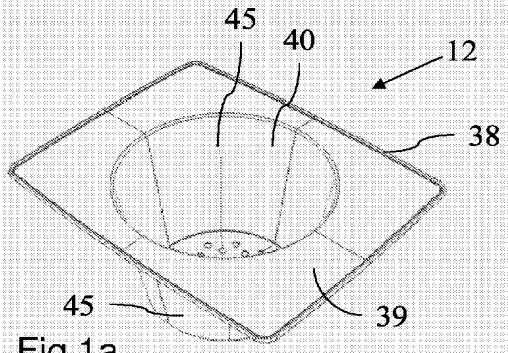


Fig 1a

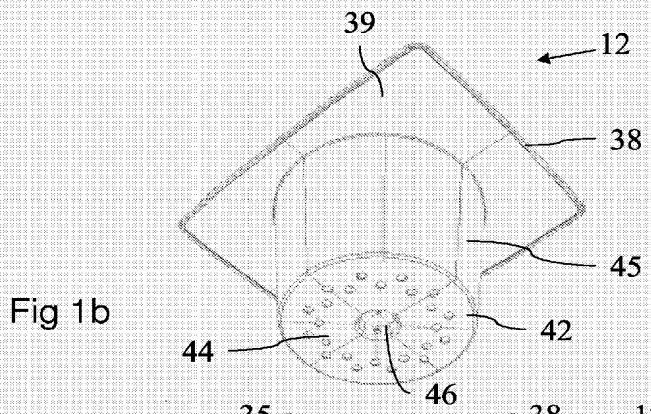


Fig 1b

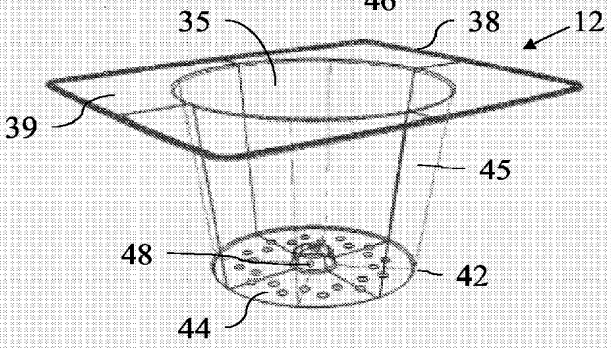


Fig 1c

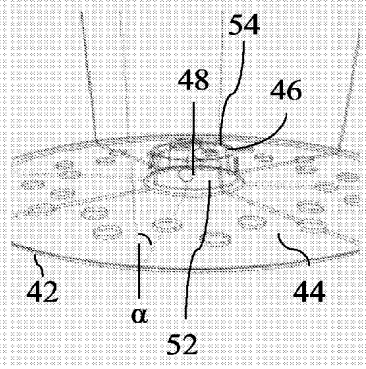


Fig 1d

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FIG 1E

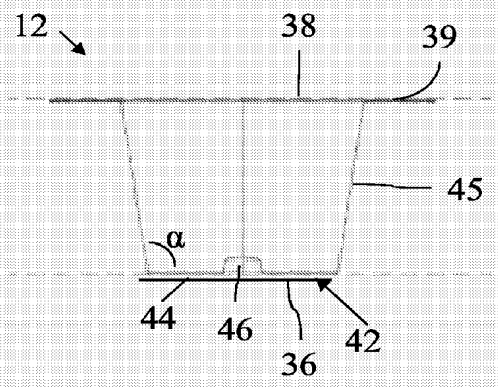
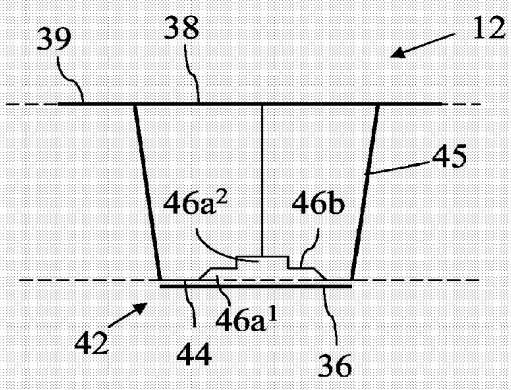
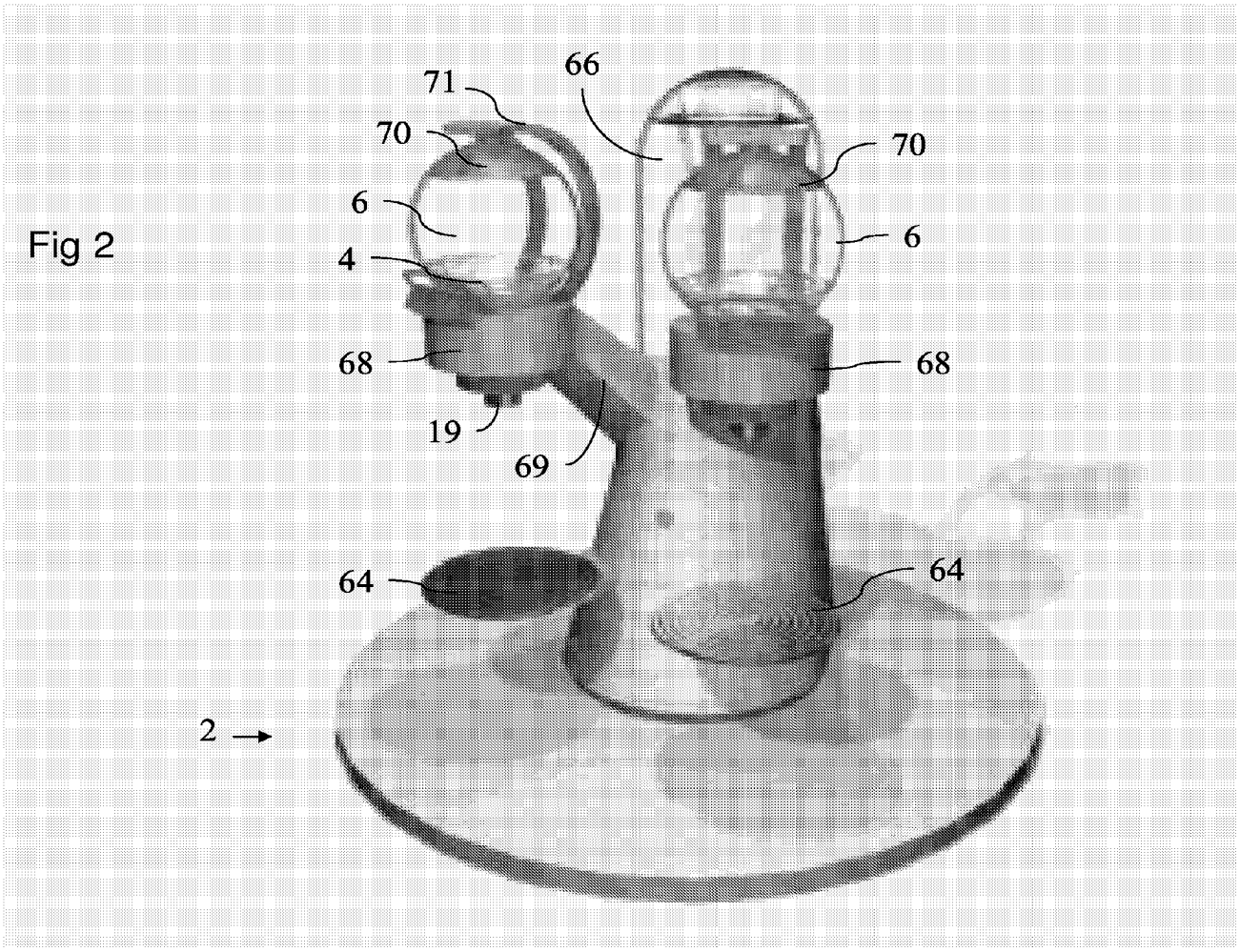


FIG 1F



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Fig 2



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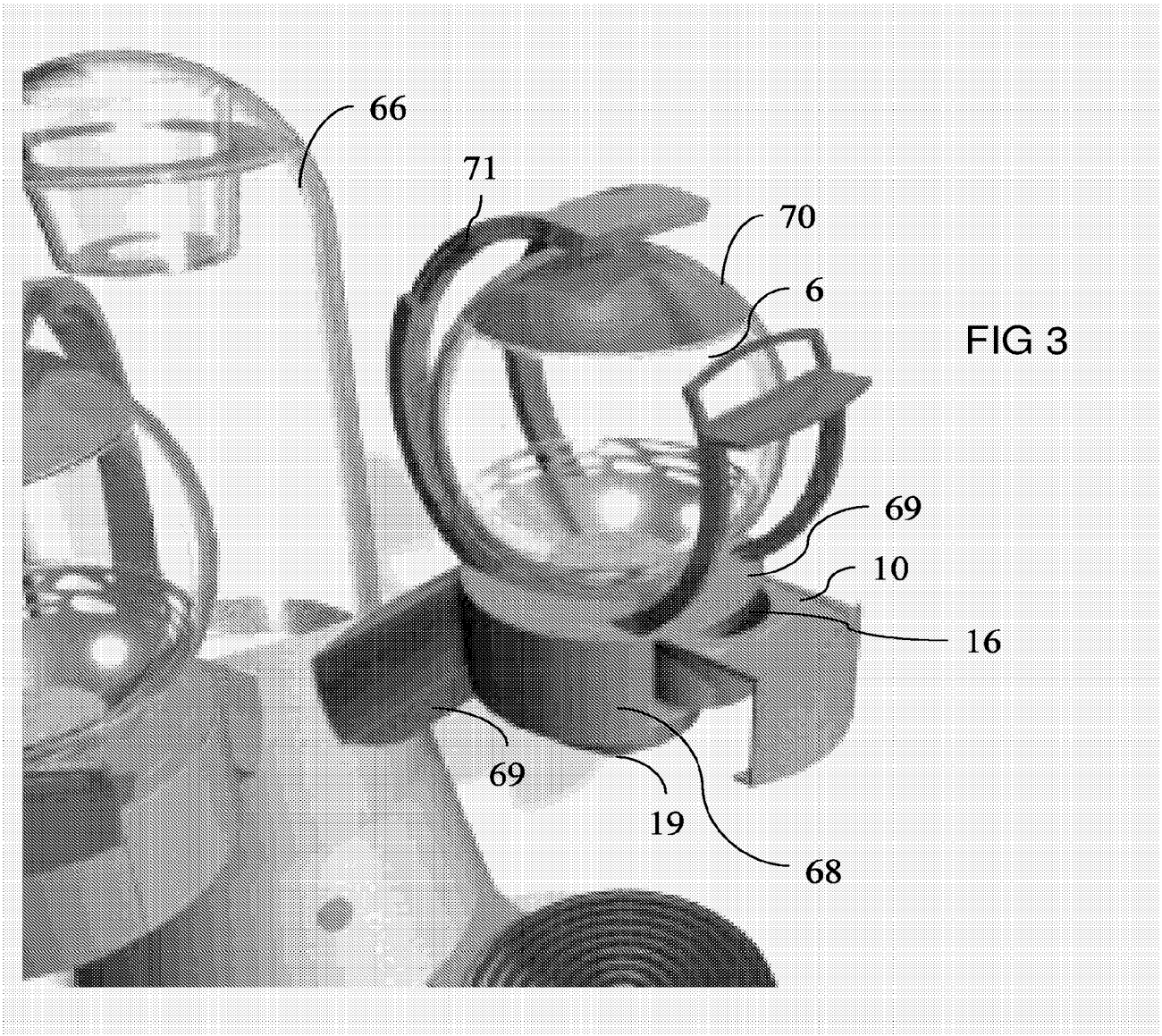
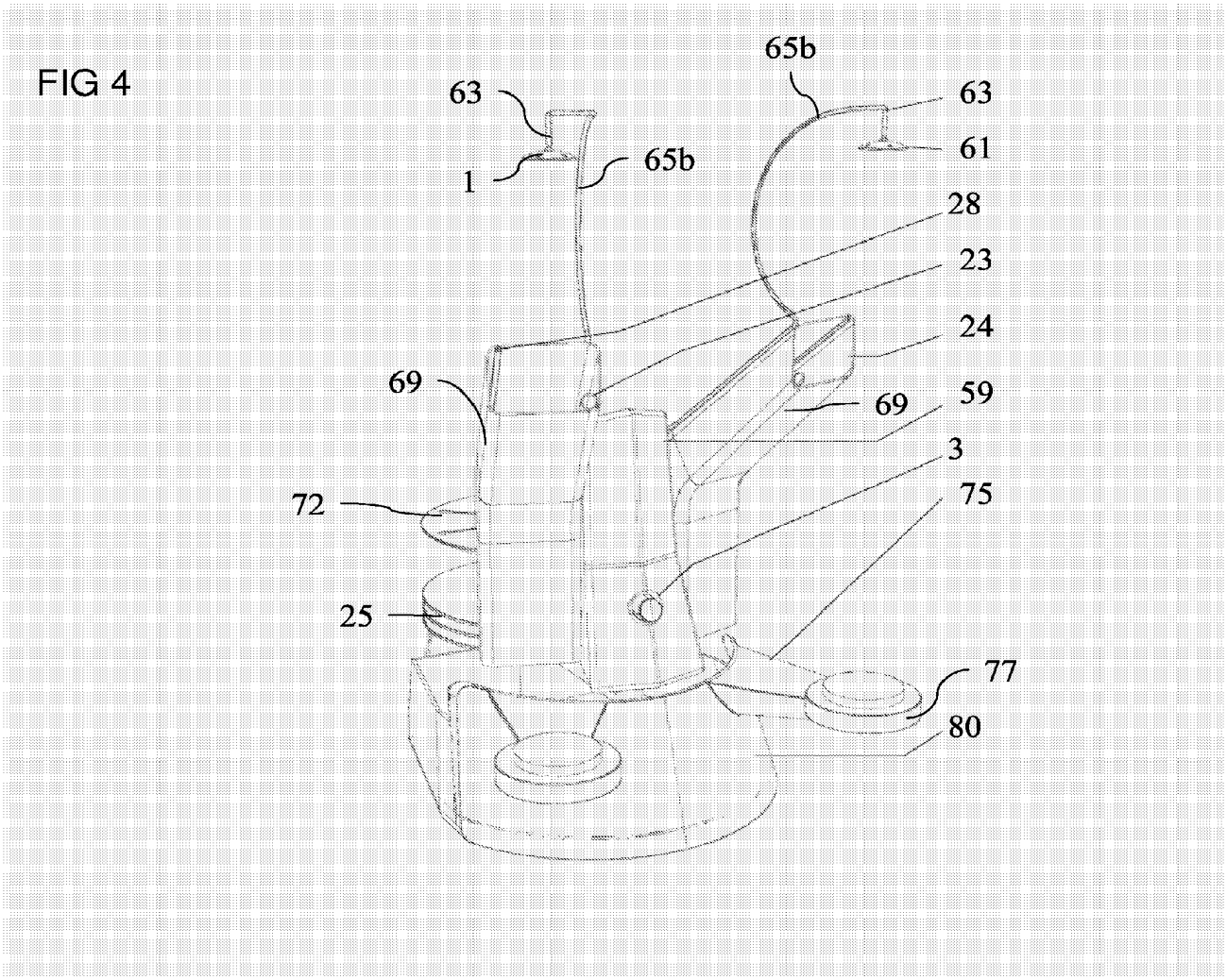


FIG 3

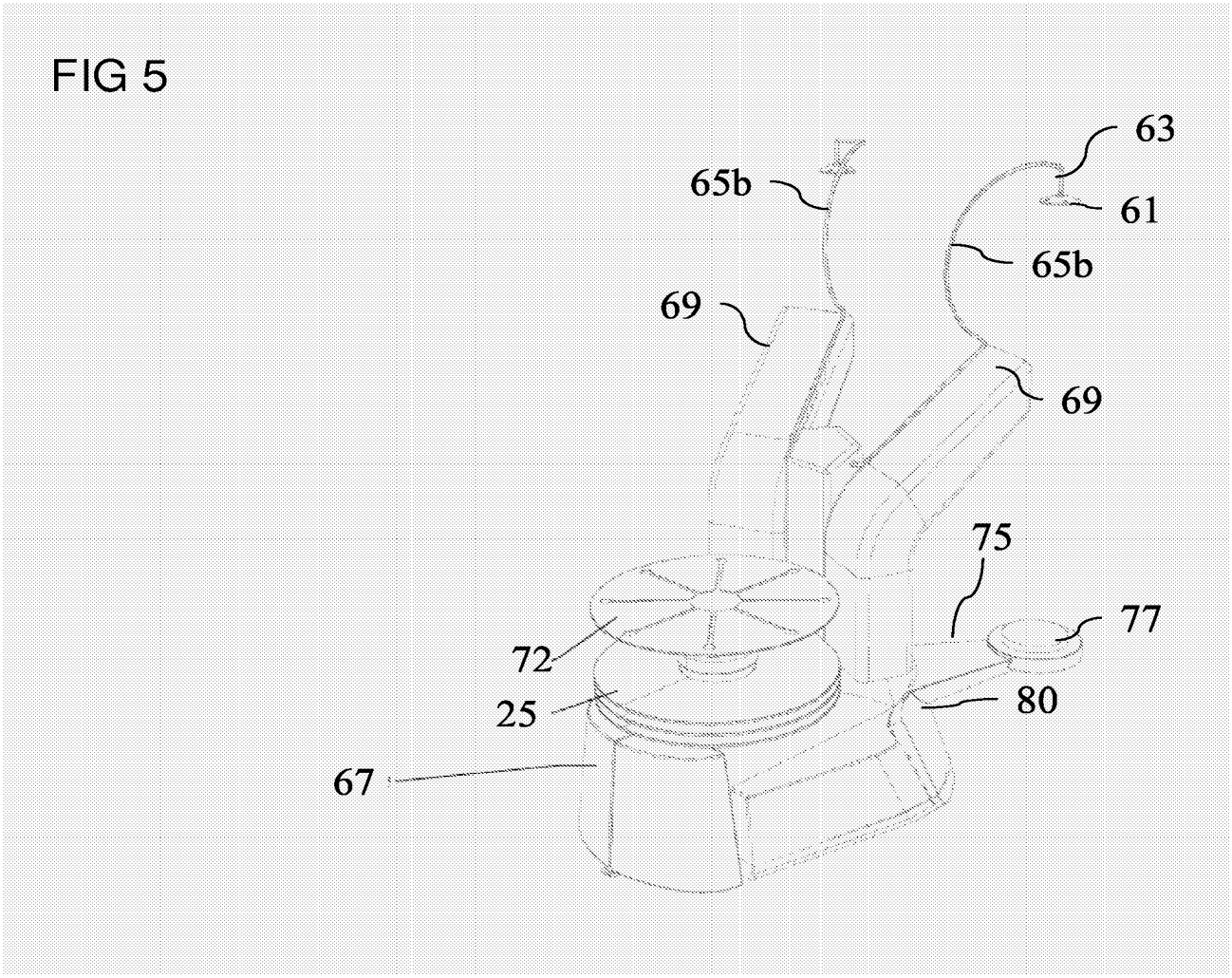
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FIG 4



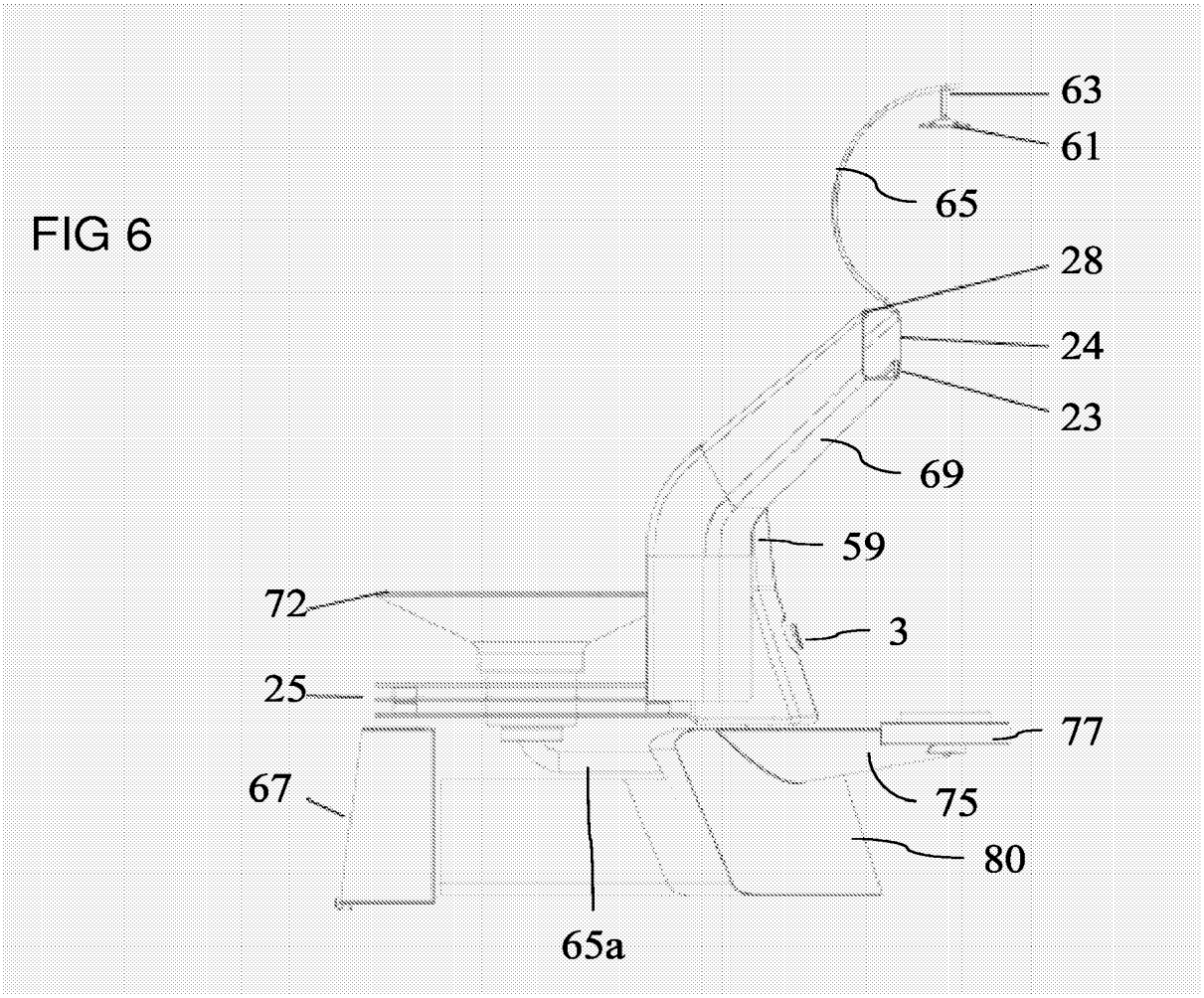
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FIG 5



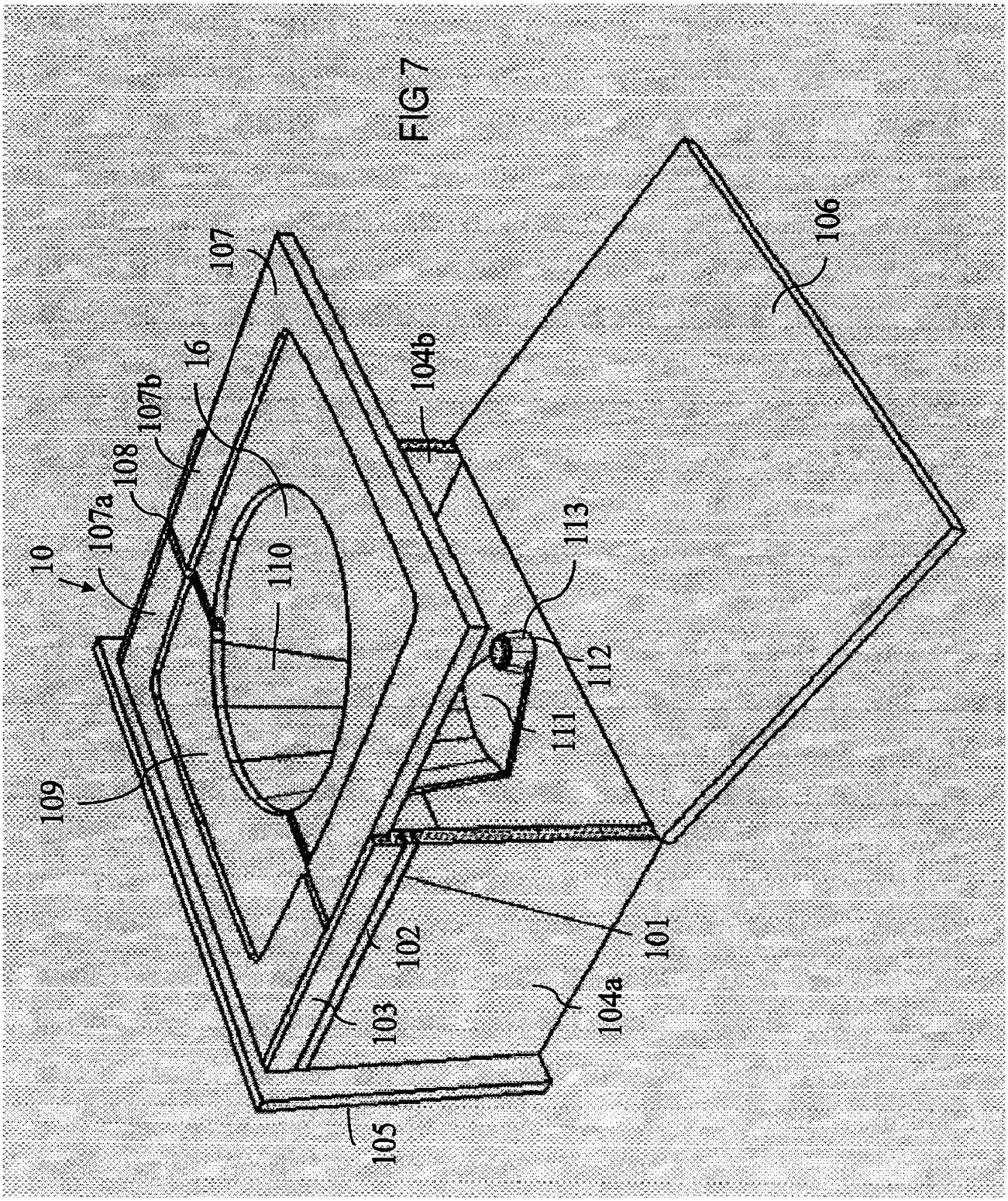
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FIG 6



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FIG 7



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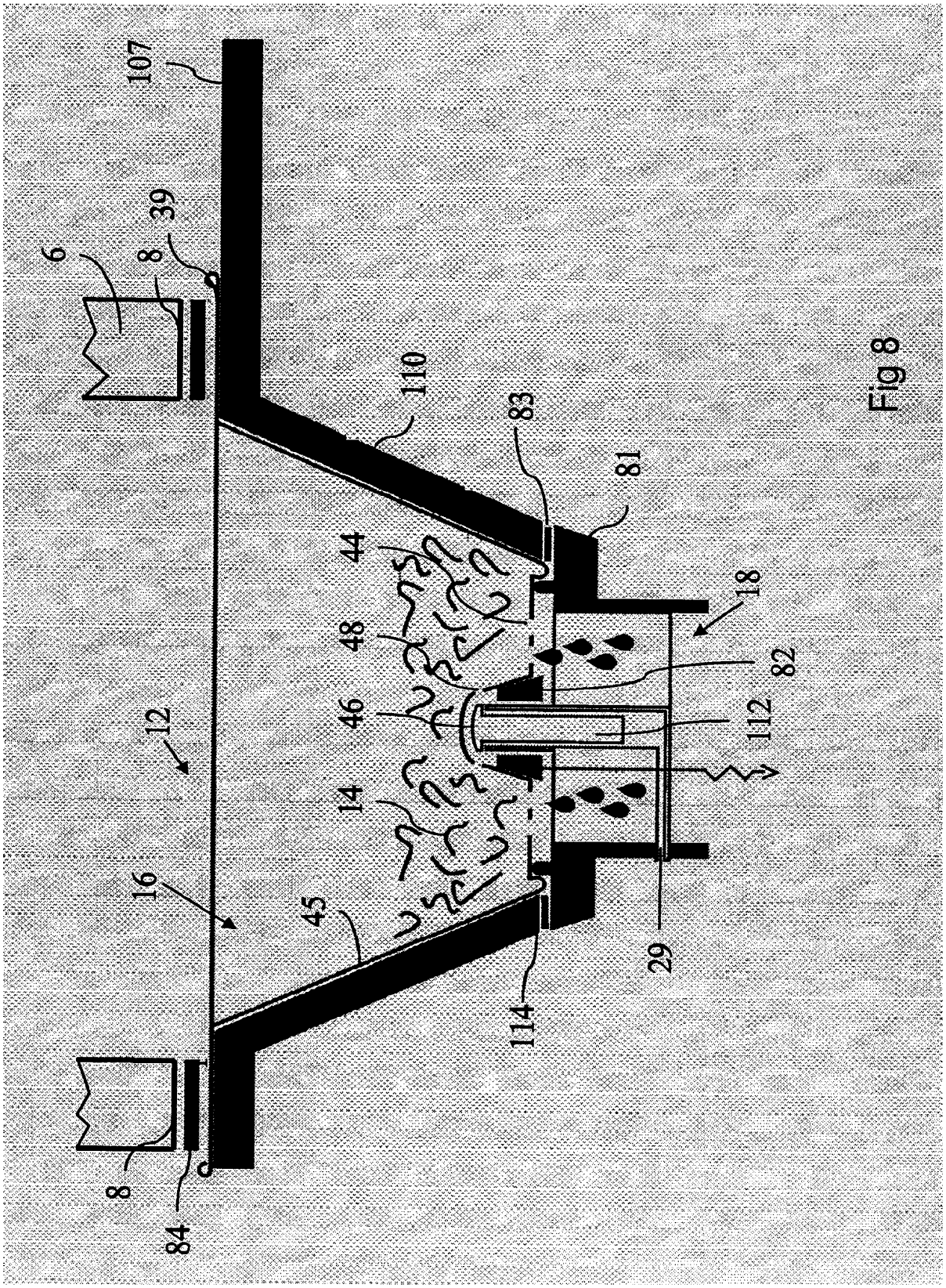
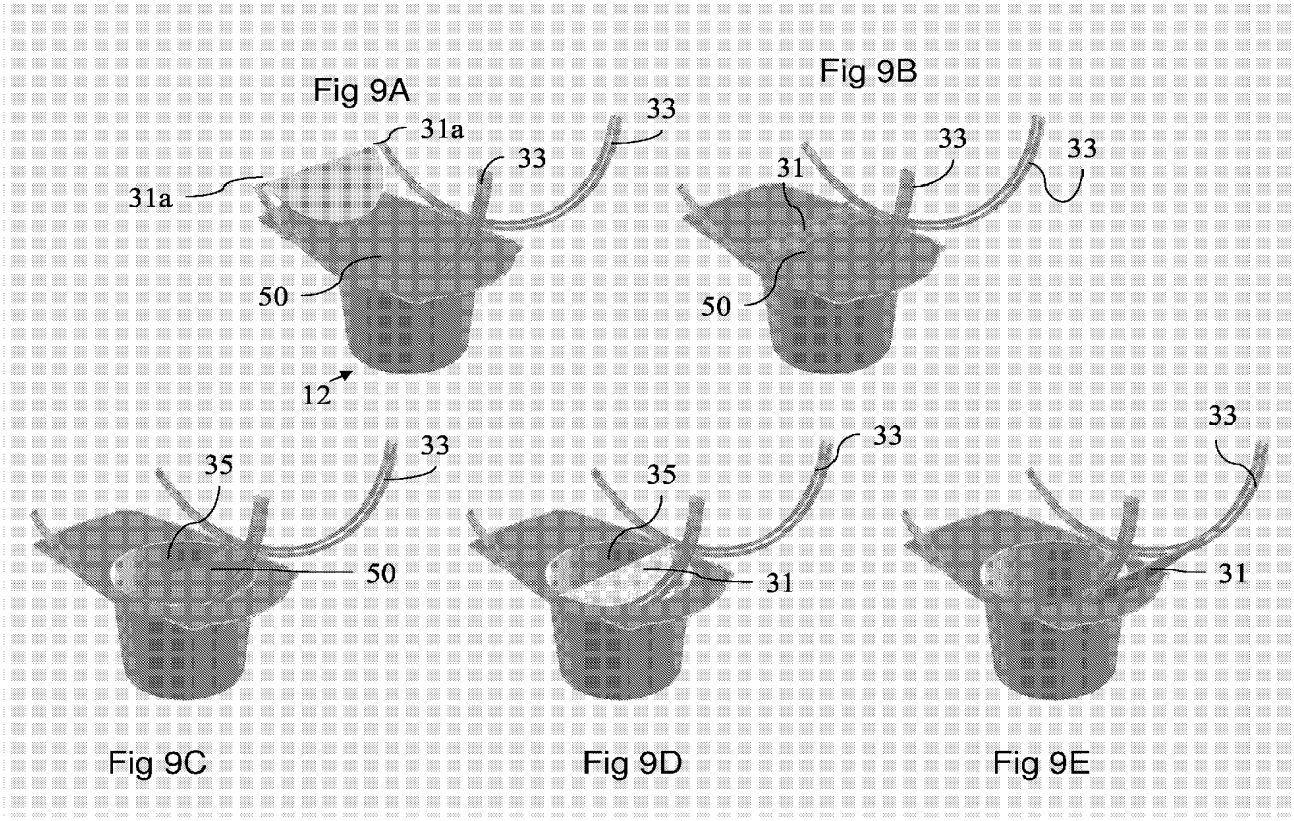


Fig 8

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FIG 10A

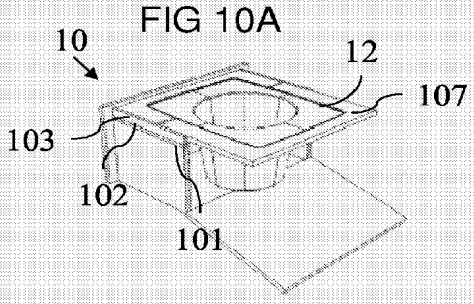
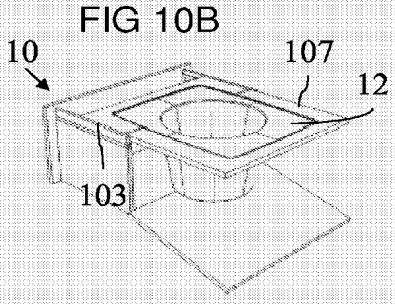


FIG 10B



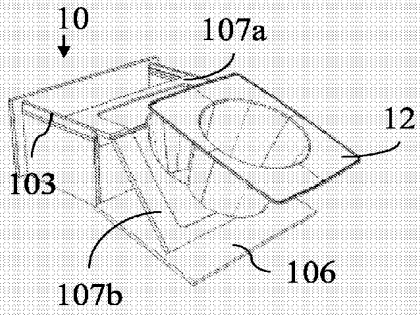


FIG 10C

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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 9370

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2005/150390 A1 (SCHIFFERLE RENE) 14 July 2005 (2005-07-14) * paragraphs [0017] - [0020]; figures 1,2 *	1,3-10	B65D85/804
X	US 2 778 739 A (RODTH JOSEPH J) 22 January 1957 (1957-01-22) * column 2, lines 9-66; figures 1,2 *	1,2,4,6, 8	
X	EP 1 344 724 A (HALE, ROBERT) 17 September 2003 (2003-09-17) * paragraphs [0048], [0049]; figures 18,19 *	1,4,6,8	
X	US 4 550 024 A (LE GRANSE ET AL) 29 October 1985 (1985-10-29) * column 3, line 57 - column 4, line 15; figure 1 *	1,3,4, 6-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 February 2006	Cazacu, C

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13-02-2006

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(51) Int. Cl **A47J 31/06**
A47J 31/02
B65D 81/34

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(71) Applicant: **KASHIWAGI MOLD:KK**

(72) Inventor: **JUSO MITSUAKI**

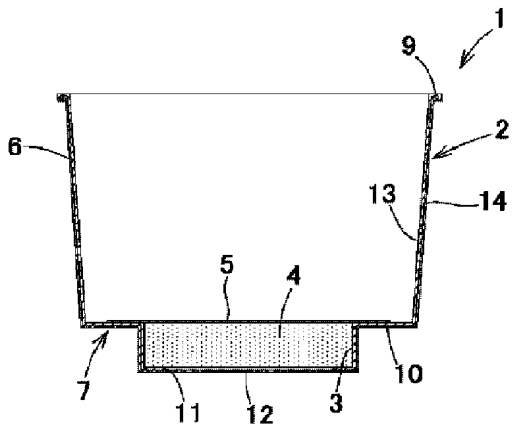
(54) **DRIPPING CARTRIDGE**

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(57) Abstract:

PROBLEM TO BE SOLVED: To provide a dripping cartridge which can be prepared cheaply, is disposable, can reduce its packed volume, can reduce the shipping cost and can improve the portability.

SOLUTION: This dripping cartridge has a cartridge-shaped base material layer 13 which is made of a thermoplastic synthetic resin material and has an extraction hole 11 at the bottom and a nonwoven fabric layer 14 which is made of a thermoplastic synthetic resin material and is laminated wholly on the inside or outside of the base material layer 13 to cover the extraction hole 11 and constitute a filter 12 in the extraction hole 11. This dripping cartridge is prepared by laminating a nonwoven sheet made of a thermoplastic synthetic resin material having a filter function wholly on at least one side of a bored thermoplastic synthetic resin sheet and then subjecting this laminated material sheet to a sheet-forming operation to form it into a cartridge shape having an extraction hole at the bore.



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(74) Agent: **BORNE, Patrice**; Avenue Nestlé 55, -, CH-1800 Vevey (CH).

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[Continued on next page]

(54) Title: CAPSULE, SYSTEM AND METHOD FOR PREPARING A BEVERAGE BY CENTRIFUGATION

(57) Abstract: Capsule for the preparation of a beverage comprising a container and a beverage ingredient contained therein, wherein the container comprises a code (65) adapted for being identified or read by external reading means (62), wherein the code is arranged on the container to be read while the capsule is rotated around an axis of rotation traversing the capsule.

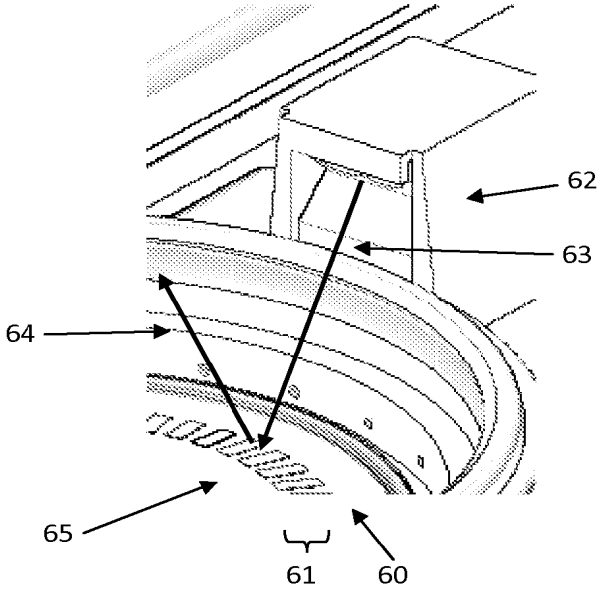


Fig. 2

WO 2011/141532 A1

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CAPSULE, SYSTEM AND METHOD FOR PREPARING A BEVERAGE BY CENTRIFUGATION

Introduction

The invention relates to the preparation of a beverage by use of a capsule containing beverage ingredient in a beverage production device. The present invention in particular focuses on the detection of the capsule.

Background art

The preparation of a beverage by a capsule containing beverage ingredient is known. In general, the capsule is inserted in a beverage production device, such as a coffee machine, liquid is fed in the capsule and a beverage is extracted from the capsule under pressure or by gravity.

The preparation of a beverage by using the centrifugation is known. The principle mainly consists in providing beverage ingredient in a container of the capsule, feeding liquid in the receptacle and rotating the receptacle at elevated speed to ensure interaction of liquid with powder while creating a gradient of pressure of liquid in the receptacle; such pressure increasing gradually from the centre towards the periphery of the receptacle. As liquid traverses the coffee bed, extraction of the coffee compounds takes place and a liquid extract is obtained that flows out at the periphery of the receptacle.

The term "capsule" refers to any flexible, rigid or semi-rigid container containing beverage ingredient. Other synonymous to a capsule are: "pod", "pad", "cartridge" or "sachet". The capsule can be single use. The container can also be filled with ingredient by the user to form the capsule just before use.

The term ingredient means any suitable beverage substance such as ground coffee, soluble coffee, leaf tea, soluble tea, herbal tea, dairy powder, baby food, culinary powder and combination thereof.

The invention relates more particularly to the identification of the capsule by means of a code. The code may be necessary to control parameters in the beverage preparation device such as liquid or beverage flow rate, pressure, rotational speed, temperature and combinations thereof.

EP0451980 relates to packages containing comestibles for the preparation of beverages. Recognition means can comprise one or more strips of a magnetic material applied to the body of the package which can be read by an appropriate magnetic sensor, one or more

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shaped or divided areas of metal foil applied to the package body which cause an inductive effect on movement of the package in the machine, which inductive effect can be sensed; or one or more electrically conductive areas formed on the body of the package which can be sensed electrically.

WO02/28241 relates to an encoded coffee packet for use in the preparation of hot or cold beverages comprising a filter defining a cavity and a brewing ingredient within the cavity. The packet further comprises a machine-interpretable feature located on the filter such as a color, a shape, a glyph, a text string, a barcode or a digital watermark.

WO02/078498 relates to a machine-readable identifier on a portion package which contains ground coffee for espresso machine. The identifier can be a concentric barcode which is read when the capsule turns around an axis which is placed outside of its perimeter such as when the capsule is stored in a carousel.

WO2005044067 relates to a system for identifying a capsule having a code visible under UV light printed thereon or a magnetic code such as a ribbon or label. The code may be read by a turning magnetic reading head. However, such system is not adapted for detecting a capsule in a device using centrifugal forces for extracting the beverage.

WO2009007292 relates to a method for reading barcodes in a drinks machine when the brewing chamber is being closed from an open position to a closed position.

WO2010/026053 relates to a controlled beverage production device using centrifugal forces. The capsule may comprise a barcode provided on an outside face of the capsule and which enables a detection of the type of capsule and/or the nature of ingredients provided within the capsule in order to apply a predefined extraction profile for the beverage to be prepared.

A problem with identifying a capsule in a beverage preparation machine is that the retrieving or reading information from the capsule is not always reliable or convenient. The present invention brings a solution to this problem.

Brief description of the invention

The aim of the present invention is to propose an improved way to identify the capsule within a beverage production machine to ensure a more reliable and convenient retrieval or reading of information so as to adjust working parameters of the machine.

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This aim is achieved by a capsule for the preparation of a beverage comprising a container and a beverage ingredient contained therein, wherein the container comprises a code adapted for being identified or read by external reading means, wherein the code is arranged on the container to be read while the capsule is rotated around an axis of rotation traversing the capsule.

More particularly, the capsule has a circumference wherein the code is arranged on the container along an arc-shaped or circular path of the circumference. In a particular mode, the capsule has a circumference wherein the code comprises successive segments which are individually rectilinear but extend substantially along at least a part of the circumference. More particularly, the code is arranged along at least a eighth of the circumference. This configuration provides a reliable reading or retrieval of information as well as an effective portion for information. In order to ensure a reliable reading or retrieval of information, the code is repeated along said circumference. The repetition ensures a higher probability that at least one code is readable but also may potentially reduce the reading time.

Preferably, the code is an optical code. The code may be a bit code formed by a series of discrete polygonal (e.g., rectangles or squares) or dot surfaces printed on the container and/or embossed in the container.

The code may printed by a visible ink by human eyes under natural light or, alternatively, an ink which is not visible by human eyes under natural light (e.g., ink visible under UV).

Preferably, the code is printed or embossed to form a pattern which possesses surfaces having different reflective and/or absorbing properties to light. In particular, the pattern possesses first surfaces and second surfaces having different reflective and/or absorbing properties to light. More particularly, the pattern possesses first surfaces inclined mirroring or absorbing properties to light and second surfaces having flat mirroring or flat reflective properties to light.

In a possible mode, the code is mechanically embossed or engraved on the container by laser or by other means such as a press.

In an embodiment, the container comprises a body and a lid connected to the body and wherein the code is present on the lid of the container. The lid may be a closed foil and/or a filter, for example.

In another embodiment, the code is present on the rim of the capsule. In the most preferred embodiment, the code is present on the bottom of the rim of the capsule which is opposed to

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the lid of the capsule. The bottom of the rim is sufficiently away from the liquid injection and beverage delivery areas so that there is a lower risk for the code to become unreadable such if partly or totally hidden or soiled by beverage residues or otherwise (e.g., coffee particles). As a result, the reading is made more reliable. The reading may also be carried out while the capsule is in place in the beverage production device. Therefore, the preparation of the beverage is simplified and the preparation time can be reduced.

The invention further relates to a system for preparing a beverage from a capsule as aforementioned and further comprising a beverage preparation device; wherein the device comprises capsule holding means for holding the capsule and rotational drive means for driving the holding means and capsule in rotation along said axis of rotation and reading means arranged for reading the code when the capsule is rotated along said axis.

In particular, the reading means may comprise a light emitter and a light sensor. In an alternative, the reading means comprises an inductive sensor. The optical reading means or inductive sensor may be arranged to detect a code on the rim of the capsule.

The invention further relates to a method for preparing a beverage from a system comprising a capsule as aforementioned and a beverage preparation device; wherein the device comprises capsule holding means for holding the capsule therein and rotational drive means for driving the holding means and capsule in rotation along said axis of rotation and reading means arranged for reading the code when the capsule is rotated along said axis.

The invention is further described in the appended claims and the following detailed description.

Brief description of the figures

The present invention will be better understood thanks to the detailed description which follows and the accompanying drawings, which are given as non-limiting examples of embodiments of the invention, namely:

- figure 1 illustrates the basic principle of the centrifugal extraction,

- figure 2 illustrates the reading method of a mark on the lid surface of the capsule,

- figure 3 illustrates the reading method of an absence of the mark,

- figure 4 illustrates an alternate position of the code on the capsule, in particular, when placed on the underside of the rim of the capsule, and the capsule fitted into a capsule holder of the extraction device,

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- figures 5 and 6 illustrate the combination of a laser source and a detector in positive and negative detection, for example, for the alternate position of the code of figure 4,

- figure 7 illustrates the detection of a color code on the capsule, for example, for the alternate position of the code of figure 4.

Detailed description

Figure 1 illustrates an example of a beverage preparation system 1 as described in WO2010/026053 for which the capsule of the invention can be used.

The centrifugal unit 2 comprises a centrifugal cell 3. The cell 3 may comprise a capsule holder and a capsule received therein. The centrifugal unit is connected to driving means 5 such as a rotary motor. The centrifugal unit comprises a collecting part and an outlet 35. A receptacle 48 can be disposed below the outlet to collect the extracted beverage. The system further comprises liquid supply means such as a water reservoir 6 and a fluid circuit 4. Heating means 31 may also be provided in the reservoir or along the fluid circuit. The liquid supply means may further comprise a pump 7 connected to the reservoir. A flow restriction means 19 is provided to create a restriction to the flow of the centrifuged liquid which leaves the capsule. The system may further comprise a flow meter such as a flow-metering turbine 8 for providing a control of the flow rate of water supplied in the cell 3. The counter 11 can be connected to the flow-metering turbine 8 to enable an analysis of the generated impulse data 10. The analysed data is then transferred to the processor 12. Accordingly, the exact actual flow rate of the liquid within the fluid circuit 4 can be calculated in real-time. A user interface 13 may be provided to allow the user to input information that is transmitted to the control unit 9. Further characteristics of the system can be found in WO2010/026053.

In the following examples (see figure 4), the capsule comprises a cup-shaped body 69 extending by a flange-like rim 73. A lid such as a foil or membrane (liquid-tight or permeable to liquid) 60 is connected to the body, e.g., sealed on the rim. The capsule is filled with beverage ingredient such as ground coffee.

The capsule is designed for rotating around an axis A. This axis A crosses perpendicularly the center of the membrane which has the form of a disk. This axis A exits at the center of the bottom of the body. This axis A will help to define the notion of "circumference" which is a circular path located on the capsule and having the axis A as reference axis. This circumference can be on the lid, e.g., membrane or on the body part such as on the flange-like rim. The lid may be impervious to liquid before insertion in the device or it may be pervious

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to liquid by means of small openings or pores provided in the center and/or periphery of the lid. The code is spread along the circumference or a part of the circumference. The code may comprise successive arch-shaped segments. The code may also comprise successive segments which are individually rectilinear but extend along at least a part of the circumference.

According to one embodiment, the sensor cannot read the code without the rotation of the capsule. This is the case where the code is spread along at least a eighth, preferably at least a quarter of the circumference or even more. The fact that the code is placed along an arc-shaped line render the reading by a sweep beam very difficult. This is why the rotation of the capsule plays an important role. In case that the code is located on the body, it is then necessary to rotate the capsule to have access, for the sensor, to the entire set of marks composing the code. The code is further located close to the peripheral edge of the capsule. The peripheral edge is defined as the outermost circular line of the capsule. Preferably, the distance of the code from the peripheral edge is not more than 10 mm, more preferably not more than 8 mm.

According to an embodiment, the code is printed by an ink which is not visible by human eyes under natural light (e.g., ink visible under UV). In this case, the sensor further comprises a UV-light beam source and a UV detector.

The code is preferably repeated along the circumference in order to ensure a reliable reading. The code is repeated at least twice on the circumference. Preferably, the code is repeated three to six times on the circumference. Repetition of the code means that the same code is duplicated and the successive codes are positioned in series along the circumference so that upon a 360-degree rotation of the capsule, the same code can be detected or read more than one time.

EXAMPLES:

1) Optical reading on foil, respectively on top side rim of capsule (figures 2 and 3):

A light beam is projected onto the capsule's lid, e.g., membrane or foil 60, as illustrated on figure 2.

Onto the capsule foil 60, a plurality of bits forming the code 61 is applied along a circular or arc-shaped path.

Preferably, the code is placed on a flat portion of the lid and close to the peripheral edge of the capsule. The code is preferably placed the lid that is supported by the flange-like

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rim of the capsule or overlaps with the rim. Hence, the code is not distorted due to mechanical constraints and can be read more reliably.

The marks may consist of:

- Mirroring or absorbing surfaces for providing bit "0" and,
- Diffusing and reflective surfaces for providing bit "1"

The binary values “0” and “1” are arbitrary chosen and can be inversed.

The code is read by rotating the capsule along a central axis A (figure 1).

The reader or sensor 62 is part of the centrifugal unit 2 and consists of

- A light source with or without focusing optic and
- A light sensor with or without focusing optic.

The light can be:

- Non polarized or
- Polarized (laser) or
- Spectrum: Any, but preferably infra red.

The code can be applied on the capsule by:

- Printing (absorbing / reflecting + diffusing), visible, invisible or
- Embossing (mirroring + rough reflecting + diffusing) or
- Laser engraving.

Optionally, the bit code may also consist of different color patterns combined with a color reading device. The combination of different colors and reading at a specific rotational speed results in a well defined “mixed color”. As an example, a capsule with half the circumference in blue and the other half in yellow would result in reading a green color during rotation. In the same manner, one third in blue and the remaining part in yellow will give another color. In this case, the light could be a simple light source without specific convergence means.

As illustrated in figure 2, when the light beam 63, sent by the light source of the sensor 62, touches the mirror code pattern (small rectangles 65) it reflects in a reflective beam 64 which is not received by the sensor.

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As the capsule is rotated (figure 3), the light beam 63 touches a diffuse reflecting surface (surface between the small rectangles) and is partially reflected to the sensor. A reflective beam 66 is received by the sensor whereas other beams 67, 68 are diffused or reflected outside the sensor.

2) Optical reading on rim bottom side of capsule (figures 4 to7):

The capsule 7 may comprise a code 70 on the bottom side 72 of its rim 73. The bit code is formed of a succession of small rectangular surfaces having light mirroring properties and intermediate surfaces having flat mirroring and/or diffusing properties. The surfaces are arranged in a circular pattern or an arc-shaped pattern at least along an angular portion of the rim.

A light beam 74 is projected to the capsule's rim 73.

Onto the capsule rim, a bit code is applied along a circular or arc-shaped path of the rim.

The bit code may consist of:

- Inclined mirroring or (flat) absorbing surfaces for bit "0" and
- Flat mirroring or flat reflective (diffusing) surfaces for bit "1"

The bit code is read by rotating the capsule along its central axis A.

The reader may consist of

- A light source with/without focusing optic and,
- A light sensor with/without focusing optic.

The light can be:

- Non polarized or
- Polarized (laser) or
- Spectrum: Any, but preferably infra red.

The code can be applied on the capsule by:

- Printing (absorbing / reflecting + diffusing), visible, invisible or,
- Laser engraving (e.g. for absorbing / reflecting-diffusing) surfaces or,
- Embossing: Flat and inclined mirroring surfaces.

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In the embodiment of the figure 4, the light source is placed at the bottom of the centrifugal cell 3. This cell is light conductive allowing the beam to reach the bottom side 72 of its rim 73. The reflected light is conducted by the transparent (or light conductive) centrifugal cell 3 to reach the sensor 62. In case that the sensor 62 cannot be aligned with the transparent part of the centrifugal cell 3, a mirror can be placed as illustrated in the figure 4 to deflect the forward and backward beams.

On figure 5, the light beam 74 from the light source "L" touches the mirror surface of the code (small rectangle 81) and is reflected into a reflective beam 76 to the sensor "S" with high intensity. A bit such as "0" or "1" is thereby provided to the control unit.

On figure 6, the light beam 74 from the light source "L" touches diffusing or absorbing surfaces (surface 82 between two small rectangles). The light beam 77 that reaches the sensor S is of small intensity. Other beams such as beam 78 are diffused outside the sensor S due to the diffusing properties of the surface.

In each configuration (e.g., Figs. 5-6), a bit such as "1" or "0" is provided to the control unit.

Therefore, the number of bits and their bit code depend on the number and specific arrangement of mirror surfaces (e.g. rectangles) and diffusing or absorbing surfaces (e.g., zones between the rectangles). The same sequence of bits forming a "code" can be repeated several times on the circumference of the rim. This repetition provides redundancy and more reliability to the reading.

Optionally (figure 7), the code comprises different color patterns combined with a color reading device. The combination of different colors and reading at a specific rotational speed results in a well defined "mixed color". As an example, a capsule with half the "dots" in blue and the other half in yellow would result in reading a green color during rotation.

3) Application modes of codes onto a capsule

The codes described in the previous examples can be applied by different methods onto a capsule such as by:

- Printing or mechanical deforming on a formed capsule or,

- Printing or mechanical deforming on the capsule raw material (foil) before container forming or,

- Printing on outer surface of a capsule container or,

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- Printing on the inner surface of a capsule container, using the curl as information support (Aluminum capsule technology).

4) Inductive code reading:

Another mode consists in sensing a code provided on a metallic surface of the capsule using an inductive sensor. The code is formed by reliefs or recesses in the metallic surface. For instance, the capsule comprises a circumferential metal rim which comprises a succession of discrete slots and/or bumps. When the capsule is rotated about its central axis, the rim is moved relative to the sensor such that the slots and/or bumps are detected. The code can be read on a time base of a CPU of the beverage preparation device. The maximum rotational speed to read the code depends on the used sensor and the internal CPU of the device.

5) Other general characteristics to all embodiments:

The speed for reading can, for instance, be comprised between 0.1 and 1000 rpm.

When reading the code, liquid can already be fed in the capsule for providing a pre-wetting of the beverage ingredients.

The code preferably comprises three sections, the synchronization section, the payload section and the verification section. The synchronization section serves for the synchronization purpose i.e. to inform the sensor when the code begins. Since the speed of the rotation of the capsule can vary, the synchronization is achieved through a known sequence of bits such as 0,1,0,1. Then the payload of the code identifying the capsule can be read. In order to avoid misinterpretation of the code, the payload can be followed by verification bits. These bits can be a checksum on the payload or a similar verification function.

The code can be replicated along the code path so that if one code gives a wrong verification value, the other code(s) can be taken into account.

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CLAIMS :

1. Capsule for the preparation of a beverage comprising a container and a beverage ingredient contained therein, wherein the container comprises a code adapted for being identified or read by external reading means, wherein the code is arranged on the container to be read while the capsule is rotated around an axis of rotation traversing the capsule.
2. Capsule according to claim 1, having a circumference wherein the code is arranged on the container along an arc-shaped or circular path of the circumference.
3. Capsule according to claim 1, having a circumference wherein the code comprises successive segments which are individually rectilinear but extend substantially along at least a part of the circumference.
4. Capsule according to claims 2 or 3, wherein the code is arranged along at least a eighth of the circumference.
5. Capsule according to any of claims 2 to 4, wherein the code is repeated along said circumference.
6. Capsule according to any of the preceding claims, wherein the code is a bit code formed by a series of discrete polygonal (e.g., rectangles or squares) or dot surfaces printed on and/or embossed in the container.
7. Capsule according to any of claims 1 to 5, wherein the code is printed by an ink which is not visible by human eyes under natural light (e.g., ink visible under UV).
8. Capsule according to any of claims 1 to 5, wherein the code is printed or embossed by a pattern which possesses surfaces having different reflective and/or absorbing properties to light.
9. Capsule according to claim 8, wherein the pattern possesses first surfaces having inclined mirroring or absorbing properties to light and second surfaces having flat mirroring or flat reflective properties to light.
10. Capsule according to any of claims 1 to 6 and 8 to 9, wherein the code is mechanically embossed or engraved on the container by laser.

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11. Capsule according to any of claims 1 to 10, wherein the container comprises a body and a lid connected to the body and wherein the code is present on the lid of the container.

12. Capsule according to any of claims 1 to 10, wherein the code is present on the rim of the capsule.

13. Capsule according to claim 12, wherein the code is present on the bottom of the rim of the capsule which is opposed to the lid or foil of the capsule.

14. System for preparing a beverage from a capsule according to any of the preceding claims and further comprising a beverage preparation device; wherein the device comprises capsule holding means for holding the capsule and rotational drive means for driving the holding means and capsule in rotation along said axis of rotation and reading means arranged for reading the code when the capsule is rotated along said axis.

15. System according to claim 14, wherein the reading means comprises a light emitter and a light sensor or an inductive sensor.

16. System according to claims 14 or 15, wherein the optical reading means or inductive sensor is arranged to detect a code on the rim of the capsule.

17. Method for preparing a beverage from a system according to any one of claims 14 to 16, wherein the beverage is extracted from the capsule by rotating the capsule along said axis.

18. Method according to claim 17, wherein the code is read at a first rotational speed and the beverage is extracted from the capsule at a second rotational speed.

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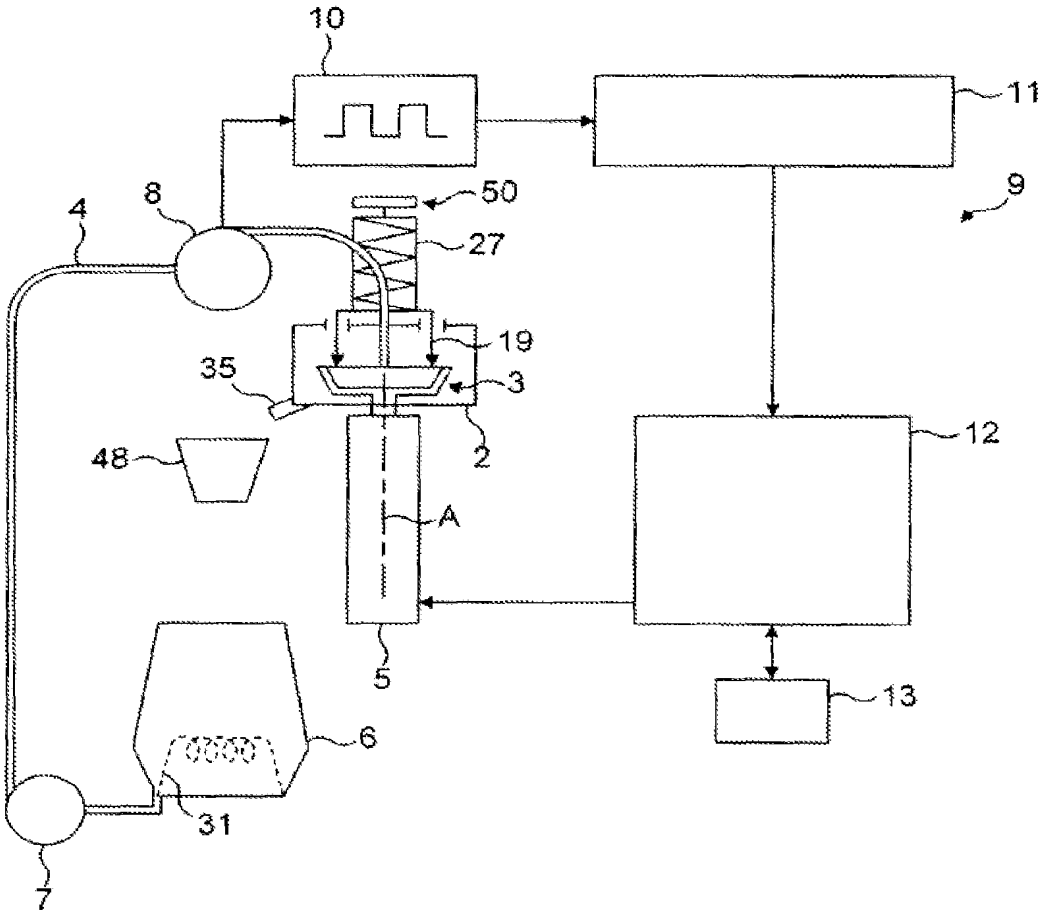


Fig. 1

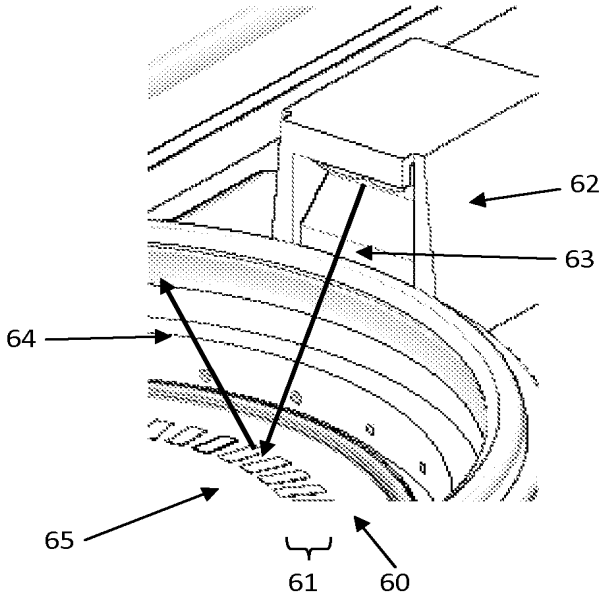


Fig. 2

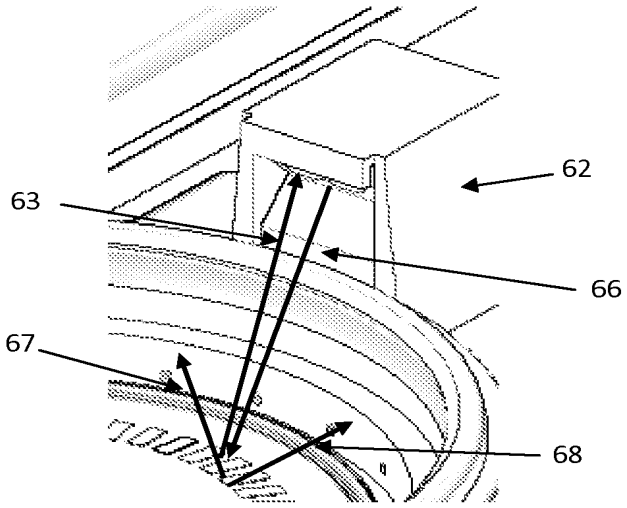


Fig. 3

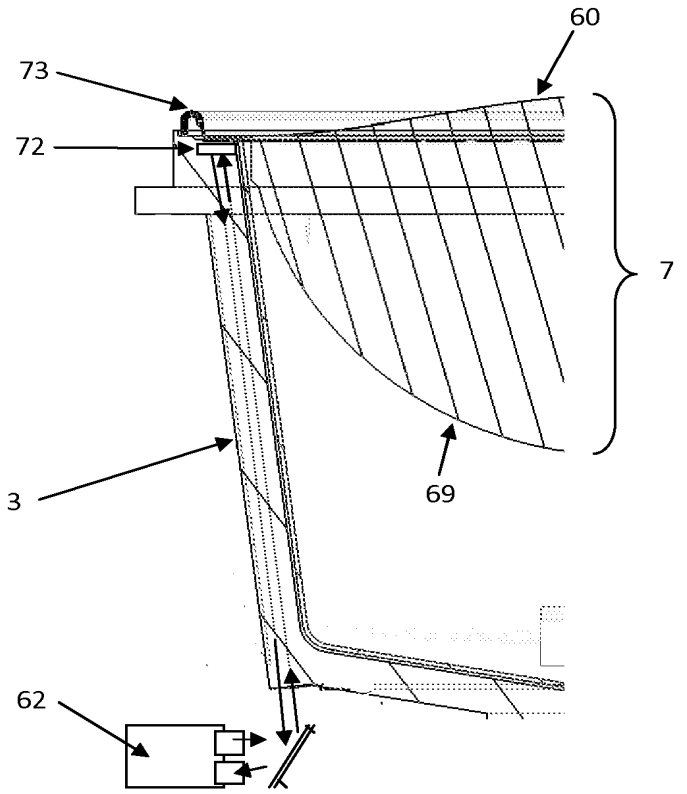


Fig. 4

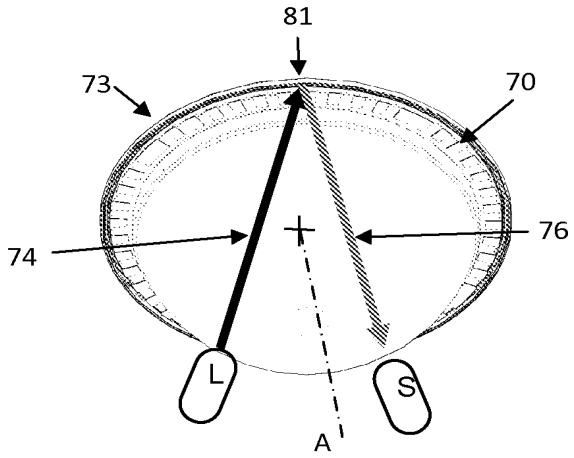


Fig. 5

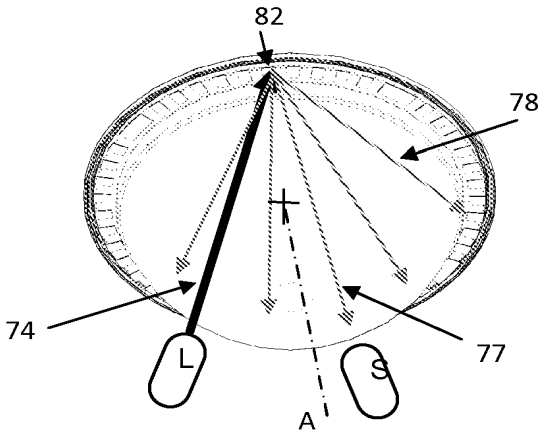

82
78
74
77
L
S
A

Fig. 6

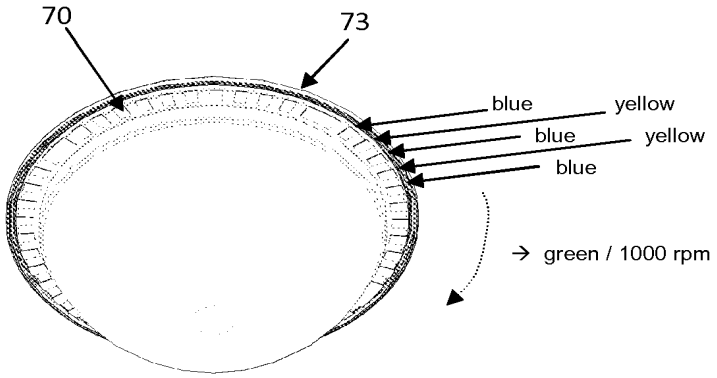

70
73
blue
yellow
blue
yellow
blue
→ green / 1000 rpm

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/057657

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D85/804 A47J31/22
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 764 015 A1 (GRIMAC S R L [IT]) 21 March 2007 (2007-03-21)	1-10,12
A	paragraph [0019]; figure 4	14,17
X	WO 02/28241 A1 (BOYD COFFEE CO [US]) 11 April 2002 (2002-04-11) cited in the application claim 1; figure 2f	1,2,6-13
A	WO 2010/026053 A1 (NESTEC SA [CH]; DENISART JEAN-PAUL [CH]; RYSER ANTOINE [CH]) 11 March 2010 (2010-03-11) cited in the application page 9, line 28 - line 33; claim 5	1,14,17

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

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
16 August 2011	24/08/2011

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/057657

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1764015 A1	21-03-2007	NONE	
WO 0228241 A1	11-04-2002	AU 1148902 A	15-04-2002
WO 2010026053 A1	11-03-2010	AU 2009289682 A1	11-03-2010
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(54) **Cartridge and method for the preparation of whipped beverages**

Patrone und Verfahren zur Zubereitung von verschäumten Getränken

Cartouche et méthode pour la préparation de boissons fouettées

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(56) References cited:
EP-A- 0 455 337

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Description

The present invention relates to a cartridge and method for the preparation of whipped beverages and, in particular, to sealed cartridges which are formed from substantially air- and water-impermeable materials and which contain one or more ingredients for the preparation of beverages and to a method of preparing whipped beverages from such cartridges.

It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee making machines which are generally termed "espresso" machines. In the production of coffee using these coffee machines the coffee cartridge is placed in a brewing chamber and hot water is generally caused to pass under pressure through the cartridge, thereby extracting the aromatic coffee constituents from the ground coffee and producing a coffee beverage. Typically in the production of "espresso" coffee a brewing time of about 25 seconds is used at a pressure of about 6×10^5 Pa.

Cartridges containing roast and ground coffee in which hot water flows under gravimetric force through the cartridge are also known. A cartridge of this general type is described in British Patent No. 1397116.

In our EP-A-0272922 there is described a package which contains at least one beverage preparation ingredient, e.g. roast and ground coffee. In a preferred embodiment the package is formed from a substantially air- and water-impermeable material and comprises a sealed body portion having a compartment containing the beverage ingredient and an outlet channel, the compartment and the outlet channel co-operating in such a manner that, in use, the beverage is filtered, thereby avoiding the necessity for an external filter.

There is also described in EP-A-0272922 a method for preparing a beverage which comprises positioning the beverage containing package at a brewing station, introducing water through water introduction means into the package, allowing the water to commingle with the beverage ingredient, and collecting the beverage so-formed through an outlet formed in the package.

The beverage packages as described in EP-A-0272922 are primarily intended to be used with a beverage preparation machine which handles the packages automatically or semi-automatically. A machine of this type is described in our EP-A-0334572. The packages may contain roast and ground coffee, leaf tea or one or more powdered beverage preparation ingredients such as powdered chocolate, powdered coffee or powdered soup.

The machines described in EP-A-0272922 operate at a relatively low pressure of less than 2×10^5 Pa and thus, although by varying the amount of water introduced into packages containing roast and ground coffee it is possible to obain a coffee beverage of the same strength as "espresso" coffee, it is not possible to incorporate gases into the coffee beverage at this pressure to provide the beverage with the foamed texture and appearance of "espresso" coffee.

We have now developed a cartridge operating at relatively low pressures which is capable of producing whipped beverages.

Accordingly, the present invention provides a cartridge containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the said cartridge comprising an inlet for the introduction of an aqueous medium into the cartridge, a compartment containing the beverage ingredient or ingredients, an outlet for the beverage produced from the beverage ingredients characterised in that the cartridge includes whipping means provided in the path of the beverage prior to the outlet to whip the said beverage.

The cartridge which is used in the present invention may be of a known type, for example as described in EP-A-0272922 or EP-A-0455337, modified to include whipping means provided in the path of the beverage prior to the outlet.

The whipping means will preferably comprise an impeller which is adapted to engage an external driving device on the beverage preparation machine, for example a machine of the type as described in EP-A-0334573. The impeller may comprise a rotor with a plurality of radial vanes, for example from 4 to 8 radial vanes. The vanes may be regularly or irregularly spaced, flat or curled, or offset, as desired. Preferably the rotor is provided with a hollow drive shaft which is adapted for engagement with the external driving device. The rotor may be made from a moulded plastics material such as polyacetal, for example Delrin (Registered Trade Mark) from DuPont, or polyester, or from nylon.

Preferably the impeller is positioned in a whipping chamber integrally formed within the cartridge, the beverage being diverted through this chamber before passing to the outlet. The whipping chamber is preferably provided with a plurality of fixed vanes or ribs formed integrally with the walls thereof. The whipping chamber is preferably also provided with means to position the impeller therein, for example, a cylindrical hole into which a drive shaft on the impeller is adapted to fit.

The cartridge of the present invention preferably has a body portion which may be formed, for example, from a moulded plastics material such as polypropylene. The inlet and/or outlet of the cartridge may be closed by a plug of a plastics material moulded into the inlet and/or outlet nozzle during the moulding of the body portion. Alternatively, the inlet and/or outlet may be covered by a substantially air- and water-impermeable material, for example aluminium foil or a laminated material, such as a laminate of plastic material/metal foil/plastic material, prior to the opening of the inlet and/or outlet. Specific examples of materials which may be used are aluminium foil having a thickness in the range of from 30 to 60 micrometres coated with a layer

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of polypropylene or a laminate of polypropylene/aluminium foil/polyester.

The outlet in the cartridge may be prepared during the beverage preparation cycle using a cutting and piercing tool for example of the type as described in our EP-A-0334573.

Alternatively, the inlet and/or outlet may be open and the cartridge provided with an outer wrapping or the like. For example, a plurality of packages may be provided with a shrink wrapped outer layer.

In the cartridges of the present invention, the communication between the inlet and the compartment containing the beverage preparation ingredient(s) is preferably via a channel which is separated from the compartment by a wall which has a plurality of openings formed therein for the entry of a liquid medium into the compartment. The channel preferably extends along at least one side of the compartment, more preferably along three sides of the compartment. The openings in the wall are preferably in the form of elongate slots which are generally arranged in a manner such that an even distribution of the liquid medium through the beverage preparation ingredients is acheived.

The cartridge of the present invention may have a filter disposed between the compartment containing the beverage ingredient(s) and a least a part of the under surface of the top of the cartridge, one or more passages being formed between the filter and the top of the cartridge, the passages communicating with the outlet. This type of cartridge is particularly preferred when the beverage ingredient is roast and ground coffee.

The filter is preferably made from a material with a high wet strength, for example a non-woven polyester fibre material or polypropylene. Other materials which may be used include a water-permeable cellulosic material, such as a cellulosic material comprising woven paper fibres. The woven paper fibres may be admixed with fibres of polypropylene, polyvinyl-chloride and/or polyethylene. The incorporation of these plastics materials into the cellulosic material renders the cellulosic material heat-sealable. The filter material may also be coated with a material which is activated by heat and/or pressure so that it can readily be sealed to ribs formed in the under surface of the top of the package, thereby forming one or more passages which communicate with the outlet.

The beverage preparation ingredients contained in the cartridges of the invention are preferably roast and ground coffee, powdered chocolate, and according to individual taste, powdered milk or creamer, sugar or artificial sweetner.

It will be understood that it may be convenient for the compartment containing the beverage preparation ingredients to be separated into two or more sections, for example, one section containing roast and ground coffee and another section containing powdered milk or creamer. In such an arrangement the means for the entry of the liquid medium into the separate compartments would be varied to suit the requirements for filtration or dissolution of the particular ingredients.

The cartridge of the present invention, when filled with roast and ground coffee, preferably contains from 2.5 to 10 grams of roast and ground coffee, preferably from 4.5 to 7 grams for the preparation of a single cup. However, cartridges which are intended to provide multiple servings of coffee will contain an appropriate amount of roast and ground coffee, for example, packages intended to provide say five cups of coffee will contain from 20 to 50 grams of roast and ground coffee, preferably from 25 to 30 grams. The roast and ground coffee is generally compacted when the beverage package is filled in order to aid the distribution and transport of water through the package.

The cartridges of the present invention are preferably provided with at least one recognition means whereby, in use, the cartridge is identified by the machine into which it is placed for treatment and the identification of the cartridge thereby causes it to be subjected to the correct treatment steps including the introduction of the aqueous medium into the cartridge and the activation of the whipping means.

The recognition means may comprise one or more surface features formed in the body of the cartridge. For example, the cartridge body may be provided with one or more indents, cut outs, protrusions or holes which can be identified by a mechanical sensor in the beverage preparation machine, the mechanical sensor registering the presence or absence of the indents, cut outs, protrusions or holes.

The recognition means may, alternatively, comprise a system which can be sensed by a simple optical device, for example a bar code printed onto the body of the cartridge, a pattern of through holes in the cartridge, a pattern of contrasting tones or colours printed onto the cartridge or cartridges containing different comestibles being of different colours.

The recognition means may also comprise one or more strips of a magnetic material applied to the body of the cartridge which can be read by an appropriate magnetic sensor; one or more shaped or divided areas of metal foil applied to the cartridge body which cause an inductive effect on movement of the cartridge in the machine, which inductive effect can be sensed; or one or more electrically conductive areas formed on the body of the cartridge which can be sensed electrically.

As mentioned above, the cartridge of the present invention contains one or more beverage preparation ingredients, for example, roast and ground coffee or leaf tea and sugar and/or creamer, as desired. One machine which can readily be adapted for the preparation of a beverage from the preferred cartridge of the invention which includes a recognition means is described in our EP-A-0334573. The only modification required to be made to such a beverage preparation machine is to incorporate an appropriate sensor or sensors into it, the sensor or sensors being designed to read the particular coding on the cartridge and to send a signal to the con-

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troller, which then selects the appropriate beverage preparation cycle and activates the whipping means.

The sensor may be, for example, a mechanical sensor, an optical sensor, a magnetic sensor, an electrical sensor or an inductive sensor. The machine is preferably adapted so that the cartridge is handled automatically following its insertion into the machine.

The present invention also includes within its scope a method for the production of a whipped beverage from a cartridge containing one or more beverage ingredients, which method comprises introducing an aqueous medium into the cartridge, extracting constituents from the beverage ingredient(s) and/or dissolving the beverage ingredient(s) to form a beverage, whipping the beverage so produced and collecting the whipped beverage as it leaves the cartridge.

The whipping of the beverage, for example by means of an impeller, will generally incorporate air into the beverage to produce a foamy, frothy beverage. Beverages which can be produced in this manner are, for example, whipped chocolate and espresso-type coffee. Preferably the whipping of the beverage to incorporate air therein will result in from 5 to 30 percent by volume of air being incorporated into the beverage as bubbles having a bubble size preferably of below 300 micrometres, more preferably in the range of from 10 to 200 micrometres. Generally, whipped chocolate will incorporate a higher percentage of air by volume therein than whipped coffee.

Alternatively, the whipping of the beverage may be used to produce carbonated drinks. For example, the aqueous medium introduced into the cartridge may be carbonated water. On contact with powdered ingredients or a syrup for the preparation of a beverage the carbonated water will generally loose some of the carbon dioxide incorporated therein. The whipping of the beverage reintroduces into the beverage at least some of the carbon dioxide which has been lost from solution during the passage of the carbonated water through the cartridge. Alternatively, carbon dioxide may be introduced into the cartridge before the beverage is whipped, for example by direct passage into the chamber which contains the whipping means.

The present invention will be further described with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view from above of a beverage cartridge of the invention;

Figure 2 is a perspective view from below of the beverage cartridge of Figure 1;

Figure 3 is a section through the beverage cartridge of Figure 1 along the lines III-III;

Figure 4 is a section through the beverage cartridge 1 along the line IV-IV;

Figure 5 illustrates one variant of an external driving mechanism;

Figure 6 illustrates another variant of an external driving mechanism;

Figure 7 illustrates a part of the driving mechanism of Figure 6 on a larger scale; and

Figure 8 illustrates a rotor of the beverage cartridge with which the driving mechanism engages.

Referring to the drawings, a cartridge of the present invention is shown generally at 1. The cartridge is mainly formed from a moulded plastics material and has a top 2 which may be decorated to identify the contents of the capsule, or which may have foil or paper laminated thereto with appropriate identification thereon. The bottom 3 of the capsule may be formed from an aluminium foil or a laminated foil.

The cartridge 1 has an inlet 4 and an outlet 5 which are formed in use of the cartridge by piercing or cutting the material covering the inlet and outlet openings.

As best shown in Figure 4, water enters the cartridge 1 via inlet 4 where it enters channel 6 formed along the edges of the package and communicates via slots 7 with the beverage ingredients 8 which are contained in a compartment within the cartridge. The water mixes with the beverage preparation ingredients contained within compartment 9 and is forced upwardly through the beverage preparation ingredients. The beverage formed by passage of water through the beverage preparation ingredients passes through filter material 10 into a plurality of passages which are formed between ribs 12 onto which the filter paper is sealed. The sealing of the filter material onto ribs 12 prevents any short circuit and all of the beverage has to pass through the filter. The passages 11 are closed at the end remote from the outlet by transverse rib 13. The beverage collected via passages 11 is funneled in area 14 in the direction as shown by the arrows and passes through inlets 15 and 16 to a whipping chamber 17 in which a rotor 18 is disposed.

The whipping chamber 17 has a plurality of fixed vanes 20 provided therein, as best shown in Figure 2. The whipper chamber 17 is provided with a hole 21 into which rotor 18 is adapted to fit. The rotor 18 is provided with a plurality of vanes 22 positioned around the central hollow drive shaft 23. The hollow drive shaft 23 has ribs 24 which are adapted for engagement with an external driving device. The rotor has an annular ring 25 fixed to the bottom of the vanes 22 which, in use, is lubricated by the beverage and the film of liquid between the annular ring and the bottom surface 3 of the cartridge 1 acts as a bearing. The film of liquid assists in pushing the rotor upwards and assists in cooling the under surface of the ring 25.

The drive shaft 23 of rotor 18 engages by means of ribs 24, an external driving mechanism which causes the rotor to rotate at very high speeds, for example at a speed of from 10,000 to 20,000 rpm. Air is drawn into the whipping chamber by a passage through the space provided between the edges of the hole 21 and the drive shaft 23. The rotor 18 rotates freely in the whipping chamber 17 and the high speed of the rotor causes considerable turbulence with the passage of the rotor vanes

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22 close to the fixed vanes 20 in whipping chamber 17. The rotation of the rotor 18 in whipping chamber 17 causes a centrifugal/centripetal effect on the beverage which causes a negative pressure in the area of the base of the shaft 23 of the rotor 18 which draws air into the whipping chamber 17. This has two benefits, namely it obviates the need for a seal on the shaft 23 and provides the air to incorporate into the beverage in the form of bubbles. The whipped beverage then exits from the whipping chamber 17 in the direction as shown by the arrows in Figure 3 to the outlet 5 from the capsule.

The cartridge as described with reference to Figures 1 to 4 is suitable for insertion into a beverage preparation machine, for example of the type as described in EP-A-0334573 longitudinally through a slot.

The cartridge is also provided, as best shown in Figure 1 with teeth 30 moulded along one side edge of the cartridge. The teeth 30 have recessess 31 formed therebetween. The teeth 30 are intended to enable the cartridge to be driven through a beverage preparation machine by the engagement of the teeth 30 with the tooth (not shown) of a cam 35 as shown in Figure 5.

The side edge of cartridge 1 opposite to the edge provided with teeth 30 has a plurality of pegs 32, 33 and 34 provided thereon. As the package is driven into the machine by the engagement of teeth 30 with cam 35, the presence or absence of the upstanding pegs 32, 33, 34 is sensed by a sensing arm (not shown). If one or more of pegs 32, 33, 34 is not present the sensing arm will thereby identify a different type of cartridge. The sensing arm operates a switch (not shown) which thereby transmits information concerning the presence or absence of the pegs on the package to the control mechanism for the beverage dispensing machine. The arrangement of pegs 32, 33, 34 on the cartridge thus identifies the type of cartridge to a controller which then selects the appropriate beverage preparation conditions.

When the beverage preparation machine has selected the appropriate beverage preparation conditions, the water inlet 4 of the package is pierced or cut, the outlet 5 in the package is uncovered and the foil 36 originally covering the outlet folded back into an outlet surround chamber 37. Water is caused to flow under pressure through the compartment containing the beverage ingredients and, after whipping, the chosen beverage is then collected in a cup or receptacle placed below the outlet 5 of the package.

The rotor 18 of the cartridge is driven by an external drive mechanism, one variant of which is shown in Figure 5. The external drive mechanism shown in Figure 5 comprises a drive wire 40 with a shaped end 41. The drive wire 40 is mounted through a sliding drive 42 and a bearing bush 43. The drive wire 40 is driven by motor 44 which is attached to a motor mounting arm 45. The flexible end 41 of driving wire 40 is adapted to pierce the foil covering the drive shaft 23 of the rotor and to engage the ribs 24 of the rotor 18. The flexibility of the drive wire 40 allows for some mis-alignment and also reduces noise which would be caused by any mis-alignment. The flexibility also allows for motor 44 to be non-critically mounted.

The high speed motor 44 is caused to move in an arc by a cam action from the main cam 35 of the brewing mechanism. The motor mounting arm 45 is also provided with a sensing arm 46 which senses the depth of the cartridge inserted into the brewing machine at location 50 thereof. If the depth of the ledge at 50 is the correct depth for the beverage to be produced from the capsule to require whipping, then the tip 41 of the drive wire will be caused to penetrate the foil covering the rotor drive shaft 23 and to engage the ribs 24 thereof. Accordingly, the brewing machine will then cause the motor 44 to be switched on and whip the beverage by means of the rotation of flexible drive 41 being transmitted to the rotor 18.

If the capsule is not of the type which requires whipping, i.e. if sensor 46 does not sense the correct depth of ledge 50, then an override spring arm 51 will be depressed, but the driving device will not penetrate the top foil of the cartridge and the motor 44 will not be activated.

Referring to Figure 6, a second variant of an external drive mechanism is shown. The drive mechanism comprises a driving dog 60 which is attached through ferrule 61 to a motor 62. The motor is located within a motor mount 63 by means of claws 64 and 65. The upper arm 66 of the motor mount 63 has a spherical shaped under surface (not shown) which allows the motor to rock in all directions and therefore allows the alignment of the driving dog in the rotor shaft, as more fully described below with reference to Figures 7 and 8.

The motor mount 63 is supported by a motor carriage 70 via the spherical under surface of the upper arm 66 of the motor mount, allowing the motor angular motion as discussed above.

The operation of the device to engage the driving dog 60 of the rotor described below with reference to Figure 8 is driven by a track in the main cam of a brewing mechanism as described with reference to European Patent No. 0334573 (not shown). This cam operates a peg 71 in a cam follower lever 72 which pivots on a support 73 of the side plate 74 of the brewing mechanism. The position of the cam (not shown) ensures that the capsule is correctly placed before the lever 72 is operated. The lever 72 is moved downwards and causes the motor carriage to move downwards via a spring 75 one end of which is located on peg 76 of the cam follower lever and one end of which is located on peg 77 on the motor carriage 70. The motor carriage 70 is provided with a feeler blade 78 which is adapted to sense if the capsule is of the type the beverage from which will require whipping. When the capsule is of the correct type the feeler locates at a lower position on the capsule than if it is not of the correct type which allows the driving dog to press onto and pierce the foil covering the rotor drive shaft. The motor is then switched on due

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to the sensing of the correct capsule and the electrical and software control supplying power to the motor.

The movement of the motor carriage in the vertical direction is achieved by means of two guides positioned on the side plate 74 of the brewing mechanism. One guide 79 is shown which locates in a complementary slot 80 on the motor carriage. The other guide is not shown.

At the end of the brewing cycle, when the whipping of the beverage is complete, the cam follower lever 72 bears against the ledge 81 on the motor carriage thereby to ensure that the driving dog 60 is positively removed from the capsule by the action of the lever 72.

The driving dog 60 is shown on a larger scale in Figure 7. The driving dog has a pointed end 85 which is adapted to pierce the film which covers the aperture 90 of the rotor shown in Figure 8. The driving dog has a shaft 86 which is attached to the ferrule 61 shown in Figure 6. The pointed end 85 of the driving dog is attached via a section 87 of circular cross section to a flat section 88.

In operation, the driving dog pierces the film covering the aperture 90 of the rotor 89 and enters the hollow drive shaft 91 of the rotor 89. The drive shaft 91 of the rotor 89 is provided with two opposing pairs of splines 92 and 93 which centre section 87 of the driving dog. The pair of splines 92 are higher than the opposing pair of splines 93. This arrangement ensures that as the driving dog 60 enters the shaft 91 of the rotor 89 it is rotated until the shaft 88 is in aligned between, or to one side, of the two adjacent higher splines 92. This arrangement also prevents the flattened section 88 from attempting to pass down the same side of the opposing splines, particularly if the driving dog is entering at an angle.

The rotor 89 as shown in Figure 8 is provided with a plurality of blades 95 which are connected to the central shaft 96 of the rotor and at their lower outer edges to an annular ring 97 which also acts as a liquid bearing surface. A gap 99 is provided between the annular ring 97 and the central shaft 96 of the rotor which allows passage of liquid beneath the ring to assist in lubrication of the rotor as it bears against the bottom surface 3 of the cartridge.

The rotor 89 is also provided with a plurality of lugs 98, one of which is shown in Figure 8, which assist in retaining the rotor in the capsule during the manufacturing process by means of an interference fit within the hole 21 of the capsule into which the rotor fits (see Figure 3). Alternatively, the hole 21 may be provided with a shoulder (not shown) upon which the lugs 78 rest when the rotor is located in the hole during manufacture. The film of liquid between the bottom surface of the ring 97 and the surface 3 of the cartridge assists in pushing the rotor upwards within the hole 21 of the cartridge. In one embodiment where the hole 21 is provided with a shoulder on which lugs 98 rest, the upwards movement of the rotor prevents the lugs from rubbing on the shoulder and, as previously described, assists in cooling the under surface of the annular ring 97.

Claims

1. A cartridge (1) containing one or more beverage ingredients (8) and being formed from substantially air- and water-impermeable materials, the said cartridge (1) comprising an inlet (4) for the introduction of an aqueous medium into the cartridge, a compartment containing the beverage ingredient or ingredients, an outlet (5) for the beverage produced from the beverage ingredients characterised in that the cartridge includes whipping means (18) provided in the path of the beverage prior to the outlet (5), to whip the said beverage.

2. A cartridge as claimed in claim 1 wherein the whipping means (18) comprises an impeller (23,24) adapted to engage an external driving device (40, 41, 60).

3. A cartridge as claimed in claim 2 wherein the impeller comprises a rotor (18) with a plurality of radial vanes(22).

4. A cartridge as claimed in claim 3 wherein the rotor (18) has a hollow drive shaft adapted for engagement with the external driving device (40, 41, 60).

5. A cartridge as claimed in any one of the preceding claims wherein the whipping means is positioned in a chamber (17) integrally formed within the cartridge (1).

6. A cartridge as claimed in claim 5 wherein the chamber (17) has a plurality of fixed vanes (20) provided therein.

7. A cartridge as claimed in any one of the preceding claims wherein the inlet (4) and/or outlet (5) is covered by a substantially air- and water-impermeable material prior to the formation, in use , of the inlet (4) and/or outlet (5) in the cartridge (1).

8. A cartridge as claimed in any one of the preceding claims wherein a channel (6) communicates with the inlet (4) for the entry of an aqueous medium into the cartridge, the channel (6) being separated from the compartment containing the beverage ingredient or ingredients (8) by a wall which has a plurality of openings (7) formed therein for the entry of the aqueous medium into the compartment containing the beverage preparation ingredient(s) (8).

9. A cartridge as claimed in claim 8 wherein the channel (6) extends along at least one side of the compartment containing the beverage preparation ingredient(s)(8).

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10. A cartridge as claimed in claim 8 or claim 9 wherein the channel (6) extends around three sides of the compartment containing the beverage preparation ingredient(s)(8).

11. A cartridge as claimed in any one of claims 8 to 10 wherein the openings (7) comprise a plurality of elongate slots.

12. A cartridge as claimed in any one of the preceding claims wherein a filter (10) is disposed between the compartment and at least a part of the under surface of the top of the cartridge (1), one or more passages (11) being formed between the filter (10) and the top of the cartridge (1), which passage(s) (11) communicate(s) with the outlet (5).

13. A cartridge as claimed in claim 12 wherein the filter (10) is made from a water-impermeable material.

14. A cartridge as claimed in any of the preceding claims wherein the beverage preparation ingredient (8) is powdered chocolate or roast and ground coffee.

15. A cartridge as claimed in any one of the preceding claims which is provided with at least one recognition means (32,33,34) whereby, in use, the cartridge (1) is identified by the machine into which it is placed for treatment therefrom and the identification of the cartridge (1) thereby causes it to be subjected to the correct treatment steps including the introduction of a aqueous medium into the cartridge (1) and the engagement of the whipping means (18) by an external driving device (40,41,60) incorporated into the machine.

16. A cartridge as claimed in claim 15 wherein the recognition means (32,33,34) comprises one or more surface features formed in the body of the cartridge (1).

17. A method for the production of a whipped beverage from a cartridge (1) containing one or more beverage ingredients (8), which method comprises introducing an aqueous medium into the cartridge (1), extracting constituents from the beverage ingredient(s) (8) and/or dissolving the beverage ingredient(s) (8) to form a beverage, whipping the beverage so produced and collecting the whipped beverage as it leaves the cartridge (1).

18. A method as claimed in claim 17 wherein the beverage is whipped by means of an impeller (18).

19. A method as claimed in claim 17 or claim 18 wherein the whipping of the beverage incorporates air therein.

20. A method as claimed in claim 17 or claim 18 wherein carbon dioxide is introduced into the cartridge before the beverage is whipped.

21. A method as claimed in claim 17 or claim 18 wherein the aqueous medium is carbonated water and the whipping of the beverage reintroduces into the beverage any carbon dioxide lost from solution during the passage of the aqueous medium through the cartridge.

22. A method as claimed in any one of claims 17 to 19 wherein the beverage produced is whipped chocolate or espresso-type coffee.

Patentansprüche

1. Patrone (1), die einen oder mehrere Getränkebestandteile (8) enthält und aus im wesentlichen luft- und wasserundurchlässigen Materialien gebildet ist, wobei die Patrone (1) umfaßt: einen Einlaß (4) für die Einführung eines wäßrigen Mediums in die Patrone, eine den Getränkebestandteil oder die -bestandteile enthaltende Kammer, einen Auslaß (5) für das aus den Getränkebestandteilen erzeugte Getränk,
dadurch gekennzeichnet, daß die Patrone ein Aufschäummittel (18) umfaßt, das in dem Weg des Getränks vor dem Auslaß (5) vorgesehen ist, um das Getränk aufzuschäumen.

2. Patrone nach Anspruch 1, bei welcher das Aufschäummittel (18) ein Flügelrad (23, 24) umfaßt, welches zum Eingriff mit einer externen Antriebsvorrichtung (40, 41, 60) ausgeführt ist.

3. Patrone nach Anspruch 2, bei welcher das Flügelrad einen Rotor (18) mit einer Mehrzahl von radialen Flügeln (22) umfaßt.

4. Patrone nach Anspruch 3, bei welcher der Rotor (18) eine hohle Antriebswelle aufweist, die zum Eingriff mit der externen Antriebsvorrichtung (40, 41, 60) ausgeführt ist.

5. Patrone nach einem der vorhergehenden Ansprüche, bei welcher das Aufschäummittel in einer Kammer (17) angeordnet ist, die in der Patrone (1) integral ausgebildet ist.

6. Patrone nach Anspruch 5, bei welcher die Kammer (17) eine Mehrzahl von darin vorgesehenen festen Flügeln (20) aufweist.

7. Patrone nach einem der vorhergehenden Ansprüche, bei welcher der Einlaß (4) und/oder der Auslaß (5) - vor der Bildung des Einlasses (4) und/oder des Auslasses (5) in der Patrone (1) bei Verwendung -

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von einem im wesentlichen luft- und wasserundurchlässigen Material abgedeckt ist.

8. Patrone nach einem der vorhergehenden Ansprüche, bei welcher ein Kanal (6) mit dem Einlaß (4) für den Eintritt eines wäßrigen Mediums in die Patrone in Verbindung steht, wobei der Kanal (6) von der den Getränkebestandteil oder die -bestandteile (8) enthaltenden Kammer durch eine Wand getrennt ist, in der für den Eintritt des wäßrigen Mediums in die den Getränkezubereitungsbestandteil bzw. die -bestandteile (8) enthaltende Kammer eine Mehrzahl von Öffnungen (7) ausgebildet sind.

9. Patrone nach Anspruch 8, bei welcher sich der Kanal (6) entlang wenigstens einer Seite der den Getränkezubereitungsbestandteil bzw. die -bestandteile (8) enthaltenden Kammer erstreckt.

10. Patrone nach Anspruch 8 oder 9, bei welcher sich der Kanal (6) um drei Seiten der den Getränkezubereitungsbestandteil bzw. die -bestandteile (8) enthaltenden Kammer erstreckt.

11. Patrone nach einem der Ansprüche 8 bis 10, bei welcher die Öffnungen (7) eine Mehrzahl von länglichen Schlitzen umfassen.

12. Patrone nach einem der vorhergehenden Ansprüche, bei welcher ein Filter (10) zwischen der Kammer und wenigstens einem Teil der unteren Fläche der Oberseite der Patrone (1) angeordnet ist, wobei ein oder mehrere Durchgänge (11) zwischen dem Filter (10) und der Oberseite der Patrone (1) gebildet sind, welcher bzw. welche Durchgänge (11) mit dem Auslaß (5) in Verbindung steht bzw. stehen.

13. Patrone nach Anspruch 12, bei welcher der Filter (10) aus einem wasserundurchlässigen Material hergestellt ist.

14. Patrone nach einem der vorhergehenden Ansprüche, bei welcher das Getränkezubereitungsbestandteil (8) Schokoladenpulver oder gerösteter und gemahlener Kaffee ist.

15. Patrone nach einem der vorhergehenden Ansprüche, die mit wenigstens einem Erkennungsmittel (32, 33, 34) versehen ist, durch welches die Patrone (1) bei Verwendung von der Maschine, in welche sie zur Behandlung durch diese eingesetzt ist, identifiziert wird und wobei die Identifizierung der Patrone (1) zur Folge hat, daß sie den richtigen Behandlungsschritten unterzogen wird, einschließlich der Einführung eines wäßrigen Mediums in die Patrone (1) und dem Eingriff einer externen Antriebsvorrichtung (40, 41, 60), die in der Maschine enthalten ist, mit dem Aufschäummittel (18) .

16. Patrone nach Anspruch 15, bei welcher das Erkennungsmittel (32, 33, 34) ein oder mehrere Oberflächenmerkmale umfaßt, die in dem Körper der Patrone (1) ausgebildet sind.

17. Verfahren zur Herstellung eines aufgeschäumten Getränks aus einer Patrone (1), die einen oder mehrere Getränkebestandteile (8) enthält, wobei das Verfahren umfaßt: das Einführen eines wäßrigen Mediums in die Patrone (1), das Extrahieren von Bestandteilen aus dem/den Getränkebestandteil(en) (8) und/oder das Auflösen des bzw. der Getränkebestandteile (8) zur Bildung eines Getränks, Aufschäumen des so erzeugten Getränks und Auffangen des aufgeschäumten Getränks, wenn es die Patrone (1) verläßt.

18. Verfahren nach Anspruch 17, bei welchem das Getränk mittels eines Flügelrads (18) aufgeschäumt wird.

19. Verfahren nach Anspruch 17 oder Anspruch 18, bei welchem durch das Aufschäumen des Getränks diesem Luft zugesetzt wird.

20. Verfahren nach Anspruch 17 oder 18, bei welchem vor dem Aufschäumen des Getränks Kohlensäure in die Patrone eingeführt wird.

21. Verfahren nach Anspruch 17 oder Anspruch 18, bei welchem das wäßrige Medium mit Kohlensäure versetztes Wasser ist und das Aufschäumen des Getränks in das Getränk Kohlensäure wieder einführt, die während des Durchtritts des wäßrigen Mediums durch die Patrone aus der Lösung verlorengegangen ist.

22. Verfahren nach einem der Ansprüche 17 bis 19, bei welchem das erzeugte Getränk aufgeschäumte Schokolade oder aufgeschäumter Kaffee vom Typ Espresso ist.

Revendications

1. Cartouche (1) contenant un ou plusieurs ingrédient(s) de boisson (8) et réalisée en matières sensiblement imperméables à l'air et à l'eau, ladite cartouche (1) comprenant une admission (4) pour l'introduction d'un fluide aqueux dans la cartouche, un compartiment contenant l'ingrédient ou les ingrédients de boisson, une sortie (5) de la boisson produite à l'aide des ingrédients de la boisson, caractérisée en ce que la cartouche comprend un moyen de battage (18) placé sur le trajet de la boisson au-devant de la sortie (5) pour battre ladite boisson.

2. Cartouche selon la revendication 1, dans laquelle le moyen de battage (18) consiste en une roue à

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palettes (23, 24) conçue pour s'enclencher avec un dispositif extérieur d'entraînement (40, 41, 60).

3. Cartouche selon la revendication 2, dans laquelle la roue à palettes comprend un rotor (18) comportant plusieurs palettes radiales (22).

4. Cartouche selon la revendication 3, dans laquelle le rotor (18) comprend un arbre creux d'entraînement conçu pour s'enclencher sur le dispositif extérieur d'entraînement (40, 41, 60).

5. Cartouche selon l'une quelconque des revendications précédentes, dans laquelle le moyen de battage est placé dans une chambre (17) réalisée monobloc à l'intérieur de la cartouche (1).

6. Cartouche selon la revendication 5, dans laquelle la chambre (17) comporte intérieurement plusieurs palettes fixes (20).

7. Cartouche selon l'une quelconque des revendications précédentes, dans laquelle l'admission (4) et/ou la sortie (5) est recouverte d'une matière sensiblement imperméable à l'air et à l'eau avant la formation, à l'utilisation, de l'admission (4) et/ou de la sortie (5) de la cartouche (1).

8. Cartouche selon l'une quelconque des revendications précédentes, dans laquelle un canal (6) communique avec l'admission (4) pour l'entrée d'un fluide aqueux dans la cartouche, le canal (6) étant séparé du compartiment contenant l'ingrédient ou les ingrédients de la boisson (8) par une cloison qui comporte plusieurs trous (7) pour l'entrée du fluide aqueux dans le compartiment contenant l'ingrédient ou les ingrédients (8) de préparation de la boisson.

9. Cartouche selon la revendication 8, dans laquelle le canal (6) est disposé le long d'au moins un côté du compartiment contenant l'ingrédient ou les ingrédients (8) de préparation de la boisson.

10. Cartouche selon la revendication 8 ou la revendication 9, dans laquelle le canal (6) est disposé autour de trois côtés du compartiment contenant l'ingrédient ou les ingrédients (8) de préparation de la boisson.

11. Cartouche selon l'une quelconque des revendications 8 à 10, dans laquelle les trous (7) consistent en plusieurs fentes allongées.

12. Cartouche selon l'une quelconque des revendications précédentes, dans laquelle un filtre (10) est disposé entre le compartiment et au moins une partie de la surface inférieure de la surface supérieure de la cartouche (1), un ou plusieurs passages (11) étant réalisés entre le filtre (10) et la cloison supérieure de la cartouche (1), ledit ou lesdits passage(s) (11) communiquant avec la sortie (5).

13. Cartouche selon la revendication 12, dans laquelle le filtre (10) est réalisé en une matière imperméable à l'eau.

14. Cartouche selon l'une quelconque des revendications précédentes, dans laquelle l'ingrédient de préparation de la boisson (8) est du chocolat en poudre ou du café grillé et moulu.

15. Cartouche selon l'une quelconque des revendications précédentes, qui est équipée d'au moins un moyen de reconnaissance (32, 33, 34) de manière qu'à l'utilisation, la cartouche (1) soit identifiée par la machine dans laquelle elle est placée pour son traitement et que l'identification de la cartouche (1) par celle-ci lui fasse subir les étapes correctes de traitement, y compris l'introduction d'un fluide aqueux dans la cartouche (1) et l'enclenchement du moyen de battage (18) sur le dispositif extérieur d'entraînement (40, 41, 60) incorporé dans la machine.

16. Cartouche selon la revendication 15, dans laquelle le moyen de reconnaissance (32, 33, 34) comprend une ou plusieurs structure(s) de surface réalisé(es) dans le corps de la cartouche (1).

17. Procédé de production d'une boisson battue à partir d'une cartouche (1) contenant un ou plusieurs ingrédient(s) de boisson (8), ledit procédé comprenant l'introduction d'un fluide aqueux dans la cartouche (1), l'extraction des constituants de l'ingrédient ou des ingrédients de la boisson (8) et/ou la dissolution de l'ingrédient ou des ingrédients de la boisson (8) pour former une boisson, le battage de la boisson ainsi produite et la récupération de la boisson battue lorsqu'elle quitte la cartouche (1).

18. Procédé selon la revendication 17, suivant lequel la boisson est battue à l'aide d'une roue à palettes (18).

19. Procédé selon la revendication 17 ou la revendication 18, suivant lequel le battage de la boisson incorpore de l'air dans celle-ci.

20. Procédé selon la revendication 17 ou la revendication 18, suivant lequel de l'anhydride carbonique est introduit dans la cartouche avant que la boisson soit battue.

21. Procédé selon la revendication 17 ou la revendication 18, suivant lequel le fluide aqueux est de l'eau gazeuse et le battage de la boisson réintroduit dans

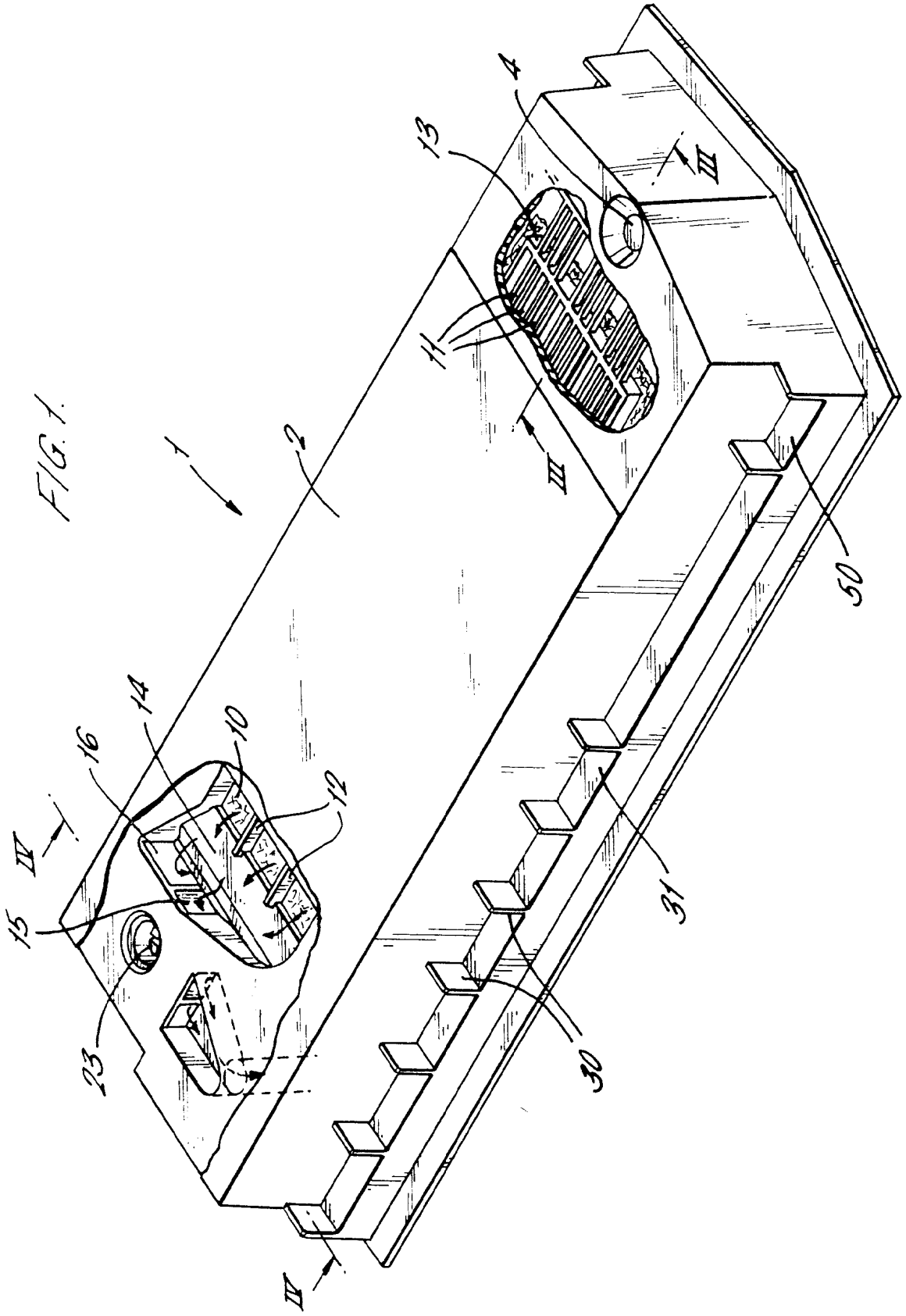
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la boisson tout anhydride carbonique perdu de la solution pendant le passage du fluide aqueux dans la cartouche.

22. Procédé selon l'une quelconque des revendications 17 à 19, suivant lequel la boisson produite est du chocolat ou du café de type expresso battu.

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FIG. 1.



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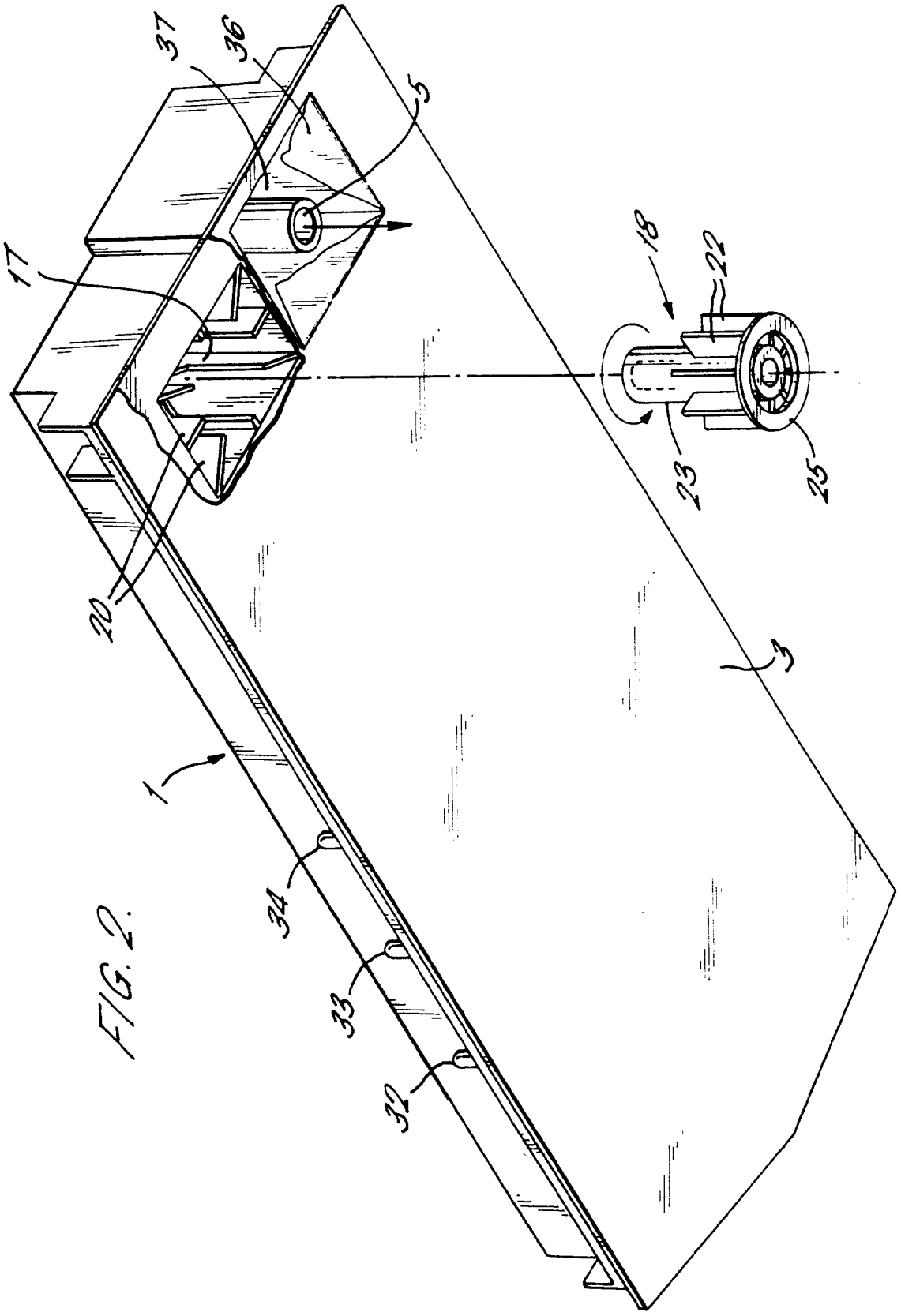


FIG. 2.

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FIG. 3.

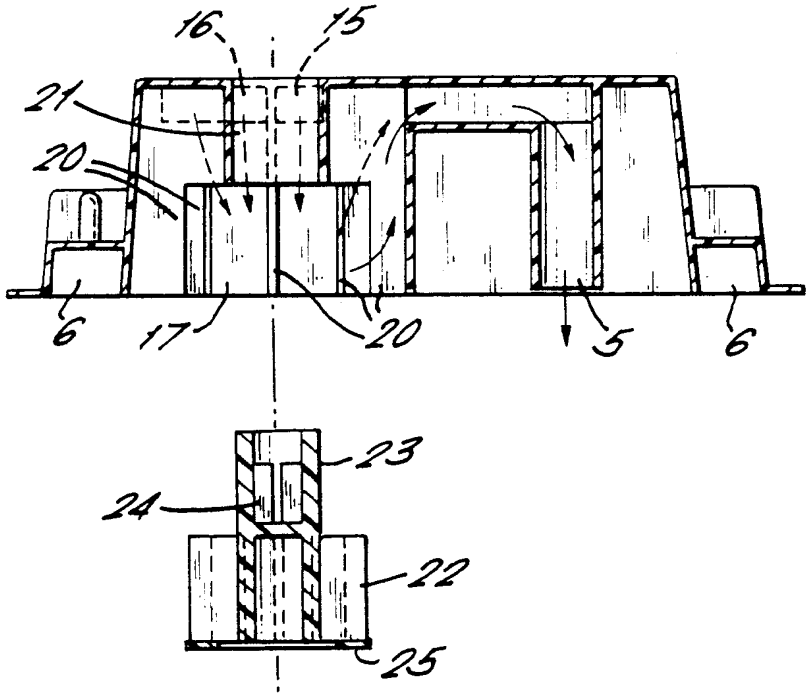
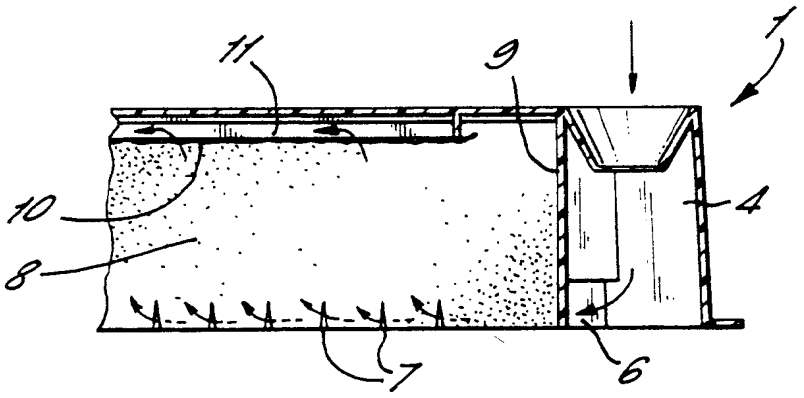
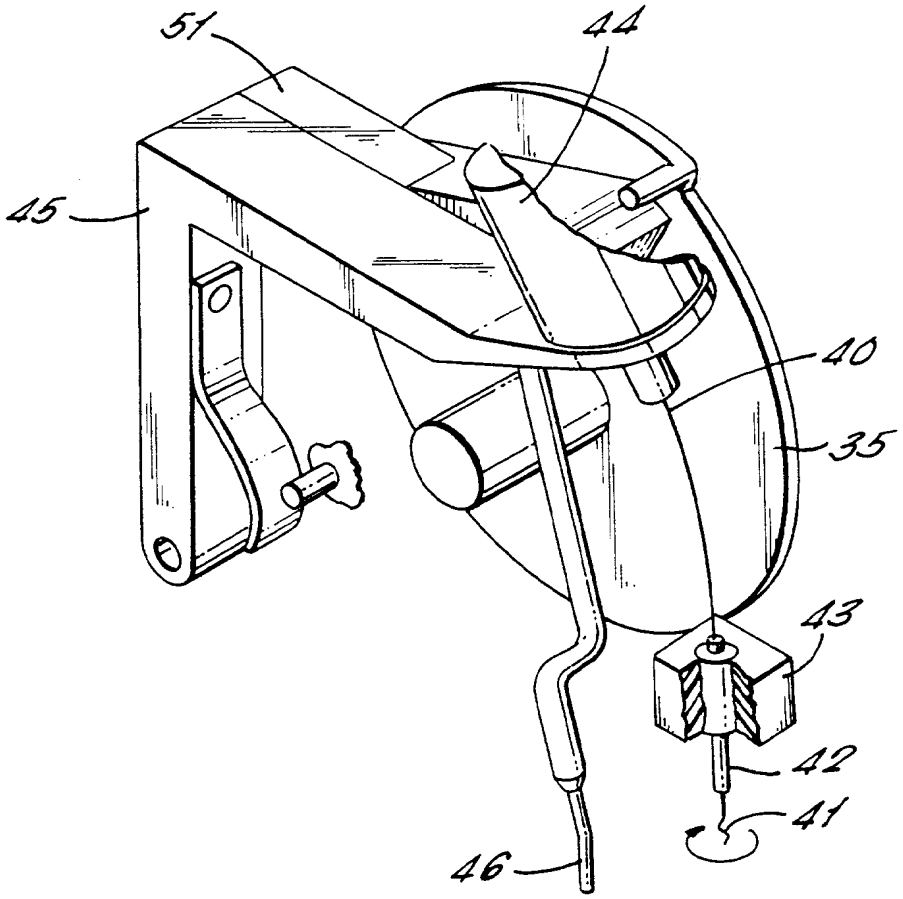


FIG. 4.



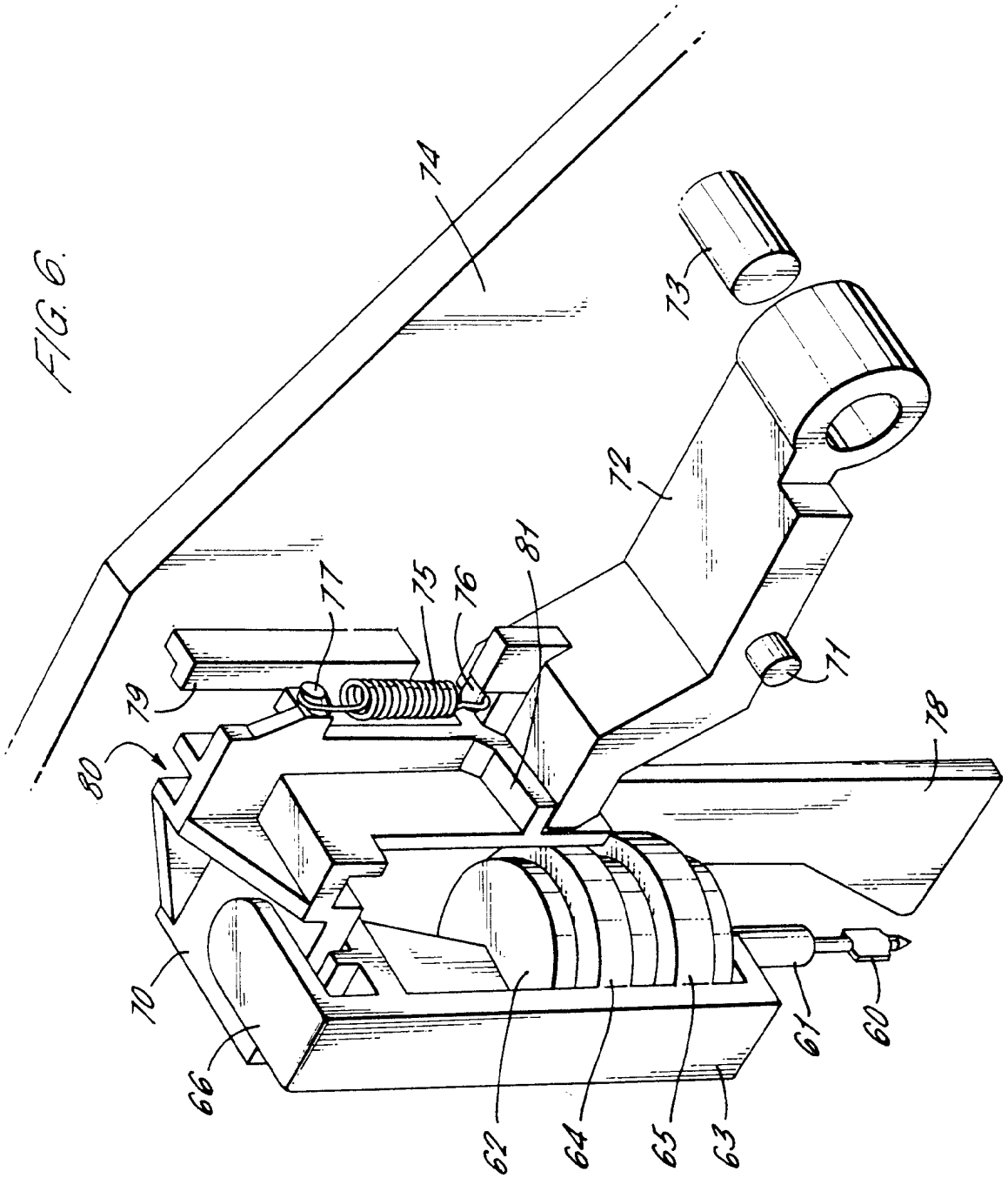
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FIG. 5.



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FIG. 6.



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FIG. 7.

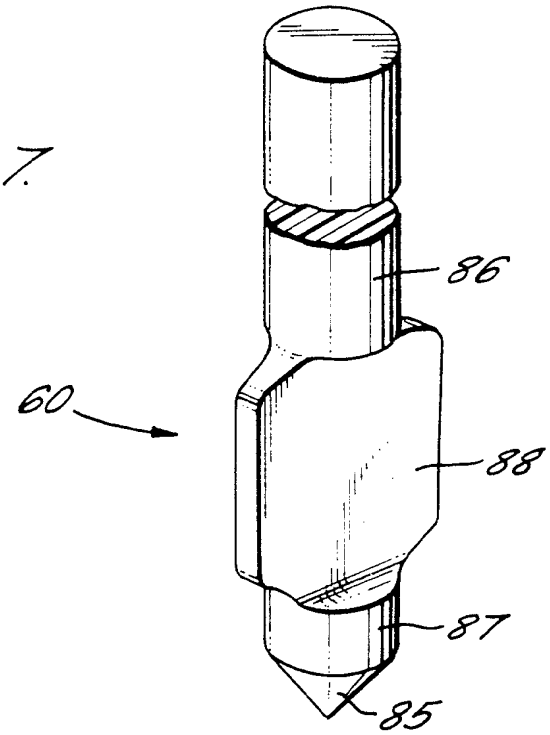
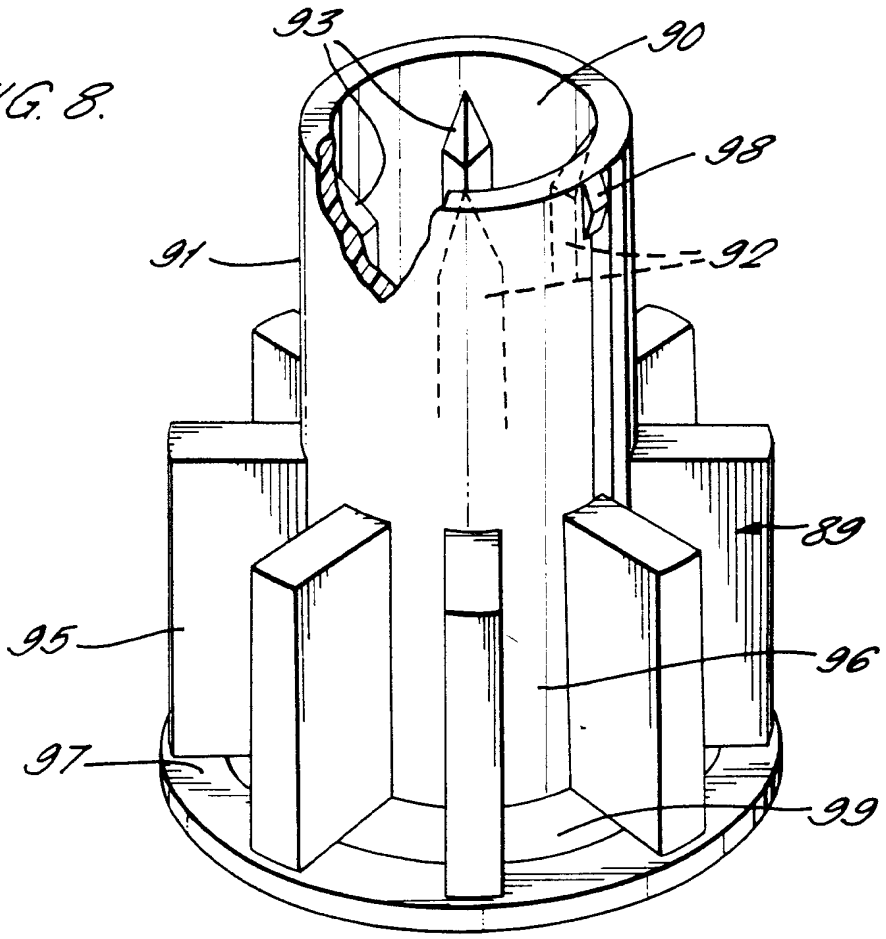


FIG. 8.



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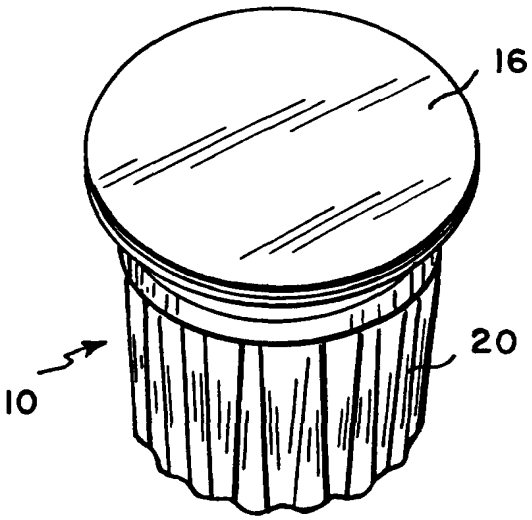
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(54) Title: BEVERAGE FILTER CARTRIDGE



(57) Abstract: A beverage filter cartridge (10) includes a cup-shaped outer container (12) with a bottom (18) and a side wall (20) extending upwardly from the bottom wall (18) to a circular rim (22) surrounding an upper opening (24). The side wall (29) has an upper section (20a) extending downwardly from the rim (22) to an intermediate section, and a tapered lower section (20c) configured to provide a plurality of circumferentially spaced flutes (20e) extending downwardly from the intermediate section to the bottom wall (18). A filter element (14) subdivides the interior of the container (12) into first (A) and second (B) chambers. A beverage medium is stored in the first chamber (A). A cover (16) is joined to the side wall (20) at the rim (22) to close the upper opening (24). The cover (16) is yieldably piercable to accommodate an injection of liquid into the first chamber (A) for combination with the beverage medium to produce a beverage. The filter element (14) is permeable to accommodate a flow of the beverage from the first chamber (A) into the second chamber (B), and the bottom wall (18) is yieldably piercable to accommodate an outflow of the beverage from the second chamber (B) to the exterior of the cartridge.

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BEVERAGE FILTER CARTRIDGE

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority from U.S. Provisional Patent Application Serial No. 60/183,708 filed 02/18/2000 and U.S. Utility Patent Application filed on February 13, 2001 (serial no. unknown), both of which are incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

This invention relates to disposable single serve beverage filter cartridges.

DESCRIPTION OF THE PRIOR ART

A known disposable single serve beverage filter cartridge is disclosed in U.S. Patent Nos. 5,325,765 and 5,840,189 (Sylvan et al.), dated respectively July 5, 1994 and November 24, 1998, the disclosures of which are herein incorporated by reference.

This beverage filter cartridge is comprised basically of an impermeable yieldably-piercable cup-shaped outer container internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powdered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably piercable lid.

During a processing cycle, the lid and container bottom are pierced, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid under pressure into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from which it exits via the outlet probe for delivery to an underlying cup.

This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding several problems that have persisted since its initial introduction. One such problem stems from a tendency of the container side

wall to buckle under the force exerted by the outlet probe as it pierces the container bottom. This sometimes results in a failure of the outlet probe to achieve bottom penetration, thus aborting the brewing process because the brewed beverage cannot be delivered to the underlying cup. Buckling of the container side wall also can distort the punctured orifice in the container bottom, thus compromising sealing and resulting in leakage of the brewed beverage.

Problems have also been encountered in reliably sealing the rim of the filter component to the interior side wall of the container, as well as in centrally securing the bottom of the filter component to the container bottom. Failure to achieve a proper rim seal can cause the unsealed portion of the filter to collapse under brew pressure, resulting in the brewed beverage being contaminated by beverage medium residue escaping from the collapsed filter. By the same token, contamination of the brewed beverage also can occur if the filter bottom is not centrally secured, resulting in the filter being punctured by the outlet probe as it projects upwardly through the container bottom. Contamination of the brewed beverage also occurs occasionally when a filter element bursts under the pressure exerted by the heated liquid being infused with the beverage medium.

Still another problem stems from heat sealing the upper rim of the filter at or closely adjacent to the upper rim of the container side wall. This increases the unoccupied so called "head space" between the outside of the filter and the surrounding container wall, and also limits the maximum amount of beverage medium that can be stored in the cartridge to that which can be contained within the filter. In some cases, this can compromise the strength of the resulting brewed beverage. Beverage strength can be optimized by filling the filter to its maximum capacity, but this can result in errant granules of the beverage medium spilling onto the container rim. This in turn can disrupt the integrity of the seal between the cover and the container rim.

Among the objectives of the present invention is a strengthening of the container side wall to thereby resist buckling when the container bottom is punctured by the outlet probe of the brewer.

Companion objectives include a beneficial increase in beverage medium storage capacity, improvements in the manner in which the filter component is sealed to and radially supported by the container side wall, as well as improvements in the manner in which the lower end of the filter is positioned and anchored to the cartridge bottom.

SUMMARY OF THE INVENTION

In accordance with the present invention, the container side wall is provided with circumferentially spaced flutes which are strategically positioned to enhance resistance to buckling without interfering with or compromising the integrity of the seal between the side wall and the filter component. The location at which the filter component is joined to the interior side wall of the container is lowered to achieve a beneficial increase in beverage medium storage capacity. This location is defined by a tapered circular ledge against which the tapered filter component is reliably sealed.

The channels formed between the circumferentially spaced flutes serve to efficiently direct the brewed beverage downwardly towards the pierced container bottom, with an accompanying beneficial increase in turbulence in the head space defined between the filter element and container side wall.

In a second embodiment of the invention, the container bottom is configured to provide a downwardly protruding centrally disposed boss defining a reduced diameter interior sump surrounded by an annular planar bottom area. The annular bottom area is available for piercing by the outlet probe. The filter projects downwardly into and is secured within the sump at a location safely out of harms way with respect to the piercing action of the outlet probe. A beneficial decrease in head space is also realized by locating the lower end of the filter in the reduced diameter sump.

In a third embodiment of the present invention, the circumferentially spaced flutes protrude sufficiently inwardly into the container interior to radially contact the filter element at circumferentially spaced locations. This radial contact beneficially guides the filter element into its centrally located position during assembly of the cartridge components, and, during the processing cycle, provides radial support which resists distortion and possible bursting of the filter element.

These and other features, objectives and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a disposable beverage filter cartridge in

accordance with one embodiment of the present invention;

Figure 2 is an exploded perspective view of the basic components of the beverage filter cartridge shown in Figure 1;

Figure 3 is a side elevational view of the beverage filter cartridge shown in Figure 1;

Figures 4 and 5 are vertical and horizontal sectional views taken, respectively, on lines 4-4 and 5-5 of Figure 3;

Figure 6 is an enlarged sectional view of a rim portion of the filter cartridge as shown in Figure 4;

Figure 7 is an enlarged view of a portion of the side wall of the beverage cartridge;

Figure 8 is a sectional view taken along line 8-8 of Figure 7;

Figure 9 is a bottom perspective view of a disposable filter cartridge in accordance with a second embodiment of the present invention;

Figure 10 is a side elevational view of the filter cartridge shown in Figure 9;

Figure 11 is a bottom view of the filter cartridge shown in Figures 9 and 10;

Figure 12 is an enlarged cross sectional view taken along line 12-12 of Figure 10;

Figure 13 is a perspective view of a disposable beverage filter cartridge in accordance with a third embodiment of the present invention;

Figure 14 is an exploded perspective view of the components of the beverage filter cartridge shown in Figure 13;

Figure 15 is a side elevational view looking in the direction depicted by the arrow "x" in Figure 13;

Figure 16 is another side elevational view looking in the direction depicted by the arrow "Y" in Figure 13;

Figure 17 is an enlarged bottom view of the beverage filter cartridge shown in Figures 13-16;

Figure 18 is an enlarged vertical sectional view taken along line 18-18 of Figure 16;

Figure 19 is a vertical sectional view taken along line 19-19 of Figure 18;

Figure 20 is a horizontal sectional view taken along line 20-20 of Figure 19; and

Figure 21 is an enlarged sectional view of a rim portion of the cartridge as shown in Figures 18 and 19.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference initially to Figures 1-5, a beverage filter cartridge in accordance with a first embodiment of the invention is generally depicted at 10. As shown in Figure 2, the basic components of the beverage filter cartridge include an outer cup-shaped container 12, a generally cone-shaped filter element 14, and a planar circular lid 16.

The cup-shaped container 12 has a bottom 18, and a side wall 20 extending upwardly from the bottom to a circular rim 22 surrounding an upper opening 24. With reference additionally to Figures 6-8, it will be seen that the side wall 20 has an upper section 20a extending downwardly from the rim 22 to an intermediate section defined by an inwardly tapered ledge 20b, and a lower tapered section 20c extending downwardly from ledge 20b to the bottom 18.

The upper wall section 20a is preferably subdivided into upper and lower segments 20a′ and 20a″. Moving down the cup, segment 20a′ is flared outwardly, and segment 20a″ tapers inwardly, with the juncture therebetween defining a stacking shoulder 20d. The bottom 18 is optionally and preferably provided with an upwardly protruding central boss 18a.

The lower tapered wall section 20c is configured to provide a plurality of circumferentially spaced flutes 20e, the upper ends of which terminate beneath the intermediate section defined by ledge 20b, and the lower ends of which terminate as indentations in the bottom wall 18.

It will be seen from Figure 8 that the depths "d" of the flutes 20e gradually increase from a minimum at their upper ends to a maximum at their lower ends. Likewise, as can be seen from Figure 7, the widths "w" of the flutes also gradually increase from a minimum at their upper ends to a maximum at their lower ends.

The cup-shaped container is preferably thermo-formed vacuum molded from an impermeable yieldably piercable heat sealable material having a nominal thickness of 0.031″ and comprising, for example, polyethylene/EVOH/polystyrene supplied by

Curwood Packaging of Oshkosh, Wisconsin, U.S.A.

The filter element 14 is formed of a pliable and permeable heat sealable material such as for example cellulose polypropylene supplied by J. R. Crompton, Ltd of Bury, Lancashire, England. The bottom of the filter element is supported on and secured as by heat sealing to the central boss 18a.

The lid may be cut or blanked from any suitable impermeable heat sealable and yieldably piercable material, such as for example, a metallic/polymer laminate supplied by Winpak Heat Seal Packaging, Inc. of Montreal, Canada.

As can best be seen in Figure 6, the filter element is heat sealed as at 26 to the intermediate wall section defined by tapered ledge 20b. The taper angle of the ledge 20b closely approximates the taper angle of the filter element 14, thereby facilitating the task of securely and reliably heat sealing the two together. The filter element serves to subdivide the interior of the container 12 into first and second chambers A, B. A dry granular or powdered beverage medium "M", typically ground roasted coffee, is stored in chamber A, and the container opening 24 is closed by heat sealing the lid 16 to the rim 22.

At the onset of a processing cycle, the lid 16 and container bottom 18 are pierced, respectively, by tubular inlet and outlet probes 28, 30 (see Figure 3). The inlet probe 28 admits a heated liquid, typically hot water, into chamber A where it infuses and combines with the beverage medium M to produce a beverage. The beverage passes through the filter element 14 into chamber B, from which it exits via outlet probe 30.

The second embodiment illustrated in Figures 9-11 is similar in many respects to the above-described first embodiment. Similar features of the second embodiment have been identified with similar reference numerals in a two hundred series. Thus, for example, reference numeral 10 identifies the filter cartridge of the first embodiment, and reference numeral 210 identifies the filter cartridge of the second embodiment.

In the second embodiment, the container bottom 218 is configured to provide a downwardly protruding centrally disposed reduced diameter boss 218a defining an interior sump 218b surrounded by an annular substantially planar bottom area. The bottom of the conical filter element is received in and secured to the bottom of the sump as at 218c.

The third embodiment illustrated in Figures 13-21 is also similar in many respects to the first embodiment. Again, similar features have been identified with similar reference numerals, but in a three hundred series.

The major difference between the first and third embodiments is that the latter has fewer and much deeper flutes 320e. As can be best seen in Figure 19, the deeper flutes 320e contact and provide radial support for the filter element 314.

In light of the foregoing, it will now be appreciated by those skilled in the art that the present invention offers significant advantages over the known beverage filter cartridge described in the previously referenced patents. For example, the circumferentially spaced flutes 20e, 220e and 320e strengthen the container side wall against buckling when the bottom is pierced by the outlet probe 30. The deeper flutes 320e of the third embodiment offer the added advantage of radially supporting the filter element, which can be particularly beneficial during the processing cycle, when the filter element is being stressed by the infusion of pressurized heated liquid into the beverage medium.

In all embodiments, the downwardly diverging and gradually deepening of the flutes serves to promote downward flow of the brewed beverage in chamber B while beneficially encouraging turbulence. The upwardly protruding bosses 18a, 318a on the container bottoms of the first and third embodiments provide readily accessible support platforms for the bottoms of the filter elements. Securing the bottoms of the filter elements to the bosses 18a, 218a insures that the filter elements will not be punctured by the outlet probe 30.

The small diameter sump 218b defined by the downwardly protruding boss 218a of the second embodiment receives the lower end of the filter component in a confined space which beneficially decreases head space and further assists in positively locating and safeguarding the filter from damaging contact with the outlet probe.

The tapered ledges 20b, 220b, 320b of all embodiments provide distinct and readily accessible lands to which the filter elements may be reliably joined by heat sealing. The upper ends of the flutes 20e, 220e, 320e terminate below the ledges 20b, 220b, 320b, thereby insuring that the ledges are not interrupted by discontinuities that would be detrimental to the critical seal of the filter elements to the container side walls.

The upper container sections 20a, 220a, 320a above the filters provide

beneficial increases in available storage capacity for the beverage medium. This increased storage capacity makes it unnecessary to fill the interior chamber A to its maximum capacity, thereby safeguarding the container rim from contamination by errant granules of the beverage medium.

Although the outer container and cover have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

Although the present invention has been described with reference to several embodiments, various changes, modifications and additions may be made without departing from the spirit and scope of the appended claims.

We claim:

1. A beverage filter cartridge comprising:

a cup-shaped outer container having a bottom and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an intermediate section, and having a tapered lower section extending downwardly from said intermediate section to said bottom wall, said tapered lower section being configured to provide a plurality of circumferentially spaced flutes;

a filter element received in said container, said filter element being joined to said side wall and being configured and positioned to subdivide the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being yieldably piercable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom wall being yieldably piercable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

2. The beverage filter cartridge of claim 1 wherein said flutes extend downwardly from upper ends terminating beneath said intermediate section to lower ends at said bottom wall.

3. The beverage filter cartridge of claim 2 wherein the lower ends of said flutes define indentations in said bottom wall.

4. The beverage filter cartridge of claims 2 or 3 wherein the depths of said flutes gradually increase from a minimum at said upper ends to a maximum at said lower ends.

5. The beverage filter cartridge of claims 2 or 3 wherein the widths of said flutes gradually increase from a minimum at said upper ends to a maximum at said lower ends.

6. The beverage filter cartridge of claim 1 wherein said filter element is joined to said side wall at said intermediate section.

7. The beverage filter cartridge of claim 1 wherein said intermediate section is defined by a ledge joining said upper section to said lower section, and wherein said filter element is joined to said side wall at said ledge.

8. The beverage filter cartridge of claim 7 wherein said ledge tapers inwardly from said upper section to said lower section, and wherein the taper angle of said intermediate section is greater than the taper angle of said lower section.

9. The beverage filter cartridge of claim 1 wherein said upper section has an upper segment extending downwardly from said circular rim and a lower segment extending upwardly from said intermediate section, said upper segment being flared outwardly and said lower segment being tapered inwardly, with the juncture of said upper and lower segments defining an exterior stacking shoulder.

10. The beverage filter cartridge of claim 1 wherein said bottom wall is provided with an upwardly protruding centrally disposed boss, a lower end of said filter element being supported on said boss.

11. The beverage filter cartridge of claim 10 wherein the lower end of said filter is secured to said boss.

12. The beverage filter cartridge of claim 1 wherein said filter element is in contact with and radially supported by said flutes.

13. The beverage filter cartridge of claim 1 wherein said bottom is provided with a downwardly protruding centrally disposed boss defining an interior sump, and wherein the lower end of said filter element is received in said sump.

14. The beverage filter cartridge of claim 13 wherein said filter element is secured to the bottom of said sump.

15. The beverage filter cartridge of claim 1 wherein said outer container is impermeable.

16. The beverage filter cartridge of claims 1 or 15 wherein said cover is impermeable.

17. A beverage filter cartridge comprising:

a cup-shaped outer container having a bottom and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an intermediate section, and having a tapered lower section extending downwardly from said intermediate section to said bottom wall, said tapered section being configured to provide a plurality of circumferentially spaced flutes;

a filter element received in said container, said filter element being in contact with and radially supported by said flutes and being joined to said side wall at a location subdividing the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being yieldably piercable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom wall being yieldably piercable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

18. A beverage filter cartridge comprising:

a cup-shaped container having a bottom and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an intermediate section, and having a tapered lower section extending downwardly from said intermediate section to said bottom wall, said tapered section being configured to provide a plurality of circumferentially spaced flutes, said bottom being provided with a downwardly protruding centrally disposed boss defining an interior sump;

a conical filter element received in said container, the bottom of said filter element protruding downwardly into and being secured within said sump, said filter element being joined to said side wall and being configured and positioned to subdivide the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being yieldably piercable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter being permeable to accommodate a flow of said beverage from said first chamber into

said second chamber, and said bottom wall being yieldably piercable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.