as fish oils or microbial oils. The lipid source preferably has a ratio of n-6 to n-3 fatty acids of about 5:1 to about 15:1; for example about 8:1 to about 10:1.

[0052] The infant formulae for use in the present invention may also contain all vitamins and minerals understood to be essential in the daily diet and in nutritionally significant amounts. Minimum requirements have been established for certain vitamins and minerals. Examples of minerals, vitamins and other nutrients optionally present in the infant formula include vitamin A, vitamin B_1, vitamin B_2, vitamin B_6, vitamin B_{12}, vitamin E, vitamin K, vitamin C, vitamin D, folic acid, inositol, niacin, biotin, pantothenic acid, choline, calcium, phosphorous, iodine, iron, magnesium, copper, zinc, manganese, chloride, potassium, sodium, selenium, chromium, molybdenum, taurine, and L-carnitine. Minerals are usually added in salt form. The presence and amounts of specific minerals and other vitamins will vary depending on the intended infant population.

[0053] The infant formulae may also comprise at least one probiotic bacterial strain. A probiotic is a microbial cell preparation or components of microbial cells with a beneficial effect on the health or well-being of the host. Suitable probiotic bacterial strains include *Lactobacillus rhamnosus* ATCC 53103 obtainable from Valio Oy of Finland under the trade mark LGG, *Lactobacillus rhamnosus* CGMCC 1.3724, *Lactobacillus paracasei* CNCM 1-2116, *Bifidobacterium lactis* CNCM 1-3446 sold inter alia by the Christian Hansen company of Denmark under the trade mark Bb12 and *Bifidobacterium longum* ATCC BAA-999 sold by Morinaga Milk Industry Co. Ltd. of Japan under the trade mark BB536. The amount of probiotic, if present, likewise preferably varies as a function of the age of the infant. Generally speaking, the probiotic content may increase with increasing age of the infant for example from 10e3 to 10e12 cfu/g formula, more preferably between 10e4 and 10e8 cfu/g formula (dry weight).

[0054] The infant formulae may also contain at least one prebiotic in an amount of 0.3 to 10%. A prebiotic is a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon, and thus improves host health. Such ingredients are non-digestible in the sense that they are not broken down and absorbed in the stomach or small intestine and thus pass intact to the colon where they are selectively fermented by the beneficial bacteria. Examples of prebiotics include certain oligosaccharides, such as fructooligosaccharides (FOS) and galactooligosaccharides (GOS). A combination of prebiotics may be used such as 90% GOS with 10% short chain fructo-oligosaccharides such as the product sold under the trade mark Raftilose® or 10% inulin such as the product sold under the trade mark Raftiline®.

[0055] The infant formulae may optionally contain other substances which may have a beneficial effect such as lactoferrin, nucleotides, nucleosides, and the like.

[0056] Preferably, the nutrition system further comprises a neonatal supplement including a carbohydrate source and a probiotic bacterial strain in an amount between 10e3 and 10e6 cfu/g supplement. The neonatal supplement can be filled in a capsule of the smallest size to complete the range of capsules intended in the infant nutritional feeding plan as aforementioned.

[0057] The invention extends to a method of providing nutrition to an infant in the first six months of life comprising feeding to the infant for at least part of the first one to eight weeks of life a first infant formula having a protein source comprising whey and optionally casein proteins and having a whey:casein ratio between 100:0 and 60:40 and a protein content between 2.0 and 3.0g protein/100 kcal and feeding to the infant for at least part of the remainder of the first six months of life a second infant formula having a protein source comprising whey and casein proteins and having a whey:casein ratio between 70:30 and 50:50 and a protein content between 1.7 and 2.1g protein/100 kcal with the proviso that either the protein content or the whey:casein ratio of the second formula or both is/are lower than for the first formula.

[0058] Preferably the method according to the invention comprises feeding to the infant for about the first two to four weeks of life a first infant formula having a protein source with a whey:casein ration between 80:20 and 60:40 and a protein content between 2.0 and 3.0g protein/100 kcal then feeding to the infant a second infant formula having a whey:casein ratio between 70:30 and 50:50 and a protein content between 1.8 and 2.0g protein/100 kcal. Even more preferably, the second infant formula is fed from the age of two to four weeks to the age of about two months and a third infant formula also having a whey:casein ratio between 70:30 and 50:50 and a protein content between 1.8 and 2.0g protein/100 kcal wherein either the protein content or the whey:casein ratio of the second formula or both is/are lower than for the second formula is fed for the remainder of the first six months of the infant's life.

[0059] In the system of the present invention, the capsules are individually processed in a nutritional dispenser 2 as illustrated in figures 2 and 3 as a matter of preferred examples.

[0060] The capsules 1 are individually received in a capsule receiver 20 of the dispenser. The capsule can be inserted in the dispenser manually, for instance, by dropping the capsule from an opening provided on the top of the dispenser (not illustrated). Thus, the capsule is inserted in the dispenser in a stable manner for being processed. The dispenser further comprises, as known per se, a water supply 21, e.g., a replenishable water reservoir. Water from the reservoir is transported via water circuit 22 using a water transport means such as a pump 23. The pump can be chosen in the large group of liquid pumps such as piston, peristaltic, centrifugal, diaphragm, gravity pump, etc. A water heater 24 is provided in the water circuit to heat the water at the required temperature. For infant formula, the water is preferably heated to a temperature of between 30 and 40 degrees. Depending on the way the sanitation of water is performed in

K-FEE SYSTEM GMBH, EX2009, page 1525
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the dispenser, water can be heated at a sanitation temperature, e.g., at the boiling point of water and then allowed to cool down before being dispensed. In a preferred mode, water is heated at about the serving temperature and then pathogens are removed by micro filtration using a microbial filter 25 placed in the water circuit, e.g.., in the dispenser or in the capsule. A preferred example of dispenser comprising a microbial filter is disclosed in co-pending European patent application No. 08100897.1 filed on 24 January 2008 entitled: "Exchangeable filter for beverage production device and beverage production device comprising such filter". A system with a monitorized water and a sanitized or disposable fluid system may prevent the need for sanitizing water.

[0061] The dispenser further comprises a water dispensing head 26 ending by a water injection means such as a water injection needle 27. The needle is designed to pierce the capsule and inject a controlled volume of water in the capsule.

[0062] The dispenser can further comprise a steam circuit 28 comprising a water transport means, e.g., pump 29 and a steam generator 30. The steam circuit can be provided for regularly sanitizing the injection head and more particularly the surfaces of the head which comes in contact with the nutritional formula and liquid. A controllable three-way valve 31 can be placed at the intersection of the water and steam circuit to controllably select the passage of water or steam through the injection head. A dispenser comprising a steam circuit for sanitizing the injection head is described in WO2009027131 (published 5 March 2009) entitled:" Dispensing device for preparing and dispensing food and/or nutritional composition". The capsule receiver can be part of a capsule transport cart 32 which comprises guiding means 33 and a motorized drive means 34 for transporting the capsule from the capsule insertion position to the injection position. Of course, the transport of the capsule can be treated differently than by a cart provided in the dispenser. For instance, the device could comprise a capsule drawer coming in and out of the dispenser at the push of a button or a drawer manually insertable in, removable from, the dispenser.

[0063] A reading means 35 can be positioned along the transport path of the cart 32 in such a way that the code on the capsule can be properly detected by the reader 35. The reading means 35 can, for example, comprise a IR barcode detector which can read a reduced circular barcode 40 placed on the upper lid 4 of the capsule (figure 4). For example, a pair of IR leds 50 bring the IR-light to the reading area and a IR detector 51 generates an electrical signal depending of the reflected IR level. A focusing lens 52 is also provided to focus the IR light. The small electrical signals generated by the IR detector is amplified by a wide band analogue amplifier 53 and converted to a digital signal by a following level comparator. The electronic elements (amplifier, converter, comparator) can be placed on a small printed circuit board 54 connected via a small cable 55 to the control unit of the dispenser. The control unit 5 comprises a microprocessor which measures the pulse length of every dark ring of the circular barcode and the spaces between the rings and compares the sequence to given pattern to decode the information of the barcode rings. Each circular barcode is thus read and provides a binary code (e.g., 000, 101,010, etc.) indicating to the control unit which type of capsules is present in the dispenser. The advantage of a circular bar code is that the code can be read in a more reliable manner from above the capsule while the capsule is in movement. The code reader can also be placed at a sufficient distance from the injection head so that the reading is not disturbed by the wet and steam environment. Of course, a linear barcode could also be utilized. Other capsule recognition means such as RFID technology can of course replace the barcode system. The technology may also be chosen as function of the number of data to be stored in the code which is itself also function of the number of capsules and the complexity of the operations in the dispenser to be controlled. For instance, RFID allows storing of a larger amount of information. Furthermore, RFID can be used to read different consumables or elements coming in the preparation of the liquid to be prepared, e.g., a disposable filter to control life time of the filter or a water bottle recommended for reconstituting the liquid formula.

[0064] Then, in figure 3, after reading (which can be carried out during the motion of the capsule towards its injection position), the capsule is transported by the transport cart 32 below the water injection head up to the point where the capsule is pierced. When the injection position has been recognized such as by a position sensor (not shown), the control unit 5 commands the water pump on to inject a controlled volume of water in the capsule. The volume of water is controlled in function of the type of capsules recognized by the code recognition means. In the event no code is recognized, the control unit may not activate the pump and the dispenser may send a warning signal to the user that the capsule has not been recognized.

[0065] The capsules of the invention can be of different structure. Preferred capsules are, for instance, "direct-flow" gastight capsules, preferably, as described in European patent EP1472156B or also in WO2009115475 (published 24 September 2009) entitled: "Cartridge for preparation of a liquid comprising puncturable delivery wall". A pressure is typically built up within the capsule during water injection, which causes a lower face (or septum) of the cartridge to open thence, enabling the output of the liquid to be prepared. Since the output of the beverage to be prepared takes place at the lower face of the capsule with no contact with opening means of the dispenser, the flow of the liquid can be directly poured into the receptacle, e.g. a baby bottle, without contaminating the surfaces of the device. This results in a very hygienic preparation and delivery of the nutritional preparation.

[0066] Of course, the present method can apply to other groups of persons such as athletes during training or preparing for competitions or persons under medication or treatment for which a followed regime is required over a certain period

K-FEE SYSTEM GMBH, EX2009, page 1526
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

of time.

EXAMPLE:

[0067] An example of nutritional feeding plan for infant using a range of capsules according to the invention is given below. The nutritional feeding plan is designed for providing a balanced regime to infants from the age of 0 to 12 months. As will be appreciated by those skilled in the art, in addition to the nutriments specified below as a preferred example, the exemplified infant formulae will also contain other ingredients usually found in such products notably including, probiotics, prebiotics, micronutrients e.g., nucleotides, vitamins and minerals. It should be noted that the plans could expand to provide additional capsules of large size for young children of respectively, 13 to 24 months and 24 to 36 months as well as a capsule containing a neonatal supplement.

K-FEE SYSTEM GMBH, EX2009, page 1527
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Table

Capsule	Size	Small	Small	Medium	Medium	Medium	Large	Large
Basics	Capsule size (ml)	40	40	60	60	60	85	85
	Binary Code	000	001	010	100	011	101	110
	Formula	TN1	TN2	TN3	TN4	TN5	TN6	TN7
	Age range	1st and 2nd wk	3rd and 4th wk	2nd mo	3rd and 4th mo	5th and 6th mo	7th and 8th mo	9th to 12th mo
	Powder (Formula) volume before capsule filling (ml)	38.5	49.8	56	59.7	66	67	NA
	Reconstitution Volume (Range in ml)	75-110 Pref. 90	90-140 Pref. 120	120-170 Pref. 145	140-190 Pref. 165	150-210 Pref. 180	180-240 Pref. 210	180-260 Pref. 210
	Capsule Contents (Range in g)	9-14	11-18	15-22	18-25	20-28	21-29	20-28
Proteins	Content (g/l)	14.6		12.4	11.3		11.3	11.0
	Whey:Casein	70 : 30		60 : 40	60 : 40		50 : 50	50 : 50
Carbohydrates	Type	Lactose		Lactose	Lactose		Lactose	Lactose: Maltodextrin (70: 30)
	Content (g/l)	65.7		72.2	73.1		66.8	64.7
Lipids	Type	Milk & Veg.		Milk & Veg.	Milk & Veg.		Veg.	Veg.
	Content (g/l)	36.4		34.5	32.1		35.3	34.2

K-FEE SYSTEM GMBH, EX2009, page 1528
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Claims

1. Nutritional delivery system using single-serve capsules comprising:

   - a dispenser for a nutritional composition comprising means for providing water into a single-use capsule containing a portion-controlled serving of a nutritional formula,
   - different types of capsules being designed according to a nutritional feeding plan corresponding to persons or categories of persons to be fed, each type comprising capsules containing a nutritional formula; the capsules of different types having at least one differentiating characteristic so that each type of capsules corresponds to a feeding time period determined by the feeding plan,
   - control operation means associated to each type of capsules, said means comprising information relating to at least one differentiating operational parameter relevant to produce and deliver a differentiated nutritional liquid in the dispenser according to the nutritional feeding plan,

   wherein the at least one differentiating characteristic of each type of capsules and the at least one differentiating operational parameter differ according to the age of the person to be fed and,
   wherein the amount of nutritional formula contained in the capsule differs for each type of capsules and,
   wherein the nutritional formula differs for each type of capsules according to at least:

   - the proteins source and/or proteins content,
   - the carbohydrates source and/or carbohydrate content and
   - the lipids source and/or lipids content,

   wherein the size of capsule further differs for at least two different types of capsules and the control operation means increase the volume of water for reconstituting the nutritional liquid as a function of the size of the capsule.

2. System according to claim 1, wherein the amount of the nutritional formulae per size varies according to the following weight distribution:

   - between 5 and 17 grams solids for a "Small" capsule;
   - between 13 and 27 grams solids for a "Medium" capsule and,
   - between 20 and 38 grams solids for a "Large" capsule.

3. System according to claims 1 or 2, wherein the control operation means comprises a code associated to each type of capsule and reader means associated to the dispenser for reading the code and a control unit configured to control the preparation of the nutritional formula liquid according to the at least one differentiating parameter relating to the code.

4. System according to any of the preceding claims 1 to 3, wherein control operation means comprise a plurality of visual marks on the capsules; each mark corresponding to one type of capsules, and a multi-choice activation means on the dispenser matching the plurality of visual marks and operating a control unit configured to control the preparation of the nutritional formula liquid according to the differentiating parameter relating to the choice made by the user on the multi-choice activation means.

5. System according to any of the preceding claims, wherein the nutritional formula is an infant formula and the nutritional feeding plan is an infant feeding plan which provides a feed regime for infants that follows a growth period of the infant covering several ranges of ages.

6. Method for delivering a nutritional formula liquid to categories of persons requiring differentiated nutritional feedings according to a nutritional feeding plan, comprising a portion-controlled nutrition system using a single-serve capsule and a dispenser for receiving the capsules and delivering a differentiated nutritional liquid by mixing water with the nutritional formula contained in said capsule,
   wherein said method further comprises:

   - providing different types of capsules; the capsule of different types having at least one differentiating characteristic so that each type of capsules corresponds to a time period recommended by the nutritional feeding plan, each type of capsules being so designed for persons or categories of persons requiring a differentiated nutritional feeding and,
   - operating the dispenser, including mixing water with the nutritional formula in the capsule, according to at least

K-FEE SYSTEM GMBH, EX2009, page 1529
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

one differentiating operational parameter relevant for delivering the differentiated nutritional liquid in compliance with said nutritional feeding plan,

wherein the at least one differentiating characteristic of each type of capsules and the at least one differentiating operational parameter differ according to the age of the person to be fed and,
wherein the amount of nutritional formula contained in the capsule differs for each type of capsules and,
wherein the nutritional formula differs for each type of capsules according to at least:

- the proteins source and/or proteins content and,
- the carbohydrates source and/or carbohydrate content and,
- the lipids source and/or lipids content,

wherein the size of capsule further differs for at least two different types of capsules and the dispenser is operated to feed the capsule with a volume of water which increases as a function of the size of the capsule.

7. Method according to claim 6, wherein the operation of the dispenser is controlled such as by a code for mixing different volumes of water in the capsule of different types as a function of the size and/or amount of nutritional formula.

Patentansprüche

1. Nahrungsabgabesystem, das Einzelportionskapseln verwendet und Folgendes umfasst:

- einen Spender für eine Nahrungszusammensetzung, der Mittel zum Bereitstellen von Wasser in eine Einzelverwendungskapsel umfasst, die eine mengengesteuerte Portion einer Formelnahrung enthält,
- unterschiedliche Kapseltypen, die gemäß einem Ernährungsplan ausgebildet sind, der Personen oder Kategorien von Personen entspricht, die ernährt werden sollen, wobei jeder Kapseltyp eine Formelnahrung umfasst; wobei die Kapseln unterschiedlicher Typen mindestens ein unterscheidendes Merkmal aufweisen, so dass jeder Kapseltyp einem Ernährungszeitraum entspricht, der durch den Ernährungsplan festgelegt wird,
- Steuerungsbetriebsmittel, die den einzelnen Kapseltypen zugeordnet sind, wobei die Mittel Informationen zu mindestens einem unterscheidenden Betriebsparameter umfassen, der für die Herstellung und Abgabe einer differenzierten Nahrungsflüssigkeit in den Spender gemäß dem Ernährungsplan relevant ist,

wobei das mindestens eine unterscheidende Merkmal jedes Kapseltyps und der mindestens eine unterscheidende Betriebsparameter sich nach dem Alter der Person unterscheiden, die ernährt werden soll, und
wobei die Menge der Formelnahrung in der Kapsel für jeden Kapseltyp unterschiedlich ist, und
wobei die Formelnahrung für jeden Kapseltyp unterschiedlich ist hinsichtlich mindestens:

- der Proteinquelle und/oder des Proteingehalts,
- der Kohlenhydratquelle und/oder des Kohlenhydratgehalts und
- der Lipidquelle und/oder des Lipidgehalts,

wobei die Größe der Kapsel ferner für mindestens zwei unterschiedliche Kapseltypen unterschiedlich ist und die Betriebsteuerungsmittel das Volumen an Wasser zur Wiederherstellung der Nahrungsflüssigkeit in Abhängigkeit von der Größe der Kapsel erhöhen.

2. System nach Anspruch 1, wobei die Menge der Formelnahrung pro Größe gemäß der folgenden Gewichtsverteilung variiert:

- zwischen 5 und 17 Gramm Feststoffe für eine "kleine" Kapsel;
- zwischen 13 und 27 Gramm Feststoffe für eine "mittlere" Kapsel und
- zwischen 20 und 38 Gramm Feststoffe für eine "große" Kapsel.

3. System nach einem der Ansprüche 1 oder 2, wobei die Steuerungsbetriebsmittel einen Code, der jedem Kapseltyp zugeordnet ist, und Lesemittel, die dem Spender zum Lesen des Codes zugeordnet sind, und eine Steuereinheit zum Steuern der Herstellung der Formelnahrungsflüssigkeit gemäß dem mindestens einen unterscheidenden Parameter in Zusammenhang mit dem Code umfassen.

K-FEE SYSTEM GMBH, EX2009, page 1530
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

4. System nach einem der vorhergehenden Ansprüche 1 bis 3, wobei die Steuerungsbetriebsmittel eine Vielzahl von optischen Markierungen auf den Kapseln umfassen; wobei jede Markierung einem Kapseltyp entspricht, und ein Mehrfachauswahlaktivierungsmittel am Spender mit der Vielzahl von optischen Markierungen übereinstimmt und eine Steuereinheit betreibt, die zum Steuern der Herstellung der Formelnahrungsflüssigkeit gemäß dem unterscheidenden Parameter in Zusammenhang mit der durch den Benutzer auf dem Mehrfachauswahlaktivierungsmittel getätigten Auswahl konfiguriert ist.

5. System nach einem der vorstehenden Ansprüche, wobei die Formelnahrung eine Säuglingsformel ist und der Ernährungsplan ein Säuglingsernährungsplan ist, der ein Ernährungssystem für Säuglinge bereitstellt, das einer Wachstumsperiode des Säuglings über mehrere Altersstufen folgt.

6. Verfahren zur Abgabe einer Formelnahrungsflüssigkeit an Kategorien von Personen, die eine differenzierte Ernährung gemäß einem Ernährungsplan erfordern, umfassend ein mengengesteuertes Ernährungssystem unter Verwendung einer Einzelportionskapsel und einen Spender zur Aufnahme der Kapseln und zur Abgabe einer differenzierten Ernährungsflüssigkeit durch Mischen von Wasser mit der Formelnahrung in der Kapsel,
wobei das Verfahren ferner Folgendes umfasst:

- das Bereitstellen unterschiedlicher Kapselntypen; wobei die Kapseln unterschiedlicher Typen mindestens ein unterscheidendes Merkmal aufweisen, so dass jeder Kapseltyp einem Zeitraum entspricht, der von dem Ernährungsplan empfohlen wird, wobei jeder Kapseltyp auf diese Weise für Personen oder Kategorien von Personen ausgelegt ist, die eine differenzierte Ernährung erfordern, und
- das Betätigen des Spenders, einschließlich Mischen von Wasser mit der Formulnahrung in der Kapsel, gemäß mindestens einem unterscheidenden Betriebsparameter, der für die Abgabe der differenzierten Ernährungsflüssigkeit in Übereinstimmung mit dem Ernährungsplan relevant ist,

wobei das mindestens eine unterscheidende Merkmal jedes Kapseltyps und der mindestens eine unterscheidende Betriebsparameter sich nach dem Alter der Person unterscheiden, die ernährt werden soll, und
wobei die Menge der Formelnahrung in der Kapsel für jeden Kapseltyp unterschiedlich ist, und
wobei die Formelnahrung für jeden Kapseltyp unterschiedlich ist hinsichtlich mindestens:

- der Proteinquelle und/oder des Proteingehalts und
- der Kohlenhydratequelle und/oder des Kohlenhydratgehalts und
- der Lipidquelle und/oder des Lipidgehalts,

wobei die Größe der Kapsel sich ferner für mindestens zwei unterschiedliche Kapseltypen unterscheidet und der Spender betätigt wird, um der Kapsel ein Volumen an Wasser zuzuführen, das in Abhängigkeit von der Größe der Kapsel zunimmt.

7. Verfahren nach Anspruch 6, wobei die Betätigung des Spenders gesteuert wird, wie etwa durch einen Code, um unterschiedliche Volumina an Wasser in der Kapsel unterschiedlicher Typen in Abhängigkeit von der Größe und/oder der Menge der Formelnahrung zu mischen.

Revendications

1. Système d'administration nutritionnelle utilisant des capsules à portion unique, comprenant :

- un distributeur pour une composition nutritionnelle comprenant un moyen de fourniture d'eau dans une capsule à usage unique contenant une portion à quantité régulée d'une préparation nutritionnelle,
- différents types de capsules étant conçus selon un plan d'alimentation nutritionnelle correspondant à des personnes ou catégories de personnes à alimenter, chaque type comprenant des capsules contenant une préparation nutritionnelle ; les capsules de types différents ayant au moins une caractéristique de différenciation de sorte que chaque type de capsules corresponde à une période d'alimentation déterminée par le plan d'alimentation,
- un moyen opérationnel de commande associé à chaque type de capsules, ledit moyen comprenant des informations se rapportant à au moins un paramètre opérationnel de différenciation approprié pour produire et administrer un liquide nutritionnel différencié dans le distributeur selon le plan d'alimentation nutritionnelle,

K-FEE SYSTEM GMBH, EX2009, page 1531
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

dans lequel ladite au moins une caractéristique de différenciation de chaque type de capsules et ledit au moins un paramètre opérationnel de différenciation diffèrent selon l'âge de la personne à alimenter et,
dans lequel la quantité de préparation nutritionnelle contenue dans la capsule diffère pour chaque type de capsules et,
dans lequel la préparation nutritionnelle diffère pour chaque type de capsules selon au moins :

- la source de protéines et/ou la teneur en protéines,
- la source de glucides et/ou la teneur en glucides et
- la source de lipides et/ou la teneur en lipides,

dans lequel la taille de la capsule diffère en outre pour au moins deux types différents de capsules et le moyen opérationnel de commande augmente le volume d'eau pour reconstituer le liquide nutritionnel en fonction de la taille de la capsule.

2. Système selon la revendication 1, dans lequel la quantité des préparations nutritionnelles par taille varie selon la répartition en poids suivante :

- entre 5 et 17 grammes de solides pour une « Petite » capsule ;
- entre 13 et 27 grammes de solides pour une capsule « Moyenne » et,
- entre 20 et 38 grammes de solides pour une « Grande » capsule.

3. Système selon les revendications 1 ou 2, dans lequel le moyen opérationnel de commande comprend un code associé à chaque type de capsule et un moyen de lecture associé au distributeur pour lire le code et une unité de commande configurée pour commander la préparation du liquide de préparation nutritionnelle selon ledit au moins un paramètre de différenciation se rapportant au code.

4. Système selon l'une quelconque des revendications précédentes 1 à 3, dans lequel le moyen opérationnel de commande comprend une pluralité de marques visuelles sur les capsules ; chaque marque correspondant à un type de capsules et un moyen d'activation à choix multiples sur le distributeur correspondant à la pluralité de marques visuelles et actionnant une unité de commande configurée pour commander la préparation du liquide de préparation nutritionnelle selon le paramètre de différenciation se rapportant au choix fait par l'utilisateur sur le moyen d'activation à choix multiples.

5. Système selon l'une quelconque des revendications précédentes, dans lequel la préparation nutritionnelle est une préparation pour nourrissons et le plan d'alimentation nutritionnelle est un plan d'alimentation de nourrisson qui fournit un régime d'alimentation pour nourrissons qui suit une période de croissance du nourrisson couvrant plusieurs plages d'âges.

6. Procédé d'administration d'un liquide de préparation nutritionnelle à des catégories de personnes exigeant des alimentations nutritionnelles différenciées selon un plan d'alimentation nutritionnelle, comprenant un système de nutrition à quantité régulée utilisant une capsule à portion unique et un distributeur pour recevoir les capsules et administrer un liquide nutritionnel différencié en mélangeant de l'eau avec la préparation nutritionnelle contenue dans ladite capsule,
où ledit procédé comprend en outre :

- la fourniture de différents types de capsules ; la capsule des différents types ayant au moins une caractéristique de différenciation de sorte que chaque type de capsules corresponde à une période recommandée par le plan d'alimentation nutritionnelle, chaque type de capsules étant conçue de la sorte pour des personnes ou catégories de personnes exigeant une alimentation nutritionnelle différenciée et,
- l'actionnement du distributeur, incluant le mélange d'eau avec la préparation nutritionnelle dans la capsule, selon au moins un paramètre opérationnel de différenciation approprié pour administrer le liquide nutritionnel différencié en conformité avec ledit plan d'alimentation nutritionnelle,

dans lequel ladite au moins une caractéristique de différenciation de chaque type de capsules et ledit au moins un paramètre opérationnel de différenciation diffèrent selon l'âge de la personne à alimenter et,
dans lequel la quantité de préparation nutritionnelle contenue dans la capsule diffère pour chaque type de capsules et,
dans lequel la préparation nutritionnelle diffère pour chaque type de capsules selon au moins :

- la source de protéines et/ou la teneur en protéines et,

K-FEE SYSTEM GMBH, EX2009, page 1532
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

- la source de glucides et/ou la teneur en glucides et,
- la source de lipides et/ou la teneur en lipides,

dans lequel la taille de la capsule diffère en outre pour au moins deux types différents de capsules et le distributeur est actionné pour alimenter la capsule avec un volume d'eau qui augmente en fonction de la taille de la capsule.

7. Procédé selon la revendication 6, dans lequel le fonctionnement du distributeur est commandé, tel que par un code pour mélanger différents volumes d'eau dans la capsule de types différents en fonction de la taille et/ou de la quantité de préparation nutritionnelle.

K-FEE SYSTEM GMBH, EX2009, page 1533
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

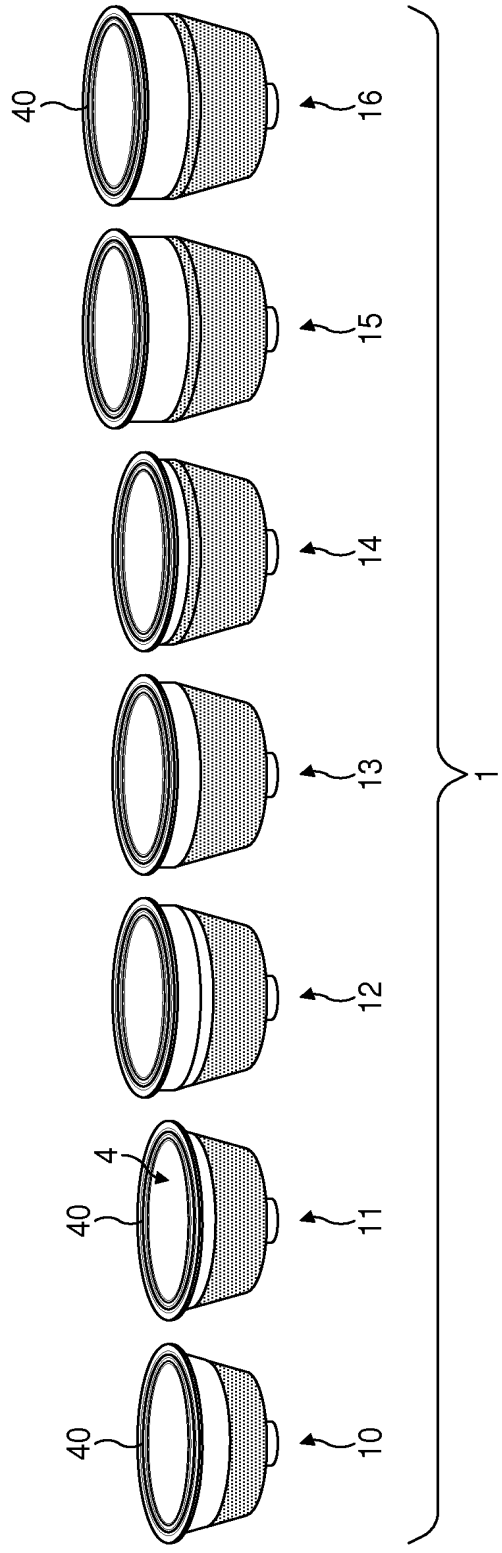


FIG. 1

K-FEE SYSTEM GMBH, EX2009, page 1534
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

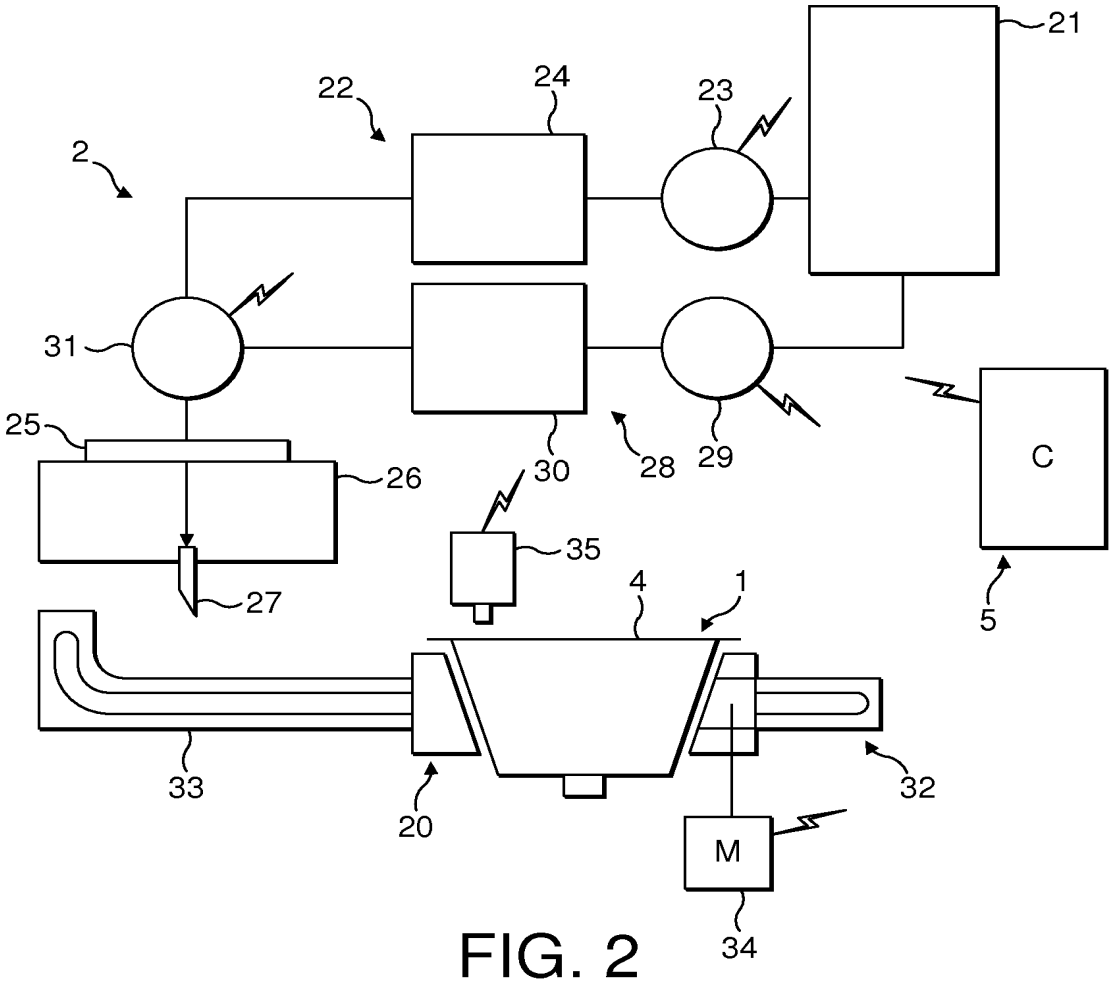


FIG. 2

K-FEE SYSTEM GMBH, EX2009, page 1535
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

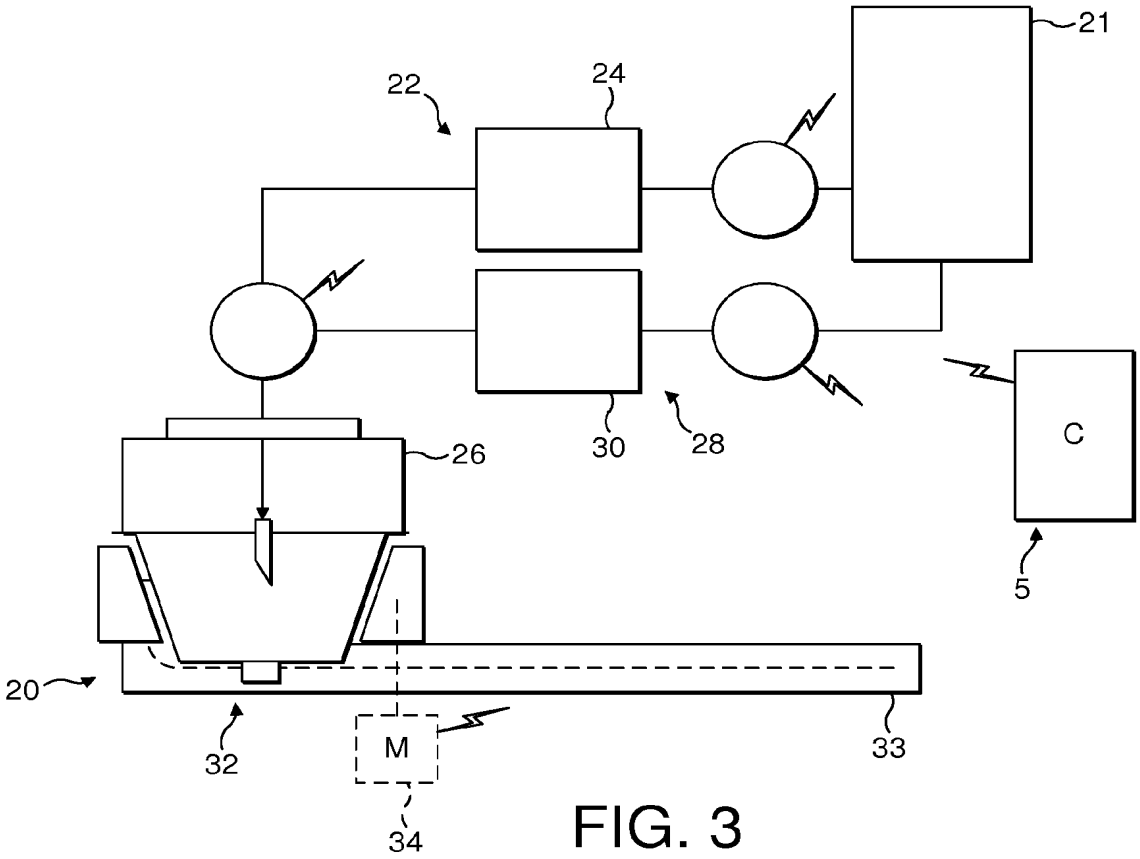


FIG. 3

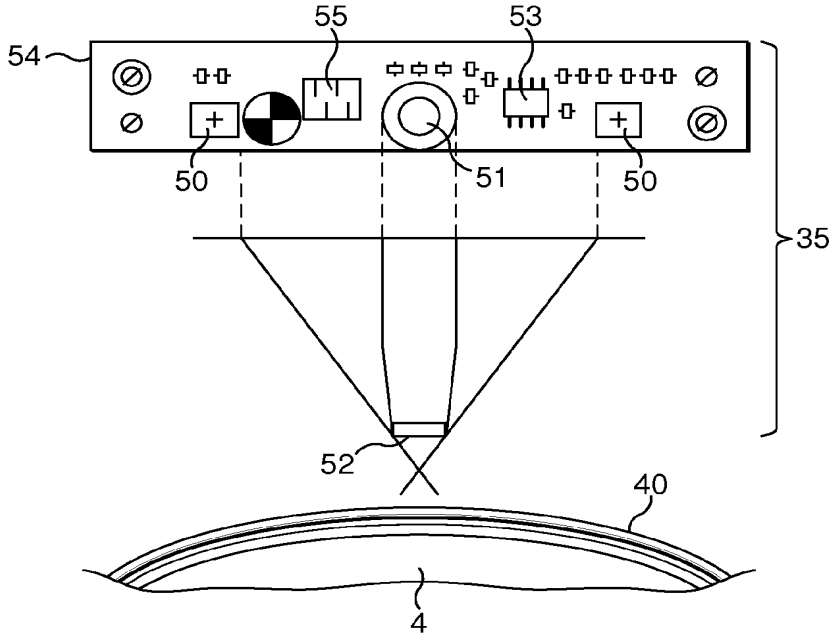


FIG. 4

K-FEE SYSTEM GMBH, EX2009, page 1536
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

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- WO 2009068549 A **[0009]**
- EP 08100897 A **[0060]**
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K-FEE SYSTEM GMBH, EX2009, page 1537
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

(12) UK Patent Application (19) GB (11) 2 399 404 (13) A

(43) Date of A Publication 15.09.2004

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(22) Date of Filing: 11.03.2003

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(51) INT CL^7:
F17C 13/00

(52) UK CL (Edition W):
F4P PAB PBX

(56) Documents Cited:
WPI A.A.N: 1991-123204 [17] & NL 8902209

(58) Field of Search:
UK CL (Edition V) **F4P** PAB PBX
INT CL^7 **F17C** 1/00 3/00 13/00
Other: **ONLINE: WPI EPODOC JAPIO**

(54) Abstract Title: **Gas cylinder indicia collar**

(57) A wrap around indicia collar 2, 30 is capable of being locked around the neck of a gas cylinder container 82. The collar 2, 30 carries indicia, which may be related to the contents of the cylinder 82, and may be in the form of a barcode. In a first embodiment, the collar 2, 30 is a hinged ring in two halves, with interlocking ends 15, 16. In a second embodiment, the collar is a single flexible strip 30 with interlocking ends 44, 46. The collar 2, 30 may overcome the problem of existing labels, which may tend to fall off, and may allow compliance with modern labelling legislation.

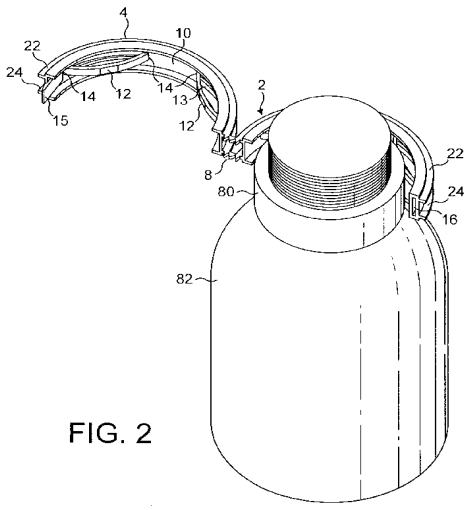


FIG. 2

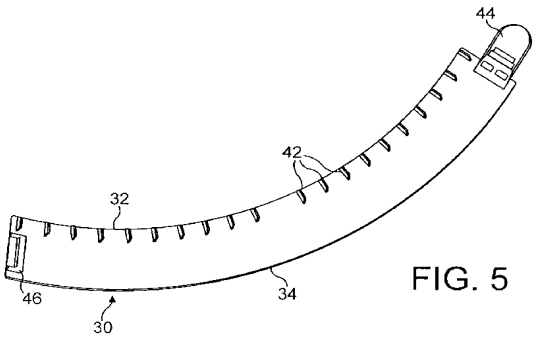


FIG. 5

GB 2 399 404 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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K-FEE SYSTEM GMBH, EX2009, page 1538
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

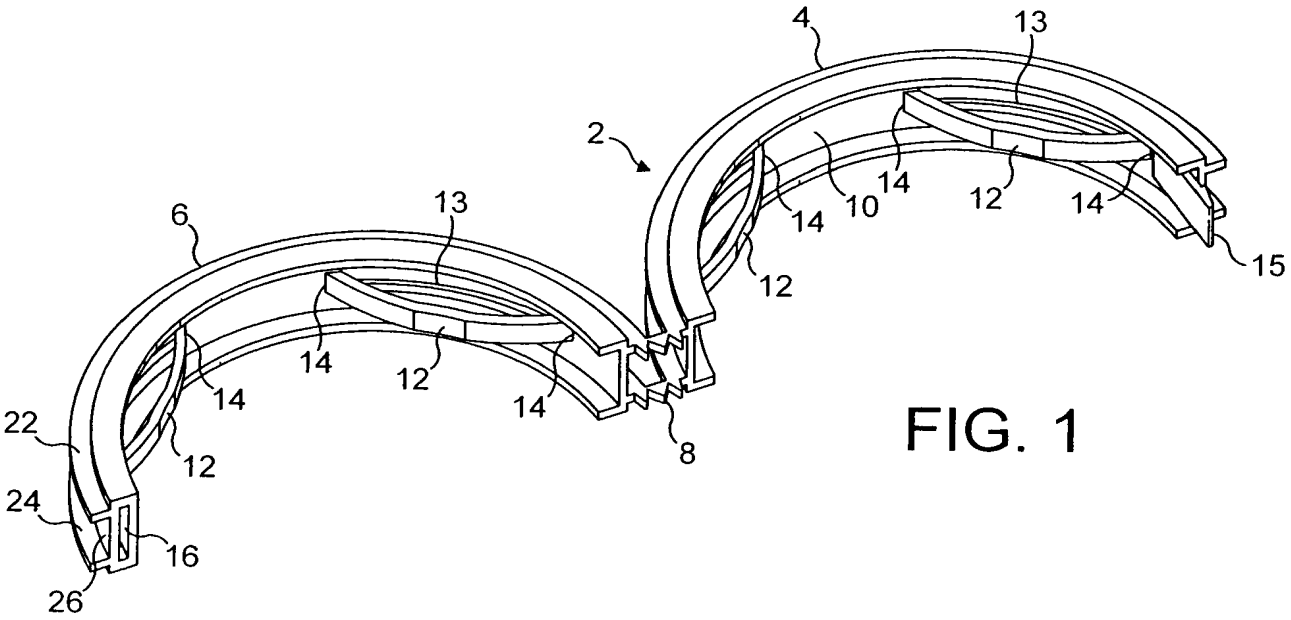

4
13
2
6
13
14
10
14
12
14
15
14
12
14
12
14
22
12
8
24
16
26

FIG. 1

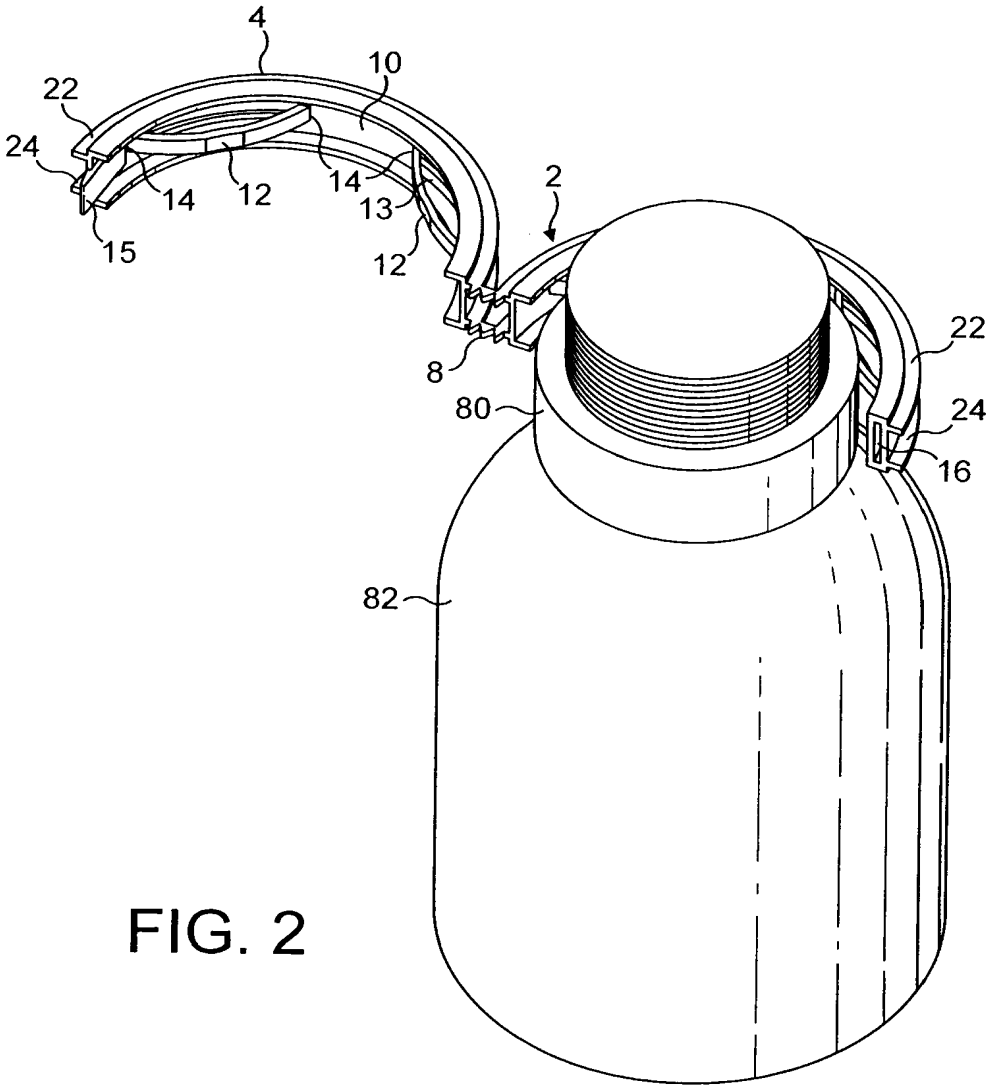

4
10
22
24
14
12
14
2
13
15
12
8
22
80
24
16
82

FIG. 2

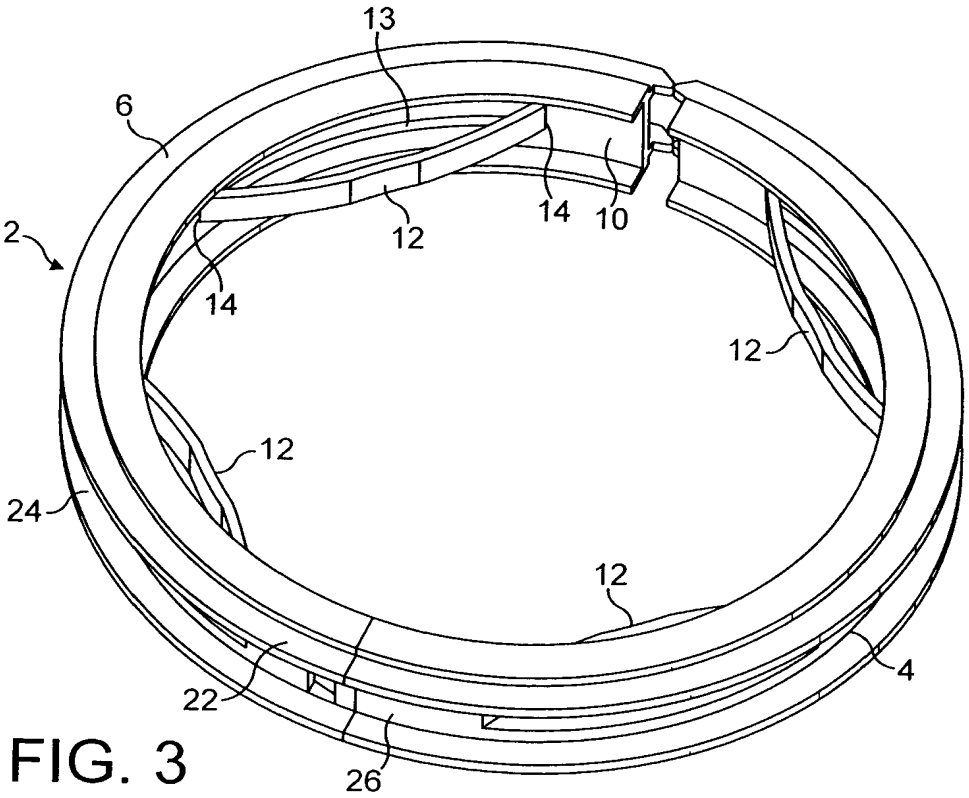

13
6
2
14
12
14
10
12
14
12
24
12
22
4
26

FIG. 3

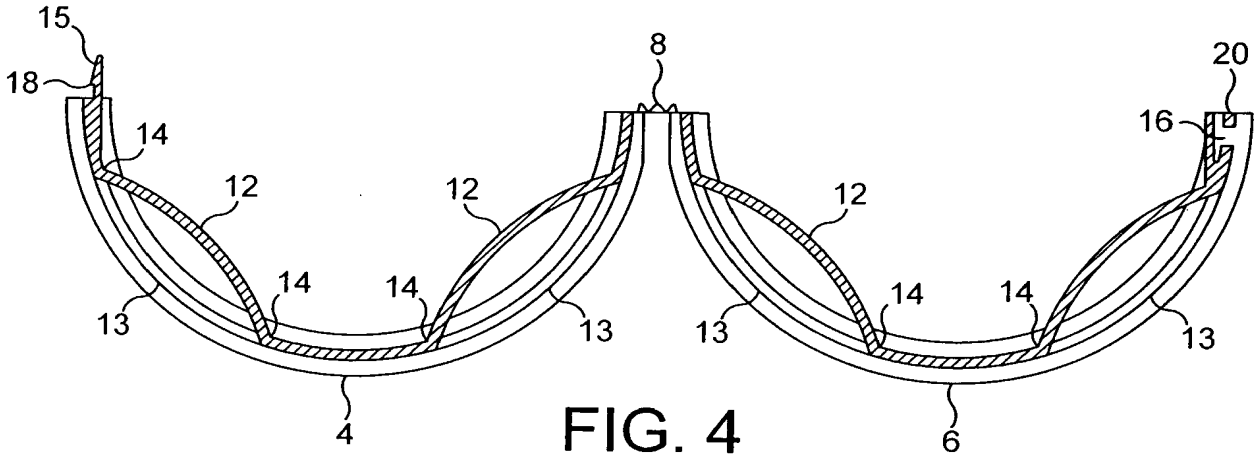

15
18
14
12
12
8
20
16
14
14
14
14
13
13
13
13
4
6

FIG. 4

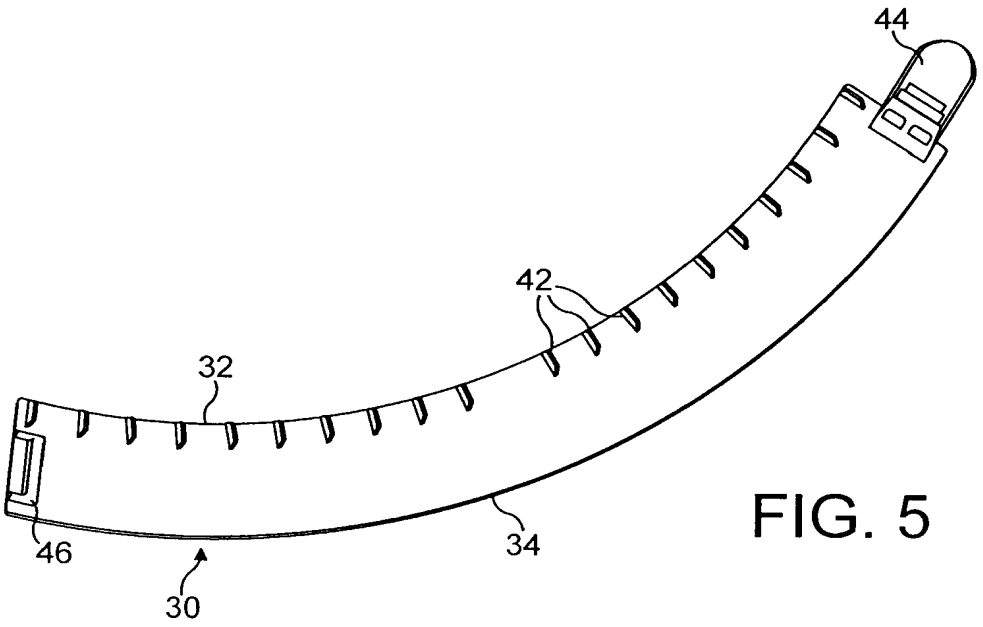


FIG. 5

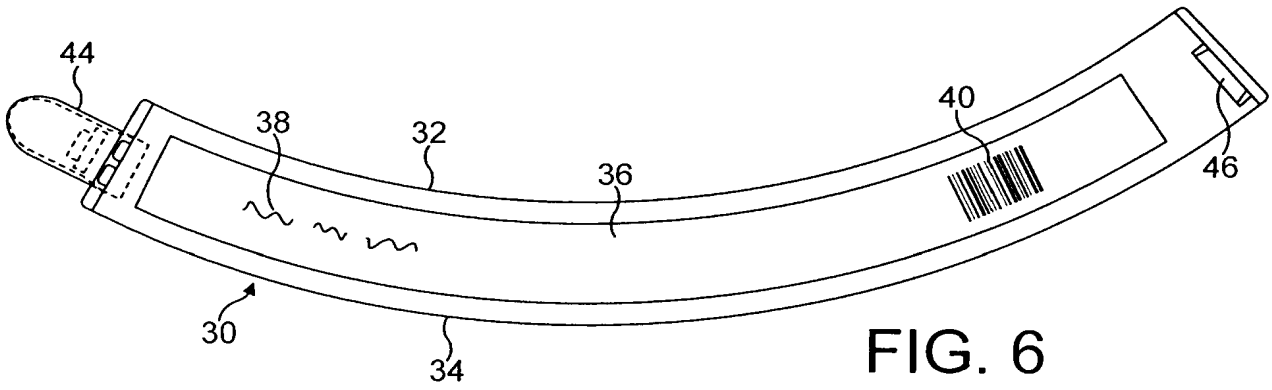


FIG. 6

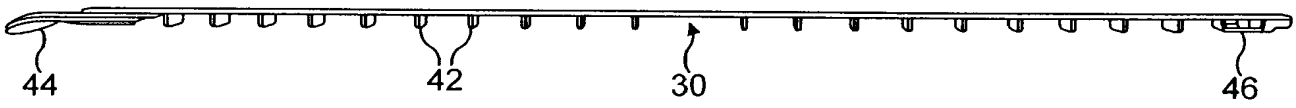


FIG. 7

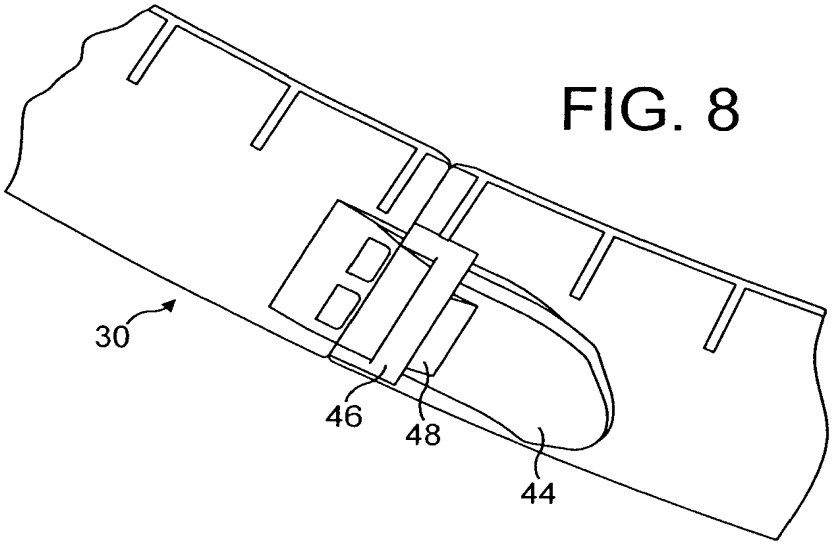


FIG. 8

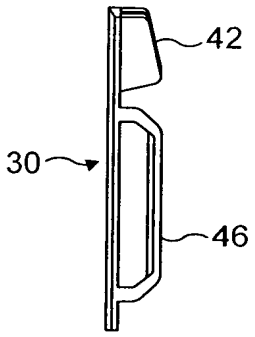


FIG. 9

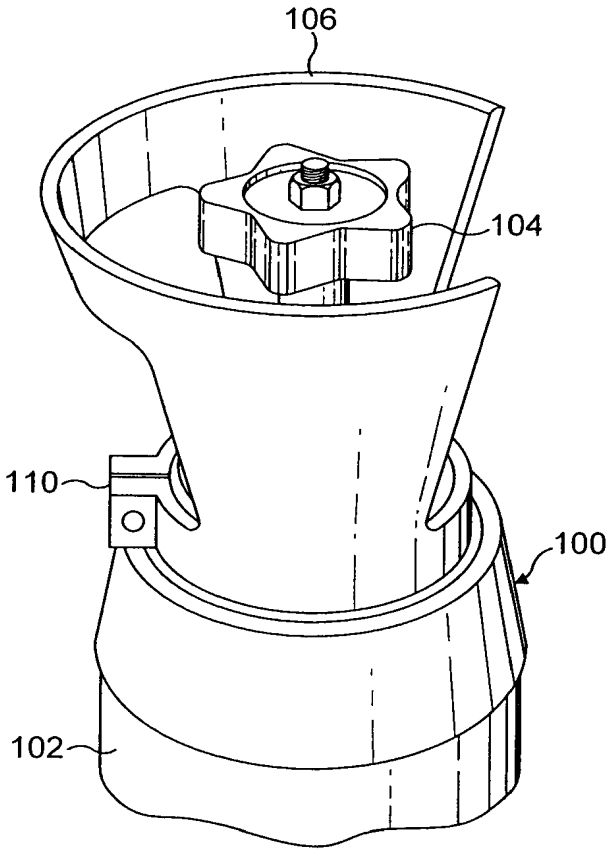


FIG. 10

INFORMATION-BEARING DEVICE

This invention relates to an information-bearing device for a gas cylinder.

There is an increasing need, partly for commercial reasons and partly to meet the requirements of new legislation, to convey more information with the product to a user of a gas cylinder. Gas cylinders are widely used to store and transport fluids under high pressure, for example up to 300 bar. Gas cylinders need to be used and handled with care not only because of the high pressure of their contents but sometime because their contents is inherently hazardous.

Difficulties arise in stencilling information onto the surface of a gas cylinder. Further, although adherent labels can often be used instead, during use the labels tend readily to lose their adherency or can otherwise be removed.

According to the present invention there is provided an information-bearing device for a gas cylinder comprising an inner circumferential locating member able to be fitted around the neck of the cylinder and to engage an outer wrap-around plastics collar which bears indicia on its outer surface and the ends of which are adapted to be locked together.

The information-bearing device according to the invention may be readily fitted to the gas cylinder without removal of its valve, any valve guard, or any handle attached to the cylinder. The collar can be formed with a label permanently attached thereto or integral therewith. For example, the collar may carry an in-moulded label. Because the collar is wrapped around the neck of the gas cylinder it can be formed as a flat strip of plastics material, thereby simplifying the tooling necessary for its manufacture. Manufacture of the label is facilitated because it too can be formed as a flat member. Because the two ends of the collar lock together, it cannot readily be opened.

Indeed the locking arrangement can be such that the collar has to be destroyed before it can be removed.

The locating member is preferably sprung. A sprung locating member offers the advantage of enabling an information-bearing device according to the invention to be fitted to a range of different cylinders each having a neck of a different diameter from the others.

The locating member is preferably of plastics material.

The locating member conveniently comprises two semi-circular parts hinged together and having free ends with cooperating members adapted to make a fastening with one another. The locating member may be formed as a one-piece moulding and therefore its semi-circular parts may be integral with the hinge.

Various arrangements of the cooperating members are possible. For example one free end of the locating member may have a tongue adapted to engage a complementary catch or socket at the other free end.

The locating member may be provided with springs attached thereto, but the springs are preferably integral therewith. In one embodiment, the locating member has integral therewith (or less preferably attached thereto) a plurality of resilient circumferentially-spaced loops against which the neck of the cylinder is able to bear in use of the information-bearing device. The locating member is thus able to grip the neck of the gas cylinder.

There are various ways of making the engagement between the collar and the locating member. In one embodiment the outer surface of the locating member has an upper circumferential ledge spaced from a lower circumferential ledge and the collar has on its inner surface an array of vertical ribs adapted to be engaged between the upper and lower ledges.

The cylinder to which the information-bearing device is fitted typically has a valve guard. An advantage of an information-bearing device according to the invention is that it can be fitted without requiring removal of the valve guard. The valve guard typically prevents the information-bearing device from being lifted off the cylinder.

Various locking arrangements may be employed on the collar. For example, the collar may have an integral tongue at one end adapted to be inserted within a catch at the other end, the tongue carrying a wedge-shaped projection. The arrangement of the tongue and catch of the collar is such that the thicker end of the projection cannot escape the catch if an attempt is made to retract the tongue once the two ends are locked together.

If desired, the label carried by the collar may include a sequential bar code. The bar code may contain a serial number so that the cylinder to which the information-bearing device is fitted can be uniquely identified.

The present invention also provides a wrap-around plastics collar which bears indicia on its outer surface and the ends of which are adapted to be locked together, the collar being adapted to form part of an information-bearing device as described above.

An information-bearing device according to the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a locating member forming part of the information-bearing device, with the locating member in an open position;

Figure 2 is a schematic perspective view of the locating member shown in Figure 1, the locating member now shown partially around the neck of a gas cylinder but still in an open position;

Figure 3 is a schematic perspective view of the locating member shown in Figures 1 and 2, the locating member now shown in a closed position but with the gas cylinder omitted;

Figure 4 is a schematic side elevation, partly in section, of the locating member shown in Figures 1 to 3;

Figure 5 is a schematic rear view of a wrap-around collar forming another part of the information-bearing device;

Figure 6 is a schematic front view of the collar shown in Figure 5;

Figure 7 is a schematic plan view of the collar shown in Figures 5 and 6;

Figure 8 is a schema showing a tongue-and-catch employed on the collar shown in Figures 5 to 7;

Figure 9 is another schema illustrating the catch shown in Figure 8; and

Figure 10 is a view of an information-bearing device in position around a cylinder which is also fitted with a valve guard.

Referring to Figures 1 to 4 of the drawings, the locating member is indicated by the reference numeral 2. The locating member 2 is formed of a suitable plastics material such as polypropylene which has structural strength and which exhibits a degree of resilience. The locating member 2 is preferably formed as a unitary article by a suitable moulding process.

The locating member 2 comprises two semi-circular parts 4 and 6 which are connected to one another by a hinge 8. The hinge is disposed in a vertical plane such that the two parts 4 and 6 can move in a horizontal plane. The locating member 2 has associated with its inner surface 10 a group of four circumferentially spaced resilient loops 12 which function as springs. Each loop 12 has two separate ends 14 which meet the inner surface 10. The loops 12 are typically integral with the locating member 2. The resilience of the plastics material from which they are made enables the loops 12 to function as springs. The loops 12 are capable of varying degrees of flexure enabling the locating device to be fitted to cylinders with necks of different sizes. When the locating member 2 is in position around the neck 80 of a cylinder 82 (see Figure 2) the two unhinged ends of the locating member engage one another (as shown in Figure 3) and the loops 12 bear against the cylinder 82. The semi-circular parts 4 and 6 of the locating member 2 are typically formed with axial slots 13 that are spanned by the loops 12.

The semi-circular part 4 of the locating member 2 has an integral tongue 15 projecting from its unhinged end. The semi-circular part 6 has a complementary catch or socket 16 formed in its unhinged end. In order to secure the locating member 2 about the neck 80 of the cylinder 82, the locating member 2 is placed in the position shown in Figure 2, the two unhinged ends are manually moved together and the tongue 15 inserted in the socket 16. As shown in Figure 4, the tongue 15 has a wedge-shaped projection 18 tapering in the direction of the unhinged end of the part 4. The resilience of the projection 18 is such that it permits insertion of the tongue 15 in the socket 16. Retraction of the tongue 15 from the socket 16 is prevented or hindered by the thicker end of the projection 18 being obstructed by a stop 20 at the unhinged end of the part 6 of the locating member 2. It is not essential, however, for the free ends of the locating member 2 to make a permanent fastening.

The locating member 2 has an upper circumferential ledge 22 and a lower circumferential ledge 24 spaced apart from one another and projecting from its outer surface 26. The ledges 22 and 24 extend almost through a full 360° being interrupted only at the hinge 8 and at its unhinged ends. The ledges 24 and 26 form guides between which a ribbed surface of the collar can fit as will be described below.

Referring now to Figures 5 to 9 of the drawings, the collar is indicated by the reference numeral 30. It is in the form of a strip of plastics material. The plastics material may be the same as that from which the locating member 2 is formed. The collar 30 has an arcuate top edge 32 and an arcuate bottom edge 34. The bottom edge 34 is longer than the top edge 32. When the collar 30 is wrapped around a cylinder neck the difference in length between the edges 32 and 34 results in the fitted collar 30 being wider at its bottom than at its top. This tapering of the collar 30, when fitted to a cylinder, matches the shape of the neck of a typical gas cylinder. (The locating member 2 may also have a complementary shape, being wider at its bottom that at its top.)

Referring to Figure 6, the front surface of the collar 30 carries a label 36 bearing indicia 38 shown schematically in Figure 6 and a bar code 40 also shown schematically in Figure 6. The label is permanently attached to the collar 30. Typically the label 36 is formed as a plastics member which is moulded into he collar 30 during manufacture.

Referring particularly now to Figure 5, the rear surface of the collar 30 is formed with a set of ribs 42 which each extend vertically downwards from the top edge 32 about one quarter of the way to the bottom edge 34. when the collar 30 is to be fitted to the cylinder, it is manually positioned such that the ribs 42 are located between the upper ledge 22 and the lower ledge 24 of the locating member 2. Once the ends of the collar 30 have been locked

together, the ledges 22 and 24 prevent upward or downward displacement of the collar 30 relative to the locating member 2.

The locking arrangement mentioned above is best shown in Figure 8 of the drawings. It is similar to that employed for the locating member 2. One end of the collar 30 is provided with an integral tongue 44. The other end is provided within an integral loop or catch 46. The tongue 44 carries an integral wedge-shaped projection 48 having its thinner end near than its wider end to the tip of the tongue 44. The natural resilience of the projection 48 enables it to be momentarily deformed as the tongue 44 is pushed through the loop 46. Once the tongue has been inserted, an attempt to retract it would fail because the thicker end of the wedge would be stopped by the top of the loop 46. Thus, the tongue 44 is locked in the loop 46.

Both the locating member 2 and the collar 30 may be made as one-piece articles by moulding. If desired, some individual elements of both articles may be pre-moulded and the premouldings then moulded together.

Referring now to Figure 10, there is shown the information-bearing device 100 in position on a gas cylinder 102. The cylinder 102 has a valve (not shown) which may be opened and closed by turning a handwheel 104. The valve is protected by a valve guard 106. The valve guard 106 is clamped by means of a clamping member 110 around a neck ring 108 integral with the cylinder 102. The information-bearing device ~~50~~ 100 is positioned immediately below the valve guard 106. The clamping member 110 prevents the device 100 from being lifted axially from the cylinder 102.

The information-bearing device shown in the drawings is readily able to be fitted around the neck of a cylinder notwithstanding the presence of a cylinder valve or any conventional valve guard of the kind shown in Figure 10. As described above with reference to Figures 1 to 4, the ledges 22 and 24 prevent upward or downward displacement of the collar 30 relative to the

locating member 2. Once the ends of the collar 30 are fastened together they cannot be separated again. Thus, the collar 30 cannot be removed from the cylinder either with the locating member 2 or separately from it. If, for example, moulded into or onto the collar 30, the label cannot be readily removed from it. The information-bearing device according to the invention therefore enables a cylinder to be effectively provided with a permanent label.

CLAIMS

1. An information-bearing device for a gas cylinder comprising an inner circumferential locating member able to be fitted around the neck of the cylinder and to engage an outer wrap-around plastics collar which bears indicia on its outer surface and the ends of which are adapted to be locked together.

2. An information-bearing device as claimed in claim 1, in which the locating member is of plastics material.

3. An information-bearing device as claimed in claim 1 or claim 2, in which the locating member comprises two semi-circular parts hinged together and having free ends with cooperating members adapted to make a fastening with one another.

4. An information-bearing device as claimed in claim 3, in which the semi-circular parts are integral with the hinge.

5. An information-bearing device as claimed in claim 3 or claim 4, in which one free end of the locating member has a tongue adapted to engage a complementary catch at the other free end of the locating member.

6. An information-bearing device as claimed in any one of the preceding claims in which the locating member is sprung.

7. An information-bearing device as claimed in any one of the preceding claims, in which the inner surface of the locating member has integral therewith or attached thereto a plurality of resilient circumferentially-spaced loops against which the neck of the cylinder is able to bear in use of the information-bearing device.

8. An information-bearing device as claimed in any one of the preceding claims, wherein the outer surface of the locating member has an upper endless circumferential ledge spaced from a lower endless circumferential ledge, and the collar has on its inner surface an array of vertical ribs adapted to be engaged between the upper and lower ledges.

9. An information-bearing device as claimed in any one of the preceding claims, in which the collar has an integral tongue at one end adapted to be inserted within a catch at the other end, the tongue carrying a wedge-shaped projection and the arrangement of the tongue and catch being such that the thicker end of the projection cannot escape the catch if an attempt is made to retract the tongue once the two ends are locked together.

10. An information-bearing device as claimed in any one of the preceding claims, in which the outer surface of the collar carries an in-moulded label.

11. An information-bearing device as claimed in claim 10, in which the label includes a sequential bar code.

12. A wrap-around plastics collar which bears indicia on its outer surface and the ends of which are adapted to be locked together, the collar being adapted to form part of an information-bearing device as claimed in any one of the preceding claims.

13. A wrap-around collar as claimed in claim 12, in the form of a flat strip.

14. A wrap-around collar as claimed in claim 12 or claim 13, in which the strip has an upper arcuate edge and a lower arcuate edge, the lower arcuate edge being longer than the upper arcuate edge.

15. A gas cylinder fitted with an information-bearing device as claimed in any one of claims 1 to 11.

16. A gas cylinder as claimed in claim 15, additionally being fitted with a valve guard, the valve guard preventing the information device being lifted off the cylinder.

17. An information-bearing device for a gas cylinder, substantially as herein described with reference to the accompanying drawings.

INVESTOR IN PEOPLE

Application No: GB 0305556.3
Claims searched: 1-17

Examiner: Michael Young
Date of search: 14 August 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1,2,6, 10,11,12, 13,15,	WPI A.A.N: 1991-123204 [17] & NL 8902209 (ZUURSTOFF) (02/04/91) See translated abstract & figs.

Categories:

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

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[V]:

F4P

Worldwide search of patent documents classified in the following areas of the IPC[7]:

F17C

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

WPI, EPODOC, JAPIO

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

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CANADIAN PATENT APPLICATION

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(30) Priorité/Priority: 2007/03/29 (EP07006600.6)

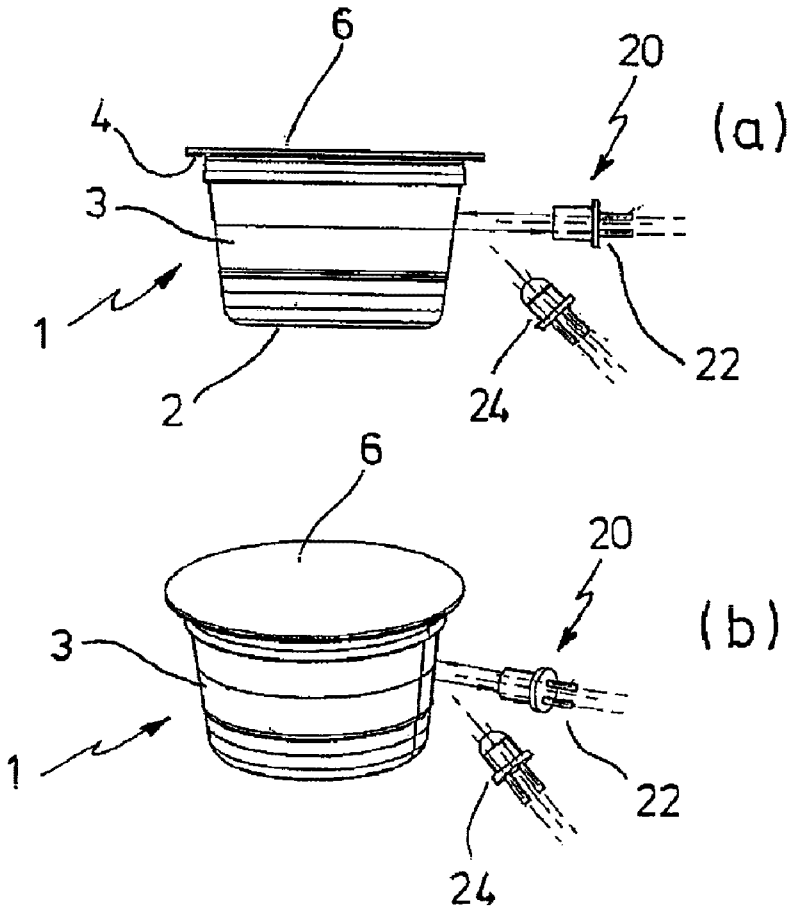
(51) Cl.Int./Int.Cl. *A47J 31/44* (2006.01), *A47J 31/34* (2006.01), *A47J 31/40* (2006.01)

(71) Demandeur/Applicant:
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MEYER-RUHSTRAT, HARTWIG, DE;
LANTZ, INGO, DE

(74) Agent: BERESKIN & PARR

(54) Titre : SYSTEME COMPRENANT UN APPAREIL A BOISSONS ET DES CAPSULES A PORTIONS
(54) Title: SYSTEM COMPRISING A BEVERAGE MACHINE AND COMPRISING PORTION CAPSULES



(57) Abrégé/Abstract:
In a system comprising a beverage machine and comprising portion capsules (1) of at least two different types which each contain a beverage substance, portion capsules (1) of different types are provided with colour codings which differ from one another. The

K-FEE SYSTEM GMBH, EX2009, page 1555
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

(21) 2 625 310

(13) A1

(57) Abrégé(suite)/Abstract(continued):
beverage machine is designed to prepare beverages, in particular to brew hot coffee beverages, by means of the portion capsules (1) and has a pressurized-water device, a capsule holder which is provided to accommodate a portion capsule (1), and a control means. The beverage machine also contains a colour-identification device (20) which is designed to detect the colour coding of a portion capsule (1) which is to be or is inserted into the capsule holder and to select a program, in the control means, for operating the beverage machine, which program is associated with this colour coding.

K-FEE SYSTEM GMBH, EX2009, page 1556
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Abstract

In a system comprising a beverage machine and comprising portion capsules (1) of at least two different types which each contain a beverage substance, portion capsules (1) of different types are provided with colour codings which differ from one another. The beverage machine is designed to prepare beverages, in particular to brew hot coffee beverages, by means of the portion capsules (1) and has a pressurized-water device, a capsule holder which is provided to accommodate a portion capsule (1), and a control means. The beverage machine also contains a colour-identification device (20) which is designed to detect the colour coding of a portion capsule (1) which is to be or is inserted into the capsule holder and to select a program, in the control means, for operating the beverage machine, which program is associated with this colour coding.

(Figure 2)

System comprising a beverage machine and comprising portion capsules

The invention relates to a system comprising a beverage machine and comprising portion capsules (cartridges) of at least two different types, to a beverage machine which is designed to prepare beverages, in particular to brew hot coffee beverages, and also to a method for preparing a beverage.

DE 10 2004 056 224 A1 discloses a system comprising a coffee machine and a portion capsule, with which system beverages can be produced from extractable substances, for example coffee. This coffee machine has a pressurized-water device, a portion-capsule holder and a control means. When or after a portion capsule is inserted into the portion-capsule holder, the cover and the base of the portion capsule are pierced by two piercing means which can move in relation to one another, so that hot water can pass into the interior of the portion capsule through the capsule cover and beverage can pass out of the portion capsule through the capsule base. In the system already known, the control means is designed to provide at least three different pressures for the pressurized water, for example for brewing espresso (for example 13 bar to 18 bar or 8 bar to 18 bar), café crema (for example 9 bar to 13 bar or 4 bar to 10 bar) and filter coffee (for example 3 bar to 9 bar or 1 bar to 4 bar). The portion capsules provided for the different pressure stages are of different design in this case. Therefore, by way of example, the portion capsule for the lowest pressure stage has a predetermined weakened point in the base, whereas the portion capsules for high pressures have a base which is not weakened. The brewing pressures prespecified by means of the control means of the coffee machine are matched to the contents of the

respective portion capsule and adapted to the coffee beverage to be brewed with the said portion capsule.

The system according to DE 10 2004 056 224 A1 is sold with portion capsules which permit simple association of the respective capsule design with the pressure stage, which is intended for brewing, of the coffee machine. To this end, the portion capsules are coloured on the capsule base and the capsule wall, for example blue for the lowest pressure stage (filter coffee) and black for the highest pressure stage (espresso). The brewing keys of the coffee machine are accordingly identified by the same colours, with each brewing key having an unambiguously associated pressure stage of the control means of the coffee machine. The user can therefore unambiguously identify which capsule should be brewed with which pressure and which function key of the coffee machine is to be operated for this purpose.

However, one disadvantage of this embodiment is that the respective pressure stage has to be explicitly selected by the user. There is therefore a risk of mistakes, for example by the user selecting the high-pressure stage of the coffee machine when a portion capsule for a low pressure is inserted.

WO 2005/079638 A1 describes a portion-capsule whose cover is provided with an RFID ("Radio Frequency IDentification" chip) or a barcode. When the portion-capsule is inserted into a brewing machine which is equipped with a suitable RFID- or barcode-reading device, the information contained in the RFID or barcode can be used to control the brewing machine. In addition to the relatively high outlay required for RFID- or barcode-reading devices, they have the disadvantage that reliable functioning is not ensured under conditions which prevail in brewing or beverage machines, for example with a view to soiling.

The object of the invention is to provide a system comprising a beverage machine and comprising portion capsules of at least two different types, in which system the portion capsule used is automatically identified, and which system is of simple construction and functions in a reliable manner.

This object is achieved by a system according to Claim 1 and also a corresponding beverage machine according to Claim 16. Claim 18 defines a method for preparing a beverage. Advantageous refinements of the invention can be found in the subclaims.

The system according to the invention has a beverage machine and also portion capsules of at least two different types, which portion capsules each contain a beverage substance. The beverage machine is designed to prepare beverages, in particular to brew hot coffee beverages, by means of portion capsules and has a pressurized-water device, a capsule holder (for example a brewing chamber) which is designed to accommodate a portion capsule, and a control means. Portion capsules of different types are provided with colour codings which differ from one another. The beverage machine is equipped with a colour-identification device which is designed to detect the colour coding of a portion capsule which is to be or is inserted into the capsule holder and to select a program, which is associated with this colour coding, for operating the beverage machine in the control means.

The term "operation" is to be understood in an entirely general manner here. In particular, running of a program for operating the beverage machine may also involve blocking use of the beverage machine with the portion capsule just detected or not permit running with this portion capsule.

A colour coding is to be understood as an identifier of the respective portion capsule which can be detected by the colour-identification device of the beverage machine. In this case, it is the colour as such which is applied, for example, in a predetermined region of the portion capsule. In this case, a barcode in the form of coloured strips, for example, does not fall within the meaning of the term "colour coding".

A colour can be reliably selected from a prespecified colour palette by means of low-cost commercially available colour-identification devices. This is true particularly when the number of colours or colour codings for the different types of portion capsules is relatively low, this being the case in practice due to the limited number of portion-capsule types. Because of this, colour deviations which actually occur (for example due to nuances in the colour coding of a specific type of portion capsule or due to soiling) or which are based on faults in the colour-identification device, can then be ignored without problems.

The colour identification device can have a colour sensor. The colour-identification device can also have a light source which is separate from the colour sensor and/or a light source which is integrated in the colour sensor. The colour coding is illuminated, for example with white light, by means of the light source. The colour sensor detects the light which is reflected by the colour coding and whose spectral composition corresponds to the colour of the colour coding. The colour sensor contains, for example, three separate sensors which are matched to the three primary colours, for example by means of a respective preset colour filter. Colour sensors of this type are known. They are connected to control and evaluation electronics.

When a portion capsule is inserted into the beverage machine, the light source can be switched on for a

brief time, for example by means of a microswitch, during which time the colour sensor identifies the colour of the colour coding of the portion capsule and forwards it, for example as a digital signal, to the control means of the beverage machine. It is also feasible for the light source to be switched on and the colour coding of the portion capsule to be detected when the user presses a start button in order to trigger the beverage-preparation process.

During operation of the beverage machine, the control means executes a program which is associated with the colour coding of the inserted portion capsule. The water pressure, the water temperature, the water quantity or the throughflow rate of the water used for preparation purposes, for example, can be controlled during running of this program. It is also possible to vary specific variable values, that is to say to not keep the said variable values constant, during preparation. Brief interruption of a brewing process allows, for example, the extraction behaviour of extractable substances to be improved.

In one embodiment of the invention, the control means of the beverage machine is designed to carry out a first step of a beverage-preparation process in accordance with the program selected by means of the colour coding of a first portion capsule and to carry out a second step of the beverage-preparation process in accordance with the colour coding of a second portion capsule which is accommodated in the capsule holder after said first portion capsule. An example of this is the brewing of cappuccino using two portion capsules. In this case, a portion capsule containing ground coffee is first inserted into the capsule holder. The colour-identification device detects its colour coding and controls the beverage machine, for example by means of a pressure which is in the medium pressure range. The empty portion capsule is then

removed and replaced by a portion capsule of another type which contains, for example, milk powder. The colour-identification device also detects the colour coding of this portion capsule and selects a corresponding program of the control means, for example a program which matches the water quantity to the milk-powder quantity. In this example, the program sequence in the beverage machine can be preselected such that a specific colour coding for the second portion capsule is expected as early as after the identification of the colour coding of the first portion capsule (that is to say the portion capsule containing the ground coffee for cappuccino). If the colour coding detected from the second portion capsule deviates from this, a fault signal may be triggered, for example.

The system according to the invention also permits complex program sequences to be associated with a predefined colour coding.

The system can be used for preparing hot beverages or for preparing cold beverages. Systems according to invention which can prepare both hot and cold beverages are likewise feasible; systems of this type can prepare, for example, a cold beverage by virtue of a heating device which is present not being heated up.

In advantageous refinements, portion capsules of different types are in each case closed on all sides in the delivery state, and they have a capsule body with a capsule base and a side wall and also a capsule cover which is fixed to the capsule body. In this case, the capsule body of the portion capsules of different types can have a circumferential, outwardly projecting flange, to which the capsule cover is fixed, on its outer end. The colour codings of portion capsules of different types can have a different colouring on the respective capsule bodies, it being possible to achieve this, for example, by completely colouring plastic

materials used for the capsule bodies. In addition or as an alternative to this, the colour codings of portion capsules of different types can have different colourings and/or colour codes on the respective capsule covers. Examples of this are a coloured dot, a uniform coat of colour in the capsule cover or a base colour of the capsule cover which is additionally provided with a label.

When the colour coding is provided on the capsule body, the light source of the colour-identification device should shine on the capsule body and therefore be arranged on the capsule holder, for example to the side of the capsule body. The same applies to the position of the colour sensor. In the case of colour codings on the capsule cover, the light source should illuminate the capsule cover and the colour sensor should be positioned such that it detects the reflection from the capsule cover. The use of a plurality of colour sensors and/or light sources is likewise feasible. Optical elements such as lenses, reflectors or light guides can also be used in order to influence the beam path.

Otherwise, the portion capsules and the capsule holder of the beverage machine can be constructed in a similar manner to that known from DE 10 2004 056 224 A1 in advantageous embodiments. The capsule base can therefore have a predetermined weakened point, in particular in portion capsules for low preparation pressures which are filled, for example, with filter coffee, in order to facilitate opening of the portion-capsule at the beginning of the preparation process. The capsule holder can have two associated piercing means which can move in relation to one another and are designed to pierce the capsule cover and the capsule base when or after a portion capsule is inserted into the capsule holder, so that water can pass into the capsule body through the capsule cover and beverage can pass out of the capsule body through the capsule base.

The capsule holder can have a portion-capsule holding device which can be removed from the rest of the beverage machine, it being possible for the beverage machine to have a movable holding device which is designed to accommodate the portion-capsule holding device and by means of which the portion-capsule holding device can be moved towards a stationary abutment face and can be moved away from the abutment face. A portion capsule of at least one type can contain a distributor device above the beverage substance and/or a screening device beneath the beverage substance, in order to ensure uniform distribution of the preparation water and/or a filter effect for the prepared beverage. The screening device can also be used as a collection device which permits the prepared beverage to flow out of the portion capsule unimpeded.

Suitable beverage substances with which a portion-capsule is filled are, for example, particulate and water-extractable beverage substances such as ground coffee, in particular ground coffee for filter coffee, ground coffee for café crema, ground coffee for espresso or decaffeinated ground coffee, but also instant coffee, tea, milk powder, cocoa powder, instant soup, sugar, sweetener, liquid milk, liquid milk concentrate, fruit concentrate etc.

The invention is explained further below with reference to exemplary embodiments. In the drawings

Figure 1 shows a schematic illustration of an arrangement of a portion capsule with a light source and a colour sensor, with the light source and the colour sensor detecting the capsule cover, specifically in a side view in part (a) and in a three-dimensional view in part (b), and

Figure 2 shows a schematic illustration of an arrangement of a portion capsule with a light source and a colour sensor, with the light source and the colour sensor detecting the capsule side wall, specifically in a side view in part (a) and in a three-dimensional view in part (b).

Figures 1 and 2 illustrate a portion capsule 1 which contains a beverage substance. In the exemplary embodiments, the portion capsule 1 is closed on all sides in the delivery state and has a capsule body with a capsule base 2 and a side wall 3. A circumferential flange 4 projects outwards at the upper end of the side wall 3. In the exemplary embodiments, the capsule base 2, the side wall 3 and the flange 4 are integrally formed as an injection-moulded part or as a thermoformed part from a food-grade plastic which can be made up of one or more layers. A capsule cover 6 comprising an aluminium foil is sealed onto the flange 4 from above.

The capsule base 2 can be provided with a predetermined weakened point. In its interior, the portion capsule can have a distributor device above the beverage substance and/or a screening device or collection device beneath the beverage substance. Examples of these can be found in DE 10 2004 056 224 A1.

In the exemplary embodiment, eight different types of portion capsule 1 are provided, namely

- a portion capsule, which is filled with ground coffee for filter coffee as the beverage substance, for a low brewing pressure and with a predetermined weakened point on the capsule base and relatively large openings in a screening or filter device beneath the beverage substance and above the capsule base,

- a portion capsule, which is filled with ground coffee for café crema as the beverage substance, for a medium brewing pressure and with a predetermined weakened point on the capsule base and a screening or filter device with relatively small openings beneath the beverage substance and above the capsule base,

- a portion capsule, which is filled with ground coffee for espresso as the beverage substance, for a high brewing pressure and with a base which is not weakened and a filter device beneath the beverage substance and above the capsule base,

- a portion capsule which is filled with liquid milk concentrate as the beverage substance,

- a portion capsule which is filled with liquid cocoa concentrate as the beverage substance,

- a portion capsule which is filled with soluble milk powder as the beverage substance,

- a portion capsule which is filled with tea leaves as the beverage substance, and

- a portion capsules, which are filled with soluble or largely soluble fruit concentrate as the beverage substance, for preparing fruit juice using cold water with a low preparation pressure.

The portion capsules 1 of different types have the same outer shape in the exemplary embodiment, but they differ by virtue of the presence or absence of a predetermined weakened point on the capsule base 2 and by virtue of internal components which are not illustrated in the figures.

Furthermore, the portion capsules 1 of different types are provided with colour codings which differ from one another. In the exemplary embodiment according to Figure 1, the capsule covers 6 have base colours which are considerably different from one another (and are provide with a label over the base colour, in order to identify the type of portion capsule). In the exemplary embodiment according to Figure 2, the capsule bodies (with capsule base 2, side wall 3 and flange 4) are uniformly coloured using significantly different colours.

The colour coding of the portion capsules 1 can be detected by a colour-identification device of a beverage machine, in order to operate the beverage machine in accordance with a program which is associated with this colour coding.

In the exemplary embodiment according to Figure 1, a colour-identification device 10 which is arranged above the capsule cover 6 has a colour sensor 12 and a light source 14. The light source 14 illuminates the capsule cover 6 from above, and the colour sensor 12 detects the reflected light and uses associated electronics, which are not illustrated in the figures, to identify the colour coding or the colour range and emits a signal, preferably a digital signal, as an output signal, possibly via the associated electronics, with which signal a program for operating the beverage machine is unambiguously selected.

According to Figure 2, a colour-identification device 20 is arranged next to the side wall 3 of the portion capsule, so that a colour sensor 22 can detect the light, which is reflected by the wall 3, of a light source 24.

Colour sensors generally operate on the principle of the human eye. In this case, all colours are described

by a mixture of the primary colours red, green and blue. The light source illuminates a coloured surface, preferably with white light. The reflected light from the coloured surface to be identified is broken down into its primary colours, with an intensity signal additionally being produced. Standardizing these values provides distance-independent colour identification. This manner of processing permits virtually all visible coloured surfaces to be identified. The colour value fractions are determined from the reflected radiation and compared with values stored in the associated electronics. If the values correspond or lie within a common range, a corresponding output signal is activated.

The optical spectrum of the light source after it is reflected into the colour sensor from the surface of a body (that is to say the colour coding), combined with the evaluation, is called the colour. The surface of the body absorbs and reflects different fractions of the spectrum, and this is detected by the colour sensor. The electrical output signal for the individual base colours corresponds to the respective intensity of the received light, and the electronics determine a colour value from this. Colour identification is dependent on the colour and the form of the light source, the reflection and absorption properties of the body and also on the sensitivity of the software used for evaluation purposes in the associated electronics.

A colour impression is ultimately subjective. However, in the present case, it is not subjective colour sensitivity that is important but instead unambiguous distinction of the colour codings used for the portion capsules 1. Variants of colour sensors which are not based on the three primary colours red, green and blue but, for example, evaluate the reflected light only in two ranges, are also feasible. There are also various options for the type of evaluation. When only two

wavelength ranges are under consideration, the measured values for the two intensities can be divided directly one by the other, for example, in order to obtain a meaningful output signal, this constituting particularly simple standardization. However, in such cases, the colour codings in question also have to be selected such that no ambiguous results are produced.

Commercially available colour sensors generally have three light-sensitive cells for the primary colours red, green and blue. Their electrical signal corresponds to the respective intensity of the received light; the associated electronics determine the colour value from this. In this case, the number of light-sensitive cells and the quality of the signal amplitude decide on how the colour can be assessed in a differentiated manner. In this case, prior calibration to white and to black using the light source provided is advisable.

In the colour-identification devices 10 and 20, the light source 14 or 24 is designed separately from the colour sensor 12 or 22. A light source which is integrated in a colour sensor, even as an additional light source, is likewise feasible.

A beverage machine in which the portion capsule 1 can be used can be of similar construction to the coffee machine (brewing machine) disclosed in DE 10 2004 056 224 A1. The content of this specification and that of the applications or specifications for which the priority has been claimed according to DE 10 2004 056 224 A1, is included in the disclosure content of the present application. If the beverage machine has a central spike for piercing the capsule cover 6, the colour sensor 12 is not arranged along the longitudinal axis of the portion capsule 1, but instead displaced to the side of it, in the exemplary embodiment according to Figure 1. In this case, the orientation of the light

source 14 is matched to the area which is detected by the colour sensor 12.

When the portion capsule 1 is inserted into the capsule holder of the beverage machine (that is to say into the brewing chamber in the exemplary embodiment), or else at a later point in time (for example at the beginning of the brewing process), the colour-identification device 10 or 20 detects the colour coding of the portion capsule 1 and selects a program, which is associated with this colour coding, for operating a beverage machine in the control means of the beverage machine. During running of the program, different variables, for example the water pressure, the water temperature, the water quantity and/or the water throughflow rate, can be varied in a manner matched to the beverage substance in the portion capsule 1, as already explained. In this case, a preparation process can also be performed by means of a plurality of portion capsules in a plurality of steps. This was described further above using the example of a cappuccino beverage.

The system comprising portion capsules which have colour codings and comprising a beverage machine which contains a colour-identification device for detecting a respective colour coding thus permits simple and reliable control of the beverage-preparation process in a manner which is largely optimally matched to the beverage to be prepared.

In the described exemplary embodiments, the colour-identification device detects the colour coding of a respective portion capsule 1 when the portion capsule is inserted into the capsule holder of the beverage machine. However, the basic idea of control of the preparation process by means of a program which is selected by means of colour coding can also be transferred to other applications. For example, in a

beverage machine which has a reservoir magazine for a relative large number of portion capsules of different types, a portion capsule of a specific type can be supplied in an automated manner from the reservoir magazine to the capsule holder with the aid of colour identification. In this case, the colour-identification device can be arranged, for example, in the capsule magazine itself or in a supply channel between the capsule magazine and the capsule holder.

Claims

1. System

- comprising a beverage machine which is designed to prepare beverages, in particular to brew hot coffee beverages, by means of portion capsules (1) and has a pressurized-water device, a capsule holder which is designed to accommodate a portion capsule (1), and a control means, and
- comprising portion capsules (1) of at least two different types which each contain a beverage substance,

characterized

- in that portion capsules (1) of different types are provided with colour codings which differ from one another, and
- in that the beverage machine has a colour-identification device (10; 20) which is designed to detect the colour coding of a portion capsule (1) which is to be or is inserted into the capsule holder and to select, in the control means, a program, which is associated with this colour coding, for operating the beverage machine.

2. System according to Claim 1, characterized in that the colour-identification device (10; 20) has a colour sensor (12; 22).

3. System according to Claim 2, characterized in that the colour-identification device (10; 20) has a light source (14; 24) which is separate from the colour sensor (12; 22).

4. System according to Claim 2 or 3, characterized in that the colour-identification device has a light source which is integrated in the colour sensor.

5. System according to one of Claims 1 to 4, characterized in that the control means is designed to control, in accordance with the program selected by means of the colour coding, during a beverage-preparation process at least one of the variables contained in the following list: water pressure, water temperature, water quantity, water throughflow rate.

6. System according to one of Claims 1 to 5, characterized in that the control means is designed to carry out a first step of a beverage-preparation process in accordance with the program selected by means of the colour coding of a first portion capsule (1) and to carry out a second step of the beverage-preparation process in accordance with the colour coding of a second portion capsule (1) which is accommodated in the capsule holder after the said first portion capsule.

7. System according to one of Claims 1 to 6, characterized in that portion capsules of different types are in each case closed on all sides in the delivery state and have a capsule body with a capsule base (2) and a side wall (3) and also a capsule cover (6) which is fixed to the capsule body.

8. System according to Claim 7, characterized in that, in the portion capsules (1) of different types, the capsule body in each case has a circumferential, outwardly projecting flange (4), to which the capsule cover (6) is fixed, at its upper end.

9. System according to Claim 7 or 8, characterized in that the colour codings of portion capsules (1) of different types have different colours on the respective capsule bodies (2, 3, 4).

10. System according to one of Claims 7 to 9, characterized in that the colour codings of portion-

capsules (1) of different types have different colourings and/or colour codes on the respective capsule covers (6).

11. System according to one of Claims 7 to 10, characterized in that the capsule base (2) has a predetermined weakened area.

12. System according to one of Claims 7 to 11, characterized in that the capsule holder has associated two piercing means which can move in relation to one another and are designed to pierce the capsule cover (6) and the capsule base (2) when a portion capsule (1) is or has been inserted into the capsule holder, so that water can pass into the capsule body through the capsule cover (6) and beverage can pass out of the capsule body through the capsule base (2).

13. System according to one of Claims 1 to 12, characterized in that the capsule holder has a portion-capsule holding device which can be removed from the rest of the beverage machine, and in that the beverage machine preferably has a movable holding device which is designed to accommodate the portion-capsule holding device and by means of which the portion-capsule holding device can be moved towards a stationary abutment face and can be moved away from the abutment face.

14. System according to one of Claims 1 to 13, characterized in that a portion capsule (1) of at least one type contains a distributor device above the beverage substance and/or a screening device beneath the beverage substance.

15. System according to one of Claims 1 to 14, characterized in that the beverage substance of a portion capsule (1) of at least one type comprises at least one of the substances selected from the following

list: particulate and water-extractable beverage substances, ground coffee, ground coffee for filter coffee, ground coffee for café crema, ground coffee for espresso, decaffeinated ground coffee, instant coffee, tea, milk powder, cocoa powder, instant soups, sugar, sweetener, liquid milk, liquid milk concentrate, fruit concentrate.

16. Beverage machine which is designed to prepare beverages, in particular to brew hot coffee beverages, by means of portion capsules (1) and which has a pressurized-water device, a capsule holder which is designed to accommodate a portion capsule (1), and a control means, characterized by a colour-identification device (10; 20) which is designed to detect the colour coding of a portion capsule (1) which is provided with a colour coding and is to be or is inserted into the capsule holder and to select, in the control means, a program, which is associated with this colour coding, for operating the beverage machine.

17. Beverage machine according to Claim 16, characterized by at least one of the features which are explicitly specified in Claims 2 to 6, 12 and 13.

18. Method for preparing a beverage, comprising the steps of:

- inserting a portion-capsule (1), which is provided with a colour coding and contains a beverage substance, into a capsule holder of a beverage machine which has a pressurized-water device and a control means,
- detecting the colour coding using a colour-identification device (10; 20) of the beverage machine,
- selecting a program, which is associated with this colour coding, for operating the beverage machine,
- operating the beverage machine by means of the control means in accordance with the selected program.

19. Method according to Claim 18, characterized in that the control means controls, in accordance with the program selected by means of the colour coding, during a beverage-preparation process at least one of the variables contained in the following list: water pressure, water temperature, water quantity, water throughflow rate.

20. Method according to Claim 18 or 19, characterized in that a first step of a beverage-preparation process is initially carried out in accordance with the program selected by means of the colour coding of a first portion capsule (1), and a second step of the beverage-preparation process is then carried out in accordance with the colour coding of a second portion capsule (1) which is accommodated in the capsule holder after the said first capsule.

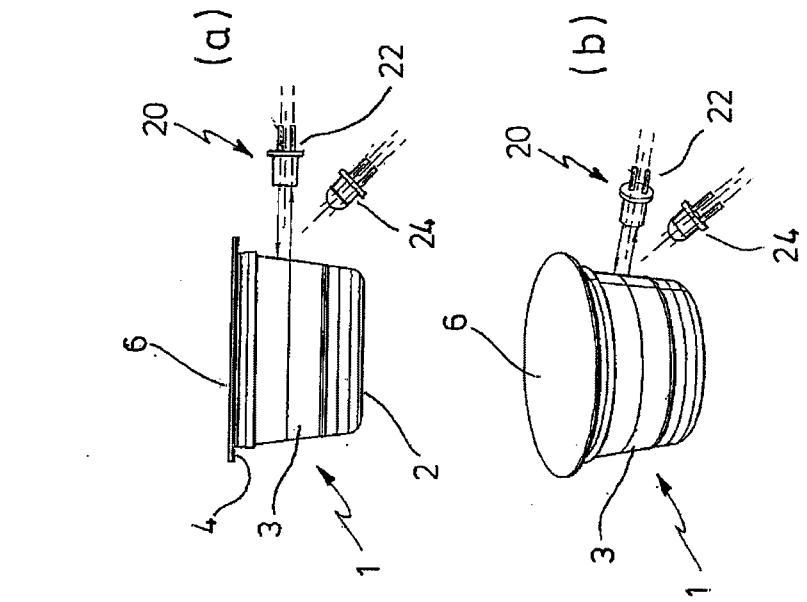


FIG.2

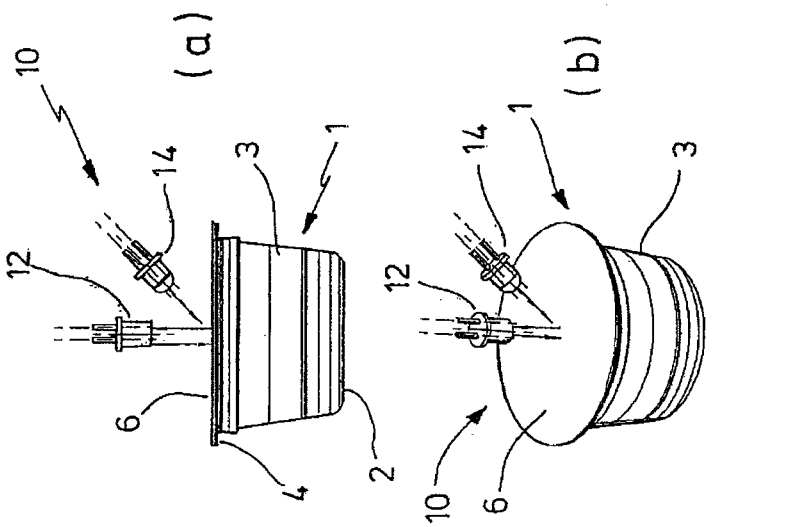
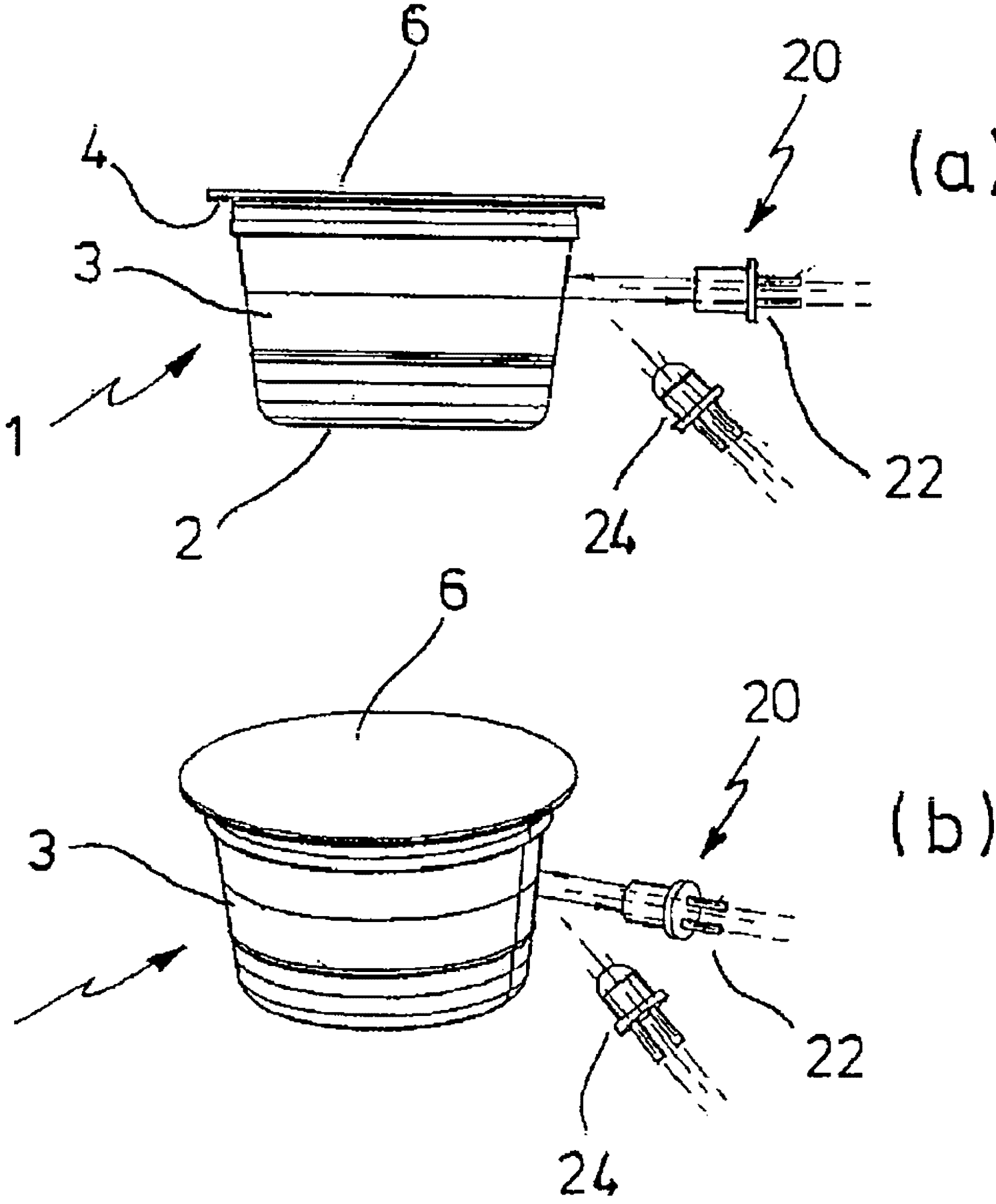


FIG.1


6
20
4
(a)
3
1
22
2
24
6
20
(b)
3
1
22
24

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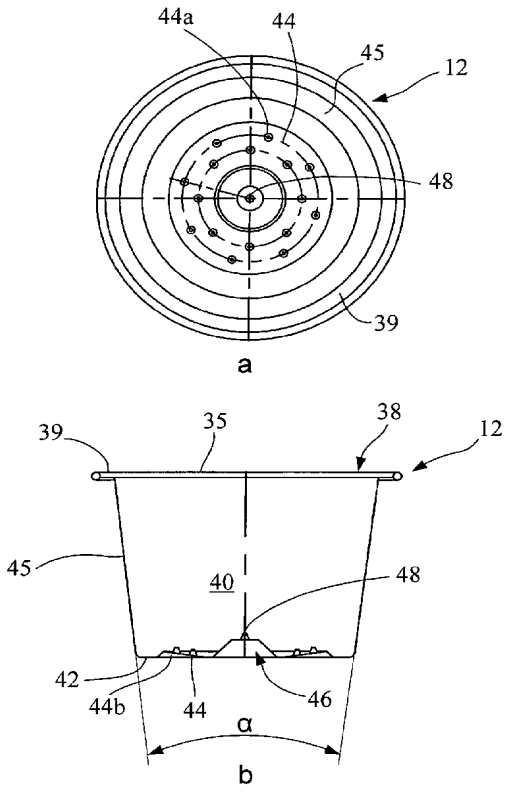
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(54) **Title:** CARTRIDGE, DEVICE AND PROCESS FOR PREPARING AN INFUSED BEVERAGE



(57) **Abstract:** The invention relates to a cartridge 12, a device 2 and a process for preparing an infused beverage. The cartridge 12 is provided with at least one opening 48 with a diameter between 0,5 mm and 2 mm for the injection of gas into the cartridge 12. The device 2 includes an infusion container 6 for containing a liquid and comprising an opening 8 for allowing the liquid to flow out of the container 6 and a receptacle 10 defining a cavity 16 for receiving a cartridge 12 containing infusible matter 14. The infusion container 6 and the receptacle 10 are operable in relation to each other to be arranged in a position wherein the infusion container 6 and the cavity 16 communicate through the opening 8 of the infusion container 6. The device 2 further includes means for introducing preferably at least slightly pressurized gas into said cartridge 12 in said cavity 16. The process includes the steps of inserting a cartridge 12 comprising infusible matter 14 in the cavity 16 of a device 2, arranging the container 6 and the receptacle 10 of the device 2 in a position in relation to each other so that the infusion container 6 and the cavity 16 communicate with each other through the opening 8, introducing liquid for infusion in the infusion container 6 so that the liquid flows into the cavity 16 immersing the infusible matter 14 contained in the cartridge 12, and introducing preferably at least slightly pressurized air into the cartridge 12 through said gas introducing means and at least one gas injection opening 48 in said cartridge 12 for agitating and oxygenating the infused liquid.

WO 2007/042486 A2

K-FEE SYSTEM GMBH, EX2009, page 1580
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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K-FEE SYSTEM GMBH, EX2009, page 1581
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
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"Cartridge, device and process for preparing an infused beverage"

Field of the invention

The invention relates to a cartridge containing an infusible matter for use in a device for preparing an infused beverage, as well as to a method of manufacturing said cartridge. The cartridge comprises a bottom part and a top part provided with at least one opening. At least one side wall joins the bottom and top parts.

As a matter of example, the infusible matter can comprise tea leaves, various different herbs and spices, herbal tea, flower petals, leaves, seeds, roots, powder, coffee or other materials capable of being infused.

The invention also relates to a device for preparing an infused beverage. The device includes an infusion container for containing a liquid and comprising an opening for allowing the liquid to flow out of the container and a receptacle defining a cavity for receiving a cartridge containing an infusible matter. 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 of the infusion container.

Furthermore, the invention also relates to a process for preparing an infused beverage in said device, including the steps of inserting a cartridge comprising an infusible matter in the cavity; arranging the container and the receptacle in a position in relation to each other so that the infusion container and the cavity communicate with each other through the opening; and introducing liquid for infusion in the

infusion container so that the liquid flows into the cavity immersing infusible matter contained in the cartridge.

Description of prior art

Such cartridges, devices and processes are known in the art. 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. 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, some of 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.

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.

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.

Although the device disclosed in the cited Japanese patent application comprises a stirring mechanism comprising a rod partially immerged in the infusion tank that can be operated to stir the water while infusing, this has several drawbacks. First of all, 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. Furthermore, deposits form on the partially immerged rod, which will need regular cleaning. Finally, the stirring mechanism introduces a degree of mechanical complexity to the detriment of reliability and cheapness.

In US Patent US 5,242,702, a coffee preparation device is disclosed that comprises a holder for coffee cartridges and means for introducing a mixture of water and air into a coffee cartridge in said holder. In use, after the cartridge is introduced in the holder, said means for introducing a mixture of water and air perforates the cartridge. When pressure builds up in the cartridge, a seal is ruptured, permitting infused coffee to flow out of the cartridge. This coffee preparation device does not comprise an infusion tank. Instead, the ground coffee remains in the cartridge, where the infusion takes place. It is therefore only adequate for a quickly-infusing beverage, such as coffee, but not for a more slowly-infusing one, such as tea. The purpose of introducing air in the coffee cartridge in this disclosure is not that of agitating the ground coffee, but that of creating a frothy coffee beverage.

Summary of the invention

It is an object of the invention to provide a more complete and homogeneous infusion of the infusible matter with a more efficient and reliable agitation means so that all the infusible matter is efficiently used in the infusion.

To this end, the cartridge of the invention is provided, preferably in said bottom part, with at least one opening with a diameter between 0,5 mm and 2 mm, preferably around 1 mm, for the injection of gas into the cartridge.

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 an infusible matter. 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 matter contained in the cartridge are immersed once liquid is poured into the infusion container to the cavity; the infusible matter is able to move and float freely in the infusion chamber. The infusion takes place.

Although cartridges provided with openings for the passage of the infusion are known in the art, the particular dimensions of this at least one gas injection opening are optimized for the injection of slightly pressurized gas into the cartridge, so that it forms small bas bubbles that will expel the infusible matter from the cartridge and agitate the liquid to provide a more homogeneous infusion.

The device disclosed in the prior art also 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.

For this reason, the cartridge comprises a first recess in its bottom part arranged toward the inside of the cartridge. In this manner, a surface of this first recess can constitute an actuating surface for cooperating with an activating element of the device. If no cartridge is inserted in the device, said activating element is not actuated and at least one mechanism of the device is not activated. The functioning of the device may be paused or stopped. This security feature prevents a user from operating the device when no cartridge is introduced.

Even more preferably, said at least one gas injection opening is located in said first recess. The first recess will provide in this way a space or compartment into which a gas injection means of the device, such as an injection nozzle, may be located. Openings in the first recess have been found to be more efficient for pushing infusible matter out of the cartridge and for uniformly agitating and oxygenating the liquid during infusion.

In one embodiment, the first recess has a substantially cylindrical or frustroconical form defining recess side walls and a recess top. The at least one opening of the first recess is preferably provided through the recess top. This arrangement provides a cartridge that can be easily manufactured, for example by stamping.

Preferably, the diameter of said first recess distally from said recess top is between 5 and 20 mm, particularly between 8 and 12 mm. Such a range consists of an optimal compromise between a first recess large enough to provide sufficient space for the injection means of the device and a first recess small enough to provide a sufficient surface for liquid to flow out of the cartridge through the filter.

It is a further object of the invention to provide a cartridge containing infusible matter which may be easily manipulated. To this end, the opening of the top part of the cartridge is provided with and closed by a closing member, preferably in the form of a sheet, arranged toward the outside of the cartridge with respect of said at least one opening of the top part and adapted to be opened and/or removed. The content of the cartridge is protected from air, light and humidity. The removable closing member may be removed manually just before the cartridge is to be used; the flavour and aromas of the infusible matter may be preserved until then.

It is another object of the present invention to provide for the filtering of the infused beverage and retention of the infusible matter after the infusion in the cartridge. For this purpose, said bottom part comprises

at least one liquid-permeable filter, preferably separate from the at least one gas injection opening.

Preferably, said filter comprises a set of perforations in said bottom part, preferably with a diameter between 0,2 mm and 0,8 mm This provides an easily produced filter integrated in the cartridge. Even more preferably, said filter comprises a second recess arranged towards the inside of the cartridge, and on which said set of perforations is located, said second recess forming a substantially conical, trough-like surface at the interior of the cartridge, arranged around said first recess and preferably having a conicity angle between 156° and 176°, particularly around 164°. This form of the filter is particularly advantageous for the expulsion of the infusible matter from the cartridge, as it facilitates the circulation of the infusible matter.

In an alternative embodiment, said filter may comprise a porous sheet. This form of filter is particularly advantageous when the infusible matter is in the form of fine particles.

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 further provided with and closed by a removable sheet, arranged toward the outside of the cartridge with respect of the filter. The infusible matter may also be vacuum-packed.

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 best infuse the infusible matter of the cartridge. 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.

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. Cartridges

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.

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 at least one minute.

It is a further object of the invention to provide a cartridge for infusible matter for use in a device for preparing infused beverage which may be firmly maintained 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 first recess the injection means of the device remains located in the first recess of the cartridge. Failure to do so could result to gas pockets developing and creating unnecessary tensions within the device.

It is a further object of the invention to provide a cartridge large enough to receive the entirety of the infusible matter after the infusion. For this, the volume of the cartridge is preferably at least twice, particularly at least three times the volume of the dry infusible matter.

It is a further object of the invention to provide a cartridge which ensures that the entirety of the infusible matter remains in the cartridge after the infusion. For this, the infusible matter is contained in the cartridge preferably between an extensible or deformable filter and

the bottom part of the cartridge. When a cartridge comprising such a filter is immersed in liquid, the filter spreads out of the cartridge, creating a space in which the infusible matter is allowed to float.

Turning now to the device of the invention, to provide a more complete and homogeneous infusion of infusible matter with a more efficient and reliable agitation means so that substantially all the infusible matter is efficiently used in the infusion, said device comprises means for introducing preferably at least slightly pressurized gas into said cartridge in said cavity. Preferably, said gas introducing means comprises a preferably protruding nozzle arranged in the cavity and provided with at least one injection opening for introducing the gas.

In one embodiment, the device comprises automatic reading means for reading preparation parameters from the cartridge, said preparation parameters comprising the temperature of the liquid, the duration of the preparation of the infusion, the timing of the introduction of gas and/or the duration of the introduction of gas.

For increased safety of operation, the device may comprise an activation element in said cavity for cooperating with an actuation surface in said cartridge, preferably in a first recess of said cartridge, to activate the device.

The device may further comprise an openable and closable passage communicating with the cavity to allow liquid to flow from the infusion container into the passage through the cavity. By these features, once the infusion is completed, the passage can be opened and the infused liquid flow 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. This has the added advantage that in its flow the infused liquid can carry the infusible matter back into the cartridge for ease of disposal.

When a cartridge containing infusible matter is introduced into the cavity of this device, it is preferably tightly fitting. Failure to do so

could result to gas pockets developing and creating unnecessary tensions within the device. For the same reason, if the gas introduction means of the device and the gas injection opening of the cartridge are preferably substantially aligned.

To agitate the infusion and expel the infusible matter from a cartridge in said cavity, the process of preparing an infusible beverage using the device of the invention comprises the step of introducing gas into the cartridge into said cartridge through said gas introducing means and at least one gas injection opening in said cartridge.

In use, when the cartridge is slot within a device for preparing infused beverage, the injection means is inserted in the first recess. Gas is injected in the infusion container through the cartridge. The infusible matter is pushed out of the cartridge to float within the infusion container. The infusible matter is prevented from remaining within the cartridge while the infusion takes place.

Preferably, the injected gas comprises oxygen. The introduction of oxygen further provides the advantage of improving the quality of the infused beverage. It is known that water, for example, when heated up loses some dissolved oxygen, which has effect on the taste of the infused beverage. Oxygenating the liquid while it infuses restores a normal oxygen concentration to the liquid and ensures a high quality taste for the infused beverage.

Preferably the process comprises a step of extracting the infused beverage from the infusion container by opening an openable and closable passage communicating with the cavity, so that the infused beverage flows from the infusion container into the passage through the cavity. As already explained, this has the advantage of helping to collect the infusible matter back into the cartridge.

A drainage hole in the holder and the passage can be arranged to discharge the infused beverage 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 infusible matter returns into the cartridge and settles there. The disclosed device provides easy setting up and preparation of a liquid infusion in a traditional way during which an infusible matter, such as tea leaves, is allowed to float freely in the liquid, and it also provides easy handling of the used infusible matter in the cartridge itself forming a filter.

In a preferred embodiment, the step of introducing gas takes place at 50 to 80 percent, or more particularly at 60 to 70 percent, of the time between the end of the step of introducing the liquid to be infused in the container and the beginning of the step of opening the passage. At that moment, the oxygenation of the liquid is particularly effective. Moreover, this also permits to decrease the temperature of the infused liquid before it is served, thus reducing the risk of burning a user who attempts to drink the infused beverage too early. Alternatively, or complementarily, the gas can be introduced substantially immediately after the step of introducing the liquid for infusion, in order to disperse the infusible matter right at the beginning.

Short description of the drawings

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 top view of a cartridge according to one embodiment for use in a device for preparing infused beverages;

Fig. 1b shows a cross-sectional side view of the same cartridge according;

Fig. 1c shows a top perspective view of a cartridge with top and bottom covering sheets;

Fig. 1d shows a bottom perspective view of the same cartridge;

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 an infused beverage;

Fig. 6 shows a perspective side view of the inside of the device for preparing an infused beverage;

Fig. 7 shows a perspective top view of a receptacle of the device for receiving a 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;

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

A cartridge 12 according to the invention is explained in reference to figures 1a to 1d. 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 a side wall 45 joining the bottom and top parts 42,38. It defines an inner volume 40 to contain infusible matter 12. The volume 40 is calculated so to receive enough infusible matter 12 for preparing a standard cup of infused beverages. Infusible matter, when soaked, tends to swell. The volume 40 is also calculated to contain all the swollen infusible matter once infused, which can be for example four times the volume of the dry infusible matter.

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 conicity angle α of the side wall 45 is between 0 and 20 degrees and preferably comprised between 5 and 15 degrees.

Such a shape allows creating an inner volume 40 big enough to contain enough infusible matter for preparing a standard cup of beverage. Such shape allows the cartridge 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.

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.

In one embodiment, the bottom part 42 includes a first recess 46 arranged toward the inside of the cartridge 12. The first recess 46 is frustroconical, the larger section of the first recess being at the level of the bottom part 42. The larger section of the first recess 46 has a diameter comprised between 2 and 15 millimetres, or more particularly between 2 and 6 millimetres. The first recess 46 comprises a gas injection opening 48.

Preferably, the filter 44 is a 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. In the illustrated embodiment, this perforated sheet forms a second recess 44b around the first recess 46, said second recess 44b comprising a substantially conical surface, preferably with a conicity angle between

156° and 176°, particularly around 164°, in the interior of the cartridge 12. This second recess 44b is therefore deepest towards the inside of the cartridge 12 at its periphery, from which the conical surface in the interior of the cartridge 12 slopes down trough-like towards the centre until it intersects the oppositely oriented conical surface of the first recess 46. This second recess 44b facilitates the circulation of the infusible matter.

Alternatively, the filter 44 may consist of at least a sheet made of a liquid-permeable 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.

The top part 38 comprises a lip 39 surrounding the opening 35 at least partly. The lip 39 rests upon the rim of the receptacle 10. The opening 35 is closed and covered by a sheet 50 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. Alternatively, it can be transparent, so as to allow a user to view the infusible matter before use. In this case, it is preferable to have a coating layer of a contrast-enhancing colour, preferably white, on the inner-layers of the cartridge.

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 a liquid-permeable natural or synthetic material adapted to infusion and filtering. When a cartridge comprising such a filter is immersed in water, the filter spreads in water out of the cartridge; the filter creates a space in water where infusible matter 14 contained in the cartridge 12 is able to float. Such a filter prevents infusible matter 14 from scattering everywhere in the infusion container 6 in particular and in the device in general.

The bottom part 42 is covered 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 grasping means, so a user can grasp and remove it from the cartridge 12.

The sheets 36 and 50 hermetically close the inner contents 40 of the cartridge 12 preferably under vacuum or in a protective atmosphere. The infusible matter 14 is protected from air and humidity. Both sheets 36, 50 and cartridge 12 are preferably made of an opaque material to protect the infusible matter 14 from light as well.

The cartridge 12 may comprise marks or any other automatically 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.

Figure 2 shows a perspective front view of a device for preparing infused beverages which uses cartridges according to the invention.

The device 2 comprises a removable 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 enough water for several cups of beverage.

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.

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.

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.

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.

Referring now to figure 3, the platform 68 comprises a receptacle 10 for receiving a cartridge 12 containing infusible matter 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 matter 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.

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.

The device 2 for preparing an infused beverage is now described in reference to figures 4, 5, 6.

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 access to the water contained in the reservoir 66.

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.

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.

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.

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.

In a manner known, the device 2 further comprises a sensor to detect the presence of a cup on one of the cup holder, 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 and memory to store data for use by the processing means.

The receptacle 10 of the device 2 is now explained in respect with figure 7.

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.

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 perpendicularly to the sliding direction of the tray 107.

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.

A protruding nozzle 112, preferably cylindrical or frustroconical, is located on the bottom part 111 towards the inside of the cavity 16. The dimensions of protruding nozzle 112 are such that the first recess 46 of a cartridge 12 inserted in the cavity 16 perfectly fits the protruding nozzle 112. The protruding nozzle 112 comprises openings 113 for injecting gas towards the inside of the cavity 12. The opening 113 are disposed in the protruding nozzle 112 in such way that the injection opening 48 in the first recess of a cartridge 12 inserted in the cavity faces the injection opening 113 in the nozzle 112.

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.

In another embodiment, the protruding nozzle 112 may be located on the partial side walls 110 of the cavity 16.

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.

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.

The device 2 comprises a pair of parallel arc-shaped bars 33 between which a flat blade 31 is attached. The blade 31 is fixedly 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.

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.

The arc-shaped bars 33 are positioned tangent to the sliding direction of the receptacle 10. The arc-shaped bars are located tangent to the tray 107 of the drawer 10 and on each side of the top part of cavity 16 of the drawer 10.

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 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.

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.

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.

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.

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.

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.

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.

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.

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 matter 14 are maintained within the cartridge 12.

The ejection mechanism to withdrawn the cartridge 12 allows to eject the cartridge smoothly. It prevents the infused matter 14 contained in the cartridge 12 from falling out of the cartridge 12. Some infused matter 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.

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.

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 cavity 16.

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 wails 110 to ensure a hermetic contact between the cavity 16 and the insert 81. The insert 81 is connected to the passage 18.

The protruding nozzle 112 is located in the insert 81 towards the inside of the cavity 16. The protruding nozzle 112 is connected to a conduit 29 located within the insert 81; the conduit 29 is connected to the inlet pipe 28.

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 pushbutton

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 first 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 first recess 46 is substantially identical to that of the cone of the pushbutton 82.

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 first 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 first recess 46.

The push-button 82 keeps on moving into the first recess 46, sliding along the surface of the first recess 46 until the pushbutton 82 is blocked between the surface of the first 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 first recess 46 of the cartridge 12; the pushbutton 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 first recess 46 of the cartridge 12, so that the openings 113 of the protruding nozzle 112 face the openings 48 of the first recess 46.

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.

The functioning of the device for preparing infused beverages is now explained. The receptacle 10 opens manually or automatically through the activation of a knob.

A cartridge 12, to which the removable bottom sheet 36 has been removed, is introduced in the receptacle 10. The receptacle 10 is closed automatically or manually and slides within the platform 68. While the receptacle 10 is closed, the sensor detects the presence of the cartridge within the cavity 12 as well as its colour.

Simultaneously the protective top seal 50 is cut out from the cartridge 12 automatically, giving access to the infusible matter 14 located within the cartridge 12.

The processor selects infusion parameters according to the colour of the cartridge 12 in a conventional manner.

A hermetic connection is created between the infusion container 6, the cavity 16 and the passage 18. The tray 107 is raised up away from the third runner 103. The snapping insert 81 is brought to contact with the cavity 16 and with the tray 107. The passage 18 is closed. The hermetic infusion chamber, closed by the passage 18, is formed with the infusion container 6, the tray 107, the cavity 16 and the snapping insert 81.

Valves are actuated to connect the conduit 65a to the relevant conduit 65b. Water is pumped from the reservoir 66 and sent to the conduit 65b at the recommended pressure selected by the processor according to the colour of the cartridge 12. Water is heated while travelling through the heating chamber 69. The sprinkler 63 pours hot water in the container 6 at the recommended temperature selected by the processor according to the colour of the cartridge 12.

Liquid is introduced in the infusion container 6 immersing the infusible matter 14 contained in the cartridge 12. The infusible matter 14 starts floating freely into the infusion chamber. The infusion takes place.

The processor controls the heating element around the container 6 to maintain the liquid 4 within the infusion container 6 at the recommended temperature.

In the embodiment where the detector comprises a pushbutton 82 located in the insert 81, the push-button may control the actuation of valves and/or of the introduction of liquid for infusion in the infusion chamber. Such detector prevents the infusion chamber 6 from being filled up with hot water when there is no cartridge 12 in the cavity 16.

Immediately after the infusion container is filled up with water 4, a first oxygenation takes place and pressurised gas is introduced within the container 6 through the opening 113 of the protruding nozzle 112.

Infusible matter 14 is mixed within the infused liquid 4, which is stirred. The gas emitted by the nozzle 113 drags away all infusible matter 14 which may remain in the cartridge 12.

If the pressure at which the gas is injected is too high in comparison to the gas permeability of the filter 44, a gas pocket may form under the surface of the cartridge 12, creating a force pushing the cartridge out of the cavity. The gas injection opening 48 provided in the recess 46 prevents the filter 44 from being torn or tensions within the device 2 from developing. The gas injection opening 48 is adapted to face the gas injection opening 113 of the injection nozzle 112. The size of the gas injection opening 48 of the cartridge 12 is substantially equal to that of the injection opening 113 of the injection nozzle 112.

A second oxygenation takes place later during the infusion; pressurised gas is introduced again in the container 6. Infusible matter 14 is mixed within the infused liquid 4, which is stirred. The gas emitted by the nozzle 113 drag away all infusible matter 14 which may still remain in the cartridge 12.

Data relating to when the second oxygenation takes place, to the duration of the first and the second oxygenations and to the pressure at which the gas is injected within the infusion chamber may be part of the parameters associated with the type of infusible matter 14 contained in the cartridge 12.

Once the infusion finished, valves are actuated automatically; the passage 18 is connected to the spout 19 and is opened. The infused beverage is brought by gravity in the cup located on the cup holder 64. A safety mechanism may be provided to maintain the passage 18 closed if no cup is present on the cup holder 64.

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.

CLA1MS

1. Cartridge (12) for containing an infusible matter (14) for use in a device for preparing an infused beverage, including:

a) a bottom part (42);

b) a top part (38) provided with at least one opening (35); and

c) at least one side wall (45) joining the bottom part (42) and the top part (38);

said cartridge (12) being characterized in that it is provided, preferably in said bottom part (42), with at least one gas injection opening (48) with a diameter between 0,5 mm and 2 mm, preferably around 1 mm, for the injection of gas into the cartridge (12).

2. Cartridge (12) according to claim 1, wherein said bottom part (42) comprises a first recess (46) arranged toward the inside of the cartridge (12).

3. Cartridge (12) according to claim 2, wherein at least one of said at least one gas injection opening (48) is located in said recess (48).

4. Cartridge (12) according to any one of claims 2 or 3, wherein said first recess (48) comprises a recess side wall (52) and a recess top (54), said recess side wall having a substantially cylindrical or frustroconical form, the diameter of said first recess (48) distally from said recess top (54) being preferably between 5 and 20 mm, even more preferably between 8 and 12 mm.

5. Cartridge (12) according to any one of the preceding claims, wherein said at least one opening (35) of the top part (38) is provided with and closed by a closing member, preferably in the form of a sheet (36), arranged toward the outside of the cartridge (12) with respect of said at least one opening (35) of the top part (38) and adapted to be opened and/or removed.

6. Cartridge (12) according to any one of the preceding claims, wherein said bottom part (42) comprises at least one liquid-permeable filter (44), preferably separate from the at least one gas injection opening (48).

7. Cartridge (12) according to claim 6, wherein said filter (44) comprises a set of perforations (44a) in said bottom part (42), preferably with a diameter between 0,2 and 0,8 mm.

8. Cartridge (12) according to claim 7, wherein said filter (44) comprises a second recess (44b), on which said set of perforations (44a) is located, said second recess (44b) forming a substantially conical, trough-like surface at the interior of the cartridge (12), preferably with a conicity angle between 156° and 176°, particularly around 164°.

9. Cartridge (12) according to claim 6, wherein said filter comprises a porous sheet.

10. Cartridge (12) according to any one of claims 6 to 9, wherein the bottom part (42) comprises a closing member, preferably in the form of a sheet (50), arranged outwardly of said filter (44) and adapted to be opened and/or removed.

11. Cartridge (12) according to any one of the preceding claims, having a substantially cylindrical or frustroconical form.

12. Cartridge (12) according to claim 9, wherein the side wall has a conicity angle α between 0° and 20°, preferably between 5° and 15°.

13. Cartridge (12) according to any one of the preceding claims, at least partially made of food contact approved aluminium and/or aluminium at least partially coated with a food contact approved coating able to resist temperatures of at least 100°C for at least one minute.

14. Cartridge (12) according to any one of the preceding claims, wherein the top part (38) comprises a lip (39) surrounding the opening (35) of the top part (38).

15. Cartridge (12) according to any one of the preceding claims, containing a dry infusible matter (14) occupying less than half, preferably less than one third of the volume of the cartridge (12).

16. Cartridge (12) according to any one of the preceding claims, containing an infusible matter (14) between the bottom part (42) of the cartridge (12) and an extensible or deformable filter.

17. Device (2) for preparing an infused beverage, including:

a) an infusion container (6) for containing a liquid and comprising an opening (8) for allowing the liquid to flow out of the container (6);

b) a receptacle (10) defining a cavity (16) for receiving a cartridge (12) containing infusible matter (14), wherein the infusion container (6) and the receptacle (10) are operable in relation to each other to be arranged in a position wherein the infusion container (6) and the cavity (16) communicate through the opening (8) of the infusion container (6);

characterized in that it further includes

c) means for introducing gas, preferably at least slightly pressurized, into said cartridge (12) in said cavity (16).

18. Device (2) according to claim 17, wherein said gas introducing means comprises a preferably protruding nozzle (112) arranged in the cavity (18) and provided with at least one injection opening (113) for introducing the gas.

19. Device (2) according to any one of claims 17 or 18, further comprising automatic reading means (34) for reading preparation parameters from the cartridge (12), said preparation parameters comprising the temperature of the liquid, the duration of the preparation of the infusion, the timing of the introduction of gas and/or the duration of the introduction of gas.

20. Device (2) according to any one of claims 17 to 19, further comprising an activation element (82) in said cavity (16) for

cooperating with an actuation surface in said cartridge (12), preferably in a first recess (46) of said cartridge (12), to activate the device (2).

21. Device (2) according to any one of claims 17 to 20, further comprising an openable and closable passage (18) communicating with the cavity (16) to allow liquid (4) to flow from the infusion container (6) into the passage (18) through the cavity (16).

22. Device (2) according to any one of claims 17 to 21, further comprising a cartridge (12) containing infusible matter (14) fitted into said cavity (16), preferably tightly.

23. Device (2) according to claim 22, wherein said cartridge (12) fitted into said cavity (16) is a cartridge according to one of claims 1 to 16 and at least one gas injection opening (48) of the cartridge (12) is substantially aligned with said gas introducing means.

24. Process for preparing an infused beverage in a device according to any one of claims 17 to 21, including the steps of:

a) inserting a cartridge (12) containing infusible matter (14) in the cavity (16);

b) arranging the container (6) and the receptacle (10) in a position in relation to each other so that the infusion container (6) and the cavity (16) communicate with each other through the opening (8);

c) introducing liquid for infusion in the infusion container (6) so that the liquid flows into the cavity (16) immersing the infusible matter (14) contained in the cartridge (12); and

characterized in that it further comprises the step of separately introducing gas, preferably at least slightly pressurized, into said cartridge (12) in said cavity (16) through said gas introducing means and at least one gas injection opening (48) in said cartridge (12) .

25. Process according to claim 24, wherein said at least slightly pressurized gas comprises oxygen.

26. Process according to one of claims 24 or 25, further comprising a step of extracting the infused liquid (4) from the infusion

container (6) by opening an openable and closable passage (18) communicating with the cavity (16), so that the infused liquid (4) flows from the infusion container (6) into the passage (18) through the cavity (16).

27. Process according to claim 26, wherein the step of introducing gas takes place at 50 to 80 percent, or more particularly at 60 to 70 percent, of the time between the end of the step of introducing the liquid (4) for infusion and the beginning of the step of extracting the infused liquid (4) and/or substantially immediately after the step of introducing the liquid (4) for infusion.

28. Process according to any one of claims 24 to 27, wherein said gas injection opening (48) is produced by perforating said cartridge (12) with a perforating means in said cavity (16), preferably in said gas introducing means.

29. Method for producing a cartridge (12) according to any one of claims 1 to 16, preferably by deep drawing a sheet of plastically deformable material.

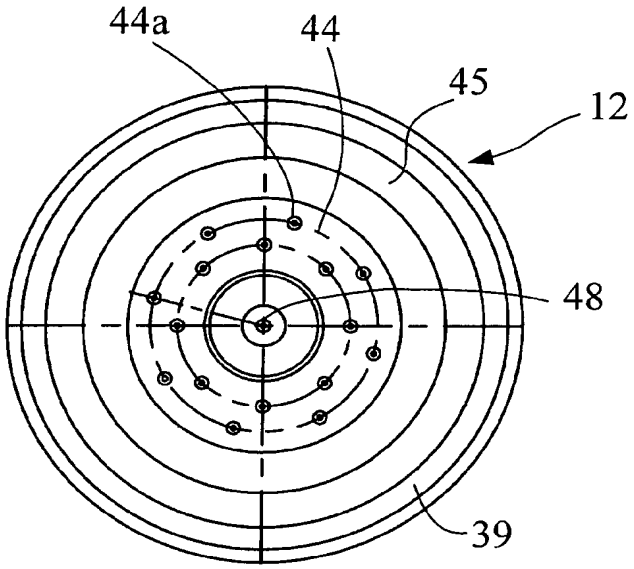


FIG 1a

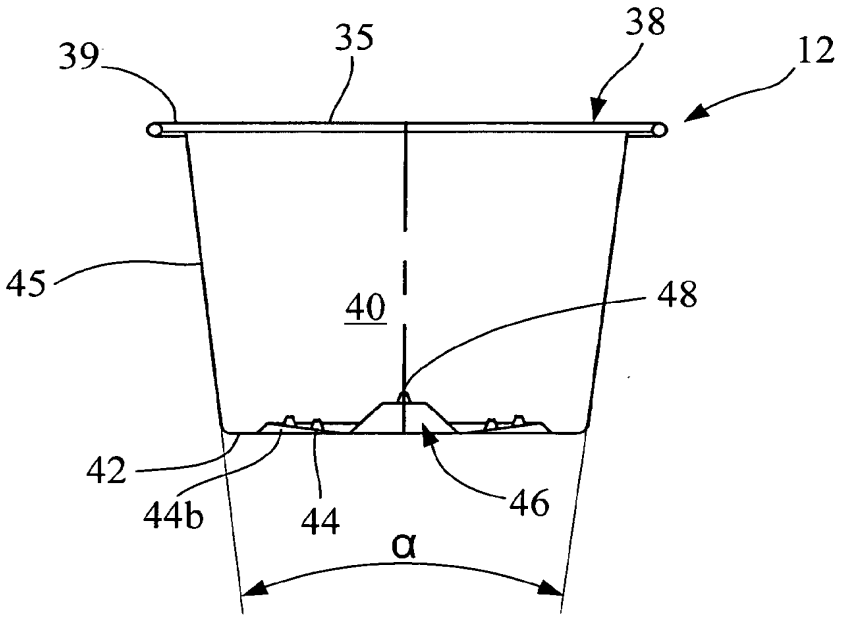


FIG 1b

K-FEE SYSTEM GMBH, EX2009, page 1613
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

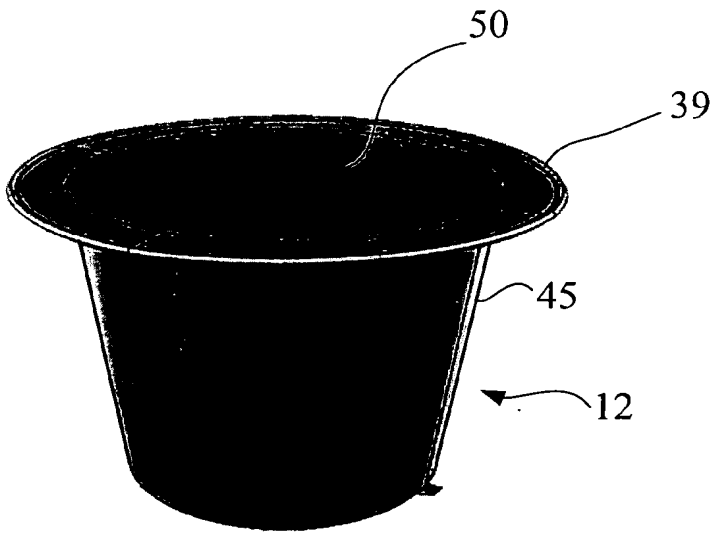


FIG 1c

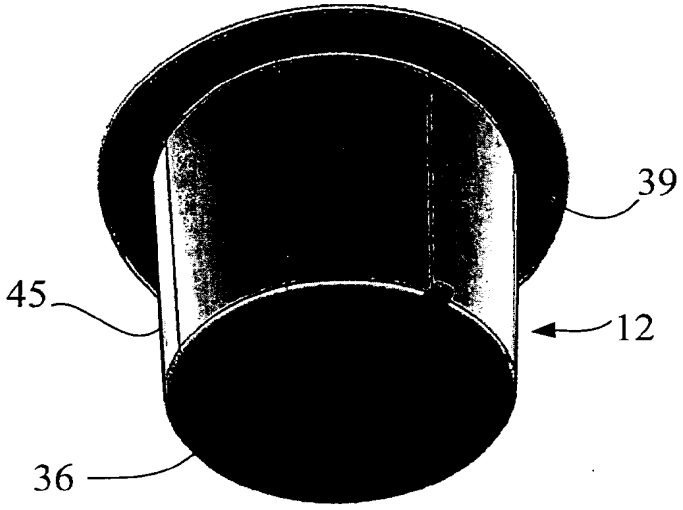


FIG 1d

K-FEE SYSTEM GMBH, EX2009, page 1614
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

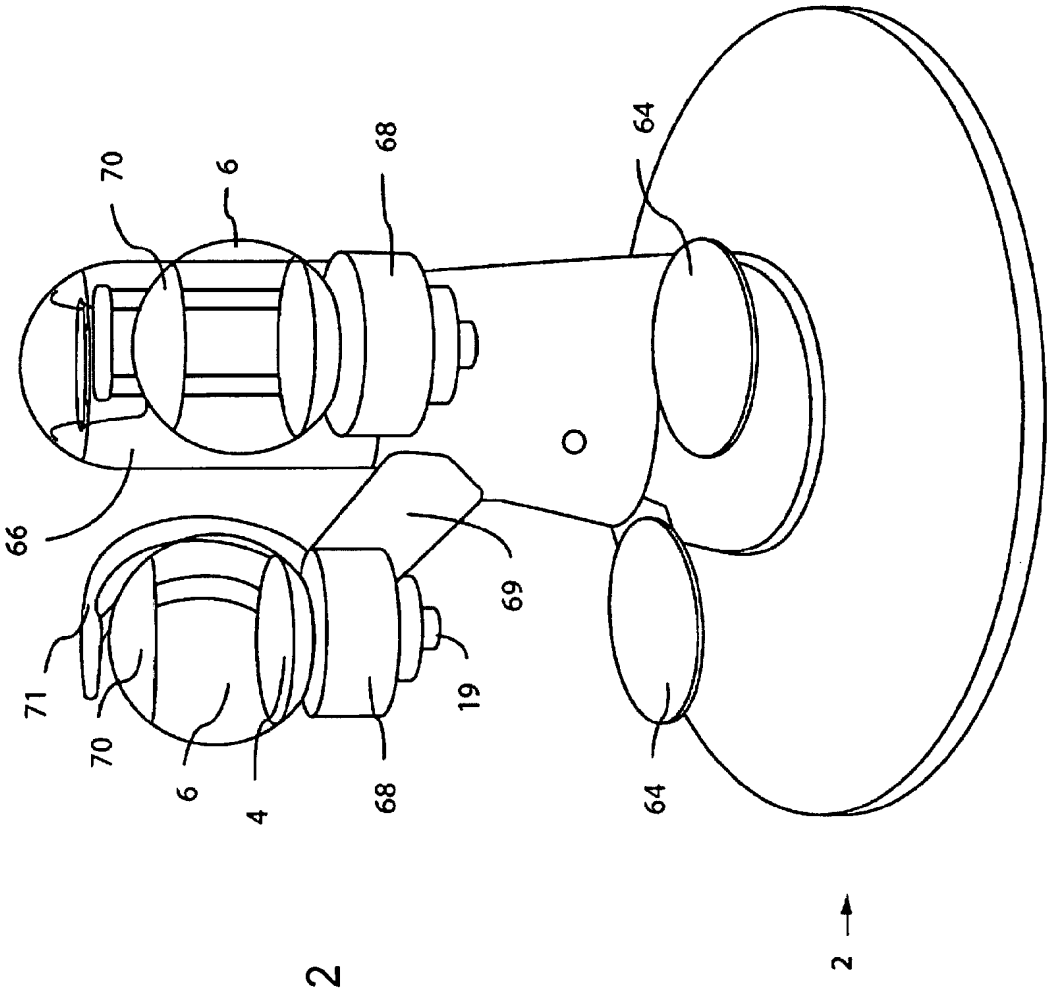
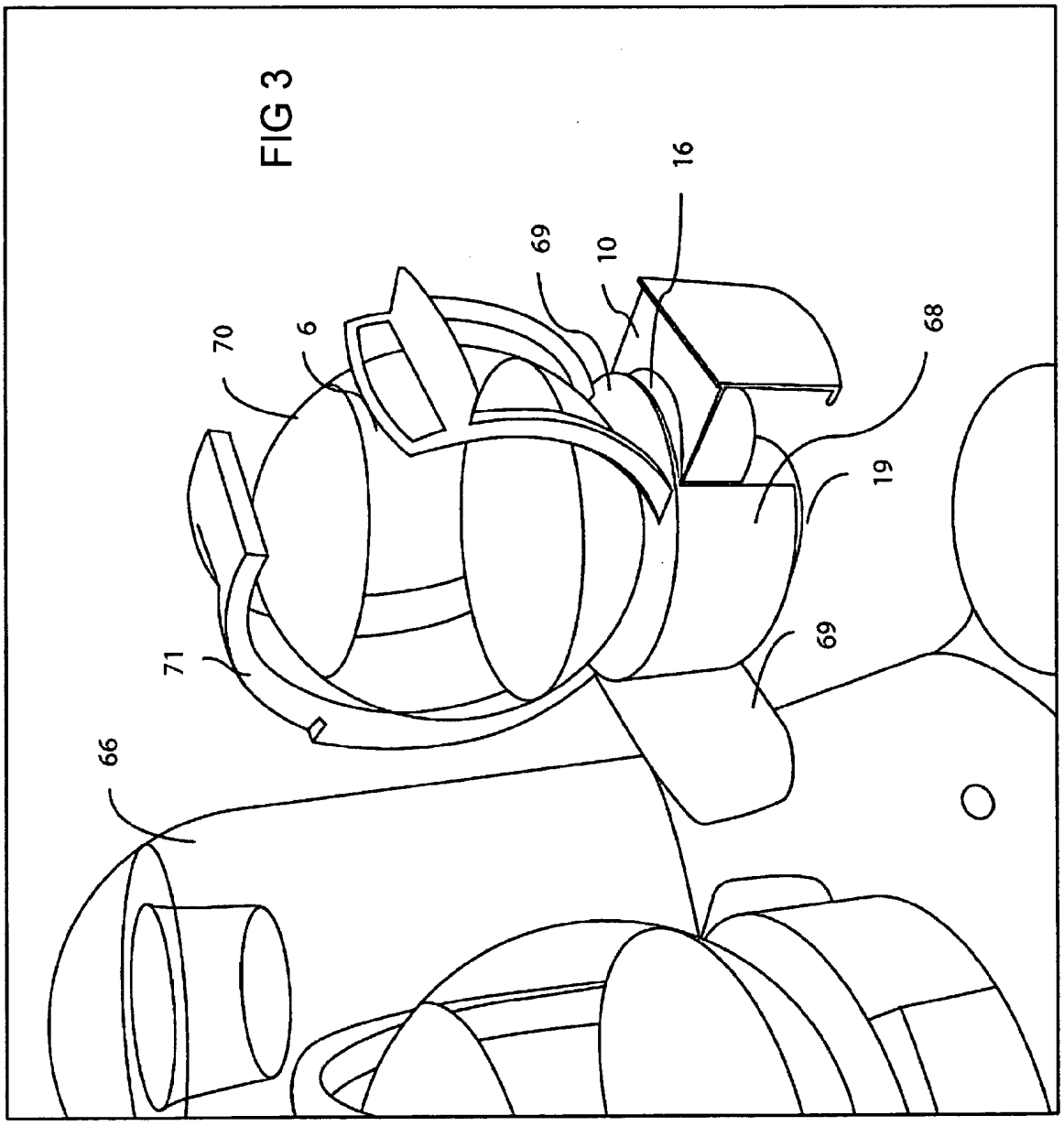


FIG 2

K-FEE SYSTEM GMBH, EX2009, page 1615
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG 3



K-FEE SYSTEM GMBH, EX2009, page 1616
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

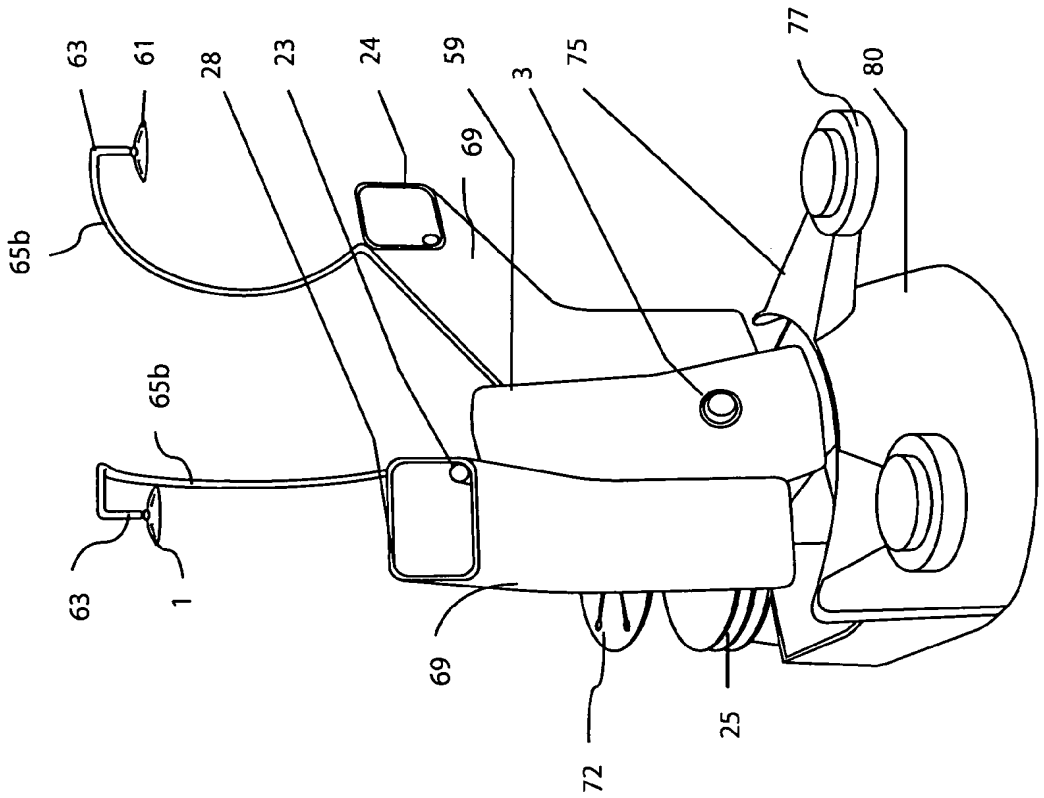


FIG 4

K-FEE SYSTEM GMBH, EX2009, page 1617
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

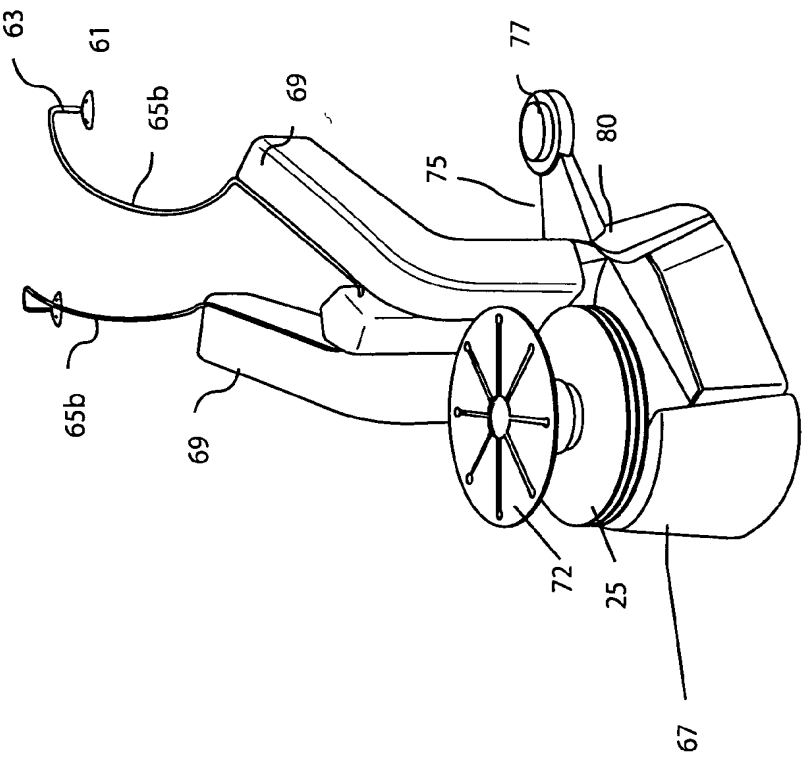


FIG 5

K-FEE SYSTEM GMBH, EX2009, page 1618
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

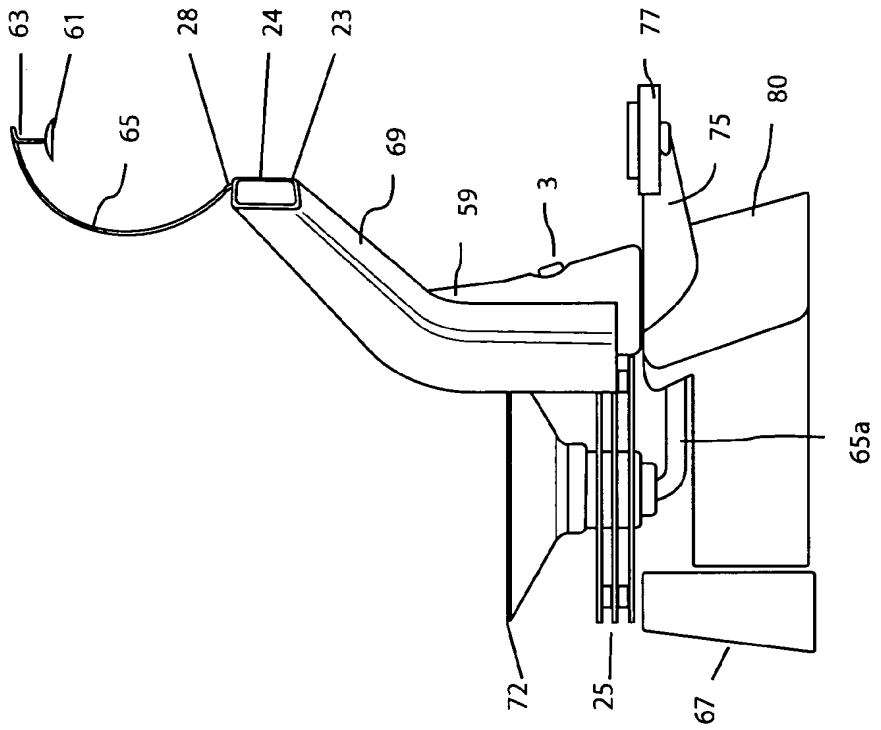
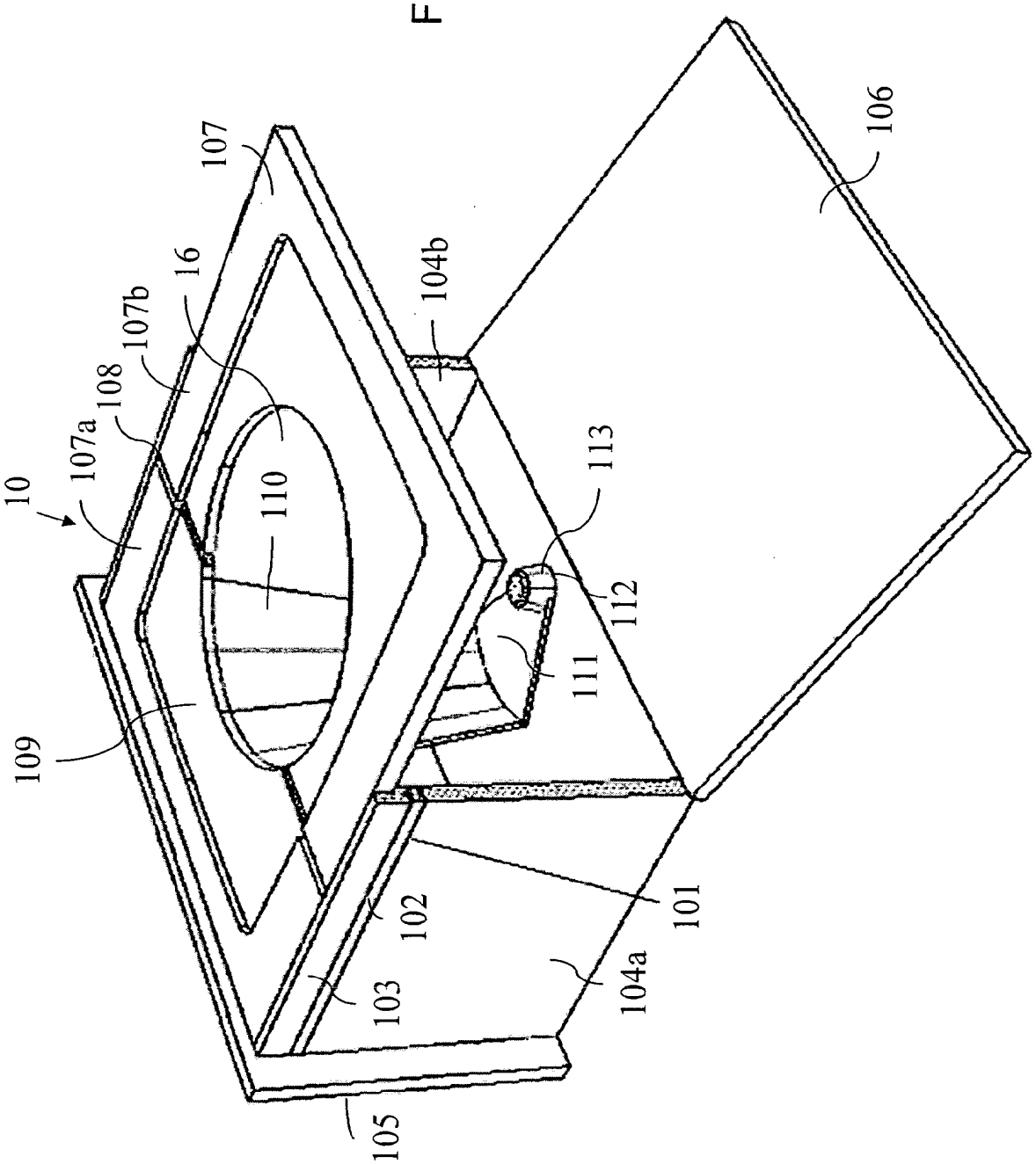


FIG 6

K-FEE SYSTEM GMBH, EX2009, page 1619
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG 7



K-FEE SYSTEM GMBH, EX2009, page 1620
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

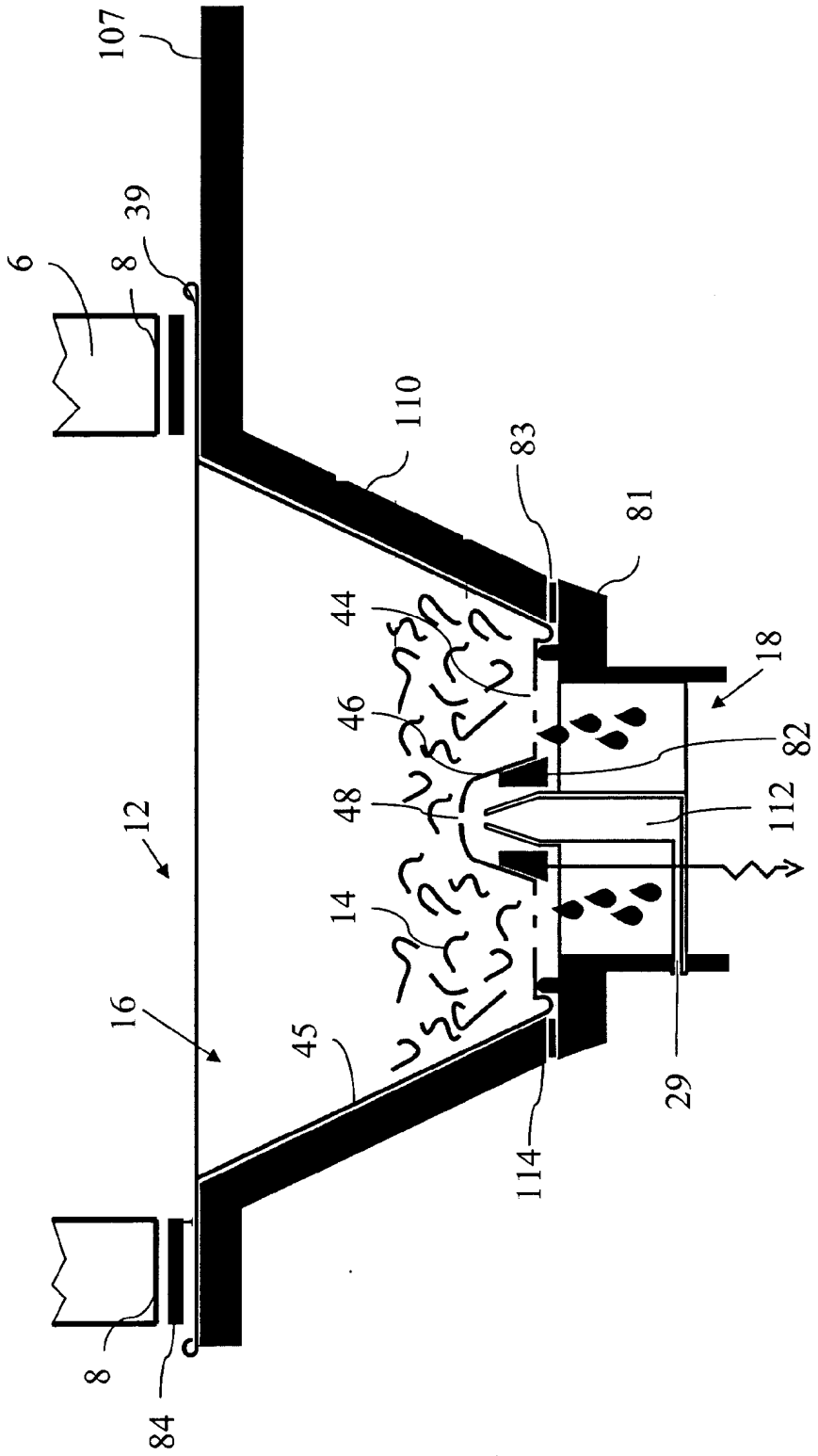
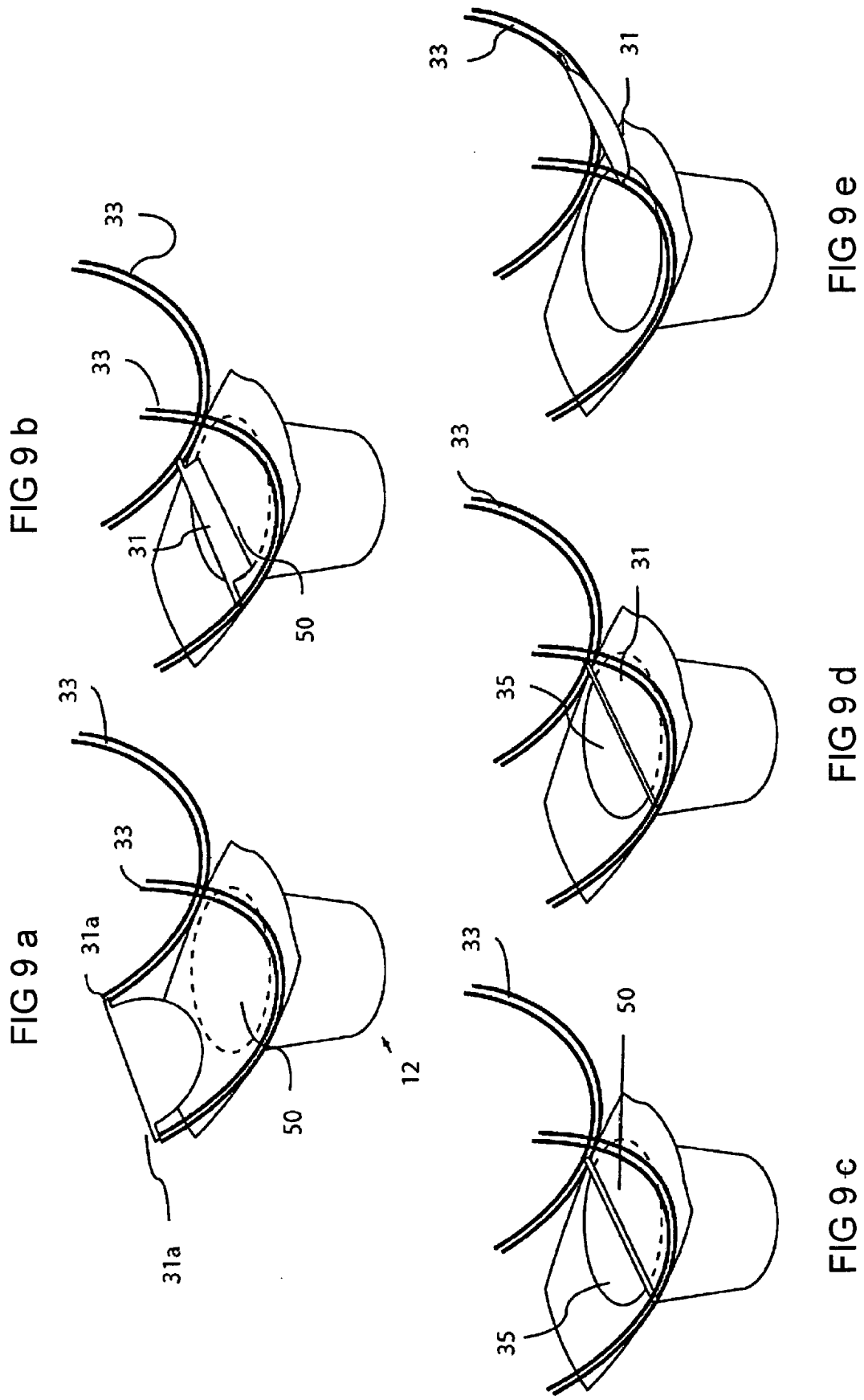


FIG 8

K-FEE SYSTEM GMBH, EX2009, page 1621
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923



K-FEE SYSTEM GMBH, EX2009, page 1622
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG 10B

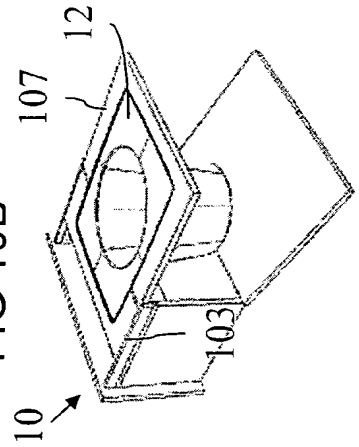
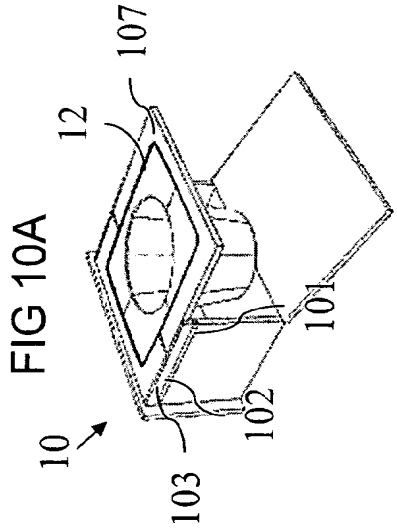


FIG 10A



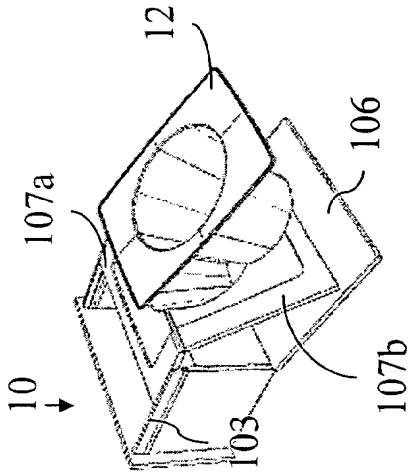


FIG 10C

K-FEE SYSTEM GMBH, EX2009, page 1623
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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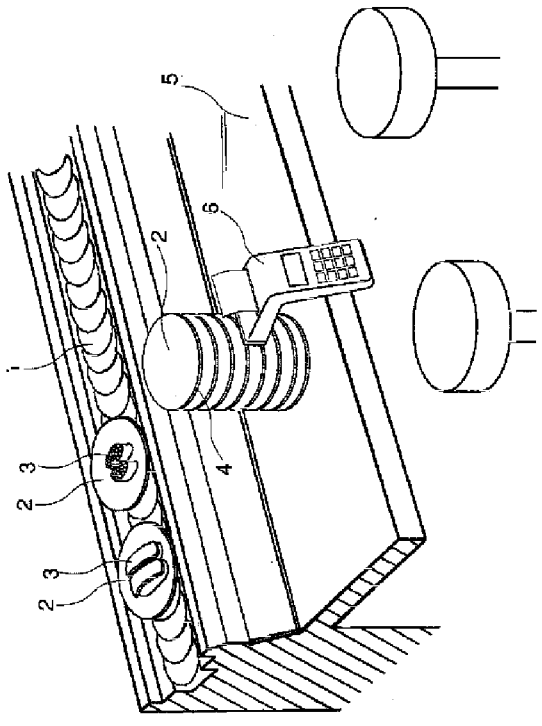
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(54)【発明の名称】　飲食物精算システムおよびそれに用いる飲食物容器

(57)【要約】

【課題】　飲食物の精算において、一々飲食物容器の数等を確認することなく、尚且つ正確に飲食物の価格を認識して精算を行うことのできる飲食物精算システムを提供する。

【解決手段】　飲食客によって飲食された飲食物を精算するシステムであって、少なくとも飲食物の価格情報と識別可能な個別情報とが記録された情報記録シンボル４が設けられた飲食物容器２と、前記情報記録シンボル４を非接触にて読み取る読み取り手段７と、読み取られた価格情報や識別可能な個別情報等を記憶する記憶手段１１と、判断手段１５とを備えた可搬型の読み取り装置６と、から成り、前記読み取り手段７にて同一の個別情報が読み取られた場合には、前記判断手段１５がこれらを一つの飲食物容器であると判断する。



K-FEE SYSTEM GMBH, EX2009, page 1624
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

【特許請求の範囲】
【請求項１】　飲食客によって飲食された飲食物を精算するシステムであって、少なくとも飲食物の価格情報と識別可能な個別情報とが記録された情報記録シンボルが設けられた飲食物容器と、前記情報記録シンボルを非接触にて読み取る読み取り手段と、読み取られた価格情報や識別可能な個別情報等を記憶する記憶手段と、判断手段とを備えた可搬型の読み取り装置と、から成り、前記読み取り手段にて同一の個別情報が読み取られた場合には、前記判断手段がこれらを一つの飲食物容器であると判断することを特徴とする飲食物精算システム。
【請求項２】　前記情報記録シンボルが、飲食物容器の側部に設けられている請求項１に記載の飲食物精算システム。
【請求項３】　前記情報記録シンボルがバーコードであり、飲食物容器の外周縁部に全周に渡って設けられている請求項１または２に記載の飲食物精算システム。
【請求項４】　前記読み取り装置に、読み取り装置により読み取られた価格情報やその数量等の精算明細を印字する印字手段が設けられている請求項１～３のいずれかに記載の飲食物精算システム。
【請求項５】　飲食物容器が皿であって、その皿の外周縁部に少なくとも飲食物の価格情報と識別可能な個別情報とが記録された１バーコード単位が繰り返し全周に渡って設けられていることを特徴とする飲食物精算システムに用いる飲食物容器。
【請求項６】　前記全周に渡って設けられているバーコードが、隙間なくほぼ連続した状態にて設けられている請求項５に記載の飲食物精算システムに用いる飲食物容器。
【請求項７】　前記バーコードが、皿の模様柄の一部となっている請求項５または６に記載の飲食物精算システムに用いる飲食物容器。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は飲食客によって飲食された飲食物の精算を行う飲食物精算システムに関する。
【０００２】
【従来の技術】従来、無端状に形成されている飲食物搬送用の循環型搬送路を、カウンター等の飲食台に沿って設け、この搬送路に、例えば寿司等の飲食物を盛り付けた皿等の容器を載置して搬送する循環搬送型の飲食カウンターは、飲食客や調理人が移動することなく飲食或いは調理することができ、更に飲食客は席にいながらにして自分の所望する商品を選びながら飲食できることから広く使用されている。
【０００３】上記したような循環搬送型の飲食カウンターにおいて、精算を実施する手法としては、各価格に対応した絵柄等の異なる寿司皿にその価格に対応する種別の寿司を載置して飲食客に供給し、飲食客が飲食した寿司皿の絵柄とその枚数より飲食料金を計算して精算がなされていた。
【０００４】しかしながら、これらの精算方法においては、一々絵柄別に寿司皿等を分別して、その枚数を数える必要があり、煩雑であるとともに、数え間違い等を生じ易いという問題があった。
【０００５】このため、これら精算を自動化するために、寿司皿等の飲食物容器に価格を判別可能なドグ等の標識を付与し、これを精算時に認識して飲食された飲食物の合計金額を算出し、精算するシステムが提案されている。
【０００６】
【発明が解決しようとする課題】しかしながら、これらの精算システムにおいては、前記飲食物容器である寿司皿等が、積み重ねられている場合が多く、そのため前記ドグ等を認識する際に、同一のドグを何回にも渡って認識してしまい、正確な金額を算出できない場合があり、そのため認識された寿司皿等の枚数を、その都度確認しなければならなかった。
【０００７】本発明は上記した問題点に着目してなされたもので、飲食物の精算において、一々飲食物容器の数等を確認することなく、尚且つ正確に飲食物の価格を認識して精算を行うことのできる飲食物精算システムを提供することを目的としている。
【０００８】
【課題を解決するための手段】上記の問題を解決するために、本発明の飲食物精算システムは、飲食客によって飲食された飲食物を精算するシステムであって、少なくとも飲食物の価格情報と識別可能な個別情報とが記録された情報記録シンボルが設けられた飲食物容器と、前記情報記録シンボルを非接触にて読み取る読み取り手段と、読み取られた価格情報や識別可能な個別情報等を記憶する記憶手段と、判断手段とを備えた可搬型の読み取り装置と、から成り、前記読み取り手段にて同一の個別情報が読み取られた場合には、前記判断手段がこれらを一つの飲食物容器であると判断することを特徴としている。この特徴によれば、飲食物容器には価格情報とともに識別可能な個別情報が記録された情報記録シンボルが設けられており、これを読み取る際に同一の情報記録シンボルを再度読み取った場合には、前記個別情報が一致することから、読み取られた個別情報を判断手段にて比較、判断することにより、同一の飲食物容器を２度読みすることに伴う精算金額の誤りを無くすことができる。さらに、２度読みしても問題がないため、複数回に渡って各飲食物容器に設けられた情報記録シンボルを確実に読み取ることができるようになり、一々読み取られた飲食物容器の総数と飲食された飲食物容器の総数とを比較、確認する必要もない。
【０００９】本発明の飲食物精算システムは、前記情報

K-FEE SYSTEM GMBH, EX2009, page 1625
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

記録シンボルが、飲食物容器の側部に設けられていることが好ましい。このようにすれば、飲食物容器が積み重ねられた状態においても、前記情報記録シンボルを飲食物側部側より読み取ることができる。

【００１０】本発明の飲食物精算システムは、前記情報記録シンボルがバーコードであり、飲食物容器の外周縁部に全周に渡って設けられていることが好ましい。このようにすれば、バーコードが外周縁部に設けられているため、飲食物容器である寿司皿等が積み重ねられた状態であっても、読み取りを実施することができるばかりか、バーコードであれば縦じま状であるために、飲食物容器である寿司皿等の狭い外周縁部であっても読み取り可能として付与することができ、これを全周に設けることで、飲食物容器がどのような状態で配置されていてもバーコードを読み取ることができる。

【００１１】本発明の飲食物精算システムは、前記読み取り装置に、読み取り装置により読み取られた価格情報やその数量等の精算明細を印字する印字手段が設けられていることが好ましい。このようにすれば、読み取り装置にて読み取られた飲食物容器の価格情報や数量等の精算明細を、客席等において飲食客が確認でき、飲食客に安心感を与えることができる。

【００１２】本発明の飲食物精算システムに用いる飲食物容器は、飲食物容器が皿であって、その皿の外周縁部に少なくとも飲食物の価格情報と識別可能な個別情報とが記録された１バーコード単位が繰り返し全周に渡って設けられていることを特徴としている。この特徴によれば、バーコードが外周縁部に設けられているため、皿が積み重ねられた状態であっても、読み取りを実施することができるばかりか、バーコードであれば縦じま状であるために、皿の狭い外周縁部であっても読み取り可能として付与することができ、これを全周に設けることで、皿がどのような状態で配置されていてもバーコードを読み取ることができる。

【００１３】本発明の飲食物精算システムに用いる飲食物容器は、前記全周に渡って設けられているバーコードが、隙間なくほぼ連続した状態にて設けられていることが好ましい。このようにすれば、バーコードが、隙間なくほぼ連続した状態にて設けられているため、連続する複数のバーコードを同時に読み取ることができ、仮にバーコードの一部が損傷していても、複数のバーコードを読み取ることで正確な情報を読み取ることができ、前記したように同一の個別情報を一つの皿として判断することから、このように複数のバーコードを読み取っても、これを複数の皿と認識することもない。

【００１４】本発明の飲食物精算システムに用いる飲食物容器は、前記バーコードが、皿の模様柄の一部となっていることが好ましい。このようにすれば、皿にバーコードが設けられていることを飲食客に解りにくくすることができ、バーコード等にいたずら等をされることを防ぐことができる。

【００１５】

【発明の実施の形態】以下、本発明の実施例を図面に基づいて説明する。

【００１６】図１は本発明の実施例における飲食物精算システムの斜視外観模式図、図２は本実施例の飲食物精算システムを示すブロック図、図３は本実施例における飲食物精算システムに用いた読み取り装置および印字例を示す図である。

【００１７】まず、本実施例の飲食物精算システムは、図１に示されるような外観構成とされており、飲食物である各種の寿司３が寿司皿２に載置されて無端状に形成された循環搬送路１にて飲食客に供給され、前記循環搬送路１に沿って飲食台１が設けられている。

【００１８】前記の寿司皿２には、図２に示されるように、寿司皿２の外周縁部の全周に渡ってバーコード４が設けられており、これらのバーコード４には、その寿司皿２に載置される寿司の価格およびその寿司皿に固有のシリアル番号が記録されたバーコードの１単位が、繰り返し設けられており、各バーコード単位間には、適宜なマージンである空隙部が設けられ、読み取り時に各バーコード単位を検出できるようにされており、各種の寿司は、その価格の一致する寿司皿２に載置されて投入されるようになっている。

【００１９】これら前記循環搬送路１にて供給された各種の寿司は、飲食客により搬送路１より取り出され、飲食され、飲食された寿司皿２は、一般的には各客席における飲食台５が狭いことから図１に示すように飲食台５上に積み重ねられる。

【００２０】これら飲食済の寿司皿２は、その寿司皿２に設けられているバーコード４を可搬型の読み取り装置６にて読み取るようになっているが、この読み取り装置６の構成は、図２に示されるような構成とされており、前記各飲食された寿司皿２のバーコード４を読み取るバーコードスキャナー部７と、これら読み取られた金額や固有のシリアル番号を記憶するメモリ１１と、入力キー郡から成る入力部１４と、入力部より入力された客席番号や読み取りデータ並びに操作状況等の各種の情報を表示するＬＣＤパネル１３と、このＬＣＤパネル１３の動作を制御するＬＣＤドライバー１２と、精算の明細等が印字されたレシートを飲食客に発行するプリンター８と、このプリンター８の印字動作を制御するプリンタードライバー１０と、確認音等を発生するサウンダ１８と、これら各部の制御を実施するとともに、各種の演算や処理プログラムに基づく判断を実施するマイクロプロセッシングユニット（ＭＰＵ）１５と、電源である電池部９とから主に構成されており、前記ＭＰＵ１５内部には、ＭＰＵ１５が行う各種の処理内容が記録された内部ＲＯＭ（図示せず）が設けられている。

【００２１】以下に本実施例の動作について説明する

K-FEE SYSTEM GMBH, EX2009, page 1626
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

と、飲食客が飲食を終了して精算を行うために店員を呼ぶと、店員は前記読み取り装置６を持ってその飲食客の客席に出向く。

【００２２】次いで店員は、読み取り装置６に設けられた入力部１４の客席番号に相当するＴのキーを入力した後、例えばその客席番号が１５番である場合には１５を入力する。

【００２３】これら客席番号の入力後、店員は図１のように積み重ねられた飲食済の寿司皿２をその側方から、バーコードスキャナー部７を寿司皿２に向けてスキャンボタン（図示せず）を押下して、各寿司皿２に設けられているバーコード４を順次読み取って行く。

【００２４】この際、本実施例ではバーコードスキャナー部７により読み取られたデータが随時表示装置１３に表示され、読み取られた固有のシリアル番号が新たに読み込まれたものである場合には、前記サウンダ１８より確認音を発生して、読み取りがなされたことを操作者である店員に告知するようになっている。

【００２５】このバーコードスキャナー部７により読み取られた各寿司皿２に付与されたバーコードデータは、前記ＭＰＵ１５に出力され、ＭＰＵ１５において読み取られた固有のシリアル番号が、既に読み取られた他の寿司皿のシリアル番号と比較され、同一である場合には２度読みと判断してそのデータを破棄し、同一のシリアル番号が存在しない場合には、新たに読み込まれたものとして、そのデータをメモリ１１に記憶する。

【００２６】店員は、これらの読み取りを各寿司皿２において複数回実施し、確実な読み取りを実施する。

【００２７】このようにして読み取られた寿司皿２の各情報は、前記メモリに記録され、その単価毎の値段、およびその合計金額や、消費税等などが前記ＭＰＵ１５により算出され、店員が入力部１４に設けられたプリントに対応するＰキーを入力することにより、プリンタ８により図３に示すように印字され、レーシート１６が発行される。

【００２８】また、こレシート１６には精算明細とともに、レジにおいて客番号や飲食金額を入力するためのバーコード１７が印字されており、レジにおいてこのバーコードを読み取ることで、正確な精算できるようになっている。

【００２９】本実施例のようにすれば、非常に簡素な機器構成にて、同一の寿司皿２の２度読み防止が実現でき、正確な精算が実施できる飲食物の精算システムを実現することができる。

【００３０】また、本実施例では、飲食物である寿司の供給を循環型の搬送路にて供給しているが、本発明はこれに限定されるものではなく、その他の供給方法を用いても良い。

【００３１】また、本実施例では、前記寿司皿２の外周縁部の側面部にバーコード４を形成しているが、これらバーコード４を図４に示すように寿司皿２上面の外周縁部に設けても良く、この場合においては、前記読み取り装置６にて読み取りを実施する場合には、寿司皿の斜め上方よりスキャンを実施すれば、寿司皿２が積み重ねられていても読み取りが可能とすることがでる。

【００３２】また、本実施例では、前記バーコード４に価格情報と固有のシリアル番号を記録しているが、この価格情報に代えて例えば寿司の種別等を載置する寿司と対応させ、その種別情報を読み取り、その種別に対応する金額を用いて精算がなされるようにしても良く、これら双方の情報を前記バーコード４に記録しても良い。

【００３３】また、本実施例では、前記バーコード４を全周に渡って設けているが、本発明はこれに限定されるものではなく、これをほぼ全周としたり、その一部に設けても良いが、本実施例のように全周に設けることにより、寿司皿２がどの方向に置かれても、寿司皿２の向きを変えることなしに読み取りを実施できることから好ましい。

【００３４】また、本実施例では、前記したようにバーコード単位を繰り返し設けており、これら各バーコード単位を区別するために、マージンとして空隙部を設けているが、本発明はこれに限定されるものではなく、これらバーコード単位を検出するために、前記マージン以外に識別記号等を用いてバーコード単位を識別するようにしても良い。

【００３５】また、本実施例では、読み取り装置６にプリンタ８を設け、レシートを発行してレジでの精算がなされるようにしているが、これら精算情報を無線等の通信手段により、レジ等へ通信により伝送して精算がなされるようにしても良いが、本実施例のように、レシート１６を客席において飲食客に発行することにより、飲食客が自分の飲食した寿司皿２の枚数と精算明細を見比べて、精算内容を確認することができることから、飲食客に精算における安心感を与えることができることから好ましい。

【００３６】また、本実施例では、前記バーコード４に記録される固有のシリアル番号は、そのバーコード４に記録される価格に依らず個別とされているが、本発明はこれに限定されず、同一金額の寿司皿２において同一の固有番号を有する寿司皿が存在しないようにすれば良く、また、これらシリアル番号も随時連続したものである必要はなく、適宜な番号、記号等を用いたものとすれば良い。

【００３７】また、本実施例では、寿司皿２にバーコード４のみが設けられているが、図４のようにバーコード４を皿の上面の外周部に設けた場合等には、これら寿司皿２の上面に絵柄等を設け、これらバーコード４を絵柄の一部とするようにしても良く、このようにすれば、これら寿司皿２にバーコード４を設けてあることを飲食客等に認識されずに済み、これらバーコード４にいたずら

K-FEE SYSTEM GMBH, EX2009, page 1627
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

等がなされることを防止することができることから好ましい。

【００３８】また、本実施形態は例として寿司を用いているが、本発明はこれに限定されるものではなく、他の飲食物においても使用することができることは言うまでもない。

【００３９】

【発明の効果】本発明は以下の効果を奏する。

【００４０】（ａ）請求項１項の発明によれば、飲食物容器には価格情報とともに識別可能な個別情報が記録された情報記録シンボルが設けられており、これを読み取る際に同一の情報記録シンボルを再度読み取った場合には、前記個別情報が一致することから、読み取られた個別情報を判断手段にて比較、判断することにより、同一の飲食物容器を２度読みすることに伴う精算金額の誤りを無くすことができる。さらに、２度読みしても問題がないため、複数回に渡って各飲食物容器に設けられた情報記録シンボルを確実に読み取ることができるようになり、一々読み取られた飲食物容器の総数と飲食された飲食物容器の総数とを比較、確認する必要もない。

【００４１】（ｂ）請求項２項の発明によれば、飲食物容器が積み重ねられた状態においても、前記情報記録シンボルを飲食物側部側より読み取ることができる。

【００４２】（ｃ）請求項３項の発明によれば、バーコードが外周縁部に設けられているため、飲食物容器である寿司皿等が積み重ねられた状態であっても、読み取りを実施することができるばかりか、バーコードであれば縦じま状であるために、飲食物容器である寿司皿等の狭い外周縁部であっても読み取り可能として付与することができ、これを全周に設けることで、飲食物容器がどのような状態で配置されていてもバーコードを読み取ることができる。

【００４３】（ｄ）請求項４項の発明によれば、読み取り装置にて読み取られた飲食物容器の価格情報や数量等の精算明細を、客席等において飲食客が確認でき、飲食客に安心感を与えることができる。

【００４４】（ｅ）請求項５項の発明によれば、バーコードが外周縁部に設けられているため、皿が積み重ねられた状態であっても、読み取りを実施することができるばかりか、バーコードであれば縦じま状であるために、皿の狭い外周縁部であっても読み取り可能として付与することができ、これを全周に設けることで、皿がどのような状態で配置されていてもバーコードを読み取ることができる。

【００４５】（ｆ）請求項６項の発明によれば、バーコードが、隙間なくほぼ連続した状態にて設けられているため、連続する複数のバーコードを同時に読み取ることができ、仮にバーコードの一部が損傷していても、複数のバーコードを読み取ることで正確な情報を読み取ることができ、前記したように同一の個別情報を一つの皿として判断することから、このように複数のバーコードを読み取っても、これを複数の皿と認識することもない。

【００４６】（ｇ）請求項７項の発明によれば、皿にバーコードが設けられていることを飲食客に解りにくくすることができ、バーコード等にいたずら等をされることを防ぐことができる。

【００４７】

【図面の簡単な説明】

【図１】本発明の実施例における飲食物精算システムの斜視外観模式図である。

【図２】本発明の実施例における飲食物精算システムを示すブロック図である。

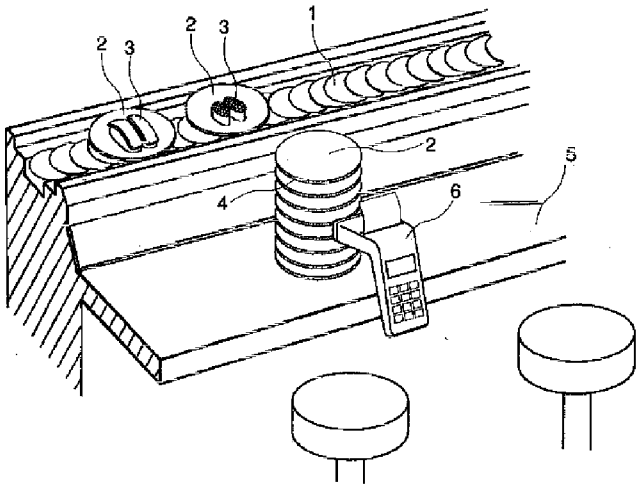
【図３】本発明の実施例における飲食物精算システムに用いた読み取り装置および印字例を示す図である。

【図４】本発明の飲食物精算システムに用いる飲食物容器である皿の例を示す図である。

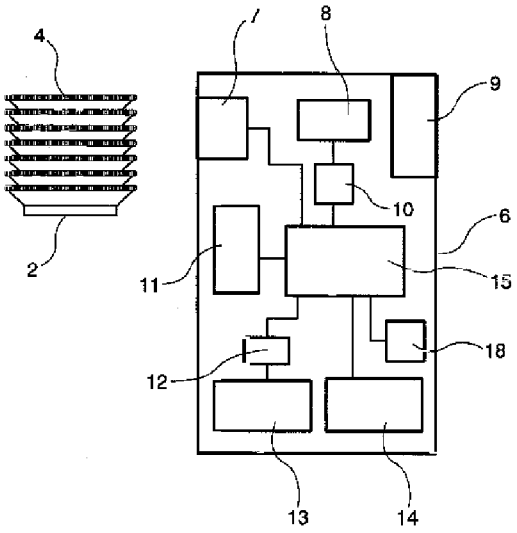
【符号の説明】

１	循環型搬送路
２	寿司皿
３	寿司
４	バーコード
５	飲食台
６	読み取り装置
７	バーコードスキャナー部（読み取り手段）
８	プリンタ
９	電源部
１０	プリンタドライバー
１１	メモリ
１２	ＬＣＤドライバー
１３	ＬＣＤパネル
１４	入力部
１５	ＭＰＵ（判断手段）
１６	レシート
１７	バーコード
１８	サウンダ

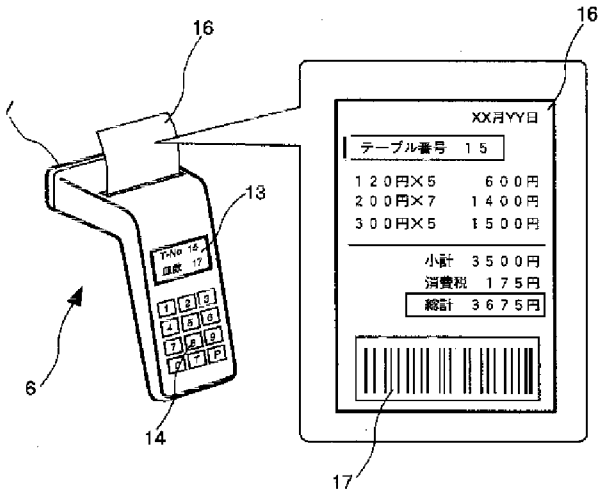
【図１】



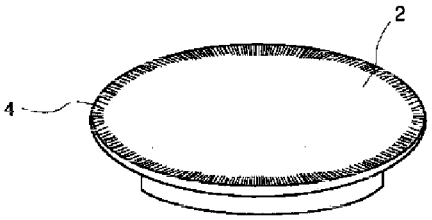
【図２】



【図３】



【図４】



K-FEE SYSTEM GMBH, EX2009, page 1629
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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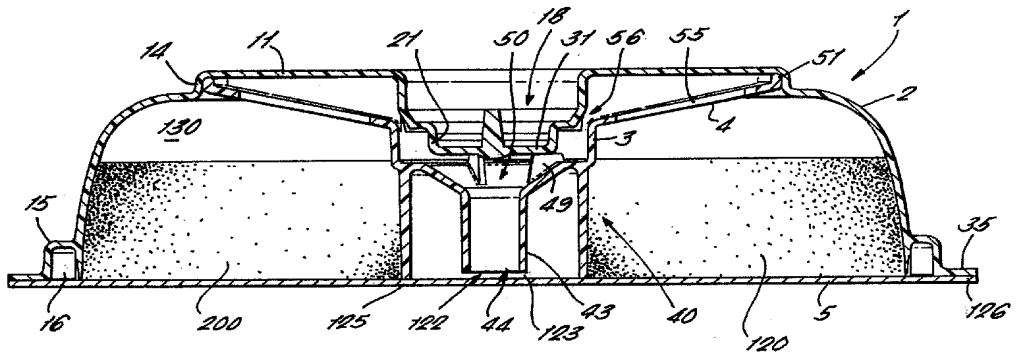
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(54) Title: CARTRIDGE AND METHOD FOR THE PREPARATION OF BEVERAGES



(57) Abstract: A cartridge (1) containing one or more liquid beverage ingredients (200) and being formed from substantially air- and water-impermeable materials, the cartridge comprising an inlet (121) for the introduction of an aqueous medium into the cartridge, a compartment (134) containing the one or more liquid beverage ingredients and an outlet (122) for a beverage produced by dilution of the one or more liquid beverage ingredients by the aqueous medium, characterised in that the compartment includes means for controlling dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

WO 2004/065258 A2

K-FEE SYSTEM GMBH, EX2009, page 1630
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

CARTRIDGE AND METHOD FOR THE PREPARATION OF BEVERAGES

The present invention relates to a cartridge and method for the preparation of beverages and, in particular, using sealed cartridges which are formed from substantially air- and water-impermeable materials 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 preparation machines which are generally termed "espresso" machines. In the production of coffee using these preparation machines the coffee cartridge is placed in a brewing chamber and hot water is passed though the cartridge at relatively high pressures, thereby extracting the aromatic coffee constituents from the ground coffee to produce the coffee beverage. Typically, such machines operate at a pressure of greater than 6×10^5 Pa. The preparation machines of the type described have to date been relatively expensive since components of the machine, such as the water pumps and seals, must be able to withstand the high pressures.

In WO01/58786 there is described a cartridge for the preparation of beverages which operates at a pressure generally in the range 0.7 to 2.0×10^5 Pa. However, the cartridge is designed for use in a beverage preparation machine for the commercial or industrial market and is relatively expensive and limited in the types of beverage produced. Hence, there remains a requirement for a cartridge for the preparation of beverages wherein the

cartridges and beverage preparation machine are suitable, in particular, for the domestic market in terms of cost, performance and reliability. There is also a need for a beverage preparation machine for such a system which is simple to operate and reliable in operation and can produce a wide range of beverage types.

It is known to provide dairy-based beverage ingredients in cartridges in the form of a powder or other dehydrated form. However, consumers consistently indicate that the use of such powdered dairy-based products adversely affects the taste, colour and texture of the final beverage. It has proven difficult to provide liquid dairy-based products in a cartridge due to the requirement to sterilise the cartridge components. Further, it has been found to be difficult to control the dilution and dispensing of the liquid milk products to arrive at a consistent and acceptable final beverage.

In addition, powdered dairy products cannot be used to produce an authentic looking frothy milk-based foam as desired by consumers for cappuccino-style beverages. A number of beverage preparation machines provide a steam wand or similar for frothing of a quantity of milk. However, the addition of the steam wand increases the cost of the machine and requires a means for generating steam. Operation of the steam wand must be done manually and requires experience to be successful. In addition, since steam is being used there is the potential for the consumer to be burnt by either the steam or hot components of the machine. Further, the consumer must keep a supply of milk available separate from the machine and carry out a further process step of a different type in order to produce a cappuccino style

beverage. This increases the complexity and time required to produce such beverages.

Hence, there remains a requirement for a system for the preparation of beverages wherein the cartridges and beverage preparation machine of the system are suitable, in particular, for the domestic market in terms of cost, performance and reliability. There is also a need for a beverage preparation machine for such a system which is simple to operate and reliable in operation and can produce a wide range of beverage types.

Accordingly, the present invention provides a cartridge containing one or more liquid beverage ingredients and being formed from substantially air- and water-impermeable materials, the cartridge comprising an inlet for the introduction of an aqueous medium into the cartridge, a compartment containing the one or more liquid beverage ingredients and an outlet for a beverage produced by dilution of the one or more liquid beverage ingredients by the aqueous medium, characterised in that the compartment includes means for controlling dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

Advantageously, the cartridge of the present invention provides superior dilution and dispensing of liquid beverage ingredients by ensuring that the liquid beverage ingredients are dispensed more evenly over the operating cycle rather that being dispensed all at the start of the operating cycle followed by substantially pure aqueous medium, which is, for example, water. This steady dispensation of the liquid beverage ingredients leads to improved homogeneity of the dispensed liquid beverage. In addition, where the diluted

liquid beverage is subsequently subjected to foaming, by for example, jetting through an orifice, the improved homogeneity of the liquid leads to a greater consistency of foaming and improved quality and quantity of foam produced per unit volume of liquid beverage.

Preferably, the means for controlling dilution delays dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

Preferably, in use, an aqueous medium flow path is established from the inlet to the outlet, the means for delaying dilution comprising a partition which hinders entry of at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path. In one embodiment the partition comprises one or more apertures for controllably releasing the at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path. Four apertures may be provided.

The partition may comprise a cup-shaped member having an open mouth directed away from the aqueous medium flow path. The cup-shaped member is preferably annular. The one or more apertures are preferably provided at or near a base of the cup-shaped member. The at least a proportion of the liquid beverage ingredients in the cup-shaped member, for example, drain by gravity through the one or more apertures in use.

In one embodiment, the cup-shaped member is spaced from a bottom of the cartridge, such that the aqueous medium flow path passes between the cup-shaped member and the bottom of the cartridge. Consequently, the at least a proportion of the liquid beverage ingredients in the cup-shaped member

drains by gravity through the one or more apertures in use vertically downwards into the aqueous medium flow path.

Preferably, the cartridge comprises an inner member and an outer member, wherein the inner member comprises the cup-shaped member. The components of the inner member and the outer member may more easily be sterilised prior to assembly when they are separated. Once the components are conjoined a number of small-apertured, tortuous pathways are created which cannot effectively be sterilised using known methods. The ability to sterilise the components is a particularly advantageous feature where the cartridges are used for dispensing dairy-based beverages such as milk.

Preferably, the cartridge further comprises means for producing a jet of the beverage, wherein said means for producing the jet of the beverage comprises an aperture in the aqueous medium flow path. The aperture may be delimited by an interface between the inner member and the outer member.

Preferably, the cartridge further comprises at least one inlet for air and means for generating a pressure reduction of the jet of beverage, whereby, in use, air from the at least one air inlet is incorporated into the beverage as a plurality of small bubbles. At least one air inlet may be provided in the inner member downstream of the aperture.

In one embodiment the at least one air inlet and means for producing a pressure reduction in the jet of beverage produces a foaming of the one or more liquid beverage ingredients of greater than 40%. Preferably, greater than 70%. Preferably, the cartridge is disc-shaped. The outer member and/or inner member are formed, for example, from polypropylene.

In one example, the liquid beverage ingredient is a concentrated liquid milk composition. Preferably, the concentrated liquid milk contains between 25 and 40% total solids. More preferably, the concentrated liquid milk contains 30% total solids. Also preferably, the concentrated liquid milk contains between 0.1 and 12% fat. Alternatively, the one or more liquid beverage ingredients are selected from the group of cocoa solids, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

The present invention also provides a method of dispensing a beverage from a cartridge containing one or more liquid beverage ingredients during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid ingredients as dispensed has a concentration at the start of the operating cycle of between 30 and 70% total solids and a concentration at the end of the operating cycle of between 1 and 15% total solids.

In one embodiment the concentration at the start of the operating cycle is between 30 and 35% total solids. The concentration at the end of the operating cycle is approximately 10% total solids. The liquid ingredient may be concentrated milk. In another embodiment, the concentration at the start of the operating cycle is between 60 and 70% total solids. The concentration at the end of the operating cycle is between 12 and 15% total solids. The liquid ingredient may contain cocoa solids. In another embodiment, the concentration at the start of the operating cycle is

between 40 and 70% total solids. The concentration at the end of the operating cycle is between 1 and 2% total solids. The liquid ingredient may contain coffee.

The present invention further provides a method of dispensing a beverage from a cartridge containing one or more liquid beverage ingredients during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid beverage ingredients is foamed on dispense to a ratio of between 20 and 150%.

Preferably the one or more liquid beverage ingredients are foamed to a ratio between 70 and 100%.

The one or more liquid beverage ingredients may include one or more of concentrated milk, coffee and cocoa solids.

The present invention further provides a beverage as produced by the above methods.

The present invention also provides a method of manufacturing a cartridge for dispensation of a beverage comprising the steps of:

a. manufacturing a plurality of outer members comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;
b. manufacturing a plurality of inner members comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;
c. storing said plurality of outer members and said inner members;

d. selecting one of the first type of outer member or the second type of outer member from the plurality of outer members;
e. selecting one of the first type of inner member or the second type of inner member from the plurality of inner members;
f. conjoining the selected inner member to the selected outer member such the inner member is within the outer member;
g. filling the outer member with one or more beverage ingredients selected from a plurality of beverage ingredients; and
h. sealing the outer member with a lid to form the cartridge.

The method of manufacture of the present invention provides an economical means for producing cartridges for the dispensation of one of a plurality of beverages. Advantageously, the cartridge is easily assembled from the main components of the inner member, the outer member, the beverage ingredient and the lid. Different types of outer member, inner member and lid are manufactured depending on the beverage ingredient to be dispensed. However, the differing types of inner member, outer member and lid are interchangeable so that individual cartridges may be assembled from specific combinations of the stock components. This results in a reduced number of total components that need to be manufactured without affecting the flexibility of the type of cartridges that can be produced. For example, the same type of outer member may be used for dispensing filter coffee and espresso-style coffee.

The cost of manufacturing the range of beverage cartridges is reduced by using interchangeable components. In addition, the types of outer member share substantially the same external shape and configuration so that all cartridges in the range can be dispensed using the same beverage preparation machine.

Optionally the method further comprises in step b. joining a filter member to the first type and/or second type of inner member.

The first type of outer member may be suitable for containing roast and ground beverage ingredients or the like. The second type of outer member may be suitable for containing soluble or liquid beverage ingredients or the like.

The first type of inner member may be suitable for filtering roast and ground beverage ingredients and the like. The second type of inner member may be suitable for filtering roast and ground beverage ingredients and the like and for entraining a plurality of air bubbles in the dispensed beverage.

The first and second type of inner member may comprise a frame having a filter disposed thereupon, and wherein a peripheral rim of the frame is conjoined to the selected type of outer member by welding.

By using separate components for the inner and outer members which are then conjoined on assembly by a welding process the manufacture of each component and the assembly of the cartridge can be optimised. This is particularly advantageous in the present cartridge where very small tolerances are desirable since the beverage flow path through the cartridge is defined by the interface between

the outer member and the inner member. In addition the components of the inner member and the outer member may more easily be sterilised prior to assembly when they are separated. Once the components are welded together a number of small-apertured, tortuous pathways are created which cannot effectively be sterilised using known methods. The ability to sterilise the components is a particularly advantageous feature where the cartridges are used for dispensing dairy-based beverages. A welded arrangement provides a quick to assemble but secure method of conjoining the inner member and outer member. Advantageously, the welding method avoids the need for glues or other such adhesives in the interior of the cartridge which will be exposed to the beverage ingredients.

Preferably, the second type of inner member comprises means for producing a jet of the beverage, which means comprises an aperture in a beverage flow path between an inlet and an outlet of the cartridge.

Preferably, the method further comprises manufacturing and storing a third type of inner member. The third type of inner member may be suitable for dispensing soluble beverage ingredients and the like.

Preferably, the method further comprises manufacturing and storing a fourth type of inner member. The fourth type of inner member may be suitable for dispensing a liquid beverage ingredients and the like.

The third or fourth type of inner member may comprise a skirt surrounding an outlet, the skirt comprising an upper extension having an upper rim which engages, on assembly of the cartridge, a co-operating formation of the selected type of outer member to form a snap-fit arrangement for

conjoining the third or fourth type of inner member to the selected type of outer member.

The present invention also provides a cartridge system for dispensing a plurality of beverages comprising:

a. a plurality of outer members comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;
b. a plurality of inner members comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;
c. a plurality of beverage ingredients; and
d. at least one lid to seal the cartridge;

wherein each cartridge comprises an outer member, an inner member, one or more beverage ingredients and a lid.

The present invention also provides a method of preparing a beverage comprising the steps of:

a. inserting a first beverage cartridge containing one or more beverage ingredients into a beverage preparation machine;
b. operating said beverage preparation machine to pass an aqueous medium through the first beverage cartridge to dispense a first portion of said beverage into a receptacle;
c. inserting a second beverage cartridge containing one or more beverage ingredients into the beverage preparation machine; and
d. operating the beverage preparation machine to pass an aqueous medium through the second beverage cartridge to dispense a second portion of said beverage into the receptacle;

characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

By using two or more cartridges to prepare a beverage a large variety of beverage can be produced by the same beverage preparation machine. In addition, each cartridge can be optimised for dispensing particular beverage ingredients. In particular, the ability to dispense liquid dairy-based ingredients allows for the formation of beverages having an authentic look, taste and mouth feel which have previously only been possible using non-cartridge based systems such as the use of a separate steam wand to froth bulk quantities of milk. The present method provides a reliable and easy to operate system for forming such beverages.

Preferably, one of the first or second beverage cartridges contains an ingredient for forming a brewed portion of a beverage.

Preferably, the method further comprises the step of removing the first beverage cartridge before inserting the second beverage cartridge.

In one embodiment, the beverage ingredient in the first or second beverage cartridge is roast and ground coffee. In another embodiment, the beverage ingredient in the first or second beverage cartridge is leaf-based tea. In another, the beverage ingredient in the first or second beverage cartridge is a liquid coffee ingredient.

Preferably, the liquid beverage ingredient is a concentrated dairy-based product. Advantageously, the concentrated dairy-based product is concentrated liquid milk. Preferably, the concentrated liquid milk contains

between 25 and 40% total solids. More preferably, the concentrated liquid milk contains 30% total solids. In addition, preferably, the concentrated liquid milk contains between 0.1 and 12% fat.

Preferably, the method further comprises the step of foaming the one or more liquid dairy-based ingredients during dispensation.

The present invention also provides a beverage preparation system comprising a beverage preparation machine having means for receiving a range of beverage cartridges and means for passing an aqueous medium through said beverage cartridges, a first beverage cartridge containing one or more beverage ingredients for preparing a first portion of said beverage, and a second beverage cartridge containing one or more beverage ingredients for preparing a second portion of said beverage, characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

It will be understood that by the term "cartridge" as used herein is meant any package, container, sachet or receptacle which contains one or more beverage ingredients in the manner described. The cartridge may be rigid, semi-rigid or flexible.

The cartridge of the present invention contains one or more liquid beverage ingredients suitable for the formation of a beverage product. The beverage product may be, for example, one of coffee, tea, chocolate or a dairy-based beverage including milk.

In the following description the terms "upper" and "lower" and equivalents will be used to describe the relational positioning of features of the invention. The

terms "upper" and "lower" and equivalents should be understood to refer to the cartridge (or other components) in its normal orientation for insertion into a beverage preparation machine and subsequent dispensing as shown, for example, in Figure 4. In particular, "upper" and "lower" refer, respectively, to relative positions nearer or further from a top surface 11 of the cartridge. In addition, the terms "inner" and "outer" and equivalents will be used to describe the relational positioning of features of the invention. The terms "inner" and "outer" and equivalents should be understood to refer to relative positions in the cartridge (or other components) being, respectively, nearer or further from a centre or major axis X of the cartridge 1 (or other component).

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

Figure 1 is cross-sectional drawing of an outer member of first and second embodiments of cartridge;

Figure 2 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing an inwardly directed cylindrical extension;

Figure 3 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing a slot;

Figure 4 is a perspective view from above of the outer member of Figure 1;

Figure 5 is a perspective view from above of the outer member of Figure 1 in an inverted orientation;

Figure 6 is a plan view from above of the outer member of Figure 1;

Figure 7 is a cross-sectional drawing of an inner member of the first embodiment of cartridge;

Figure 8 is a perspective view from above of the inner member of Figure 7;

Figure 9 is a perspective view from above of the inner member of Figure 7 in an inverted orientation;

Figure 10 is a plan view from above of the inner member of Figure 7;

Figure 11 is a cross-sectional drawing of the first embodiment of cartridge in an assembled condition;

Figure 12 is a cross-sectional drawing of an inner member of the second embodiment of cartridge;

Figure 13 is a cross-sectional drawing of a detail of the inner member of Figure 12 showing an aperture;

Figure 14 is a perspective view from above of the inner member of Figure 12;

Figure 15 is a perspective view from above of the inner member of Figure 12 in an inverted orientation;

Figure 16 is another cross-sectional drawing of the inner member of Figure 12;

Figure 17 is a cross-sectional drawing of another detail of the inner member of Figure 12 showing an air inlet;

Figure 18 is a cross-sectional drawing of the second embodiment of cartridge in an assembled condition;

Figure 19 is cross-sectional drawing of an outer member of third and fourth embodiments of cartridge;

Figure 20 is a cross-sectional drawing of a detail of the outer member of Figure 19 showing an inwardly directed cylindrical extension;

Figure 21 is a plan view from above of the outer member of Figure 19;

Figure 22 is a perspective view from above of the outer member of Figure 19;

Figure 23 is a perspective view from above of the outer member of Figure 19 in an inverted orientation;

Figure 24 is a cross-sectional drawing of an inner member of the third embodiment of cartridge;

Figure 25 is a plan view from above of the inner member of Figure 24;

Figure 26 is a cross-sectional drawing of a detail of the inner member of Figure 24 showing an in-turned upper rim;

Figure 27 is a perspective view from above of the inner member of Figure 24;

Figure 28 is a perspective view from above of the inner member of Figure 24 in an inverted orientation;

Figure 29 is a cross-sectional drawing of the third embodiment of cartridge in an assembled condition;

Figure 30 is a cross-sectional drawing of an inner member of the fourth embodiment of cartridge according to the present invention;

Figure 31 is a plan view from above of the inner member of Figure 30;

Figure 32 is a perspective view from above of the inner member of Figure 30;

Figure 33 is a perspective view from above of the inner member of Figure 30 in an inverted orientation;

Figure 34 is a cross-sectional drawing of the fourth embodiment of cartridge in an assembled condition;

Figure 35 is a front perspective view of a beverage preparation machine for use with the present invention;

Figure 36 is a front perspective view of the machine of Figure 35 with a cartridge head in an open position;

Figure 37 is a rear perspective view of the machine of Figure 35 with some parts omitted for clarity;

Figure 38 is another rear perspective view of the machine of Figure 35 with some parts omitted for clarity;

Figure 39 is a perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;

Figure 40 is another perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;

Figure 41 is a cross-sectional view of the cartridge head in a closed position;

Figure 42 is a cross-sectional view of the cartridge head in an open position;

Figure 43 is a schematic layout of the machine of Figure 35;

Figure 44a and 44b are schematic layouts of first and second code recognition means for the machine of Figure 35;

Figure 45 is a plan view of a beverage of the present invention comprising a barcode;

Figure 46a is a graph of concentration vs. operating cycle time;

Figure 46b is a graph of foamability vs. operating cycle time; and

Figure 46c is a graph of temperature vs. operating cycle time.

As shown in Figure 11, the cartridge 1 generally comprises an outer member 2, an inner member 3 and a laminate 5. The outer member 2, inner member 3 and laminate 5 are assembled to form the cartridge 1 which has an interior 120 for containing one or more beverage ingredients, an inlet 121, an outlet 122 and a beverage flow path linking the inlet 121 to the outlet 122 and which passes through the interior 120. The inlet 121 and outlet 122 are initially sealed by the laminate 5 and are opened in use by piercing or cutting of the laminate 5. The beverage flow path is defined by spatial inter-relationships between the outer member 2, inner member 3 and laminate 5 as discussed below. Other components may optionally be included in the cartridge 1, such as a filter 4, as will be described further below.

A first version of cartridge 1 which will be described for background purposes is shown in Figures 1 to 11. The first version of the cartridge 1 is particularly designed for use in dispensing filtered products such as roast and ground coffee or leaf tea. However, this version of the cartridge 1 and the other versions described below may be used with other products such as chocolate, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

As can be seen from Figure 5, the overall shape of the cartridge 1 is generally circular or disc-shaped with the diameter of the cartridge 1 being significantly greater than its height. A major axis X passes through the centre of the outer member as shown in Figure 1. Typically the overall diameter of the outer member 2 is 74.5 mm ±6mm and the

overall height is 16 mm ±3mm. Typically the volume of the cartridge 1 when assembled is 30.2 ml ±20%.

The outer member 2 generally comprises a bowl-shaped shell 10 having a curved annular wall 13, a closed top 11 and an open bottom 12. The diameter of the outer member 2 is smaller at the top 11 compared to the diameter at the bottom 12, resulting from a flaring of the annular wall 13 as one traverses from the closed top 11 to the open bottom 12. The annular wall 13 and closed bottom 11 together define a receptacle having an interior 34.

A hollow inwardly directed cylindrical extension 18 is provided in the closed top 11 centred on the major axis X. As more clearly shown in Figure 2, the cylindrical extension 18 comprises a stepped profile having first, second and third portions 19, 20 and 21. The first portion 19 is right circular cylindrical. The second portion 20 is frusto-conical in shape and is inwardly tapered. The third portion 21 is another right circular cylinder and is closed off by a lower face 31. The diameter of the first, second and third portion 19, 20 and 21 incrementally decreases such that the diameter of the cylindrical extension 18 decreases as one traverses from the top 11 to the closed lower face 31 of the cylindrical extension 18. A generally horizontal shoulder 32 is formed on the cylindrical extension 18 at the junction between the second and third portions 20 and 21.

An outwardly extending shoulder 33 is formed in the outer member 2 towards the bottom 12. The outwardly extending shoulder 33 forms a secondary wall 15 co-axial with the annular wall 13 so as to define an annular track forming a manifold 16 between the secondary wall 15 and the annular wall 13. The manifold 16 passes around the

circumference of the outer member 2. A series of slots 17 are provided in the annular wall 13 level with the manifold 16 to provide gas and liquid communication between the manifold 16 and the interior 34 of the outer member 2. As shown in Figure 3, the slots 17 comprise vertical slits in the annular wall 13. Between 20 and 40 slots are provided. In the embodiment shown thirty-seven slots 17 are provided generally equi-spaced around the circumference of the manifold 16. The slots 17 are preferably between 1.4 and 1.8 mm in length. Typically the length of each slot is 1.6 mm representing 10% of the overall height of the outer member 2. The width of each slot is between 0.25 and 0.35 mm. Typically, the width of each slot is 0.3 mm. The width of the slots 17 is sufficiently narrow to prevent the beverage ingredients passing therethrough into the manifold 16 either during storage or in use.

An inlet chamber 26 is formed in the outer member 2 at the periphery of the outer member 2. A cylindrical wall 27 is provided, as most clearly shown in Figure 5, which defines the inlet chamber 26 within, and partitions the inlet chamber 26 from, the interior 34 of the outer member 2. The cylindrical wall 27 has a closed upper face 28 which is formed on a plane perpendicular to the major axis X and an open lower end 29 co-planar with the bottom 12 of the outer member 2. The inlet chamber 26 communicates with the manifold 16 via two slots 30 as shown in Figure 1. Alternatively, between one and four slots may be used to communicate between the manifold 16 and the inlet chamber 26.

A lower end of the outwardly extending shoulder 33 is provided with an outwardly extending flange 35 which extends

perpendicularly to the major axis X. Typically the flange 35 has a width of between 2 and 4 mm. A portion of the flange 35 is enlarged to form a handle 24 by which the outer member 2 may be held. The handle 24 is provided with an upturned rim 25 to improve grip.

The outer member 2 is formed as a single integral piece from high density polyethylene, polypropylene, polystyrene, polyester, or a laminate of two or more of these materials. A suitable polypropylene is the range of polymers available from DSM UK Limited (Redditch, United Kingdom). The outer member may be opaque, transparent or translucent. The manufacturing process may be injection moulding.

The inner member 3 as shown in Figures 7 to 10, comprises an annular frame 41 and a downwardly extending cylindrical funnel 40. A major axis X passes through the centre of the inner member 3 as shown in Figure 7.

As best shown in Figure 8, the annular frame 41 comprises an outer rim 51 and an inner hub 52 joined by ten equi-spaced radial spokes 53. The inner hub 52 is integral with and extends from the cylindrical funnel 40. Filtration apertures 55 are formed in the annular frame 41 between the radial spokes 53. A filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The filter is preferably made from a material with a high wet strength, for example a non-woven fibre material of polyester. Other materials which may be used include a water-impermeable 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 plastic materials into the cellulosic material

renders the cellulosic material heat-sealable. The filter 4 may also be treated or coated with a material which is activated by heat and/or pressure so that it can be sealed to the annular frame 41 in this way.

As shown in the cross-sectional profile of Figure 7, the inner hub 52 is located at a lower position than the outer rim 51, resulting in the annular frame 41 having a sloping lower profile.

The upper surface of each spoke 53 is provided with an upstanding web 54 which divides a void space above the annular frame 41 into a plurality of passages 57. Each passage 57 is bounded on either side by a web 54 and on a lower face by the filter 4. The passages 57 extend from the outer rim 51 downwardly towards, and open into, the cylindrical funnel 40 at openings 56 defined by the inner extremities of the webs 54.

The cylindrical funnel 40 comprises an outer tube 42 surrounding an inner discharge spout 43. The outer tube 42 forms the exterior of the cylindrical funnel 40. The discharge spout 43 is joined to the outer tube 42 at an upper end of the discharge spout 43 by means of an annular flange 47. The discharge spout 43 comprises an inlet 45 at an upper end which communicates with the openings 56 of the passages 57 and an outlet 44 at a lower end through which the prepared beverage is discharged into a cup or other receptacle. The discharge spout 43 comprises a frusto-conical portion 48 at an upper end and a cylindrical portion 58 at a lower end. The cylindrical portion 58 may have a slight taper such that it narrows towards the outlet 44. The frusto-conical portion 48 helps to channel beverage from the passages 57 down towards the outlet 44 without inducing

turbulence to the beverage. An upper surface of the frusto-conical portion 48 is provided with four support webs 49 equi-spaced around the circumference of the cylindrical funnel 40. The support webs 49 define channels 50 therebetween. The upper edges of the support webs 49 are level with one another and perpendicular to the major axis X.

The inner member 3 may be formed as a single integral piece from polypropylene or a similar material as described above and by injection moulding in the same manner as the outer member 2.

Alternatively, the inner member 3 and/or the outer member 2 may be made from a biodegradable polymer. Examples of suitable materials include degradable polyethylene (for example, SPITEK supplied by Symphony Environmental, Borehamwood, United Kingdom), biodegradable polyester amide (for example, BAK 1095 supplied by Symphony Environmental), poly lactic acids (PLA supplied by Cargil, Minnesota, USA), starch-based polymers, cellulose derivatives and polypeptides.

The laminate 5 is formed from two layers, a first layer of aluminium and a second layer of cast polypropylene. The aluminium layer is between 0.02 and 0.07 mm in thickness. The cast polypropylene layer is between 0.025 and 0.065 mm in thickness. In one embodiment the aluminium layer is 0.06 mm and the polypropylene layer is 0.025 mm thick. This laminate is particularly advantageous as it has a high resistance to curling during assembly. As a result the laminate 5 may be pre-cut to the correct size and shape and subsequently transferred to the assembly station on the production line without undergoing distortion. Consequently,

the laminate 5 is particularly well suited to welding. Other laminate materials may be used including PET/Aluminium/PP, PE/EVOH/PP, PET/metallised/PP and Aluminium/PP laminates. Roll laminate stock may be used instead of die cut stock.

The cartridge 1 may be closed by a rigid or semi-rigid lid instead of a flexible laminate.

Assembly of the cartridge 1 involves the following steps:

a) the inner member 3 is inserted into the outer member 2;

b) the filter 4 is cut to shape and placed onto the inner member 3 so to be received over the cylindrical funnel 40 and come to rest against the annular frame 41;

c) the inner member 3, outer member 2 and filter 4 are joined by ultrasonic welding;

d) the cartridge 1 is filled with one or more beverage ingredients;

e) the laminate 5 is affixed to the outer member 2.

These steps will be discussed in greater detail below.

The outer member 2 is orientated with the open bottom 12 directed upwards. The inner member 3 is then inserted into the outer member 2 with the outer rim 51 being received as a loose fit in an axial extension 14 at top 11 of the cartridge 1. The cylindrical extension 18 of the outer member 2 is at the same time received in the upper portion of the cylindrical funnel 40 of the inner member 3. The third portion 21 of the cylindrical extension 18 is seated inside the cylindrical funnel 40 with the closed lower face 31 of the cylindrical extension 18 bearing against the support webs 49 of the inner member 3. The filter 4 is then

placed over the inner member 3 such that the filter material contacts the annular rim 51. An ultrasonic welding process is then used to join the filter 4 to the inner member 3 and at the same time, and in the same process step, the inner member 3 to the outer member 2. The inner member 3 and filter 4 are welded around the outer rim 51. The inner member 3 and outer member 2 are joined by means of weld lines around the outer rim 51 and also the upper edges of the webs 54.

As shown most clearly in Figure 11, the outer member 2 and inner member 3 when joined together define a void space 130 in the interior 120 below the annular flange 41 and exterior the cylindrical funnel 40 which forms a filtration chamber. The filtration chamber 130 and passages 57 above the annular frame 41 are separated by the filter paper 4.

The filtration chamber 130 contains the one or more beverage ingredients 200. The one or more beverage ingredients are packed into the filtration chamber 130. For a filtered style beverage the ingredient is typically roast and ground coffee or leaf tea. The density of packing of the beverage ingredients in the filtration chamber 130 can be varied as desired. Typically, for a filtered coffee product the filtration chamber contains between 5.0 and 10.2 grams of roast and ground coffee in a filtration bed of thickness of typically 5 to 14 mm. Optionally, the interior 120 may contain one or more bodies, such as spheres, which are freely movable within the interior 120 to aid mixing by inducing turbulence and breaking down deposits of beverage ingredients during discharge of the beverage.

The laminate 5 is then affixed to the outer member 2 by forming a weld 126 around the periphery of the laminate 5 to

join the laminate 5 to the lower surface of the outwardly extending flange 35. The weld 126 is extended to seal the laminate 5 against the lower edge of the cylindrical wall 27 of the inlet chamber 26. Further, a weld 125 is formed between the laminate 5 and the lower edge of the outer tube 42 of the cylindrical funnel 40. The laminate 5 forms the lower wall of the filtration chamber 130 and also seals the inlet chamber 26 and cylindrical funnel 40. However, a small gap 123 exists prior to dispensation between the laminate 5 and the lower edge of the discharge spout 43. A variety of welding methods may be used, such as heat and ultrasonic welding, depending on the material characteristics of the laminate 5.

Advantageously, the inner member 3 spans between the outer member 2 and the laminate 5. The inner member 3 is formed from a material of relative rigidity, such as polypropylene. As such, the inner member 3 forms a load-bearing member that acts to keep the laminate 5 and outer member 2 spaced apart when the cartridge 1 is compressed. It is preferred that the cartridge 1 is subjected to a compressive load of between 130 and 280N in use. The compressive force acts to prevent the cartridge failing under internal pressurisation and also serves to squeeze the inner member 3 and outer member 2 together. This ensures that the internal dimensions of passageways and apertures in the cartridge 1 are fixed and unable to change during pressurisation of the cartridge 1.

To use the cartridge 1 it is first inserted into a beverage preparation machine and the inlet 121 and outlet 122 are opened by piercing members of the beverage preparation machine which perforate and fold back the

laminate 5. An aqueous medium, typically water, under pressure enters the cartridge 1 through the inlet 121 into the inlet chamber 26 at a pressure of between 0.1-2.0 bar. From there the water is directed to flow through the slots 30 and round the manifold 16 and into the filtration chamber 130 of the cartridge 1 through the plurality of slots 17. The water is forced radially inwardly through the filtration chamber 130 and mixes with the beverage ingredients 200 contained therein. The water is at the same time forced upwardly through the beverage ingredients. The beverage formed by passage of the water through the beverage ingredients passes through the filter 4 and filtration apertures 55 into the passages 57 lying above the annular frame 41. The sealing of the filter 4 onto the spokes 53 and the welding of the rim 51 with the outer member 2 ensures that there are no short-circuits and all the beverage has to pass through the filter 4.

The beverage then flows downwardly along the radial passages 57 formed between the webs 54 and through the openings 56 and into the cylindrical funnel 40. The beverage passes along the channels 50 between the support webs 47 and down the discharge spout 43 to the outlet 44 where the beverage is discharged into a receptacle such as a cup.

Preferably, the beverage preparation machine comprises an air purge facility, wherein compressed air is forced through the cartridge 1 at the end of the operating cycle to flush out the remaining beverage into the receptacle.

A second version of cartridge 1 will now be described for background purposes with reference to Figures 12 to 18. The second version of the cartridge 1 is particularly designed for use in dispensing espresso-style products such

as roast and ground coffee where it is desirable to produce a beverage having a froth of tiny bubbles known as a crema. Many of the features of the second version of the cartridge 1 are the same as in the first version and like numerals have been used to reference like features. In the following description the differences between the first and second versions will be discussed. Common features which function in the same manner will not be discussed in detail.

The outer member 2 is of the same construction as in the first version of cartridge 1 and as shown in Figures 1 to 6.

The annular frame 41 of the inner member 3 is the same as in the first version. Also, a filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The outer tube 42 of the cylindrical funnel 40 is also as before. However, there are a number of differences in the construction of the inner member 2 of the second version compared to the first version. As shown in Figure 16, the discharge spout 43 is provided with a partition 65 which extends part way up the discharge spout 43 from the outlet 44. The partition 65 helps to prevent the beverage spraying and/or splashing as it exits the discharge spout 43. The profile of the discharge spout 43 is also different and comprises a stepped profile with a distinct dog-leg 66 near an upper end of the tube 43.

A rim 67 is provided upstanding from the annular flange 47 joining the outer tube 42 to the discharge spout 43. The rim 67 surrounds the inlet 45 to the discharge spout 43 and defines an annular channel 69 between the rim 67 and the upper portion of the outer tube 42. The rim 67 is provided with an inwardly directed shoulder 68. At one point around

the circumference of the rim 67 an aperture 70 is provided in the form of a slot which extends from an upper edge of rim 67 to a point marginally below the level of the shoulder 68 as most clearly shown in Figures 12 and 13. The slot has a width of 0.64 mm.

An air inlet 71 is provided in annular flange 47 circumferentially aligned with the aperture 70 as shown in Figures 16 and 17. The air inlet 71 comprises an aperture passing through the flange 47 so as to provide communication between a point above the flange 47 and the void space below the flange 47 between the outer tube 42 and discharge spout 43. Preferably, and as shown, the air inlet 71 comprises an upper frusto-conical portion 73 and a lower cylindrical portion 72. The air inlet 71 is typically formed by a mould tool such as a pin. The tapered profile of the air inlet 71 allows the mould tool to be more easily removed from the moulded component. The wall of the outer tube 42 in the vicinity of the air inlet 71 is shaped to form a chute 75 leading from the air inlet 71 to the inlet 45 of the discharge spout 43. As shown in Figure 17, a canted shoulder 74 is formed between the air inlet 71 and the chute 75 to ensure that the jet of beverage issuing from the slot 70 does not immediately foul on the upper surface of the flange 47 in the immediate vicinity of the air inlet 71.

The assembly procedure for the second version of cartridge 1 is similar to the assembly of the first version. However, there are certain differences. As shown in Figure 18, the third portion 21 of the cylindrical extension 18 is seated inside the support rim 67 rather than against support webs. The shoulder 32 of the cylindrical extension 18 between the second portion 20 and third portion 21 bears

against the upper edge of the support rim 67 of the inner member 3. An interface zone 124 is thus formed between the inner member 3 and the outer member 2 comprising a face seal between the cylindrical extension 18 and the support rim 67 which extends around nearly the whole circumference of the cartridge 1. The seal between the cylindrical extension 18 and the support rim 67 is not fluid-tight though since the slot 70 in the support rim 67 extends through the support rim 67 and downwardly to a point marginally below the shoulder 68. Consequently the interface fit between the cylindrical extension 18 and the support rim 67 transforms the slot 70 into an aperture 128, as most clearly shown in Figure 18, providing gas and liquid communication between the annular channel 69 and the discharge spout 43. The aperture is typically 0.64 mm wide by 0.69 mm long.

Operation of the second version of cartridge 1 to dispense a beverage is similar to the operation of the first version but with certain differences. Beverage in the radial passages 57 flows downwardly along the passages 57 formed between the webs 54 and through the openings 56 and into the annular channel 69 of the cylindrical funnel 40. From the annular channel 69 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 130 and passages 57. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 18, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is entrained into the beverage stream in the form of a multitude of small air

bubbles as the air is drawn up through the air inlet 71. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired crema. Thus, the aperture 128 and the air inlet 71 together form an eductor which acts to entrain air into the beverage. Flow of beverage into the eductor should be kept as smooth as possible to reduce pressure losses. Advantageously, the walls of the eductor should be made concave to reduce losses due to 'wall effect' friction. The dimensional tolerance of the aperture 128 is small. Preferably the aperture size is fixed plus or minus 0.02 mm^2. Hairs, fibrils or other surface irregularities can be provided within or at the exit of the eductor to increase the effective cross-sectional area which has been found to increase the degree of air entrainment.

A third version of cartridge 1 will now be described for background purposes and is shown in Figures 19 to 29. The third version of the cartridge 1 is particularly designed for use in dispensing soluble products which may be in powdered, liquid, syrup, gel or similar form. The soluble product is dissolved by or forms a suspension in, an aqueous medium such as water when the aqueous medium is passed, in use, through the cartridge 1. Examples of beverages include chocolate, coffee, milk, tea, soup or other rehydratable or aqueous-soluble products. Many of the features of the third version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the third and previous versions will be discussed.

Common features which function in the same manner will not be discussed in detail.

Compared to the outer member 2 of the previous versions, the hollow inwardly directed cylindrical extension 18 of the outer member 2 of the third version has a larger overall diameter as shown in Figure 20. In particular the diameter of the first portion 19 is typically between 16 and 18 mm compared to 13.2 mm for the outer member 2 of the previous versions. In addition, the first portion 19 is provided with a convex outer surface 19a, or bulge, as most clearly shown in Figure 20, the function of which will be described below. The diameter of the third portions 21 of the cartridges 1 are however the same resulting in the area of the shoulder 32 being greater in this, the third version of the cartridge 1. Typically the volume of the cartridge 1 when assembled is 32.5 ml ±20%.

The number and positioning of the slots in the lower end of the annular wall 13 is also different. Between 3 and 5 slots are provided. In the embodiment as shown in Figure 23, four slots 36 are provided equi-spaced around the circumference of the manifold 16. The slots 36 are slightly wider than in the previous versions of the cartridge 1 being between 0.35 and 0.45 mm, preferably 0.4 mm wide.

In other respects the outer members 2 of the cartridges 1 are the same.

The construction of the cylindrical funnel 40 of the inner member 3 is the same as in the first version of cartridge 1 with an outer tube 42, discharge spout 45, annular flange 47 and support webs 49 being provided. The only difference is that the discharge spout 45 is shaped

with an upper frusto-conical section 92 and a lower cylindrical section 93.

In contrast to the previous versions and as shown in Figures 24 to 28, the annular frame 41 is replaced by a skirt portion 80 which surrounds the cylindrical funnel 40 and is joined thereto by means of eight radial struts 87 which adjoin the cylindrical funnel 40 at or near the annular flange 47. A cylindrical extension 81 of the skirt portion 80 extends upwardly from the struts 87 to define a chamber 90 with an open upper face. An upper rim 91 of the cylindrical extension 81 has an in-turned profile as shown in Figure 26. An annular wall 82 of the skirt portion 80 extends downwardly from the struts 87 to define an annular channel 86 between the skirt portion 80 and the outer tube 42.

The annular wall 82 comprises at a lower end an exterior flange 83 which lies perpendicular to the major axis X. A rim 84 depends downwardly from a lower surface of the flange 83 and contains five apertures 85 which are circumferentially equi-spaced around the rim 84. Thus, the rim 84 is provided with a castellated lower profile.

Apertures 89 are provided between the struts 87 allowing communication between the chamber 90 and the annular channel 86.

The assembly procedure for the third version of cartridge 1 is similar to the assembly of the first version but with certain differences. The outer member 2 and inner member 3 are push-fitted together as shown in Figure 29 and retained by means of a snap-fit arrangement rather than welded together. On joining the two members the inwardly directed cylindrical extension 18 is received inside the

upper cylindrical extension 81 of the skirt portion 80. The inner member 3 is retained in the outer member 2 by frictional interengagement of the convex outer surface 19a of the first portion 19 of the cylindrical extension 18 with the in-turned rim 91 of the upper cylindrical extension 81. With the inner member 3 located in the outer member 2 a mixing chamber 134 is defined located exterior to the skirt portion 80. The mixing chamber 134 contains the beverage ingredients 200 prior to dispensation. It should be noted that the four inlets 36 and the five apertures 85 are staggered circumferentially with respect to one another. The radial location of the two parts relative to each other need not be determined or fixed during assembly since the use of four inlets 36 and five apertures 85 ensures that misalignment occurs between the inlets and apertures whatever the relative rotational positioning of the components.

The one or more beverage ingredients are packed into the mixing chamber 134 of the cartridge. The density of packing of the beverage ingredients in the mixing chamber 134 can be varied as desired.

The laminate 5 is then affixed to the outer member 2 and inner member 3 in the same manner as described above in the previous versions.

In use, water enters the mixing chamber 134 through the four slots 36 in the same manner as previous versions of the cartridge. The water is forced radially inwardly through the mixing chamber and mixes with the beverage ingredients contained therein. The product is dissolved or mixed in the water and forms the beverage in the mixing chamber 134 and is then driven though the apertures 85 into the annular

channel 86 by back pressure of beverage and water in the mixing chamber 134. The circumferential staggering of the four inlet slots 36 and the five apertures 85 ensures that jets of water are not able to pass radially directly from the inlet slots 36 to the apertures 85 without first circulating within the mixing chamber 134. In this way the degree and consistency of dissolution or mixing of the product is significantly increased. The beverage is forced upwardly in the annular channel 86, through the apertures 89 between the struts 87 and into the chamber 90. The beverage passes from chamber 90 through the inlets 45 between the support webs 49 into the discharge spout 43 and towards the outlet 44 where the beverage is discharged into a receptacle such as a cup. The cartridge finds particular application with beverage ingredients in the form of viscous liquids or gels. In one application a liquid chocolate ingredient is contained in the cartridge 1 with a viscosity of between 1700 and 3900mPa at ambient temperature and between 5000 and 10000mPa at 0°C and a refractive solids of 67 Brix ±3. In another application liquid coffee is contained in the cartridge 1 with a viscosity of between 70 and 2000mPa at ambient and between 80 and 5000mPa at 0°C where the coffee has a total solids level of between 40 and 70%. The liquid coffee ingredient may contain between 0.1 and 2.0% by weight sodium bicarbonate, preferably between 0.5 and 1.0% by weight. The sodium bicarbonate acts to maintain the pH level of the coffee at or below 4.8 enabling a shelf-life for coffee-filled cartridges of up to 12 months.

A fourth version of cartridge 1 embodying the present invention is shown in Figures 30 to 34. The fourth version of the cartridge 1 is particularly designed for use in

dispensing liquid products such as concentrated liquid milk. Many of the features of the fourth version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the fourth and previous versions will be discussed. Common features which function in the same manner will not be discussed in detail.

The outer member 2 is the same as in the third version of cartridge 1 and as shown in Figures 19 to 23.

The cylindrical funnel 40 of the inner member 3 is similar to that shown in the second version of cartridge 1 but with certain differences. As shown in Figure 30 the discharge spout 43 is shaped with an upper frusto-conical section 106 and a lower cylindrical section 107. Three axial ribs 105 are provided on the inner surface of the discharge spout 43 to direct the dispensed beverage downwards towards the outlet 44 and prevent the discharged beverage from spinning within the spout. Consequently, the ribs 105 act as baffles. As in the second version of cartridge 1, an air inlet 71 is provided through the annular flange 47. However, the chute 75 beneath the air inlet 71 is more elongated than in the second version.

A skirt portion 80 is provided similar to that shown in the third version of the cartridge 1 described above. Between 5 and 12 apertures 85 are provided in the rim 84. Typically ten apertures are provided rather than the five provided in the third version of cartridge 1.

An annular bowl 100 is provided extending from and integral with the flange 83 of the skirt portion 80. The annular bowl 100 comprises a flared body 101 with an open upper mouth 104 which is directed upwards. Four feed

apertures 103 shown in Figures 30 and 31 are located in the body 101 at or near the lower end of the bowl 100 where it joins the skirt portion 80. Preferably, the feed apertures are equi-spaced around the circumference of the bowl 100. The bowl 100 joins the skirt portion 80 part-way up its length such that a discrete gap is provided between the bowl 100 and the laminate 5 when the cartridge is assembled. Thus, the apertures 85 are located below the level of the bowl 100. As can be seen from Figure 34, when the cartridge 1 is assembled and filled the bowl 100 contains a proportion of the liquid beverage ingredients therein, effectively partitioning that proportion of the beverage ingredients from the apertures 85.

The laminate 5 is of the type described above in the previous embodiments.

The assembly procedure for the fourth version of cartridge 1 is the same as that for the third version.

Operation of the fourth version of cartridge is similar to that of the third version. The water enters the cartridge 1 and the mixing chamber 134 in the same manner as before. There the water mixes with and dilutes the liquid product which is then forced out below the bowl 100 and through the apertures 85 towards the outlet 44 as described above. The proportion of the liquid product initially contained within the annular bowl 100 as shown in Figure 34 is not subject to immediate dilution by the water entering the mixing chamber 134. Rather, the diluted liquid product in the lower part of the mixing chamber 134 will tend to exit through apertures 85 rather than be forced up and into the annular bowl 100 through upper mouth 104. Consequently, the liquid product in the annular bowl 100 will remain

relatively concentrated during the initial stages of the operating cycle compared to the product in the lower part of the mixing chamber 134. The liquid product in the annular bowl 100 drips through the feed apertures 103 under gravity into the stream of product exiting the mixing chamber 134 through the apertures 85 and below the bowl 100. The annular bowl 100 acts to even out the concentration of the diluted liquid product entering the cylindrical funnel 40 by holding back a proportion of the concentrated liquid product and releasing it into the exiting liquid stream flow path steadily throughout the operating cycle as illustrated in Figure 46a where the concentration of the milk measured as a percentage of the total solids present is shown during an operating cycle of approximately 15 seconds. Line a illustrates the concentration profile with the bowl 100 whilst line b illustrates a cartridge without the bowl 100. As can be seen the concentration profile with the cup 100 is more even during the operating cycle and there is no immediate large drop in concentration as occurs without the bowl 100. The initial concentration of the milk is typically 30-35% SS and at the end of the cycle 10% SS. This results in a dilution ratio of around 3 to 1, although dilution ratios of between 1 to 1 and 6 to 1 are possible with the present invention. For other liquid beverage ingredients the concentrations may vary. For example for liquid chocolate the initial concentration is approximately 67% SS and at the end of the cycle 12-15% SS. This results in a dilution ratio (ratio of aqueous medium to beverage ingredient in dispensed beverage) of around 5 to 1, although dilution ratios of between 2 to 1 and 10 to 1 are possible with the present invention. For liquid coffee the initial concentration is

between 40-67% and the concentration at the end of dispense 1-2% SS. This results in a dilution ratio of between 20 to 1 and 70 to 1, although dilution ratios of between 10 to 1 and 100 to 1 are possible with the present invention.

From the annular channel 86 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 134 and chamber 90. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 34, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is entrained into the beverage stream in the form of a multitude of small air bubbles as the air is drawn up through the air inlet 71. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired frothy appearance.

Advantageously, the inner member 3, outer member 2, laminate 5 and filter 4 can all be readily sterilised due to the components being separable and not individually comprising tortuous passageways or narrow crevices. Rather, it is only after conjoining the components, after sterilisation, that the necessary passageways are formed. This is particularly important where the beverage ingredient is a dairy-based product such as liquid milk concentrate.

The fourth embodiment of beverage cartridge is particularly advantageous for dispensing a concentrated dairy-based liquid product such as liquid milk. Previously, powdered milk products have been provided in the form of

sachets for adding to a pre-prepared beverage. However, for a cappuccino-style beverage it is necessary to foam the milk. This has been achieved previously by passing steam through a liquid milk product. However this necessitates the provision of a steam supply which increases the cost and complexity of the machine used to dispense the beverage. The use of steam also increases the risk of injury during operation of the cartridge. Accordingly the present invention provides for a beverage cartridge having a concentrated dairy-based liquid product therein. It has been found that by concentrating the milk product a greater amount of foam can be produced for a particular volume of milk when compared to fresh or UHT milk. This reduces the size required for the milk cartridge. Fresh semi-skimmed milk contains approximately 1.6% fat and 10% total solids. The concentrated liquid milk preparations of the present invention contain between 0.1 and 12% fat and 25 to 40% total solids. In a typical example, the preparation contains 4% fat and 30% total solids. The concentrated milk preparations are suitable for foaming using a low pressure preparation machine as will be described below. In particular, foaming of the milk is achieved at pressures below 2 bar, preferably approximately 1.5 bar using the cartridge of the fourth embodiment described above.

The foaming of the concentrated milk is particularly advantageous for beverages such as cappuccinos and milk shakes. Preferably the passing of the milk through the aperture 128 and over the air inlet 71 and the optional use of the bowl 100 enables foaming levels of greater than 40%, preferably greater than 70% for milk. For liquid chocolate foaming levels of greater than 70% are possible. For liquid

coffee foaming levels of greater than 70% are possible. The foamability level is measured as the ratio of the volume of the foam produced to the volume of liquid beverage ingredient dispensed. For example, where 138.3ml of beverage is dispensed, of which 58.3ml is foam the foamability is measured as [58.3/(138.3-58.3)]*100 = 72.9%. The foamability of the milk (and other liquid ingredients) is enhanced by the provision of the bowl 100 as can be seen in Figure 46b. The foamability of the milk dispensed with the bowl 100 present (line a) is greater than that of milk dispensed without the bowl present (line b). This is because the foamability of the milk is positively correlated to the concentration of the milk and as shown in Figure 35a the bowl 100 maintains a higher concentration of the milk a larger part of the operating cycle. It is also known that foamability of the milk is positively correlated to temperature of the aqueous medium as shown in Figure 46c. Thus the bowl 100 is advantageous since more of the milk remains in the cartridge until near the end of the operating cycle when the aqueous medium is at its hottest. This again improves foamability.

The cartridge of the fourth embodiment is also advantageous in dispensing liquid coffee products.

It has been found that the embodiments of beverage cartridge of the present invention advantageously provide an improved consistency of the brewed beverage when compared to prior art cartridges. Reference is made to Table 1 below which shows the results of brew yields for twenty samples each of cartridges A and B containing roast and ground coffee. Cartridge A is a beverage cartridge according to the first embodiment of the present invention. Cartridge B is a

prior art beverage cartridge as described in the applicant's document WO01/58786. The refractive index of the brewed beverage is measured in Brix units and converted to a percentage of soluble solids (%SS) using standard tables and formulae. In the examples below:

%SS = 0.7774 * (Brix value) + 0.0569.

% Yield = (%SS * Brew Volume (g))/
(100 * Coffee Weight (g))

Table 1

CARTRIDGE A

Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	105.6	6.5	1.58	1.29	20.88
2	104.24	6.5	1.64	1.33	21.36
3	100.95	6.5	1.67	1.36	21.05
4	102.23	6.5	1.71	1.39	21.80
5	100.49	6.5	1.73	1.40	21.67
6	107.54	6.5	1.59	1.29	21.39
7	102.70	6.5	1.67	1.36	21.41
8	97.77	6.5	1.86	1.50	22.61
9	97.82	6.5	1.7	1.38	20.75
10	97.83	6.5	1.67	1.36	20.40
11	97.6	6.5	1.78	1.44	21.63
12	106.64	6.5	1.61	1.31	21.47
13	99.26	6.5	1.54	1.25	19.15
14	97.29	6.5	1.59	1.29	19.35
15	101.54	6.5	1.51	1.23	19.23
16	104.23	6.5	1.61	1.31	20.98
17	97.5	6.5	1.73	1.40	21.03
18	100.83	6.5	1.68	1.36	21.14
19	101.67	6.5	1.67	1.36	21.20
20	101.32	6.5	1.68	1.36	21.24
				AVERAGE	20.99

CARTRIDGE B

Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	100.65	6.5	1.87	1.511	23.39
2	95.85	6.5	1.86	1.503	22.16
3	98.4	6.5	1.8	1.456	22.04
4	92.43	6.5	2.3	1.845	26.23
5	100.26	6.5	1.72	1.394	21.50
6	98.05	6.5	2.05	1.651	24.90
7	99.49	6.5	1.96	1.581	24.19
8	95.62	6.5	2.3	1.845	27.14
9	94.28	6.5	2.17	1.744	25.29
10	96.13	6.5	1.72	1.394	20.62
11	96.86	6.5	1.81	1.464	21.82
12	94.03	6.5	2.2	1.767	25.56
13	96.28	6.5	1.78	1.441	21.34
14	95.85	6.5	1.95	1.573	23.19
15	95.36	6.5	1.88	1.518	22.28
16	92.73	6.5	1.89	1.526	21.77
17	88	6.5	1.59	1.293	17.50
18	93.5	6.5	2.08	1.674	24.08
19	100.88	6.5	1.75	1.417	22.00
20	84.77	6.5	2.37	1.899	24.77
				AVERAGE	23.09

Performing a t-test statistical analysis on the above data gives the following results:

Table 2

t-Test: Two-Sample Assuming Equal Variances

	% Yield (Cartridge A)	*% Yield (Cartridge B)*
Mean	20.99	23.09
Variance	0.77	5.04
Observations	20	20
Pooled Variance	2.90	
Hypothesized Mean Difference	0	
df	38	
t Stat	-3.90	
P(T<=t) one-tail	0.000188	

t Critical one-tail	1.686	
P(T<=t) two-tail	0.000376	
t Critical two-tail	2.0244	
Standard Deviation	0.876	2.245

The analysis shows that the consistency of % yield, which equates to brew strength, for the cartridges of the present invention is significantly better (at a 95% confidence level) than the prior art cartridges, with a standard deviation of 0.88% compared to 2.24%. This means that beverages brewed with the cartridges of the present invention have a more repeatable and uniform strength. This is preferred by consumers who like their drinks to taste the same time after time and do not want arbitrary changes in brew strength.

The materials of the cartridges described above may be provided with a barrier coating to improve their resistance to oxygen and/or moisture and/or other contaminant ingress. The barrier coating may also improve the resistance to leakage of the beverage ingredients from within the cartridges and/or reduce the degree of leaching of extractibles from the cartridge materials which might adversely affect the beverage ingredients. The barrier coating may be of a material selected from the group of PET, Polyamide, EVOH, PVDC or a metallised material. The barrier coating may be applied by a number of mechanisms including but not limited to vapour deposition, vacuum deposition, plasma coating, co-extrusion, in-mould labelling and two/multi-stage moulding.

A beverage preparation machine 201 for use with the present invention for use with the above described beverage cartridges is shown in Figures 35 to 45. The beverage

preparation machine 201 generally comprises a housing 210 containing a water tank 220, a water heater 225, a water pump 230, an air compressor 235, a control processor, a user interface 240 and a cartridge head 250. The cartridge head 250 in turn generally comprises a cartridge holder 251 for holding, in use, the beverage cartridge 1, cartridge recognition means 252 and inlet and outlet piercers 253, 254 for forming, in use, the inlet 121 and the outlet 122 in the beverage cartridge 1.

The housing 210 contains and holds in position the other components of the machine 201. The housing 210 preferably made in whole or in part from a robust plastics material such as ABS. Alternatively, the housing 210 can be made in whole or in part from a metallic material such as stainless steel or aluminium. The housing 210 is preferably comprises a clam-shell design having a front half 211 and a rear half 212 which allow access during assembly for fitting of the machine 201 components and can afterwards be joined together to define an interior 213 of the housing 210. The rear half 212 provides a recess 214 for the attachment of the water tank 220. The housing 210 is formed with means, such as detents, abutments, bosses and threaded portions, for retaining the components of the machine 201 in position without the need for a separate chassis. This reduces the overall cost and weight of the machine 201. A base 215 of the housing 210 is preferably provided with feet for standing the machine thereon in a stable manner. Alternatively, the base 215 itself may have a shape forming a stable support.

The front half 211 of the housing 210 comprises a dispense station 270 where dispensation of the beverage

takes place. The dispense station 270 comprises a receptacle stand 271 having a hollow interior forming a drip tray 272. An upper surface 273 of the receptacle stand is provided with a grill 274 on which the receptacle is positioned. The drip tray 272 is removable from the housing 210 to ease emptying of the collected water. A recess 275 is formed in the front half of the housing 210 above the receptacle stand 271 to accommodate the dimensions of the receptacle.

The cartridge head 250 is located towards the top of the housing 210 above the receptacle stand as shown in Figures 35 and 36. Preferably, the height of the grill 274 relative to the cartridge head 250 can be adjusted to accommodate different sizes of receptacle. It is preferred that the receptacle is as close to the cartridge head 250 as possible, whilst still allowing the receptacle to be inserted and withdrawn from the dispense station 270, so as to minimise the height that the dispensed beverage has to descend before contacting the receptacle. This acts to minimise spraying and splashing of the beverage and minimise loss of entrained air bubbles where these are present. Preferably receptacles of between 70mm and 110 mm in height can be inserted between the grill 274 and cartridge head 250.

The machine user interface 240 is located on the front of the housing 210 and comprises a start/stop button 241, and a plurality of status indicators 243-246.

The status indicators 243-246 preferably include a light emitting diode (LED) 243 to indicate readiness of the machine 201, a LED 244 to indicate if an error has occurred in the machine 201 operation, and one or more LEDs 245-256

to indicate whether the machine 201 is operating in manual or automatic modes. The LEDs 243-246 may be controlled to illuminate at a constant intensity, to flash intermittently, or both depending on the status of the machine 201. The LEDs 243-246 may have a variety of colours including green, red and yellow.

The start/stop button 241 controls commencement of the operating cycle and is a manually operated push-button, switch or similar.

A volume adjustment control may be provided to allow a user of the machine 201 to manually adjust the volume of the delivered beverage without altering the other operating characteristics. Preferably the volume adjustment control allows an adjustment in volume of plus or minus 20%. The volume adjustment control may be a rotary knob, a linear slider, a digital readout with increment and decrement buttons, or similar. More typically, volume is controlled by a user operating the start/stop button 241.

A manual power switch (not shown) may be provided on the machine 201. Alternatively, power supply can be controlled simply by insertion or removal or the power supply plug from the mains power supply.

The water tank 220 is located to the rear of the housing 210 and is connected to the rear half 212 of the housing 210. The water tank 220 comprises a generally cylindrical body 221 which may be right circular or a frustum as desired for aesthetic reasons. The tank comprises an inlet for filling the tank with water which is closed off in use by a manually removable lid 222. An outlet is provided towards a lower end of the tank which communicates with the water pump 230. The water tank 220 may

be made from a transparent or translucent material to allow a consumer to view the quantity of water remaining in the tank. Alternatively, the water tank 220 may be made from an opaque material but have provided a viewing window therein. In addition, or in place of the above, the water tank 220 may be provided with a low level sensor which prevents operation of the water pump 230 and optionally triggers a warning indicator, such as an LED, when the water level in the tank descends to a preselected level. The water tank 220 preferably has an internal capacity of approximately 1.5 litres.

The water pump 230 is operatively connected between the water tank 220 and the water heater 225 as shown schematically in Figure 43 and is controlled by the control processor. The pump provides a maximum flow rate of 900 ml/min of water at a maximum pressure of 2.5 bar. Preferably, in normal use, the pressure will be limited to 2 bar. The flow rate of water through the machine 201 can be controlled by the control processor to be a percentage of the maximum flow rate of the pump by cycle chopping the electrical supply to the pump. Preferably the pump can be driven at any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100% of the maximum rated flow rate. The accuracy of the volume of water pumped is preferably + or - 5% leading to a + or - 5% accuracy in the final volume of the dispensed beverage. A suitable pump is the Evolution EP8 pump produced by Ulka S.r.l. (Pavia, Italy). A volumetric flow sensor (not shown) is preferably provided in the flow line either upstream or downstream of the water pump 230. Preferably, the volumetric flow sensor is a rotary sensor.

The water heater 225 is located in the interior of the housing 210. The heater 225 has a power rating of 1550 W and is able to heat water received from the water pump 230 from a starting temperature of approximately 20 °C to an operating temperature of around 85 °C in under 1 minute. Preferably the dwell time between the end of one operating cycle and the heater 225 being able to commence a subsequent operating cycle is less than 10 seconds. The heater maintains the selected temperature to within + or - 2 °C during the operating cycle. As discussed below, the water for the operating cycle may be delivered to the cartridge head 250 at 83 °C or 93 °C. The heater 225 is able to quickly adjust the delivery temperature to either 83 °C or 93 °C from a nominal water temperature of 85 °C. The heater 225 comprises an over-temperature cut-off which shuts off the heater if the temperature exceeds 98 °C. Water output from the heater 225 is fed to the cartridge head 250 and cartridge 1 by means of a three-way valve. If the pressure of the water flow is acceptable the water is passed to the cartridge 1. If the pressure is below or above predetermined limits then the water is diverted by means of the three-way valve into the drip tray recovery receptacle 270.

The air compressor 235 is operatively connected to the cartridge head 250 by means of a one-way valve and controlled by the control processor. The air compressor 235 provides a maximum flow rate of air of 500 ml/min at 1.0 bar. In use a working volume of 35 ml is pressurised to 2.0 bar. Preferably, the air compressor 235 can produce two flow rates: a fast (or maximum) flow rate and a slow flow rate.

The control processor of the beverage preparation machine 201 comprises a processing module and a memory. The

control processor is operatively connected to, and controls operation of, the water heater 225, water pump 230, air compressor 235 and user interface 240.

The memory of the control processor includes one or more variables for one or more operational parameters for the beverage preparation machine 201. In the illustrated embodiment the operational parameters are the temperature of the water passed through the beverage cartridge 1 during the operating stage, the speed of charging the beverage cartridge 1, the presence or otherwise of a soak step, the total dispensed volume of the beverage, the flow rate of the water during the discharge stage, and the flow rate and period of the purge stage.

The variables for the operational parameters are stored in the memory. The cartridge 1 comprises a code provided on or in the cartridge 1 representing the operational parameters required for optimal dispensation of the beverage in that cartridge 1. The code is in binary format and comprises a plurality of data bits corresponding to the variables stored in the control processor memory. Table 3 illustrates how 13 bits of data can be used to represent the necessary variables for the operational parameters described above.

Table 3

Bit	Parameter	Description
0 & 1	Water temperature	00 = cold 01 = warm 10 = 83 °C 11 = 93 °C
2 & 3	Cartridge charge	00 = fast charge with soak 01 = fast charge without soak

		10 = slow charge with soak 11 = slow charge without soak
4, 5, 6 & 7	Beverage volume	0000 = 50 ml 0001 = 60 ml 0010 = 70 ml 0011 = 80 ml 0100 = 90 ml 0101 = 100 ml 0110 = 110 ml 0111 = 130 ml 1000 = 150 ml 1001 = 170 ml 1010 = 190 ml 1011 = 210 ml 1100 = 230 ml 1101 = 250 ml 1110 = 275 ml 1111 = 300 ml
8, 9 & 10	Flow rate	000 = 30% 001 = 40% 010 = 50% 011 = 60% 100 = 70% 101 = 80% 110 = 90% 111 = 100%
11 &12	Purge	00 = slow flow/short period 01 = slow flow/long period 10 = fast flow/short period 11 = fast flow/long period

The code on or in the cartridge 1 will normally comprises one or more extra data bits for error checking. In one example a 16 bit code is provided. For example, using the variables listed in Table 3, a cartridge 1 bearing the

code "1000100011110" would have the following operational parameters:

10	Water temperature of 83 °C
00	Fast charge with soak
1000	Dispensed drink volume of 150ml
111	Flow rate equals 100%
10	Fast air flow purge/short period.

Thus, unlike in previous beverage preparation machines, the memory of the control processor does not store operational instructions for beverage cartridges based on the cartridge type, i.e. instructions for a coffee cartridge, instructions for a chocolate cartridge, instructions for a tea cartridge etc. Instead the memory of the control processor stores variables for adjusting the individual operational parameters of the operating cycle. This has a number of advantages. Firstly, a greater degree of control of the dispensation cycle can be exercised. For example, slightly different operational parameters can be used for different grades or blends of coffee rather than using the same parameters for all types of coffee. Prior coding solutions relying on storing instructions by cartridge type rather than by individual parameters are unsuited to such subtle differences in operating cycles for similar beverage types because they quickly consume the available storage space in the coding medium and control processor. Secondly, the coding method of the present invention allows for new beverage cartridge types to be used in pre-existing beverage preparation machines even where the operational parameters for the operating cycle for the new beverage cartridge 1 are only decided upon after sale of the beverage preparation machine 201. This is because the

control processor of the beverage preparation machine 201 does not need to recognise that the beverage is of a new type. Rather the operational parameters of the operating cycle are set without direct reference to the beverage type. Hence the coding method of the present invention provides excellent backward compatibility of the beverage preparation machines for new beverage types. In contrast, with prior machines, the manufacturer is restricted to dispensing a new beverage type using one of the pre-existing dispensation cycles as determined by the in-market machines.

The cartridge head 250 is shown in Figures 39 to 42. The cartridge holder 251 of the cartridge head 250 comprises a fixed lower part 255, a rotatable upper part 256 and a pivotable cartridge mount 257 positioned inbetween the fixed lower part 255 and the rotatable upper part 256. The upper part 256, lower part 255 and cartridge mount 257 are rotated about a common hinge axis 258. Figures 39 to 42 show the cartridge holder 251 with some components of the machine 201 omitted for clarity.

The rotatable upper part 256 and pivotable cartridge mount 257 are moved relative to the fixed lower part 255 by means of a clamping mechanism 280. The clamping mechanism 280 comprises a clamping lever having first and second members or parts 281 and 282. The first part 281 of the clamping lever comprises a U-shaped arm which is pivotably mounted to the upper part 256 at two first pivot points 283, one on each side of the cartridge holder 251.

The second part of the clamping lever comprises two over-centre arms 282, one on each side of the cartridge holder 251 which are each pivotably mounted to the upper part 256 at a second pivot point 285 located on the hinge

axis 258 coupling the upper part 256 to the fixed lower part 255. Each over-centre arm 282 is a reciprocal member comprising a cylinder 282a, a stem 282b and a resilient sleeve 282c. The cylinder 282a has an internal bore and is rotatably mounted at one end at the hinge axis 258. A first end of the stem 282b is slidingly received in the bore of the cylinder 282a. The opposite end of the stem 282b is rotatably mounted to the U-shaped arm 281 at a third pivot point 286. The third pivot points 286 are unconnected to, and freely moveable relative to, the upper part 256 and lower part 255. The resilient sleeve 282c is mounted externally on the stem 282b and extends, in use, between abutment surfaces on the cylinder 282a and stem 282b. The resilient sleeve 282c accommodates shortening of the over-centre arm 282 but biases the over-centre arm 282 into an extended configuration. Movement of the third pivot points 286 towards and away from the hinge axis 258 is thus possible by relative movement of the stems 282b in the cylinders 282a. The resilient sleeves 282c are preferably formed from silicone.

The U-shaped arm 281 extends around the front of the cartridge holder 251 and comprises two downwardly dependant hook members 287, one on each side of the cartridge holder 251, each comprising a cam surface 288 facing the hinge axis 258. The fixed lower part 255 of the cartridge holder 251 is provided with two bosses 259, or detents, located one on each side of the lower part 255 at or near a front edge 260 thereof aligned generally with the hook members 287.

As shown in Figure 39, the U-shaped arm 281 may be formed from a one piece plastics moulding comprising an

ergonomic hand grip and the hook members 287 integral to the arm.

The cartridge mount 257 is rotatably mounted between the upper and lower parts 255, 256 of the cartridge holder 251. The mount 257 is provided with a substantially circular recess 290 which receives in use the beverage cartridge 1. The recess 290 includes an irregularity 291 for accommodating the handle portion 24 of the beverage cartridge 1 which also acts to prevent rotation of the beverage cartridge 1 in the cartridge holder 251. The cartridge mount 257 is sprung relative to the fixed lower part 255 such that in the open position, as shown in Figure 41, the cartridge mount 257 is biased out of contact with the fixed lower part 255 so that the cartridge mount 257 is moved out of contact with the outlet and inlet piercer members 254, 253. The cartridge mount 257 is provided with an aperture 292 for receiving therethrough the inlet and outlet piercers 253, 254 and a head 300 of the cartridge recognition means 252 when the cartridge mount 257 is moved into the closed position.

The upper part 255 comprises a generally circular body 310 housing a circular viewing window 312 through which a consumer can view the beverage cartridge 1 during an operating cycle and also visually confirm whether a cartridge 1 is loaded in the machine 201. The viewing window 312 is cup-shaped having a downwardly directed rim 311 which engages and grips the flange 35 of the beverage cartridge 1 against the lower part 256 when the cartridge holder 251 is closed. At the same time the window 312 contacts the closed top 11 of the cartridge 1. A wave spring (not shown) is positioned between the viewing window 312 and the circular

body 310 to enable the viewing window 312 to move axially relative to the circular body 310 by a small degree. The pressure exerted by the rim 311 on the flange 35 and by the window 312 on the closed top 11 ensures a fluid tight seal between the cartridge 1 and the cartridge holder 251.

The lower part 255 comprises the inlet and outlet piercers 253, 254 and the head 300 of the cartridge recognition means 252. The inlet piercer 253 comprises a hollow needle-like tube 260 having a sharpened end 261 for perforating the laminate 5 of the beverage cartridge 1 in use. The inlet piercer 253 is in fluid communication with a water conduit 262 as shown in Figure 42 which passes through the lower part 255 and is connected to an outlet conduit 263 of the water heater 225. The outlet piercer 254 is similar in type to the outlet piercer described in the applicant's European patents EP 0 389 141 and EP 0 334 572 and comprises an open ended cylinder 264 of circular or D-shaped cross-section having dimensions larger than the discharge spout 43. An arcuate portion 265 of the upper end of the outlet piercer 254 is serrated to pierce and eventually cut the laminate of the beverage cartridge 1. The remainder of the upper end is cut back longitudinally of the cylinder at least to the base of the teeth 266 of the serrated portion to fold or pull the cut laminate 5 away from the outlet aperture before the beverage is dispensed therethrough. The outlet piercer 254 pierces the laminate 5 externally of the discharge spout 43 and when the cartridge mount 257 is in the closed position, rests in the annulus between the discharge spout 43 and the outer wall 42 of the discharge funnel 40. The outlet piercer 254 folds back the cut laminate 105 into the annulus. Thereby both the outlet

piercer 254 and the cut laminate 105 are held out of the way of the discharged beverage.

The outlet piercer 254 is surrounded by a ledge 254a which is raised relative to its surroundings by 0.5mm.

Advantageously, the outlet piercer 254 is removable from the lower part 255 to enable it to be thoroughly cleaned, for example, in a dishwasher. The removable outlet piercer 254 is received in a recess 267 in the lower part 255 where it is seated. The inlet piercer 253 and/or the outlet piercer 254 may be made of a metal, such as stainless steel, or from a plastics material. Advantageously, the use of plastic cutting elements is enabled by use of a laminate 5 which is able to be punctured and cut by a non-metallic material. Consequently, the piercers 253, 254 can be made less sharp which lowers the risk of injury to the consumer. In addition, plastic piercing elements are not prone to rust. Preferably, the inlet piercer 253 and the outlet piercer 24 are formed as a single, integral unit which is removable from the lower part 255.

In use, the upper part 256 of the cartridge holder 251 is movable from an open position in which it is orientated vertically or towards the vertical as shown in Figure 36, to a closed position in which it is orientated substantially horizontally and in interengagement with the fixed lower part 255 and cartridge mount 257. The upper part 256 is moved from the open to the closed positions by operation of the clamping lever. To close the upper part 256 a user takes hold of the clamping lever by the U-shaped arm 281 and pulls downwards. Consequently, the upper part 256 rotates which first brings the rim 311 of the viewing window 312 into contact with the flange 35 of the beverage cartridge 1 in

the cartridge mount 257 and the window 312 itself into contact with the closed top 11 of the cartridge 1. Continued rotation of the upper part 256 rotates the upper part 256 and cartridge mount 257 down into contact with the lower part 255. Further rotation of the U-shaped arm 281 causes the U-shaped arm 281 to rotate relative to the upper part 256 and the lower part 255 resulting in the hook members 287 of the upper part 256 engaging the bosses 259 of the lower part 255 with the cam surface 288 riding over the bosses 259. During this last stage of rotation the cartridge 1 is compressed between the cartridge mount 257 and the viewing window 312. As a result, the viewing window 312 is moved axially relative to the circular body 310 of the upper part 256 against the bias of the wave spring. This movement allows for a take up of tolerances in the beverage cartridge 1 and beverage preparation machine and ensures that the amount of compressive force applied to the cartridge is kept within an acceptable range. The clamping force of the mechanism as moderated by the action of the wave spring ensures a clamping pressure on the cartridge of between 130 and 280N. Preferably the force is approximately 200N. A force less than about 130N does not provide an adequate seal, whilst a force greater than about 280N leads to plastic failure of the components of the cartridge 1. During closure of the cartridge head the laminate 5 of the cartridge 1 is tensioned as it is brought into contact with the ledge 254a surrounding the outlet piercer 254 which causes the laminate 5 to flex out of plane as the distal end of the outer tube 42 of the cylindrical funnel is moved upwardly by 0.5mm relative to the flange 35. This movement also ensures that the great majority of the compressive

force applied to the cartridge acts through the central region of the cartridge 1 through the load-bearing inner member 3. In the closed position the cartridge 1 is thus clamped around the flange 35 by means of the rim 311 of the viewing window 312 and firmly clamped between the closed top 11 of the cartridge and the outer tube 42 of the inner member 3 by contact with the viewing window 312 and the ledge 254a. These clamping forces help prevent failure of the cartridge 1 during pressurisation and also ensure that the inner member 3 and outer member 2 are fully seated relative to one another and thus that all internal passageways and apertures remain at their intended dimensions even during internal pressurisation.

An imaginary datum line can be drawn between the first and second pivot points 283, 285 of the cartridge holder 251. As can be seen in Figure 41, in the open position the third pivot points 286 are located on the side of the datum line nearest the fixed lower part 255. As the upper part 256 reaches the closed position, the third pivot points 286 of the clamping lever pass through the datum line joining the first and second pivot points 283, 285 to the opposite side of the line, furthest from the fixed lower part 255. Consequently, the U-shaped arm 281 'snaps through' from a first stable position to a second stable position. The snap through action is accommodated by shortening of the over-centre arms 282 and consequential compression of the resilient sleeves 282c. Once the third pivot points 286 are past the imaginary datum line then recovery of the resilient sleeves 282c acts to continue the motion of the third pivot points 286 away from the imaginary datum line. The clamping lever thus has a bi-stable operation in that the lever is

stable in the open or closed positions but unstable at the point when the third pivot points 286 lie on the imaginary datum line joining the first and second pivot points 283, 285. Thus, the snap-through action of the clamping lever provides a positive closure mechanism which leads to a definite closure action wherein in the final stages of the clamping lever's rotation, the snap-through action of the U-shaped arm 281 and second arms 284 forces the hook members 287 firmly into engagement with the bosses 259. In addition, the resilient sleeves 282c provide a resistance to re-opening of the upper part 256 since a minimum force is required to compress the sleeves 282c sufficiently to move the third pivot points 286 back into line with the datum line joining the first and second pivot points 283, 285. Advantageously, the interengagement of the hook members 287 and the bosses 259 prevents separation of the upper and lower parts other than by rotation of the clamping lever. This is useful in preventing opening of the cartridge head 250 during operation when the cartridge head 250 is subject to internal pressurisation.

The purpose of the cartridge recognition means 252 is to allow the machine 201 to recognise the type of beverage cartridge 1 that has been inserted and to adjust one or more operational parameters accordingly. In a typical embodiment, the cartridge recognition means 252 comprises an optical barcode reader which reads a printed barcode 320 provided on the laminate 5 of the beverage cartridge 1 as shown in Figure 45. The barcode 320 is formed from a plurality of bars of contrasting colour. Preferably the bars are black on a white background to maximise the contrast. The barcode 320 is not required to conform to a published standard but a

standard format for barcodes, such as EAN-13, UPC-A, or Interleaf 2 of 5 may be used. The optical barcode reader comprises one or more LEDs 321 to illuminate the barcode 320, a focusing lens 322 to acquire an image of the barcode, a charge coupled device (CCD) 323 for producing an electrical signal representative of the acquired image and support circuitry for the LEDs and CCD. The space in the lower part for accommodating the barcode reader is limited. A mirror or mirrors 324 may be used to reflect the light from the LEDs 321 to a focussing lens which is not located in the lower part 255. Schematic arrangements are shown in Figures 44a and 44b. The lower part 255 comprises an aperture 326 which is the same size as the barcode 320 on the beverage cartridge 1. In use the electrical signals produced are decoded by signal processing software and the results forwarded to the control processor. The software can recognise whether the read of the barcode contained errors. The barcode 320 may be rescanned a number of times before an error message is presented to the consumer. If the machine 201 is unable to read the barcode the consumer is able to use the beverage cartridge 1 to dispense a beverage using a manual mode of operation.

The cartridge head 250 also includes a cartridge sensor for detecting whether a cartridge is present in the cartridge holder 251.

The cartridge head 250 also includes a lock sensor which detects whether the cartridge holder 251 is properly closed. Preferably the lock sensor comprises a micro-switch which is triggered when the cartridge holder 251 is closed and locked. Preferably the cartridge sensor and lock sensor are connected in series such that the output of both sensors

must be satisfactory, i.e. cartridge present and mechanism locked, before the operating cycle can be commenced.

Operation of the machine 201 comprises insertion of a beverage cartridge 1 into the cartridge head 250, carrying out an operating cycle in which the beverage is dispensed and removal of the cartridge 1 from the machine.

The operational behaviour of the machine 201 is determined by software embedded in the control processor. Operation of the machine can be described in terms of 'States', wherein the machine 201 will normally exist in a particular State until an event occurs to change the State, a step called a State transition.

Table 4 shows a State Transition Table which illustrates the States and State transitions for one embodiment of the beverage preparation machine 201.

Table 4

State	State Description	Temperature	Lock Sensor	Cartridge Sensor variable (OK, NOK, CLR)	Water level indicator	Water flow rate	StartStop
1	WATER HEATING	> or = 85 goto 2	Closed: [Cartridge Sensor= readpod()] Open: [Cartridge Sensor =CLR]	N/A	Low goto 10	N/A	No Action
2	WATER READY If timeout 10mins goto 9	< 85 goto 2	Closed: [Cartridge Sensor = readpod()] Open: [Cartridge Sensor =CLR]	Cartridge Sensor =OK goto 4 Cartridge Sensor =NOK goto 3	Low goto 10	N/A	No Action
3	READY TO BREW AUTO	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 2	N/A	Low goto 10	N/A	Goto 5
4	BREW IN PROGRESS AUTO [Run Brew State] goto 7	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Water off goto 6
5	BREW SUSPENDED	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	N/A	Goto 5
6	READY TO BREW MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 2	N/A	Low goto 10	N/A	[Water On] Goto 8

7	BREW IN PROGRESS MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Release d goto 7
8	PURGE [Water off; air on, timeout n sec then goto 9]	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	No action	N/A	No Action
9	BREW DONE [air purge] [Cartridge Sensor =CLR] if timeout 10s goto 2	N/A [temperature controlled in background]	Open goto 2	N/A	Low goto 10	N/A	Goto 9
10	STANDBY	N/A [heater off]	Open: [Cartridge Sensor =CLR] goto 1 Closed: [Cartridge Sensor = readpod()]	N/A	Low goto 10	N/A	Goto 1
11	ERROR Power off/on required to clear	N/A	N/A	N/A	N/A	N/A	N/A
12	WATER LOW				Low goto 10		

The following example illustrates an operating cycle to exemplify the use of the State Transitions by the control processor.

It is assumed that the machine 201 is initially switched off and with no cartridge 1 inserted in the cartridge head 250. When the machine 201 is switched on the control processor is in State 1. The water heater 225 is switched on. Once the temperature reaches 85 °C the control

processor transits to State 2. If at any time during State 1 or 2 the cartridge holder 251 is closed the lock sensor will be triggered to send a signal to the control processor indicating that the cartridge holder 251 is properly closed. The control processor then interrogates the cartridge sensor by sending a 'readpod' instruction. The cartridge sensor returns a signal to the control processor indicating whether a cartridge is in place in the cartridge holder 251. If no cartridge is present the control processor transits to State 3 where it remains in a readiness state until the cartridge holder 251 is reopened at which point the control processor transits back to State 2. If a cartridge is present in State 2 then the control processor transits to State 4 and operation is commenced automatically. During States 4 to 9 the water temperature is controlled in the background to remain within the required tolerance range of the desired temperature as set by the operational parameters set by the barcode on the beverage cartridge 1. Once the discharge stage of dispense is completed an air purge is commenced in State 8. Once the air purge is completed the operating cycle is completed and the machine enters to standby mode in State 10. If, during operation, an error occurs then the processor transits to State 11. If a low water level is detected then the processor transits to State 12.

To insert the cartridge 1 the cartridge holder 251 is opened as described above to expose the cartridge mount 257. The cartridge 1 is then placed on the cartridge mount 257 received within the recess 290 such that the handle 24 of the cartridge is located in the irregularity 291. The optical or magnetic barcode 320 of the cartridge 1 is orientated directly above the aperture 326 in the cartridge

mount 257. The cartridge holder 251 is then closed by operation of the clamping lever as described above. During closure the inlet and outlet piercers 253, 254 pierce the laminate 5 of the cartridge 1 to form the cartridge inlet 121 and outlet 122. As described above the laminate 5 cut by the outlet piercer 254 is folded up into the annulus surrounding the discharge spout 43. When closed the cartridge holder 251 grips the cartridge 1 around the rim 35 between the cartridge mount 257 and the upper part 256 and between the window 311 and the top 11 of the cartridge 1 to form a fluid tight seal of sufficient integrity to withstand the pressures developed during the operating cycle.

To commence the operating cycle the consumer operates the start/stop button 241.

The operating cycle comprises the steps of cartridge recognition and the discharge cycle.

Cartridge recognition is performed by the optical cartridge recognition means 252 as described above assuming that the outputs from the cartridge sensor and lock sensor are satisfactory. Once the barcode 320 has been decoded the operational parameters of the machine 201 are adjusted by the control processor. The discharge cycle is then automatically commenced.

The discharge cycle has four main stages, not all of which are used for all beverage types:

(i) Pre-wet

(ii) Pause

(iii) Brew/Mixing

(iv) Purge

In the pre-wet stage the cartridge 1 is charged with water from the water storage tank 220 by means of the water

pump 230. The charging with water causes the beverage ingredients 200 in the filtration chamber 130 to be wetted. The charging may take place at a "fast" flow rate of 600 ml/min or a "slow" flow rate of 325 ml/min. The slow charging rate is particularly useful for cartridges containing viscous liquid beverage ingredients where the ingredients require some dilution before they are able to be pumped at a higher volume flow rate. The volume of water injected into the cartridge 1 is selected to ensure that water or beverage does not drip out of the cartridge outlet 122 during this stage.

The pause stage allows the beverage ingredients 200 to soak in the water injected during the pre-wet stage for a predetermined period of time. Both the pre-wetting and soaking stages are known to increase the yield of the extractibles from the beverage ingredients 200 and to improve the end flavour of the beverage. Pre-wetting and soaking are particularly used where the beverage ingredients are roast and ground coffee.

In the brew/mixing stage water is passed through the cartridge 1 in order to produce the beverage from the beverage ingredients 200. The temperature of the water is determined by the control processor which sends instructions to the water heater 225 to heat the water passing from the water tank 220 to the cartridge head 250. Water enters the lower part 255 of the cartridge holder 251 through the conduit 262 via the inlet valve and the inlet piercer 253 into the inlet chamber 126 of the beverage cartridge 1. Brewing and/or mixing and subsequent dispensing of the beverage from the beverage cartridge 1 is as described above with reference to the versions of the beverage cartridge 1.

The air purge comprises the blowing of pressurised air through the beverage preparation machine and the beverage cartridge 1 to ensure that all beverage is dispensed and that the flow path is cleared ready for dispensing another beverage. The air purge does not commence immediately on cessation of the brew/mixing stage to allow for the majority of the fluid to clear the flow path. This prevents an unacceptable spike in internal pressure on commencement of the air purge.

In normal operation a user manually stops the machine 201 by operating the start/stop button 241.

Once the operating cycle has been completed the consumer removes the cartridge 1 by opening the cartridge holder 251 and manually removing and disposing of the cartridge. Alternatively, the machine 201 may be provided with an automatic ejection mechanism for removing the cartridge automatically on opening the cartridge holder 251.

As described above, two or more of the beverage cartridges are used in combination according to the present invention to produce a wide variety of beverages including incorporating the advantage of dispensing a liquid dairy-based beverage portion from a cartridge of the same overall size as the cartridges used to prepare the remainder of the beverage. Thus a single beverage preparation machine may be used with all types of cartridges since the interface between the cartridges and the machine are the same irrespective of the beverage ingredients contained in the cartridges.

The delivery times for beverages using the machine 201 and cartridges 1 are typically between 10 and 120 seconds, preferably 30 to 40 seconds for roast and ground coffee,

between 5 and 120 seconds, preferably 10 to 20 seconds for chocolate and between 5 and 120 seconds, preferably 10 to 20 seconds for milk.

The machine 201 may also advantageously comprise a memory in operative communication with the control processor that stores information on the type of beverage dispensed by a user. The operating cycle of the machine 201 may then be adjusted for the next cartridge 1. This is especially advantageous where two or more beverage cartridges 1 are used sequentially to form a beverage. For example a coffee cartridge may be dispensed followed by a milk cartridge to form a cappuccino beverage. Alternatively a chocolate cartridge could be used followed by a milk cartridge to produce a creamy hot chocolate beverage. By using a memory that stores information on the first beverage dispensed, the manner of dispensing the second cartridge, say a milk cartridge, may be altered to achieve an optimum beverage. In the above example the milk dispensed for hot chocolate may, typically, be diluted less than the milk added to the coffee. In addition, the milk dispensed for chocolate may be dispensed at a slower flow rate to lessen the degree of foaming of the beverage. Many combinations of cartridges are possible and operating parameters as will be obvious to the skilled person. In addition, the memory may be used to allow the machine 201 to 'predict' the type of beverage that a user will next want to dispense. For example, if a user predominantly drinks one beverage type then the machine can instruct the water heater to remain at the optimum temperature for that beverage type.

Claims:

1. A cartridge (1) containing one or more liquid beverage ingredients (200) and being formed from substantially air- and water-impermeable materials, the cartridge comprising an inlet (121) for the introduction of an aqueous medium into the cartridge, a compartment (134) containing the one or more liquid beverage ingredients and an outlet (122) for a beverage produced by dilution of the one or more liquid beverage ingredients by the aqueous medium, characterised in that the compartment includes means for controlling dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

2. A cartridge (1) as claimed in claim 1 wherein the means for controlling dilution delays dilution of at least a proportion of the one or more liquid beverage ingredients on introduction of the aqueous medium into the compartment.

3. A cartridge (1) as claimed in claim 1 or claim 2 wherein, in use, an aqueous medium flow path is established from the inlet to the outlet, the means for delaying dilution comprising a partition (100) which hinders entry of at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path.

4. A cartridge (1) as claimed in claim 3 wherein the partition (100) comprises one or more apertures (103) for controllably releasing the at least a proportion of the one or more liquid beverage ingredients into the aqueous medium flow path.

5. A cartridge (1) as claimed in claim 4 wherein four apertures (103) are provided.

6. A cartridge (1) as claimed in any of claims 3 to 5 wherein the partition comprises a cup-shaped member having an open mouth (104) directed away from the aqueous medium flow path.

7. A cartridge (1) as claimed in claim 6 wherein the cup-shaped member is annular.

8. A cartridge (1) as claimed in claim 6 or claim 7 wherein one or more apertures (103) are provided at or near a base of the cup-shaped member.

9. A cartridge (1) as claimed in claim 8 wherein the at least a proportion of the liquid beverage ingredients in the cup-shaped member (100) drain by gravity through the one or more apertures (103) in use.

10. A cartridge (1) as claimed in claim 9 wherein the cup-shaped member is spaced from a bottom of the cartridge, such that the aqueous medium flow path passes between the cup-shaped member and the bottom of the cartridge.

11. A cartridge (1) as claimed in claim 10 wherein the at least a proportion of the liquid beverage ingredients in the cup-shaped member (100) drain by gravity through the one or more apertures (103) in use vertically downwards into the aqueous medium flow path.

12. A cartridge (1) as claimed in any of claims 6 to 11 comprising an inner member (3) and an outer member (2), wherein the inner member comprises the cup-shaped member.

13. A cartridge as claimed in any of claims 3 to 12 further comprising means for producing a jet of the beverage, wherein said means for producing the jet of the beverage comprises an aperture (128) in the aqueous medium flow path.

14. A cartridge as claimed in claim 13 as dependent on claim 11 wherein the aperture (128) is delimited by an interface between the inner member and the outer member.

15. A cartridge as claimed in claim 13 or claim 14 further comprising at least one inlet (71) for air and means for generating a pressure reduction of the jet of beverage, whereby, in use, air from the at least one air inlet is incorporated into the beverage as a plurality of small bubbles.

16. A cartridge (1) as claimed in claim 15 wherein the at least one air inlet (71) is provided in the inner member downstream of the aperture (128).

17. A cartridge (1) as claimed in claim 16 wherein the at least one air inlet (71) and means for producing a pressure reduction in the jet of beverage produces a foaming of the one or more liquid beverage ingredients of greater than 40%.

18. A cartridge (1) as claimed in claim 17 wherein the foaming is greater than 70%.

19. A cartridge (1) as claimed in any preceding claim wherein the cartridge is disc-shaped.

20. A cartridge (1) as claimed in any preceding claim wherein the outer member and/or inner member are formed from polypropylene.

21. A cartridge (1) as claimed in any preceding claim wherein the outer member and/or inner member is formed by injection moulding.

22. A cartridge (1) as claimed in any preceding claim wherein the liquid beverage ingredient is a concentrated liquid milk composition.

23. A cartridge (1) as claimed in claim 22 wherein the concentrated liquid milk contains between 25 and 40% total solids.

24. A cartridge (1) as claimed in claim 23 wherein the concentrated liquid milk contains 30% total solids.

25. A cartridge (1) as claimed in any of claims 22 to 24 wherein the concentrated liquid milk contains between 0.1 and 12% fat.

26. A cartridge (1) as claimed in any of claims 1 to 21 wherein the one or more liquid beverage ingredients are selected from the group of cocoa solids, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

27. A method of dispensing a beverage from a cartridge (1) containing one or more liquid beverage ingredients (200) during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid ingredients as dispensed has a concentration at the start of the operating cycle of between 30 and 70% total solids and a concentration at the end of the operating cycle of between 1 and 15% total solids.

28. A method as claimed in claim 27 wherein the concentration at the start of the operating cycle is between 30 and 35% total solids.

29. A method as claimed in claim 28 wherein the concentration at the end of the operating cycle is approximately 10% total solids.

30. A method as claimed in claim 28 or claim 29 wherein the liquid ingredient is concentrated milk.

31. A method as claimed in claim 27 wherein the concentration at the start of the operating cycle is between 60 and 70% total solids.

32. A method as claimed in claim 31 wherein the concentration at the end of the operating cycle is between 12 and 15% total solids.

33. A method as claimed in claim 31 or claim 32 wherein the liquid ingredient contains cocoa solids.

34. A method as claimed in claim 27 wherein the concentration at the start of the operating cycle is between 40 and 70% total solids.

35. A method as claimed in claim 34 wherein the concentration at the end of the operating cycle is between 1 and 2% total solids.

36. A method as claimed in claim 34 or claim 35 wherein the liquid ingredient is contains coffee.

37. A method of dispensing a beverage from a cartridge (1) containing one or more liquid beverage ingredients

(200) during an operating cycle, comprising the steps of passing an aqueous medium through the cartridge to form a beverage by dilution of said one or more beverage ingredients, and dispensing the beverage into a receptacle, wherein the one or more liquid beverage ingredients is foamed on dispense to a ratio of between 20 and 150%.

38. A method as claimed in claim 37 wherein the one or more liquid beverage ingredients are foamed to a ratio between 70 and 100%.

39. A method as claimed in claim 37 or claim 38 wherein the one or more liquid beverage ingredients includes one or more of concentrated milk, coffee and cocoa solids.

40. A beverage as produced by the method of any of claims 27 to 39.

41. A method of manufacturing a cartridge (1) for dispensation of a beverage comprising the steps of:

a. manufacturing a plurality of outer members (2) comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;

b. manufacturing a plurality of inner members (3) comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;

c. storing said plurality of outer members and said inner members;

d. selecting one of the first type of outer member or the second type of outer member from the plurality of outer members;
e. selecting one of the first type of inner member or the second type of inner member from the plurality of inner members;
f. conjoining the selected inner member to the selected outer member such the inner member is within the outer member;
g. filling the outer member with one or more beverage ingredients (200) selected from a plurality of beverage ingredients; and
h. sealing the outer member with a lid (5) to form the cartridge.

42. A method as claimed in claim 41 further comprising in step b. of joining a filter member (4) to the first type and/or second type of inner member (3).

43. A method as claimed in claim 41 or claim 42 wherein the first type of outer member (2) is suitable for containing roast and ground beverage ingredients or the like.

44. A method as claimed in any of claims 41 to 43 wherein the second type of outer member (2) is suitable for containing soluble or liquid beverage ingredients or the like.

45. A method as claimed in any of claims 41 to 44 wherein the first type of inner member (3) is suitable for

filtering roast and ground beverage ingredients and the like.

46. A method as claimed in any of claims 41 to 45 wherein the second type of inner member (3) is suitable for filtering roast and ground beverage ingredients and the like and for entraining a plurality of air bubbles in the dispensed beverage.

47. A method as claimed in claim 45 or claim 46 wherein the first and second type of inner member (3) comprise a frame (41) having a filter (4) disposed thereupon, and wherein a peripheral rim (51) of the frame is conjoined to the selected type of outer member by welding.

48. A method as claimed in claim 47 wherein the second type of inner member (3) comprises means (70) for producing a jet of the beverage, which means comprises an aperture in a beverage flow path between an inlet and an outlet of the cartridge.

49. A method as claimed in any of claims 41 to 48 further comprising manufacturing and storing a third type of inner member (3).

50. A method as claimed in claim 49 wherein the third type of inner member is suitable for dispensing soluble beverage ingredients and the like.

51. A method as claimed in any of claims 41 to 50 further comprising manufacturing and storing a fourth type of inner member (3).

52. A method as claimed in claim 51 wherein the fourth type of inner member (3) is suitable for dispensing a liquid beverage ingredients and the like.

53. A method as claimed in any of claims 49 to 52 wherein the third or fourth type of inner member (3) comprises a skirt (80) surrounding an outlet, the skirt comprising an upper extension (81) having an upper rim (91) which engages, on assembly of the cartridge, a co-operating formation (19) of the selected type of outer member (2) to form a snap-fit arrangement for conjoining the third or fourth type of inner member to the selected type of outer member.

54. A cartridge system for dispensing a plurality of beverages comprising:

a. a plurality of outer members (3) comprising at least a first type of outer member and a second type of outer member having differing shape or configurations;
b. a plurality of inner members (2) comprising at least a first type of inner member and a second type of inner member having differing shape or configurations;
c. a plurality of beverage ingredients (200); and
d. at least one lid (5) to seal the cartridge;

wherein each cartridge comprises an outer member, an inner member, one or more beverage ingredients and a lid.

55. A cartridge system as claimed in claim 54 wherein each cartridge further comprises a filter (4).

56. A cartridge system as claimed in claim 54 or claim 55 wherein the first type of outer member (3) is suitable for containing roast and ground beverage ingredients or the like.

57. A cartridge system as claimed in any of claims 54 to 56 wherein the second type of outer member (3) is suitable for containing soluble or liquid beverage ingredients or the like.

58. A cartridge system as claimed in any of claims 54 to 57 wherein the first type of inner member (3) is suitable for filtering roast and ground beverage ingredients and the like.

59. A cartridge system as claimed in any of claims 54 to 58 wherein the second type of inner member (3) is suitable for filtering roast and ground beverage ingredients and the like and comprises means entraining a plurality of air bubbles in the dispensed beverage.

60. A cartridge system as claimed in any of claims 54 to 59 wherein the first and second type of inner member (3) comprise a frame (41) having a filter (4) disposed

thereupon, and wherein a peripheral rim (51) of the frame is conjoined to the selected type of outer member by welding.

61. A cartridge system as claimed in claim 59 or claim 60 wherein the second type of inner member (3) comprises means (70) for producing a jet of the beverage, which means comprises an aperture in a beverage flow path between an inlet and an outlet of the cartridge.

62. A cartridge system as claimed in any of claims 54 to 61 further comprising a third type of inner member (3).

63. A cartridge system as claimed in claim 62 wherein the third type of inner member (3) is suitable for dispensing soluble beverage ingredients and the like.

64. A cartridge system as claimed in any of claims 54 to 63 further comprising a fourth type of inner member (3).

65. A cartridge system as claimed in claim 64 wherein the fourth type of inner member (3) is suitable for dispensing a liquid beverage ingredients and the like.

66. A cartridge system as claimed in any of claims 62 to 65 wherein the third or fourth type of inner member (3) comprises a skirt (80) surrounding an outlet, the skirt comprising an upper extension (81) having an upper rim (91) which engages, on assembly of the cartridge, a co-operating formation (19) of the selected type of outer member to form a snap-fit arrangement for conjoining

the third or fourth type of inner member to the selected type of outer member.

67. A method of preparing a beverage comprising the steps of:

a) inserting a first beverage cartridge (1) containing one or more beverage ingredients (200) into a beverage preparation machine (201);

b) operating said beverage preparation machine to pass an aqueous medium through the first beverage cartridge to dispense a first portion of said beverage into a receptacle;

c) inserting a second beverage cartridge (1) containing one or more beverage ingredients (200) into the beverage preparation machine; and

d) operating the beverage preparation machine to pass an aqueous medium through the second beverage cartridge to dispense a second portion of said beverage into the receptacle;

characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

68. A method as claimed in claim 67 wherein one of the first or second beverage cartridges (1) contains an ingredient for forming a brewed portion of a beverage.

69. A method as claimed in claim 67 or claim 68 further comprising the step of removing the first beverage

cartridge (1) before inserting the second beverage cartridge (1).

70. A method as claimed in any of claims 67 to 69 wherein the beverage ingredient in the first or second beverage cartridge is roast and ground coffee.

71. A method as claimed in any of claims 67 to 69 wherein the beverage ingredient in the first or second beverage cartridge is leaf-based tea.

72. A method as claimed in any of claims 67 to 69 wherein the beverage ingredient in the first or second beverage cartridge is a liquid coffee ingredient.

73. A method as claimed in any of claims 67 to 69 wherein the liquid dairy-based ingredient is a concentrated dairy-based product.

74. A method as claimed in claim 73 wherein the concentrated dairy-based product is concentrated liquid milk.

75. A method as claimed in claim 74 wherein the concentrated liquid milk contains between 25 and 40% total solids.

76. A method as claimed in claim 75 wherein the concentrated liquid milk contains 30% total solids.

77. A method as claimed in any of claims 73 to 76 wherein the concentrated liquid milk contains between 0.1 and 12% fat.

78. A method as claimed in any of claims 73 to 77 further comprising the step of foaming the one or more liquid dairy-based ingredients during dispensation.

79. A beverage preparation system comprising a beverage preparation machine (201) having means for receiving a range of beverage cartridges (1) and means for passing an aqueous medium through said beverage cartridges, a first beverage cartridge (1) containing one or more beverage ingredients (200) for preparing a first portion of said beverage, and a second beverage cartridge (1) containing one or more beverage ingredients (200) for preparing a second portion of said beverage, characterised in that one of the first or second beverage cartridges contains a liquid dairy-based ingredient.

FIG. 1.

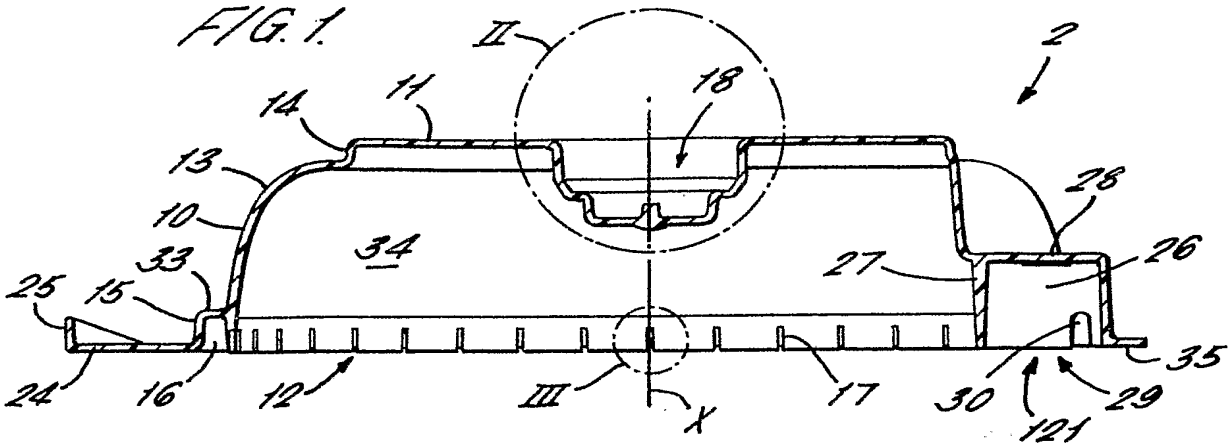


FIG. 2.

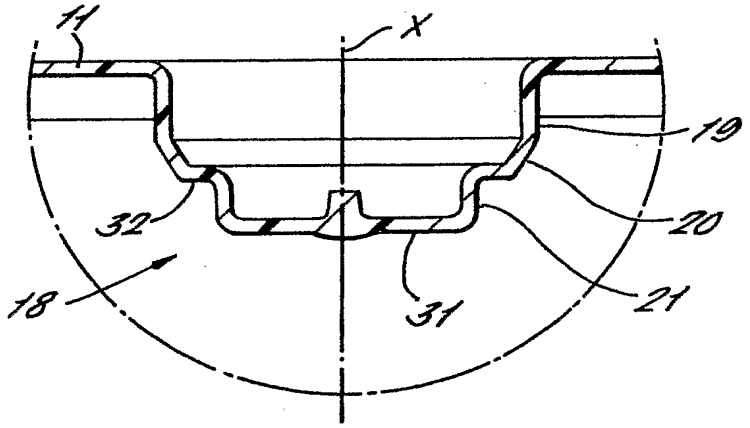


FIG. 3.

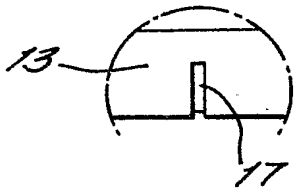


FIG. 4.

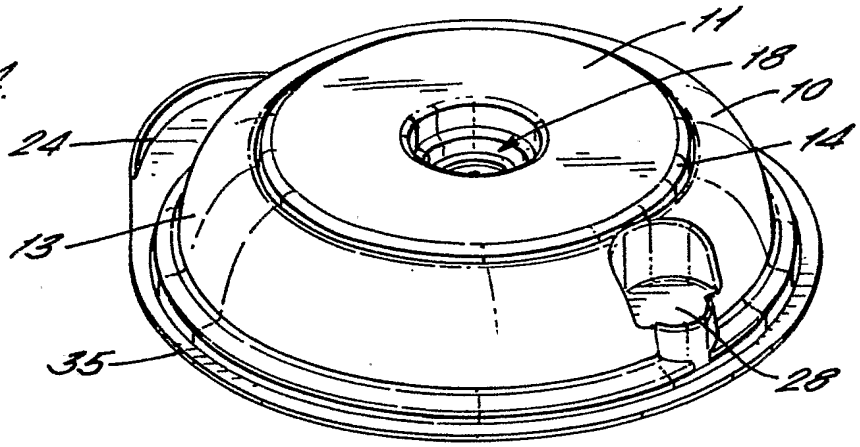


FIG. 5.

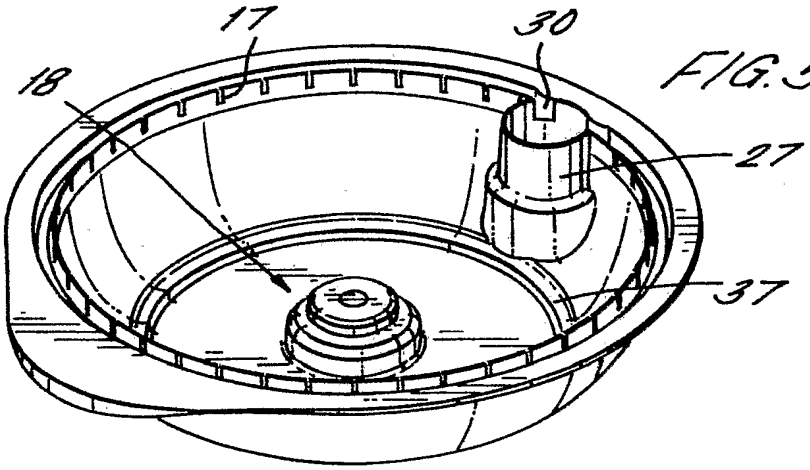


FIG. 6.

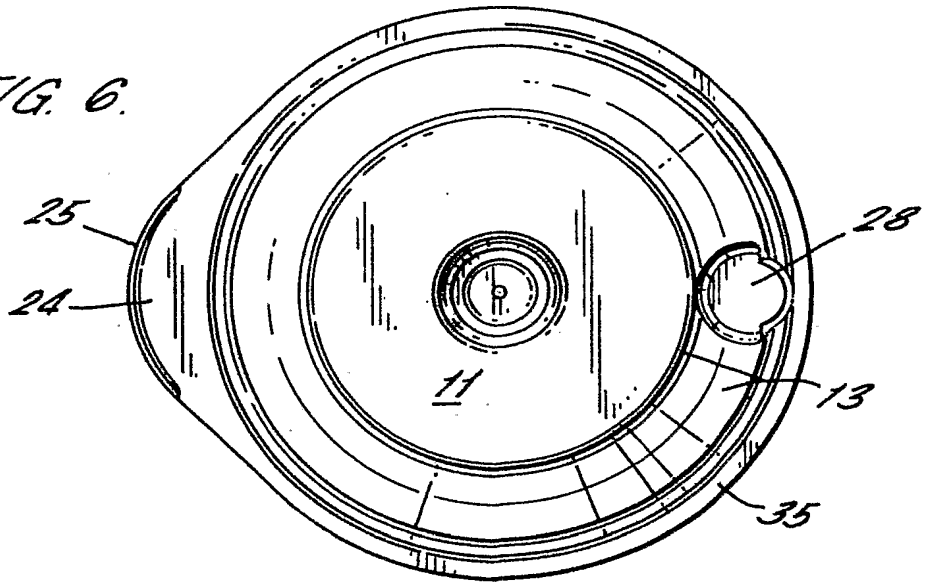


FIG. 7.

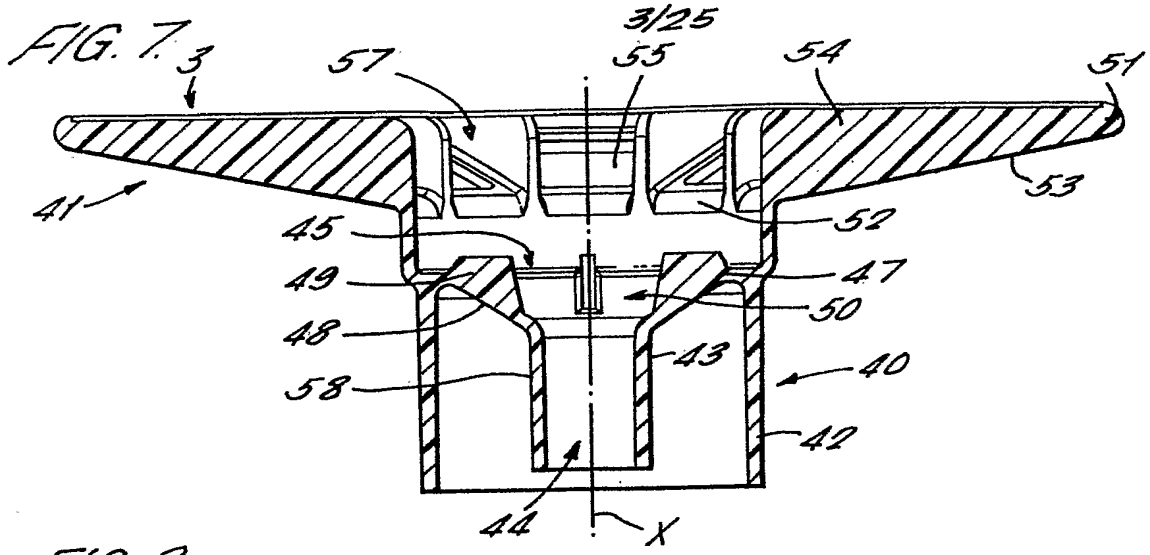


FIG. 8.

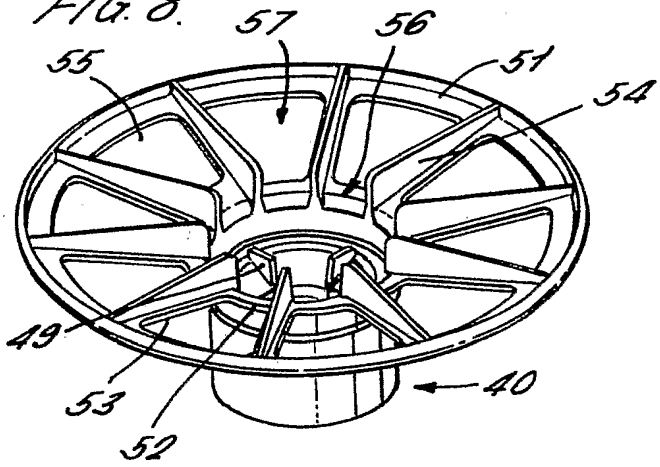


FIG. 9.

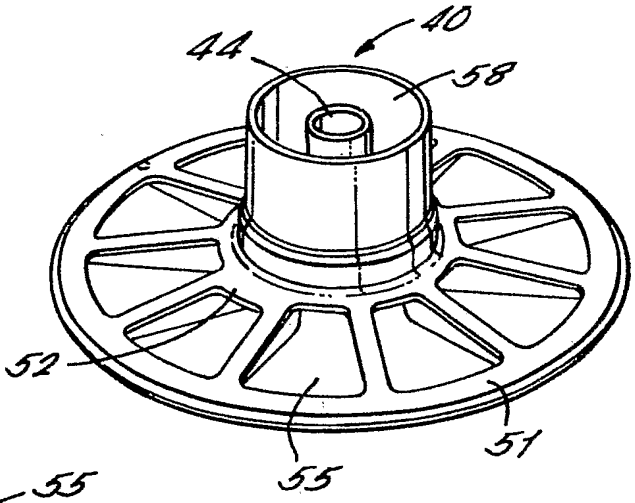


FIG. 10.

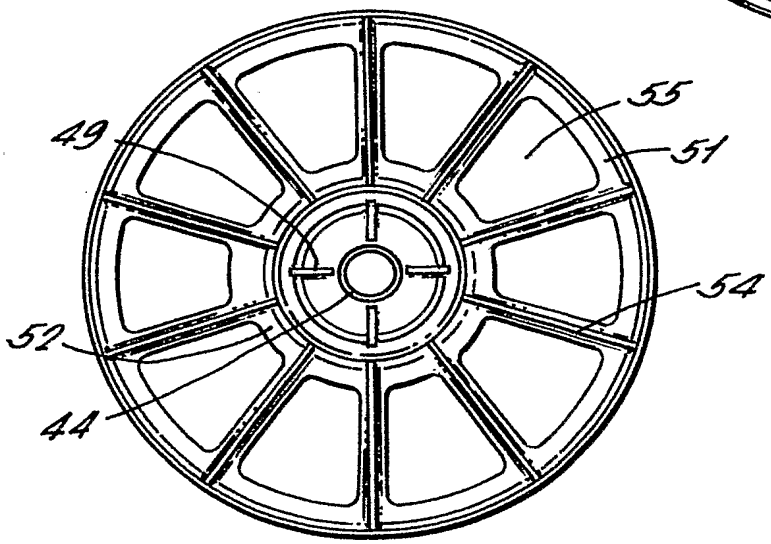


FIG. 11.

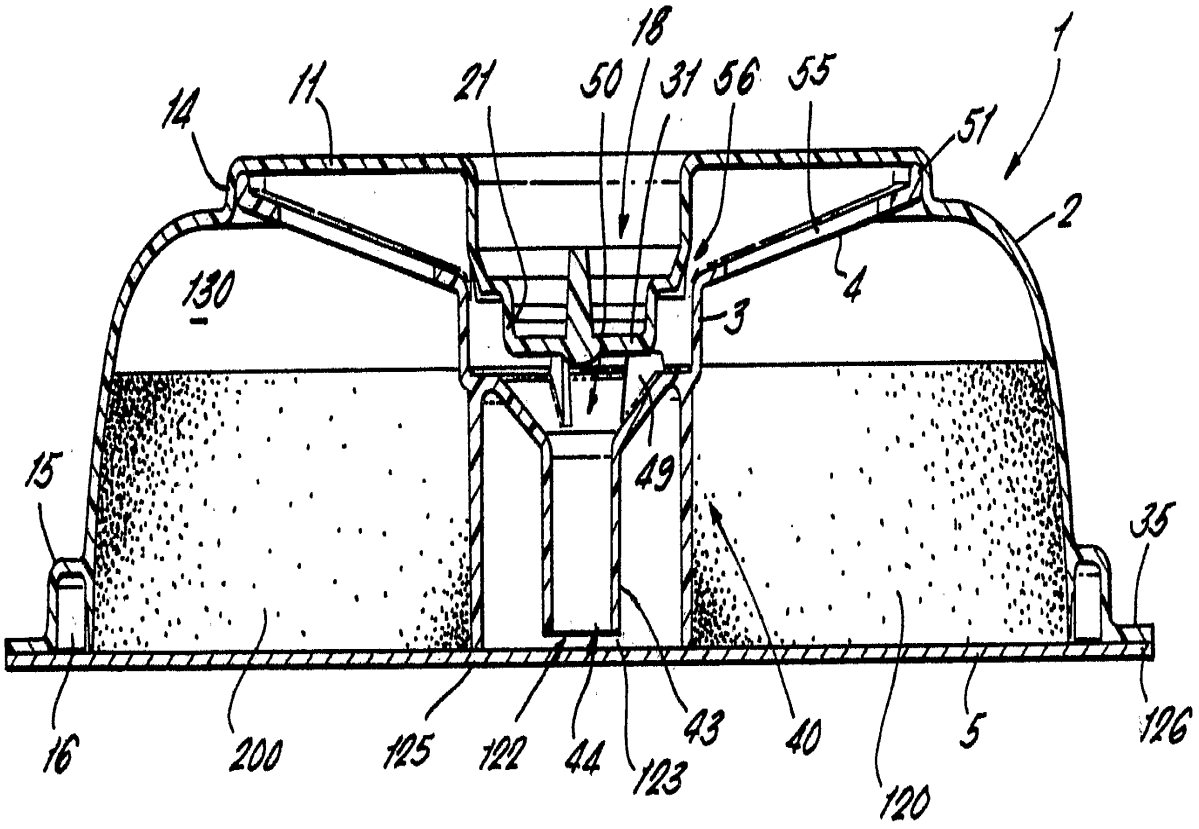

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FIG. 12.

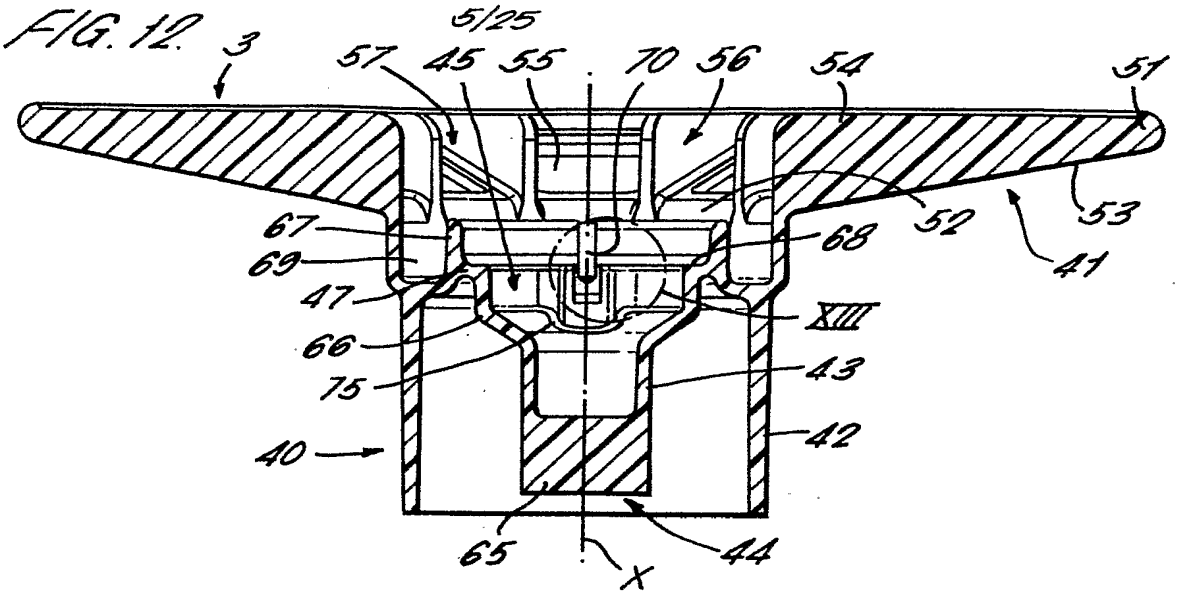


FIG. 13.

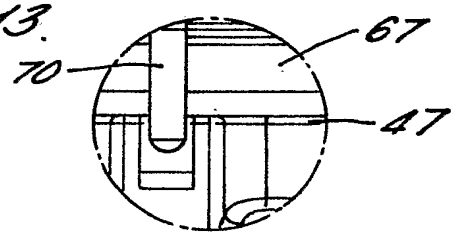


FIG. 14.

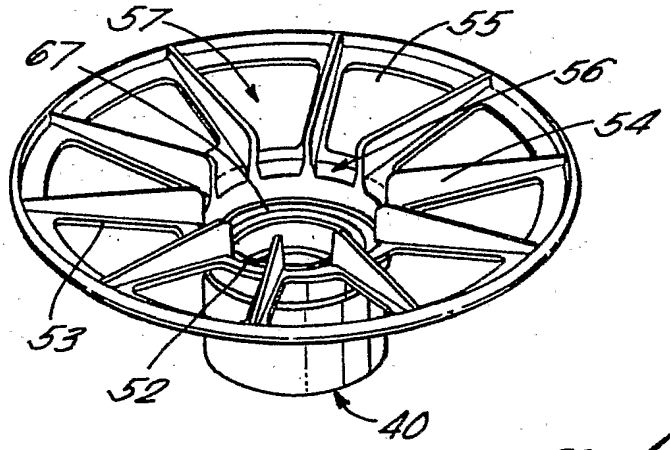


FIG. 15.

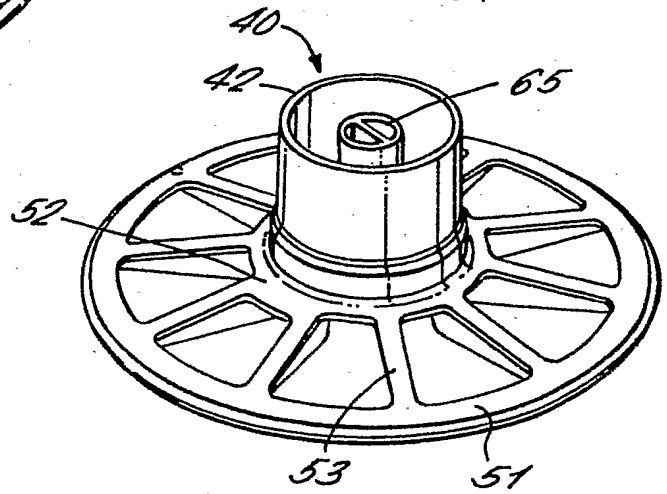


FIG. 16.

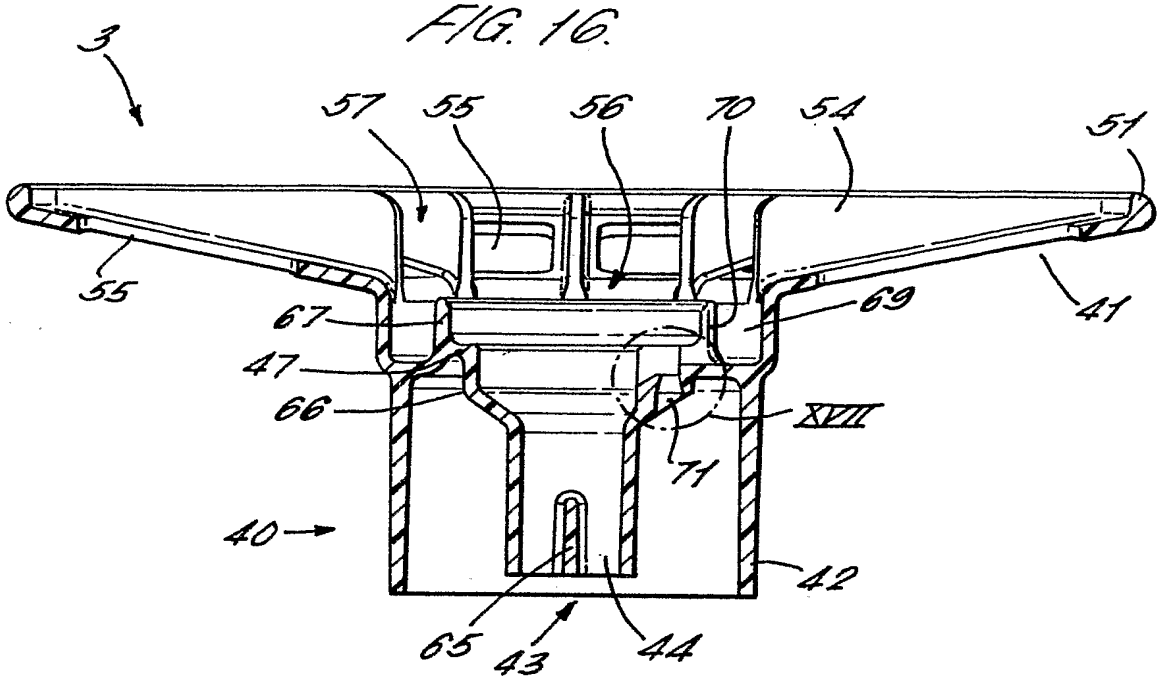
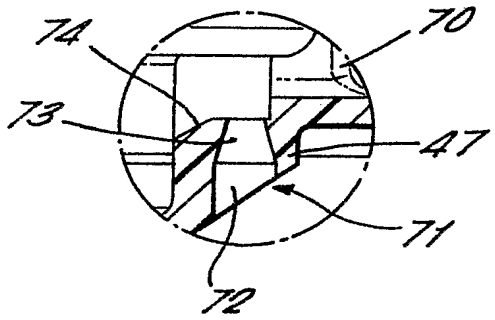

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FIG. 17.


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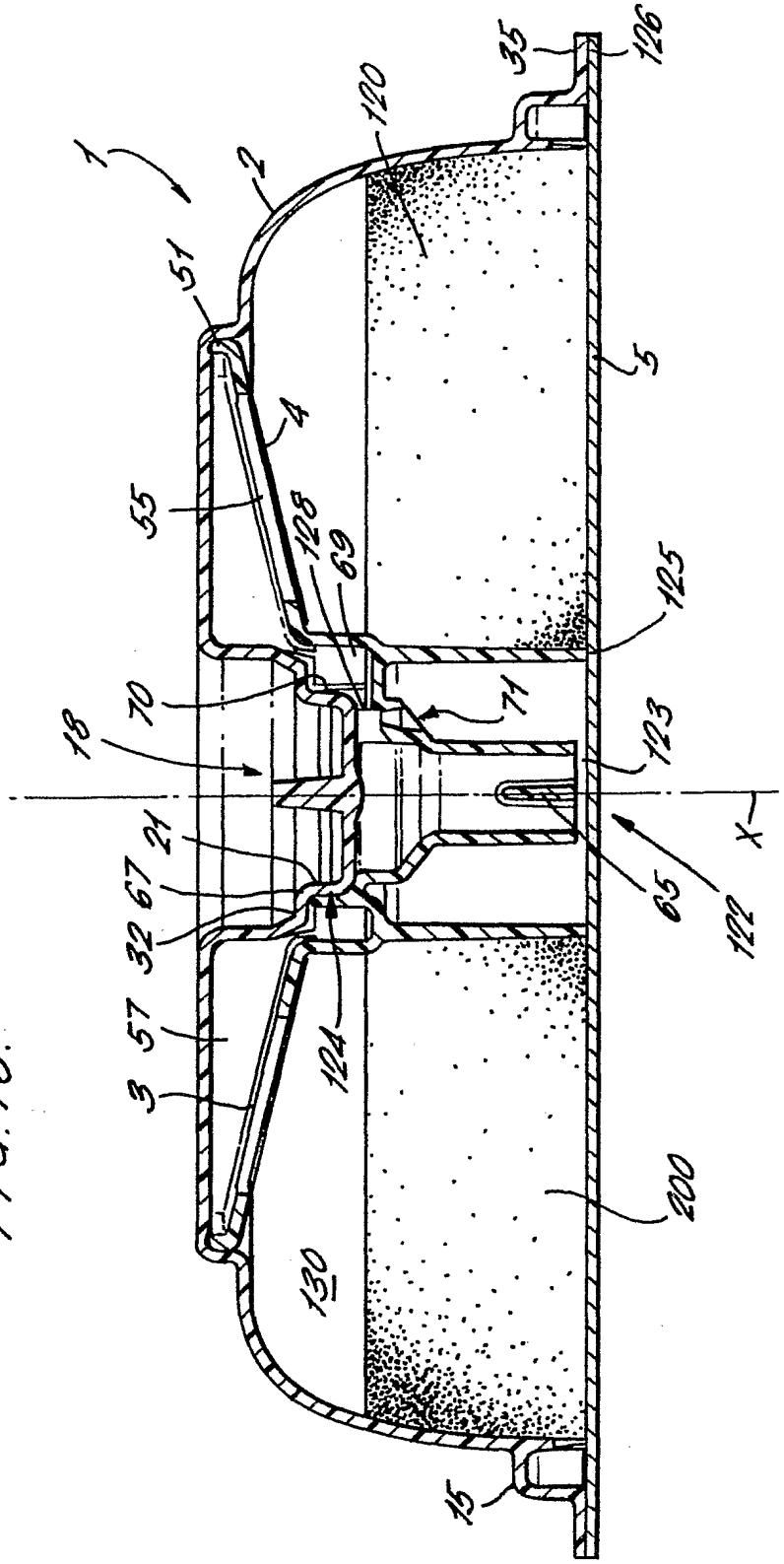

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FIG. 18.

FIG. 19.

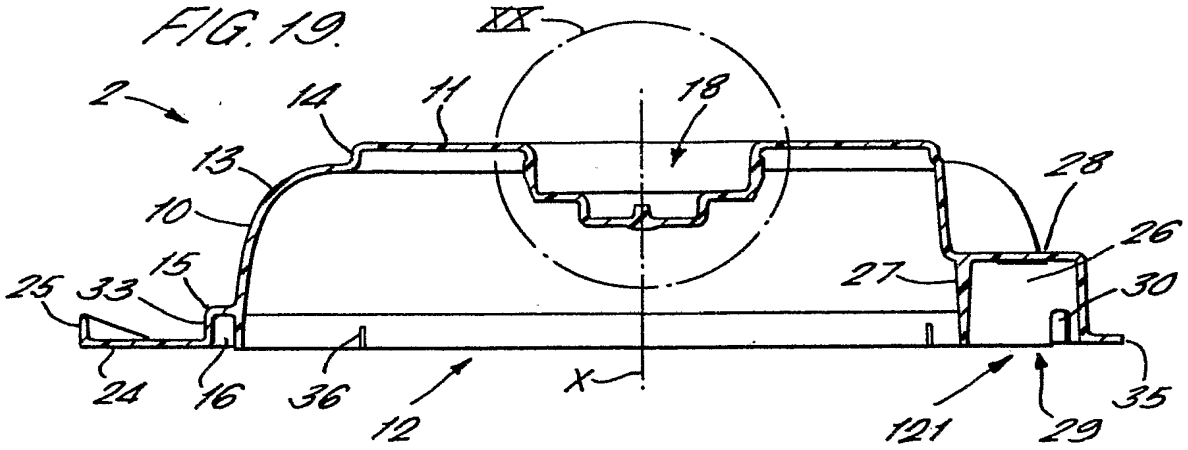

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FIG. 20.

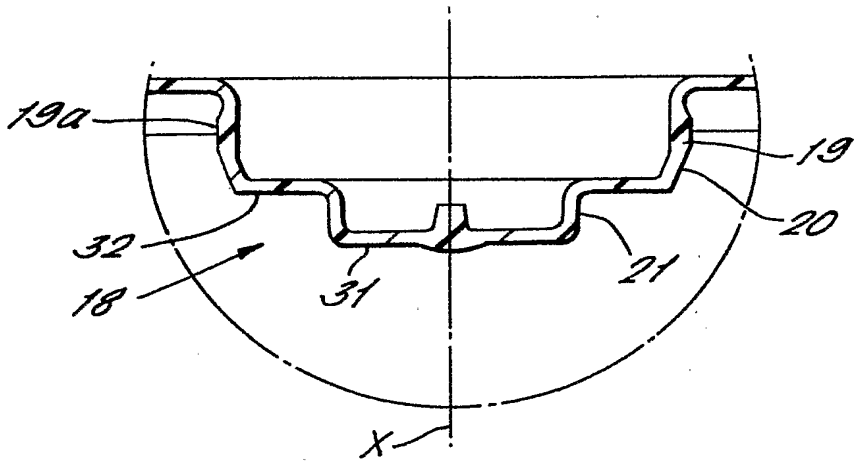

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FIG. 21.

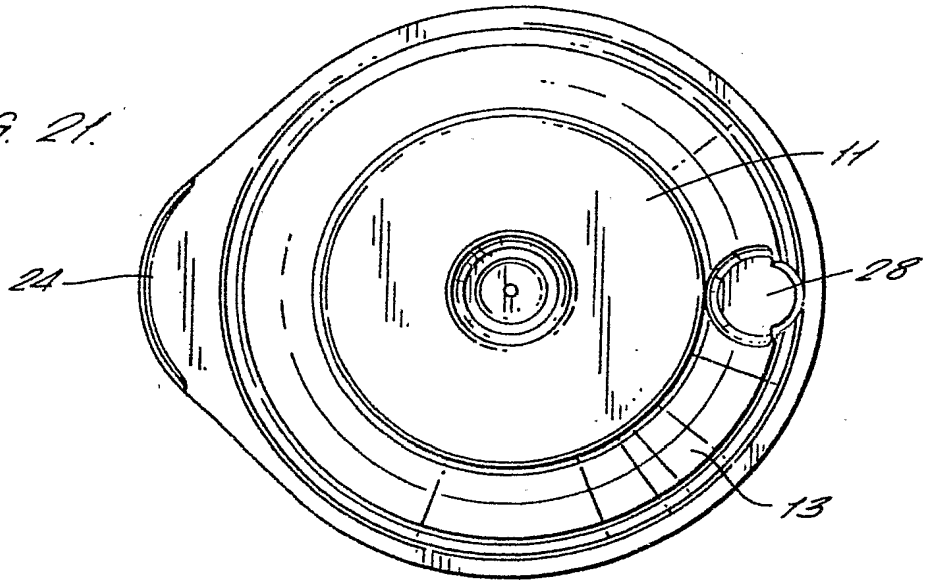


FIG. 22.

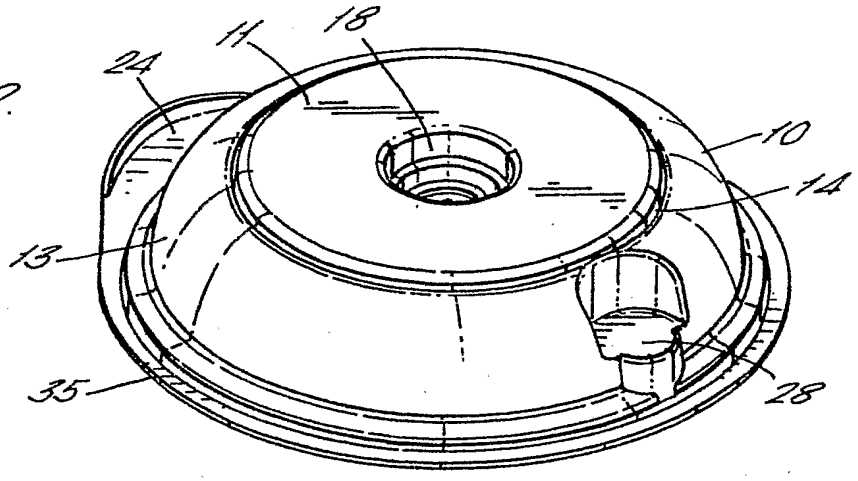


FIG. 23.

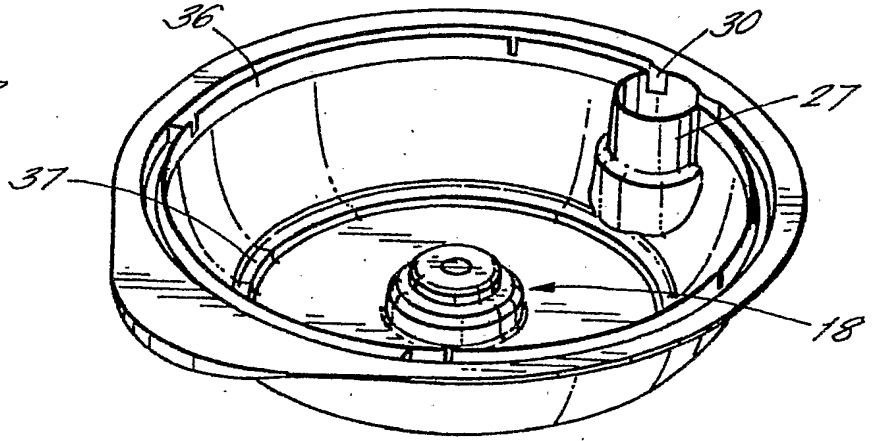


FIG. 24.

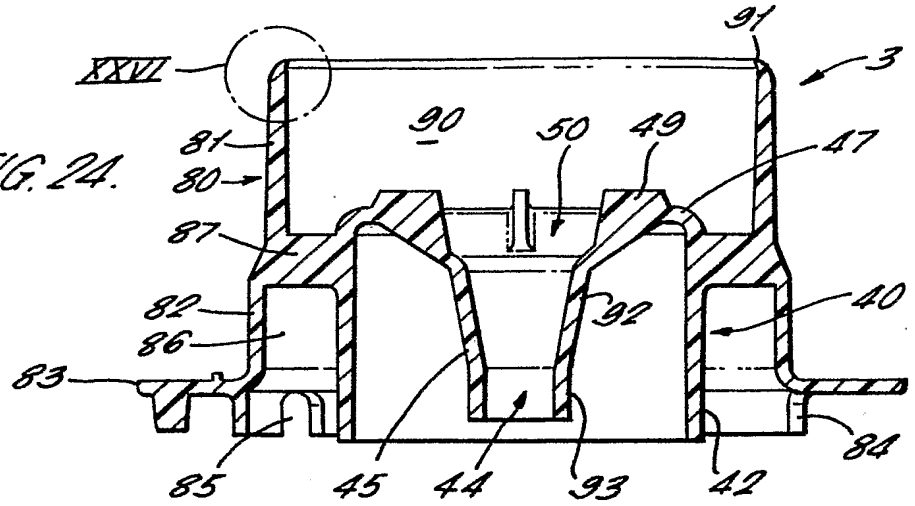


FIG. 25.

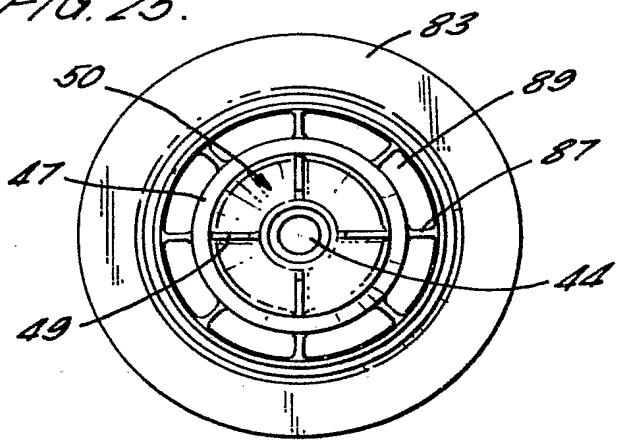


FIG. 26.

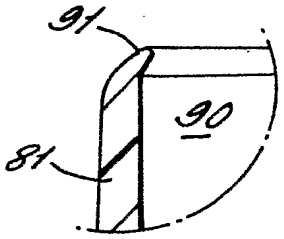


FIG. 27.

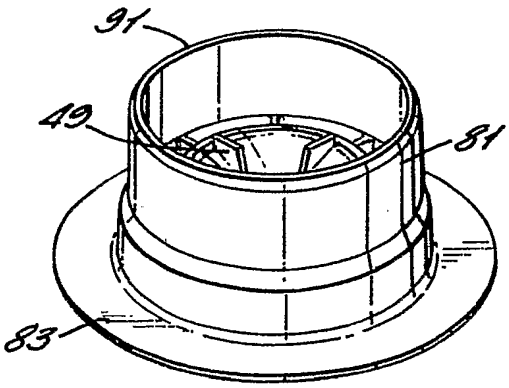
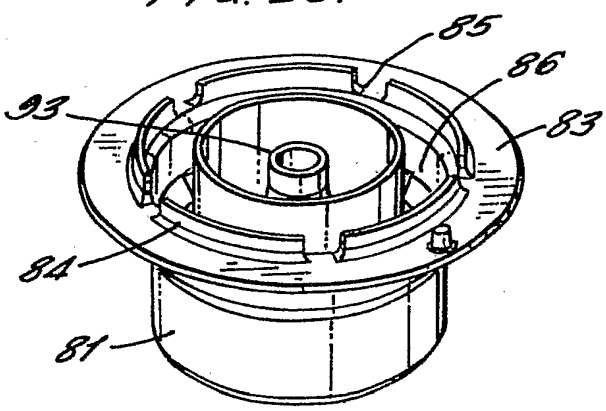


FIG. 28.



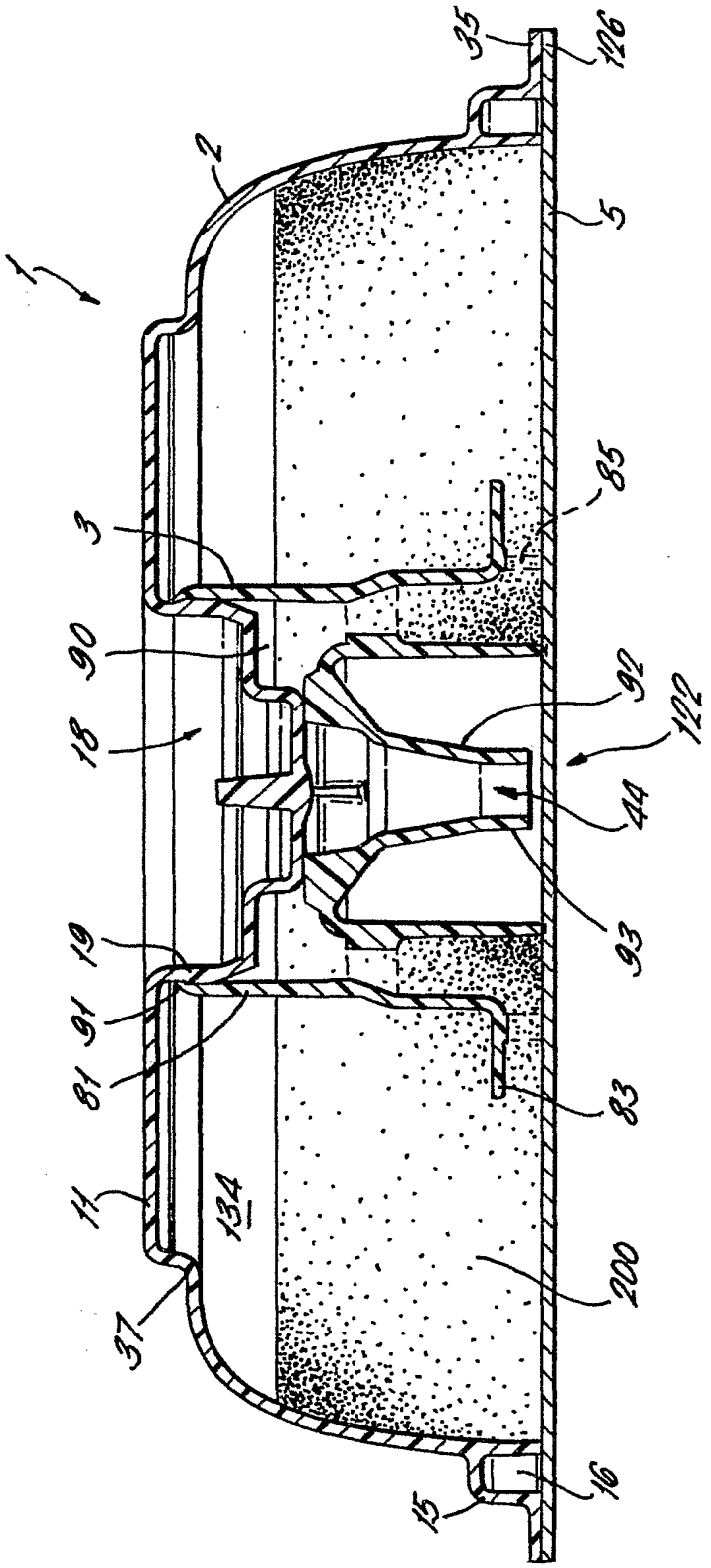


FIG. 29.

FIG. 30.

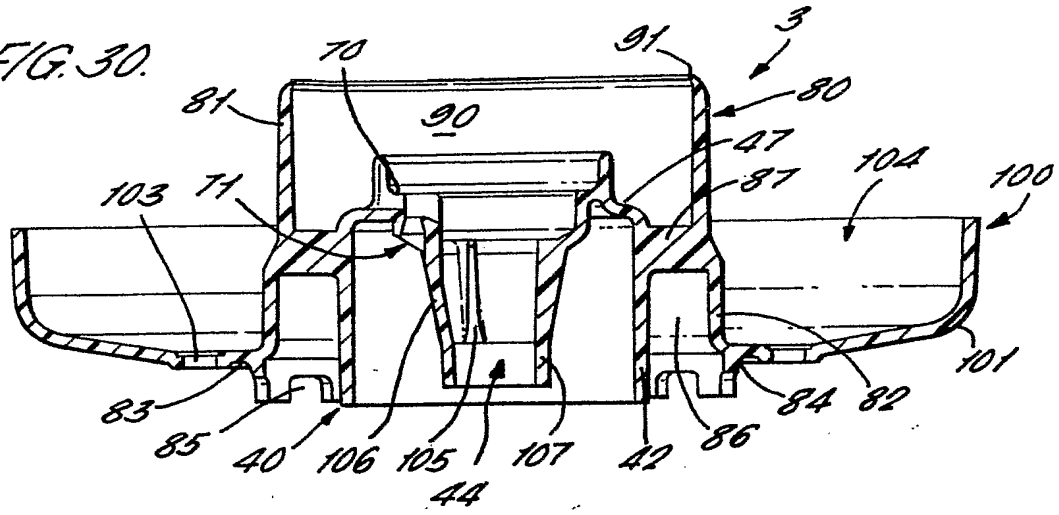


FIG. 32.

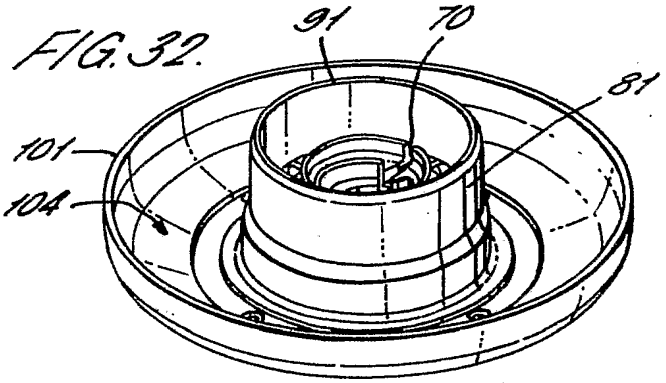


FIG. 31.

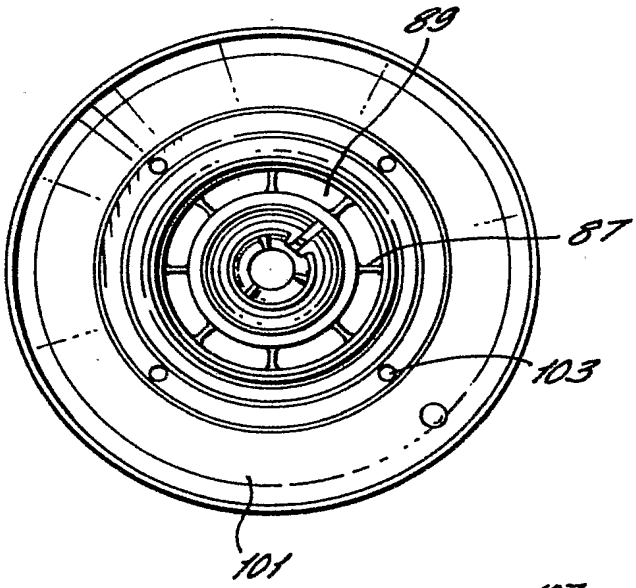


FIG. 33.

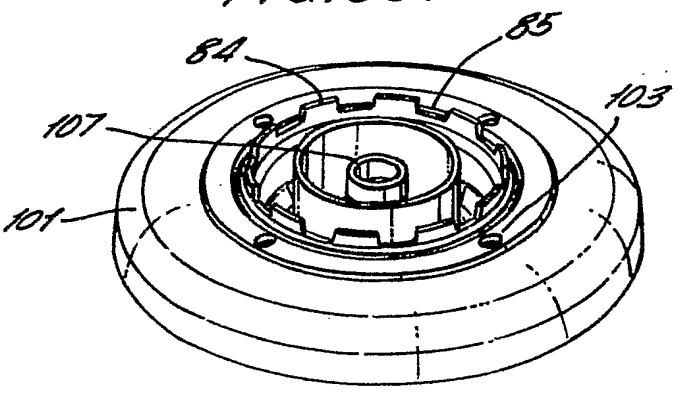


FIG. 34.

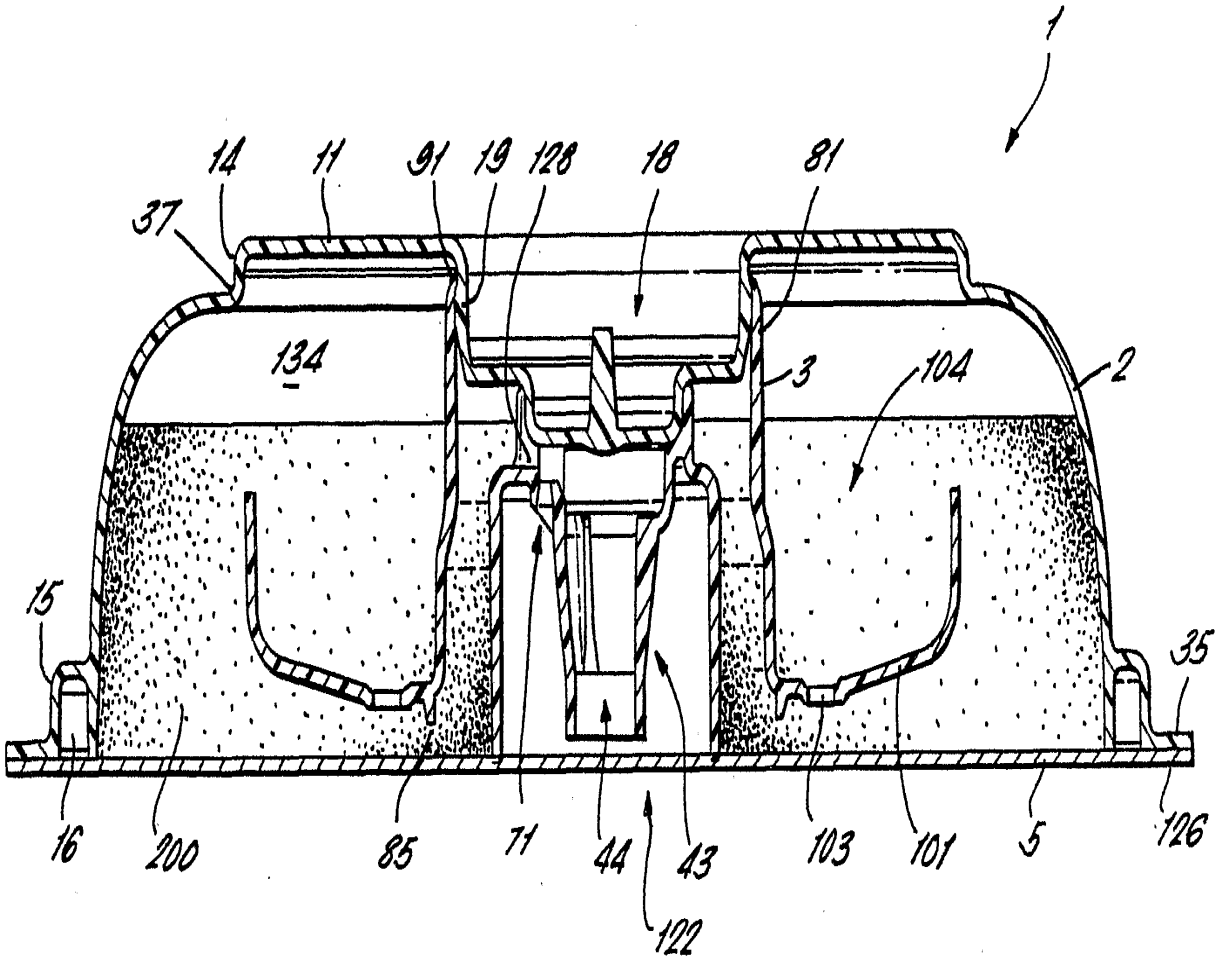

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FIG.35.

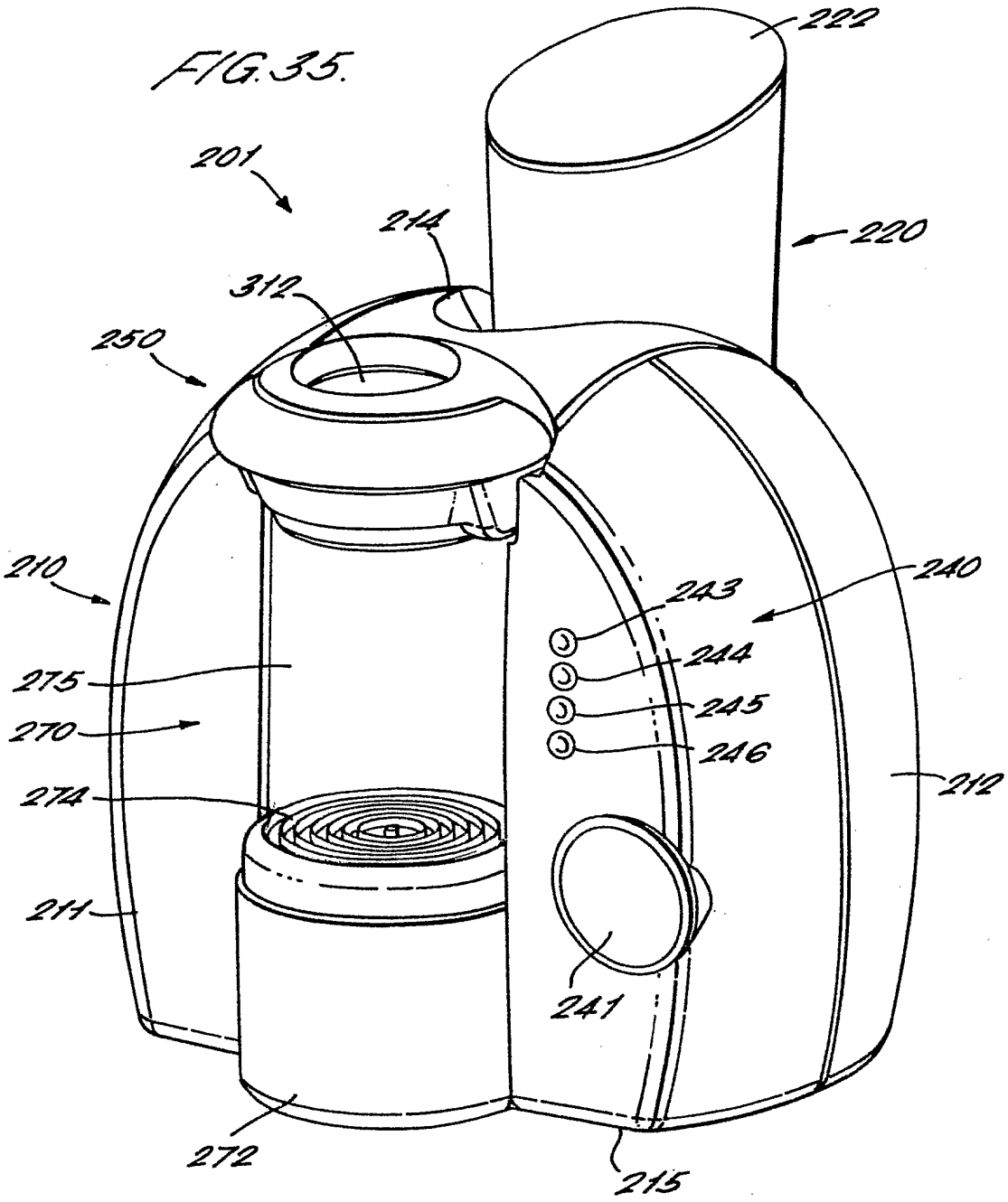

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FIG. 36.

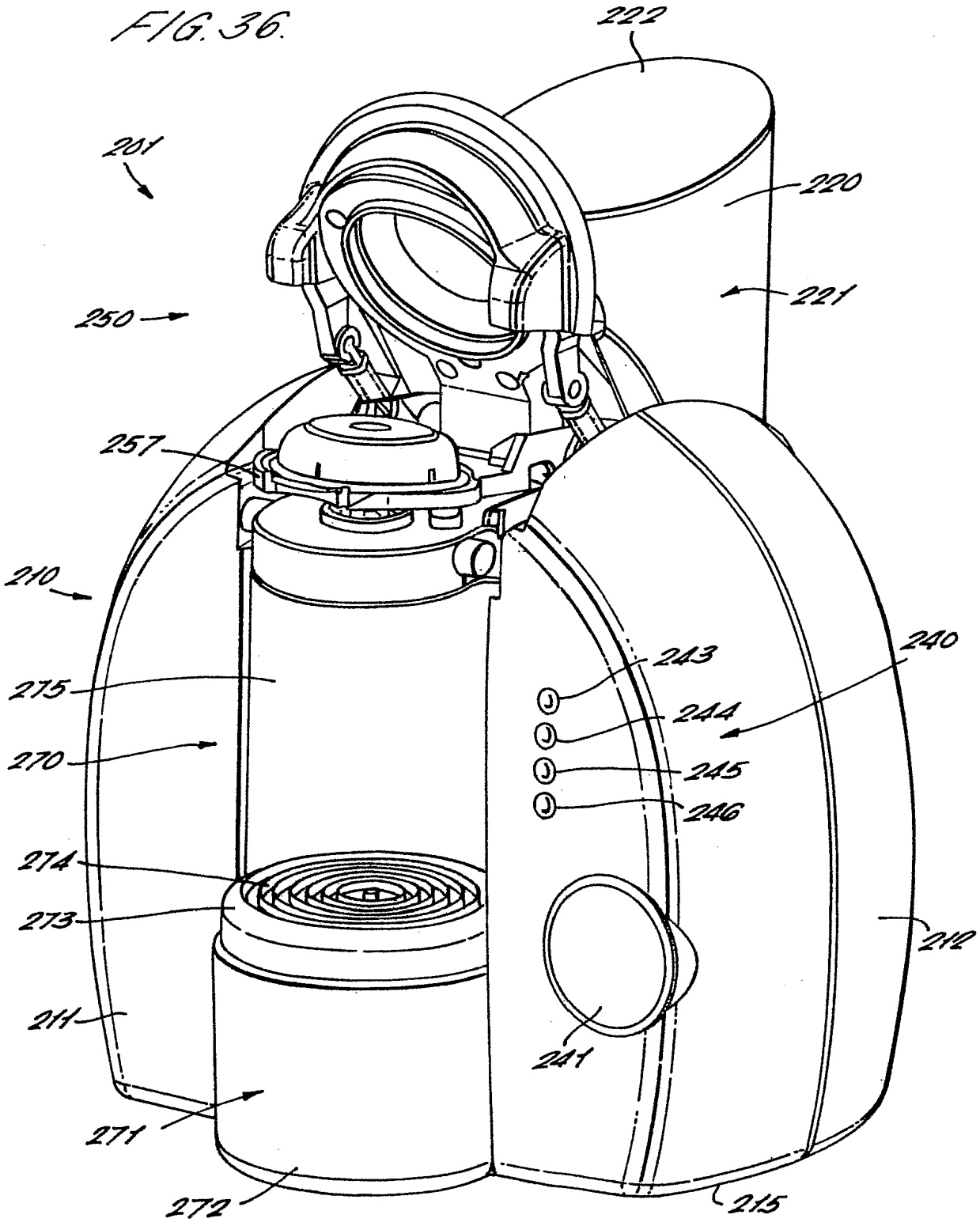
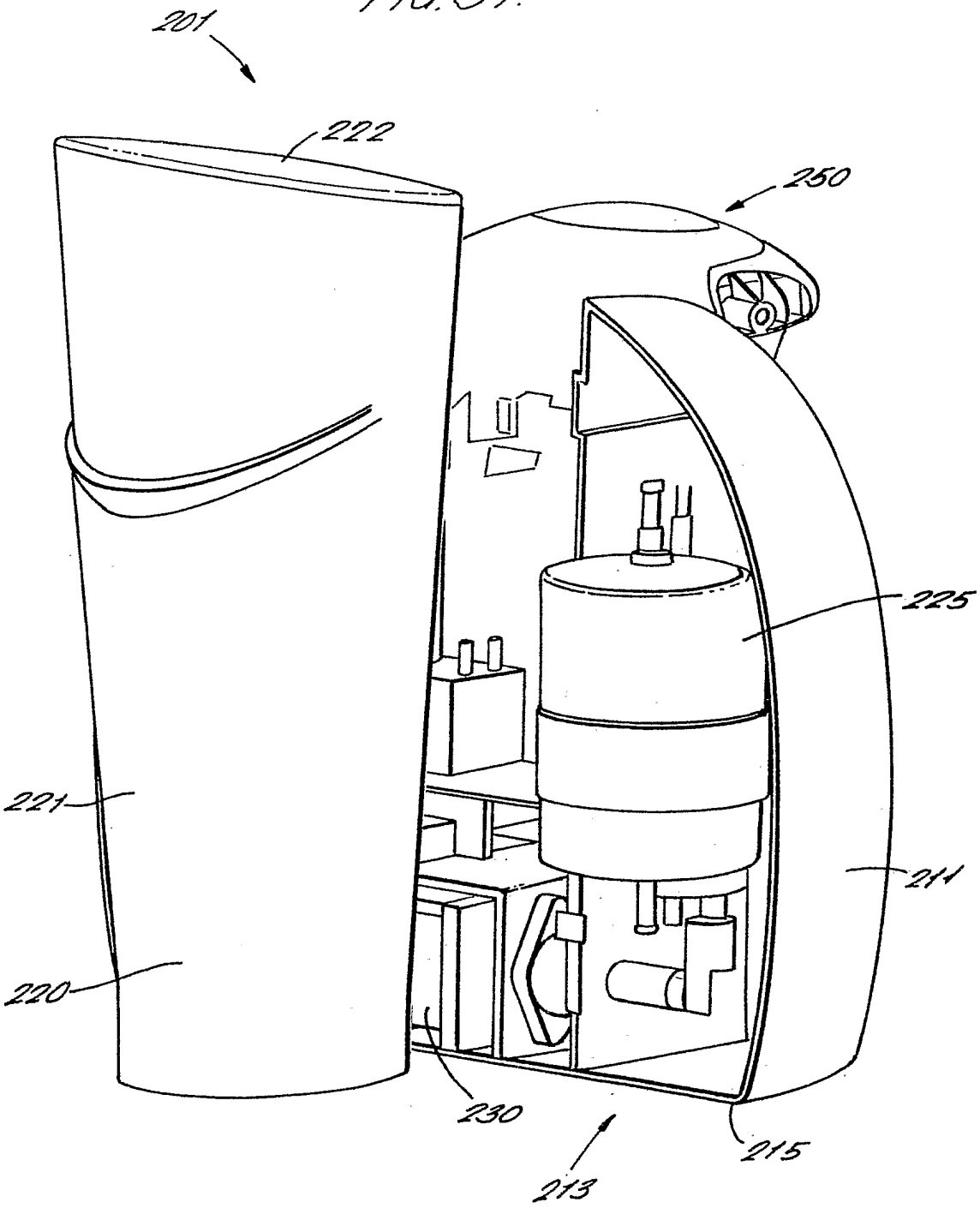
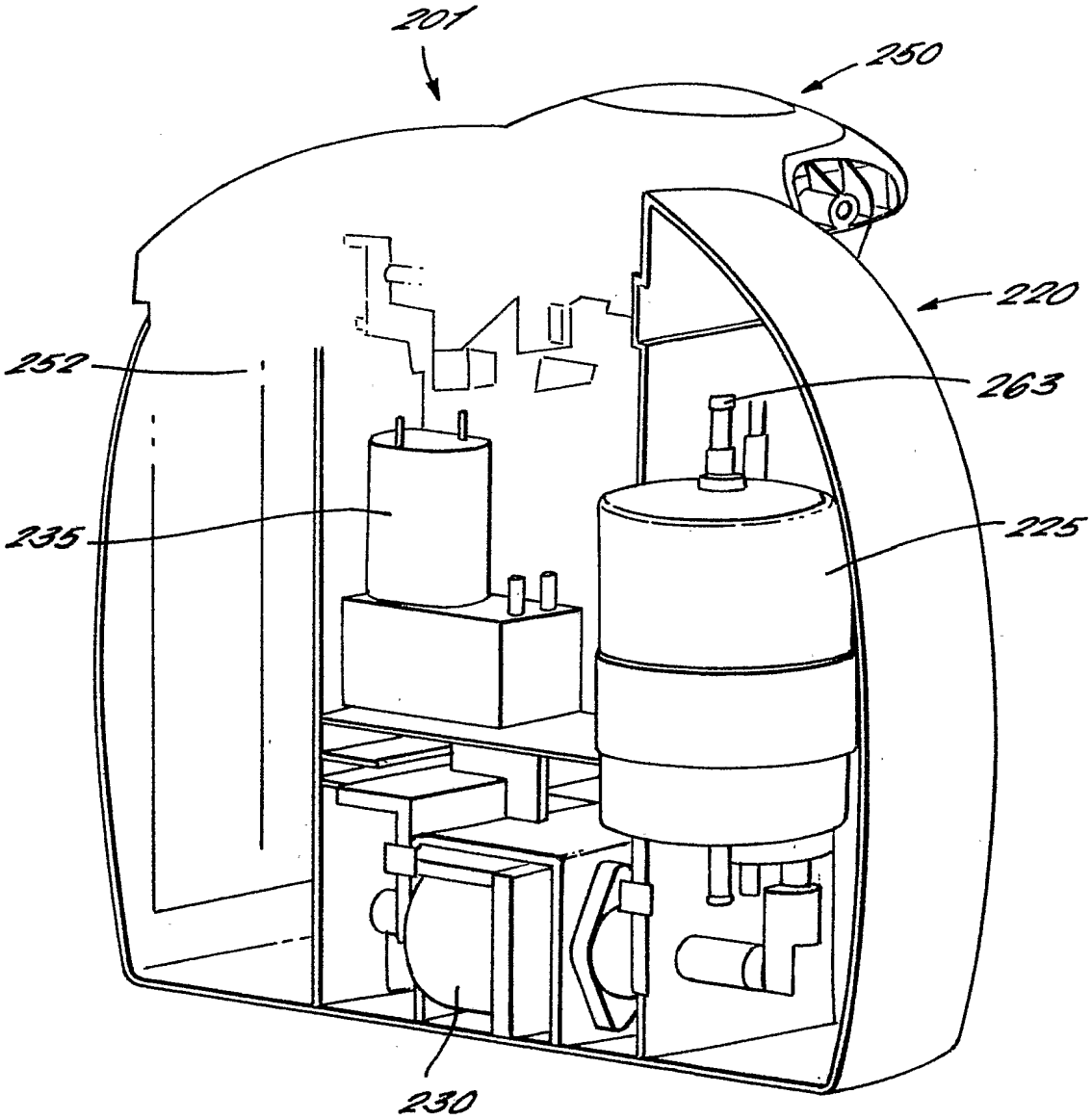

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FIG. 37.



K-FEE SYSTEM GMBH, EX2009, page 1730
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 38.



K-FEE SYSTEM GMBH, EX2009, page 1731
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

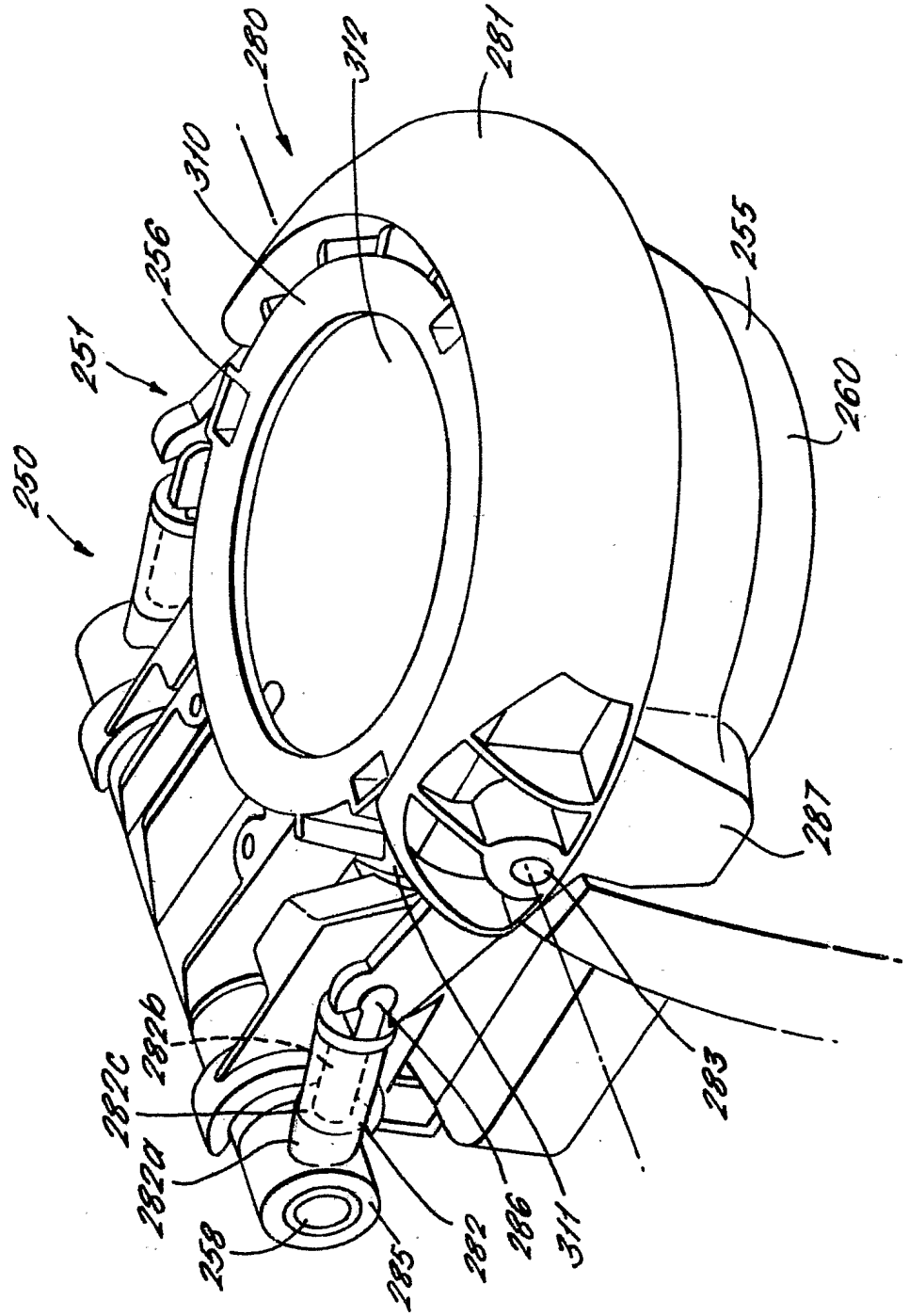
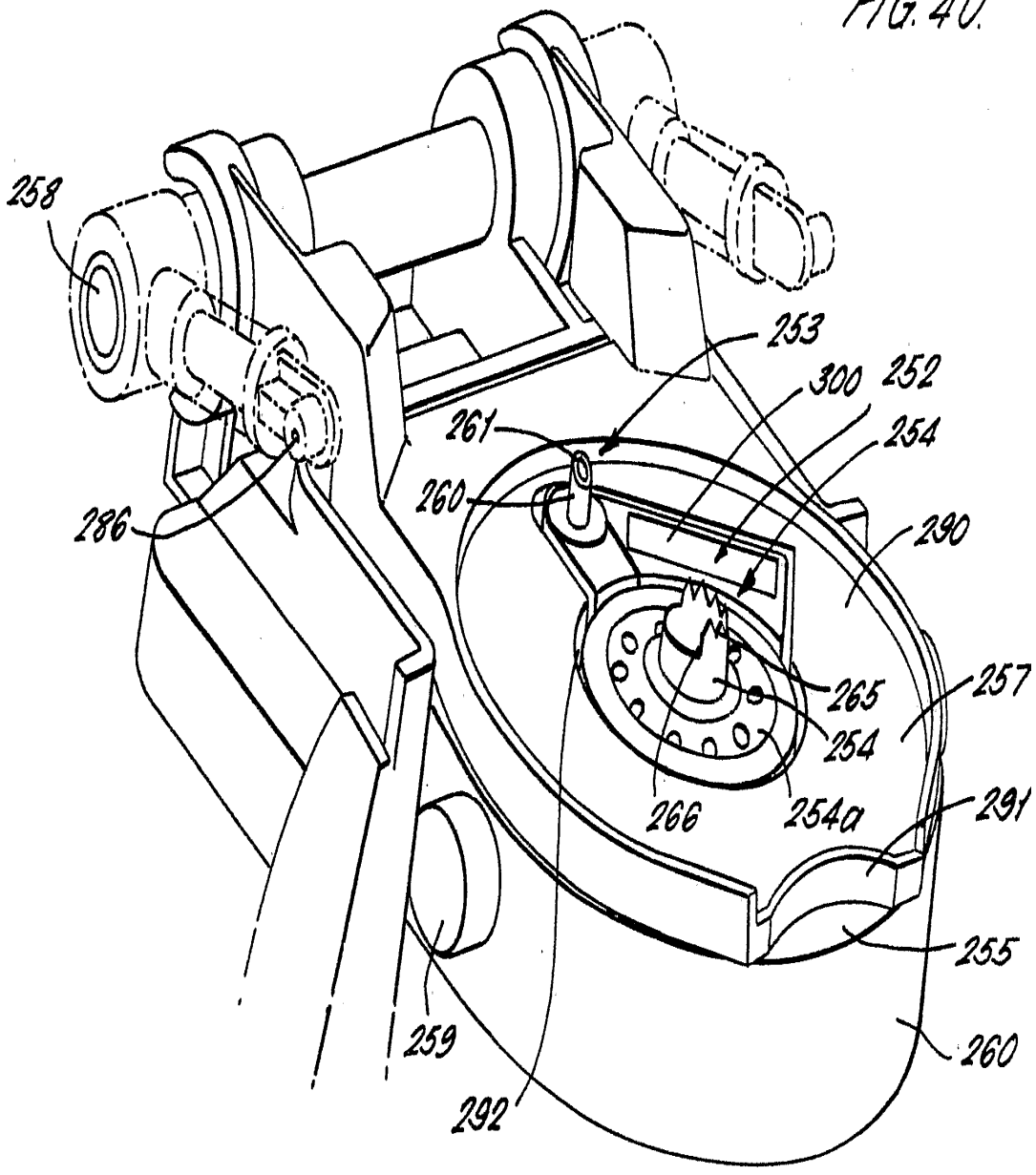

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FIG. 39.

FIG. 40.


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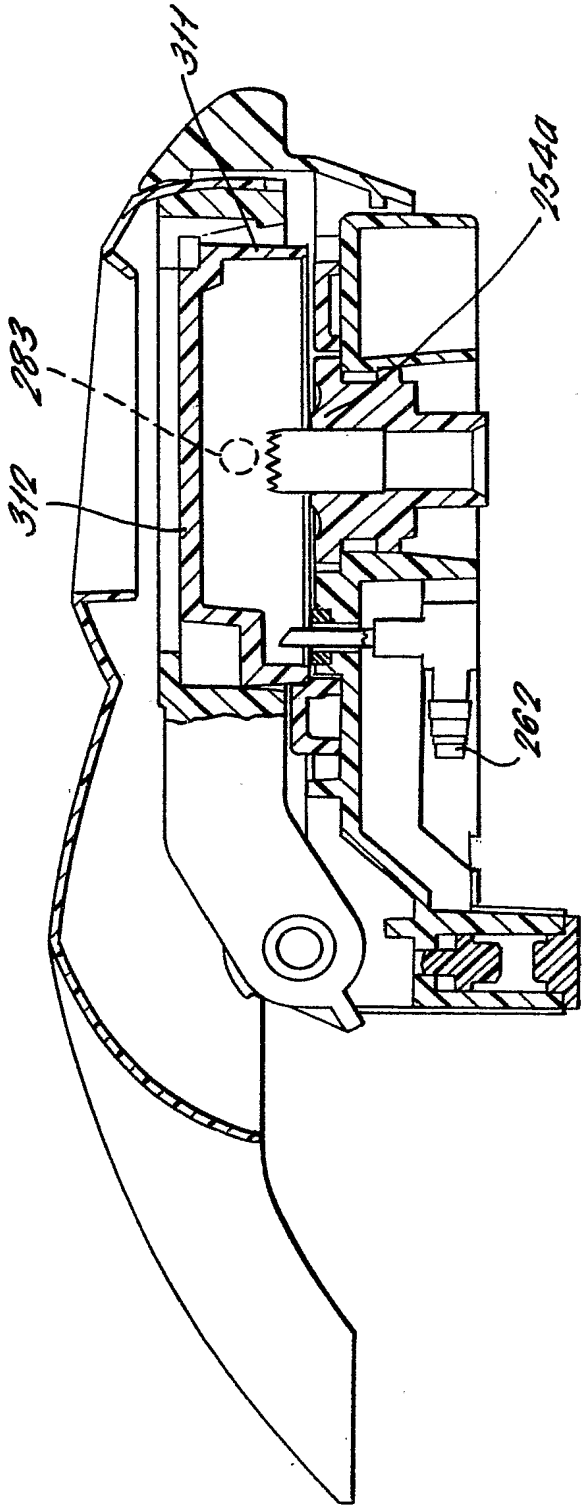
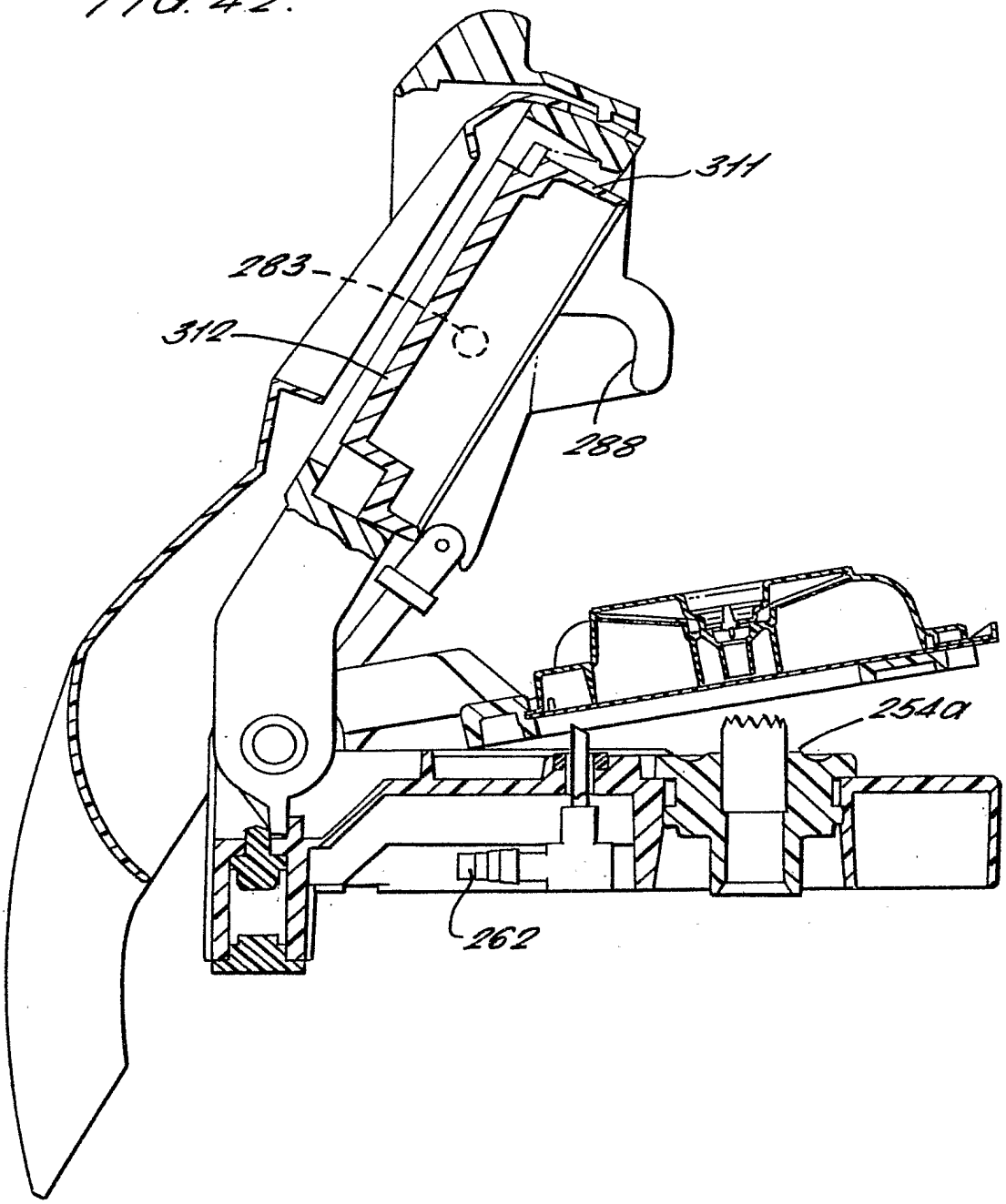


FIG. 41.

K-FEE SYSTEM GMBH, EX2009, page 1734
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 42.



K-FEE SYSTEM GMBH, EX2009, page 1735
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

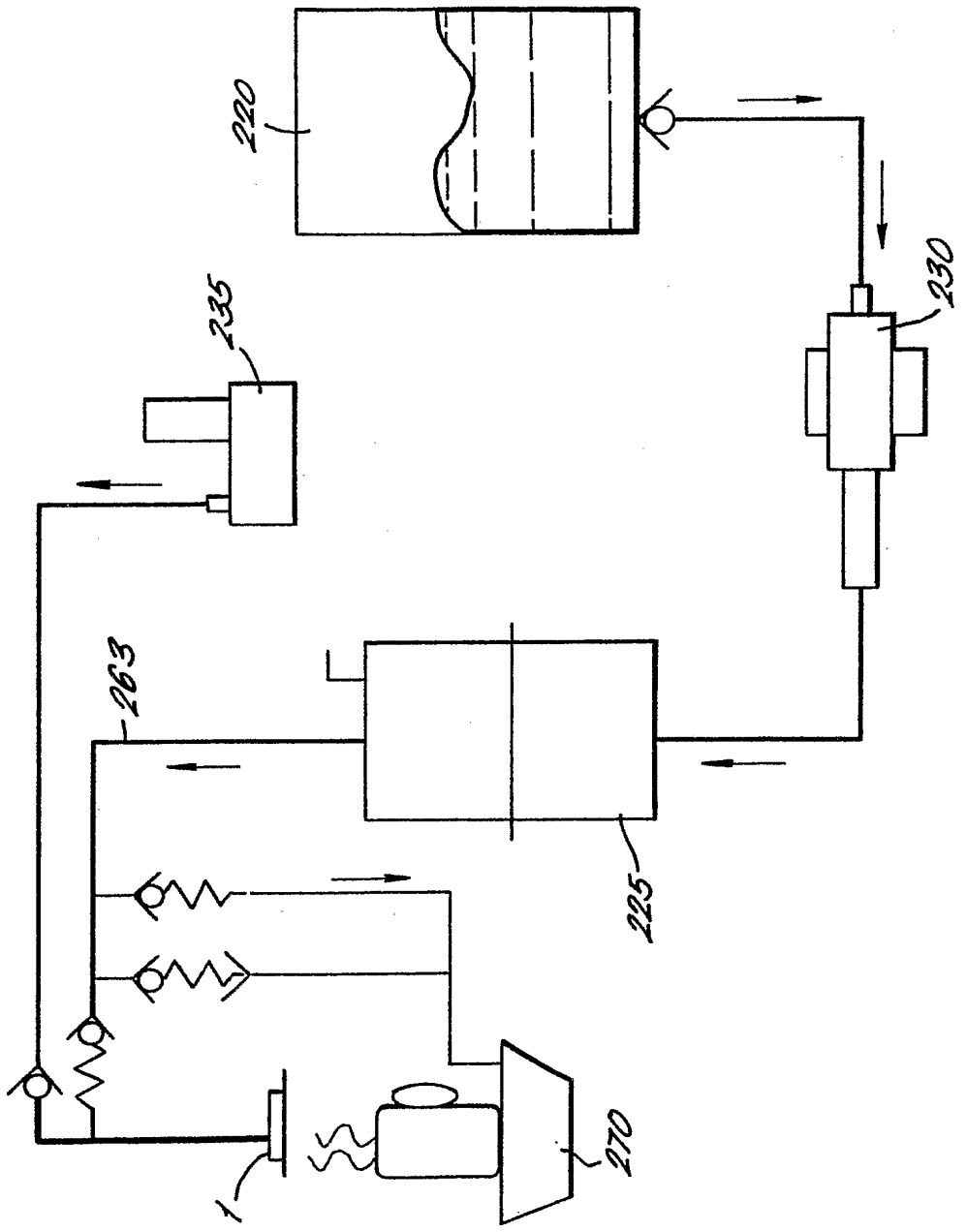


FIG. 43.

FIG. 44a.

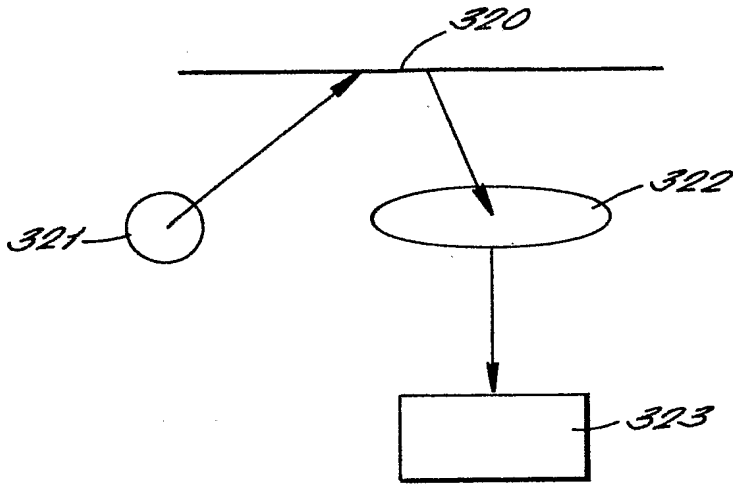


FIG. 44b.

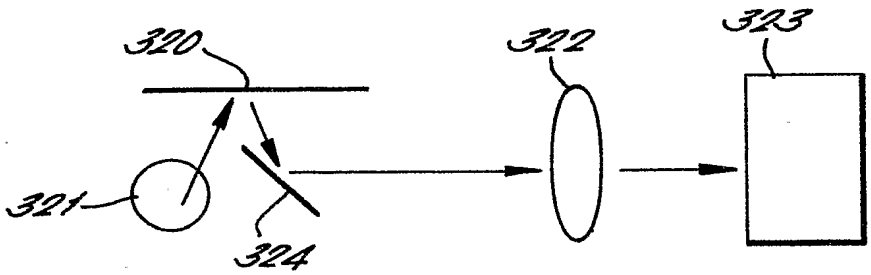
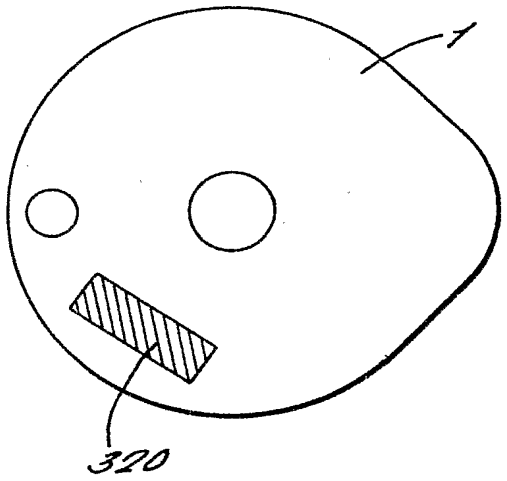


FIG. 45.



K-FEE SYSTEM GMBH, EX2009, page 1738
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 46a.

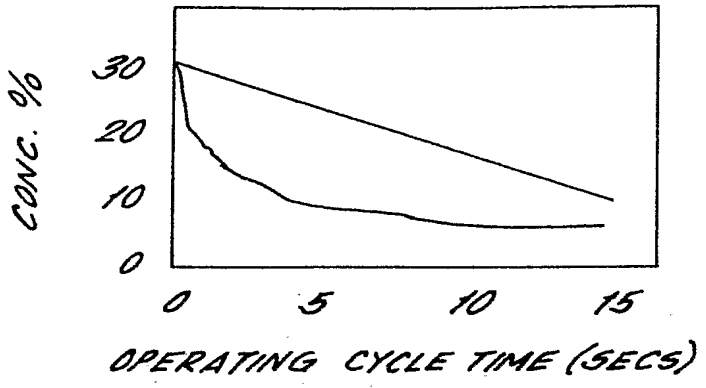


FIG. 46b.

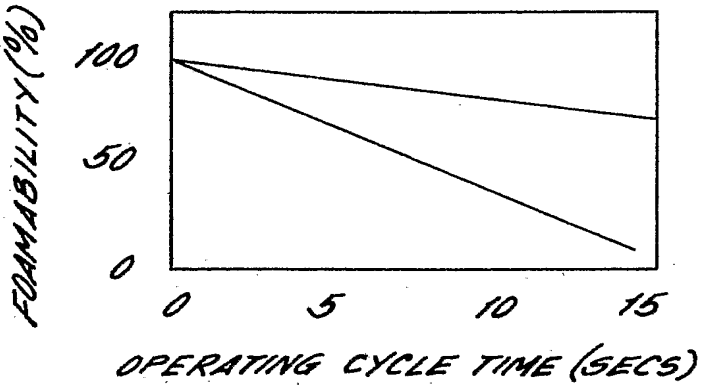
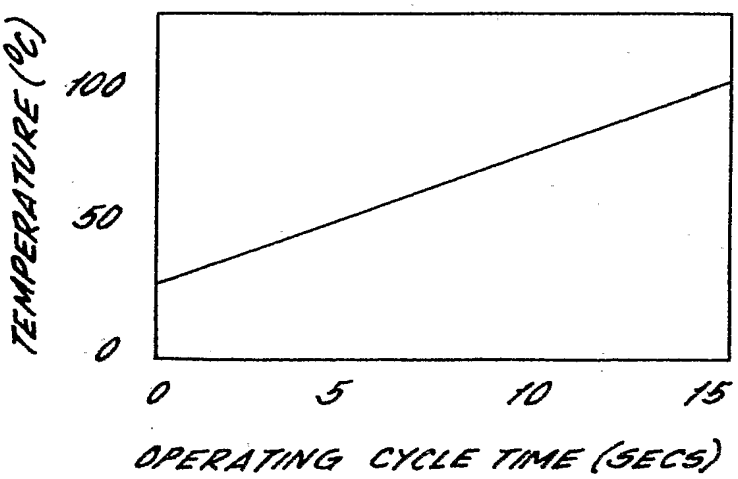


FIG. 46c.



K-FEE SYSTEM GMBH, EX2009, page 1739
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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(54) Capsule, device, and method for preparing infused beverages.

(57) The present invention relates to a capsule 102 containing dry infusible matter 101 for preparing infused beverages, and comprising:
- a front face 103 comprising a filter wall 114;
- a rim 105 surrounding said front face 103 and presenting a tapered outer edge 108;
- a back face 104, substantially opposed to said front face 103, and comprising a frangible region 116 for the injection of infusing liquid; and
- a solid envelope 106 between said rim 105 and said back face 104.

The present invention also relates to a device 120 for preparing infused beverages comprising:
- a receptacle 118 for receiving said capsule 102, with the front face 103 in a substantially vertical position; and
- injecting means 124 for introducing an infusing liquid into said capsule 102 through said frangible region 116 when said capsule 102 is in said receptacle 118; and
- an infusion chamber 123 with a substantially vertical side opening 125 to said receptacle 118, so as to be in fluid connection with said filter wall 114 of the capsule 102 when said capsule 102 is in said receptacle 118, and an openable and closable bottom opening 127 to allow an infused beverage to flow out of the infusion chamber 123.

Finally, the present invention also relates to a method of preparing infused beverages using said capsule 102 and device 120.

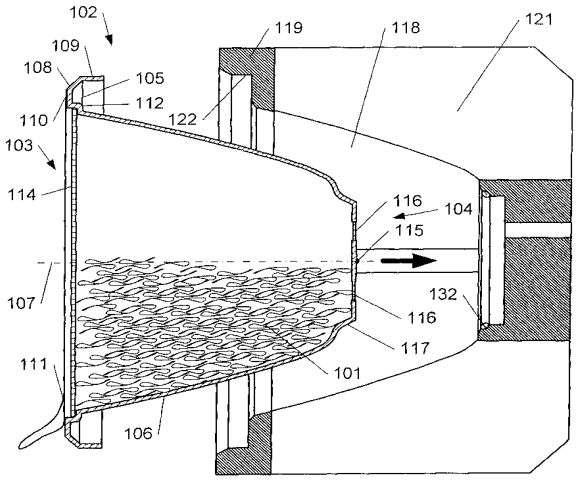


Fig. 2a

EP 2 159 167 A1

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K-FEE SYSTEM GMBH, EX2009, page 1740
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Description

[0001] The present invention relates to a capsule, device, and method for preparing infused beverages.

[0002] In particular, the present invention relates to a capsule containing dry infusible matter for preparing infused beverages, and comprising a front face, comprising a filter wall and a rim; a back face substantially opposed to said front face, and comprising a frangible region for the injection of infusion liquid; and a solid envelope between said front face and said back face.

[0003] In the present specification, the term "capsule" is preferentially used, although it should be considered synonymous with the terms "cartridge", "package" or "container" used elsewhere in this particular technical domain.

[0004] The present invention also relates to a device for preparing infused beverages comprising a receptacle for receiving the abovementioned capsule, with the front face in a substantially vertical position; and injecting means for introducing an infusing liquid into said capsule through said liquid injection point when said capsule is in said receptacle.

[0005] In the present specification, the term "infusing liquid" generally refers to the liquid used to infuse ingredients contained in the dry infusible matter, so as to produce an infused beverage wherein said infusing liquid carries said ingredients in dissolved or suspended form. Usually, but not necessarily, the infusing liquid will be hot water, and the infused beverage a tea, such as black tea, green tea, white tea, flavoured tea, or also a so-called herbal or fruit tea using infusible matter other than the leaves of the tea plant (for instance, rooibos, camomile, peppermint, etc.) .

[0006] Similar capsules and devices are known from the state of the art.

[0007] Canadian patent application CA 2 448 474 A1 discloses one such capsule. However, this capsule presents several drawbacks. The capsule disclosed in this document is particularly adapted to use for preparing beverages by percolation, in which a hot liquid percolates down continuously through the matter contained in the capsule. For this, the capsule is placed in a horizontal position, with the back face comprising the liquid injection point at the top, and the front face at the bottom. This method, though appropriate for preparing such beverages as coffee, is entirely inappropriate for, for instance, tea, which requires a longer and gentler infusion. With the infusing liquid flowing too rapidly downwards under the influence of gravity, it provokes a chaotic and exceedingly fast breakdown of various tea molecules, ruining the quality and flavour of the infusion.

[0008] In order to solve this problem, it has been proposed to place such capsules with the front face in a vertical position. However, such a position has the drawback of being considerably more leak-prone than one in which the front face remains in a substantially horizontal position.

[0009] This problem has been addressed in a number of similar capsules for preparing coffee by incorporating a sealing ring in the rim around the front face, as disclosed, for instance, in WO 2007/137974, WO 2007/122208, or EP 0 468 079. However, these prior art capsules are adapted to the preparation of espresso coffee by injecting water at high pressure into the capsule and extracting it at the front face, as illustrated in Fig. 1. Since the water injection point 1 and the back face 2 of the capsule 3 are not sealed, the high-pressure water 4 both percolates through the ground coffee in the capsule 3 and flows around the envelope 5 of the capsule 3. In use, the water pressure thus pushes the capsule 3 forward, pressing the front of the rim 6 against an opposite surface 7 of the receptacle receiving the capsule 3. The principal purpose of the sealing rings in these prior art capsules is to prevent leaks of high-pressure water 4 from behind the rim 6.

[0010] The capsule of the present invention, however, is adapted to be used in a device for preparing infused beverages comprising an infusion chamber with a substantially vertical side opening to said receptacle, so as to be in fluid connection with said filter wall of the capsule when said capsule is in said receptacle, and an openable and closable bottom opening to allow an infused beverage to flow out of the chamber. When the infusion chamber is full, it is necessary to prevent leaks of infusion liquid from the front of the capsule.

[0011] It is thus an object of the present invention to provide a capsule adapted to prevent such leaks through the front of the rim of the capsule.

[0012] The capsule of the present invention is adapted to solve this problem by presenting a rim with a tapered outer edge. This ensures a self-adjusting sealing fit when said tapered outer edge is pressed against the edge of the abovementioned side opening of the infusion chamber. Liquid leaks through the interface between the capsule and the infusion chamber are thus successfully prevented without unduly complicating the production of the capsule.

[0013] Although WO 2006/0121520 comprises an embodiment of a tea pod presenting a rim with a similar configuration, it must be noted that this pod, which is adapted to percolation, does not present a liquid injection point. In this pod, the front face is adapted to receive, in a substantially horizontal position, the infusing liquid which will exit through the back face. Liquid flow is thus in the opposite direction as in the capsule of the invention. Moreover, not only is the conical surface around the rim not suggested to improve the seal, a flat rim is even explicitly preferred for this purpose.

[0014] It is a further object of the present invention to prevent liquid leaking out from around the liquid injection point.

[0015] Advantageously, the capsule of the present invention may thus also present, a tapered outer edge around its back face. Besides ensuring a self-adjusting sealing fit around the liquid injection point when a corre-

K-FEE SYSTEM GMBH, EX2009, page 1741
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

sponding edge of a receptacle receiving the capsule presses against it, it transmits to the capsule the force pressing the first sealing surface against the abovementioned side opening of the infusion chamber. The capsule can thus be clamped between the tapered outer edge of the rim and the tapered outer edge of the back face.

[0016] A further object of the present invention is to facilitate the correct positioning of the capsule when placing it in the receptacle, and thus ensure the leak-tightness of at least said tapered outer edge of the rim.

[0017] Advantageously, the capsule of the present invention may thus also present on its rim, behind its tapered outer edge, a substantially cylindrical centring surface.

[0018] A further object of the present invention is to ensure the freshness of the dry infusible matter within the capsule.

[0019] Advantageously, the rim of the capsule of the present invention may thus also present a substantially flat front surface, and a freshness seal in the form of a foil fixed to said substantially flat front surface so as to close the capsule in a substantially gas-tight manner.

[0020] Even more advantageously, to preserve the freshness of the dry infusible matter, said capsule may contain the dry infusible matter in a substantially inert atmosphere.

[0021] Also more advantageously, to provide support for the filter wall, the envelope of the capsule may comprise, behind said rim, an inwards step presenting a substantially flat surface on which said filter wall is fixed.

[0022] It is a further object of the present invention to provide an effective filter wall for said capsule. Advantageously, said filter wall may thus be formed by a plastic mesh.

[0023] It is a further object of the present invention to provide a hygienic, taste-neutral, stable and inexpensive capsule. Advantageously, the capsule may thus be substantially made of a plastic material, which reduces the production costs, while providing a hygienic and taste-neutral container. By "plastic material" should be understood a polymer-based material, such as a thermoplastic polymeric material. Alternatively, any other material suitable for contact with hot drinks for human consumption could also be used.

[0024] Particularly advantageously, the capsule may be produced by injection moulding.

[0025] It is a further object of the present invention to provide an improved device for preparing infused beverages. The device for preparing infused beverages according to the invention also comprises an infusion chamber with a substantially vertical side opening to said receptacle, so as to be in fluid connection with said filter wall of the capsule when said capsule is in said receptacle, and an openable and closable bottom opening to allow an infused beverage to flow out of the chamber. The infusion chamber provides an enlarged volume with respect to the capsule for carrying out the infusion process, so that a whole serving can be prepared in one go without requiring serving-sized capsules. The substantially vertical opening between the infusion chamber and the capsule allows significant fluid exchange through natural convection during the infusion process, homogenising the infused beverage.

[0026] It is a further object of the present invention to provide a device that substantially prevents contamination of subsequent servings of infused beverage. For this purpose, said infusion chamber may preferably be made at least partially of a polyfluoride material, such as, for instance PTFE, FEP, or PFE.

[0027] It is a further object of the present invention to provide a device wherein the temperature of the receptacle remains significantly close to ambient temperature, regardless of prior use of the device. Advantageously, said receptacle may be arranged in a capsule carrier having a significantly open structure, so that the capsule carrier absorbs only a small fraction of the heat of the capsule during the infusion process.

[0028] Advantageously, the device may also comprise cleaning means for introducing a rinsing fluid into said infusion chamber. The infusion chamber can thus be cleaned, for instance after preparing each serving, thus preventing contamination of the following servings and ensuring their taste.

[0029] The present invention also relates to the combination of a capsule and a device according to the invention.

[0030] The present invention also relates to a method for preparing infused beverages, comprising the steps of introducing a capsule according to the invention into the receptacle of a device according to the invention; injecting an infusing liquid into said capsule and the infusion chamber through the liquid injection point of the capsule; infusing the infusing liquid with said infusible matter so as to produce an infused beverage; and discharging said infused beverage through said bottom opening after said infusion step.

[0031] Advantageously, the method according to the invention may further comprise a separate second step of injecting infusing liquid into said capsule during said infusion step in order to agitate the infusible matter so as to obtain a more homogeneous infusion. This will facilitate the diffusion of a higher density of infusion molecules from around the infusible matter into the rest of the infusing liquid, and also reactivate the diffusion of infusion molecules from the infusible matter into the infusing liquid.

[0032] Advantageously, the method according to the invention may further comprise a cleaning step wherein a rinsing fluid is introduced and discharged from said infusion chamber.

[0033] Advantageously, the method according to the invention may further comprise a step of removing said capsule from said receptacle after said infused beverage is discharged from said infusion chamber.

[0034] In particular, said cleaning step may follow said capsule removing step, and the device according to the

K-FEE SYSTEM GMBH, EX2009, page 1742
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

invention may comprise control means, such as, for example, an electronic circuit, for activating the capsule removing and cleaning steps in that order, and/or closing means, such as a lid, to close the abovementioned side opening during said cleaning step.

[0035] Several preferred embodiments of the invention will be described illustratively, but not restrictively, with reference to the accompanying figures, in which:

Fig. 1 is a longitudinal section through a prior art capsule in a device for preparing coffee;
Fig. 2a is a longitudinal section through a preferred embodiment of a capsule according to the invention, as it is being received in a receptacle in a corresponding device;
Fig. 2b is a detail view of the rim of the capsule of Fig. 2a;
Fig. 2c is a view of the capsule in use in said corresponding device; and
Fig. 3 is a flowchart representing a preferred embodiment of a method of preparing infused beverages according to the invention.

[0036] A preferred embodiment of the invention is illustrated in Fig. 2a. An infusible dry matter 101, such as tea leaves, is contained within a capsule 102 with a front face 103, and a back face 104. A rim 105 surrounds said front face 103, and a solid envelope 106 extends from the rim 105 to the back face 104, enclosing the contents of the capsule 102. Preferably, the capsule 102 may be rotationally symmetrical around a central axis 107. In the preferred embodiment, the capsule 102 is made of plastic material by injection moulding, conferring it favourable properties of hygiene, taste neutrality, and form stability at a low production price. However, production processes and materials suitable for contact with hot drinks for human consumption could also be used would be considered by the skilled person according to the circumstances. The capsule 102 may also comprise an external indication of its precise content, for instance a machine-readable code, such as a colour code, a bar code or an RFID code, for indicating the nature of the infusible matter or a set of appropriate parameters for its infusion, such as temperature, duration, etc.

[0037] The rim 105 of the capsule 102, which is illustrated in greater detail in Fig. 2b, presents a tapered outer edge 108. This tapered outer edge 108 thus forms a surface extending in an outwards and backwards direction front the front face 103 of the capsule. Behind this tapered outer edge 108, the rim 105 further presents a substantially cylindrical centring surface 109, whereas inwardly from the tapered outer edge 108 it presents a substantially flat front surface 110.

[0038] Before use, a freshness seal 111 formed by a foil fixed to said substantially flat front surface 110, closes the front face 103 of the capsule 102, so that its contents are isolated from the environment. The foil may be, for example, a metallized plastic foil heat-bonded to the substantially flat surface 110. As the interior of the capsule 102 is thus isolated from the environment in a substantially gas-tight manner, the infusible dry matter 101 within the capsule 102 may be preserved in a substantially inert atmosphere before use.

[0039] In the preferred embodiment, behind the rim 105, the solid envelope 105 forms an inwards step 112 presenting another substantially flat surface 113 to which is fixed a filter wall 114. This filter wall 114 may preferably be formed by a plastic mesh heat-bonded to said substantially flat surface 113. The filter wall 114 allows the flow of an infused liquid, while substantially blocking the passage of solid particles beyond a certain particle size.

[0040] In the illustrated preferred embodiment of the capsule 102, being injection-moulded, its back face 104 presents a plastic injection point 115 aligned with the central axis 107 of the capsule. Around this plastic injection point 115, an annular frangible region 116 is arranged for the injection of infusion liquid into the capsule. In this preferred embodiment, this frangible region 116 is characterised by a thinner wall than the rest of the capsule 102. However, it could alternatively take other forms such as, for instance, a region made of a weaker material, a precut orifice, eventually covered by a detachable or frangible lid, a non-reinforced area in a capsule presenting strengthening ribs or similar, and other alternatives readily available to the skilled person.

[0041] The back face 104 also presents an outer edge 117 oppositely tapered to the outer edge 108 of the front rim 105.

[0042] Fig. 2a represents the capsule 102 as it is being introduced in a receptacle 118 in a capsule carrier 119 in a device 120 for preparing infused beverages. The capsule carrier 119 has a substantially open structure with large lateral openings 121 for evacuating heat. The rim 122 of the receptacle 118, together with the substantially cylindrical centring surface 109 of the capsule 102 ensures that the capsule 102 is properly positioned. For this purpose, this rim 122 may also present an inwardly tapered surface (not illustrated).

[0043] The device 120 for preparing infused beverages is illustrated in use in Fig. 2c, and comprises, besides said capsule carrier 119, an infusion chamber 123, and infusion liquid injecting means 124 in the form of a hot water nozzle. The capsule carrier 119 is movably mounted in the device 120, so that, once the capsule 102 is in the receptacle 118, it can be displaced so as to place the front face 103 of the capsule 102 against a substantially vertical side opening 125 of said infusion chamber 123, as illustrated in Fig. 2c. The device 120 may also comprise a device for opening the freshness seal 111, for instance by slicing it open during the movement of the capsule carrier 119 towards the position illustrated in Fig. 2c.

[0044] Through the substantially vertical side opening 125, the infusion chamber 123 can thus be put in fluid connection with said front face 103 of the capsule 102. The infusion chamber 123 further comprises an openable

K-FEE SYSTEM GMBH, EX2009, page 1743
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

and closable bottom opening 127 to allow an infused beverage to flow out of the chamber 123. It may also be provided with an upper vent 128 to ensure a smooth discharge of said infused beverage.

[0045] In the illustrated position, a rear support 129 of the capsule carrier 119 pushes against the tapered outer edge 117 of the back face 104, so that the tapered outer edge 108 of the rim 105 is pressed against the edge 130 of the substantially vertical side opening 125 of said infusion chamber 123. The opposite tapers on the outer edges 108, 117 of, respectively, the rim 105 and the back face 104 ensure a self adjusting sealing fit on both sides. Since both the freshness seal 111 and the filter wall 114 are fixed to surfaces different from the tapered outer edge 108, they will not interfere with this seal. This tapered outer edge 108 is also less susceptible than a flat surface to surface damage such as bumps or scratches that could affect the leak-tightness of the seal.

[0046] To further ensure the leak-tightness of these seals, both said rear support 129 and said edge 130 may be provided with sealing elements, for instance in the form of the illustrated sealing O-rings 131, 132.

[0047] The device 120 also comprises cleaning means 133, in this particular embodiment in the form of a rinsing nozzle near the top of the infusion chamber 123, for introducing a rinsing fluid into said infusion chamber 123. This rinsing fluid may be, for instance, water or steam. In a preferred embodiment, in order to ensure that the flavour and taste of the infusion beverage is substantially removed from the infusion chamber 123, so as to prevent contaminating subsequently prepared infusion beverages, the infusion chamber 123 is realised in a material presenting a low surface adherence, such as a polyfluoride, for example PTFE, FEP, or PFE.

[0048] The preferred embodiment of the method for preparing infused beverages according to the invention is illustrated by the flowchart of Fig. 3. In a first step 301, the capsule 102 is introduced in the receptacle 118 of the capsule carrier 119 of the device 120 for preparing infused beverages, as illustrated in Fig. 2a. Then, in the following positioning step 302, the capsule carrier 119 is first moved so as to align the front face 103 of the capsule 102 with the substantially vertical side opening 125 of said infusion chamber 123. During this movement, an opening device slices open the freshness seal 111 of the capsule 102. Once the capsule 102 is aligned with the side opening 125 of the infusion chamber 123, it is pushed forward by the rear support 129 until the tapered edges 108, 117 are in liquid-tight engagement with, respectively, said edge 130 of the substantially vertical side opening 125, and said rear support 129. The frangible region 116 is pierced by the infusion liquid injecting means 124.

[0049] In the next step 303, a code reader reads an identification code, such as a colour code, on the capsule 102, and selects a corresponding infusion program. This is followed by a first injection step 304 in which infusion liquid is injected into the capsule 102 through the infusion liquid injecting means 124, wherein both the quantity and temperature of the infusion liquid injected in this first injection step are determined by the injection program.

[0050] The injection program also determines the duration of the following infusion step 305, as well as, in a parallel step 306, whether a second injection step 307 is to be performed during the infusion 305, the moment in time at which this second injection step 307 will be performed, and the quantity and temperature of the infusion liquid to be injected in this second injection step 307.

[0051] At the moment determined by the infusion program, the device 120 will then execute the step 308 of discharging the infused beverage through the bottom opening 127 of the infusion chamber 123.

[0052] Once the infused beverage is discharged, the capsule carrier 119 may be moved again to remove the used capsule 102 from the receptacle 118 in a removal step 309. This may be followed by a cleaning step 310 wherein a rinsing fluid is introduced into said infusion chamber 123 through said cleaning means 133 and subsequently discharged.

[0053] Although the present invention has been described with reference to specific exemplary embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader scope of the invention as set forth in the claims. For instance, the front surface 110 may receive both the freshness seal 111 and the filter wall 114 in a capsule 102 without an inwards step 112. Also, although the surfaces 110 and 113 are described as "substantially flat", they may present ridges or protrusions to facilitate the adhesion of freshness seal 111 and filter wall 114. Accordingly, the description and drawings are to be regarded in an illustrative sense rather than a restrictive sense.

Claims

1. Capsule (102) containing dry infusible matter (101) for preparing infused beverages, and comprising:

   - a front face (103) comprising a filter wall (114);
   - a rim (105) surrounding said front face (103);
   - a back face (104), substantially opposed to said front face (103), and comprising a frangible region (116) for the injection of infusing liquid; and
   - a solid envelope (106) between said rim (105) and said back face (104);

   and **characterised in that** said rim (105) presents a tapered outer edge (108).

2. Capsule (102) according to claim 1, wherein the back face (104) also presents a tapered outer edge (117).

3. Capsule (102) according to any one of the previous claims, wherein said rim (105) further presents, be-

K-FEE SYSTEM GMBH, EX2009, page 1744
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

hind its tapered outer edge (117), a substantially cylindrical centring surface (109).

4. Capsule (102) according to any one of the previous claims, wherein said rim (105) further presents a substantially flat front surface (110), said capsule further comprising a freshness seal (111) in the form of a foil fixed to said substantially flat front surface (110) so as to close the capsule (102) in a substantially gas-tight manner, and preferably containing the dry infusible matter in a substantially inert atmosphere..

5. Capsule (102) according to claim 4, wherein said solid envelope (106) comprises, behind said rim (105), an inwards step (112) presenting another substantially flat surface (113) on which said filter wall (114) is fixed.

6. Capsule (102) according to any one of the previous claims, wherein said filter wall (114) is formed by a plastic mesh.

7. Capsule (102) according to any one of the previous claims, substantially made of a plastic material, preferably injection moulded.

8. A device (120) for preparing infused beverages comprising:

- a receptacle (118) for receiving a capsule (102) according to any one of the previous claims, with the front face (103) in a substantially vertical position; and
- injecting means (124) for introducing an infusing liquid into said capsule (102) through said liquid injection point when said capsule is in said receptacle; and

characterised in that it also comprises an infusion chamber (123) with a substantially vertical side opening (125) to said receptacle (118), so as to be in fluid connection with said filter wall (114) of the capsule (102) when said capsule (102) is in said receptacle (118), and an openable and closable bottom opening (127) to allow an infused beverage to flow out of the infusion chamber (123).

9. A device (120) according to claim 8, wherein said infusion chamber (123) is at least partially made of a polyfluoride material, such as, for instance PTFE, FEP, or PFE.

10. A device (120) according to any one of claims 8 or 9, wherein said receptacle (118) is arranged in a capsule carrier (119) having a significantly open structure.

11. A device (120) according to any one of claims 8 to 10, further comprising cleaning means for introducing a rinsing fluid into said infusion chamber (123).

12. A device (120) according to any one of claims 8 to 11, with a capsule (102) according to any one of claims 1 to 7 within said receptacle (118).

13. A method for preparing infused beverages, comprising the steps of:

- introducing a capsule according to any one of claims 1 to 7 into the receptacle of a device according to any one of claims 8 to 11;
- injecting (301) an infusing liquid into said capsule (102) and the infusion chamber (123) through the frangible region (116) of the capsule (102);
- infusing (305) the infusing liquid with said infusible matter (101) so as to produce an infused beverage; and
- discharging (308) said infused beverage through said bottom opening (127) after said infusion step (305).

14. A method according to claim 13, further comprising a separate second step (307) of injecting infusing liquid into said capsule (102) during said infusion step (305) in order to agitate the infusible matter (101) so as to obtain a more homogeneous infusion.

15. A method according to any one of claims 13 or 14, further comprising a cleaning step (310) wherein a rinsing fluid is introduced and discharged from said infusion chamber (123).

16. A method according to any one of claims 13 to 15, further comprising a step (309) of removing said capsule (102) from said receptacle (118) after said infused beverage is discharged from said infusion chamber (123).

K-FEE SYSTEM GMBH, EX2009, page 1745
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

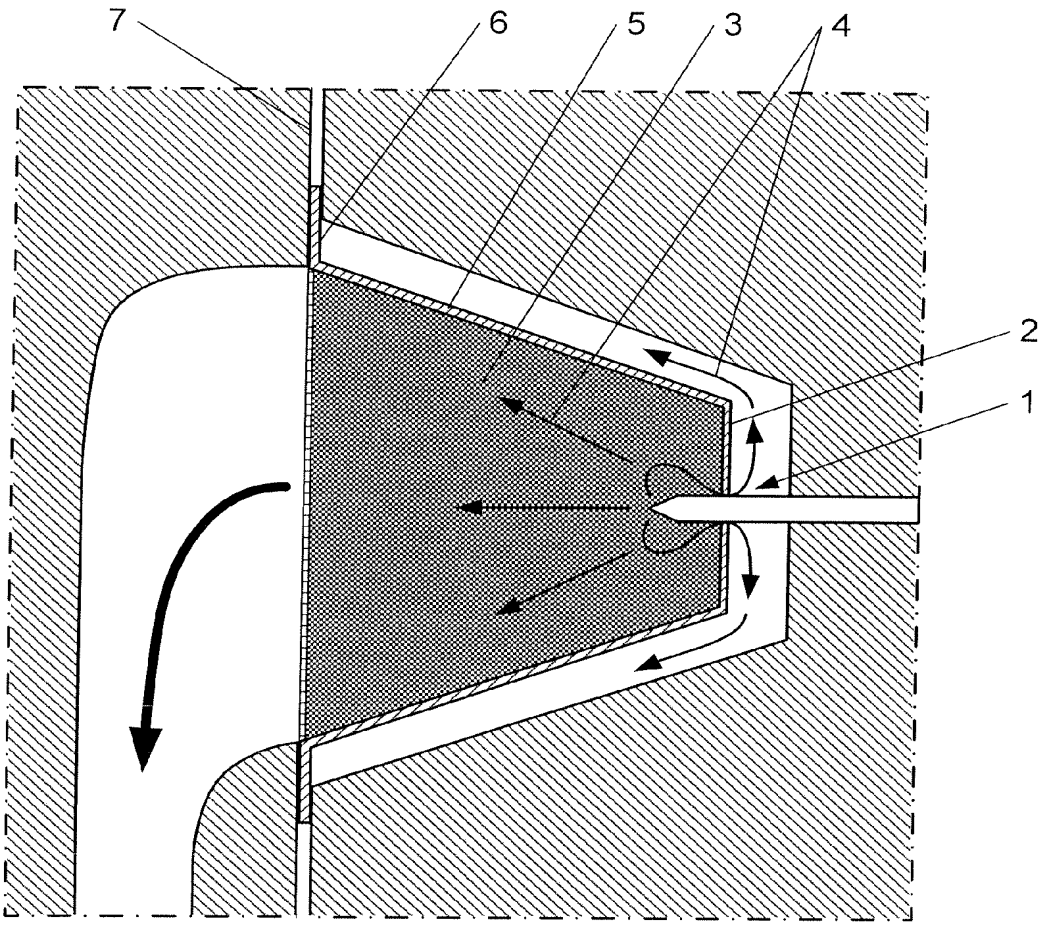


Fig. 1
(PRIOR ART)

K-FEE SYSTEM GMBH, EX2009, page 1746
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

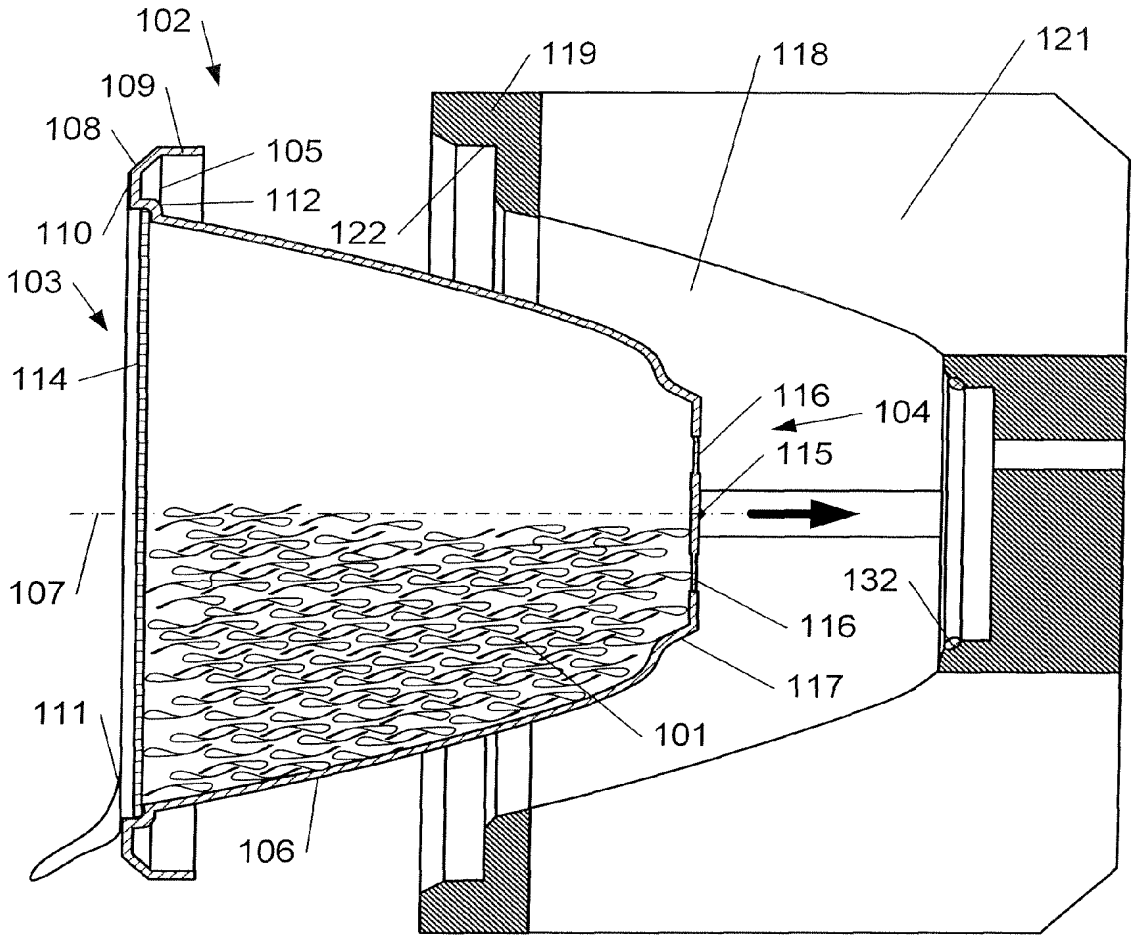


Fig. 2a

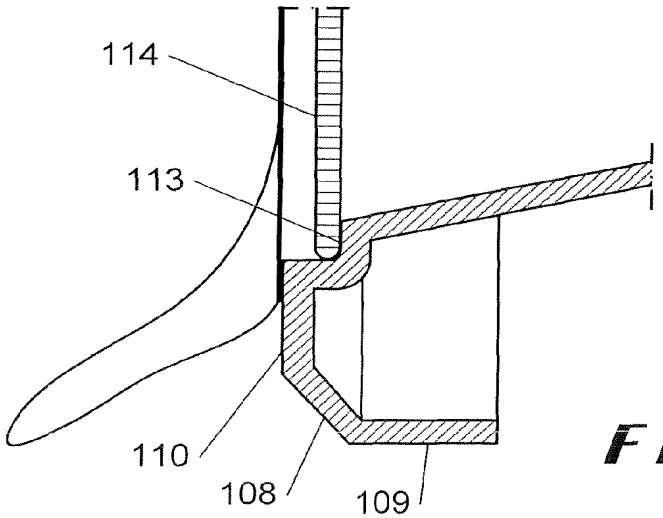


Fig. 2b

K-FEE SYSTEM GMBH, EX2009, page 1747
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

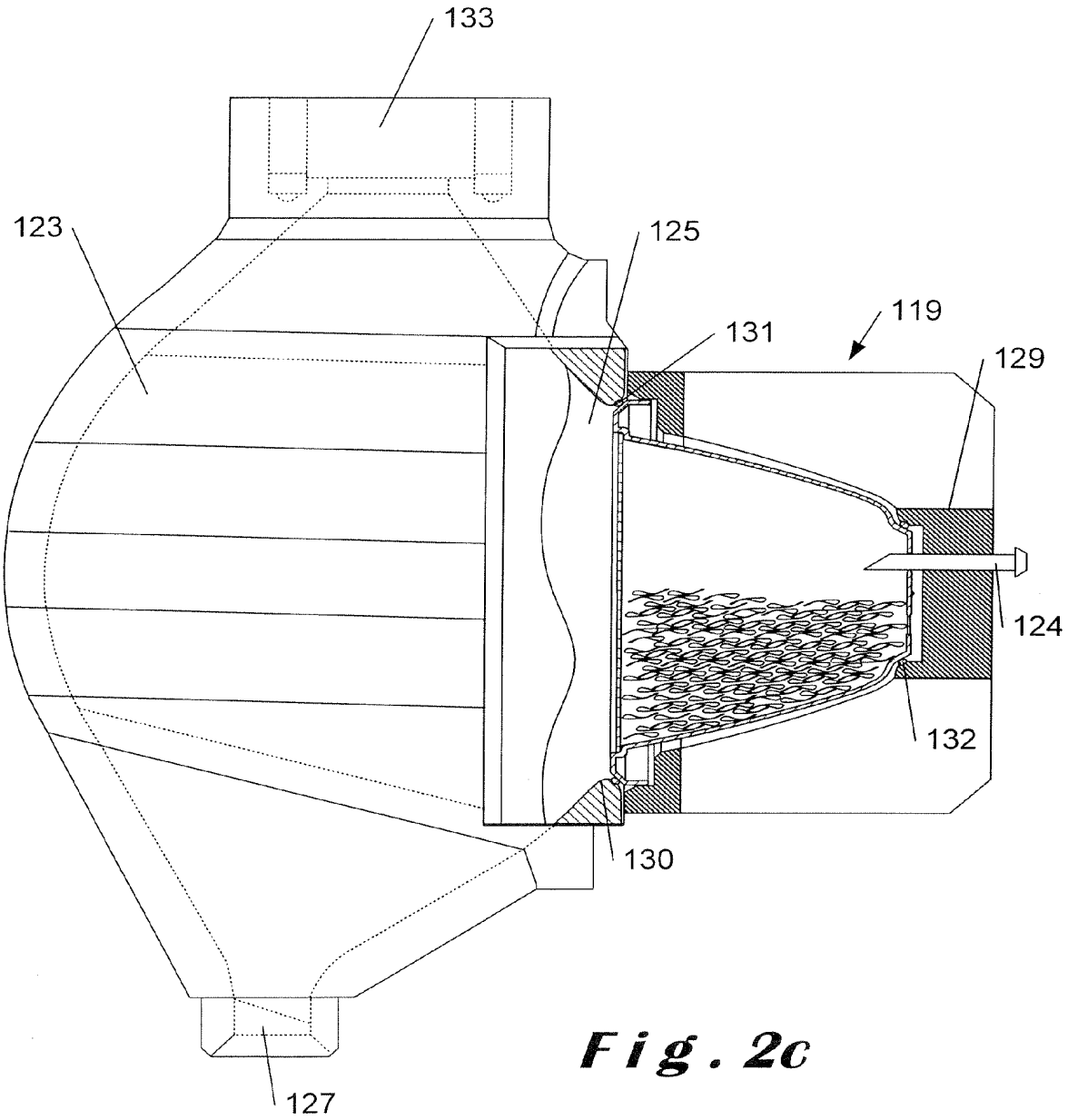


Fig. 2c

K-FEE SYSTEM GMBH, EX2009, page 1748
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

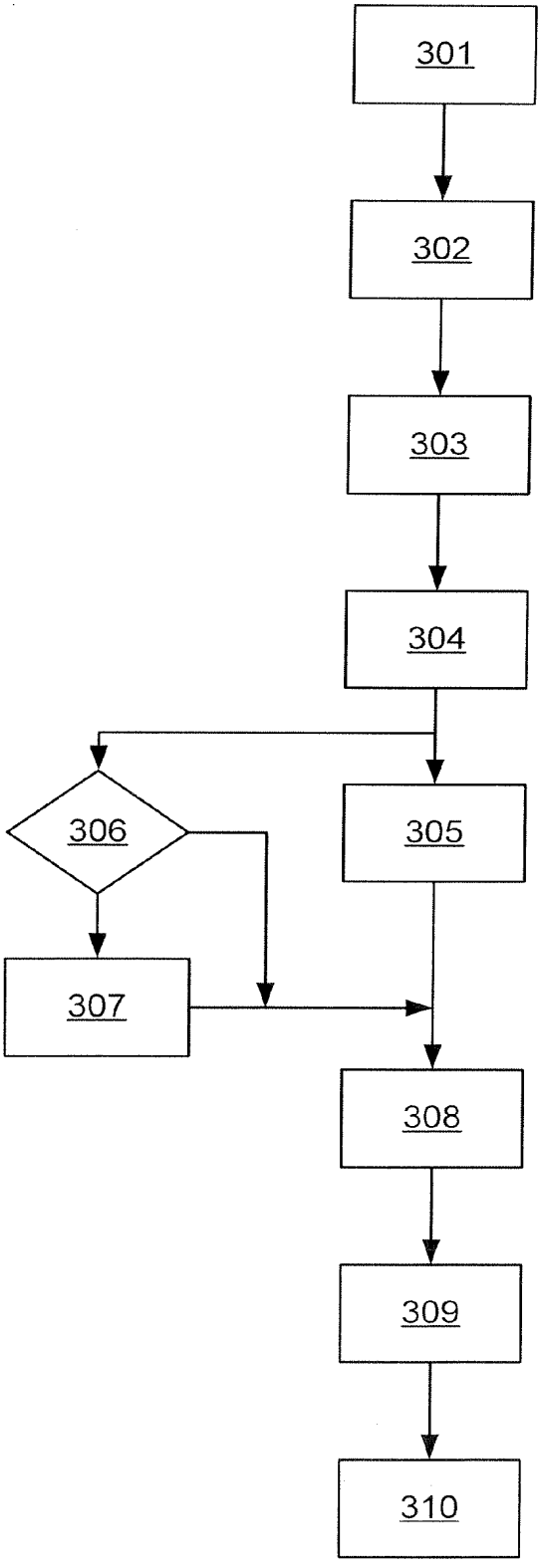


Fig. 3

K-FEE SYSTEM GMBH, EX2009, page 1749
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Europäisches Patentamt
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Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 16 3120

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	EP 1 929 904 A (NESTEC SA [CH]) 11 June 2008 (2008-06-11) * paragraphs [0001], [0002], [0029] * * paragraph [0039] - paragraph [0056] * * figures 2-4,10-12 * -----	1-7	INV. B65D85/804
X,D	WO 2007/122208 A (NESTEC SA [CH]; ABEGGLEN DANIEL [CH]; KAESER THOMAS [CH]; KOLLEP ALEXA) 1 November 2007 (2007-11-01) * page 12, line 10 - page 13, line 5 * * page 20, lines 27-30 * * figures 1-3 * -----	1-4	
A	EP 1 774 878 A (NESTEC SA [CH]) 18 April 2007 (2007-04-18) * the whole document * -----	1-7	

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 2009	Dick, Birgit

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

K-FEE SYSTEM GMBH, EX2009, page 1750
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 08 16 3120

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

K-FEE SYSTEM GMBH, EX2009, page 1751
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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European Patent Office
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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 08 16 3120

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7

   Capsule for the preparation of infused beverages comprising a rim with a tapered outer edge at the front face of the capsule.

   ---

2. claims: 8-16

   Device and method for the preparation of infused beverages.

K-FEE SYSTEM GMBH, EX2009, page 1752
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 16 3120

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-02-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		KR 20080078641 A	27-08-2008
		PT 1774878 E	19-02-2008
		SI 1774878 T1	30-04-2008

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

K-FEE SYSTEM GMBH, EX2009, page 1753
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

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- WO 2007137974 A **[0009]**
- WO 2007122208 A **[0009]**
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K-FEE SYSTEM GMBH, EX2009, page 1754
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

(12) UK Patent Application (19) GB (11) 2 259 078 (13) A

(43) Date of A publication 03.03.1993

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United Kingdom

(51) INT CL[5]
G09F 3/02, B65F 1/14, G06K 7/08 19/06

(52) UK CL (Edition L)
B8F FBC FBG
A4A AE
G4H HJ H13D H14D
U1S S1436 S1807

(56) Documents cited
DE 009011787 U **DE 008612623 U**

(58) Field of search
UK CL (Edition K) **A4A AE, B8F FBB FBC FBG FBX, G4H HJ**
INT CL[5] **B65F 1/14, G09F 3/02**
Online databases: WPI

(54) Synthetic refuse container with identification means; reading code stored therein

(57) The synthetic refuse container is provided with an identification means for storing an identification code, which identification means is formed by a series of metal strips (4) which are embedded in a synthetic material in or on a projecting edge (5) of the container. The identification code is then determined by the number and mutual position of the strips, in particular the presence or absence of a metal strip (4) on a number of predetermined positions. Apparatus for reading this identification code detects by means of magnetic fields whether there is a metal strip (4) on these predetermined positions or not. The code can thus be read automatically enabling automatic registration of the refuse.

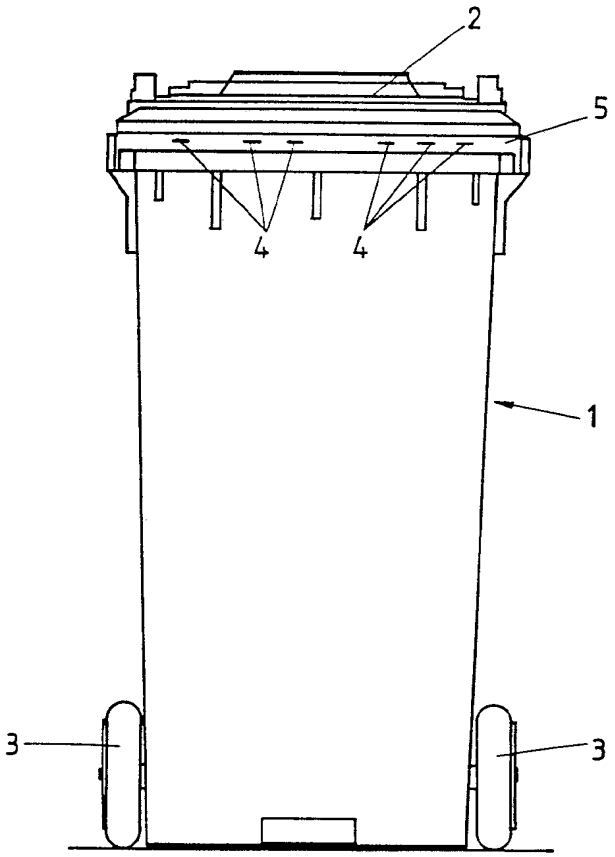


Fig.1

GB 2 259 078 A

K-FEE SYSTEM GMBH, EX2009, page 1755
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

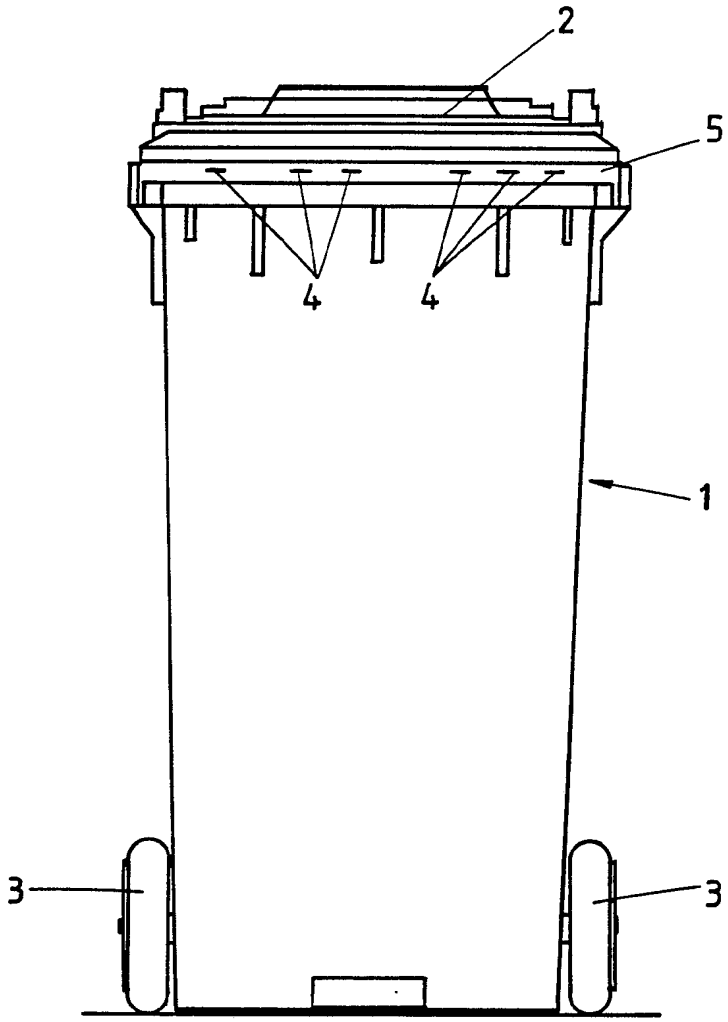


Fig.1

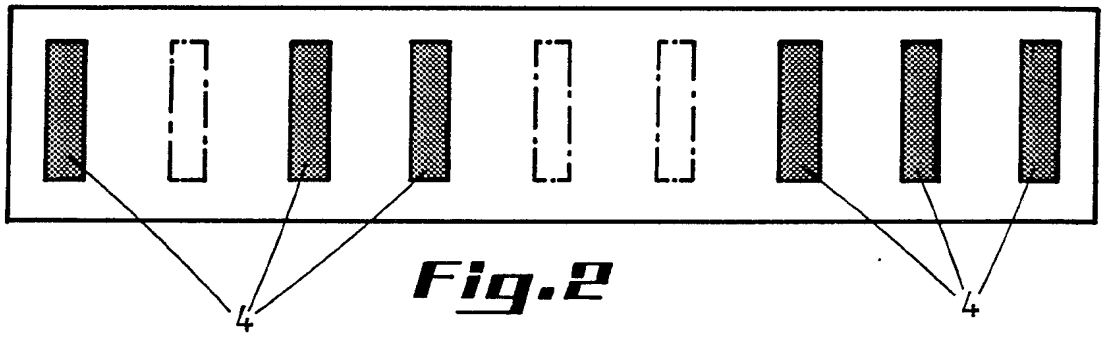


Fig.2

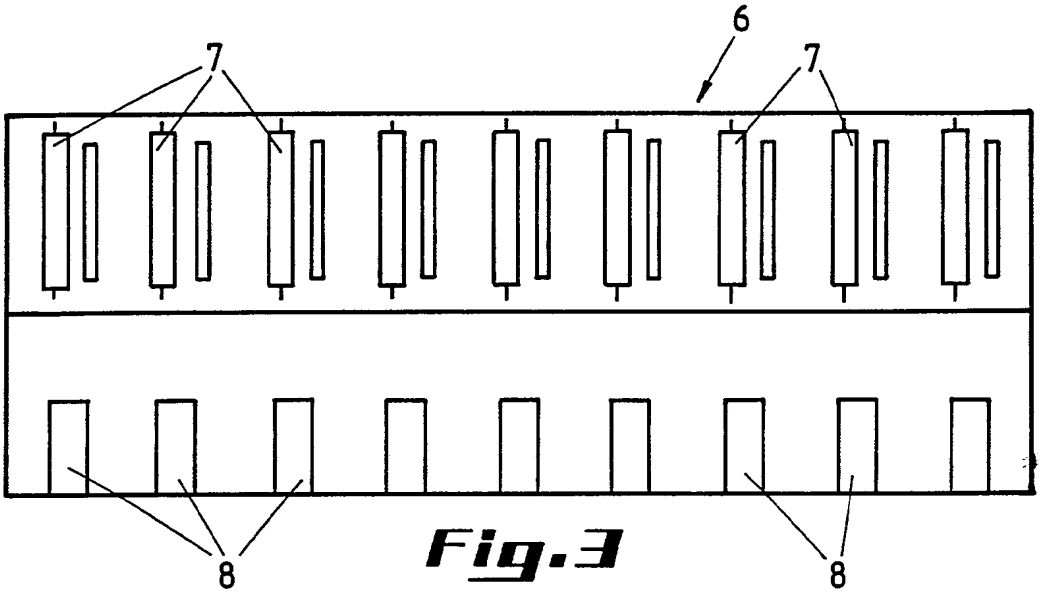


Fig.3

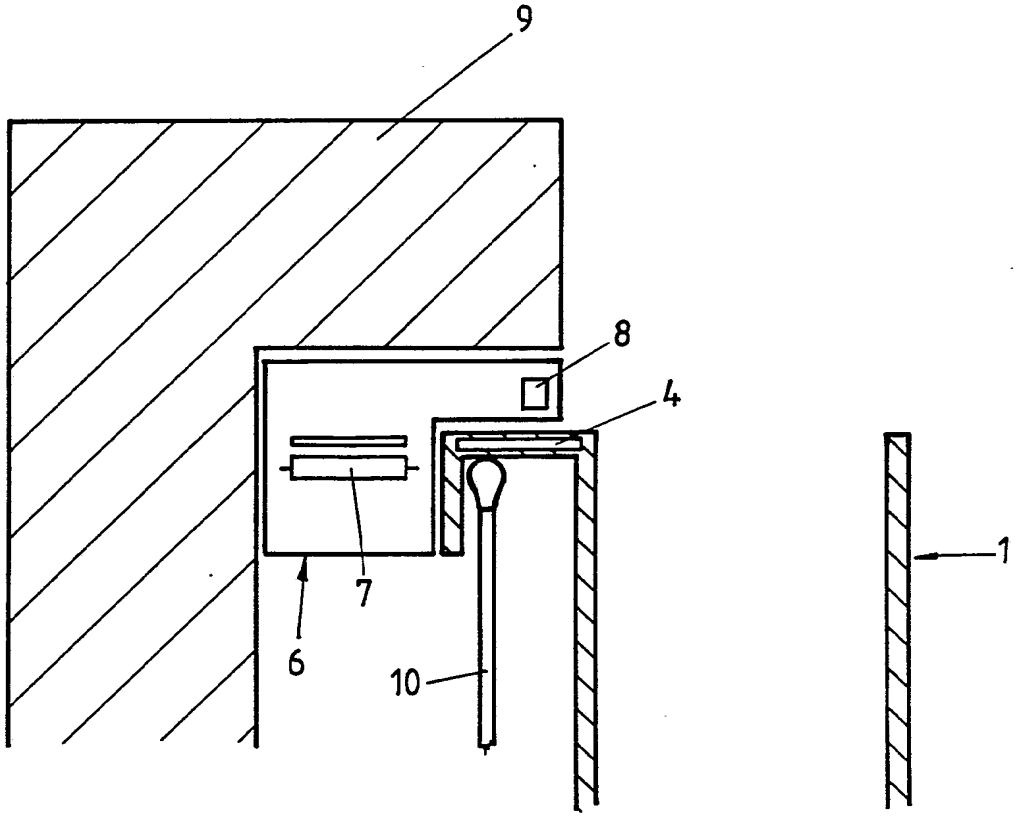


Fig.4

"Synthetic refuse container provided with an identification means and apparatus for reading the identification code stored therein"

The present invention relates to a synthetic refuse container provided with an identification means for storing an identification code in a manner such as to enable an automatic reading of this code.

Such a synthetic container is for example disclosed in the German utility model DE-U1-90 11 787.5. This known synthetic container is provided with a small identification sensor which is applied more particularly in a recess underneath the uppermost edge of the container. A drawback of such for example electronic sensors is that they are relatively expensive and that their life or the life of their energy source is limited. Moreover, it is relatively simple to put them out of order in order to disturb in this way the registration of the collected refuse.

A further synthetic container of the type defined in the preamble is disclosed in the German utility model DE-U1-86 12 623.7. In this known synthetic container, there is provided at the top in the wall of the container an identification element which can be read for example optically. However, it appeared already in practice that such an optical reading is not appropriate for use with refuse containers and this amongst others due to the dirt which accumulates on such containers and more particularly on the identification element and which disturbs in this way the reading. Moreover, it is clear that also the identification element of this type of refuse container can be put out of order relatively simple.

An object of the present invention is therefore to provide a synthetic refuse container provided with a simple and consequently cheap identification means which enables moreover an automatic read out of the identification code in a reliable way.

To this end, said identification means is formed by a series of metal strips which are embedded in a synthetic material and which are anchored to or in a projecting edge of the synthetic container, the identification code being determined by the mutual positions and the number of the metal strips. In particular, there are only a limited number of positions on the edge of the synthetic container where a metal strip may be present or not. The presence or absence of metal strips in these positions can be detected automatically in a simple and reliable way and is easy to convert into a binary code. Indeed, applying the metal strips in a projecting edge of the container offers the advantage that their presence can be determined by means of magnetic fields without any disturbance for example by metal objects which may be present in the container.

In a first particular embodiment of the synthetic container according to the invention, said series of metal strips are embedded in a synthetic plate which is fixed against said projecting edge. This embodiment offers the advantage that the identification means containing the identification code can be applied to previously manufactured containers or even to containers which have already been used.

In a second particular embodiment of the synthetic container according to the invention, said series of metal strips are embedded in the synthetic material of said projecting edge of the container, either because the metal strips were applied into the synthetic material as inserts during the moulding of the

container or because recesses were provided in the container during its production wherein a metal strip is either or not anchored afterwards for example by snapping and/or gluing.

In a preferred embodiment of the synthetic container according to the invention, it is provided with a sidewards projecting upper edge wherein said series of metal strips are embedded. This upper edge is used during emptying the container for lifting the latter mechanically. Since the metal strips can only be removed by destroying the upper edge, it is not possible to disturb the registration of the collected refuse. Indeed, a synthetic container with a destroyed upper edge can no longer be used for collecting refuse.

Preferably, the series of metal strips are distributed substantially over the entire length of said projecting edge. This characteristic contributes to a reliable read out of the identification code and this in particular under the rough circumstances wherein this read out is to be performed.

The invention further also relates to an apparatus for reading the identification code of the identification means of a synthetic container according to the invention, which apparatus comprises a read member and positioning means for positioning the read member with respect to the identification means, which read member is provided with presence detection means for detecting, after positioning, the presence of said metal strips on predetermined positions and for generating a first respectively a second signal in the presence respectively in the absence of a strip. The first signal can then for example be converted into a logic 1 whereas the second signal is converted into a logic 0 so that a binary code is obtained in this way. This binary code forms then for example an address for a memory location in a memory wherein all kinds of data

are stored such as the identity of the user and wherein further data such as the collected amount of refuse can also be stored automatically during each collection.

The read apparatus according to the invention enables to read the identification code of the synthetic container in a reliable manner under the rough circumstances when emptying the container due to the fact that said presence detection means comprise at least one element for generating a magnetic field on said predetermined positions at a first extremity of the metal strips and at least one sensor disposed on a predetermined distance from said element for measuring the magnetic field generated by said element near the other extremity of the metal strips and for generating the first signal in the presence of a magnetic field with a predetermined minimum field intensity which is only obtained if a metal strip is present on the concerned predetermined position so as to conduct the generated magnetic field.

Further particularities and advantages of the invention will become apparent from the following description of a synthetic container and of a read apparatus according to the invention. This description is only given by way of example and does not limit the scope of the present invention. The reference numerals relate to the annexed drawings wherein :

Figure 1 represents a front view of a synthetic container for household refuse according to the invention;

Figure 2 represents schematically a top plan view of a part of the uppermost edge of the container of Figure 1;

Figure 3 represents schematically the read member of a read apparatus according to the invention; and

Figure 4 represents schematically a cross sectional view of the uppermost edge of the container according to Figure 1 which is caught between the loader of a refuse truck, which loader is provided with a read apparatus according to Figure 3.

In the different figures, the same reference numerals relate to the same or analogous elements.

In the present society, the problem of the increasing amount of refuse continues to become bigger and bigger. In order to solve this problem, there is sought already for some considerable time to collect as much as possible of the produced refuse in separate fractions, a number of which can be processed again into useful raw materials. In this way, it is possible to compost separately collected organic refuse while new raw materials can be made from other refuse materials such as old metals, paper and cardboard, textile, glass, etc.

However, in order to obtain a sufficient result, the population has to be stimulated to separate the produced refuse and to put it into separate refuse containers. An effective means hereto consists for example in registering the amount of household refuse which can not be recycled and in introducing a payment system on the basis of this amount. Recyclable refuse would then be collected for example for nothing. Such a system requires however a reliable and automatic registration of the collected household refuse. A problem in this respect is that no system is known up to now which enables an automatic identification of the refuse containers in a reliable way. It has already been proposed to apply a bar code onto the refuse containers but these bar codes appeared to be an insufficiently reliable system when applied to refuse containers.

Figure 1 shows a refuse container 1 according to the invention and provided with a lid 2 and two wheels 3. It will be clear that these refuse containers can have all kinds of different shapes, either or not with wheels, so that the general shape of the containers will not be described further.

Essential to the invention is the identification means provided on the container for storing an identification code. This identification means is formed according to the invention by a series of metal strips 4 which are embedded in synthetic material and which are anchored to or in a projecting edge of the synthetic container 1. The identification code is then determined by the mutual positions and the number of the metal strips 4. The metal strips 4 of the container represented in Figure 1 are moulded in the foremost upper edge 5 of the container 1.

Figure 2 represents a top plan view of this edge. On the represented edge 5, there are provided nine predetermined positions either or not provided with a metal strip 4. In this case, a nine bits code is formed by the metal strips, the presence of a strip on one of said predetermined positions corresponding for example to a logic 1 value whereas the absence of a metal strip on such a predetermined position corresponds then to a logic 0 value. The use of nine predetermined positions results in 512 different identification codes. In an effective embodiment there are provided 24 predetermined positions for metal strips, 20 of which are for example used to determine the identification code (1.048.576 possible different codes) and the remaining four positions for indicating other instructions (16 possible different instructions). A possible instruction is for example the choice of the compartment of the refuse truck when a refuse truck containing different compartments for different kinds of

refuse is used. This choice can then be made also automatically.

In order to simplify the automatic detection of the metal strips, they have a minimum length of 20 mm, a minimum width of 4 mm and a minimum thickness of 0.5 mm. When there is provided every 2 cm a position for a metal strip 4, it is possible to provide the hereabove described 24 positions for metal strips even onto small containers having a foremost upper edge with a length of 48 cm.

Figure 3 shows schematically the read member 6 of a read apparatus for reading the identification code, in particular from the identification means represented in Figure 2, of a synthetic container 1 according to the invention. In addition to this read member 6, the read apparatus according to the invention comprises further positioning means for positioning the read member with respect to the identification means, which positioning means are not shown in the figures. These positioning means are formed for example in a simple embodiment of the invention by mechanical means which have to be pressed around an uppermost corner of the container in order to position the read member exactly above the identification means. Electronic positioning means are however also possible.

The read member 6 according to the invention is provided with presence detection means for detecting, after positioning, the presence of metal strips on the hereabove already mentioned predetermined positions and for generating in the presence respectively in the absence of a strip on these positions a first respectively a second signal. These signals correspond then for example respectively to a logic 1 or a logic 0 in such a manner that a binary number attached to the container is obtained, which number is transmitted through an input/output interface to a computer system.

This system stores the number which has been put in for example in a memory or transmits it to a central computer. The number can further also form entirely or partially an address for addressing a memory location where data about the owner of the container are stored. It is further also possible to measure other data such as the weight of the refuse and to store them into a memory location linked to the read out number.

The detection is realized in the read apparatus according to the invention by means of magnetic or electromagnetic fields. The presence detection means comprise then, when magnetic fields are used, at least one element 7 for generating on said predetermined positions a magnetic field and at least one sensor 8 disposed on a predetermined distance from this element for generating the first signal upon detection of a magnetic field with a predetermined minimum field intensity. In Figure 3, there is provided for each of the nine predetermined positions an element 7 and a sensor 8 in the read member 6. The elements 7 are for example composed of coils wherein a magnetic field is generated by means of an electric current. The intensity of this magnetic field is chosen in such a manner that said minimum field intensity is not obtained near the sensor 8 without the presence of a metal strip between the element 7 and the sensor 8. The elements 7 and the sensors 8 are further disposed in such a manner with respect to one another that, after positioning of the read member 6, and in the presence of a metal strip 4, the field lines of the generated magnetic field are concentrated in this strip 4 and are directed hereby further to the sensor 8 in such a manner that said minimum field intensity is reached on the contrary in this case near the sensor 8.

Possible suited sensors are for example reed-relays, hall-generators, magnetic field sensitive resistances and magnetic probes.

For a detection by means of electromagnetic fields, use is for example made of an inductive proximity switch. Such a switch is put for example on the market by Télémécanique under type XS 1/N 18 PA349. An inductive proximity switch comprises mainly an oscillator which generates an electromagnetic field. When a metal strip is placed in that electromagnetic field, the Foucault currents created in the strip form an additional load so that the oscillation stops. This stopping of the oscillation is detected and will result in the formation of the first signal. The presence of a metal strip can therefore be detected by means of such a proximity switch. This can be done by determining the intensity of the electromagnetic field generated by the oscillator. Indeed when the oscillator stops, the field disappears also.

The read apparatus according to the invention can be a portable apparatus which is positioned manually onto the container but preferably this apparatus is mounted on the loader of the refuse truck. In Figure 4, the read member 6 of the read apparatus is mounted for example against the clamp 9 of a so-called seat loader in such a manner that when the container 1 is clamped with its uppermost edge 5 between the hook 10 and the clamp 9, and pushed for example with a corner against positioning means which are not represented in the figures, the elements 7 are situated on one end of the metal strips 4 whereas the sensors 8 are disposed above the other end of these strips.

In order to prevent the magnetic field of one element 7 from disturbing the detection of the magnetic field of an adjoining element 7, the detection is performed preferably in two or more series in such a

manner that two adjoining elements 7 are not activated simultaneously.

The elements 7 do not necessarily have to be coils but use can possibly also be made of permanent magnets which are mounted movably in the read member 6.

As represented in the figures, the metal strips 4 are preferably anchored fixedly in the upper edge 5 of the container or possibly in another sidewards projecting edge which is situated at a lower level. In this way, the magnetic field generated by the elements 7 is not influenced by metal objects which may possibly be present in the container. In order to simplify the detection, the metal strips are directed in the represented embodiment at right angles to the front wall of the container and are disposed substantially parallel to one another. It is however also possible to apply the metal strips in the foremost vertical portions of the uppermost edge 5.

In the embodiment represented in Figure 4, the metal strips 4 are anchored to the container 1 because they were applied during the moulding process as inserts in the uppermost edge 5 of the container, for example on a distance of about 2 mm from the uppermost side of the edge 5. Even under such a synthetic layer, for example HDPE, the strips can still be detected by means of a magnetic or electromagnetic field. It is also possible to provide recesses in the edge 5 of the container 1 during the moulding process wherein there is snapped and/or glued afterwards a metal strip 4 or not.

In a not represented variant embodiment, the series of metal strips 4 is moulded first in a synthetic plate, for example of HDPE. These synthetic plates are fixed then onto already manufactured containers or even onto containers which have already been used, for example by gluing in such a manner that they can no longer be removed from the container.

According to the invention, the metal strips or rods are preferably made of a soft magnetic material which has a high magnetic permeability and which demagnetizes quickly. Examples of such metals are transformer tin, Si-steel (4.5 % Si) having a low carbon content, so-called "Permalloy" containing 78 % Nickel and so-called "Mumetal" having a content of 75 % Ni.

The hereabove described container with identification means offers the advantage that the code stored in the identification means can be read automatically in a very reliable way, even when the container is dirty on the outside. The cost price of the identification means is low per container. Further, it is almost impossible to damage this identification means without damaging also the container.

Finally, it will be clear that the invention is not limited to the hereabove described embodiments but that these embodiments can be modified in many ways amongst others with respect to the shape, the content and the synthetic material of the container without leaving the scope of the present invention.

CLAIMS

1. A synthetic refuse container provided with an identification means for storing an identification code in a manner such as to enable an automatic reading of this code, characterized in that said identification means is formed by a series of metal strips (4) which are embedded in a synthetic material and which are anchored to or in a projecting edge (5) of the synthetic container (1), the identification code being determined by the mutual positions and the number of the metal strips (4).

2. A synthetic container according to claim 1, characterized in that said series of metal strips (4) are embedded in a synthetic plate which is fixed against said projecting edge (5).

3. A synthetic container according to claim 1, characterized in that said series of metal strips (4) are embedded in the synthetic material of said projecting edge (5) of the container (1).

4. A synthetic container according to any one of the claims 1 to 3, characterized in that it is provided with a sidewards projecting upper edge (5) wherein said series of metal strips (4) are embedded.

5. A synthetic container according to any one of the claims 1 to 4, characterized in that said series of metal strips (4) are disposed substantially over the entire length of said projecting edge (5).

6. A synthetic container according to any one of the claims 1 to 5, characterized in that said metal strips (4) are disposed substantially at right angles to a wall of the synthetic container (1).

7. A synthetic container according to any one of the claims 1 to 6, characterized in that said metal strips (4) are substantially parallel to one another.

8. A synthetic container according to any one of the claims 1 to 7, characterized in that said metal strips (4) are made of a soft magnetic material.

9. A synthetic container according to any one of the claims 1 to 8, characterized in that said metal strips (4) have a minimum length of 20 mm, a minimum width of 4 mm and a minimum thickness of 0.5 mm.

10. An apparatus for reading the identification code of an identification means of a synthetic container according to any one of the claims 1 to 9, which apparatus comprises a read member (6) and positioning means for positioning the read member (6) with respect to the identification means, which read member (6) is provided with presence detection means (7, 8) for detecting, after positioning, the presence of said metal strips (4) on predetermined positions and for generating a first respectively a second signal in the presence respectively in the absence of a strip, characterized in that said presence detection means comprise at least one element (7) for generating a magnetic field on said predetermined positions at a first extremity of the metal strips and at least one sensor (8) disposed on a predetermined distance from said element (7) for measuring the magnetic field generated by said element near the other extremity of the metal strips and for generating the first signal in the presence of a magnetic field with a predetermined minimum field intensity which is only obtained if a metal strip (4) is present on the concerned predetermined position so as to conduct the generated magnetic field.

11. An apparatus for reading the identification code of an identification means of a synthetic container according to any one of the claims 1 to 9, which apparatus comprises a read member (6) and positioning means for positioning the read member (6)

with respect to the identification means, which read member (6) is provided with presence detection means (7, 8) for detecting, after positioning, the presence of said metal strips (4) on predetermined positions and for generating a first respectively a second signal in the presence respectively in the absence of a strip, characterized in that said presence detection means comprise at least one element for generating an electromagnetic field on said predetermined positions and determining the intensity of said electromagnetic field and for generating the first respectively the second signal if said intensity of the electromagnetic field is situated under respectively above a predetermined threshold value.

12. An apparatus according to claim 11, characterized in that said element comprises an induction switch provided with a Foucault current sensitive oscillator.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
GB 9218093.4

Relevant Technical fields

(i) UK Cl (Edition K) A4A (AE), B8F (FBB, FBC, FBG, FBX), G4H (HJ)

(ii) Int Cl (Edition 5) B65F 1/14, G09F 3/02

Search Examiner
S R SMITH

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Date of Search
23 OCTOBER 1992

Documents considered relevant following a search in respect of claims 1-9

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	DE 9011787 U1 (SCHAFER)	
A	DE 8612623 U1 (PONTECH)	

K-FEE SYSTEM GMBH, EX2009, page 1772
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Category	Identity of document and relevant passages	Relevant to claim(s)

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(54) ASSEMBLY, PACKAGE AND APPARATUS FOR PREPARING A BEVERAGE

ANORDNUNG, PACKUNG UND GERÄT ZUR ZUBEREITUNG EINES GETRÄNKS

ENSEMBLE, EMBALLAGE ET APPAREIL POUR LA PRÉPARATION D'UNE BOISSON

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K-FEE SYSTEM GMBH, EX2009, page 1774
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Description

[0001] The invention firstly relates to an apparatus for preparing a beverage. Known apparatus of such type use a package comprising a concentrate for preparing a beverage, and the apparatus receives therein said package, opens the package and leads its contents into a mixing chamber in which the beverage is prepared by mixing the concentrate with water. The prepared beverage then is dispensed through a dispensing channel into a receptacle.

[0002] It is an object of the present invention to provide a novel assembly for preparing a beverage.

[0003] Thus, in accordance with the present invention, there is provided an apparatus according to the main claim.

[0004] Because of the position of the package rupturing means within the concentrate discharge channel without effectively protruding therefrom into the recess, the risk of an unintentional rupturing of the package or the risk of injuries to a user of the apparatus is minimized. Only when the package is pressurized sufficiently by the pressure means, it can deform such (due to its flexible nature) that it contacts the package rupturing means such that these can rupture the package as a result of which its contents (the concentrate) flows through the concentrate discharge channel towards the mixing chamber. The material of which the package is made should be flexible enough to allow such a deformation/bulging out. It is within the reach of persons skilled in the relevant art to chose such materials which are available on the market.

[0005] It is noted that the phrase "in a manner as not to protrude effectively into the recess" tries to express that it is within the scope of the present invention that the package rupturing means project slightly from the concentrate discharge channel, however not sufficiently far for rupturing the package or for injuring a user.

[0006] In an embodiment of the apparatus according to the present invention the package rupturing means do not protrude at all into the recess (and the package will bulge out into the concentrate discharge channel when pressurized by the pressure means).

[0007] Such an embodiment offers the best protection against unintentionally rupturing the package or against injuries.

[0008] When, in accordance with another embodiment of the apparatus according to the invention, the concentrate discharge channel is provided in a lower wall of the recess, the outflow of concentrate, once the package is ruptured by the package rupturing means, is aided by gravity.

[0009] Such an outflow of the concentrate, but also an effective operation of the package rupturing means, then may be optimized when, in accordance with yet another embodiment of the apparatus according to the invention, the concentrate discharge channel and the package rupturing means extend substantially vertically.

[0010] The package rupturing means should be effective in rupturing the package, preferably without the need for excessive high pressures by the pressure means. For example such package rupturing means may comprise a knife (of which the cutting edge is directed towards the recess). In a very effective embodiment of such package rupturing means the knife comprises two crossing knife blades. For example said crossing knife blades may define four inwardly inclined cutting edges for defining a central raised cutting point. Such a knife realises a cross-like cut with four flaps which easily open for the outflow of the concentrate.

[0011] In a very user-friendly embodiment of the apparatus according to the invention, the apparatus comprises package loading means for loading the package into the recess. Such package loading means are adapted to automatically position the package correctly in the recess. But also such loading means may be used for unloading or discharging a package when emptied by the pressure means.

[0012] For example, such package loading means may comprise drive wheels for engaging the package. These drive wheels may be controlled by sensors sensing the presence of a package.

[0013] It is noted, however, that also manually loading the package into the recess is within the scope of the present invention. Likewise, other loading means may be provided, for example a movable tray in accordance with a disc tray of a personal computer.

[0014] In yet another embodiment of the apparatus according to the present invention the apparatus comprises markings reading means (for reading markings provided on the package).

[0015] For example such markings and markings reading means may cooperate for at least one of the following purposes: checking the correct position of the package in the recess and based thereon allowing or preventing the operation of the apparatus; checking the nature of the package and based thereon allowing or preventing the operation of the apparatus; providing information about the package and its contents (for example taste, mixing ratio, expiration date).

[0016] Checking the correct position of the package in the recess may be needed to avoid a malfunction of the apparatus (for example spilling concentrate). Checking the nature of the package also may comprise checking the origin of the package. When the package comes from a non-authorized source the markings reading means may notify such to a control means which then prevents an operation of the apparatus. Providing information about the package may be helpful to a user of the package/apparatus.

[0017] For example the markings comprise, among others, any of: a bar code, rf-chip and a pattern of holes. Correspondingly, of course, the markings reading means then may comprise a bar code reader, a rf-receiver, a hole pattern scanner, or alike.

[0018] For avoiding an outflow of concentrate other

K-FEE SYSTEM GMBH, EX2009, page 1775
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

than through the concentrate discharge channel, the apparatus according to the present invention may comprise sealing means surrounding the concentrate discharge channel. Such sealing means, e.g. a rubber ring encircling the mouth of the concentrate discharge channel, will effectively engage the package when latter is pressurized by the pressure means.

[0019] When, in accordance with another embodiment of the apparatus according to the present invention, the recess and/or mixing chamber are defined in removable inserts of the apparatus, these parts can be removed easily for cleansing purposes (for which, moreover, it may be necessary that at least the mixing chamber may be opened for accessing its interior). It is noted that, basically, the recess and mixing chamber (and interconnecting concentrate discharge channel) are the only parts which will come in contact with the concentrate and thus are the only parts which need a thorough cleansing.

[0020] Secondly the present invention relates to an assembly comprising a concentrate containing package and an apparatus according to the present invention. referring to the drawings, in which

Figure 1 shows, schematically, a top plan view of an embodiment of a package according to the present invention;
figure 2 shows, schematically, a partial top plan view of an embodiment of an apparatus according to the present invention;
figure 3 shows, schematically, a side elevational view of the apparatus of figure 2;
figure 4 shows a top plan view with the package partially received in the apparatus;
figure 5 shows a side elevational view of the situation according to figure 4;
figure 6 shows a top plan view with the package completely housed in the apparatus;
figure 7 shows a side elevational view of the situation of figure 6;
figure 8 shows a side elevational view corresponding to figure 7, however with the pressure means partially engaging the package;
figure 9 also shows a side elevational view corresponding to figure 7, however with the pressure means fully engaging the package;
figure 10 show a side elevational view corresponding to figure 7, after retraction of the pressure means;
figure 11 shows a top plan view of the package and apparatus during removal of the package from the apparatus, and
figure 12 shows a side elevational view of the situation of figure 11.

[0021] Figure 1 shows a package which, in combination with an apparatus to be described hereafter, is used for preparing a beverage. In the illustrated embodiment the package is substantially rectangular or square having a circumferential sealing edge 2 and a central pouch 3 for receiving therein a concentrate for preparing a beverage. The package may be defined by two sheets of material sealed to each other at the sealing edge and defining between central parts the pouch 3. Further figure 1 illustrates a barcode 4 imprinted upon the sealing edge 2 and two holes 5 in the sealing edge 2.

[0022] Referring to figures 2 and 3, an apparatus for use with the package 1 is illustrated schematically. It is noted, that only those parts of the apparatus have been illustrated which are necessary for understanding the present invention. Other components (such as for example drive means for moving parts of the apparatus) have not been illustrated, but are within the reach of a person skilled in the pertinent art.

[0023] The apparatus comprises a recess 6 for at least partially receiving the package 1 (especially the pouch 3 of the package), a concentrate discharge channel 7 debouching in said recess 6 and connecting to a mixing chamber 8 and movable pressure means 9 for pressurizing the package. It is noted that said pressure means have not been illustrated in fig 2 or any other of the following top plan views (figs 4,6,11).

[0024] Further loading means 10 for loading the package 1 into the recess 6 (and unloading it therefrom) are provided, as well as a barcode reader 11 and scanning means 12.

[0025] The shape of the recess 6 will be adopted to the shape of the (pouch 4 of the) package 1 in an unloaded rest position. Likewise the shape of the lower part of the pressure means 9 corresponds with the shape of the recess 6. The concentrate discharge channel is provided in a lower wall of the recess 6 and extends substantially vertically.

[0026] In the present embodiment, the loading means 10 are shaped as toothed drive wheels for securely engaging the package 1, especially the sealing edge 2 thereof.

[0027] The bar code reader 11 will read the bar code 4 when the package 1 enters the recess 6. The scanning means 12 will cooperate with the holes 5 in the sealing edge 2 of the package 1 to determine whether or not the package 1 is in a correct position.

[0028] Within the concentrate discharge channel 7 package rupturing means 13 are positioned which, in the illustrated embodiment, are shaped as a knife comprising two crossing knife blades (see figure 2). This knife 13 is positioned such in the concentrate discharge channel 7 that it does not protrude into the recess 6 (see figure 3).

[0029] The apparatus operates in the following manner for preparing a beverage using the package 1:

[0030] As illustrated in figures 4 and 5 a package 1 enters the apparatus and is gripped by the drive wheels 10 which engage the sealing edge 2 of the package 1. Sensors (not illustrated) may be present to detect a package 1 and to automatically activate the drive wheels 10. The pressure means 9 (for example a die movable upwards and downwards by means of an appropriate drive means not illustrated) is in an upper position.

K-FEE SYSTEM GMBH, EX2009, page 1776
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

[0031] Although, as illustrated, loading the package 1 into the recess 6 occurs automatically by means of the drive wheels 10, it also might be possible to use an embodiment in which the package 1 is positioned into the recess 6 manually.

[0032] Figures 6 and 7 show a situation, in which the package 1 with its pouch 3 is positioned correctly in the recess 6. Such a correct positioning is determined by the scanning means 12 which in such a correct position are aligned with the holes 5 in the sealing edge 2 of the package 1.

[0033] When such a correct positioning of the package 1 has been determined, the pressure means 9 is lowered, as illustrated in figure 8. As a result of lowering the pressure means 9, the package 1 is pressurized such that the part of the package 1 positioned just above the concentrate discharge channel 7 bulges out into this channel and engages knife 13. Thus knife 13 ruptures the package 1 and the contents thereof (concentrate) is free to flow into the concentrate discharge channel 7.

[0034] During this process a sealing means 14 (for example a rubber ring) surrounding the concentrate discharge channel 7 avoids that concentrate flow into the recess 6 instead of through the concentrate discharge channel.

[0035] When the package 1 has been ruptured by the knife 13, a further downward movement of the pressure means 9 (figure 9) pushes the entire volume of concentrate out of the pouch 3 of the package 1 (the pouch is flattened), into the concentrate discharge channel 7 and towards the mixing chamber 8. An inlet 15 supplies water to the mixing chamber 8 such that the concentrate together with the water prepares the requested beverage which then leaves the mixing chamber 8 through an appropriate outlet 16.

[0036] The water may be supplied by the inlet 15 tangentially into the mixing chamber 8 creating a swirl for effectively mixing the concentrate with the water.

[0037] Figure 10 shows a situation, in which the pouch 3 of the package 1 is fully emptied (and flattened) and in which the pressure means 9 is retracted upwardly.

[0038] Finally, as illustrated in figures 11 and 12, the drive wheels 10 are activated again and the empty package 1 is removed from the apparatus. The apparatus now is ready for receiving a next package 1.

[0039] The invention is limited to the embodiments described before, which may be varied widely within the scope of the invention as defined by the appending claims. For example, the apparatus may comprise control means for enabling its operation (such as for example automatically activating the loading means for loading and unloading the package, automatically activating the pressure means, etcetera).

Claims

1. Apparatus for preparing a beverage using a concentrate containing package, comprising a recess (6) for receiving said package, a mixing chamber (8) for mixing the concentrate with water and a concentrate discharge channel (7) debouching in said recess (6) and connecting to said mixing chamber (8), and means (9) for pressurizing the package, wherein package rupturing means (13) are positoned in said concentrate discharge channel, **characterised in that** the means (9) are movable pressure means for externally pressurizing the package and wherein the rupturing means (13) are positioned in a manner as not to protrude effectively into the recess (6).

2. Apparatus according to claim 1, wherein the package rupturing means (13) do not protrude at all into the recess (6).

3. Apparatus according to claim 1 or 2, wherein the concentrate discharge channel (7) is provided in a lower wall of the recess (6).

4. Apparatus according to claim 3, wherein the concentrate discharge channel (7) and the package rupturing means (13) extend substantially vertically.

5. Apparatus according to any of the claims 1-4, wherein the package rupturing means (13) comprise a knife.

6. Apparatus according to claim 5, wherein the knife comprises two crossing knife blades.

7. Apparatus according to any of the claims 1-6, comprising package loading means (10) for loading the package (1) into the recess (1).

8. Apparatus according to claim 7, wherein the package loading means (10) comprise drive wheels for engaging the package.

9. Apparatus according to any of the claims 1-8, wherein the apparatus comprises reading means (11) for markings (4) provided on the package.

10. Apparatus according to claim 9, wherein the markings reading means (11) operate for at least one of the following purposes: checking the correct position of the package in the recess and based thereon allowing or preventing the operation of the apparatus; checking the nature of the package and based thereon allowing or preventing the operation of the apparatus; providing information about the package and its contents (for example taste, mixing ratio, expiration date).

11. Apparatus according to any of the claims 1- 10, comprising sealing means (14) surrounding the concentrate discharge channel (7).

K-FEE SYSTEM GMBH, EX2009, page 1777
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

12. Apparatus according to any of the claims 1-11, wherein the recess (6) and/or mixing chamber (8) are defined in removable inserts of the apparatus.

13. Assembly for preparing a beverage, comprising a concentrate containing package (1) and an apparatus according to any of the previous claims for receiving the package and for preparing a beverage with the concentrate, wherein the package is sufficiently flexible as to bulge out locally towards the concentrate discharge channel (7) and into contact with the package rupturing means (13) when pressurized by the pressure means (9)

14. Assembly according to claim 13, wherein the package (1) is provided with markings (4) and wherein the apparatus comprises markings reading means (11).

15. Assembly according to claim 14, wherein the markings (4) comprise, among others, any of: a bar code, rf-chip and a pattern of holes.

Patentansprüche

1. Vorrichtung zum Zubereiten eines Getränks mittels einer ein Konzentrat enthaltenden Verpackung, aufweisend eine Aussparung (6) zum Aufnehmen der Verpackung, eine Mischkammer (8) zum Mischen konzentrats mit Wasser, und einen Konzentrat-Ableitungskanal (7), der in die Aussparung (6) mündet und mit der Mischkammer (8) verbunden ist, und Mittel (9) zum Unter-Druck-Setzen der Verpackung, wobei Verpackungs-Aufreißmittel (13) in dem Konzentrat-Ableitungskanal angeordnet sind, **dadurch gekennzeichnet, dass** die Mittel (9) bewegbare Druckmittel zum externen Unter-Druck-Setzen der Verpackung sind, und wobei die Aufreißmittel (13) derart angeordnet sind, dass sie nicht effektiv in die Aussparung (6) hineinragen.

2. Vorrichtung- gemäß Anspruch 1, wobei die Verpakkungx-Aufreißmittel (13) überhaupt nicht in die Aussparung (6) hineinragen.

3. Vorrichtung gemäß Anspruch 1 oder 2, wobei der Konzentrat-Ableitungskanal (7) in einer unteren Wand der Aussparung (6) vorgesehen ist.

4. Vorrichtung Anspruch 3, wobei der Konzentratleitungskanal (7) und die Verpackungs-Aufreißmittel (13) sich im Wesentlichen vertikal erstrecken.

5. Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 4, wobei die Verpackungs-Aufreißmittel (13) ein Messer aufweisen.

6. Vorrichtung gemäß Anspruch 5, wobei das Messer (13) zwei sich kreuzende Messerklingen aufweist.

7. Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 6, aufweisend Verpackungs-Lademittel (10) zum Laden der Verpackung (1) in die Aussparung (6).

8. Vorrichtung Anspruch 7, wobei die Verpackungs-Lademittel (10) Antriebsräder für einen Eingriff mit der Verpackung aufweisen.

9. Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 8, wobei die Vorrichtung Lesemittel (11) für auf der Verpackung vorgesehene Markierungen (4) aufweist.

10. Vorrichtung gemäß Anspruch 9, wobei die Markierung-Lesemittel (11) zu mindestens einem der folgenden Zwecke funktionieren: Prüfen der korrekten Position der Verpackung in der Aussparung und, basierend darauf, Zulassen oder Verhindern betätigung der Vorrichtung, Prüfen der Art der Verpackung und, basierend darauf, Zulassen oder Verhindert der Betätigung der Vorrichtung, Bereitstellen von Informationen über die Verpakkung und ihre Inhalte (zum Beispiel Geschmack, Mischverhältnis, Ablaufdatum).

11. Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 10, aufweisend Dichtungsmittel (14), die den Konzentrat-Ableitungskanal (7) umgeben.

12. Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 11, wobei die Aussparung (6) und/oder die Mischkammer (8) in lösbaren Einsätzen der Vorrichtung definiert sind.

13. Einrichtung zum Zubereiten eines Getränks, aufweisend eine ein Konzentrat enthaltende Verpackung (1) und eine Vorrichtung gemäß irgendeinem der vorhergehenden Ansprüche zum Aufnehmen verpackung und zum Zubereiten eines Getränks mit dem Konzentrat, wobei die Verpackung ausreichend flexibel ist, um sich lokal in Richtung zu dem Konzentrat-Ableitungskanal (7) und in Kontakt mit den Verpackungs-Aufreißmitteln (13) vorzuwölben, wenn sie durch die Druckmittel (9) unter Druck gesetzt wird.

14. Einrichtung gemäß Anspruch 13, wobei die Verpakkung (1) mit Markierungen (4) versehen ist, und wobei die Vorrichtung Markierungs-Lesemittel (11) aufweist.

15. Einrichtung gemäß Anspruch 14, wobei die Markierungen (4) unter anderem irgendeines von einem Strichcode, einem RF-Chip und einem Muster von Löchern aufweisen.

K-FEE SYSTEM GMBH, EX2009, page 1778
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Revendications

1. Appareil permettant de préparer une boisson à l'aide d'un contenant on concentré, comprenant un évidement (6) permettant de recevoir ledit emballage, une chambre de mélange (8) permettant de mélanger le concentré avec de l'eau et un canal d'évacuation de concentré (7) débouchant dans ledit évidement (6) et relié à ladite chambre de mélange (8), et des moyens (9) permettant de mettre l'emballage sous pression, dans lequel des moyens de rupture d'emballage (13) sont positionnés dans ledit canal d'évacuation de concentré ; **caractérisé en ce que** les moyens (9) sont des moyens de pression mobiles permettant de mettre sous pression de façon externe l'emballage et dans lequel les moyens de rupture (13) sont positionnés de manière à ne pas faire saillie effectivement dans l'évidement (6).

2. Appareil selon la revendication 1, dans lequel les moyens de rupture d'emballage (13) ne font pas du tout saillie dans l'évidement (6).

3. Appareil selon la revendication 1 ou 2, dans lequel le canal d'évacuation de concentré (7) est disposé dans une paroi inférieure de l'évidement (6).

4. Appareil selon la revendication 3, dans lequel le canal d'évacuation de concentré (7) et les moyens de rupture d'emballage (13) s'étendent sensiblement verticalement.

5. Appareil selon l'une quelconque des revendications 1 à 4, dans lequel les moyens de rupture d'emballage (13) comprennent un couteau.

6. Appareil selon la revendication 5, dans lequel le couteau (13) comprend deux lames de couteau se croisant.

7. Appareil selon l'une quelconque des revendications 1 à 6, comprenant des moyens de chargement d'emballage (10) permettant de charger l'emballage (1) dans l'évidement (6).

8. Appareil selon la revendication 7, dans lequel les moyens de chargement d'emballage (10) comprennent des roues d'entraînement permettant de venir en contact avec l'emballage.

9. Appareil selon l'une quelconque des revendications 1 à 8, dans lequel l'appareil comprend des moyens de lecture (11) pour des marquages (4) disposés sur l'emballage.

10. Appareil selon la revendication 9, dans lequel les moyens de lecture de marquage (11) fonctionnent dans au moins un des buts suivants : vérifier la position correcte de l'emballage dans l'évidement et d'après cela, permettre ou empêcher le fonctionnement de l'appareil ; vérifier la nature de l'emballage et d'après cela permettre ou empêcher le fonctionnement de l'appareil fournir des informations relatives à l'emballage et à son contenu (par exemple le goût, le rapport de mélange, la date d'expiration).

11. Appareil selon l'une quelconque des revendications 1 à 10, comprenant des moyens de scellement (14) entourant le canal d'évacuation de concentré (7).

12. Appareil selon l'une quelconque des revendications 1 à 11, dans lequel l'évidement (6) et/ou la chambre de mélange (8) sont définis dans des inserts amovibles de l'appareil.

13. Ensemble permettant de préparer une boisson, comprenant un emballage contenant un concentré (1) et un appareil selon l'une quelconque des revendications précédentes permettant de recevoir l'emballage et de préparer une boisson avec le concentre, dans l'emballage est suffisamment flexible pour se renfler localement vers le canal d'évacuation de concentré (7) et venir en contact avec les moyens de rupture d'emballage (13) lorsqu'il est mis sous pression par les moyens de pression (9).

14. Ensemble selon la revendication 13, dans lequel l'emballage (1) est pourvu de marquages (4) et dans lequel l'appareîl comprend des moyens de lecture de marquages (11).

15. Ensemble selon la revendication 14, dans lequel les marquages (4) comprennent, entre autres, l'un quelconque des éléments suivants : un code-barres, une puce radiofréquence et un motif de trous.

K-FEE SYSTEM GMBH, EX2009, page 1779
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

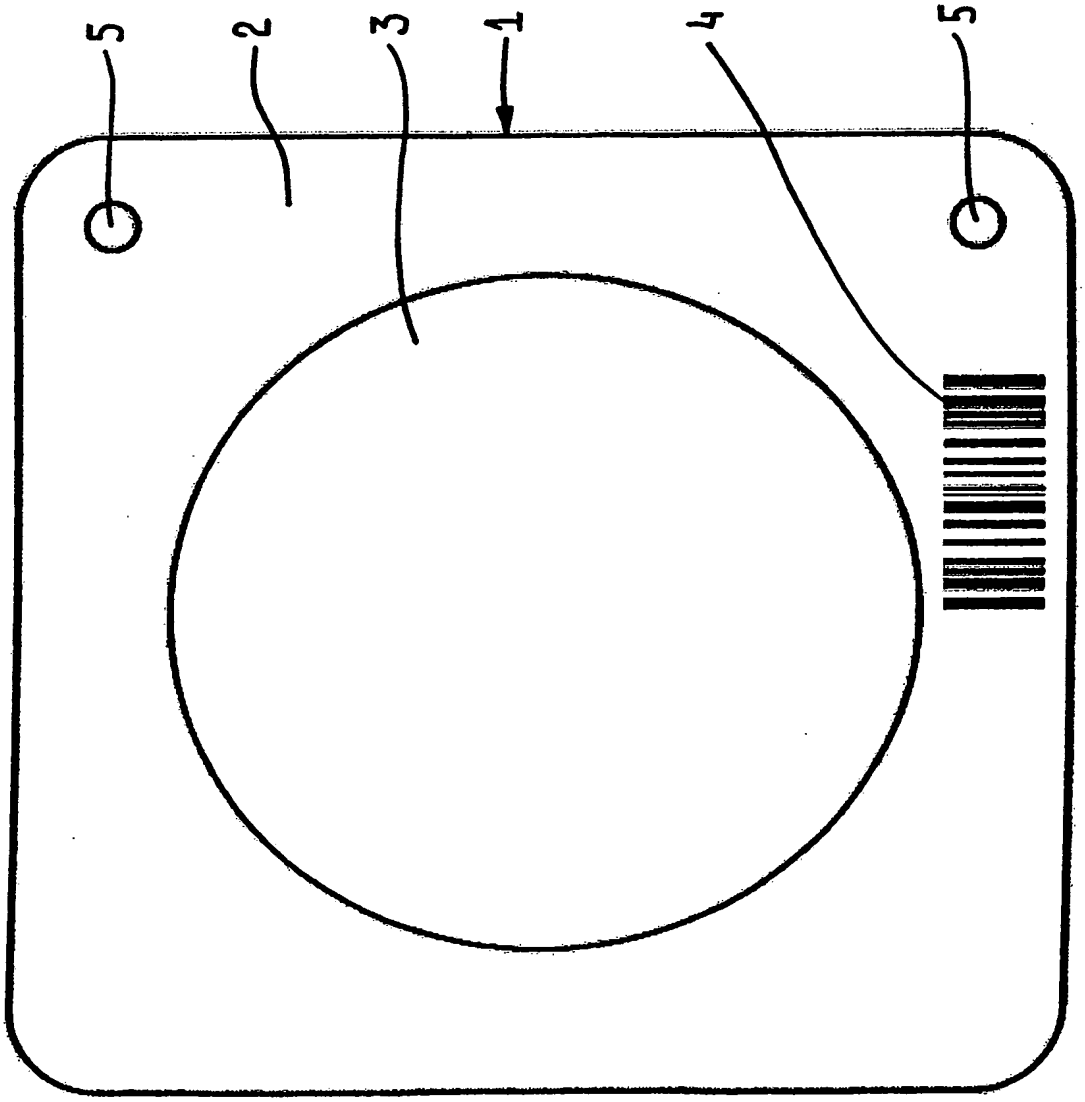


Fig.1

K-FEE SYSTEM GMBH, EX2009, page 1780
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

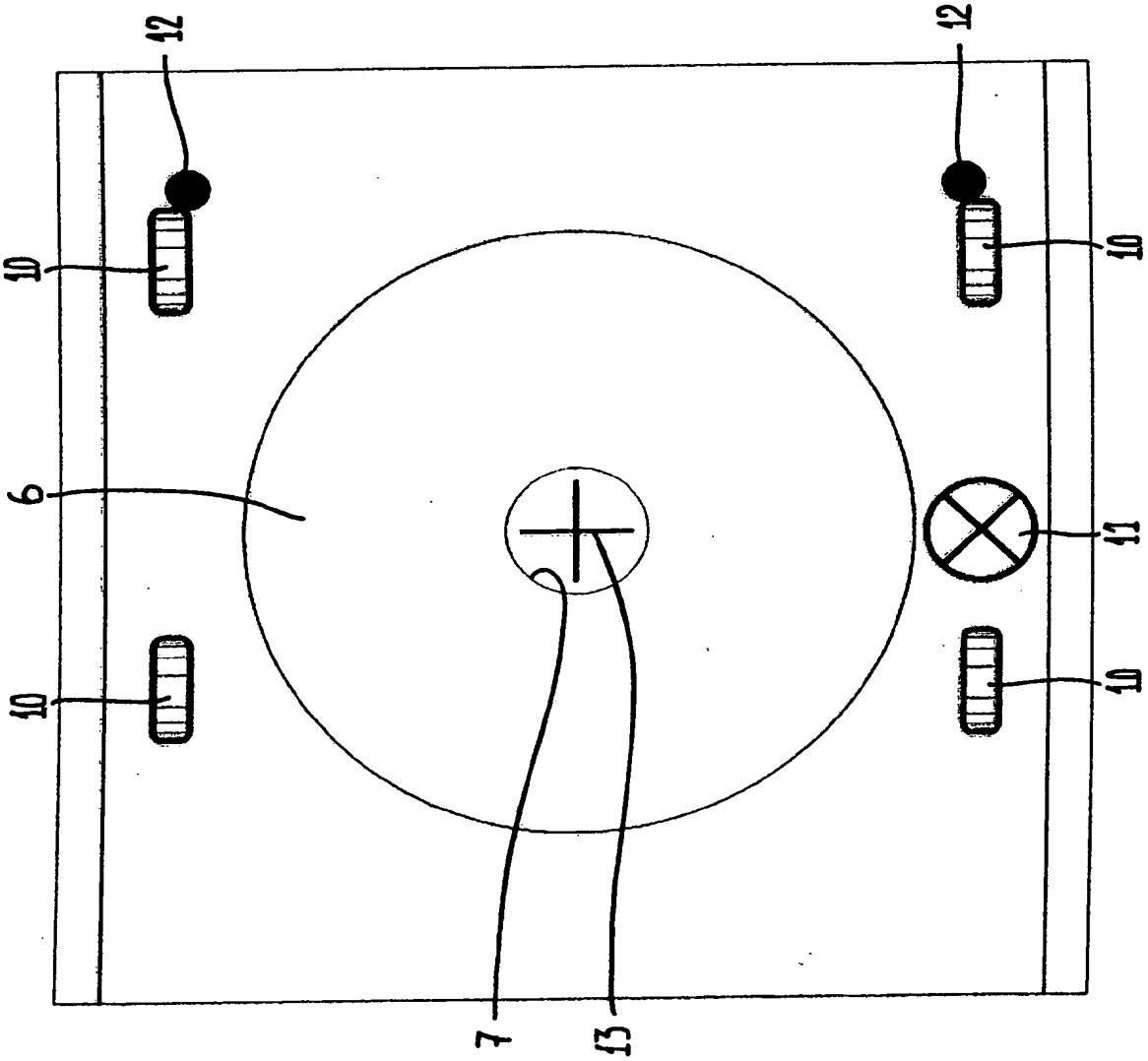


Fig.2

K-FEE SYSTEM GMBH, EX2009, page 1781
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

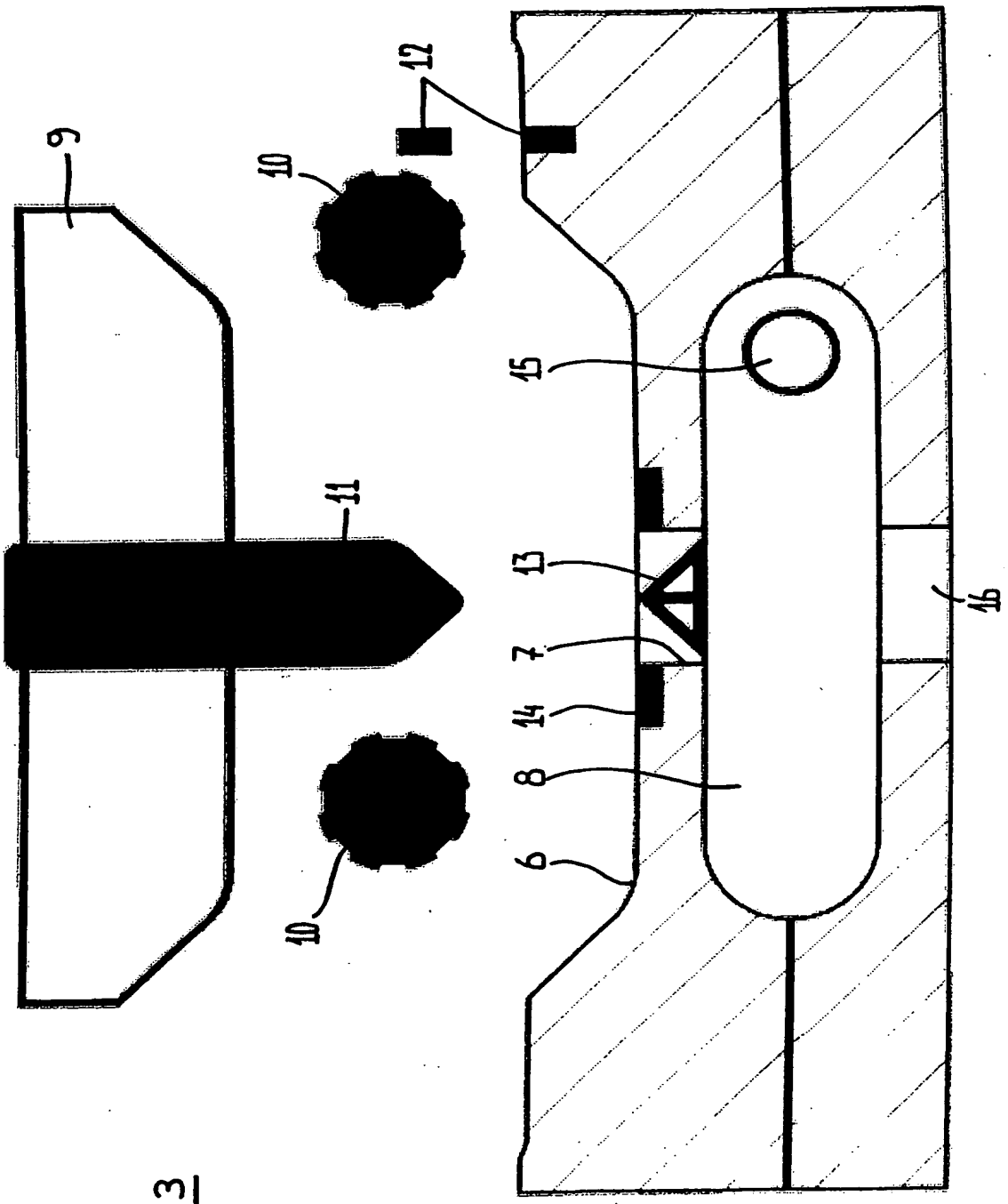


Fig.3

K-FEE SYSTEM GMBH, EX2009, page 1782
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

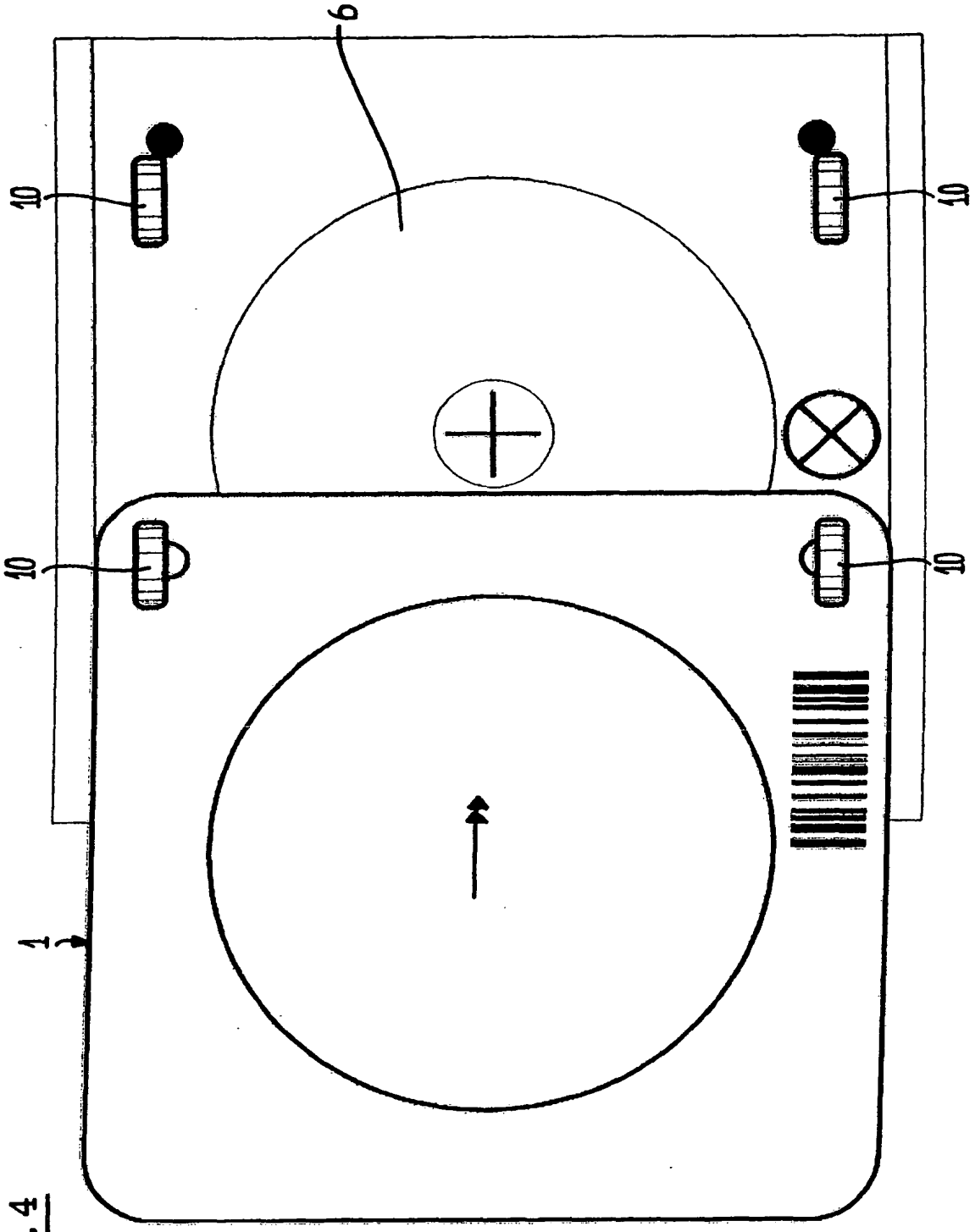


Fig.4

K-FEE SYSTEM GMBH, EX2009, page 1783
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

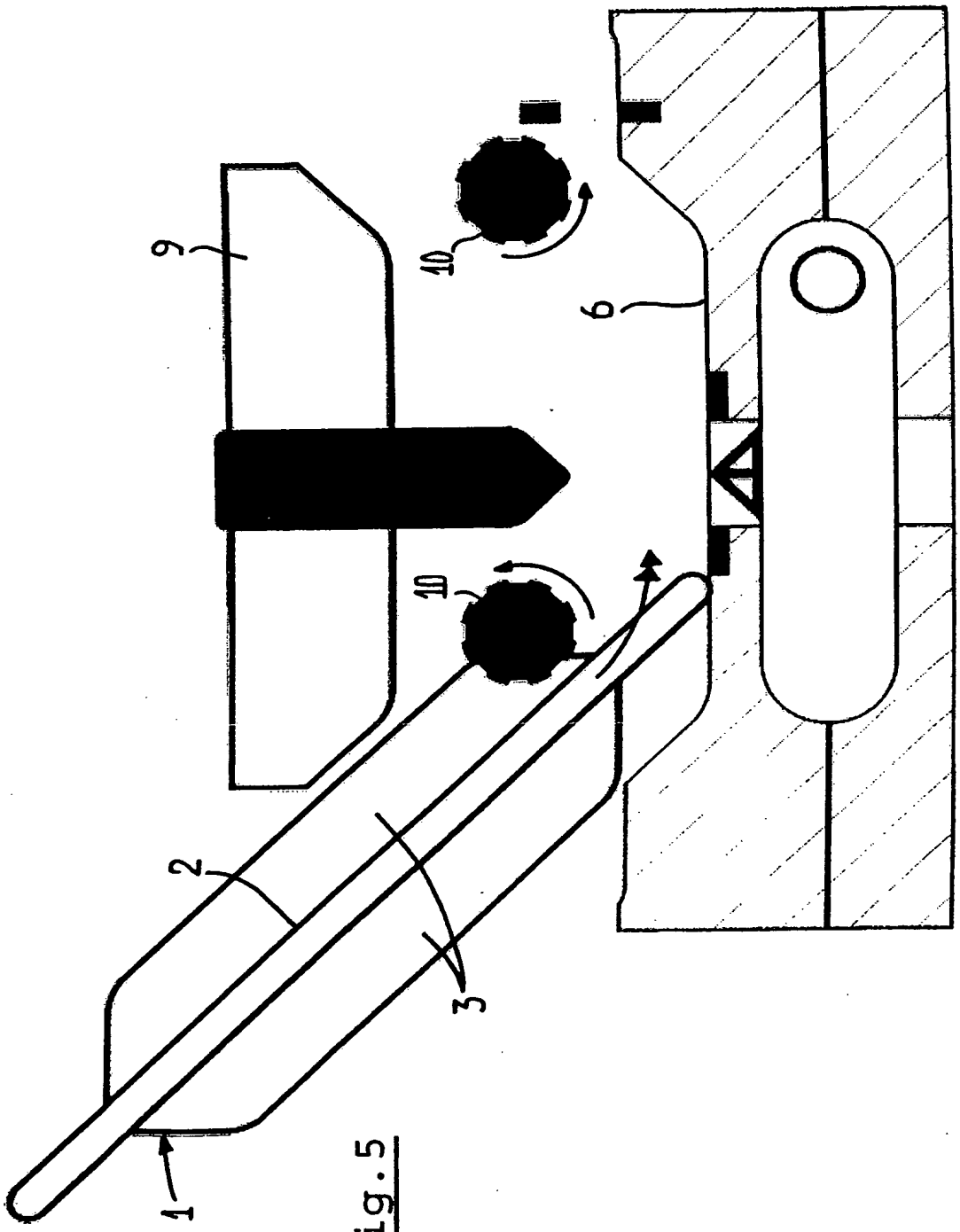


Fig.5

K-FEE SYSTEM GMBH, EX2009, page 1784
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

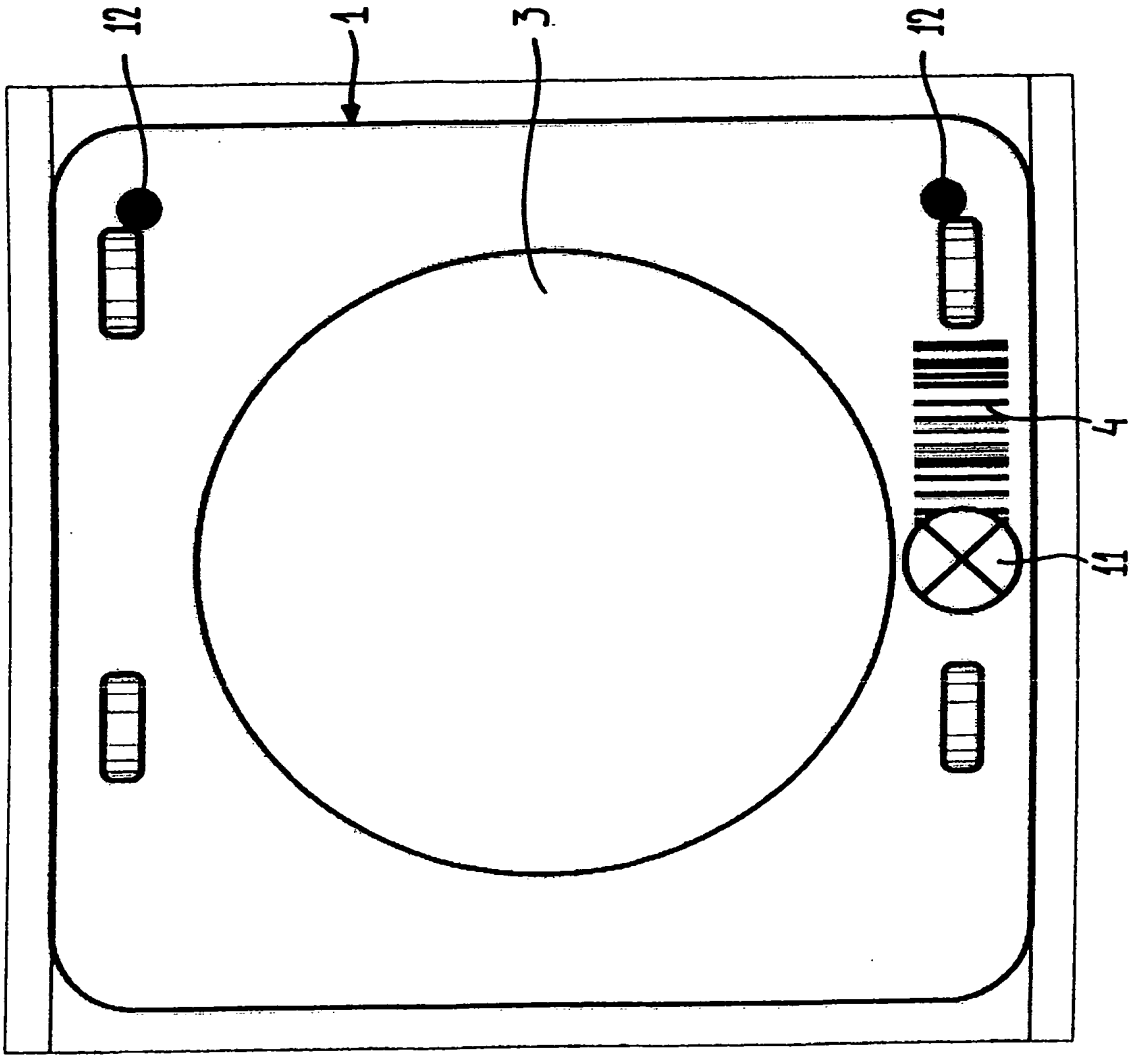


Fig.6

K-FEE SYSTEM GMBH, EX2009, page 1785
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

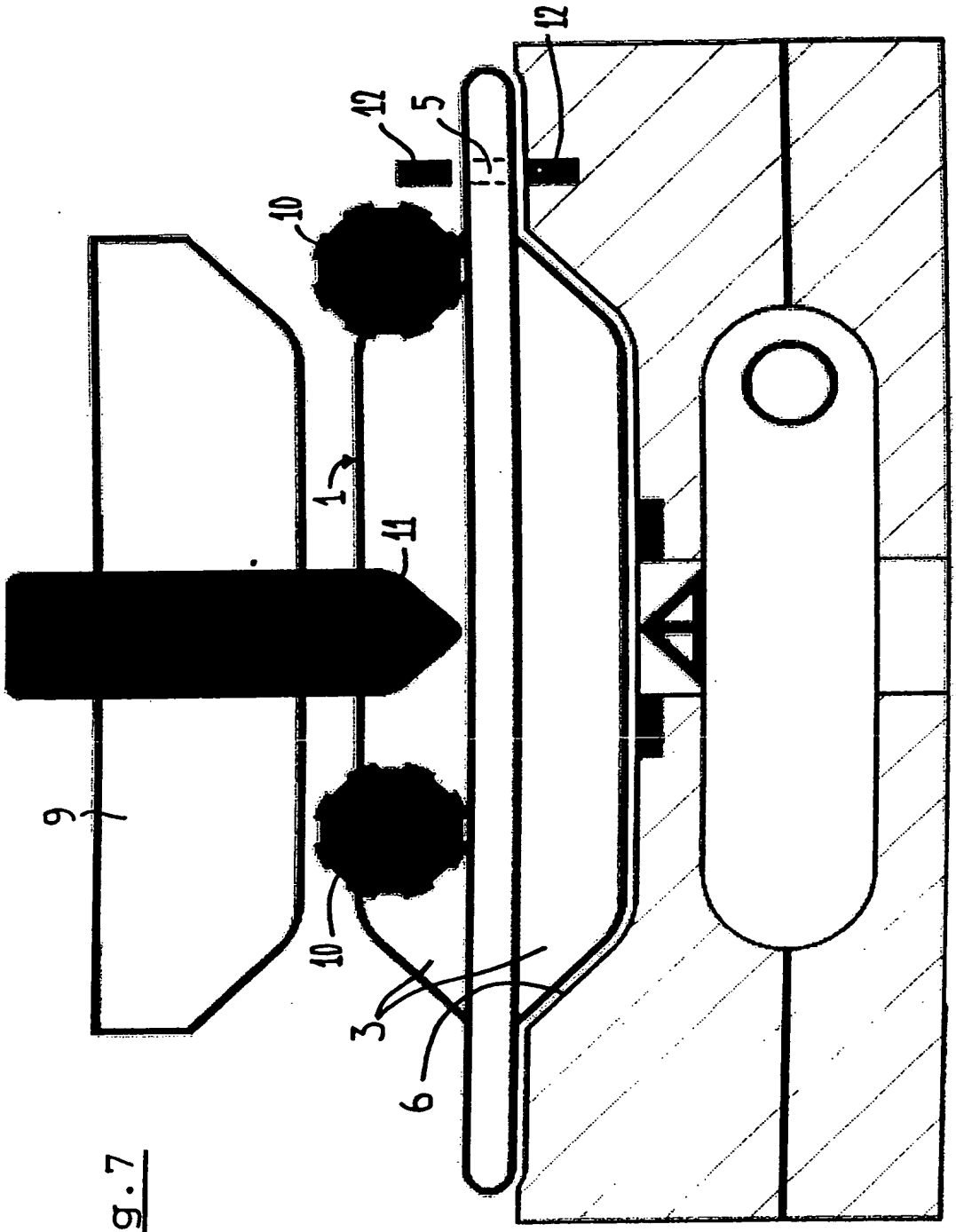


Fig.7

K-FEE SYSTEM GMBH, EX2009, page 1786
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

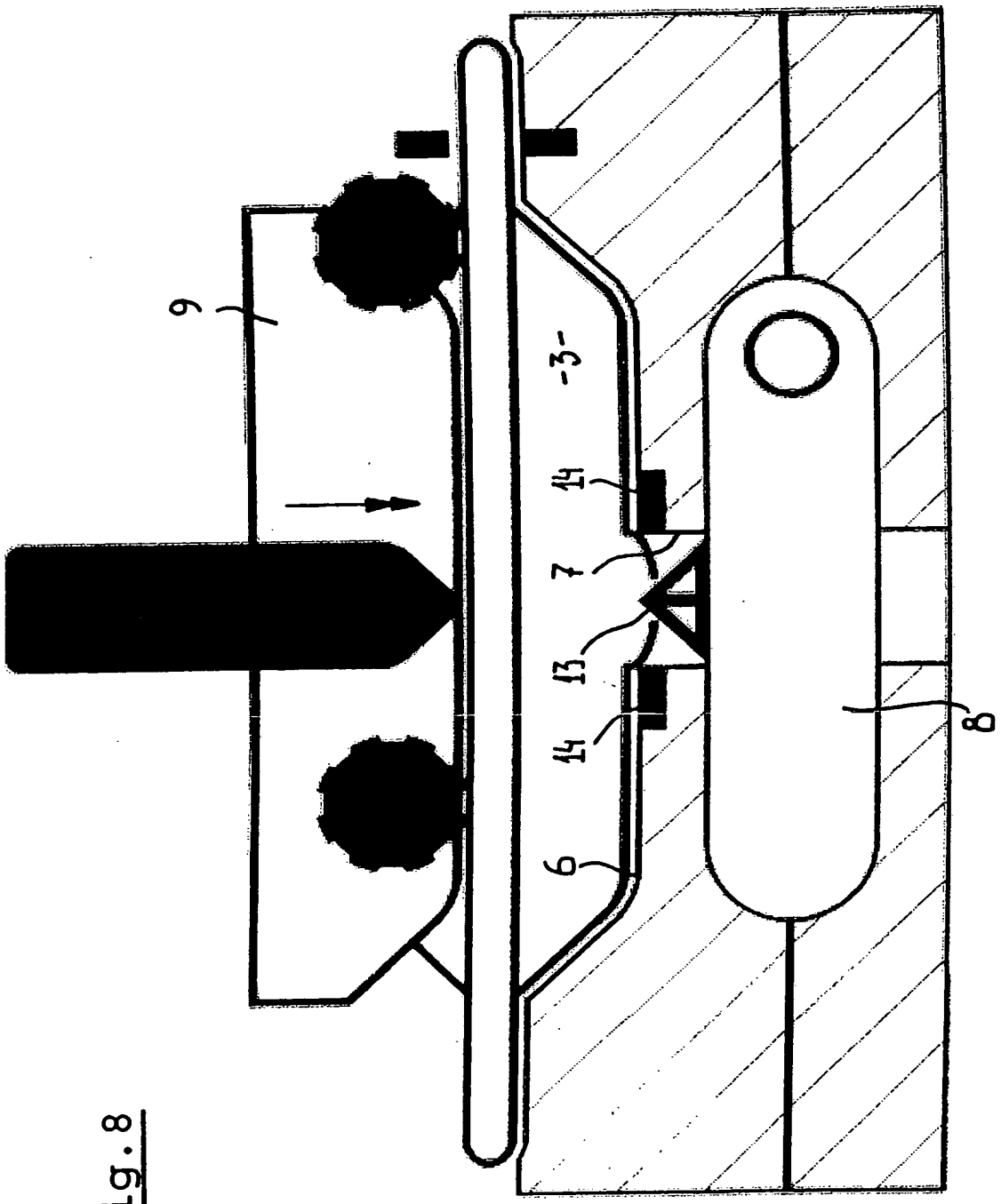


Fig.8

K-FEE SYSTEM GMBH, EX2009, page 1787
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

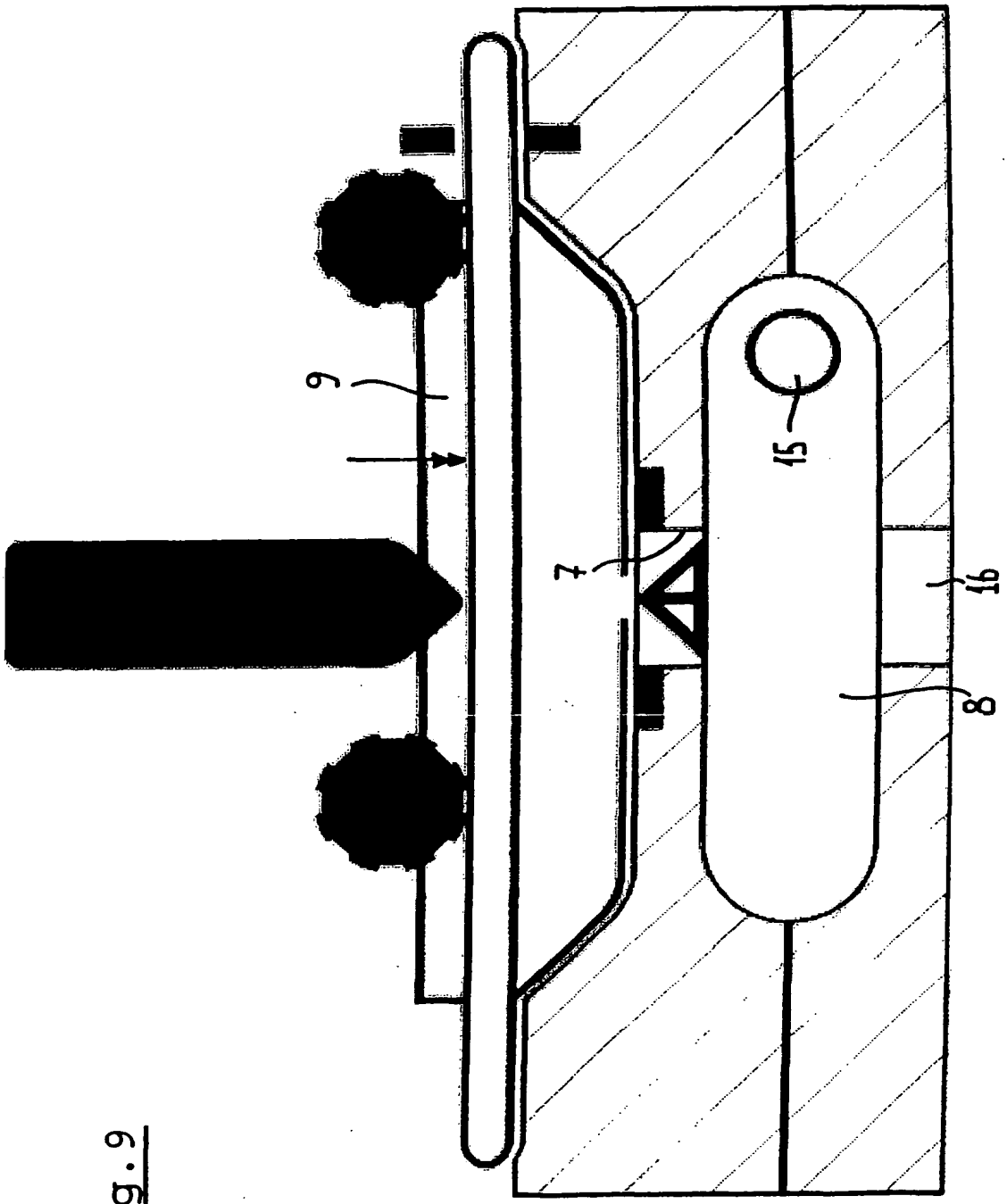


Fig.9

K-FEE SYSTEM GMBH, EX2009, page 1788
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

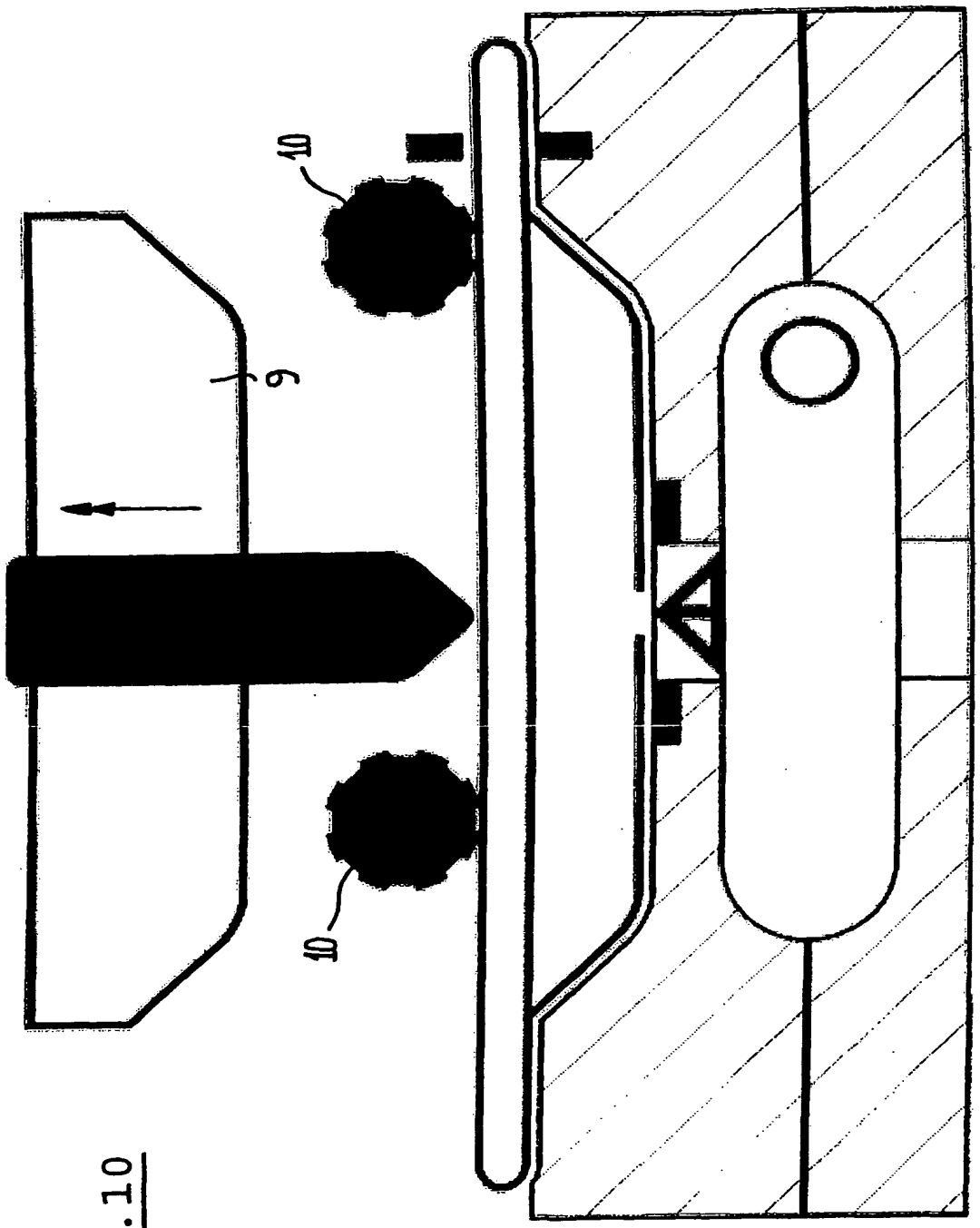


Fig.10

K-FEE SYSTEM GMBH, EX2009, page 1789
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

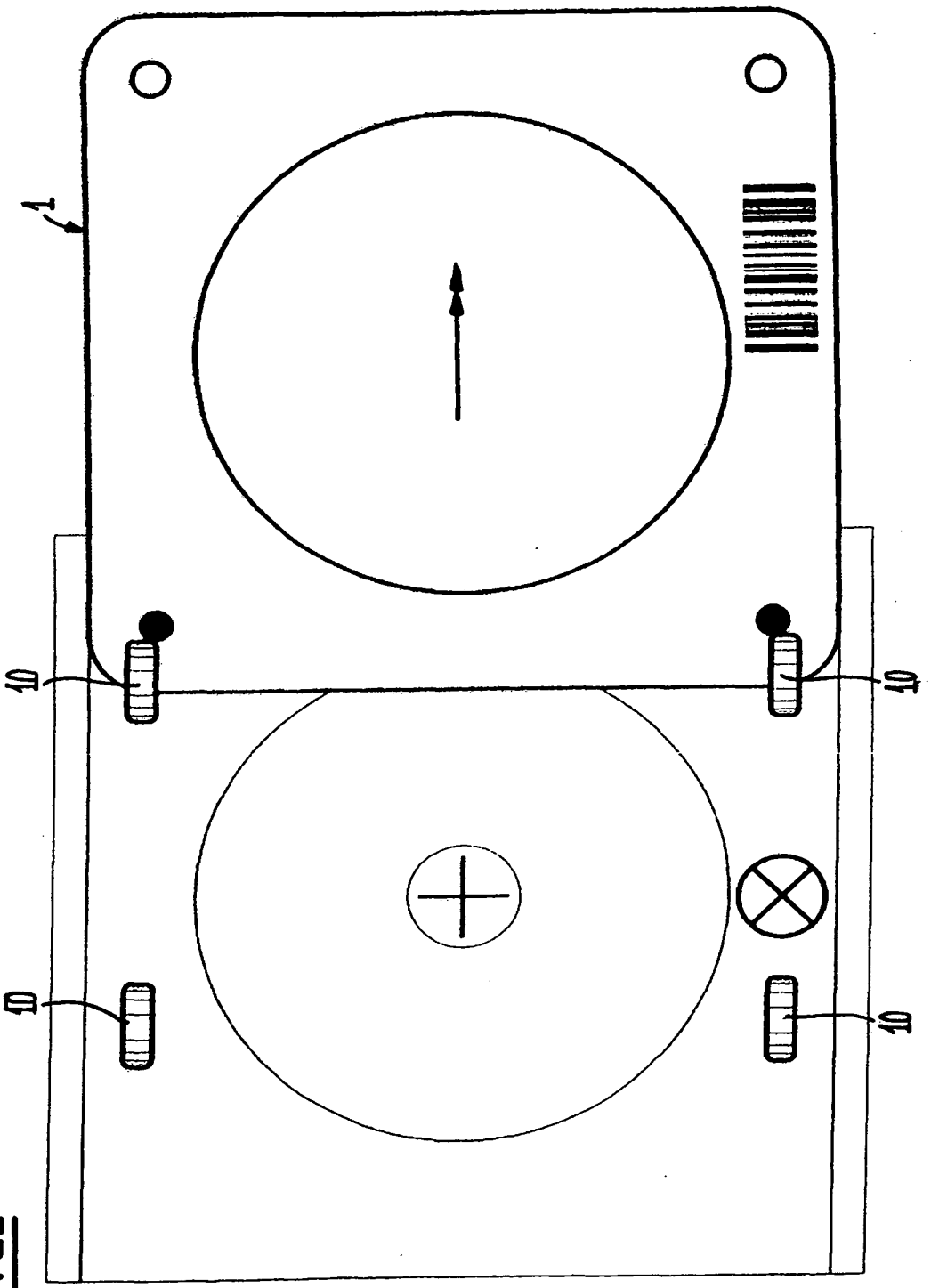


Fig.11

K-FEE SYSTEM GMBH, EX2009, page 1790
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

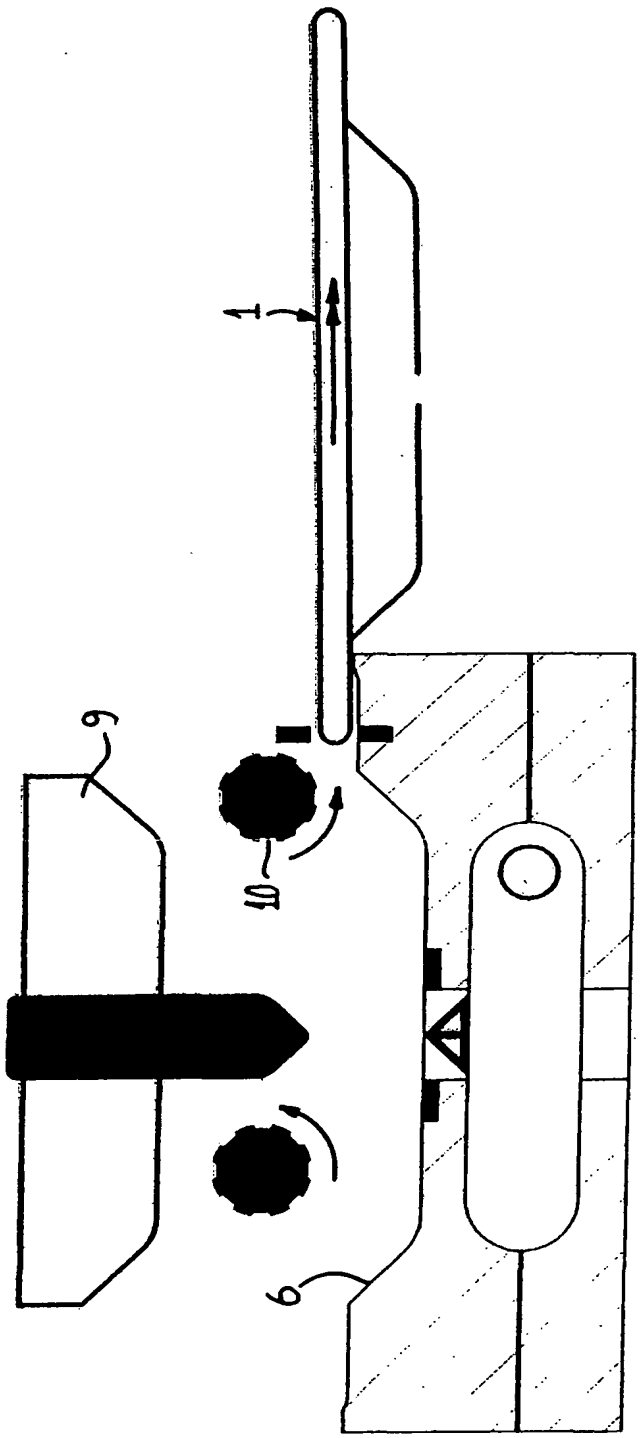


Fig.12

K-FEE SYSTEM GMBH, EX2009, page 1791
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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A47G 23/08

(54)【発明の名称】　飲食物搬送装置

(57)【特許請求の範囲】

【請求項１】　飲食物を収容した複数の容器（Ｔ）を循環搬送する搬送路（３）を備えた飲食物搬送装置であって、前記各容器（Ｔ）に識別マーク（４）を設ける一方、前記搬送路（３）を周回する各容器（Ｔ）の識別マーク（４）を読み取る読み取り装置（５）と、この読み取り装置（５）からの出力信号に基づいて各容器（Ｔ）の前記搬送路（３）における周回回数をカウントして、周回回数が設定回数以上となった容器を検索するコントローラ（６）と、該コントローラ（６）からの出力信号に基づいて、搬送路（３）での周回回数が設定回数以上となった容器（Ｔ）を報知する報知装置（７）とを設けていることを特徴とする飲食物搬送装置。

【請求項２】　飲食物を収容した複数の容器（Ｔ）を循環搬送する搬送路（３）を備えた飲食物搬送装置であって、前記各容器（Ｔ）に識別マーク（４）を設ける一方、前記搬送路（３）を周回する各容器（Ｔ）の識別マーク（４）を読み取る読み取り装置（５）と、この読み取り装置（５）からの出力信号に基づいて各容器（Ｔ）の前記搬送路（３）における周回回数をカウントして、周回回数が設定回数以上となった容器を検索するコントローラ（６）と、該コントローラ（６）からの出力信号に基づいて、搬送路（３）での周回回数が設定回数以上となった容器（Ｔ）を前記搬送路（３）上から退避させる退避装置（８）を設けていることを特徴とする飲食物搬送装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、寿司店などにおいて、例えば皿に盛り合わせた寿司を搬送路を介して循環搬送

K-FEE SYSTEM GMBH, EX2009, page 1792
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

する飲食物搬送装置に関する。

【０００２】

【従来の技術】近年、寿司店等において、例えば実公昭６０－２９９３２号公報に示されているように、店内の各テーブルに沿って循環する搬送路を備えた搬送装置を設置して、従業員が寿司等の飲食物を盛った皿を、随時前記搬送路に供給する一方、各テーブルの客が、前記搬送路により順次送られてくる各種の飲食物を選んで前記搬送路から取り出して食べるようにした店舗を見受ける。

【０００３】

【発明が解決しようとする課題】ところで以上の搬送装置においては、搬送路に載せられた皿上の飲食物は、顧客が取り出すまでは搬送路上を周回し続けるのであり、そのため搬送路上を周回する飲食物が長時間に渡って搬送路から取り出されない場合には、飲食物の品質が時間の経過と共に低下し、結果として品質の低下した飲食物を顧客に提供してしまう不具合がある。

【０００４】以上の不具合を解消するためには、従業員が搬送路を周回している飲食物のうち、所定時間経過したものをより分けて回収すればよいのであるが、前記搬送路には、飲食物を盛った皿が順次送りこまれていることから、搬送路上の各飲食物がそれぞれ搬送路上に置かれてからどれだけ時間を経過しているかを知ることは事実上不可能である。そのため現状では、飲食物の品質の低下を防止するために、所定時間ごとに、搬送路上に載っている飲食物を一括して交換しているのが現状である。

【０００５】本発明は以上の実情に鑑みて開発したものであって、目的とするところは、搬送路上に載せられた飲食物中、所定時間の経過したものを選び出すことの出来る飲食物搬送装置を提供するにある。

【０００６】

【課題を解決するための手段】以上の目的を達成すべく請求項１記載の発明は、各容器Ｔに識別マーク４を設ける一方、搬送路３を周回する各容器Ｔの識別マーク４を読み取る読み取り装置５と、この読み取り装置５からの出力信号に基づいて各容器Ｔの前記搬送路３における周回回数をカウントして、周回回数が設定回数以上となった容器を検索するコントローラ６と、該コントローラ６からの出力信号に基づいて、搬送路３での周回回数が設定回数以上となった容器Ｔを報知する報知装置７とを設けたのである。

【０００７】また請求項２記載の発明は、各容器Ｔに識別マーク４を設ける一方、搬送路３を周回する各容器Ｔの識別マーク４を読み取る読み取り装置５と、この読み取り装置５からの出力信号に基づいて各容器Ｔの前記搬送路３における周回回数をカウントして、周回回数が設定回数以上となった容器を検索するコントローラ６と、該コントローラ６からの出力信号に基づいて、搬送路３

での周回回数が設定回数以上となった容器Ｔを前記搬送路３上から退避させる退避装置８を設けたのである。

【０００８】

【作用】請求項１記載の発明によれば、前記読み取り装置５により、搬送路３を周回する容器Ｔに附した識別マーク４を読み取る一方、前記コントローラ６が、読み取り装置５からの出力信号に基づいて各容器Ｔの前記搬送路３における周回回数をカウントして、前記搬送路３を周回する容器中、その周回回数が設定回数以上となったならば、該コントローラ６からの出力信号により、前記報知装置７がその容器を報知するのである。

【０００９】また請求項２記載の発明によれば、前記読み取り装置５により、搬送路３を周回する容器Ｔに附した識別マーク４を読み取る一方、前記コントローラ６が、読み取り装置５からの出力信号に基づいて各容器Ｔの前記搬送路３における周回回数をカウントして、前記搬送路３を周回する容器中、その周回回数が設定回数以上となったならば、該コントローラ６からの出力信号により、前記退避装置８が、設定回数以上周回した容器Ｔを前記搬送路３から退避させるのである。

【００１０】

【実施例】図１は、客室Ｓ２に設置するカウンターテーブル１ａ及び複数の脚付きテーブル１ｂと、厨房室Ｓ１の前面乃至各テーブル１ａ・１ｂに沿って配置した仕切ハウジング２と、該仕切ハウジング２上に周回状に設けられて、前記厨房室Ｓ１内で皿Ｔ（容器）に盛り合わされた寿司を各テーブル１ａ・１ｂに循環搬送するための搬送路３を設けた寿司店舗内を平面的に表したものである。

【００１１】前記仕切ハウジング２は、所定間隔開けて相対向する側壁２１・２２と、これら両側壁２１・２２の上端及び下端を結ぶ上壁２３及び底壁（図示せず）とから断面ボックス状に形成されたものであって、前記厨房室Ｓ１の前面に沿って配設されて該厨房室Ｓ１と客室Ｓ２とを区画する第１ハウジング部２ａと、該第１ハウジング部２ａの長手方向両端から屈曲して前記客室Ｓ２内に平行に延びる第２、第３ハウジング部２ｂ・２ｃとから成り、前記第２、第３ハウジング部２ｂ・２ｃにおける側壁２１・２２の外側方には、前記したカウンターテーブル１ａと、脚付きテーブル１ｂとを配置している。

【００１２】前記搬送路３は、前記各ハウジング部２ａ・２ｂ・２ｃの上壁２３に設けた凹所３１と、該凹所３１の幅方向両側に設けられた案内壁３２に案内されながら前記凹所３１内をモータ駆動により循環移動する無端状のフラットチエン３３とを備えている。

【００１３】以上の構成から成る搬送装置において、図１から図２に示す実施例では、各皿Ｔを特定するための識別マークとして、バーコードを印刷した複数枚（実施例では６枚）のシール４を用い、この複数枚のシール４

K-FEE SYSTEM GMBH, EX2009, page 1793
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

を皿Ｔの下面外周縁部に、周方向に所定間隔開けて貼り付けている。

【００１４】一方、前記仕切ハウジング２における前記１ハウジング部２ａの前記第３ハウジング部２ｃ側端部には、前記搬送路３を周回する各容器Ｔの識別マーク４を読み取る読み取り装置として、レーザー式のバーコードスキャナー５を設置すると共に、このバーコードスキャナー５の出力側には、該バーコードスキャナー５からの出力信号に基づいて各容器Ｔの前記搬送路３における周回回数をカウントして、周回回数が設定回数以上となった容器Ｔを検索するマイクロコンピュータから成るコントローラ６を接続している。

【００１５】また、前記第１ハウジング部２ａにおける前記バーコードスキャナー５の設置位置よりも前記搬送路３の搬送方向前方側の上方には、該コントローラ６からの出力信号に基づいて、搬送路３での周回回数が設定回数以上となった容器Ｔを照明具７０により照らして該容器Ｔを従業者に報知する報知装置７を設け、該報知装置７を前記コントローラ６の出力側に接続している。

【００１６】また図３から図５に示す別の実施例は、前記した実施例における報知装置７に替えて、前記コントローラ６からの出力信号に基づき、搬送路３での周回回数が設定回数以上となった容器Ｔを前記搬送路３上から退避させる退避装置８を設けている。

【００１７】この退避装置８は、図５において概略的に示すように、モータ駆動する一対の駆動ローラ８１間に無端状の搬送ベルト８２を掛け渡した退避路８ａと、前記搬送路３上の皿Ｔを前記退避路８ａに乗換えさせる乗換え装置８ｂとから成り、前記退避路８ａを、前記第１ハウジング部２ａにおける前記バーコードスキャナー５の設置位置よりも前記搬送路３の搬送方向前方側に設けて、前記乗換え装置８ｂにより前記退避路８ａに乗換えさせた皿Ｔを前記搬送ベルト８２を介して厨房室Ｓ２に取り込むようにしている。

【００１８】また前記乗換え装置８ｂは、図５に概略的に示すように、枢軸８３を前記上壁２３に対して軸回転可能に取付けて、該枢軸８３の上端部に、ガイド体８４の長さ方向一端部を固定する一方、前記枢軸８３の下端部に、モータ等の駆動装置８５を組付けて、該駆動装置８５を前記コントローラ６の出力側に接続して、該コントローラ６による前記駆動装置８５の駆動制御により、前記ガイド体８４を図４において２点鎖線で示す様に前記搬送路３を交差するように揺動させて、該搬送路３上の飲食物を前記退避路８ａに案内退避させるようにしている。

【００１９】次に以上の構成からなる搬送装置の作用を説明する。

【００２０】前記厨房室Ｓ１において従業員により皿Ｔに盛られる寿司は、該厨房室Ｓ１の前面を流れている搬送路３上に順次載せられて、該搬送路３を介して客室Ｓ２内の各テーブル１ａ・１ｂに循環搬送され、各テーブルの客が、好みの寿司の載った皿Ｔを前記搬送路３から適宜取り出して食事をする一方、客により取り出されない皿Ｔは該搬送路３を周回し、前記バーコードスキャナー５がその皿Ｔに附したシール４のバーコードを読み取り、前記コントローラ６が、該バーコードスキャナー５からの出力信号に基づいて各皿Ｔの前記搬送路３における周回回数をカウントするのである。そして、前記搬送路３を周回する皿中、その周回回数が設定回数（例えば１０回）以上となったならば、図１から図２で示す実施例のものでは、該コントローラ６からの出力信号により、前記報知装置７の照明具７０が直ちに所定時間、即ち該照明具７０の照明領域内を前記皿Ｔが通過するのに要する時間だけ点灯して、この設定回数以上周回した皿Ｔを照らし、従業員に知らせるのである。

【００２１】尚、報知装置７によって報知された皿Ｔが従業員により搬送路３から取り出された場合には、搬送路３が一周するのに要する時間内にこの皿Ｔに附しているシールのバーコードが、前記スキャナー５で読み取られることがないので、従って前記コントローラ６においては、該搬送路３の一周に要する時間が経過した段階でカウント中の皿に附したバーコードの読み取りが行えなくなったものは、その皿が搬送路３から客若しくは従業員により取り出されたものとして、そのカウントを直ちにクリアする一方、前記報知装置７による報知後においても、搬送路３の一周に要する時間内において、周回回数が設定回数以上となった皿Ｔに附したバーコードが前記スキャナー５より再度読み取られる場合は、前記皿Ｔが今だ搬送路３上に置かれたままであるので、再度前記コントローラ６を介して前記報知装置７を作動させ、前記照明具７０により前記皿Ｔを再度照らすのである。

【００２２】一方、図３から図５に示す実施例のものでは、前記搬送路３を周回する皿中、その周回回数が設定回数（例えば１０回）以上となったならば、前記乗換え装置８ｂを構成する駆動装置８５が、前記コントローラ６からの出力信号で駆動して、前記ガイド体８４が前記搬送路３を交差する位置まで揺動すると共に、前記退避路８ａを構成する搬送ベルト８２が駆動して、設定回数以上周回した皿Ｔを、前記ガイド体８４により前記搬送路３から前記退避路８ａに乗り換えさて、該退避路８ａを介して厨房室Ｓ１に戻すのであって、以上のように厨房室Ｓ１に戻された皿Ｔに附されているバーコードは、その後、搬送路３の一周に要する時間内において前記スキャナー５で読み取られることがないので、前記コントローラ６でカウントしていたこの皿の周回回数はクリアされるのである。

【００２３】斯くして前記搬送路３上には、該搬送路３上において設定回数以上の周回により時間の経過した寿司皿は、すべて回収されるのであって、従って顧客には、常に新鮮な寿司を盛った皿Ｔのみが前記搬送路３を

7

介して提供されることとなる。

【００２４】以上の実施例では、識別マークとして、バーコードを附したシールを用いたが、これに限定されるものではない。

【００２５】また以上の実施例では、報知装置７として照明具を用いたが、これに限定されるものではなく、例えばブザー等を用いてもよい。

【００２６】

【発明の効果】以上のごとく請求項１記載の発明によれば、前記読み取り装置５により、搬送路３を周回する容器Ｔに附した識別マーク４を読み取る一方、前記コントローラ６が、読み取り装置５からの出力信号に基づいて各皿Ｔの前記搬送路３における周回回数をカウントして、前記搬送路３を周回する皿中、その周回回数が設定回数以上となったならば、該コントローラ６からの出力信号により、前記報知装置７がその容器を報知するので、搬送路上に載せられた飲食物中、所定時間の経過したものを確実に選び出すことが出来るのである。

【００２７】また請求項２記載の発明によれば、前記読み取り装置５により、搬送路３を周回する容器Ｔに附した識別マーク４を読み取る一方、前記コントローラ６が、読み取り装置５からの出力信号に基づいて各容器T*

8

*の前記搬送路３における周回回数をカウントして、前記搬送路３を周回する容器中、その周回回数が設定回数以上となったならば、該コントローラ６からの出力信号により、前記退避装置８が、設定回数以上周回した容器Ｔを前記搬送路３から退避させるので、搬送路上に載せられた飲食物中、所定時間の経過したものを自動的に搬送路から除去することが出来るのである。

【図面の簡単な説明】

【図１】飲食物搬送装置を設けた店舗内の概略平面図。

【図２】同、要部の拡大断面図。

【図３】別の実施例にかかる飲食物搬送装置を設けた店舗内の概略平面図。

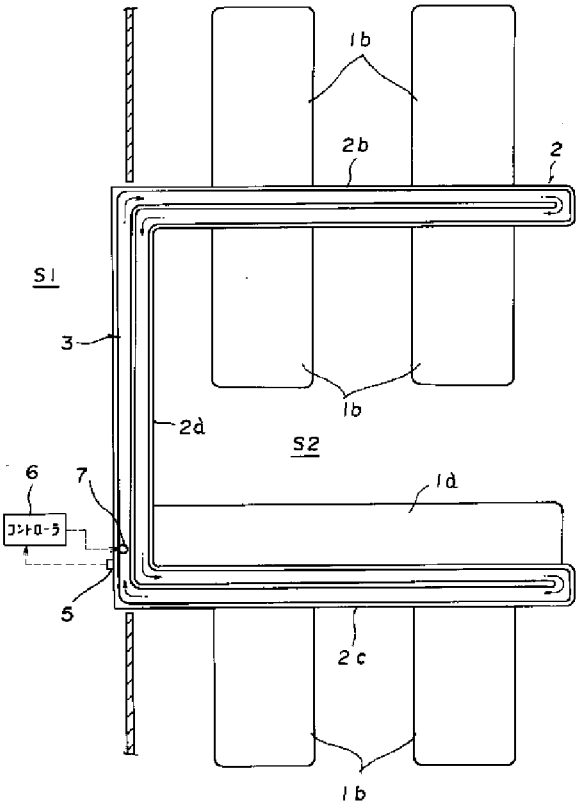
【図４】同、要部の拡大平面図。

【図５】図４におけるＸ－Ｘ線拡大断面図。

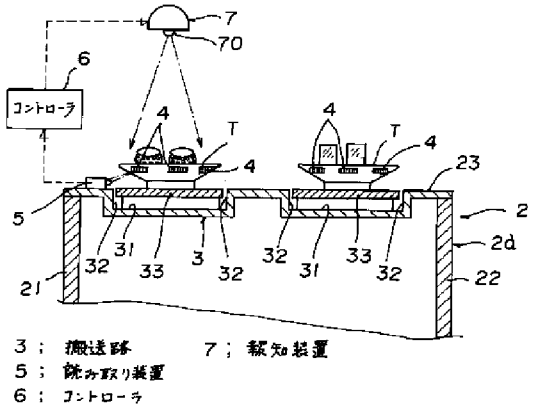
【符号の説明】

Ｔ	皿（容器）
3	搬送路
5	バーコードスキャナ（読み取り装置）
6	コントローラ
7	報知装置
8	退避装置

【図１】

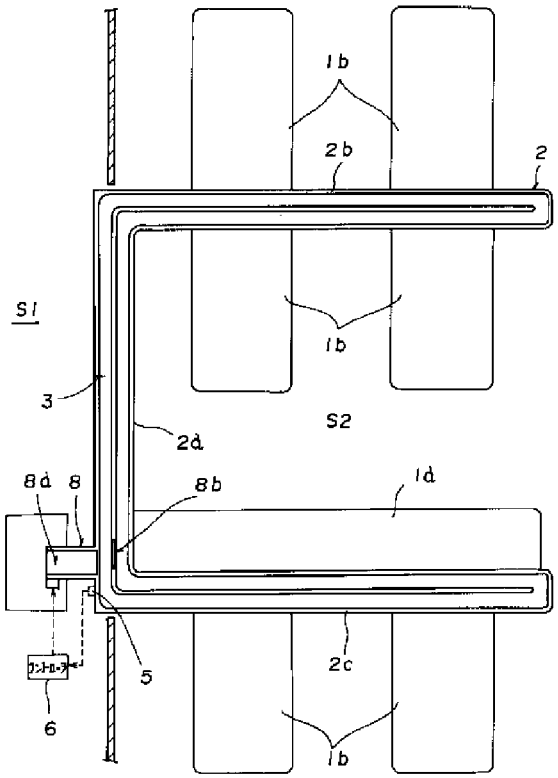


【図２】

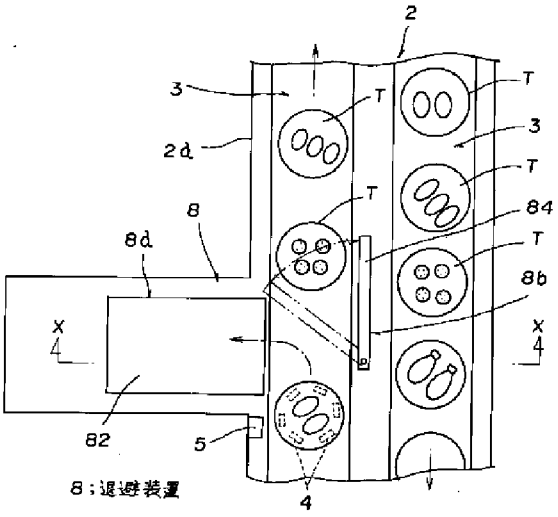


K-FEE SYSTEM GMBH, EX2009, page 1795
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

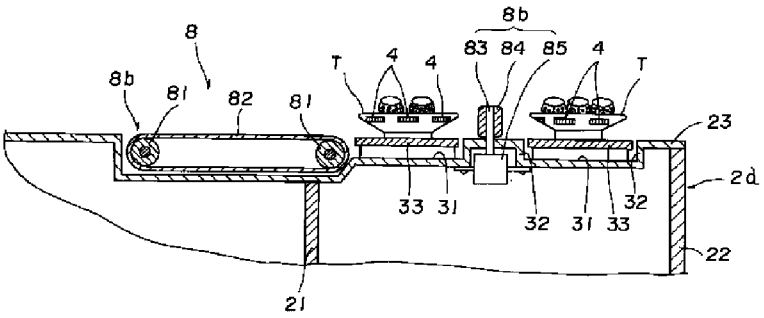
【図３】



【図４】



【図５】



フロントページの続き

(58)調査した分野(Int.Cl.[6]，ＤＢ名)
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K-FEE SYSTEM GMBH, EX2009, page 1796
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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(54) CAPSULE FOR THE PREPARATION OF A BEVERAGE COMPRISING AN IDENTIFICATION CODE

KAPSEL ZUR HERSTELLUNG EINES GETRÄNKS MIT EINEM IDENTIFIKATIONSCODE

CAPSULE POUR LA PRÉPARATION D'UNE BOISSON COMPORTANT UN CODE D'IDENTIFICATION

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US-B1- 6 203 069

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EP 2 525 691 B1

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K-FEE SYSTEM GMBH, EX2009, page 1797
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Description

Field of the invention

[0001] The present invention relates to a capsule and system for the preparation of a beverage, more particularly to a capsule with a code for identifying the capsule in the beverage production device and for providing information and/or setting parameters in the device for beverage preparation. The invention also relates to a method for providing information to a user from a capsule for the preparation of a beverage in beverage dispensing device.

Background

[0002] It has been previously proposed capsule systems comprising an identification code for setting parameters in a beverage production machine. For example, capsules or cartridges containing coffee, milk, chocolate, tea or combinations of these ingredients are used in specifically designed machines in which water is fed under pressure in the capsule which interacts with the ingredients for preparing a beverage. Such machines may operate at different pressures.

[0003] WO 02/28241 describes a cartridge for the preparation of hot or cold beverages wherein the packet includes a machine interpretable feature which may be interpreted to direct the beverage producing device to employ specific brewing operation suitable for the particular brewing packet.

[0004] WO 02/074144 describes a beverage brewing system comprising a beverage brewing device recognition system allowing the beverage brewing system to recognize the presence, type and/or capabilities of the beverage brewing device inserted in the system.

[0005] In WO 02/078498, a machine-readable identifier on a portion package, which contains ground coffee, for espresso machines is provided in a rotationally symmetrical manner, whereby permitting it to be easily and reliably read, on essentially a flat surface of the portion package. The portion package is preferably a portion of the capsule with an essentially round bottom to which the identifier is coaxially applied. A problem lies in that reading of the code requires the capsule to be read over a large path of movement which forces the capsule to be moved for carrying out the reading. Furthermore, the surface onto which the code is printed is not typically flat but rather convex due to the pressure of internal gas in the capsule. As a result, the code can be distorted and its reading negatively affected. Finally, the code contains a too limited number of information thereby making this solution not very attractive.

[0006] In order to solve the problems of code printed on flexible surfaces, such as in WO 02/078498, attempts have been made to flatten the surface by mechanical elements of the device such as in EP 1593329. However, such a method may cause the rupture of the capsule and will cause mechanical frictions in the device which are not desirable or even accidental tearing of the package.

[0007] EP 1440640 describes a method of preparing at least one range of beverages comprising different steps including the insertion of at least one beverage cartridge, operating a user interface to initiate an operating cycle, creating a specific brewing cycle based on a traditional barcode, passing aqueous medium through the beverage cartridge to produce a beverage wherein the temperature, pre-wet, volume flow rate and air purge of the aqueous medium is set based on the code, providing eductor means in certain cartridge to provide foaming of the beverage.

[0008] Solutions have also consisted in replacing the optical code by a radio-frequency code such as in EP 1715778. However, this technology remains expensive for disposable containers such as beverage capsules.

[0009] WO 2009007292 describes a method of a reading device in a drinks preparation apparatus for recording an image of a one-dimensional or multidimensional pattern on a drinks or service disc which is inserted into an open brewing chamber of the apparatus and, before the start of the preparation or service operation, is changed from a loading position to a closure position via intermediate positions in a closing operation of the brewing chamber. It is developed by virtue of the fact that the reading apparatus is activated before the brewing chamber is dosed, with the result that at least one image of the pattern is recorded before the closure position is reached. The problem here comes from the complexity of the image processing, in particular, the comparison of several images which is necessary,

[0010] In general, the systems of the prior art suffer the problem of a reliable reading of the identification code of the capsule. Attempts have been made to improve the identification but most of the solutions are complicated to implement and/or provide other problems.

[0011] Generally, the capsule must be oriented or inserted in the beverage device in a precise manner to ensure the correct reading of an optical barcode in the machine. For example, in EP 1440640, the capsule must be placed in a single precise orientation in the capsule holder to allow reading by capsule recognition means (see **figure 40**). Therefore, there are clear limitations to the possible automation of the beverage producing device, in particular, if several capsules needs to be read sequentially in the device. Furthermore, capsule systems of the prior art suffer the problem of limited storage size of the code which largely reduces the scope of the communication between the capsule and the device or user.

[0012] Document DE 102007032287 disclose a capsule with a barcode and a system provided with reading means.

Summary of the invention

[0013] The present invention alleviates the problems of the prior art system by providing a simple, reliable and

K-FEE SYSTEM GMBH, EX2009, page 1798
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

economical solution for identifying the capsule, communicate information and set parameters that can also be implemented in any beverage producing device, including in a high throughput automated device, in which it is essential to reliably identify capsules inserted therein, such as when preparing multi-component beverages from several capsules. The invention also provides solutions for improving communication with the user during and/or outside the periods of preparation of the beverage.

[0014] Therefore, the present invention relates to a capsule for the preparation of a beverage from beverage ingredients contained therein, comprising:

- a body comprising at least one compartment for receiving said beverage ingredients and a flange-like rim extending outwardly and transversally to a central axis (I) of said body:
- a membrane for closing the opening which is sealed onto the flange-like rim,
- an optical code containing binary information configured to be read by a camera of a beverage producing device,

wherein the optical code is a two-dimensional barcode having rectilinear borders and which is inscribed in a circular area concentric relative to the centre (O) of the membrane having a radius at least 1.5 times, preferably at least two times smaller than the radius of the membrane.

[0015] The solution of the invention provides several advantages.

[0016] First of all, the capsule no longer requires to be specifically inserted in a predetermined orientation in the capsule holder or charger to ensure proper detection. A degree of freedom is given as to the orientation of the capsule relative to its central axis. This greatly facilitates the insertion of the capsule in the device.

[0017] Secondly, in particular due to its small size, the code can be identified without flattening the package and without necessarily moving the device relative to the capsule (or vice versa) for reading the code. Therefore, the code can be read while the capsule is in a static position thereby rendering the device simpler and more reliable. Furthermore, the visual properties of the capsule such as the brand, colour, labelling, etc, are not affected so much as compared to prior art solutions.

[0018] Thirdly, the two-dimensional code contains more information than typical optical code thereby offering a wider choice of parameterization and improved communication.

[0019] Preferably, the two-dimensional barcode is inscribed in a circular area of radius lower than 15 mm, preferably lower than 13 mm. As a result, reading of the capsule can be carried out while the capsule is static and the camera is placed relatively close to the capsule thus not affecting both the simplicity and compactness of the device.

[0020] Furthermore, the two-dimensional code is placed between at least one inner opaque layer and an outer transparent layer of the membrane. As a result, the code is protected against the external physical and/or chemical attacks but also provide a sufficient contrast to be read despite its small size.

[0021] The two-dimensional barcode comprises information in binary format including: product information, authentication data, brewing parameter settings, URL and combinations thereof.

[0022] **In a preferred embodiment of the present invention, the two-dimensional barcode is printed onto the capsule, using an invisible ink. This brings the advantage of keeping the surface of the capsule free for decoration with visible ink, which is advantageous, particularly from an aesthetic viewpoint. Invisible ink is generally known as a substance used for writing, which is invisible to the human eye, either on application or soon thereafter, and which later on can be made visible by some means, or is visible under certain conditions (e.g. under UV light) by recognition devices such as camera or barcode readers.**

[0023] The invention also relates to a system for preparing a beverage from a capsule according to any of the preceding claims wherein it comprises:

a beverage producing device comprising capsule handling means including a capsule-holder for receiving the capsule therein and identification and control means,
wherein the identification and control means comprises a digital camera positioned relative to the handling means and configured for capturing an image of the two-dimensional code placed on the capsule and transferring said image or binary information related thereof to a control unit of the identification and control means.

[0024] The said means for identification and control means can comprise a display configured for displaying product information in decoded form from said image or binary information.

[0025] In a preferred mode, the system comprises a range of capsules corresponding to different beverage families (e.g., espresso, lungo, latte macchiato, cappuccino, etc.). For at least two capsules of the range, the code of each capsule is of a different matricial size which is adapted for coding information related to its beverage family. The camera of the device is thereby also configured to read barcodes of at least two different matricial sizes to identify to which beverage family the identified capsule belongs to.

[0026] In a particular mode, the code for the at least two capsules can comprise a number of bits that varies according to the number of characters of the name of the beverage.

[0027] The capsule handling means of the device pref-

K-FEE SYSTEM GMBH, EX2009, page 1799
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

erably comprises a slider or tubular feeder for guiding the capsule in a capsule holder movably placed underneath. When a capsule is inserted in the device, it falls by gravity in the capsule holder and is positioned while its coded membrane remains uncovered for subsequent proper identification. The camera is preferably placed in the transport path between the capsule handling means and liquid injection means. Furthermore, a capsule transport means is provided for moving the capsule holder receiving the capsule in front of the digital camera. In particular, the capsule transport means can comprise a conveying belt driven by a motor.

[0028] The invention further relates to a method for providing information to a user from a capsule for the preparation of a beverage in a beverage producing device comprising providing a capsule with a two-dimensional barcode thereon, capturing at least one image of the barcode via a digital camera and displaying decoded information from said image on a display.

[0029] In particular, the digital camera can be part of the beverage producing device and/or a portable telecommunication terminal.

[0030] The displayed information includes direct information and/or a web address. As direct information, it is meant essentially information obtainable directly from data contained in the barcode such as product information, brewing parameters or user's instructions.

Brief description of drawings

[0031] Additional characteristics and advantages of the present invention will be detailed in the description of the drawings that follows.

- **Figure 1** shows a side view of a capsule of the invention,
- **Figure 2** shows a top view of the capsule of figure 1,
- **Figure 2a** shows an enlarged view of figure 2,
- **Figure 2b** shows an enlarged view of figure 2 according to a first variant,
- **Figure 2c** shows an enlarged view of figure 2 according to a second variant,
- **Figure 2d** shows an enlarged view of figure 2 according to a third variant,
- **Figure 3** illustrates a capsule in a reading mode in the device of the invention,
- **Figure 4** shows the top of the capsule when read in a reading mode in the device of the invention,
- **Figure 5** illustrates a system of the invention when the capsule is in insertion mode in the device,
- **Figure 6** illustrates the system of figure 5 when the capsule is in a reading mode,
- **Figure 7** illustrates the system of figure 5 when the capsule is in a brewing mode,
- **Figure 8** illustrates a method of communication using the capsule system of the invention with a mobile telecommunication terminal,
- **Figure 9** illustrates the processing of the barcode on the capsule using the mobile telecommunication terminal,
- **Figure 10** illustrate the acquisition of information from a portable telecommunication device from an image displayed on the beverage producing device.

Detailed description of the invention

[0032] The invention relates to a capsule containing beverage ingredients for the preparation of a beverage, by injection of liquid in the capsule and interaction of the liquid with these ingredients. The beverage ingredients comprise: roast and ground coffee, instant coffee, leaf tea, instant tea, cocoa, dairy or non-dairy creamer, chicories, fruit or vegetable extract, culinary extract and combinations thereof. Additives may also be added in suitable amounts such as sweeteners, flavouring agents, thickeners, edible carriers, dyes, foaming agents, stabilizers, buffers, emulsifiers, processing aids and combinations thereof. The term "capsule" refers in general to any single-use beverage package that can be rigid, semi-rigid, sometimes even flexible, including cartridges, pods or pads, sachets, etc., used in a beverage producing machine by injection of a liquid, usually water, under pressure and at a certain temperature (hot, cold or ambient), for interaction with ingredients contained in the package and for delivery from the package of a liquid or partially liquid product (i.e., the beverage) The interaction between the liquid and the ingredients may happen by extraction, dissolution, dilution, infusion, dispersion, mixing, emulsification and combinations thereof.

[0033] The capsule 1 typically comprises a body 2 comprising at least one internal compartment for receiving the beverage ingredients, The body can be a form of revolution of central axis I, such as a substantially truconical cup, with a larger side and a narrower side terminating by a delivery duct 3 At its larger side, the body comprises a flange-like rim 4 extending outwardly and transversally to the central axis I. The body is closed by a top membrane 5 sealed onto the flange like rim 4, thereby delimiting with the body, the internal compartment. Inside, the capsule may comprise means for opening a closing wall at the delivery duct, as described in patent EP 1472156 B1.

[0034] Referring to **figure 2,** there is illustrated a top view of the capsule of figure 1 showing the membrane 5

K-FEE SYSTEM GMBH, EX2009, page 1800
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

and its annular sealed portion 6 onto the flange-like rim The membrane is not necessarily flat Sometimes, a gas-light membrane bulges slightly outwardly due to the internal pressure of gas (carbon dioxide, nitrogen, etc.). The membrane comprises a centre of axis "O" which represents the point of central axis "I" intersecting the membrane's surface

[0035] As more clearly illustrated in regard to figure 2a, the membrane 5 comprises a DataMatrix optical code 7 containing binary information configured to be read by a camera of a beverage producing device as will be explained. The optical code is a two-dimensional barcode having rectilinear borders 7a, 7b, 7c, 7d As known per se, the illustrated barcode is a matrix code made of small squared cells that represents bits ("0" if the cell is light and "1" if the cell is dark or vice versa). The left border 7a and bottom border 7b form an "L" shape which is known as the finder pattern and is used to locate and orient the code. The top border 7c and right border 7d represent the timing pattern which provides the count for the number of bits that determines the matricial size of the code The encoding for such specific code is more specifically described in ISO standard, ISO/IEC 16022

[0036] According to the invention, the optical code 7 is inscribed in a circular area 8 (illustrated by a circle in dotted lines) whose centre is concentric with the centre "O" of the membrane and which has a radius "R" is smaller, at least 1.5 times, preferably at least two times smaller than the radius "R_0" of the membrane. By definition, the code is inscribed in the circular area 8 when none of its angles exceeds the limits of the circular area The radius "R_0" represents the radius of the whole membrane including the sealed portion 6.

[0037] In the example of **figure 2a,** the code is formed of four borders 7a- 7d of equal length making it a square with four angles which intersect the limits of the circular area (i.e., the circle in dotted line)

[0038] In the example of **figure 2b,** the code is formed of a rectangular polygon with four angles which intersect the limit of the circular area. Thereby, the longer sides of the rectangular code intersect the limit of the circular area (i.e., the circle in dotted line).

[0039] In the example of **figure 2c,** the code is formed of a squared code that is off-centred relative to centre "O" but still inscribed into a circular area whose centre is concentric with centre "O" of the membrane. In particular, a single angle of the squared code intersects the limit of the circular area (i.e., the circle in dotted line).

[0040] In example of **figure 2d,** the code is formed of a rectangular code that is off-centred relative to centre "O" but still inscribed into a circular area whose centre is concentric with centre "O" of the membrane. In particular, a single angle of the rectangular code intersects the limit of the circular area (i.e., the circle in dotted line).

[0041] Typically, off-centring of the code occurs because the membrane is cut and sealed at elevated cadences onto the body after receiving the code, thereby centring of the membrane cannot be guaranteed during manufacturing. Typically, off-centring of the centre of the code relative to the centre O for a maximal value of about 5 mm is possible.

[0042] In all these examples, the radius "R" of the circular area 8 is much smaller than the radius "R_0" of the membrane. Hence, the circular area determines the limiting position zone for the code that needs to be respected for providing the advantages of the present invention, in particular, the reliable detection in all angular position of the capsule as will be explained later. The limits of the area 8 are only virtual (illustrated by the dotted lines) and it does not need to be apparent on the capsule. Preferably, the barcode is inscribed in a circular area 8, as previously defined, of radius "R" lower than 15 mm, preferably lower than 13 mm, most preferably comprised between 3 and 11 mm. In the more preferred designs, the barcode has a surface area lower than 120 mm^2, most preferably comprised between 20 and 90 mm^2. The lower limit is essentially guided by the constraints of the reading detection technology but also to the possible visual defects of the code during printing on or in the membrane.

[0043] The invention is not necessarily limited to DataMatrix code as illustrated but is applicable with any two-dimensional barcode consisting of a matrix code comprising black and white or coloured modules arranged in a square or rectangular pattern and including any of the following code standards: DataMatrix code, Semacode, Quick Response ("QR") code, Aztec code, Maxi-code or EZ-code. All of these codes use the same two dimensional principles, although using different encoding algorithms and different symbologies involving patterns of symbols such as squares, dots, circles, etc., hidden with images and combinations thereof.

[0044] The barcode is designed with a matricial size sufficient for storing beverage related information (i.e., "product information"), parameters relevant to the preparation of the beverage in the beverage producing device, update bits, error bits and optical reference bits. Preferably, the matricial size (i.e., number of row by number of column representing the number of bits) is comprised between 10 by 10 and 22 by 22, preferably 12 by 12 and 18 by 18.

[0045] The barcode can be an eye-naked visible pattern inserted in layers of the membrane 4 for purpose of protection against scratching, hot liquid and the like. In particular, the membrane preferably comprises at least one inner opaque layer and at least one transparent or translucent layer wherein the code is inserted between those two layers. For example, the barcode can be printed directly onto the surface of the said inner or outer layers or it can be printed onto a label that is inserted between the two layers. Preferably, the opaque layer is made of polymer selected amongst: PP, PE, PET and combinations thereof. The outer layer is preferably chosen amongst PET. For example, the membrane comprises two opaque layers of PP and PET of respectively 70 and 12 microns and one outer transparent layer of PET of about 10-20 microns.

K-FEE SYSTEM GMBH, EX2009, page 1801
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

[0046] In a possible alternative, the barcode can be an invisible-to-naked-eye pattern, such as if printed with a special ink, and readable within at a specific light frequency rang such as UV. In particular, a specific invisible pattern can be used to distinguish genuine capsules from counterfeiting capsules.

[0047] For product information, information relative to the name of the beverage can be stored in the code enabling identification of the capsule. The full name of beverages can be thereby made available as a binary part of the code utilizing up to 125 bits. Other product information such as the expiry date of the capsule can be stored in the code as well using other bits of the code.

[0048] The beverage name such as an alphabetic or alpha-numeric sequence ("espresso", "lungo", "cappuccino", "latte macchiato", etc.) can therefore be stored in the code in a sequence of bits. The name can then be displayed on a display 12 connected or part of the device, for example, before and/or during preparation.

[0049] In a possible mode, the 2-D barcode comprises an URL (Uniform Resource Locator) address enabling to connect the user via a display and communication means to a website, such as the website of the capsule's supplier. The communication means may be a mobile telecommunication device such as a mobile phone, PDA, etc., with digital camera function or it may be embedded in the beverage producing device. For this, the beverage producing device comprises a communication unit configured for accessing the website via an internet transmitter and an internet browser. Therefore, information services such as up-to-date commercial offers, advertisings or product information can be easily displayed or capsule ordering services (e.g., on a virtual store hosted on the website) can be offered to the user through the display.

[0050] Concerning the device setting parameters, the 2-D barcode comprises bits for storing information such as:

- water temperature, e.g., hot, warm, ambient, cold temperatures,
- beverage volume, e.g., 25, 40, 110, 150, 250, 500 mL, etc.,
- nature of the ingredients, e.g., roast & ground coffee, soluble ingredient, herbal tea, etc.,
- capsule emptying operation in particular for soluble ingredient,
- capsule type, e.g., single, two-in-one, doppio, etc.,
- infusing time, in particular for infusion ingredient,
- a serial number for each capsule referring to a data base,
- updating data and combinations thereof.

[0051] As illustrated in **figure 3,** the beverage producing device comprises capsule identification and control means 9 whose function is to identify, set parameters of the beverage producing device and optionally provides information and added value services to the user such as oriented access to internet. These means comprises a control unit 10, such as a central controller or several controllers, a digital camera 11, optionally, a display 12 which can be linked together or be integrated in one or several units and a communication unit 19. The control unit 10 is to be regarded in a general sense as including one or several units including processors, memories, programs and algorithms, input-output interfaces capable of running the different modules and units of the identification and control means as well as the brewing system of the device such as the heater, pumps, etc. Separate control modules may be designed to isolate the communication control from the control of the brewing system. The programs and algorithms may include decoding applications for the camera.

[0052] The control unit may further comprise a user interface for receiving inputs as to various choices for brewing parameters, beverages, internet communication, etc.

[0053] The display may, for instance, be a LCD or plasma screen, a touch-screen, or be combined to the control unit 10 and/or communication unit 19, such as in the form of a computer, a laptop, a mobile telecommunication terminal such as a mobile phone, I-pod, PDA, etc., and other equivalent communication devices. The communication unit 19 may comprise, for example, an intranet connection, a wifi and/or Bluetooth connection enabling communication with an external server and/or terminal.

[0054] The camera 11 can be any input device that captures an optical image and digitalises it into an electronic image represented as binary data. The camera is designed as a digital camera typically comprising an image sensor 17 (e.g., CCD), an optical lens and aperture 14 for shaping, focusing and sharpening the image-capturing zone of the camera and a processor which may be associated to the camera 11 or be placed in the control unit. The camera may also be designed as a flutter shutter camera to be capable of taking an image of the barcode while the capsule is in movement in the device. The camera can designed as a scanner with the ability to move relative to the device when reading the barcode of the capsule. The camera can also be portable and plugged in an allocated place of the device.

[0055] As illustrated in **figure 4,** the camera is arranged relative to the capsule so that the image-capturing zone of the device, illustrated by rectangular zone 15, onto the membrane of the capsule, encompasses the circular area 8 into which the barcode is inscribed, as previously defined. The image-capturing zone may be from about 10 to 300% wider than the surface area of the circular area 8 and it may be any suitable polygonal zone such

K-FEE SYSTEM GMBH, EX2009, page 1802
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

as rectangular, squared or circular depending on the type of camera. Preferably, the camera is configured to provide an image-capturing zone that is wide enough to capture barcode of different positions (centred or off-centred relative to "O"), of different matricial sizes and also possibly different shapes (squared or rectangular). The definition of the image-capturing zone depends on different parameters such as the characteristics of the lens and aperture, the distance between the camera and the code, the CCD and shutter characteristics, etc. In a particular application, two barcodes of different size are necessary to product information for different capsules corresponding to different beverage families (e.g., espresso, lungo, cappuccino, etc.). Larger size codes may be necessary when the name of the beverage is too long or additional instructions are required for complex beverage recipes.

[0056] The beverage producing system represented in **figure 5** comprises a capsule 1, a beverage producing device 20 including the capsule identification and control means 9. In a preferred mode, the device 20 comprises capsule handling means 21 for enabling insertion of the capsule in the device and its transport to a liquid injection unit 22 of the device. For this, the capsule handling means comprise a gravity insertion means 23, such as a slider or charger 23, for guiding the capsule in the device by gravity into a capsule-holder 24. It should be noted that the gravity insertion means may receive the capsule while the capsule has its top membrane substantially vertical or inclined as illustrated using a "slider". Alternatively, the capsule can be substantially horizontal when dropped in the device using a tubular feeder such as described a capsule selection mechanism described in EP 1593326. The capsule then falls into a capsule-holder 24 and may be recovered in a substantially horizontal position of its membrane as illustrated in **figure 6.** The capsule-holder is associated to transport means 25 which move the capsule from the insertion zone to the identification zone where the capsule is placed below the camera 11 with the barcode facing the camera a predefined distance. The transport means may comprise any suitable carrier driving the capsule holder linearly and/or rotationally. For example, the transport means comprise an electric motor 26 and linearly driving a conveying belt 27 which supports the capsule holder. When positioned below the camera 11, the transport means may be stopped for capturing at least one image of the barcode 7 placed onto the membrane of the capsule. Alternatively, image-capturing operation can take place with a digital flutter shutter camera while the capsule-holder is moved from the insertion zone to the liquid injection zone.

[0057] After identification, the control unit activates the transport means 25 to move the capsule-holder in the liquid injection zone. In this zone, the device comprises liquid injecting means 28 comprising a closure plate 29 and a liquid injector 30 which is engaged onto the capsule such as by relative movement of the capsule-holder and closure plate 29. When engaged, the liquid injector communicates with the compartment of the capsule to enable feeding of liquid in the capsule. As known 'per se', the liquid injecting means 28 are fluidically connected to fluid supply means 31 including a water tank 32, a liquid metering means 33 (e.g., piston pump) for metering the proper volume of liquid in the capsule as a function of the identified capsule and a liquid heater 34. Typically, the liquid used for preparation of the beverage is water. The fluid supply means may further comprise a gas supply means 35 such as an air pump for emptying the capsule from residual liquid after the brewing operation. The selective activation of the supply means, in particular, the liquid metering means 33, heater 34 and gas supply means 35 is controlled by the identification and control means 9 according to the device setting parameters stored in the code.

[0058] During the different operations, the display may be controlled to prompt the user to operate different functions and/or to provide information. For example, before insertion of the capsule in the beverage producing device, the control unit prompts, via the display 12, the user to insert a capsule in the device to initiate the brewing operation **(figure 5).** A capsule presence sensor 36 of the identification and control means can verify presence of the capsule in the handling means, e.g., in the slider, tubular feeder or capsule holder. If a capsule is detected, the transport means can be activated and/or the prompt message to insert a capsule be removed from the display.

[0059] As already mentioned, after capsule identification by the camera 11 **(figure 3),** product information is decoded and the control unit can command a message on the display 12 related to this product information, such as the name of the beverage and/or such decoded information can initiate a program displaying additional information contained in a memory of the control unit or information retrieved by the communication unit 19 from a remote date base. Such additional information could be commercials, nutritive information, information concerning the geographical origin of the coffee or tea ingredients, etc.

[0060] In the brewing operation **(figure 7),** further information can be displayed on the display 12 such as product information, user's instructions, brewing information, etc. For instance, product information displayed during or after capsule identification can be initiated at this stage only or be continued. User's instructions can be provided to prompt the user to carry out steps relevant to the brewing procedure. For instance, a prompt to wait the end of the beverage component coming out of the capsule can be provided. Also, a prompt to insert a second capsule can also be displayed, when a beverage is prepared from two or more beverage components such as cappuccino or latte macchiato necessitating more than one capsule. Brewing information can cover information as to the temperature of the beverage or of injected liquid, pressure, beverage volume, etc. This information can also be displayed at suitable time during the process.

[0061] In a possible application illustrated in **figure 8,**

K-FEE SYSTEM GMBH, EX2009, page 1803
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the beverage producing device is configured via its communication unit to communicate with a mobile telecommunication terminal 40 of the user to exchange information such as to display information on its display 41 such as product information or a link to a commercial website corresponding to the coded URL address.

[0062] As illustrated in **figure 9,** the product information as well as URL contained in the code can also be read by a mobile telecommunication terminal 40 before insertion of the capsule in the beverage producing device. For this, the mobile telecommunication terminal requires a digital camera 42 and a decoding application which can be downloaded by the user onto the terminal or preloaded. The loading application is configured to read the 2-D barcode on the capsule and decode usable information therefrom. It should be noted that only certain bits of the code can be made accessible to the user as others can be confidential or useless. Thereby, algorithms or software for selecting relevant data from the code is provided in the terminal. Such algorithms or software can be downloaded as part of the decoding application. Various applications already exist to decode matrix code such as Kaywa reader and the like. Softwares can also be tailored with menus and submenus, graphics, images, movies, avatar, etc., for displaying various services in a more attractive or intuitive manner.

[0063] The invention provide the user's benefits in that he/she can obtain product information, e.g., nutritive content, product recipes, etc., such as before inserting the capsule in the beverage producing device, or access relevant websites if the terminal has an internet browser and transmitter. For instance, this straight and rapid link to websites enables to achieve a transaction such as ordering new capsules or accessories, or participate to contests, promotions, or access a client's call after sale or call centres, etc.

[0064] As other examples, recipes instructions can be displayed to the user for preparing a multi-component beverage such as a cappuccino, latte macchiato, etc, using more than one capsule.

[0065] It should also be noted that the mobile telecommunication terminal can serve to download information from a remote server and subsequently uploaded it into the control unit of the beverage producing device such as to update it on: brewing parameterization software, user's instruction software, decoding application and combinations thereof.

[0066] Another application of the 2-D bar-coded capsule is illustrated in figure 10 where the beverage producing device 20 is configured to display on its display 12, an image 50 of the 2-D barcode, as captured by its digital camera 11. The image can be a complete or partial reproduction of the 2-D barcode 7 and of the same or different size. When displayed, the barcode image 50 can be re-captured by a portable telecommunication device 40, decoded via a decoding application and processed using various communication software.

[0067] Of course, the present invention is not limited to the preferred described embodiments but extends to other equivalent ones which are covered by the scope of the following claims.

Claims

1. Capsule for the preparation of a beverage from beverage ingredients contained therein, comprising:

   - a body (2) comprising at least one compartment for receiving said beverage ingredients and a flange-like rim (4) extending outwardly and transversally to a central axis (I) of said body;
   - a circular membrane (6) for closing the opening which is sealed onto the flange-like rim,
   - an optical code (7) containing binary information configured to be read by a camera (11) of a beverage producing device (20), **characterized in that**

   the optical code (7) is a two-dimensional barcode having rectilinear borders (7a-7d) and which is inscribed in a circular area (8) concentric relative to the centre (O) of the membrane having a radius (R) at least 1.5 times, preferably at least two times, smaller than the radius (R_0) of the membrane.

2. Capsule according to claim 1, **characterized in that** the two-dimensional barcode (7) is inscribed in a circular area (8) of radius (R) lower than 15 mm, preferably lower than 13 mm.

3. Capsule according to any of the preceding claims, **characterized in that** the two-dimensional barcode (7) has a matricial size comprised between 10 by 10 and 22 by a 22, preferably between 12 by 12 and 20 by 20; the size of it depending on the number of encoded data needed

4. Capsule according to any of the preceding claims **characterized in that** the two-dimensional barcode (7) comprises encoded data including at least the name of the beverage

5. Capsule according to any of the preceding claims **characterized in that** the two-dimensional code (7) comprises an URL (Uniform Resource Locator) address.

6. Capsule according to any of the preceding claims, wherein the two-dimensional barcode (7) is printed onto said capsule with an invisible ink.

7. System for preparing a beverage from a capsule according to any of the preceding claims wherein it comprises:

K-FEE SYSTEM GMBH, EX2009, page 1804
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

- a beverage producing device (20) comprising capsule handling means (21) including a capsule-holder (24) for receiving the capsule (1) therein and identification and control means (9), **characterized in that**
the identification and control means (9) comprises a digital camera (11) positioned relative to the handling means (21) and configured for capturing an image of the two-dimensional code (7) placed on the capsule and transferring said image or binary information related thereof to a control unit (10) of the identification and control means (9).

8. System for preparing a beverage according to claim 7, wherein said means for identification and control means (9) comprises a display (12) configured for displaying product information in decoded form from said image or binary information.

9. System according to claims 7 or 8, **characterized in that** it comprises a range of capsules corresponding to different beverage families (e.g., espresso, lungo, latte macchiato, cappuccino, etc.), wherein for at least two capsules of the range, the code of each capsule is of a different matricial size for being adapted for coding information related to its beverage family and wherein the camera is configured to read barcodes of at least two different matricial sizes to identify to which beverage family the identified capsule belongs to.

10. System according to claim 9, **characterized in that** the barcode for the at least two capsules comprises a number of bits that varies according to the number of characters of the name of the beverage.

11. System according to any of the preceding claims 7 to 10, **characterized in that** the capsule handling means (21) comprises a slider (23) or tubular feeder for guiding the capsule in a capsule holder (24) movably placed underneath.

12. System according to any of claims 9 to 11, **characterized in that** the camera (11) is placed in the transport path between the capsule handling means (21) and the liquid injection means (22).

13. System according to claim **12, characterized in** it comprises a capsule transport means (25) for moving the capsule holder (24) with the capsule therein in front of the digital camera (11).

14. System according to claim **13,** wherein the transport means (25) comprises a conveying belt (27) driven by a motor (26).

Patentansprüche

1. Kapsel zur Zubereitung eines Getränks aus in dieser enthaltenen Getränkezutaten, mit:

   - einem Körper (2) mit mindestens einer Kammer zur Aufnahme der Getränkezutaten und einem flanschartigen Rand (4), der sich nach außen und quer zu einer Mittelachse (I) des Körpers erstreckt;
   - einer kreisförmigen Membran (6) zum Verschließen der Öffnung, welche Membran auf dem flanschartigen Rand versiegelt ist,
   - einem optischen Code (7), der binäre Informationen enthält, die zum Lesen durch eine Kamera (11) einer Getränkeherstellungsvorrichtung (20) ausgeführt sind, **dadurch gekennzeichnet, dass**
   der optische Code (7) ein zweidimensionaler Barcode mit geradlinigen Grenzen (7a-7d) ist, der in einen kreisförmigen Bereich (8) eingeschrieben ist, der bezüglich der Mitte (O) der Membran konzentrisch ist und einen Radius (R) aufweist, der mindestens 1,5 mal kleiner, vorzugsweise halb so groß ist wie der Radius (R_o) der Membran.

2. Kapsel gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der zweidimensionale Barcode (7) in einen kreisförmigen Bereich (8) mit einem Radius (R) von weniger als 15 mm, vorzugsweise weniger als 13 mm eingeschrieben ist.

3. Kapsel gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der zweidimensionale Barcode (7) eine Rastergröße zwischen 10 mal 10 und 22 mal 22, vorzugsweise 12 mal 12 und 20 mal 20 aufweist; wobei seine Größe von der Zahl der benötigten codierten Daten abhängt.

4. Kapsel gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der zweidimensionale Barcode (7) codierte Daten umfasst, die zumindest den Namen des Getränks enthalten.

5. Kapsel gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der zweidimensionale Code (7) eine URL (Uniform Resource Locator)-Adresse umfasst.

6. Kapsel gemäß einem der vorhergehenden Ansprüche, wobei der zweidimensionale Barcode (7) mit einer unsichtbaren Tinte auf die Kapsel aufgedruckt ist.

7. System zur Zubereitung eines Getränks aus einer Kapsel gemäß einem der vorhergehenden Ansprüche, wobei es Folgendes umfasst:

K-FEE SYSTEM GMBH, EX2009, page 1805
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

- eine Getränkeherstellungsvorrichtung (20) mit einer Kapselhandhabungseinrichtung (21), die einen Kapselhalter (24) zur Aufnahme der Kapsel (1) in dieser und eine Erkennungs- und Steuereinrichtung (9) aufweisen, **dadurch gekennzeichnet, dass**
die Erkennungs- und Steuereinrichtung (9) eine Digitalkamera (11) umfasst, die bezüglich der Handhabungseinrichtung (21) positioniert ist und zum Erfassen eines Bildes des zweidimensionalen Codes (7) ausgelegt ist, der auf der Kapsel platziert ist und das Bild oder die diesbezügliche binäre Information auf eine Steuereinheit (10) der Erkennungs- und Steuereinrichtung (9) überträgt.

8. System zur Zubereitung eines Getränks gemäß Anspruch 7, wobei die Erkennungs- und Steuereinrichtung (9) eine Anzeige (12) umfasst, die zum Anzeigen von Produktinformationen in decodierter Form aus dem Bild oder der binären Information ausgeführt ist.

9. System gemäß Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** es Auswahl an Kapseln umfasst, die unterschiedlichen Getränkefamilien entsprechen (z.B. Espresso, Lungo, Latte macchiato, Cappuccino etc.), wobei für mindestens zwei Kapseln der Auswahl der Code jeder Kapsel eine unterschiedliche Rastergröße aufweist, damit er zur Codierung von auf ihre Getränkefamilie bezogenen Informationen geeignet ist, und wobei die Kamera so ausgeführt ist, dass sie Barcodes von mindestens zwei unterschiedlichen Rastergrößen ausliest, um zu erkennen, zu welcher Getränkefamilie die identifizierte Kapsel gehört.

10. System gemäß Anspruch 9, **dadurch gekennzeichnet, dass** der Barcode für die mindestens zwei Kapseln eine Reihe von Bits umfasst, die je nach der Anzahl der Zeichen des Getränkenamens variiert.

11. System gemäß einem der vorhergehenden Ansprüche 7 bis 10, **dadurch gekennzeichnet, dass** die Kapselhandhabungseinrichtung (21) einen Schieber (23) oder ein rohrförmiges Zuführteil umfasst, um die Kapsel in einen beweglich darunter platzierten Kapselhalter (24) zu leiten.

12. System gemäß einem der Ansprüche 9 bis 11, **dadurch gekennzeichnet, dass** die Kamera (11) in dem Transportweg zwischen der Kapselhandhabungseinrichtung (21) und der Flüssigkeitseinspritzeinrichtung (22) angebracht ist.

13. System gemäß Anspruch 12, **dadurch gekennzeichnet, dass** es eine Kapseltransporteinrichtung (25) zum Bewegen des Kapselhalters (24) mit der darin befindlichen Kapsel vor die Digitalkamera (11) umfasst.

14. System gemäß Anspruch 13, wobei die Transporteinrichtung (25) ein von einem Motor (26) angetriebenes Förderband (27) umfasst.

Revendications

1. Capsule pour la préparation d'une boisson à partir d'ingrédients de boisson contenus dans celle-ci, comportant:

- un corps (2) comprenant au moins un compartiment destiné à recevoir lesdits ingrédients de boisson et un rebord annulaire (4) s'étendant vers l'extérieur et transversalement à un axe central (I) dudit corps;
- une membrane circulaire (6) destinée à fermer l'ouverture et qui est scellée sur le rebord annulaire,
- un code optique (7) contenant des informations binaires configuré pour être lu par un appareil de prise de vues (11) d'un dispositif de production de boisson (20), **caractérisée en ce que** le code optique (7) est un code à barres bidimensionnel présentant des bordures rectilignes (7a-7d) et qui s'inscrit dans une zone circulaire (8) concentrique par rapport au centre (O) de la membrane et présentant un rayon (R) au moins 1,5 fois, de préférence au moins deux fois, inférieur au rayon (Ro) de la membrane.

2. Capsule selon la revendication 1, **caractérisée en ce que** le code à barres bidimensionnel (7) s'inscrit dans une zone circulaire (8) de rayon (R) inférieur à 15 mm, de préférence inférieur à 13 mm.

3. Capsule selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le code à barres bidimensionnel (7) présente une taille matricielle comprise entre 10 par 10 et 22 par 22, de préférence entre 12 par 12 et 20 par 20 ; la taille de celui-ci dépendant du nombre de données encodées nécessaires.

4. Capsule selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le code à barres bidimensionnel (7) comprend des données encodées comprenant au moins le nom de la boisson.

5. Capsule selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le code bidimensionnel (7) comprend une adresse URL (Uniform Resource Locator).

6. Capsule selon l'une quelconque des revendications

K-FEE SYSTEM GMBH, EX2009, page 1806
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

précédentes, **caractérisée en ce que** le code à barres bidimensionnel (7) est imprimé sur ladite capsule avec une encre invisible.

7. Système pour préparer une boisson à partir d'une capsule selon l'une quelconque des revendications précédentes, comprenant :

- un dispositif de production de boisson (20) comprenant des moyens de manipulation de capsule (21) comprenant un support de capsule (24) destiné à recevoir la capsule (1) dans celui-ci et des moyens d'identification et de commande (9), **caractérisé en ce que** les moyens d'identification et de commande (9) comprennent un appareil photographique numérique (11) positionné par rapport aux moyens de manipulation (21) et configuré pour capturer une image du code bidimensionnel (7) placé sur la capsule et pour transférer à une unité de commande (10) des moyens d'identification et de commande (9) ladite image ou les informations binaires associées.

8. Système de préparation d'une boisson selon la revendication 7, dans lequel lesdits moyens d'identification et moyens de commande (9) comprennent un dispositif d'affichage (12) configuré pour afficher des informations de produit sous forme décodée à partir de ladite image ou desdites informations binaires.

9. Système selon les revendications 7 ou 8, **caractérisé en ce qu'il** comprend une gamme de capsules correspondant à différentes familles de boissons (par exemple, expresso, lungo, latte macchiato, cappuccino, etc.), dans lequel, pour au moins deux capsules de la gamme, le code de chaque capsule est d'une taille matricielle différente pour être adapté pour coder des informations relatives à sa famille de boisson et dans lequel l'appareil photographique est configuré pour lire des codes à barres d'au moins deux tailles matricielles différentes afin d'identifier à quelle famille de boisson la capsule identifiée appartient.

10. Système selon la revendication 9, **caractérisé en ce que** le code à barres pour les au moins deux capsules comprend un nombre de bits qui varie selon le nombre de caractères du nom de la boisson.

11. Système selon l'une quelconque des revendications précédentes 7 à 10, **caractérisé en ce que** les moyens de manipulation de capsule (21) comprennent un dispositif de coulissage (23) ou un dispositif de transport tubulaire pour guider la capsule dans un support de capsule (24) placé au-dessous de façon mobile.

12. Système selon l'une quelconque des revendications 9 à 11, **caractérisé en ce que** l'appareil photographique (11) est placé dans le trajet de transport entre les moyens de manipulation de capsule (21) et les moyens d'injection de liquide (22).

13. Système selon la revendication 12, **caractérisé en ce qu'il** comprend un moyen de transport de capsule (25) pour déplacer le support de capsule (24) avec la capsule dedans ci en face de l'appareil photographique numérique (11).

14. Système selon la revendication 13, dans lequel le moyen de transport (25) comprend une bande transporteuse (27) entraînée par un moteur (26).

K-FEE SYSTEM GMBH, EX2009, page 1807
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

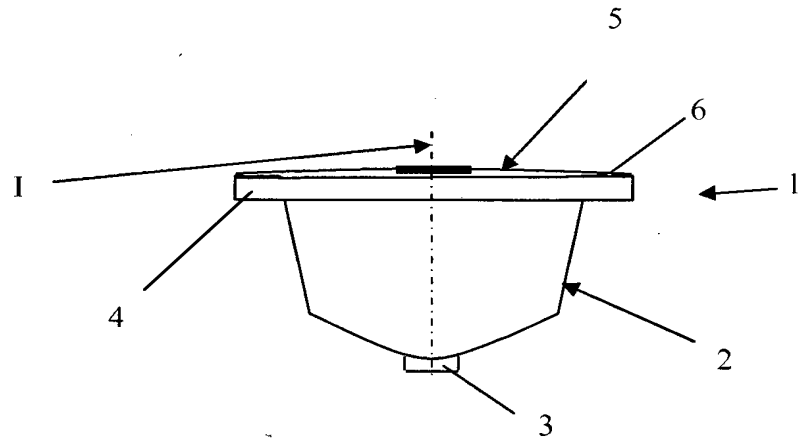


FIG. 1

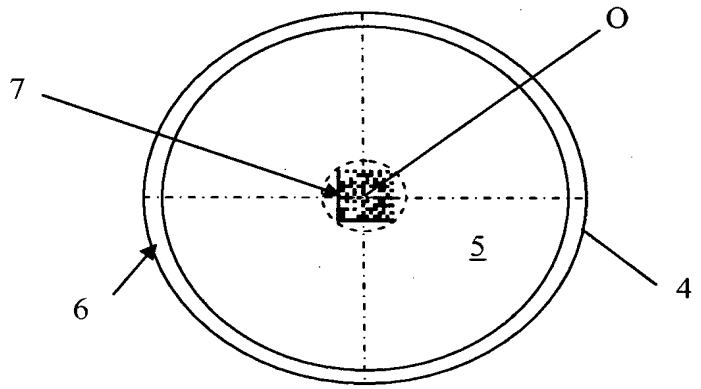


FIG. 2

K-FEE SYSTEM GMBH, EX2009, page 1808
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

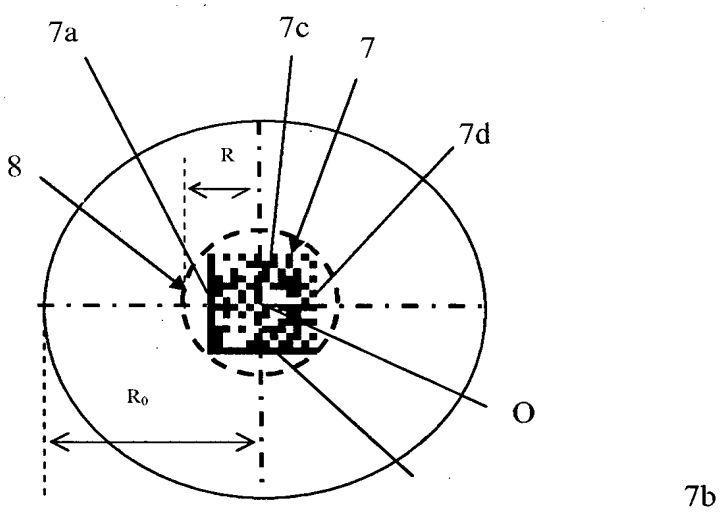


FIG. 2a

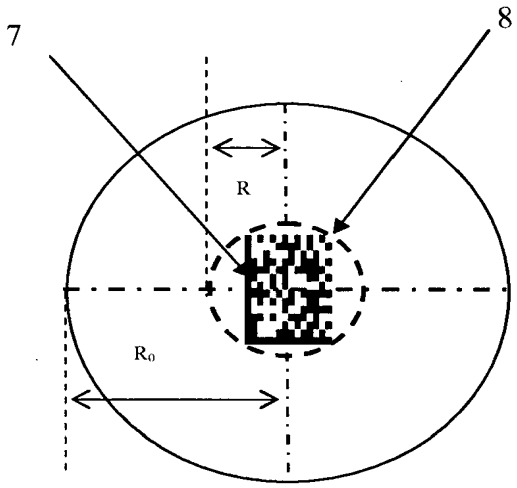


FIG. 2b

K-FEE SYSTEM GMBH, EX2009, page 1809
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

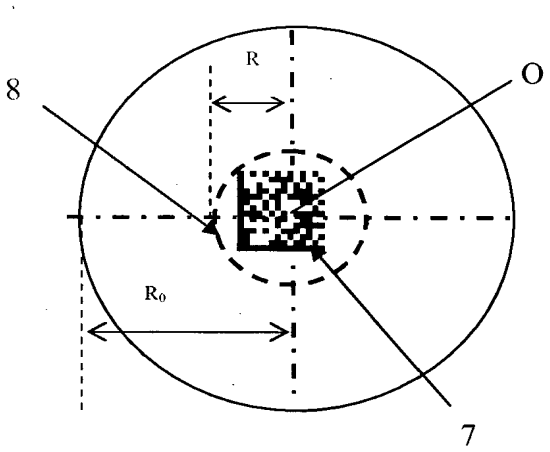


FIG. 2c

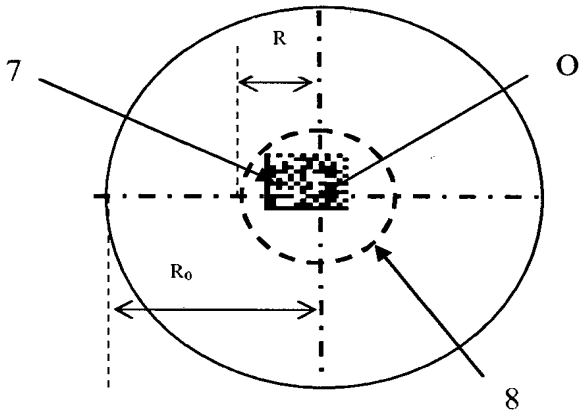


FIG. 2d

K-FEE SYSTEM GMBH, EX2009, page 1810
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

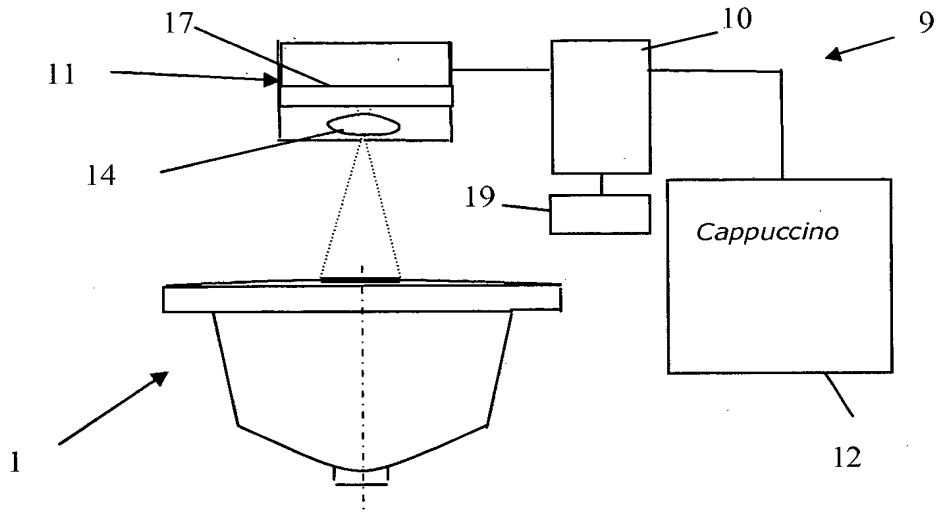


FIG. 3

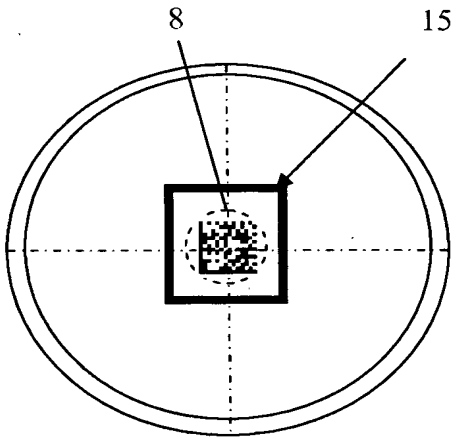


FIG. 4

K-FEE SYSTEM GMBH, EX2009, page 1811
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

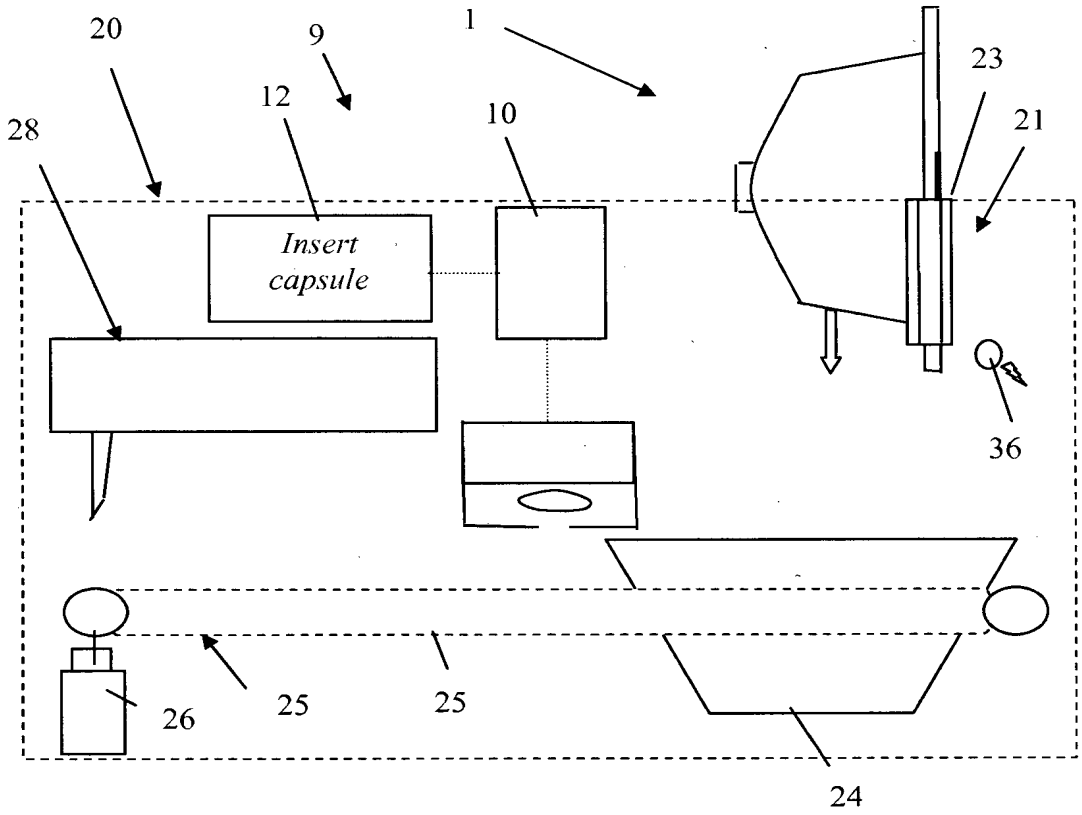


FIG. 5

K-FEE SYSTEM GMBH, EX2009, page 1812
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

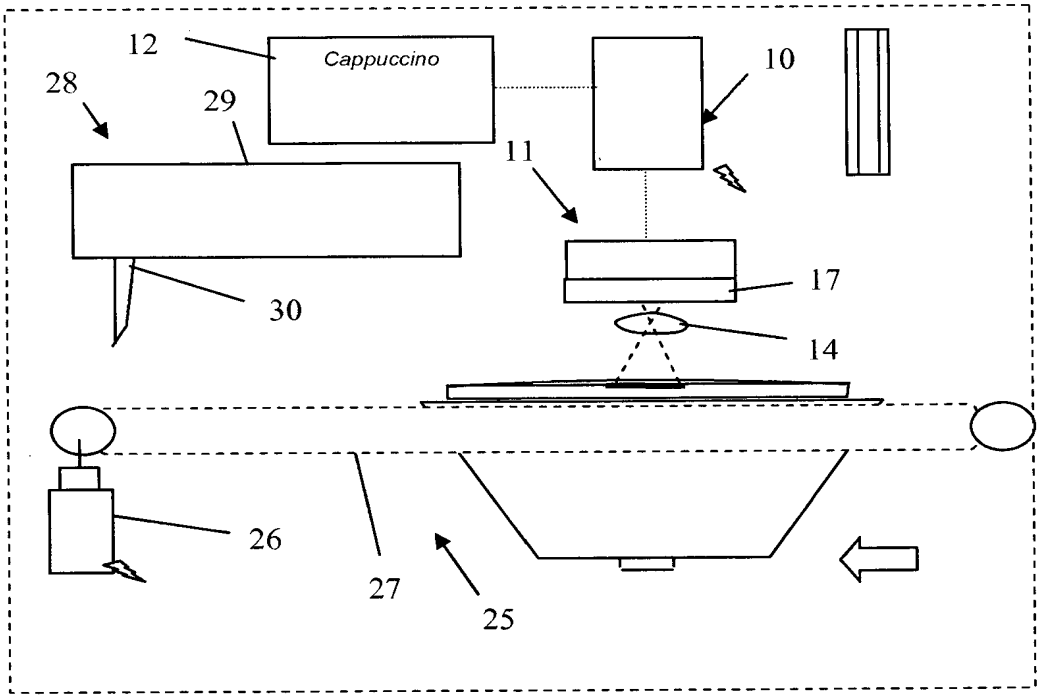


FIG. 6

K-FEE SYSTEM GMBH, EX2009, page 1813
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

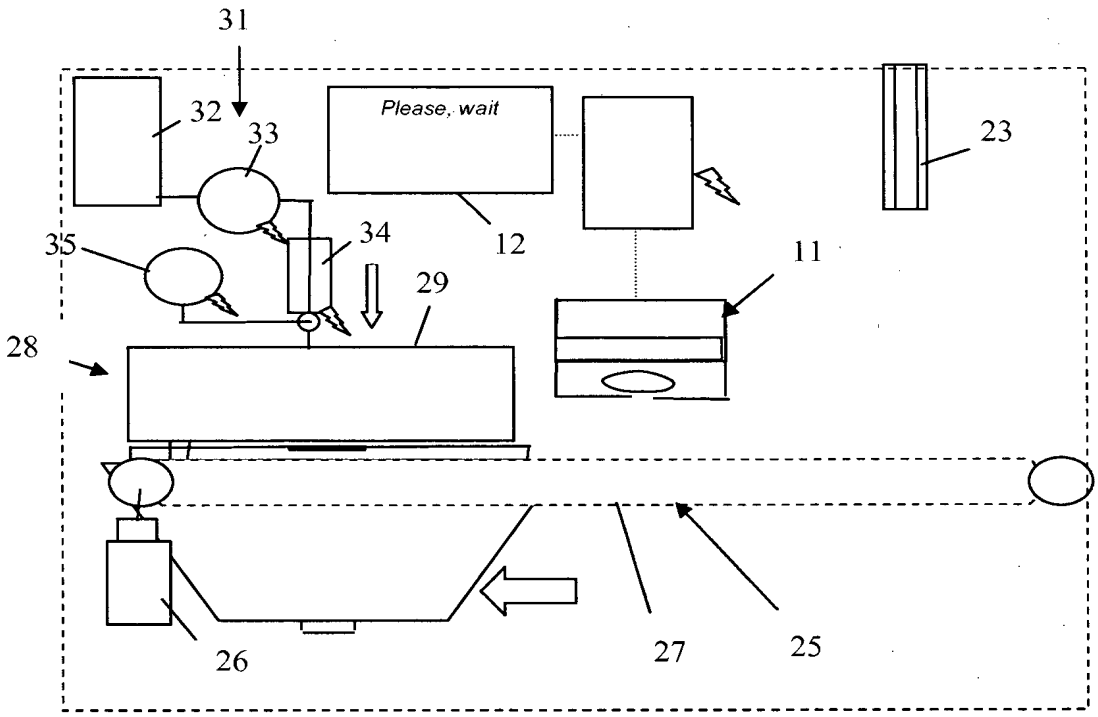


FIG. 7

K-FEE SYSTEM GMBH, EX2009, page 1814
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

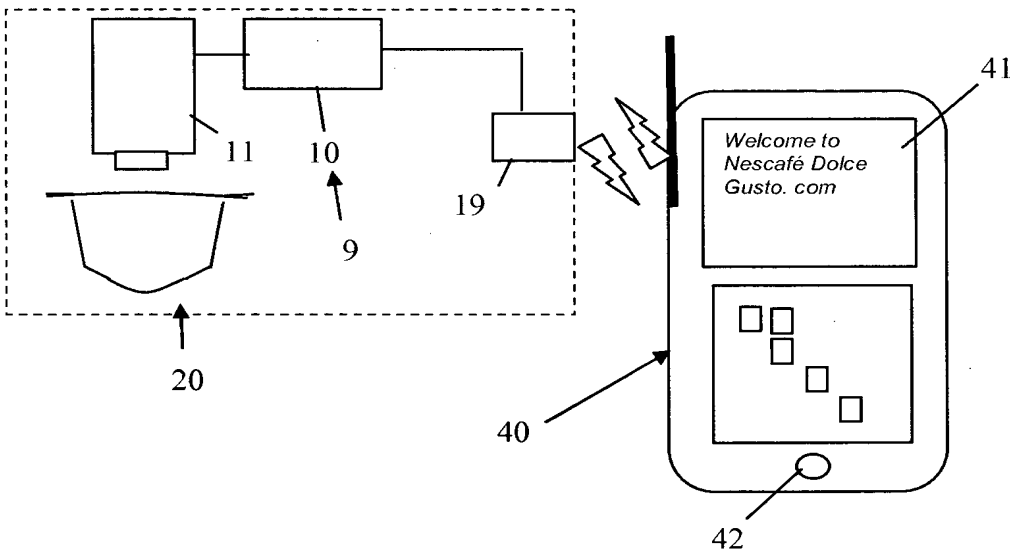


FIG. 8

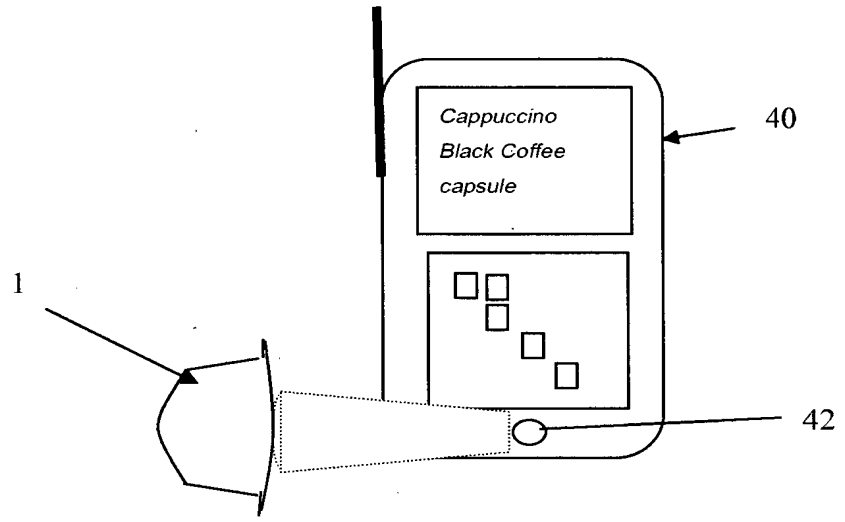


FIG. 9

K-FEE SYSTEM GMBH, EX2009, page 1815
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

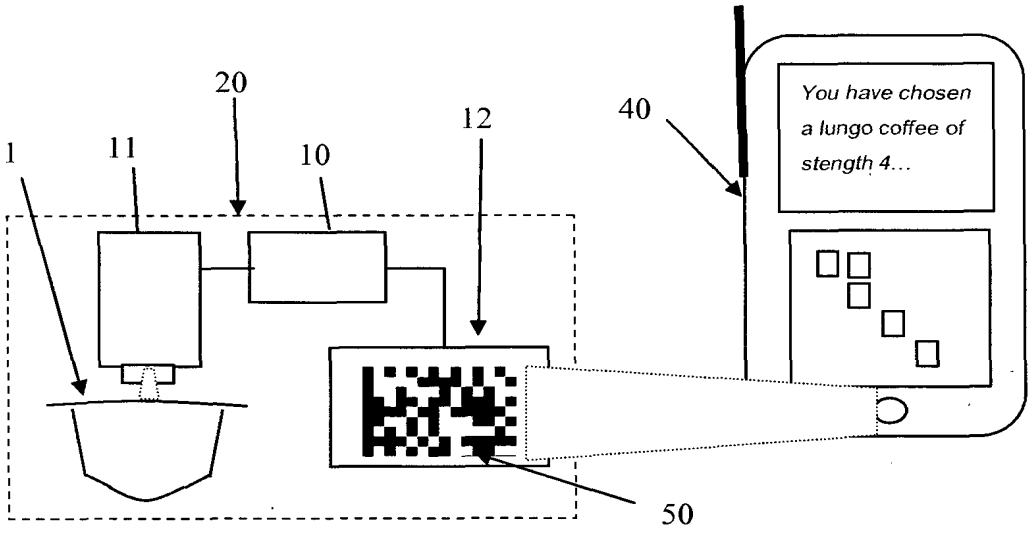


FIG. 10

K-FEE SYSTEM GMBH, EX2009, page 1816
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

REFERENCES CITED IN THE DESCRIPTION

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K-FEE SYSTEM GMBH, EX2009, page 1817
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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(54) **Machine for the preparation of beverages**

Vorrichtung zum Zubereiten von Getränken

Appareil pour préparer des boissons

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US-A1- 2002 121 198

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EP 1 440 644 B1

Description

[0001] The present invention relates to a machine for the preparation of beverages and, in particular a closure mechanism for such a machine. The machine is especially suitable for use with sealed cartridges which are formed from substantially air- and water-impermeable materials and which contain one or more ingredients for the preparation of beverages.

[0002] It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable packages for use in beverage machines. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee preparation machines which are generally termed "espresso" machines. In the production of coffee using these preparation machines the coffee cartridge is placed in a brewing chamber and hot water is passed though the cartridge at relatively high pressures, thereby extracting the aromatic coffee constituents from the ground coffee to produce the coffee beverage. Typically, such machines operate at a pressure of greater than 6×10^5 Pa. The preparation machines of the type described have to date been relatively expensive since components of the machine, such as the water pumps and seals, must be able to withstand the high pressures.

[0003] US 2002/0121198 describes a device for extracting a substance for the preparation of a drink, wherein the device comprises a first, fixed piece and a second piece that is movable relative to the first piece about an axis of rotation lying at the rear of the two pieces. The front of each piece provides a cavity for the substance to be extracted. The device also includes a system for closing and opening the two pieces possessing a two-armed closing lever and two traction rods. US-A-5794519 describes a brewing head comprising a lower brewing head part having a first recess and an upper brewing head part having a second recess. The upper brewing head part being pivotable to a closed position in which the lower brewing head part and an upper brewing head part form a receptacle that receives a coffee portion capsule.

[0004] In WO01/58786 there is described a cartridge for the preparation of beverages which operates at a pressure generally in the range 0.7 to 2.0×10^5 Pa. However, the cartridge is designed for use in a beverage preparation machine for the commercial or industrial market and is relatively expensive. Hence, there remains a requirement for a cartridge for the preparation of beverages wherein the cartridges and beverage preparation machine are suitable, in particular, for the domestic market in terms of cost, performance and reliability. There is also a need for a beverage preparation machine for such cartridges which is simple to operate and reliable in operation. In particular, the means for inserting and withdrawing the beverage cartridge must be simple to operate and provide a reliable sealing force to maintain pressure within the beverage cartridge during a dispense cycle.

[0005] Accordingly, the present invention provides a closure mechanism for a beverage preparation machine comprising a fixed lower part and an upper part rotatable relative to the lower part, the upper part being moveable from an open position, in which the upper part is disengaged from the lower part, and a closed position, in which the upper part is engaged with the lower part, the closure mechanism further comprising a clamping lever operable to retain the upper part in the closed position, wherein the clamping lever comprises a first member being pivotably connected at a first pivot to the upper part and a second member having a first end pivotable about a second pivot, an end of the first member and a second end of the second member being pivotably connected together at a third pivot such that the clamping lever has first and second positions of stability, wherein on operation of the clamping lever to move the upper part from the open position to the closed position the clamping lever moves from the first to the second position of stability, characterised in that the second member comprises a reciprocal member.

[0006] It will be understood that by the term "cartridge" as used herein is meant any package, container, sachet or receptacle which contains one or more beverage ingredients in the manner described. The cartridge may be rigid, semi-rigid or flexible.

[0007] The cartridge for use in the present invention may contain one or more beverage ingredients suitable for the formation of a beverage product. The beverage product may be, for example, one of coffee, tea, chocolate or a dairy-based beverage including milk. The beverage ingredients may be powdered, ground, leaf-based or liquid. The beverage ingredients may be insoluble or soluble. Examples include roast and ground coffee, leaf tea, powdered chocolate and soup, liquid milk-based beverages, carbonated drinks and concentrated fruit juices.

[0008] The closure mechanism of the present invention provides a reliable and inexpensive mechanism for inserting and withdrawing a beverage cartridge into and from a beverage preparation machine. The mechanism may be operated by one hand and does not require electrical power. Complicated lever arrangements are avoided.

[0009] Preferably the clamping lever comprises at least one hook member for engaging a detent on the lower part.

[0010] Preferably, in the first position of stability the third pivot lies on a first side of a datum line joining the first and second pivot points. In the second position of stability the third pivot lies on a second side of a datum line joining the first and second pivot points.

[0011] Typically the first side of the datum line is nearest the fixed lower part and the second side of the datum line is furthest from the fixed lower part.

[0012] Preferably the first end of the second member is pivotally connected to the lower part. The reciprocal member preferably comprises a cylinder, a stem received in said cylinder and a resilient sleeve for biasing said stem into an

K-FEE SYSTEM GMBH, EX2009, page 1819
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

extended configuration. Movement of the clamping lever from the first to the second position of stability is accommodated by deformation of the resilient sleeve.

[0013] Preferably, the first member of the clamping lever comprises a U-shaped arm extending round a front side of the beverage preparation machine.

[0014] Typically, the clamping mechanism comprises two second members, one on each side of the beverage preparation machine.

[0015] Advantageously, the closure mechanism further comprises a cartridge holder interposed between the lower part and the upper part and being rotatable relative to the lower part and the upper part. In this case rotation of the upper part towards the lower part causes the upper part to engage the cartridge holder and to move the cartridge holder into contact with the lower part and at the same time to cause, in use, inlet piercing means and the outlet piercing means provided in the lower part to pierce a cartridge received in the cartridge holder. Reliable and accurate positioning of the beverage cartridge is assured by means of the cartridge mount. Further, the cartridge mount automatically disengages the beverage cartridge from the inlet and outlet piercers on opening. This greatly increases the ease of removal of the cartridge and ensures that the inlet and outlet piercers are below the level of the cartridge mount when a consumer inserts their hand. This reduces the chances of the consumer injuring themselves.

[0016] In the following description the terms "upper" and "lower" and equivalents will be used to describe the relational positioning of features of the invention. The terms "upper" and "lower" and equivalents should be understood to refer to the cartridge (or other components) in its normal orientation for insertion into a beverage preparation machine and subsequent dispensing as shown, for example, in Figure 4. In particular, "upper" and "lower" refer, respectively, to relative positions nearer or further from a top surface 11 of the cartridge. In addition, the terms "inner" and "outer" and equivalents will be used to describe the relational positioning of features of the invention. The terms "inner" and "outer" and equivalents should be understood to refer to relative positions in the cartridge (or other components) being, respectively, nearer or further from a centre or major axis X of the cartridge 1 (or other component) .

[0017] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is cross-sectional drawing of an outer member of first and second embodiments of cartridge for use with the present invention;
Figure 2 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing an inwardly directed cylindrical extension;
Figure 3 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing a slot;
Figure 4 is a perspective view from above of the outer member of Figure 1;
Figure 5 is a perspective view from above of the outer member of Figure 1 in an inverted orientation;
Figure 6 is a plan view from above of the outer member of Figure 1;
Figure 7 is a cross-sectional drawing of an inner member of the first embodiment of cartridge;
Figure 8 is a perspective view from above of the inner member of Figure 7;
Figure 9 is a perspective view from above of the inner member of Figure 7 in an inverted orientation;
Figure 10 is a plan view from above of the inner member of Figure 7;
Figure 11 is a cross-sectional drawing of the first embodiment of cartridge in an assembled condition;
Figure 12 is a cross-sectional drawing of an inner member of the second embodiment of cartridge;
Figure 13 is a cross-sectional drawing of a detail of the inner member of Figure 12 showing an aperture;
Figure 14 is a perspective view from above of the inner member of Figure 12;
Figure 15 is a perspective view from above of the inner member of Figure 12 in an inverted orientation;
Figure 16 is another cross-sectional drawing of the inner member of Figure 12;
Figure 17 is a cross-sectional drawing of another detail of the inner member of Figure 12 showing an air inlet;
Figure 18 is a cross-sectional drawing of the second embodiment of cartridge in an assembled condition;
Figure 19 is cross-sectional drawing of an outer member of third and fourth embodiments of cartridge for use with the present invention;
Figure 20 is a cross-sectional drawing of a detail of the outer member of Figure 19 showing an inwardly directed cylindrical extension;
Figure 21 is a plan view from above of the outer member of Figure 19;
Figure 22 is a perspective view from above of the outer member of Figure 19;
Figure 23 is a perspective view from above of the outer member of Figure 19 in an inverted orientation;
Figure 24 is a cross-sectional drawing of an inner member of the third embodiment of cartridge;
Figure 25 is a plan view from above of the inner member of Figure 24;
Figure 26 is a cross-sectional drawing of a detail of the inner member of Figure 24 showing an in-turned upper rim;
Figure 27 is a perspective view from above of the inner member of Figure 24;
Figure 28 is a perspective view from above of the inner member of Figure 24 in an inverted orientation;

K-FEE SYSTEM GMBH, EX2009, page 1820
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Figure 29 is a cross-sectional drawing of the third embodiment of cartridge in an assembled condition;
Figure 30 is a cross-sectional drawing of an inner member of the fourth embodiment of cartridge;
Figure 31 is a plan view from above of the inner member of Figure 30;
Figure 32 is a perspective view from above of the inner member of Figure 30;
Figure 33 is a perspective view from above of the inner member of Figure 30 in an inverted orientation;
Figure 34 is a cross-sectional drawing of the fourth embodiment of cartridge in an assembled condition;
Figure 35 is a front perspective view of a beverage preparation machine including a closure mechanism according to the present invention;
Figure 36 is a front perspective view of the machine of Figure 35 with a cartridge head in an open position;
Figure 37 is a rear perspective view of the machine of Figure 35 with some parts omitted for clarity;
Figure 38 is another rear perspective view of the machine of Figure 35 with some parts omitted for clarity;
Figure 39 is a perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;
Figure 40 is another perspective view of the cartridge head of the machine of Figure 35 embodying the closure mechanism of the present invention and with some parts omitted for clarity;
Figure 41 is a cross-sectional view of the cartridge head in a closed position;
Figure 42 is a cross-sectional view of the cartridge head in an open position;
Figure 43 is a schematic layout of the machine of Figure 35;
Figure 44a and 44b are schematic layouts of first and second code recognition means for the machine of Figure 35; and
Figure 45 is a plan view of a beverage of the present invention comprising a barcode.

[0018] As shown in Figure 11, a cartridge 1 generally comprises an outer member 2, an inner member 3 and a laminate 5. The outer member 2, inner member 3 and laminate 5 are assembled to form the cartridge 1 which has an interior 120 for containing one or more beverage ingredients, an inlet 121, an outlet 122 and a beverage flow path linking the inlet 121 to the outlet 122 and which passes through the interior 120. The inlet 121 and outlet 122 are initially sealed by the laminate 5 and are opened in use by piercing or cutting of the laminate 5. The beverage flow path is defined by spatial inter-relationships between the outer member 2, inner member 3 and laminate 5 as discussed below. Other components may optionally be included in the cartridge 1, such as a filter 4, as will be described further below.

[0019] A first version of cartridge 1 which will be described for background purposes is shown in Figures 1 to 11. The first version of the cartridge 1 is particularly designed for use in dispensing filtered products such as roast and ground coffee or leaf tea. However, this version of the cartridge 1 and the other versions described below may be used with other products such as chocolate, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

[0020] As can be seen from Figure 5, the overall shape of the cartridge 1 is generally circular or disc-shaped with the diameter of the cartridge 1 being significantly greater than its height. A major axis X passes through the centre of the outer member as shown in Figure 1. Typically the overall diameter of the outer member 2 is 74.5 mm ±6mm and the overall height is 16 mm ±3mm. Typically the volume of the cartridge 1 when assembled is 30.2 ml +20%.

[0021] The outer member 2 generally comprises a bowl-shaped shell 10 having a curved annular wall 13, a closed top 11 and an open bottom 12. The diameter of the outer member 2 is smaller at the top 11 compared to the diameter at the bottom 12, resulting from a flaring of the annular wall 13 as one traverses from the closed top 11 to the open bottom 12. The annular wall 13 and closed bottom 11 together define a receptacle having an interior 34.

[0022] A hollow inwardly directed cylindrical extension 18 is provided in the closed top 11 centred on the major axis X. As more clearly shown in Figure 2, the cylindrical extension 18 comprises a stepped profile having first, second and third portions 19, 20 and 21. The first portion 19 is right circular cylindrical. The second portion 20 is frusto-conical in shape and is inwardly tapered. The third portion 21 is another right circular cylinder and is closed off by a lower face 31. The diameter of the first, second and third portion 19, 20 and 21 incrementally decreases such that the diameter of the cylindrical extension 18 decreases as one traverses from the top 11 to the closed lower face 31 of the cylindrical extension 18. A generally horizontal shoulder 32 is formed on the cylindrical extension 18 at the junction between the second and third portions 20 and 21.

[0023] An outwardly extending shoulder 33 is formed in the outer member 2 towards the bottom 12. The outwardly extending shoulder 33 forms a secondary wall 15 co-axial with the annular wall 13 so as to define an annular track forming a manifold 16 between the secondary wall 15 and the annular wall 13. The manifold 16 passes around the circumference of the outer member 2. A series of slots 17 are provided in the annular wall 13 level with the manifold 16 to provide gas and liquid communication between the manifold 16 and the interior 34 of the outer member 2. As shown in Figure 3, the slots 17 comprise vertical slits in the annular wall 13. Between 20 and 40 slots are provided. In the embodiment shown thirty-seven slots 17 are provided generally equi-spaced around the circumference of the manifold 16. The slots 17 are preferably between 1.4 and 1.8 mm in length. Typically the length of each slot is 1.6 mm representing 10% of the overall height of the outer member 2. The width of each slot is between 0.25 and 0.35 mm. Typically, the

K-FEE SYSTEM GMBH, EX2009, page 1821
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

width of each slot is 0.3 mm. The width of the slots 17 is sufficiently narrow to prevent the beverage ingredients passing therethrough into the manifold 16 either during storage or in use.

[0024] An inlet chamber 26 is formed in the outer member 2 at the periphery of the outer member 2. A cylindrical wall 27 is provided, as most clearly shown in Figure 5, which defines the inlet chamber 26 within, and partitions the inlet chamber 26 from, the interior 34 of the outer member 2. The cylindrical wall 27 has a closed upper face 28 which is formed on a plane perpendicular to the major axis X and an open lower end 29 co-planar with the bottom 12 of the outer member 2. The inlet chamber 26 communicates with the manifold 16 via two slots 30 as shown in Figure 1. Alternatively, between one and four slots may be used to communicate between the manifold 16 and the inlet chamber 26.

[0025] A lower end of the outwardly extending shoulder 33 is provided with an outwardly extending flange 35 which extends perpendicularly to the major axis X. Typically the flange 35 has a width of between 2 and 4 mm. A portion of the flange 35 is enlarged to form a handle 24 by which the outer member 2 may be held. The handle 24 is provided with an upturned rim 25 to improve grip.

[0026] The outer member 2 is formed as a single integral piece from high density polyethylene, polypropylene, polystyrene, polyester, or a laminate of two or more of these materials. A suitable polypropylene is the range of polymers available from DSM UK Limited (Redditch, United Kingdom). The outer member may be opaque, transparent or translucent. The manufacturing process may be injection moulding.

[0027] The inner member 3 as shown in Figures 7 to 10, comprises an annular frame 41 and a downwardly extending cylindrical funnel 40. A major axis X passes through the centre of the inner member 3 as shown in Figure 7.

[0028] As best shown in Figure 8, the annular frame 41 comprises an outer rim 51 and an inner hub 52 joined by ten equi-spaced radial spokes 53. The inner hub 52 is integral with and extends from the cylindrical funnel 40. Filtration apertures 55 are formed in the annular frame 41 between the radial spokes 53. A filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The filter is preferably made from a material with a high wet strength, for example a non-woven fibre material of polyester. Other materials which may be used include a water-impermeable 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 plastic materials into the cellulosic material renders the cellulosic material heat-sealable. The filter 4 may also be treated or coated with a material which is activated by heat and/or pressure so that it can be sealed to the annular frame 41 in this way.

[0029] As shown in the cross-sectional profile of Figure 7, the inner hub 52 is located at a lower position than the outer rim 51, resulting in the annular frame 41 having a sloping lower profile.

[0030] The upper surface of each spoke 53 is provided with an upstanding web 54 which divides a void space above the annular frame 41 into a plurality of passages 57. Each passage 57 is bounded on either side by a web 54 and on a lower face by the filter 4. The passages 57 extend from the outer rim 51 downwardly towards, and open into, the cylindrical funnel 40 at openings 56 defined by the inner extremities of the webs 54.

[0031] The cylindrical funnel 40 comprises an outer tube 42 surrounding an inner discharge spout 43. The outer tube 42 forms the exterior of the cylindrical funnel 40. The discharge spout 43 is joined to the outer tube 42 at an upper end of the discharge spout 43 by means of an annular flange 47. The discharge spout 43 comprises an inlet 45 at an upper end which communicates with the openings 56 of the passages 57 and an outlet 44 at a lower end through which the prepared beverage is discharged into a cup or other receptacle. The discharge spout 43 comprises a frusto-conical portion 48 at an upper end and a cylindrical portion 58 at a lower end. The cylindrical portion 58 may have a slight taper such that it narrows towards the outlet 44. The frusto-conical portion 48 helps to channel beverage from the passages 57 down towards the outlet 44 without inducing turbulence to the beverage. An upper surface of the frusto-conical portion 48 is provided with four support webs 49 equi-spaced around the circumference of the cylindrical funnel 40. The support webs 49 define channels 50 therebetween. The upper edges of the support webs 49 are level with one another and perpendicular to the major axis X.

[0032] The inner member 3 may be formed as a single integral piece from polypropylene or a similar material as described above and by injection moulding in the same manner as the outer member 2.

[0033] Alternatively, the inner member 3 and/or the outer member 2 may be made from a biodegradable polymer. Examples of suitable materials include degradable polyethylene (for example, SPITEK supplied by Symphony Environmental, Borehamwood, United Kingdom), biodegradable polyester amide (for example, BAK 1095 supplied by Symphony Environmental), poly lactic acids (PLA supplied by Cargil, Minnesota, USA), starch-based polymers, cellulose derivatives and polypeptides.

[0034] The laminate 5 is formed from two layers, a first layer of aluminium and a second layer of cast polypropylene. The aluminium layer is between 0.02 and 0.07 mm in thickness. The cast polypropylene layer is between 0.025 and 0.065 mm in thickness. In one embodiment the aluminium layer is 0.06 mm and the polypropylene layer is 0.025 mm thick. This laminate is particularly advantageous as it has a high resistance to curling during assembly. As a result the laminate 5 may be pre-cut to the correct size and shape and subsequently transferred to the assembly station on the production line without undergoing distortion. Consequently, the laminate 5 is particularly well suited to welding. Other laminate materials may be used including PET/Aluminium/PP, PE/EVOH/PP, PET/metallised/PP and Aluminium/PP

K-FEE SYSTEM GMBH, EX2009, page 1822
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

laminates. Roll laminate stock may be used instead of die cut stock.

[0035] The cartridge 1 may be closed by a rigid or semi-rigid lid instead of a flexible laminate.

[0036] Assembly of the cartridge 1 involves the following steps:

a) the inner member 3 is inserted into the outer member 2;
b) the filter 4 is cut to shape and placed onto the inner member 3 so to be received over the cylindrical funnel 40 and come to rest against the annular frame 41;
c) the inner member 3, outer member 2 and filter 4 are joined by ultrasonic welding;
d) the cartridge 1 is filled with one or more beverage ingredients;
e) the laminate 5 is affixed to the outer member 2.

[0037] These steps will be discussed in greater detail below.

[0038] The outer member 3 is orientated with the open bottom 12 directed upwards. The inner member 3 is then inserted into the outer member 2 with the outer rim 51 being received as a loose fit in an axial extension 14 at top 11 of the cartridge 1. The cylindrical extension 18 of the outer member 2 is at the same time received in the upper portion of the cylindrical funnel 40 of the inner member 3. The third portion 21 of the cylindrical extension 18 is seated inside the cylindrical funnel 40 with the closed lower face 31 of the cylindrical extension 18 bearing against the support webs 49 of the inner member 3. The filter 4 is then placed over the inner member 3 such that the filter material contacts the annular rim 51. An ultrasonic welding process is then used to join the filter 4 to the inner member 3 and at the same time, and in the same process step, the inner member 3 to the outer member 2. The inner member 3 and filter 4 are welded around the outer rim 51. The inner member 3 and outer member 2 are joined by means of weld lines around the outer rim 51 and also the upper edges of the webs 54.

[0039] As shown most clearly in Figure 11, the outer member 2 and inner member 3 when joined together define a void space 130 in the interior 120 below the annular flange 41 and exterior the cylindrical funnel 40 which forms a filtration chamber. The filtration chamber 130 and passages 57 above the annular frame 41 are separated by the filter paper 4.

[0040] The filtration chamber 130 contains the one or more beverage ingredients 200. The one or more beverage ingredients are packed into the filtration chamber 130. For a filtered style beverage the ingredient is typically roast and ground coffee or leaf tea. The density of packing of the beverage ingredients in the filtration chamber 130 can be varied as desired. Typically, for a filtered coffee product the filtration chamber contains between 5.0 and 10.2 grams of roast and ground coffee in a filtration bed of thickness of typically 5 to 14 mm. Optionally, the interior 120 may contain one or more bodies, such as spheres, which are freely movable within the interior 120 to aid mixing by inducing turbulence and breaking down deposits of beverage ingredients during discharge of the beverage.

[0041] The laminate 5 is then affixed to the outer member 2 by forming a weld 126 around the periphery of the laminate 5 to join the laminate 5 to the lower surface of the outwardly extending flange 35. The weld 126 is extended to seal the laminate 5 against the lower edge of the cylindrical wall 27 of the inlet chamber 26. Further, a weld 125 is formed between the laminate 5 and the lower edge of the outer tube 42 of the cylindrical funnel 40. The laminate 5 forms the lower wall of the filtration chamber 130 and also seals the inlet chamber 26 and cylindrical funnel 40. However, a small gap 123 exists prior to dispensation between the laminate 5 and the lower edge of the discharge spout 43. A variety of welding methods may be used, such as heat and ultrasonic welding, depending on the material characteristics of the laminate 5.

[0042] Advantageously, the inner member 3 spans between the outer member 2 and the laminate 5. The inner member 3 is formed from a material of relative rigidity, such as polypropylene. As such, the inner member 3 forms a load-bearing member that acts to keep the laminate 5 and outer member 2 spaced apart when the cartridge 1 is compressed. It is preferred that the cartridge 1 is subjected to a compressive load of between 130 and 280N in use. The compressive force acts to prevent the cartridge failing under internal pressurisation and also serves to squeeze the inner member 3 and outer member 2 together. This ensures that the internal dimensions of passageways and apertures in the cartridge 1 are fixed and unable to change during pressurisation of the cartridge 1.

[0043] To use the cartridge 1 it is first inserted into a beverage preparation machine (which will be described in further detail below) and the inlet 121 and outlet 122 are opened by piercing members of the beverage preparation machine which perforate and fold back the laminate 5. An aqueous medium, typically water, under pressure enters the cartridge 1 through the inlet 121 into the inlet chamber 26 at a pressure of between 0.1-2.0 bar. From there the water is directed to flow through the slots 30 and round the manifold 16 and into the filtration chamber 130 of the cartridge 1 through the plurality of slots 17. The water is forced radially inwardly through the filtration chamber 130 and mixes with the beverage ingredients 200 contained therein. The water is at the same time forced upwardly through the beverage ingredients. The beverage formed by passage of the water through the beverage ingredients passes through the filter 4 and filtration apertures 55 into the passages 57 lying above the annular frame 41. The sealing of the filter 4 onto the spokes 53 and the welding of the rim 51 with the outer member 2 ensures that there are no short-circuits and all the beverage has to pass through the filter 4.

[0044] The beverage then flows downwardly along the radial passages 57 formed between the webs 54 and through

K-FEE SYSTEM GMBH, EX2009, page 1823
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the openings 56 and into the cylindrical funnel 40. The beverage passes along the channels 50 between the support webs 47 and down the discharge spout 43 to the outlet 44 where the beverage is discharged into a receptacle such as a cup.

[0045] Preferably the beverage preparation machine comprises an air purge facility, wherein compressed air is forced through the cartridge 1 at the end of the dispense cycle to flush out the remaining beverage into the receptacle.

[0046] A second version of cartridge 1 is shown in Figures 12 to 18. The second version of the cartridge 1 is particularly designed for use in dispensing espresso-style products such as roast and ground coffee where it is desirable to produce a beverage having a froth of tiny bubbles known as a crema. Many of the features of the second version of the cartridge 1 are the same as in the first version and like numerals have been used to reference like features. In the following description the differences between the first and second versions will be discussed. Common features which function in the same manner will not be discussed in detail.

[0047] The outer member 2 is of the same construction as in the first version of cartridge 1 and as shown in Figures 1 to 6.

[0048] The annular frame 41 of the inner member 3 is the same as in the first version. Also, a filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The outer tube 42 of the cylindrical funnel 40 is also as before. However, there are a number of differences in the construction of the inner member 2 of the second version compared to the first version. As shown in Figure 16, the discharge spout 43 is provided with a partition 65 which extends part way up the discharge spout 43 from the outlet 44. The partition 65 helps to prevent the beverage spraying and/or splashing as it exits the discharge spout 43. The profile of the discharge spout 43 is also different and comprises a stepped profile with a distinct dog-leg 66 near an upper end of the tube 43.

[0049] A rim 67 is provided upstanding from the annular flange 47 joining the outer tube 42 to the discharge spout 43. The rim 67 surrounds the inlet 45 to the discharge spout 43 and defines an annular channel 69 between the rim 67 and the upper portion of the outer tube 42. The rim 67 is provided with an inwardly directed shoulder 68. At one point around the circumference of the rim 67 an aperture 70 is provided in the form of a slot which extends from an upper edge of rim 67 to a point marginally below the level of the shoulder 68 as most clearly shown in Figures 12 and 13. The slot has a width of 0.64 mm.

[0050] An air inlet 71 is provided in annular flange 47 circumferentially aligned with the aperture 70 as shown in Figures 16 and 17. The air inlet 71 comprises an aperture passing through the flange 47 so as to provide communication between a point above the flange 47 and the void space below the flange 47 between the outer tube 42 and discharge spout 43. Preferably, and as shown, the air inlet 71 comprises an upper frusto-conical portion 73 and a lower cylindrical portion 72. The air inlet 71 is typically formed by a mould tool such as a pin. The tapered profile of the air inlet 71 allows the mould tool to be more easily removed from the moulded component. The wall of the outer tube 42 in the vicinity of the air inlet 71 is shaped to form a chute 75 leading from the air inlet 71 to the inlet 45 of the discharge spout 43. As shown in Figure 17, a canted shoulder 74 is formed between the air inlet 71 and the chute 75 to ensure that the jet of beverage issuing from the slot 70 does not immediately foul on the upper surface of the flange 47 in the immediate vicinity of the air inlet 71.

[0051] The assembly procedure for the second version of cartridge 1 is similar to the assembly of the first version. However, there are certain differences. As shown in Figure 18, the third portion 21 of the cylindrical extension 18 is seated inside the support rim 67 rather than against support webs. The shoulder 32 of the cylindrical extension 18 between the second portion 20 and third portion 21 bears against the upper edge of the support rim 67 of the inner member 3. An interface zone 124 is thus formed between the inner member 3 and the outer member 2 comprising a face seal between the cylindrical extension 18 and the support rim 67 which extends around nearly the whole circumference of the cartridge 1. The seal between the cylindrical extension 18 and the support rim 67 is not fluid-tight though since the slot 70 in the support rim 67 extends through the support rim 67 and downwardly to a point marginally below the shoulder 68. Consequently the interface fit between the cylindrical extension 18 and the support rim 67 transforms the slot 70 into an aperture 128, as most clearly shown in Figure 18, providing gas and liquid communication between the annular channel 69 and the discharge spout 43. The aperture is typically 0.64 mm wide by 0.69 mm long.

[0052] Operation of the second version of cartridge 1 to dispense a beverage is similar to the operation of the first version but with certain differences. Beverage in the radial passages 57 flows downwardly along the passages 57 formed between the webs 54 and through the openings 56 and into the annular channel 69 of the cylindrical funnel 40. From the annular channel 69 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 130 and passages 57. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 18, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is incorporated into the beverage stream via the air inlet 71 in the form of a multitude of small air bubbles. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired crema. Thus, the aperture 128 and the air inlet 71 together form an eductor which acts to entrain air into the beverage. Flow of beverage into the eductor should be kept as smooth as possible to reduce pressure losses. Advantageously, the walls of the eductor should be

K-FEE SYSTEM GMBH, EX2009, page 1824
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

made concave to reduce losses due to 'wall effect' friction. The dimensional tolerance of the aperture 128 is small. Preferably the aperture size is fixed plus or minus 0.02 mm^2. Hairs, fibrils or other surface irregularities can be provided within or at the exit of the eductor to increase the effective cross-sectional area which has been found to increase the degree of air entrainment.

[0053] A third version of cartridge 1 is shown in Figures 19 to 29. The third version of the cartridge 1 is particularly designed for use in dispensing soluble products which may be in powdered, liquid, syrup, gel or similar form. The soluble product is dissolved by or forms a suspension in, an aqueous medium such as water when the aqueous medium is passed, in use, through the cartridge 1. Examples of beverages include chocolate, coffee, milk, tea, soup or other rehydratable or aqueous-soluble products. Many of the features of the third version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the third and previous versions will be discussed. Common features which function in the same manner will not be discussed in detail.

[0054] Compared to the outer member 2 of the previous versions, the hollow inwardly directed cylindrical extension 18 of the outer member 2 of the third version has a larger overall diameter as shown in Figure 20. In particular the diameter of the first portion 19 is typically between 16 and 18- mm compared to 13.2 mm for the outer member 2 of the previous versions. In addition, the first portion 19 is provided with a convex outer surface 19a, or bulge, as most clearly shown in Figure 20, the function of which will be described below. The diameter of the third portions 21 of the cartridges 1 are however the same resulting in the area of the shoulder 32 being greater in this, the third version of the cartridge 1. Typically the volume of the cartridge 1 when assembled is 32.5 ml $\pm$20%.

[0055] The number and positioning of the slots in the lower end of the annular wall 13 is also different. Between 3 and 5 slots are provided. In the embodiment as shown in Figure 23, four slots 36 are provided equi-spaced around the circumference of the manifold 16. The slots 36 are slightly wider than in the previous versions of the cartridge 1 being between 0.35 and 0.45 mm, preferably 0.4 mm wide.

[0056] In other respects the outer members 2 of the cartridges 1 are the same.

[0057] The construction of the cylindrical funnel 40 of the inner member 3 is the same as in the first version of cartridge 1 with an outer tube 42, discharge spout 45, annular flange 47 and support webs 49 being provided. The only difference is that the discharge spout 45 is shaped with an upper frusto-conical section 92 and a lower cylindrical section 93.

[0058] In contrast to the previous versions and as shown in Figures 24 to 28, the annular frame 41 is replaced by a skirt portion 80 which surrounds the cylindrical funnel 40 and is joined thereto by means of eight radial struts 87 which adjoin the cylindrical funnel 40 at or near the annular flange 47. A cylindrical extension 81 of the skirt portion 80 extends upwardly from the struts 87 to define a chamber 90 with an open upper face. An upper rim 91 of the cylindrical extension 81 has an in-turned profile as shown in Figure 26. An annular wall 82 of the skirt portion 80 extends downwardly from the struts 87 to define an annular channel 86 between the skirt portion 80 and the outer tube 42.

[0059] The annular wall 82 comprises at a lower end an exterior flange 83 which lies perpendicular to the major axis X. A rim 84 depends downwardly from a lower surface of the flange 83 and contains five apertures 85 which are circumferentially equi-spaced around the rim 84. Thus, the rim 84 is provided with a castellated lower profile.

[0060] Apertures 89 are provided between the struts 87 allowing communication between the chamber 90 and the annular channel 86.

[0061] The assembly procedure for the third version of cartridge 1 is similar to the assembly of the first version but with certain differences. The outer member 2 and inner member 3 are push-fitted together as shown in Figure 29 and retained by means of a snap-fit arrangement rather than welded together. On joining the two members the inwardly directed cylindrical extension 18 is received inside the upper cylindrical extension 81 of the skirt portion 80. The inner member 3 is retained in the outer member 2 by frictional interengagement of the convex outer surface 19a of the first portion 19 of the cylindrical extension 18 with the in-turned rim 91 of the upper cylindrical extension 81. With the inner member 3 located in the outer member 2 a mixing chamber 134 is defined located exterior to the skirt portion 80. The mixing chamber 134 contains the beverage ingredients 200 prior to dispensation. It should be noted that the four inlets 36 and the five apertures 85 are staggered circumferentially with respect to one another. The radial location of the two parts relative to each other need not be determined or fixed during assembly since the use of four inlets 36 and five apertures 85 ensures that misalignment occurs between the inlets and apertures whatever the relative rotational positioning of the components.

[0062] The one or more beverage ingredients are packed into the mixing chamber 134 of the cartridge. The density of packing of the beverage ingredients in the mixing chamber 134 can be varied as desired.

[0063] The laminate 5 is then affixed to the outer member 2 and inner member 3 in the same manner as described above in the previous versions.

[0064] In use, water enters the mixing chamber 134 through the four slots 36 in the same manner as previous versions of the cartridge. The water is forced radially inwardly through the mixing chamber and mixes with the beverage ingredients contained therein. The product is dissolved or mixed in the water and forms the beverage in the mixing chamber 134 and is then driven though the apertures 85 into the annular channel 86 by back pressure of beverage and water in the

K-FEE SYSTEM GMBH, EX2009, page 1825
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

mixing chamber 134. The circumferential staggering of the four inlet slots 36 and the five apertures 85 ensures that jets of water are not able to pass radially directly from the inlet slots 36 to the apertures 85 without first circulating within the mixing chamber 134. In this way the degree and consistency of dissolution or mixing of the product is significantly increased. The beverage is forced upwardly in the annular channel 86, through the apertures 89 between the struts 87 and into the chamber 90. The beverage passes from chamber 90 through the inlets 45 between the support webs 49 into the discharge spout 43 and towards the outlet 44 where the beverage is discharged into a receptacle such as a cup. The cartridge finds particular application with beverage ingredients in the form of viscous liquids or gels. In one application a liquid chocolate ingredient is contained in the cartridge 1 with a viscosity of between 1700 and 3900mPa at ambient temperature and between 5000 and 100OOmPa at 0°C and a refractive solids of 67 Brix ±3. In another application liquid coffee is contained in the cartridge 1 with a viscosity of between 70 and 2000mPa at ambient and between 80 and 5000mPa at 0°C where the coffee has a total solids level of between 40 and 70%.

[0065] A fourth version of cartridge 1 is shown in Figures 30 to 34. The fourth version of the cartridge 1 is particularly designed for use in dispensing liquid products such as concentrated liquid milk. Many of the features of the fourth version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the fourth and previous versions will be discussed. Common features which function in the same manner will not be discussed in detail.

[0066] The outer member 2 is the same as in the third version of cartridge 1 and as shown in Figures 19 to 23.

[0067] The cylindrical funnel 40 of the inner member 3 is similar to that shown in the second version of cartridge 1 but with certain differences. As shown in Figure 30 the discharge spout 43 is shaped with an upper frusto-conical section 106 and a lower cylindrical section 107. Three axial ribs 105 are provided on the inner surface of the discharge spout 43 to direct the dispensed beverage downwards towards the outlet 44 and prevent the discharged beverage from spinning within the spout. Consequently, the ribs 105 act as baffles. As in the second version of cartridge 1, an air inlet 71 is provided through the annular flange 47. However, the chute 75 beneath the air inlet 71 is more elongated than in the second version.

[0068] A skirt portion 80 is provided similar to that shown in the third version of the cartridge 1 described above. Between 5 and 12 apertures 85 are provided in the rim 84. Typically ten apertures are provided rather than the five provided in the third version of cartridge 1.

[0069] An annular bowl 100 is provided extending from and integral with the flange 83 of the skirt portion 80. The annular bowl 100 comprises a flared body 101 with an open upper mouth 104 which is directed upwards. Four feed apertures 103 shown in Figures 30 and 31 are located in the body 101 at or near the lower end of the bowl 100 where it joins the skirt portion 80. Preferably, the feed apertures are equi-spaced around the circumference of the bowl 100.

[0070] The laminate 5 is of the type described above in the previous embodiments.

[0071] The assembly procedure for the fourth version of cartridge 1 is the same as that for the third version.

[0072] Operation of the fourth version of cartridge is similar to that of the third version. The water enters the cartridge 1 and the mixing chamber 134 in the same manner as before. There the water mixes with and dilutes the liquid product which is then forced out through the apertures 85 towards the outlet 44 as described above. A proportion of the liquid product is initially contained within the annular bowl 100 as shown in Figure 34 and is not subject to immediate dilution by the water entering the mixing chamber 134. The diluted liquid product in the lower part of the mixing chamber 134 will tend to exit through apertures 85 rather than be forced up and into the annular bowl 100 through upper mouth 104. Consequently, the liquid product in the annular bowl 100 will remain relatively concentrated compared to the product in the lower part of the mixing chamber 134. The liquid product in the annular bowl 100 drips through the feed apertures 103 into the stream of product exiting the mixing chamber 134 through the apertures 85. The annular bowl 100 acts to even out the concentration of the diluted liquid product entering the cylindrical funnel 40 by holding back a proportion of the concentrated liquid product and releasing it into the exiting liquid stream more steadily throughout the dispensation cycle.

[0073] From the annular channel 86 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 134 and chamber 90. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 34, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is incorporated into the beverage stream via the air inlet 71 in the form of a multitude of small air bubbles. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired frothy appearance.

[0074] Advantageously, the inner member 3, outer member 2, laminate 5 and filter 4 can all be readily sterilised due to the components being separable and not individually comprising tortuous passageways or narrow crevices. Rather, it is only after conjoining the components, after sterilisation, that the necessary passageways are formed. This is particularly important where the beverage ingredient is a dairy-based product such as liquid milk concentrate.

[0075] The fourth embodiment of beverage cartridge is particularly advantageous for dispensing a concentrated dairy-

K-FEE SYSTEM GMBH, EX2009, page 1826
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

based liquid product such as liquid milk. Previously, powdered milk products have been provided in the form of sachets for adding to a pre-prepared beverage. However, for a cappuccino-style beverage it is necessary to foam the milk. This has been achieved previously by passing steam through a liquid milk product. However this necessitates the provision of a steam supply which increases the cost and complexity of the machine used to dispense the beverage. The use of steam also increases the risk of injury during operation of the cartridge. Accordingly the present invention provides for a beverage cartridge having a concentrated dairy-based liquid product therein. It has been found that by concentrating the milk product a greater amount of foam can be produced for a particular volume of milk when compared to fresh or UHT milk. This reduces the size required for the milk cartridge. Fresh semi-skimmed milk contains approximately 1.6% fat and 10% total solids. The concentrated liquid milk preparations of the present invention contain between 3 and 10% fat and 25 to 40% total solids. In a typical example, the preparation contains 4% fat and 30% total solids. The concentrated milk preparations are suitable for foaming using a low pressure preparation machine as will be described below. In particular, foaming of the milk is achieved at pressures below 2 bar, preferably approximately 1.5 bar using the cartridge of the fourth embodiment described above.

[0076] The cartridge of the fourth embodiment is also advantageous in dispensing liquid coffee products.

[0077] It has been found that the embodiments of beverage cartridge described above advantageously provide an improved consistency of the brewed beverage when compared to prior art cartridges. Reference is made to Table 1 below which shows the results of brew yields for twenty samples each of cartridges A and B containing roast and ground coffee. Cartridge A is a beverage cartridge according to the first embodiment of the present invention. Cartridge B is a prior art beverage cartridge as described in the applicant's document WO01/58786. The refractive index of the brewed beverage is measured in Brix units and converted to a percentage of soluble solids (%SS) using standard tables and formulae. In the examples below:

$$\%SS = 0.7774 * (\text{Brix value}) + 0.0569.$$

$$\%\ \text{Yield} = (\%SS * \text{Brew Volume (g)})/(100 * \text{Coffee Weight (g)})$$

K-FEE SYSTEM GMBH, EX2009, page 1827
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Table 1

CARTRIDGE A

Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	105.6	6.5	1.58	1.29	20.88
2	104.24	6.5	1.64	1.33	21.36
3	100.95	6.5	1.67	1.36	21.05
4	102.23	6.5	1.71	1.39	21.80
5	100.49	6.5	1.73	1.40	21.67
6	107.54	6.5	1.59	1.29	21.39
7	102.70	6.5	1.67	1.36	21.41
8	97.77	6.5	1.86	1.50	22.61
9	97.82	6.5	1.7	1.38	20.75
10	97.83	6.5	1.67	1.36	20.40
11	97.6	6.5	1.78	1.44	21.63
12	106.64	6.5	1.61	1.31	21.47
13	99.26	6.5	1.54	1.25	19.15
14	97.29	6.5	1.59	1.29	19.35
15	101.54	6.5	1.51	1.23	19.23
16	104.23	6.5	1.61	1.31	20.98
17	97.5	6.5	1.73	1.40	21.03
18	100.83	6.5	1.68	1.36	21.14
19	101.67	6.5	1.67	1.36	21.20
20	101.32	6.5	1.68	1.36	21.24
				AVERAGE	20.99

CARTRIDGE B

Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	100.65	6.5	1.87	1.511	23.39
2	95.85	6.5	1.86	1.503	22.16
3	98.4	6.5	1.8	1.456	22.04
4	92.43	6.5	2.3	1.845	26.23
5	100.26	6.5	1.72	1.394	21.50
6	98.05	6.5	2.05	1.651	24.90
7	99.49	6.5	1.96	1.581	24.19
8	95.62	6.5	2.3	1.845	27.14
9	94.28	6.5	2.17	1.744	25.29
10	96.13	6.5	1.72	1.394	20.62
11	96.86	6.5	1.81	1.464	21.82
12	94.03	6.5	2.2	1.767	25.56
13	96.28	6.5	1.78	1.441	21.34

K-FEE SYSTEM GMBH, EX2009, page 1828
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

14	95.85	6.5	1.95	1.573	23.19
15	95.36	6.5	1.88	1.518	22.28
16	92.73	6.5	1.89	1.526	21.77
17	88	6.5	1.59	1.293	17.50
18	93.5	6.5	2.08	1.674	24.08
19	100.88	6.5	1.75	1.417	22.00
20	84.77	6.5	2.37	1.899	24.77
				AVERAGE	23.09

[0078] performing a t-test statistical analysis on the above data gives the following results:

Table 2 t-Test: Two-Sample Assuming Equal Variances

	% Yield (Cartridge A)	*% Yield (Cartridge B)*
Mean	20.99	23.09
Variance	0.77	5.04
Observations	20	20
Pooled Variance	2.90	
Hypothesized Mean Difference	0	
df	38	
t Stat	-3.90	
P(T<=t) one-tail	0.000188	
t Critical one-tail	1.686	
P(T<=t) two-tail	0.000376	
t Critical two-tail	2.0244	
Standard Deviation	0.876	2.245

[0079] The analysis shows that the consistency of % yield, which equates to brew strength, for the cartridges is significantly better (at a 95% confidence level) than the prior art cartridges, with a standard deviation of 0.88% compared to 2.24%. This means that beverages brewed with the cartridges have a more repeatable and uniform strength. This is preferred by consumers who like their drinks to taste the same time after time and do not want arbitrary changes in brew strength.

[0080] The materials of the cartridges described above may be provided with a barrier coating to improve their resistance to oxygen and/or moisture and/or other contaminant ingress. The barrier coating may also improve the resistance to leakage of the beverage ingredients from within the cartridges and/or reduce the degree of leaching of extractibles from the cartridge materials which might adversely affect the beverage ingredients. The barrier coating may be of a material selected from the group of PET, Polyamide, EVOH, PVDC or a metallised material. The barrier coating may be applied by a number of mechanisms including but not limited to vapour deposition, vacuum deposition, plasma coating, co-extrusion, in-mould labelling and two/multi-stage moulding.

[0081] A beverage preparation machine 201 incorporating the present invention for use with the above described beverage cartridges is shown in Figures 35 to 45. The beverage preparation machine 201 generally comprises a housing 210 containing a water tank 220, a water heater 225, a water pump 230, an air compressor 235, a control processor, a user interface 240 and a cartridge head 250. The cartridge head 250 in turn generally comprises a cartridge holder 251 for holding, in use, the beverage cartridge 1, cartridge recognition means 252 and inlet and outlet piercers 253, 254 for forming, in use, the inlet 121 and the outlet 122 in the beverage cartridge 1.

[0082] The housing 210 contains and holds in position the other components of the machine 201. The housing 210 preferably made in whole or in part from a robust plastics material such as ABS. Alternatively, the housing 210 can be made in whole or in part from a metallic material such as stainless steel or aluminium. The housing 210 is preferably comprises a clam-shell design having a front half 211 and a rear half 212 which allow access during assembly for fitting of the machine 201 components and can afterwards be joined together to define an interior 213 of the housing 210. The rear half 212 provides a recess 214 for the attachment of the water tank 220. The housing 210 is formed with means,

K-FEE SYSTEM GMBH, EX2009, page 1829
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

such as detents, abutments, bosses and threaded portions, for retaining the components of the machine 201 in position without the need for a separate chassis. This reduces the overall cost and weight of the machine 201. A base 215 of the housing 210 is preferably provided with feet for standing the machine thereon in a stable manner. Alternatively, the base 215 itself may have a shape forming a stable support.

[0083] The front half 211 of the housing 210 comprises a dispense station 270 where dispensation of the beverage takes place. The dispense station 270 comprises a receptacle stand 271 having a hollow interior forming a drip tray 272. An upper surface 273 of the receptacle stand is provided with a grill 274 on which the receptacle is positioned. The drip tray 272 is removable from the housing 210 to ease emptying of the collected water. A recess 275 is formed in the front half of the housing 210 above the receptacle stand 271 to accommodate the dimensions of the receptacle.

[0084] The cartridge head 250 is located towards the top of the housing 210 above the receptacle stand as shown in Figures 35 and 36. Preferably, the height of the grill 274 relative to the cartridge head 250 can be adjusted to accommodate different sizes of receptacle. It is preferred that the receptacle is as close to the cartridge head 250 as possible, whilst still allowing the receptacle to be inserted and withdrawn from the dispense station 270, so as to minimise the height that the dispensed beverage has to descend before contacting the receptacle. This acts to minimise spraying and splashing of the beverage and minimise loss of entrained air bubbles where these are present. Preferably receptacles of between 70mm and 110 mm in height can be inserted between the grill 274 and cartridge head 250.

[0085] The machine user interface 240 is located on the front of the housing 210 and comprises a start/stop button 241, and a plurality of status indicators 243-246.

[0086] The status indicators 243-246 preferably include a light emitting diode (LED) 243 to indicate readiness of the machine 201, a LED 244 to indicate if an error has occurred in the machine 201 operation, and one or more LEDs 245-256 to indicate whether the machine 201 is operating in manual or automatic modes. The LEDs 243-246 may be controlled to illuminate at a constant intensity, to flash intermittently, or both depending on the status of the machine 201. The LEDs 243-246 may have a variety of colours including green, red and yellow.

[0087] The start/stop button 241 controls commencement of the dispense cycle and is a manually operated push-button, switch or similar.

[0088] A volume adjustment control may be provided to allow a user of the machine 201 to manually adjust the volume of the delivered beverage without altering the other operating characteristics. Preferably the volume adjustment control allows an adjustment in volume of plus or minus 20%. The volume adjustment control may be a rotary knob, a linear slider, a digital readout with increment and decrement buttons, or similar. More typically, volume is controlled by a user operating the start/stop button 241.

[0089] A manual power switch (not shown) may be provided on the machine 201. Alternatively, power supply can be controlled simply by insertion or removal or the power supply plug from the mains power supply.

[0090] The water tank 220 is located to the rear of the housing 210 and is connected to the rear half 212 of the housing 210. The water tank 220 comprises a generally cylindrical body 221 which may be right circular or a frustum as desired for aesthetic reasons. The tank comprises an inlet for filling the tank with water which is closed off in use by a manually removable lid 222. An outlet is provided towards a lower end of the tank which communicates with the water pump 230. The water tank 220 may be made from a transparent or translucent material to allow a consumer to view the quantity of water remaining in the tank. Alternatively, the water tank 220 may be made from an opaque material but have provided a viewing window therein. In addition, or in place of the above, the water tank 220 may be provided with a low level sensor which prevents operation of the water pump 230 and optionally triggers a warning indicator, such as an LED, when the water level in the tank descends to a preselected level. The water tank 220 preferably has an internal capacity of approximately 1.5 litres.

[0091] The water pump 230 is operatively connected between the water tank 220 and the water heater 225 as shown schematically in Figure 43 and is controlled by the control processor. The pump provides a maximum flow rate of 900 ml/min of water at a maximum pressure of 2.5 bar. Preferably, in normal use, the pressure will be limited to 2 bar. The flow rate of water through the machine 201 can be controlled by the control processor to be a percentage of the maximum flow rate of the pump by cycle chopping the electrical supply to the pump. Preferably the pump can be driven at any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100% of the maximum rated flow rate. The accuracy of the volume of water pumped is preferably + or - 5% leading to a + or - 5% accuracy in the final volume of the dispensed beverage. A suitable pump is the Evolution EP8 pump produced by Ulka S.r.1. (Pavia, Italy). A volumetric flow sensor (not shown) is preferably provided in the flow line either upstream or downstream of the water pump 230. Preferably, the volumetric flow sensor is a rotary sensor.

[0092] The water heater 225 is located in the interior of the housing 210. The heater 225 has a power rating of 1550 W and is able to heat water received from the water pump 230 from a starting temperature of approximately 20 °C to an operating temperature of around 85°C in under 1 minute. Preferably the dwell time between the end of one dispense cycle and the heater 225 being able to commence a subsequent dispense cycle is less than 10 seconds. The heater maintains the selected temperature to within + or - 2 °C during the dispense cycle. As discussed below, the water for the dispense cycle may be delivered to the cartridge head 250 at 83 °C or 93 °C. The heater 225 is able to quickly adjust

K-FEE SYSTEM GMBH, EX2009, page 1830
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the delivery temperature to either 83 °C or 93 °C from a nominal water temperature of 85 °C. The heater 225 comprises an over-temperature cut-off which shuts off the heater if the temperature exceeds 98 °C. Water output from the heater 225 is fed to the cartridge head 250 and cartridge 1 by means of a three-way valve. If the pressure of the water flow is acceptable the water is passed to the cartridge 1. If the pressure is below or above predetermined limits then the water is diverted by means of the three-way valve into the drip tray recovery receptacle 270.

[0093] The air compressor 235 is operatively connected to the cartridge head 250 by means of a one-way valve and controlled by the control processor. The air compressor 235 provides a maximum flow rate of air of 500 ml/min at 1.0 bar. In use a working volume of 35 ml is pressurised to 2.0 bar. Preferably, the air compressor 235 can produce two flow rates: a fast (or maximum) flow rate and a slow flow rate.

[0094] The control processor of the beverage preparation machine 201 comprises a processing module and a memory. The control processor is operatively connected to, and controls operation of, the water heater 225, water pump 230, air compressor 235 and user interface 240.

[0095] The memory of the control processor includes one or more variables for one or more operational parameters for the beverage preparation machine 201. In the illustrated embodiment the operational parameters are the temperature of the water passed through the beverage cartridge 1 during the operating stage, the speed of charging the beverage cartridge 1, the presence or otherwise of a soak step, the total dispensed volume of the beverage, the flow rate of the water during the discharge stage, and the flow rate and period of the purge stage.

[0096] The variables for the operational parameters are stored in the memory. The cartridge 1 comprises a code provided on or in the cartridge 1 representing the operational parameters required for optimal dispensation of the beverage in that cartridge 1. The code is in binary format and comprises a plurality of data bits corresponding to the variables stored in the control processor memory. Table 3 illustrates how 13 bits of data can be used to represent the necessary variables for the operational parameters described above.

Table 3

Bit	Parameter	Description
0 & 1	Water temperature	00 = cold 01 = warm 10 = 83 °C 11 = 93 °C
2 & 3	Cartridge charge	00 = fast charge with soak 01 = fast charge without soak 10 = slow charge with soak 11 = slow charge without soak
4, 5, 6 & 7	Beverage volume	0000 = 50 ml 0001 = 60 ml 0010 = 70 ml 0011 = 80 ml 0100 = 90 ml 0101 = 100 ml 0110 = 110 ml 0111 = 130 ml 1000 = 150 ml 1001 = 170 ml 1010 = 190 ml
		1011 = 210 ml 1100 = 230 ml 1101 = 250 ml 1110 = 275 ml 1111 = 300 ml
8, 9 & 10	Flow rate	000 = 30% 001 = 40% 010 = 50% 011 = 60% 100 = 70%

K-FEE SYSTEM GMBH, EX2009, page 1831
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Table continued

Bit	Parameter	Description
		101 = 80% 110 = 90% 111 = 100%
11 &12	Purge	00 = slow flow/short period 01 = slow flow/long period 10 = fast flow/short period 11 = fast flow/long period

[0097] The code on or in the cartridge 1 will normally comprises one or more extra data bits for error checking. In one example a 16 bit code is provided. For example, using the variables listed in Table 3, a cartridge 1 bearing the code "1000100011110" would have the following operational parameters:

10	Water temperature of 83 °C
00	Fast charge with soak
1000	Dispensed drink volume of 150ml
111	Flow rate equals 100%
10	Fast air flow purge/short period.

[0098] Thus, unlike in previous beverage preparation machines, the memory of the control processor does not store operational instructions for beverage cartridges based on the cartridge type, i.e. instructions for a coffee cartridge, instructions for a chocolate cartridge, instructions for a tea cartridge etc. Instead the memory of the control processor stores variables for adjusting the individual operational parameters of the dispense cycle. This has a number of advantages. Firstly, a greater degree of control of the dispensation cycle can be exercised. For example, slightly different operational parameters can be used for different grades or blends of coffee rather than using the same parameters for all types of coffee. Prior coding solutions relying on storing instructions by cartridge type rather than by individual parameters are unsuited to such subtle differences in dispense cycles for similar beverage types because they quickly consume the available storage space in the coding medium and control processor. Secondly, the coding method allows for new beverage cartridge types to be used in pre-existing beverage preparation machines even where the operational parameters for the dispense cycle for the new beverage cartridge 1 are only decided upon after sale of the beverage preparation machine 201. This is because the control processor of the beverage preparation machine 201 does not need to recognise that the beverage is of a new type. Rather the operational parameters of the dispense cycle are set without direct reference to the beverage type. Hence the coding method of the present invention provides excellent backward compatibility of the beverage preparation machines for new beverage types. In contrast, with prior machines, the manufacturer is restricted to dispensing a new beverage type using one of the pre-existing dispensation cycles as determined by the in-market machines.

[0099] The cartridge head 250 is shown in Figures 39 to 42. The cartridge holder 251 of the cartridge head 250 comprises a fixed lower part 255, a rotatable upper part 256 and a pivotable cartridge mount 257 positioned inbetween the fixed lower part 255 and the rotatable upper part 256. The upper part 256, lower part 255 and cartridge mount 257 are rotated about a common hinge axis 258. Figures 39 to 42 show the cartridge holder 251 with some components of the machine 201 omitted for clarity.

[0100] The rotatable upper part 256 and pivotable cartridge mount 257 are moved relative to the fixed lower part 255 by means of a clamping mechanism 280. The closure mechanism 280 of the present invention comprises a clamping lever having first and second members or parts 281 and 282. The first part 281 of the clamping lever comprises a U-shaped arm which is pivotably mounted to the upper part 256 at two first pivot points 283, one on each side of the cartridge holder 251.

[0101] The second part of the clamping lever comprises two over-centre arms 282, one on each side of the cartridge holder 251 which are each pivotably mounted to the upper part 256 at a second pivot point 285 located on the hinge axis 258 coupling the upper part 256 to the fixed lower part 255. Each over-centre arm 282 is a reciprocal member comprising a cylinder 282a, a stem 282b and a resilient sleeve 282c. The cylinder 282a has an internal bore and is rotatably mounted at one end at the hinge axis 258. A first end of the stem 282b is slidingly received in the bore of the cylinder 282a. The opposite end of the stem 282b is rotatably mounted to the U-shaped arm 281 at a third pivot point 286. The third pivot points 286 are unconnected to, and freely moveable relative to, the upper part 256 and lower part 255. The resilient sleeve 282c is mounted externally on the stem 282b and extends, in use, between abutment surfaces

K-FEE SYSTEM GMBH, EX2009, page 1832
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

on the cylinder 282a and stem 282b. The resilient sleeve 282c accommodates shortening of the over-centre arm 282 but biases the over-centre arm 282 into an extended configuration. Movement of the third pivot points 286 towards and away from the hinge axis 258 is thus possible by relative movement of the stems 282b in the cylinders 282a. The resilient sleeves 282c are preferably formed from silicone. Whilst the illustrated embodiment uses two over-centre arms 282, it will be apparent that the closure mechanism my be configured with only one over-centre arm 282.

[0102] The U-shaped arm 281 extends around the front of the cartridge holder 251 and comprises two downwardly dependant hook members 287, one on each side of the cartridge holder 251, each comprising a cam surface 288 facing the hinge axis 258. The fixed lower part 255 of the cartridge holder 251 is provided with two bosses 259, or detents, located one on each side of the lower part 255 at or near a front edge 260 thereof aligned generally with the hook members 287.

[0103] As shown in Figure 39, the U-shaped arm 281 may be formed from a one piece plastics moulding comprising an ergonomic hand grip and the hook members 287 integral to the arm.

[0104] The cartridge mount 257 is rotatably mounted between the upper and lower parts 255, 256 of the cartridge holder 251. The mount 257 is provided with a substantially circular recess 290 which receives in use the beverage cartridge 1. The recess 290 includes an irregularity 291 for accommodating the handle portion 24 of the beverage cartridge 1 which also acts to prevent rotation of the beverage cartridge 1 in the cartridge holder 251. The cartridge mount 257 is sprung relative to the fixed lower part 255 such that in the open position, as shown in Figure 41, the cartridge mount 257 is biased out of contact with the fixed lower part 255 so that the cartridge mount 257 is moved out of contact with the outlet and inlet piercer members 254, 253. The cartridge mount 257 is provided with an aperture 292 for receiving therethrough the inlet and outlet piercers 253, 254 and a head 300 of the cartridge recognition means 252 when the cartridge mount 257 is moved into the closed position.

[0105] The upper part 255 comprises a generally circular body 310 housing a circular viewing window 312 through which a consumer can view the beverage cartridge 1 during a dispense cycle and also visually confirm whether a cartridge 1 is loaded in the machine 201. The viewing window 312 is cup-shaped having a downwardly directed rim 311. The viewing window 312 is able to move axially relative to the body 310 of the upper part 255. One arrangement of accomplishing the relative movement is to provide a wave spring (not shown), or similar resilient means such as a rubberised ring, positioned between the viewing window 312 and the circular body 310. In an alternative arrangement, a series of helical compression springs (not shown) are provided extending between the viewing window 312 and the body 310. In both cases the resilient means allows the viewing window 312 to move axially relative to the circular body 310 by a small degree.

[0106] When the cartridge holder 251 is in the closed position, the viewing window 312 bears against the beverage cartridge 1 biasing it against the lower part 256. In one arrangement, the rim 311 of the viewing window contacts and bears against the flange 35 of the beverage cartridge. At the same time the window 312 contacts the closed top 11 of the cartridge 1. In an alternative arrangement, only the viewing window 312 contacts the closed top 11 of the cartridge 1, and there is no bearing contact between the rim 311 and the flange 35. The pressure exerted by the rim 311 on the flange 35 and/or by the window 312 on the closed top 11 ensures a fluid tight seal between the cartridge 1 and the cartridge holder 251.

[0107] The lower part 255 comprises the inlet and outlet piercers 253, 254 and the head 300 of the cartridge recognition means 252. The inlet piercer 253 comprises a hollow needle-like tube 260 having a sharpened end 261 for perforating the laminate 5 of the beverage cartridge 1 in use. The inlet piercer 253 is in fluid communication with a water conduit 262 as shown in Figure 42 which passes through the lower part 255 and is connected to an outlet conduit 263 of the water heater 225. The outlet piercer 254 is similar in type to the outlet piercer described in the applicant's European patents EP 0 389 141 and EP 0 334 572 and comprises an open ended cylinder 264 of circular or D-shaped cross-section having dimensions larger than the discharge spout 43. An arcuate portion 265 of the upper end of the outlet piercer 254 is serrated to pierce and eventually cut the laminate of the beverage cartridge 1. The remainder of the upper end is cut back longitudinally of the cylinder at least to the base of the teeth 266 of the serrated portion to fold or pull the cut laminate 5 away from the outlet aperture before the beverage is dispensed therethrough. The outlet piercer 254 pierces the laminate 5 externally of the discharge spout 43 and when the cartridge mount 257 is in the closed position, rests in the annulus between the discharge spout 43 and the outer wall 42 of the discharge funnel 40. The outlet piercer 254 folds back the cut laminate 105 into the annulus. Thereby both the outlet piercer 254 and the cut laminate 105 are held out of the way of the discharged beverage.

[0108] The outlet piercer 254 is surrounded by a ledge 254a which is raised relative to its surroundings by 0.5mm.

[0109] Advantageously, the outlet piercer 254 is removable from the lower part 255 to enable it to be thoroughly cleaned, for example, in a dishwasher. The removable outlet piercer 254 is received in a recess 267 in the lower part 255 where it is seated. The inlet piercer 253 and/or the outlet piercer 254 may be made of a metal, such as stainless steel, or from a plastics material. Advantageously, the use of plastic cutting elements is enabled by use of a laminate 5 which is able to be punctured and cut by a non-metallic material. Consequently, the piercers 253, 254 can be made less sharp which lowers the risk of injury to the consumer. In addition, plastic piercing elements are not prone to rust. Preferably,

K-FEE SYSTEM GMBH, EX2009, page 1833
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the inlet piercer 253 and the outlet piercer 24 are formed as a single, integral unit which is removable from the lower part 255.

[0110] In use, the upper part 256 of the cartridge holder 251 is movable from an open position in which it is orientated vertically or towards the vertical as shown in Figure 36, to a closed position in which it is orientated substantially horizontally and in interengagement with the fixed lower part 255 and cartridge mount 257. The upper part 256 is moved from the open to the closed positions by operation of the clamping lever. To close the upper part 256 a user takes hold of the clamping lever by the U-shaped arm 281 and pulls downwards. Consequently, the upper part 256 rotates which first brings the rim 311 of the viewing window 312 into contact with the flange 35 of the beverage cartridge 1 in the cartridge mount 257 and/or the window 312 itself into contact with the closed top 11 of the cartridge 1. Continued rotation of the upper part 256 rotates the upper part 256 and cartridge mount 257 down into contact with the lower part 255. Further rotation of the U-shaped arm 281 causes the U-shaped arm 281 to rotate relative to the upper part 256 and the lower part 255 resulting in the hook members 287 of the upper part 256 engaging the bosses 259 of the lower part 255 with the cam surface 288 riding over the bosses 259. During this last stage of rotation the cartridge 1 is compressed between the cartridge mount 257 and the viewing window 312. As a result, the viewing window 312 is moved axially relative to the circular body 310 of the upper part 256 against the bias of the wave spring or helical springs. This movement allows for a take up of tolerances in the beverage cartridge 1 and beverage preparation machine and ensures that the amount of compressive force applied to the cartridge is kept within an acceptable range. The clamping force of the mechanism as moderated by the action of the wave spring or helical springs ensures a clamping pressure on the cartridge. For the arrangement where bearing pressure is applied to both the flange 35 and the closed top 11 of the cartridge 1, it has been found that a pressure of between 130 and 280N is required. Preferably the force is approximately 200N. A force less than about 130N does not provide an adequate seal, whilst a force greater than about 280N leads to plastic failure of the components of the cartridge 1. For the arrangement where bearing pressure is applied only to the closed top 11 of the cartridge 1 it has been found that a pressure of between 50N and 280N is required. It will be noted that a lower pressure level is possible with this arrangement without a deleterious effect on the sealing of the cartridge 1. During closure of the cartridge head the laminate 5 of the cartridge 1 is tensioned as it is brought into contact with the ledge 254a surrounding the outlet piercer 254 which causes the laminate 5 to flex out of plane as the distal end of the outer tube 42 of the cylindrical funnel is moved upwardly by 0.5mm relative to the flange 35. This movement also ensures that the great majority of the compressive force applied to the cartridge acts through the central region of the cartridge 1 through the load-bearing inner member 3. In the closed position the cartridge 1 may thus be clamped around the flange 35 by means of the rim 311 of the viewing window 312 and is always firmly clamped between the closed top 11 of the cartridge and the outer tube 42 of the inner member 3 by contact with the viewing window 312 and the ledge 254a. These clamping forces help prevent failure of the cartridge 1 during pressurisation and also ensure that the inner member 3 and outer member 2 are fully seated relative to one another and thus that all internal passageways and apertures remain at their intended dimensions even during internal pressurisation.

[0111] An imaginary datum line can be drawn between the first and second pivot points 283, 285 of the cartridge holder 251. As can be seen in Figure 41, in the open position the third pivot points 286 are located on the side of the datum line nearest the fixed lower part 255. As the upper part 256 reaches the closed position, the third pivot points 286 of the clamping lever pass through the datum line joining the first and second pivot points 283, 285 to the opposite side of the line, furthest from the fixed lower part 255. Consequently, the U-shaped arm 281 'snaps through' from a first stable position to a second stable position. The snap through action is accommodated by shortening of the over-centre arms 282 and consequential compression of the resilient sleeves 282c. Once the third pivot points 286 are past the imaginary datum line then recovery of the resilient sleeves 282c acts to continue the motion of the third pivot points 286 away from the imaginary datum line. The clamping lever thus has a bi-stable operation in that the lever is stable in the open or closed positions but unstable at the point when the third pivot points 286 lie on the imaginary datum line joining the first and second pivot points 283, 285. Thus, the snap-through action of the clamping lever provides a positive closure mechanism which leads to a definite closure action wherein in the final stages of the clamping lever's rotation, the snap-through action of the U-shaped arm 281 and second arms 284 forces the hook members 287 firmly into engagement with the bosses 259. In addition, the resilient sleeves 282c provide a resistance to re-opening of the upper part 256 since a minimum force is required to compress the sleeves 282c sufficiently to move the third pivot points 286 back into line with the datum line joining the first and second pivot points 283, 285. Advantageously, the interengagement of the hook members 287 and the bosses 259 prevents separation of the upper and lower parts other than by rotation of the clamping lever. This is useful in preventing opening of the cartridge head 250 during operation when the cartridge head 250 is subject to internal pressurisation.

[0112] The purpose of the cartridge recognition means 252 is to allow the machine 201 to recognise the type of beverage cartridge 1 that has been inserted and to adjust one or more operational parameters accordingly. In a typical embodiment, the cartridge recognition means 252 comprises an optical barcode reader which reads a printed barcode 320 provided on the laminate 5 of the beverage cartridge 1 as shown in Figure 45. The barcode 320 is formed from a plurality of bars of contrasting colour. Preferably the bars are black on a white background to maximise the contrast.

K-FEE SYSTEM GMBH, EX2009, page 1834
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

The barcode 320 is not required to conform to a published standard but a standard format for barcodes, such as EAN-13, UPC-A, or Interleaf 2 of 5 may be used. The optical barcode reader comprises one or more LEDs 321 to illuminate the barcode 320, a focusing lens 322 to acquire an image of the barcode, a charge coupled device (CCD) 323 for producing an electrical signal representative of the acquired image and support circuitry for the LEDs and CCD. The space in the lower part for accommodating the barcode reader is limited. A mirror or mirrors 324 may be used to reflect the light from the LEDs 321 to a focussing lens which is not located in the lower part 255. Schematic arrangements are shown in Figures 44a and 44b. The lower part 255 comprises an aperture 326 which is the same size as the barcode 320 on the beverage cartridge 1. In use the electrical signals produced are decoded by signal processing software and the results forwarded to the control processor. The software can recognise whether the read of the barcode contained errors. The barcode 320 may be rescanned a number of times before an error message is presented to the consumer. If the machine 201 is unable to read the barcode the consumer is able to use the beverage cartridge 1 to dispense a beverage using a manual mode of operation.

[0113] The cartridge head 250 also includes a cartridge sensor for detecting whether a cartridge is present in the cartridge holder 251.

[0114] The cartridge head 250 also includes a lock sensor which detects whether the cartridge holder 251 is properly closed. Preferably the lock sensor comprises a micro-switch which is triggered when the cartridge holder 251 is closed and locked. Preferably the cartridge sensor and lock sensor are connected in series such that the output of both sensors must be satisfactory, i.e. cartridge present and mechanism locked, before the dispense cycle can be commenced.

[0115] The cartridge mount 257 may be removable from the cartridge head 250 in order to facilitate cleaning. Preferably, a micro-switch or other interlock is provided to prevention operation of the machine if the cartridge mount 257 is not replaced.

[0116] Operation of the machine 201 comprises insertion of a beverage cartridge 1 into the cartridge head 250, carrying out a dispense cycle in which the beverage is dispensed and removal of the cartridge 1 from the machine.

[0117] The operational behaviour of the machine 201 is determined by software embedded in the control processor. Operation of the machine can be described in terms of 'States', wherein the machine 201 will normally exist in a particular State until an event occurs to change the State, a step called a State transition.

[0118] Table 4 shows a State Transition Table which illustrates the States and State transitions for one embodiment of the beverage preparation machine 201.

K-FEE SYSTEM GMBH, EX2009, page 1835
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Table 4

State	State Description	Temperature	Lock Sensor	Cartridge Sensor variable (OK, NOK, CLR)	Water level indicator	Water flow rate	StartStop
1	WATER HEATING	> or = 85 goto 2	Closed: [Cartridge Sensor= readpod()] Open: [Cartridge Sensor =CLR]	N/A	Low goto 10	N/A	No Action
2	WATER READY If timeout 10mins goto 9	< 85 goto 2	Closed: [Cartridge Sensor = readpod()] Open: [Cartridge Sensor =CLR]	Cartridge Sensor =OK goto 4 Cartridge Sensor =NOK goto 3	Low goto 10	N/A	No Action
3	READY TO BREW AUTO	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 2	N/A	Low goto 10	N/A	Goto 5
4	BREW IN PROGRESS AUTO [Run Brew State] goto 7	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Water off goto 6
5	BREW SUSPENDED	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	N/A	Goto 5
6	READY TO BREW MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 2	N/A	Low goto 10	N/A	[Water On] Goto 8

K-FEE SYSTEM GMBH, EX2009, page 1836
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

7	BREW IN PROGRESS MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Released goto 7
8	PURGE [Water off; air on, timeout n sec then goto 9]	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	No action	N/A	No Action
9	BREW DONE [air purge] [Cartridge Sensor =CLR] if timeout 10s goto 2	N/A [temperature controlled in background]	Open goto 2	N/A	Low goto 10	N/A	Goto 9
10	STANDBY	N/A [heater off]	Open: [Cartridge Sensor =CLR] goto 1 Closed: [Cartridge Sensor = readpod()]	N/A	Low goto 10	N/A	Goto 1
11	ERROR Power off/on required to clear	N/A	N/A	N/A	N/A	N/A	N/A
12	WATER LOW				Low goto 10		

[0119] The following example illustrates a dispense cycle to exemplify the use of the State Transitions by the control processor.

[0120] It is assumed that the machine 201 is initially switched off and with no cartridge 1 inserted in the cartridge head 250. When the machine 201 is switched on the control processor is in State 1. The water heater 225 is switched on. Once the temperature reaches 85 °C the control processor transits to State 2. If at any time during State 1 or 2 the cartridge holder 251 is closed the lock sensor will be triggered to send a signal to the control processor indicating that the cartridge holder 251 is properly closed. The control processor then interrogates the cartridge sensor by sending a 'readpod' instruction. The cartridge sensor returns a signal to the control processor indicating whether a cartridge is in place in the cartridge holder 251. If no cartridge is present the control processor transits to State 3 where it remains in a readiness state until the cartridge holder 251 is reopened at which point the control processor transits back to State 2. If a cartridge is present in State 2 then the control processor transits to State 4 and operation is commenced automatically. During States 4 to 9 the water temperature is controlled in the background to remain within the required tolerance range of the desired temperature as set by the operational parameters set by the barcode on the beverage cartridge 1. Once the discharge stage of dispense is completed an air purge is commenced in State 8. Once the air purge is completed the operating cycle is completed and the machine enters to standby mode in State 10. If, during operation, an error occurs then the processor transits to State 11. If a low water level is detected then the processor transits to State 12.

[0121] To insert the cartridge 1 the cartridge holder 251 is opened as described above to expose the cartridge mount 257. The cartridge 1 is then placed on the cartridge mount 257 received within the recess 290 such that the handle 24 of the cartridge is located in the irregularity 291. The optical or magnetic barcode 320 of the cartridge 1 is orientated

K-FEE SYSTEM GMBH, EX2009, page 1837
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

directly above the aperture 326 in the cartridge mount 257. The cartridge holder 251 is then closed by operation of the clamping lever as described above. During closure the inlet and outlet piercers 253, 254 pierce the laminate 5 of the cartridge 1 to form the cartridge inlet 121 and outlet 122. As described above the laminate 5 cut by the outlet piercer 254 is folded up into the annulus surrounding the discharge spout 43. When closed the cartridge holder 251 grips the cartridge 1 around the rim 35 between the cartridge mount 257 and the upper part 256 and/or between the window 311 and the top 11 of the cartridge 1 to form a fluid tight seal of sufficient integrity to withstand the pressures developed during the dispense cycle.

[0122] To commence the operating cycle the consumer operates the start/stop button 241.

[0123] The operating cycle comprises the steps of cartridge recognition and the discharge cycle.

[0124] Cartridge recognition is performed by the optical cartridge recognition means 252 as described above assuming that the outputs from the cartridge sensor and lock sensor are satisfactory. Once the barcode 320 has been decoded the operational parameters of the machine 201 are adjusted by the control processor. The discharge cycle is then automatically commenced.

[0125] The discharge cycle has four main stages, not all of which are used for all beverage types:

(i) Pre-wet
(ii) Pause
(iii) Brew/Mixing
(iv) Purge

[0126] In the pre-wet stage the cartridge 1 is charged with water from the water storage tank 220 by means of the water pump 230. The charging with water causes the beverage ingredients 200 in the filtration chamber 130 to be wetted. The charging may take place at a "fast" flow rate of 600 ml/min or a "slow" flow rate of 325 ml/min. The slow charging rate is particularly useful for cartridges containing viscous liquid beverage ingredients where the ingredients require some dilution before they are able to be pumped at a higher volume flow rate. The volume of water injected into the cartridge 1 is selected to ensure that water or beverage does not drip out of the cartridge outlet 122 during this stage.

[0127] The pause stage allows the beverage ingredients 200 to soak in the water injected during the pre-wet stage for a predetermined period of time. Both the pre-wetting and soaking stages are known to increase the yield of the extractibles from the beverage ingredients 200 and to improve the end flavour of the beverage. Pre-wetting and soaking are particularly used where the beverage ingredients are roast and ground coffee.

[0128] In the brew/mixing stage water is passed through the cartridge 1 in order to produce the beverage from the beverage ingredients 200. The temperature of the water is determined by the control processor which sends instructions to the water heater 225 to heat the water passing from the water tank 220 to the cartridge head 250. Water enters the lower part 255 of the cartridge holder 251 through the conduit 262 via the inlet valve and the inlet piercer 253 into the inlet chamber 126 of the beverage cartridge 1. Brewing and/or mixing and subsequent dispensing of the beverage from the beverage cartridge 1 is as described above with reference to the versions of the beverage cartridge 1.

[0129] The air purge comprises the blowing of pressurised air through the beverage preparation machine and the beverage cartridge 1 to ensure that all beverage is dispensed and that the flow path is cleared ready for dispensing another beverage. The air purge does not commence immediately on cessation of the brew/mixing stage to allow for the majority of the fluid to clear the flow path. This prevents an unacceptable spike in internal pressure on commencement of the air purge.

[0130] In normal operation a user manually stops the machine 201 by operating the start/stop button 241.

[0131] Once the operating cycle has been completed the consumer removes the cartridge 1 by opening the cartridge holder 251 and manually removing and disposing of the cartridge. Alternatively, the machine 201 may be provided with an automatic ejection mechanism for removing the cartridge automatically on opening the cartridge holder 251.

[0132] The delivery times for beverages using the machine 201 and cartridges 1 are typically between 10 and 120 seconds, preferably 30 to 40 seconds for roast and ground coffee, between 5 and 120 seconds, preferably 10 to 20 seconds for chocolate and between 5 and 120 seconds, preferably 10 to 20 seconds for milk.

[0133] The machine 201 may also advantageously comprise a memory in operative communication with the control processor that stores information on the type of beverage dispensed by a user. The operating cycle of the machine 201 may then be adjusted for the next cartridge 1. This is especially advantageous where two or more beverage cartridges 1 are used sequentially to form a beverage. For example a coffee cartridge may be dispensed followed by a milk cartridge to form a cappuccino beverage. Alternatively a chocolate cartridge could be used followed by a milk cartridge to produce a creamy hot chocolate beverage. By using a memory that stores information on the first beverage dispensed, the manner of dispensing the second cartridge, say a milk cartridge, may be altered to achieve an optimum beverage. In the above example the milk dispensed for hot chocolate may, typically, be diluted less than the milk added to the coffee. In addition, the milk dispensed for chocolate may be dispensed at a slower flow rate to lessen the degree of foaming of the beverage. Many combinations of cartridges are possible and operating parameters as will be obvious to the skilled

K-FEE SYSTEM GMBH, EX2009, page 1838
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

person. In addition, the memory may be used to allow the machine 201 to 'predict' the type of beverage that a user will next want to dispense. For example, if a user predominantly drinks one beverage type then the machine can instruct the water heater to remain at the optimum temperature for that beverage type.

Claims

1. A closure mechanism for a beverage preparation machine (201) comprising a fixed lower part (255) and an upper part (256) rotatable relative to the lower part, the upper part being moveable from an open position, in which the upper part is disengaged from the lower part, and a closed position, in which the upper part is engaged with the lower part, the closure mechanism further comprising a clamping lever (280) operable to retain the upper part in the closed position, wherein the clamping lever comprises a first member (281) being pivotably connected at a first pivot (283) to the upper part (256) and a second member (282) having a first end pivotable about a second pivot (285), an end of the first member (281) and a second end of the second member (282) being pivotably connected together at a third pivot (286) such that the clamping lever has first and second positions of stability, wherein on operation of the clamping lever to move the upper part from the open position to the closed position the clamping lever moves from the first to the second position of stability, **characterised in that** the second member (282) comprises a reciprocal member.

2. A closure mechanism as claimed in 1, wherein the clamping lever (280) comprises at least one hook member (287) for engaging a detent (259) on the lower part (255).

3. A closure mechanism as claimed in claim 1 or claim 2, wherein in the first position of stability the third pivot (286) lies on a first side of a datum line joining the first (283) and second (285) pivot points.

4. A closure mechanism as claimed in claim 3, wherein in the second position of stability the third pivot (286) lies on a second side of a datum line joining the first (283) and second (285) pivot points.

5. A closure mechanism as claimed in claim 3 or claim 4, wherein the first side of the datum line is nearest the fixed lower part (255) and the second side of the datum line is furthest from the fixed lower part (255).

6. A closure mechanism as claimed in any preceding claim wherein the first end of the second member (282) is pivotally connected to the lower part (255).

7. A closure mechanism as claimed in claim 6 wherein the reciprocal member comprises a cylinder (282a), a stem (282b) received in said cylinder and a resilient sleeve (282c) for biasing said stem into an extended configuration.

8. A closure mechanism as claimed in claim 7 wherein movement of the clamping lever (280) from the first to the second position of stability is accommodated by deformation of the resilient sleeve (282c).

9. A closure mechanism as claimed in any preceding claim, wherein the first member of the clamping lever comprises a U-shaped arm extending round a front side of the beverage preparation machine.

10. A closure mechanism as claimed in any preceding claim, wherein the clamping mechanism comprises two second members, one on each side of the beverage preparation machine.

11. A closure mechanism as claimed in any preceding claim, wherein the closure mechanism further comprises a cartridge holder interposed between the lower part and the upper part and being rotatable relative to the lower part and the upper part.

12. A closure mechanism as claimed in claim 11, wherein rotation of the upper part towards the lower part causes the upper part to engage the cartridge holder and to move the cartridge holder into contact with the lower part and at the same time to cause, in use, inlet piercing means and the outlet piercing means provided in the lower part to pierce a cartridge received in the cartridge holder.

K-FEE SYSTEM GMBH, EX2009, page 1839
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Revendications

1. Mécanisme de fermeture pour une machine de préparation de boissons (201) comprenant une partie inférieure fixe (255) et une partie supérieure (256) rotative par rapport à la partie inférieure, la partie supérieure étant mobile depuis une position ouverte, dans laquelle la partie supérieure est dégagée de la partie inférieure, et une position fermée, dans laquelle la partie supérieure est engagée avec la partie inférieure, le mécanisme de fermeture comprenant, en outre, un levier de serrage (280) manoeuvrable pour retenir la partie supérieure dans la position fermée, dans lequel mécanisme le levier de serrage comprend un premier élément (281) étant relié pivotant au niveau d'un premier pivot (283) à la partie supérieure (256) et un deuxième élément (282) comportant une première extrémité apte à pivoter autour d'un deuxième pivot (285), une extrémité du premier élément (281) et une deuxième extrémité du deuxième élément (282) étant reliées pivotantes conjointement au niveau d'un troisième pivot (286) de telle sorte que le levier de serrage a des première et deuxième positions de stabilité, dans lequel mécanisme lors de l'actionnement du levier de serrage pour déplacer la partie supérieure de la position ouverte à la position fermée le levier de serrage se déplace de la première à la deuxième position de stabilité, **caractérisé en ce que** le deuxième élément (282) comprend un élément à va-et-vient.

2. Mécanisme de fermeture selon la revendication 1, dans lequel le levier de serrage (280) comprend au moins un élément de crochet (287) pour engager un cliquet (259) sur la partie inférieure (255).

3. Mécanisme de fermeture selon la revendication 1 ou la revendication 2, dans lequel, dans la première position de stabilité, le troisième pivot (286) se situe sur un premier côté d'une ligne de référence reliant les premier (283) et deuxième (285) points de pivotement.

4. Mécanisme de fermeture selon la revendication 3, dans lequel, dans la deuxième position de stabilité, le troisième pivot (286) se situe sur un deuxième côté d'une ligne de référence reliant les premier (283) et deuxième (285) points de pivotement.

5. Mécanisme de fermeture selon la revendication 3 ou la revendication 4, dans lequel le premier côté de la ligne de référence est le plus proche de la partie inférieure fixe (255) et le deuxième côté de la ligne de référence est le plus éloigné de la partie inférieure fixe (255).

6. Mécanisme de fermeture selon l'une quelconque des revendications précédentes, dans lequel la première extrémité du deuxième élément (282) est reliée pivotante à la partie inférieure (255).

7. Mécanisme de fermeture selon la revendication 6, dans lequel l'élément à va-et-vient comprend un cylindre (282a), une tige (282b) reçue dans ledit cylindre et un manchon résilient (282c) pour solliciter ladite tige dans une configuration déployée.

8. Mécanisme de fermeture selon la revendication 7, dans lequel le déplacement du levier de serrage (280) de la première à la deuxième position de stabilité est permis par déformation du manchon résilient (282c).

9. Mécanisme de fermeture selon l'une quelconque des revendications précédentes, dans lequel le premier élément du levier de serrage comprend un bras en forme de U s'étendant autour d'un côté avant de la machine de préparation de boissons.

10. Mécanisme de fermeture selon l'une quelconque des revendications précédentes, dans lequel le mécanisme de fermeture comprend deux deuxièmes éléments, un sur chaque côté de la machine de préparation de boissons.

11. Mécanisme de fermeture selon l'une quelconque des revendications précédentes, dans lequel le mécanisme de fermeture comprend, en outre, un support de cartouche intercalé entre la partie inférieure et la partie supérieure et étant rotatif par rapport à la partie inférieure et la partie supérieure.

12. Mécanisme de fermeture selon la revendication 11, dans lequel la rotation de la partie supérieure vers la partie inférieure amène la partie supérieure à engager le support de cartouche et à déplacer le support de cartouche en contact avec la partie inférieure et, en même temps, à amener, à l'utilisation, le moyen de percement d'entrée et le moyen de percement de sortie situés dans la partie inférieure à percer une cartouche reçue dans le support de cartouche.

K-FEE SYSTEM GMBH, EX2009, page 1840
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Patentansprüche

1. Verschlussmechanismus für eine Getränkezubereitungsmaschine (201), die einen festen unteren Teil (255) und einen relativ zum unteren Teil drehbaren oberen Teil (256) umfasst, wobei der obere Teil von einer offenen Position, in welcher der obere Teil vom unteren Teil gelöst ist, und einer geschlossenen Position, in welcher der obere Teil mit dem unteren Teil eingreift, beweglich ist, wobei der Verschlussmechanismus weiter einen Spannhebel (280) umfasst, der bedienbar ist, um den oberen Teil in der geschlossenen Position zu halten, wobei der Spannhebel ein erstes Element (281), das drehbar über ein erstes Scharnier (283) mit dem oberen Teil (256) verbunden ist, und ein zweites Element (282) das ein um ein zweites Scharnier (285) drehbares erstes Ende aufweist, umfasst, wobei ein Ende des ersten Elements (281) und ein zweites Ende des zweiten Elements 282 über ein drittes Scharnier (286) miteinander verbunden sind, sodass der Spannhebel eine erste und zweite stabile Position aufweist, wobei beim Betätigen des Spannhebels, um den oberen Teil aus der offenen Position in die geschlossene Position zu bewegen, sich der Spannhebel aus der ersten in die zweite stabile Position bewegt, **dadurch gekennzeichnet, dass** das zweite Element (282) ein hin und her bewegliches Element umfasst.

2. Verschlussmechanismus nach Anspruch 1, wobei der Spannhebel (280) mindestens ein Hakenelement (287) zum Eingreifen mit einer Arretierung (259) am unteren Teil (255) umfasst.

3. Verschlussmechanismus nach Anspruch 1 oder Anspruch 2, wobei in der ersten stabilen Position das dritte Scharnier (286) auf einer ersten Seite einer Führungslinie liegt, die den ersten (283) und zweiten (285) Scharnierpunkt verbindet.

4. Verschlussmechanismus nach Anspruch 3, wobei in der zweiten stabilen Position das dritte Scharnier (286) auf einer zweiten Seite einer Bezugslinie liegt, die den ersten (283) und zweiten (285) Scharnierpunkt verbindet.

5. Verschlussmechanismus nach Anspruch 3 oder Anspruch 4, wobei die erste Seite der Bezugslinie dem festen unteren Teil (255) am nächsten liegt und die zweite Seite der Bezugslinie vom festen unteren Teil (255) am entferntesten liegt.

6. Verschlussmechanismus nach einem der vorangehenden Ansprüche, wobei das erste Ende des zweiten Elements (288) drehbar mit dem unteren Teil (255) verbunden ist.

7. Verschlussmechanismus nach Anspruch 5, wobei hin und her bewegliche Element einen Zylinder (282a), einen in dem Zylinder aufgenommenen Schaft (282b) und eine elastische Hülse (282c) zum Vorspannen des Schafts in eine verlängerte Gestalt umfasst.

8. Verschlussmechanismus nach Anspruch 7, wobei die Bewegung des Spannhebels (280) aus der ersten in die zweite stabile Position durch Verformung der elastischen Hülse (282c) aufgenommen wird.

9. Verschlussmechanismus nach einem der vorangehenden Ansprüche, wobei das erste Element des Spannhebels einen U-förmigen Arm umfasst, der sich um eine Vorderseite der Getränkezubereitungsmaschine erstreckt.

10. Verschlussmechanismus nach einem der vorangehenden Ansprüche, wobei der Spannmechanismus zwei zweite Elemente umfasst, eines auf jeder Seite der Getränkezubereitungsmaschine.

11. Verschlussmechanismus nach einem der vorangehenden Ansprüche, wobei der Verschlussmechanismus weiter einen Kartuschenhalter umfasst, der zwischen den unteren Teil und den oberen Teil zwischengestellt ist und relativ zum unteren Teil und zum oberen Teil drehbar ist.

12. Verschlussmechanismus nach Anspruch 11, wobei eine Drehung des oberen Teils zum unteren Teil hin den oberen Teil dazu veranlasst, mit dem Kartuschenhalter einzugreifen und den Kartuschenhalter mit dem unteren Teil in Kontakt zu bewegen und bei Gebrauch gleichzeitig zu veranlassen, dass im unteren Teil vorgesehene Einlassdurchstechungsmittel und Auslassdurchstechungsmittel eine im Kartuschenhalter aufgenommene Kartusche durchstechen.

K-FEE SYSTEM GMBH, EX2009, page 1841
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 1.

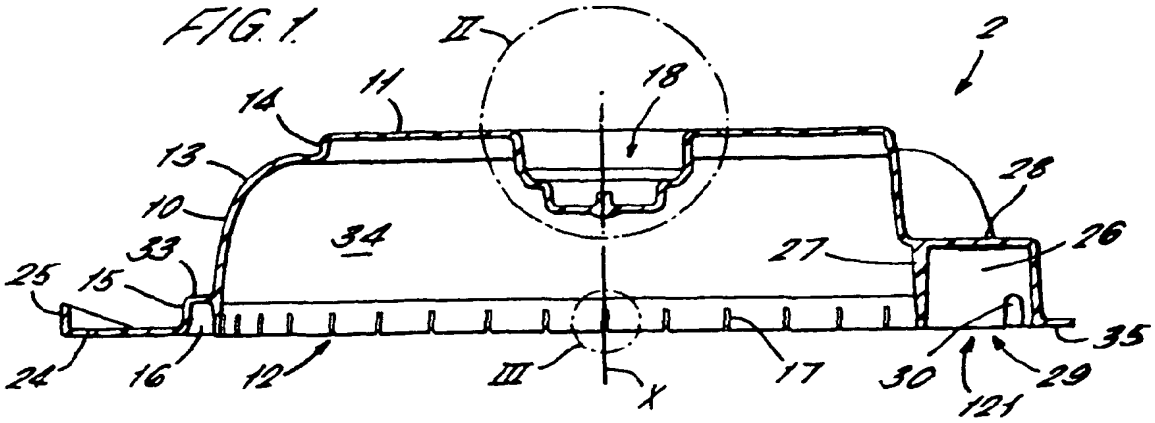


FIG. 2.

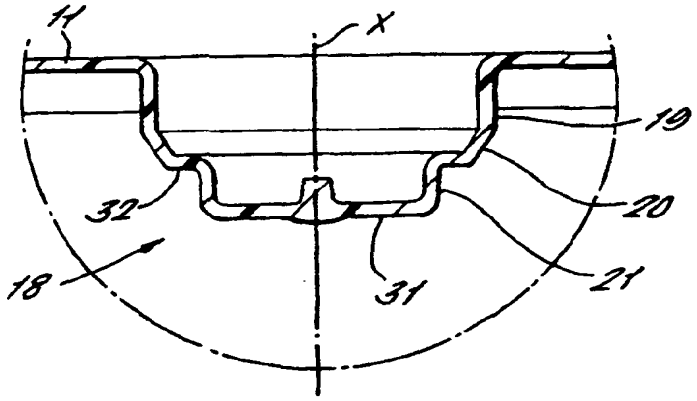
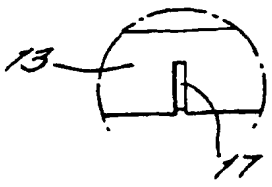
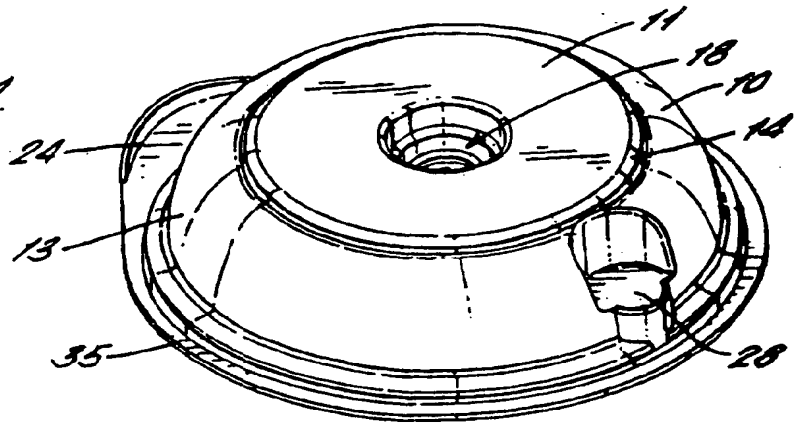


FIG. 3.



K-FEE SYSTEM GMBH, EX2009, page 1842
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 4.



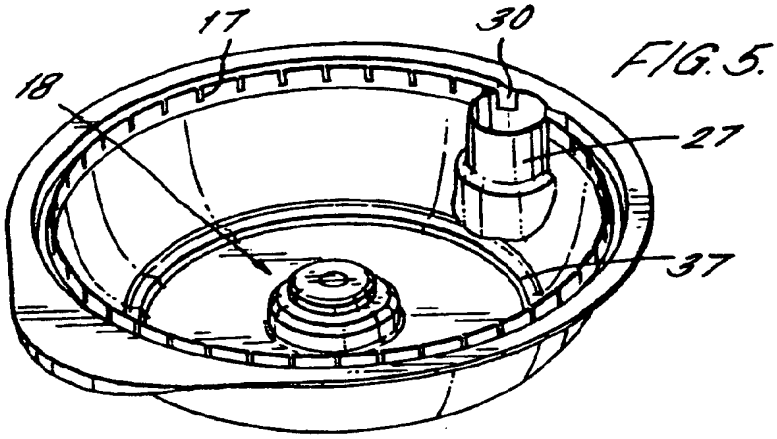
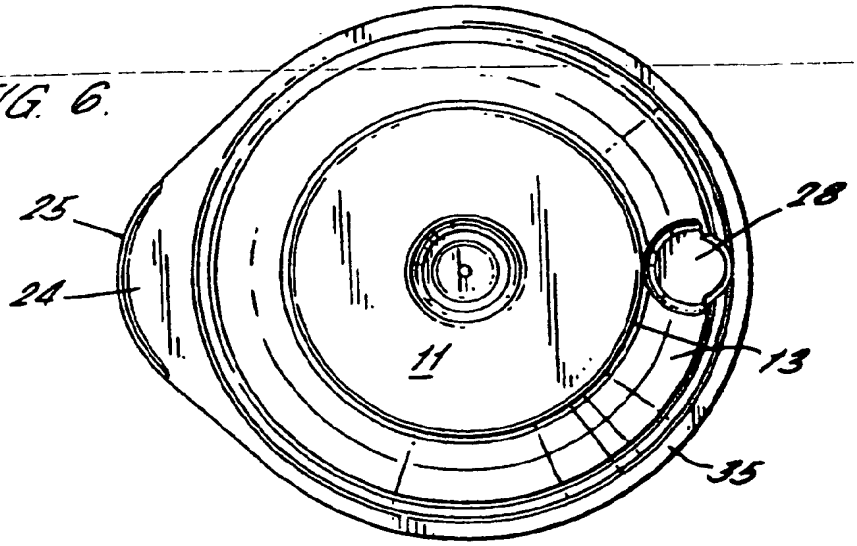


FIG. 5.

FIG. 6.



K-FEE SYSTEM GMBH, EX2009, page 1843
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 7

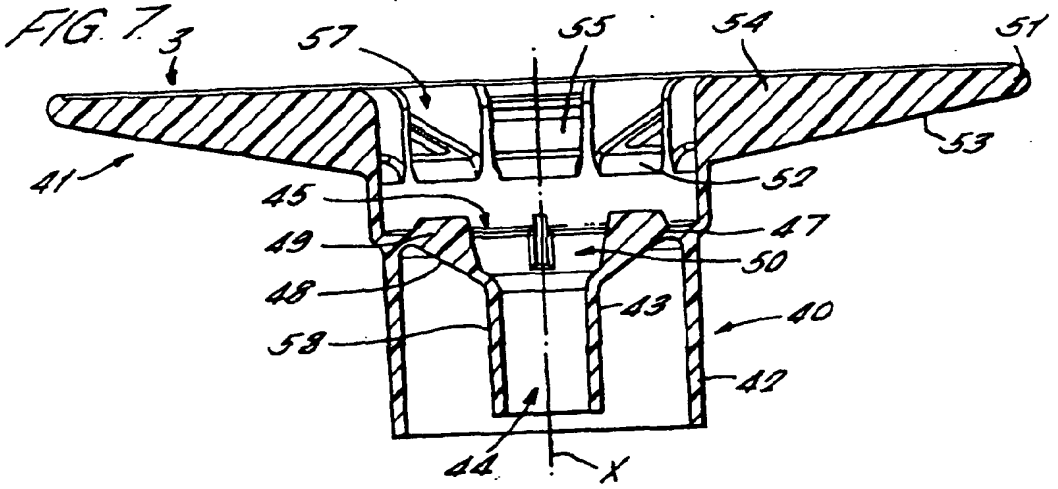


FIG. 8

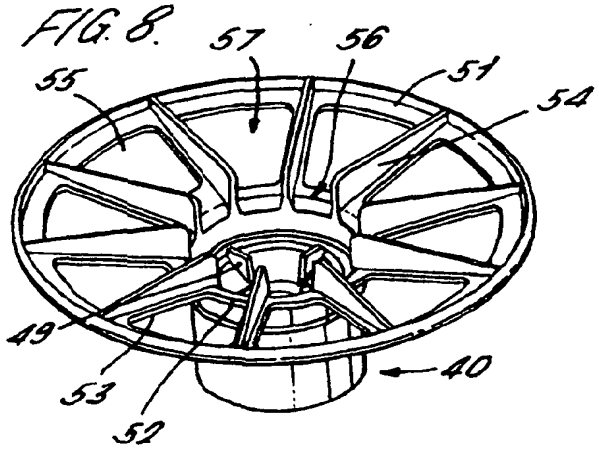


FIG. 9

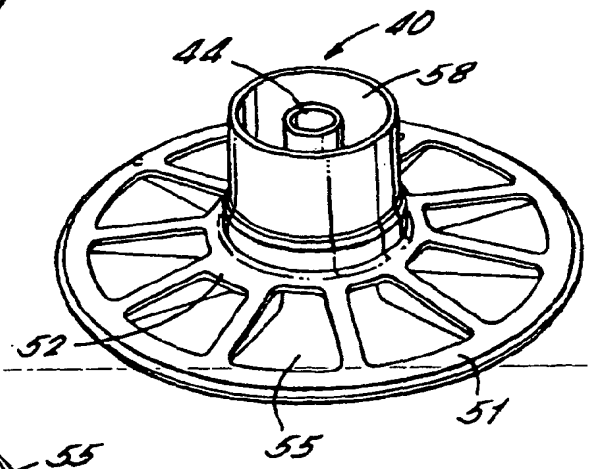
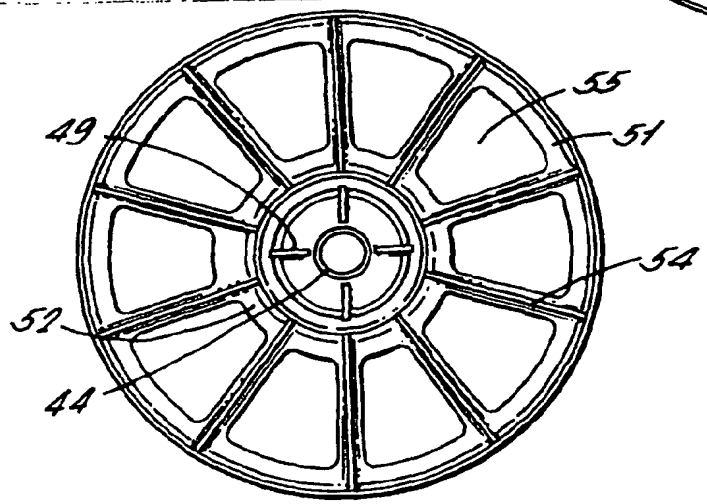


FIG. 10



K-FEE SYSTEM GMBH, EX2009, page 1844
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

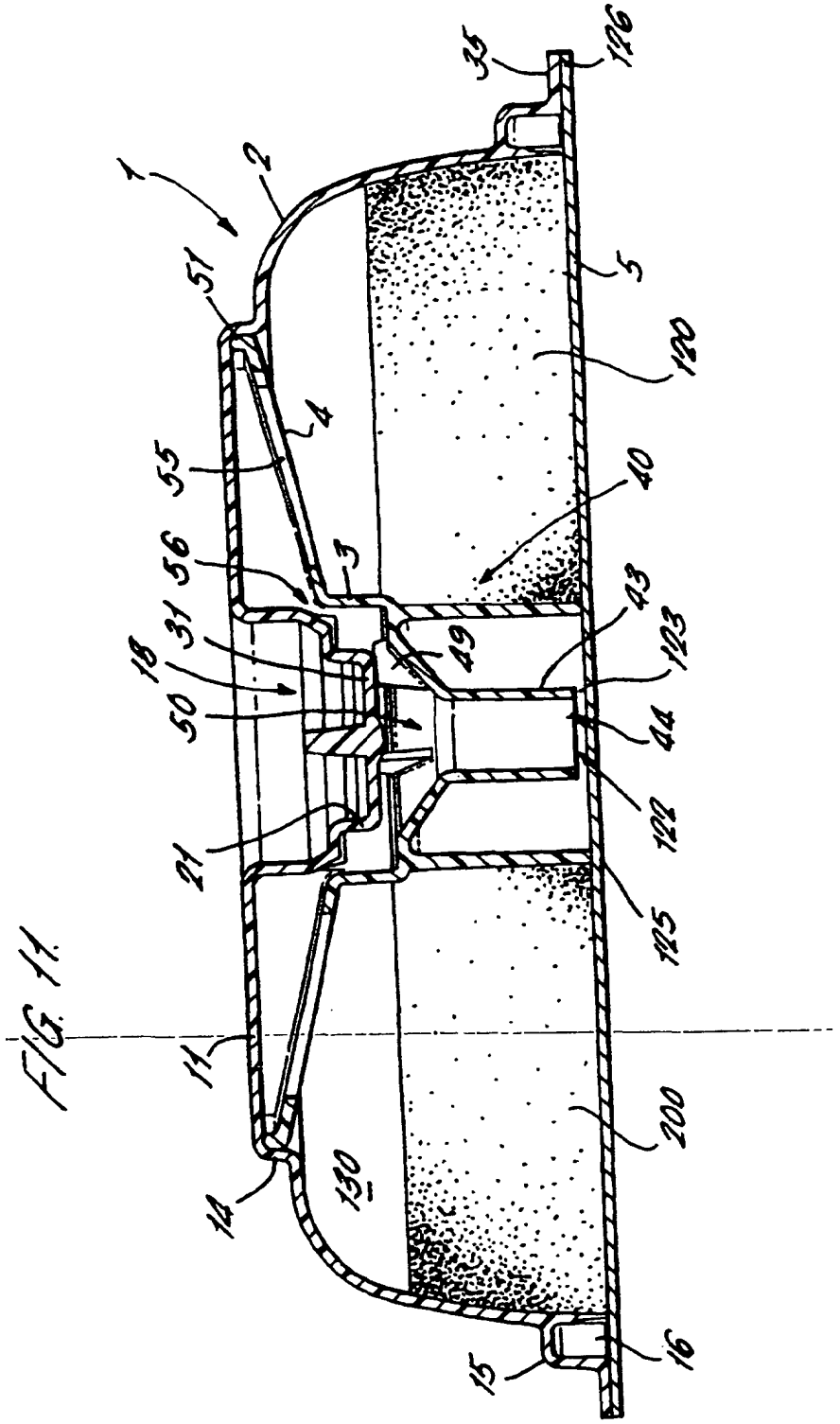


FIG. 11.

K-FEE SYSTEM GMBH, EX2009, page 1845
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 12.

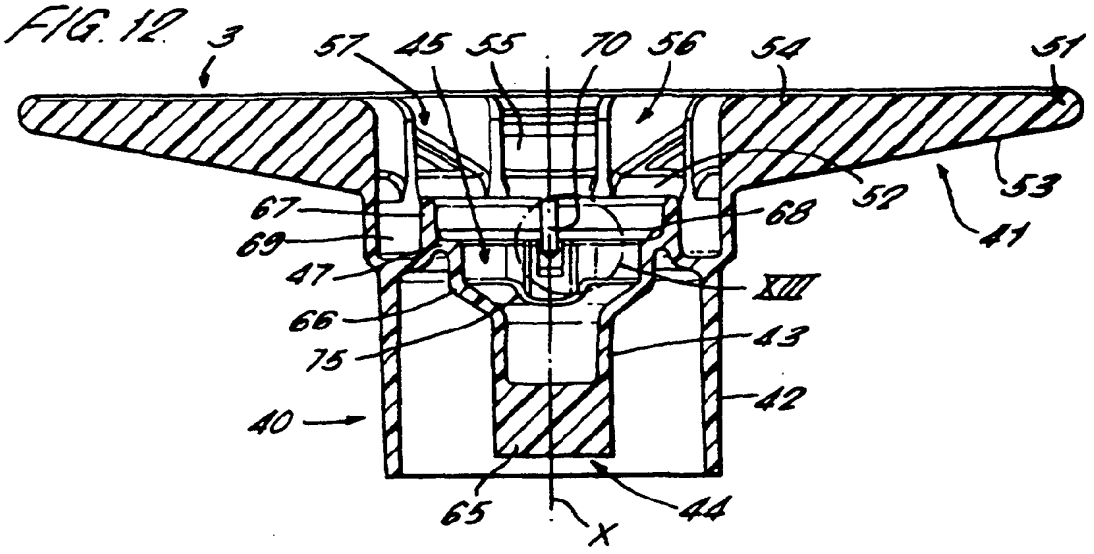


FIG. 13.

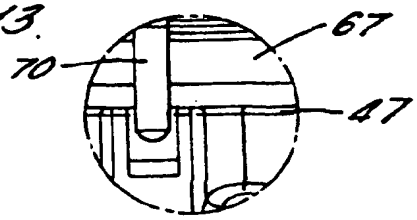


FIG. 14.

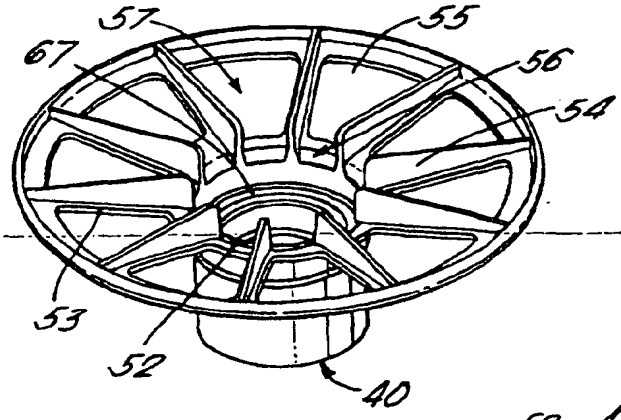
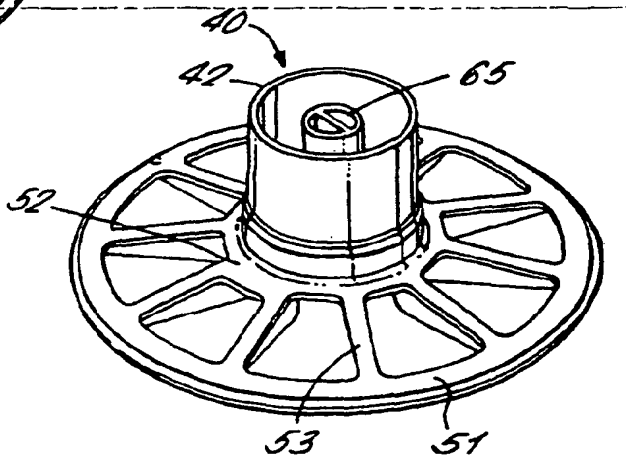


FIG. 15.



K-FEE SYSTEM GMBH, EX2009, page 1846
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 16.

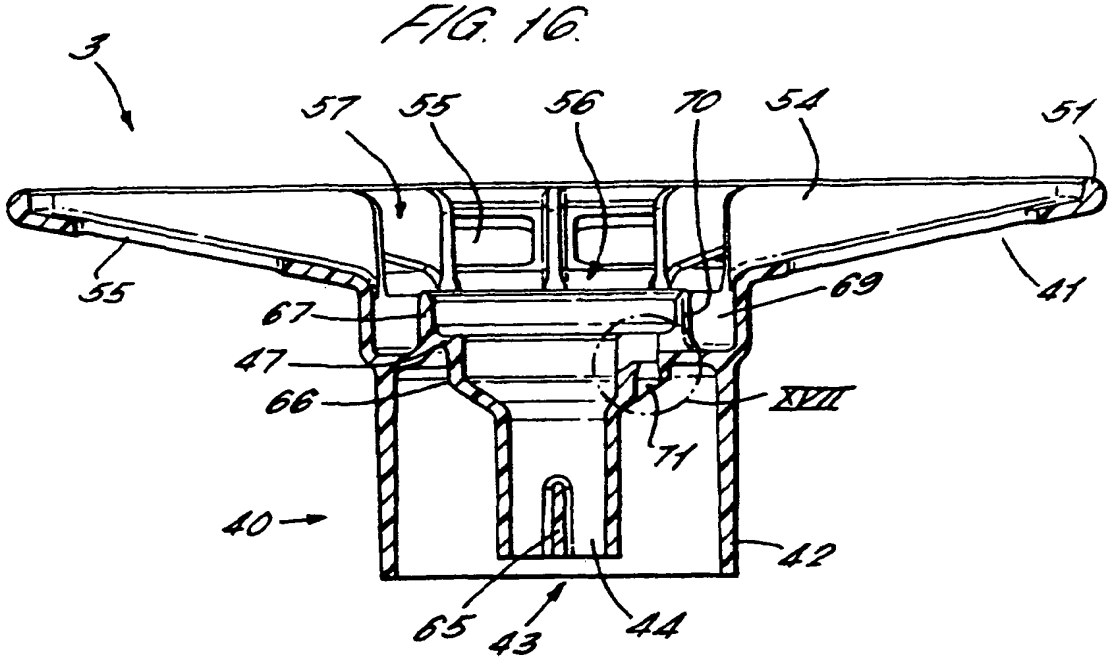
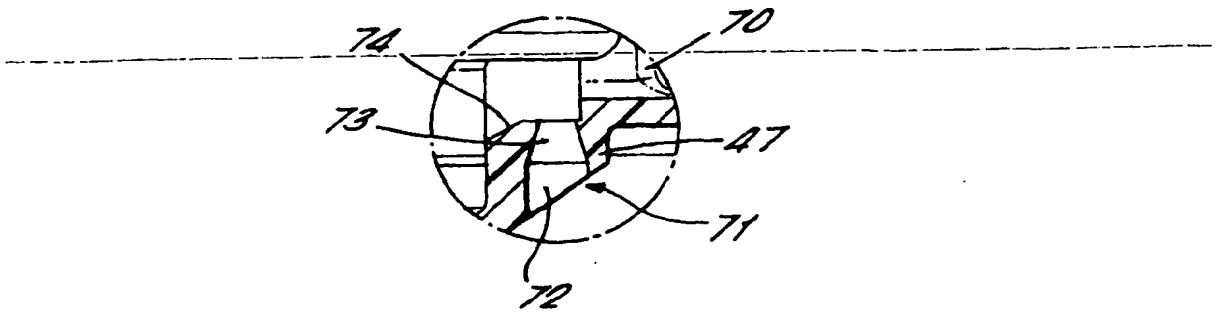


FIG. 17.



K-FEE SYSTEM GMBH, EX2009, page 1847
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

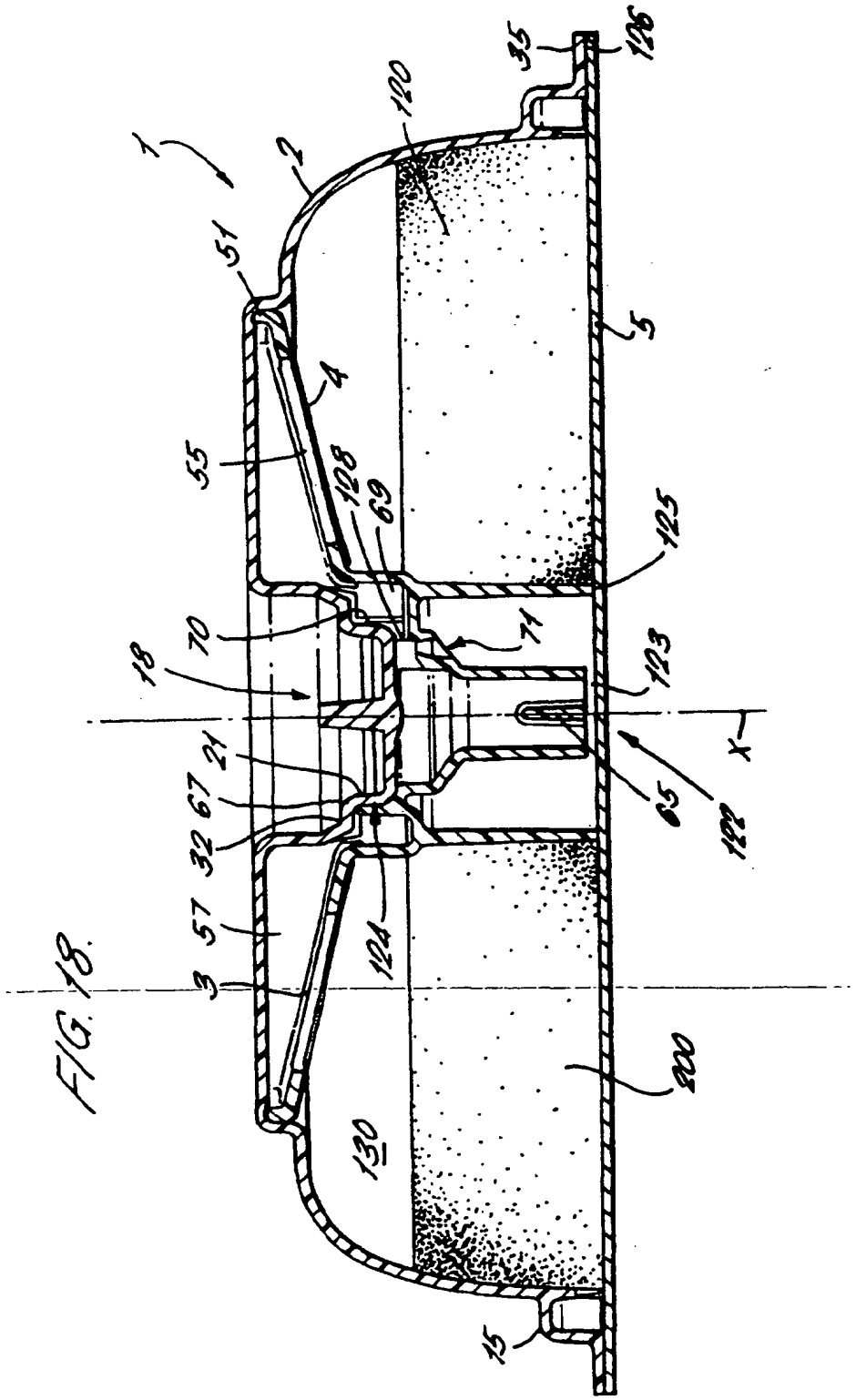


FIG. 18.

K-FEE SYSTEM GMBH, EX2009, page 1848
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 19.

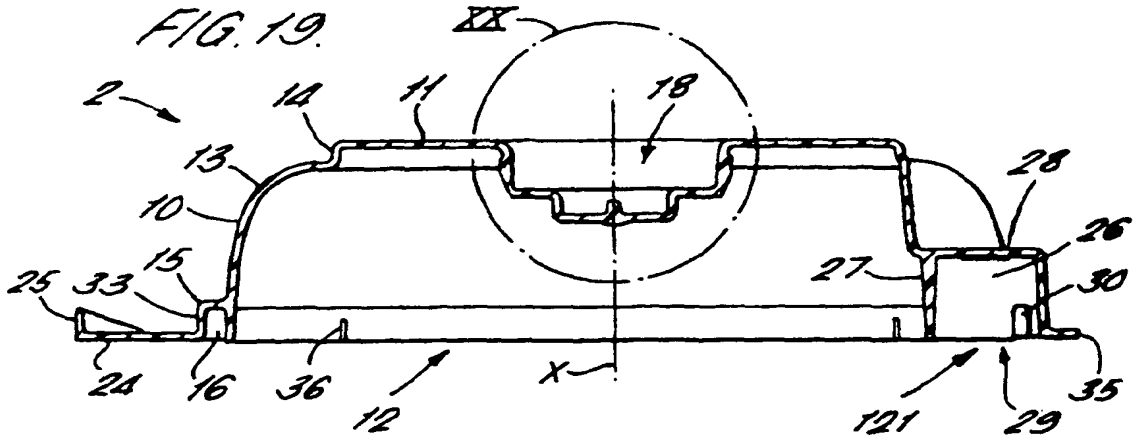
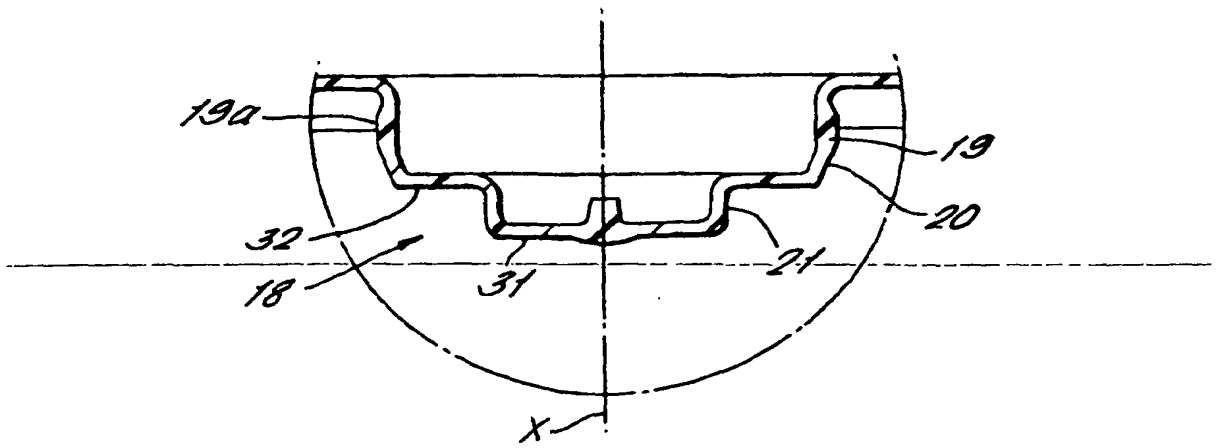


FIG. 20.



K-FEE SYSTEM GMBH, EX2009, page 1849
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 21.

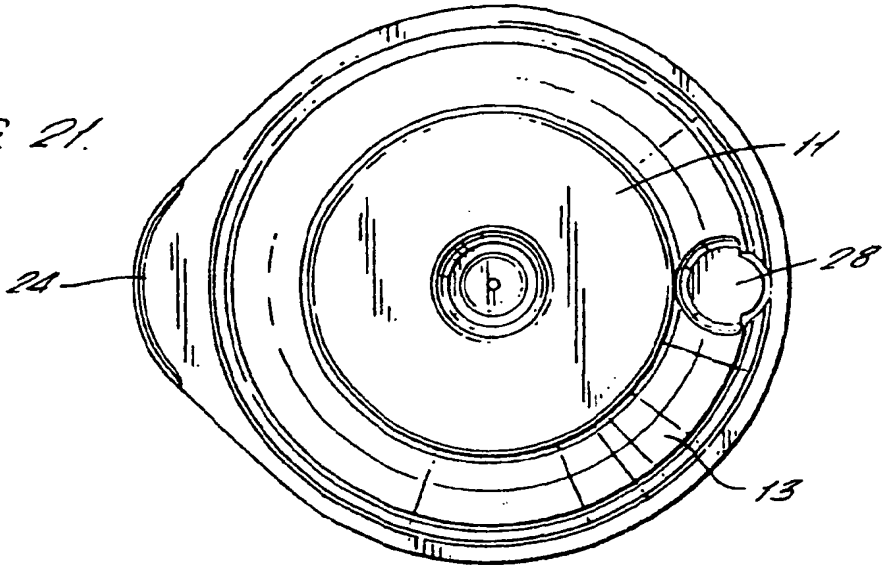


FIG. 22.

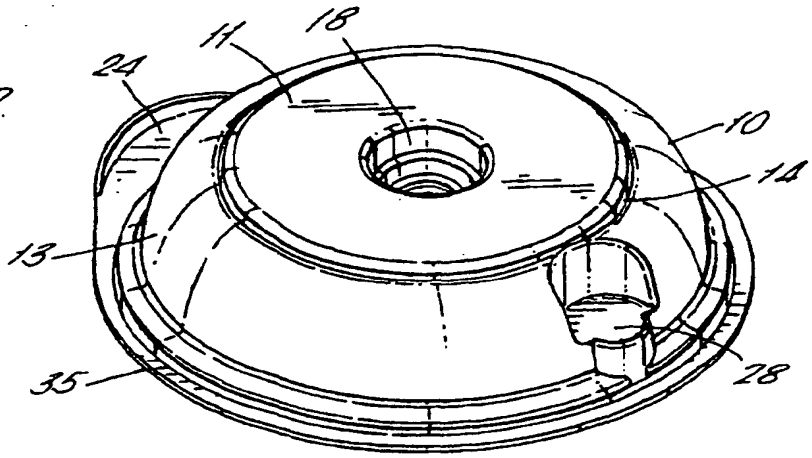
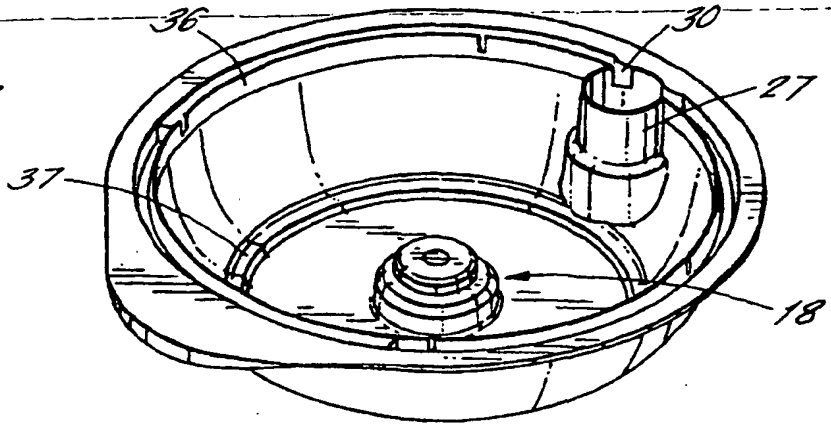


FIG. 23.



K-FEE SYSTEM GMBH, EX2009, page 1850
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 24.

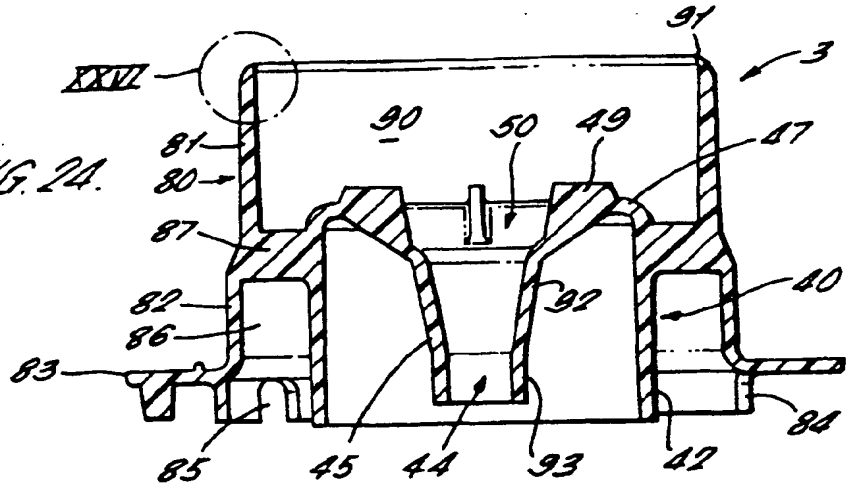


FIG. 25.

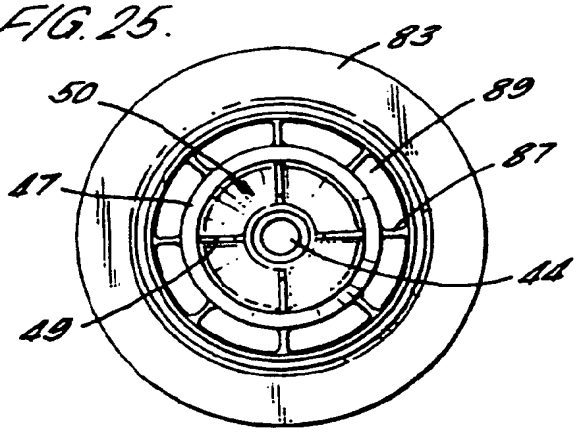


FIG. 26.

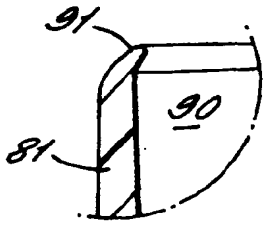


FIG. 27.

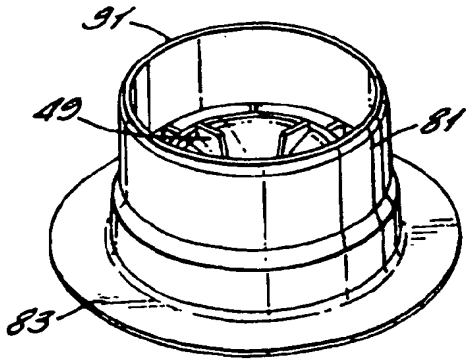
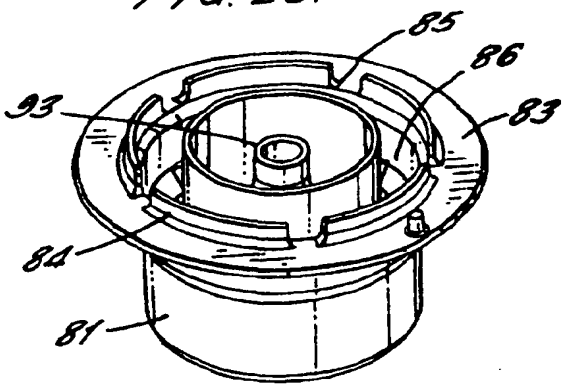


FIG. 28.



K-FEE SYSTEM GMBH, EX2009, page 1851
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

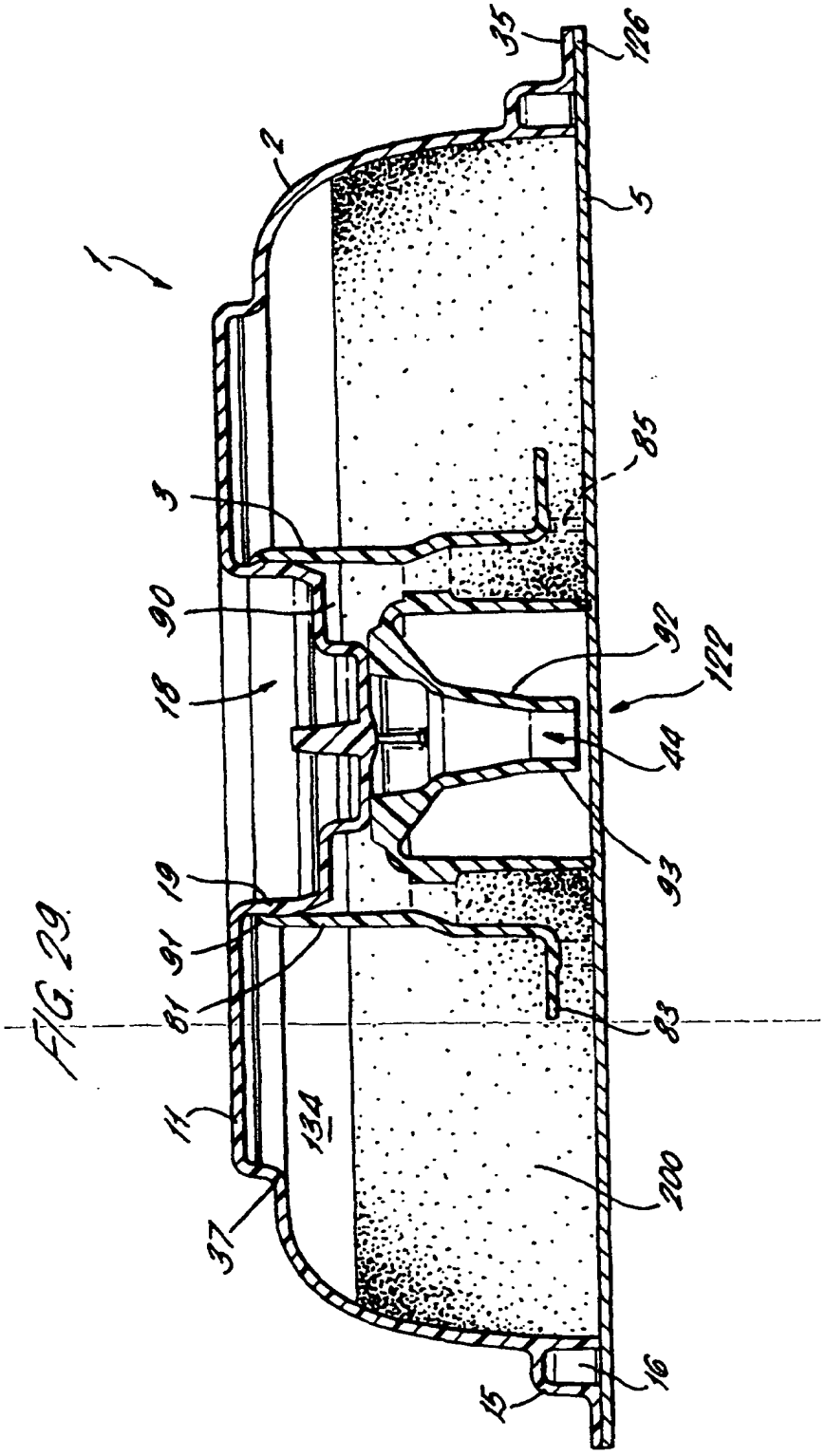


FIG. 29.

K-FEE SYSTEM GMBH, EX2009, page 1852
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 30.

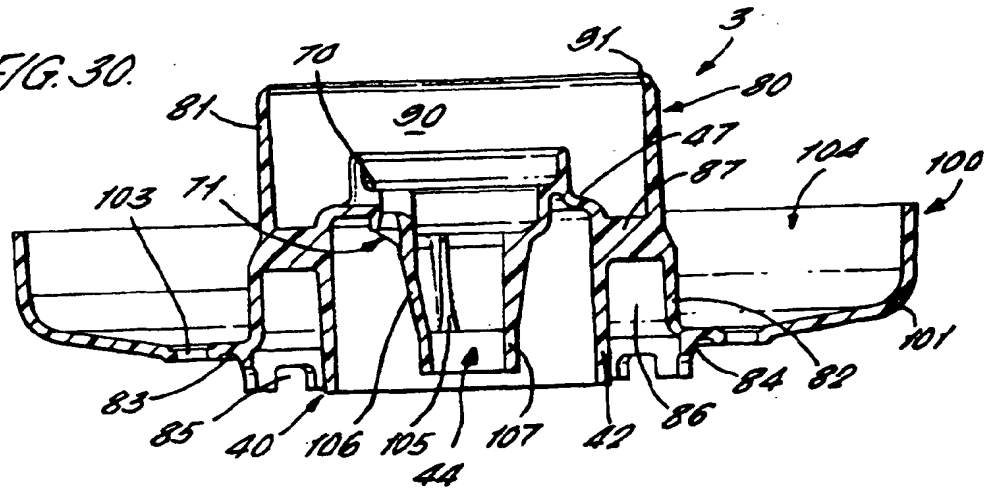


FIG. 32.

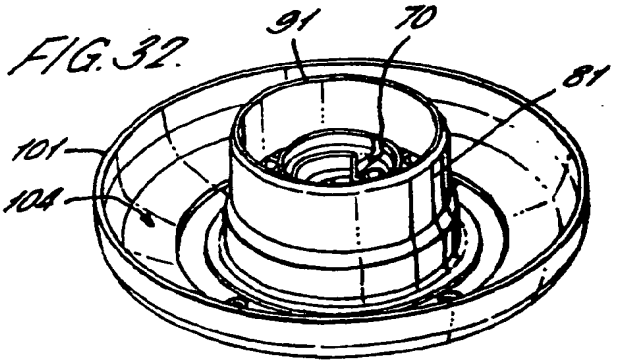


FIG. 31.

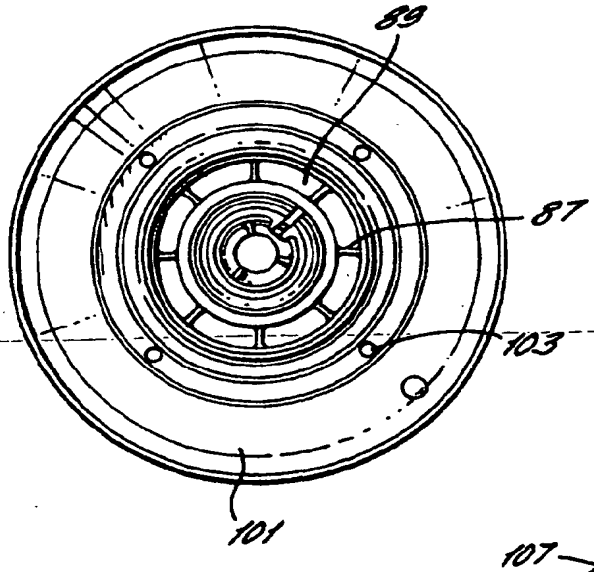
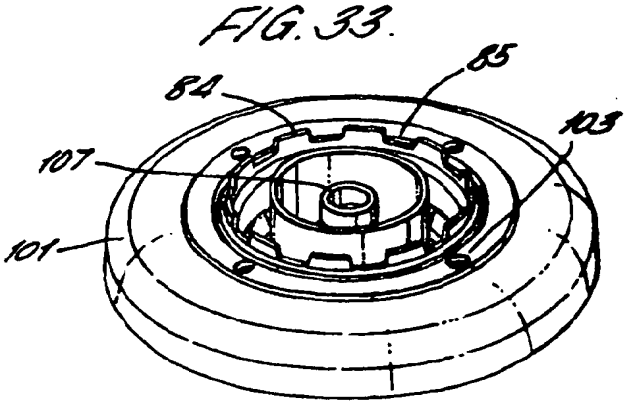


FIG. 33.



K-FEE SYSTEM GMBH, EX2009, page 1853
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

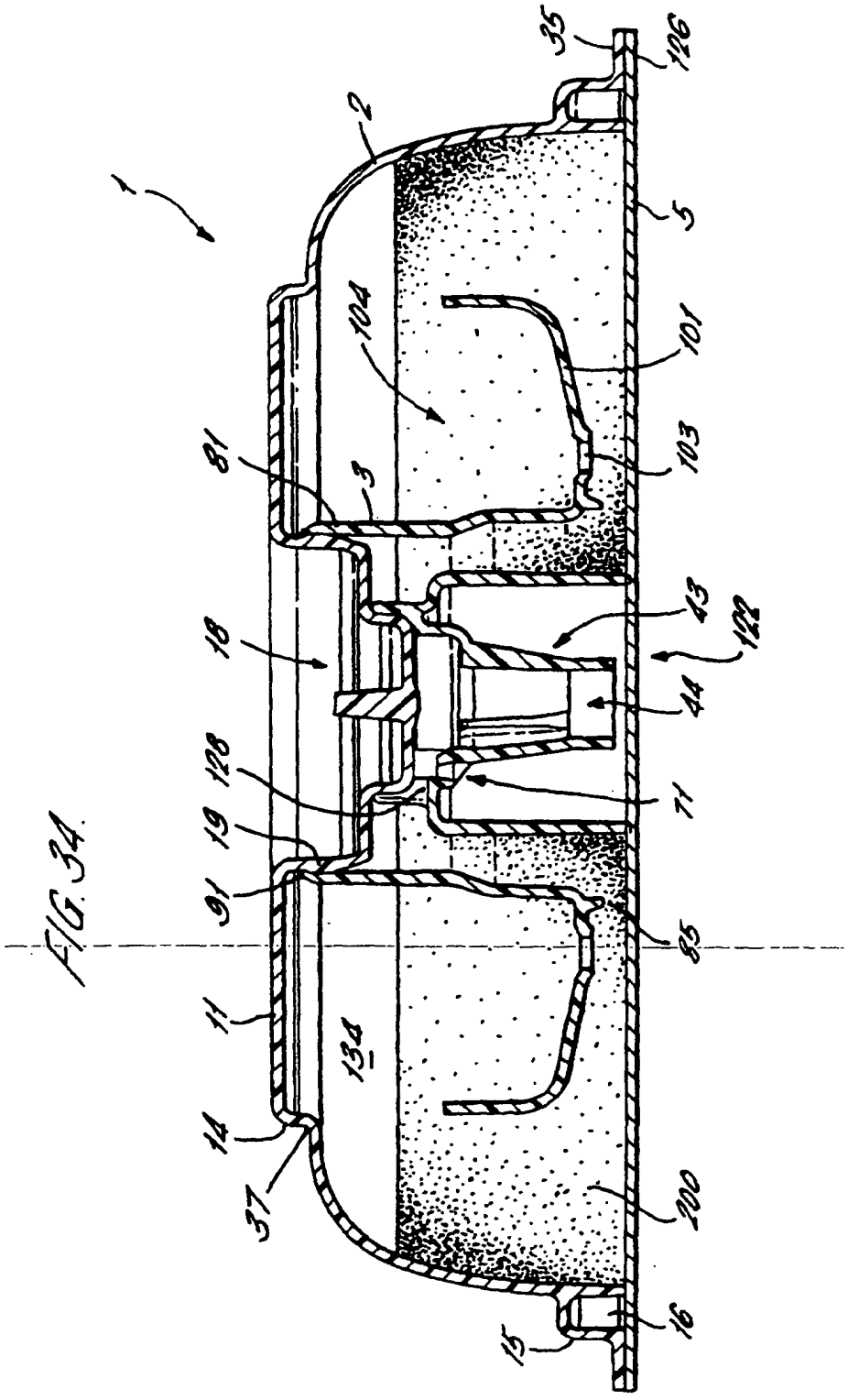
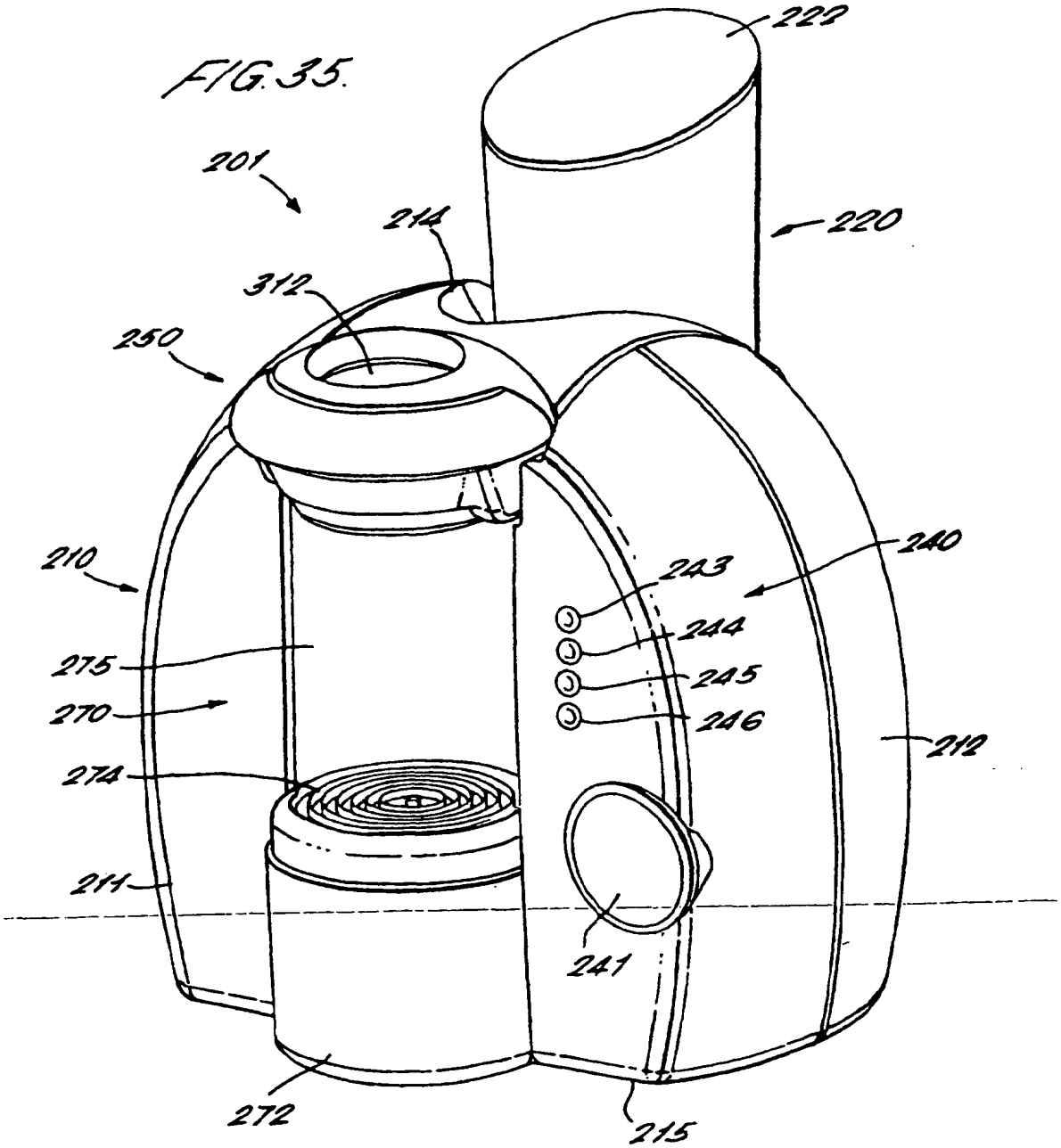


FIG. 34.

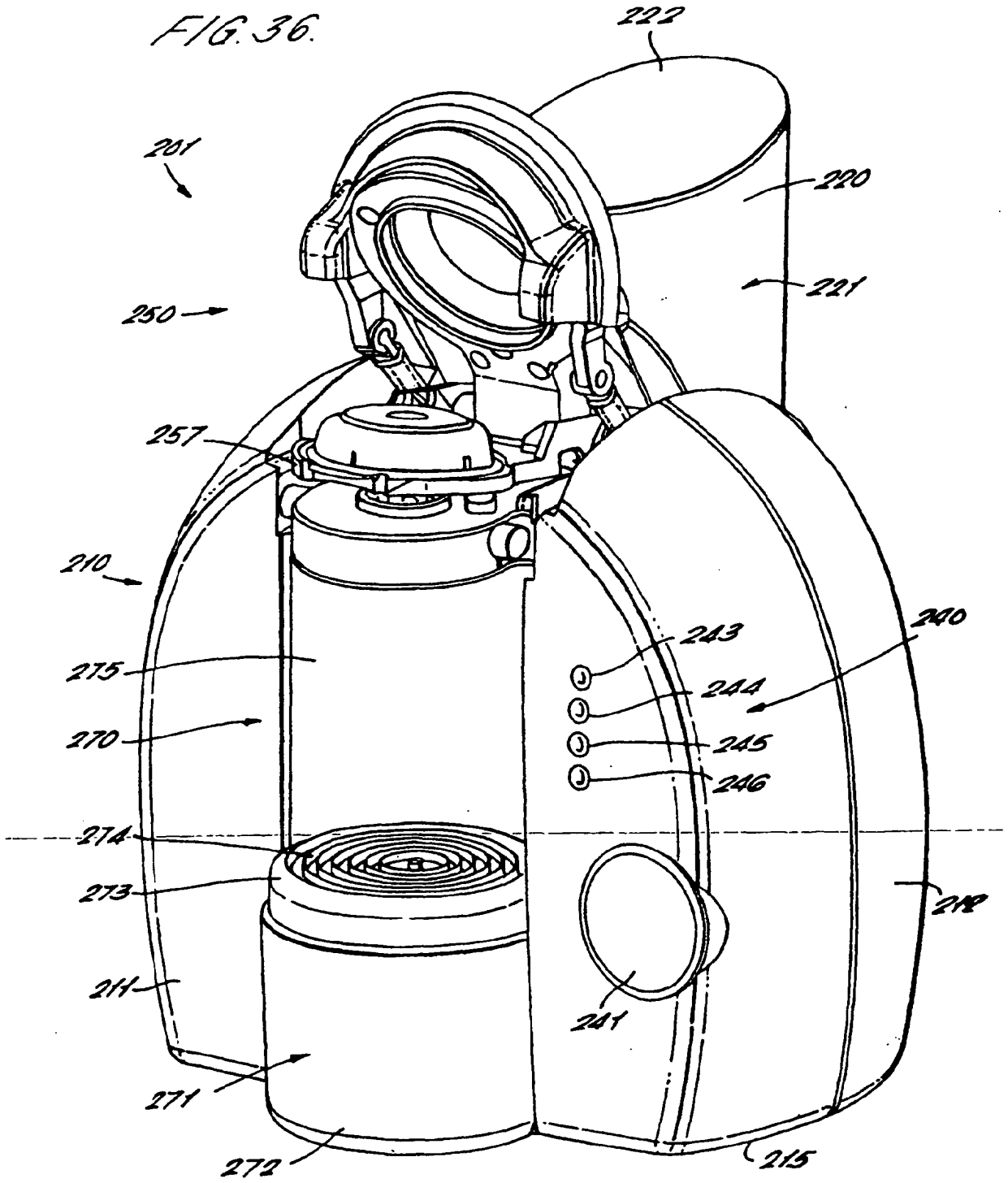
K-FEE SYSTEM GMBH, EX2009, page 1854
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 35.



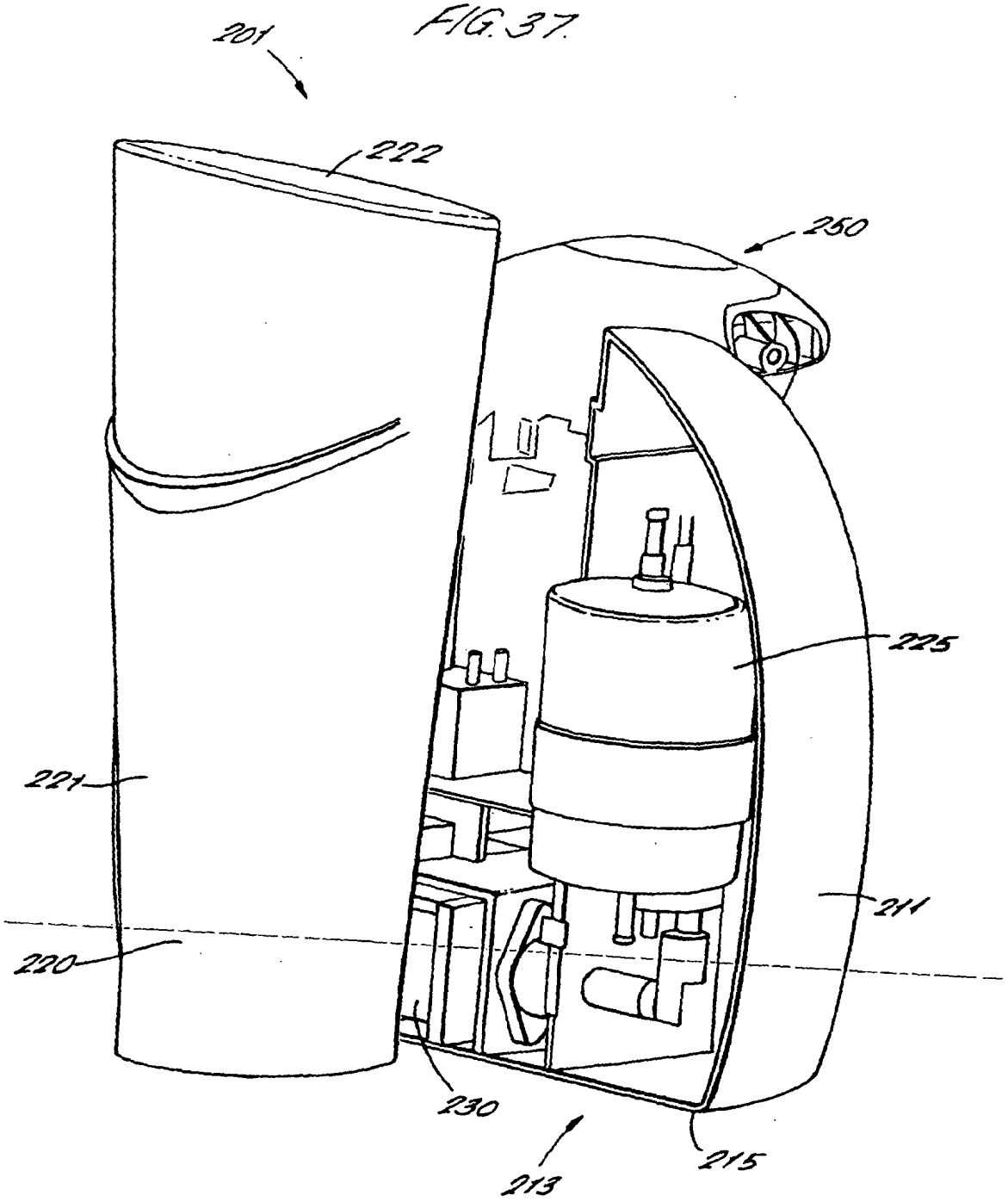
K-FEE SYSTEM GMBH, EX2009, page 1855
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 36.



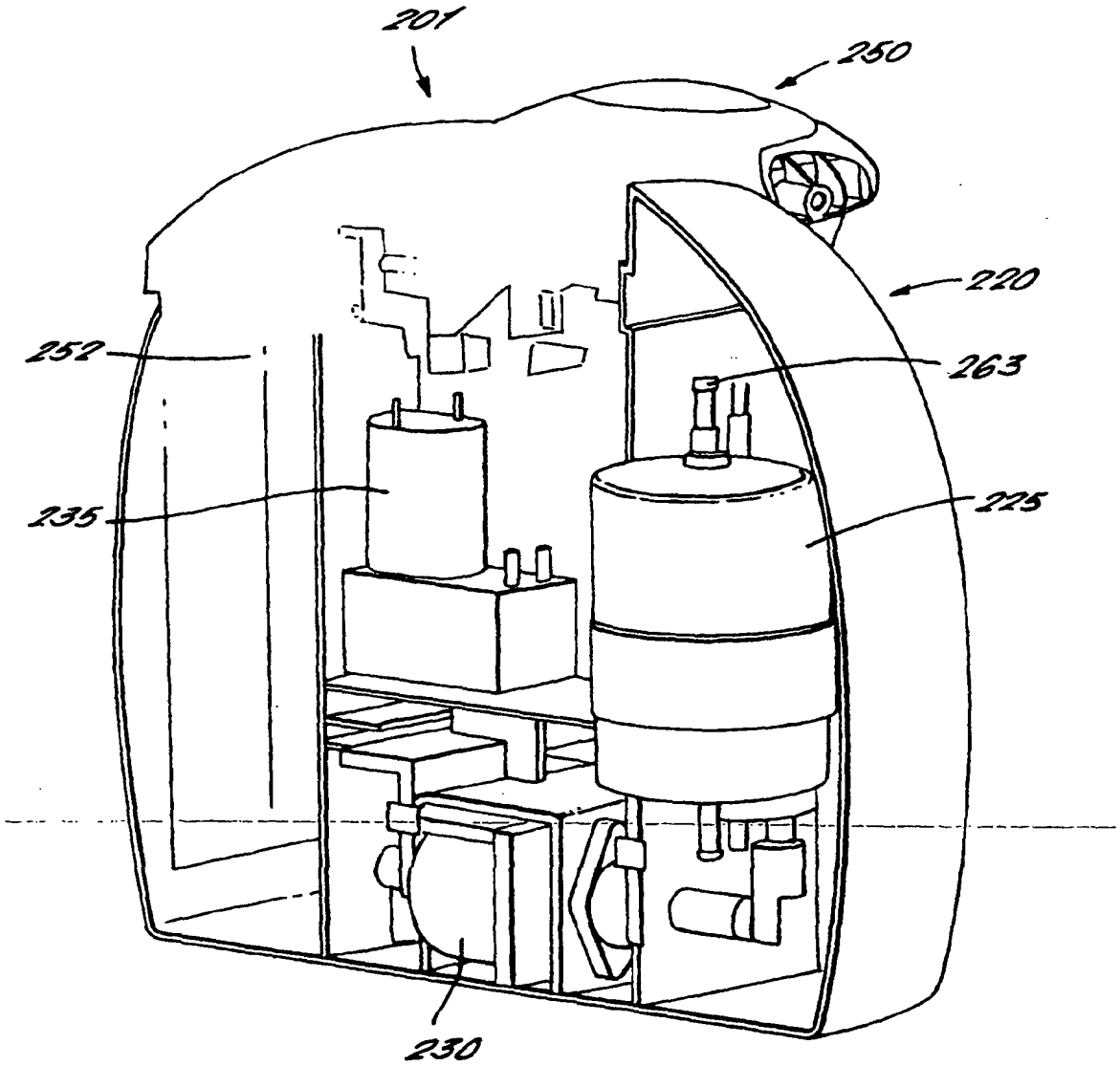
K-FEE SYSTEM GMBH, EX2009, page 1856
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 37.



K-FEE SYSTEM GMBH, EX2009, page 1857
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 38.



K-FEE SYSTEM GMBH, EX2009, page 1858
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

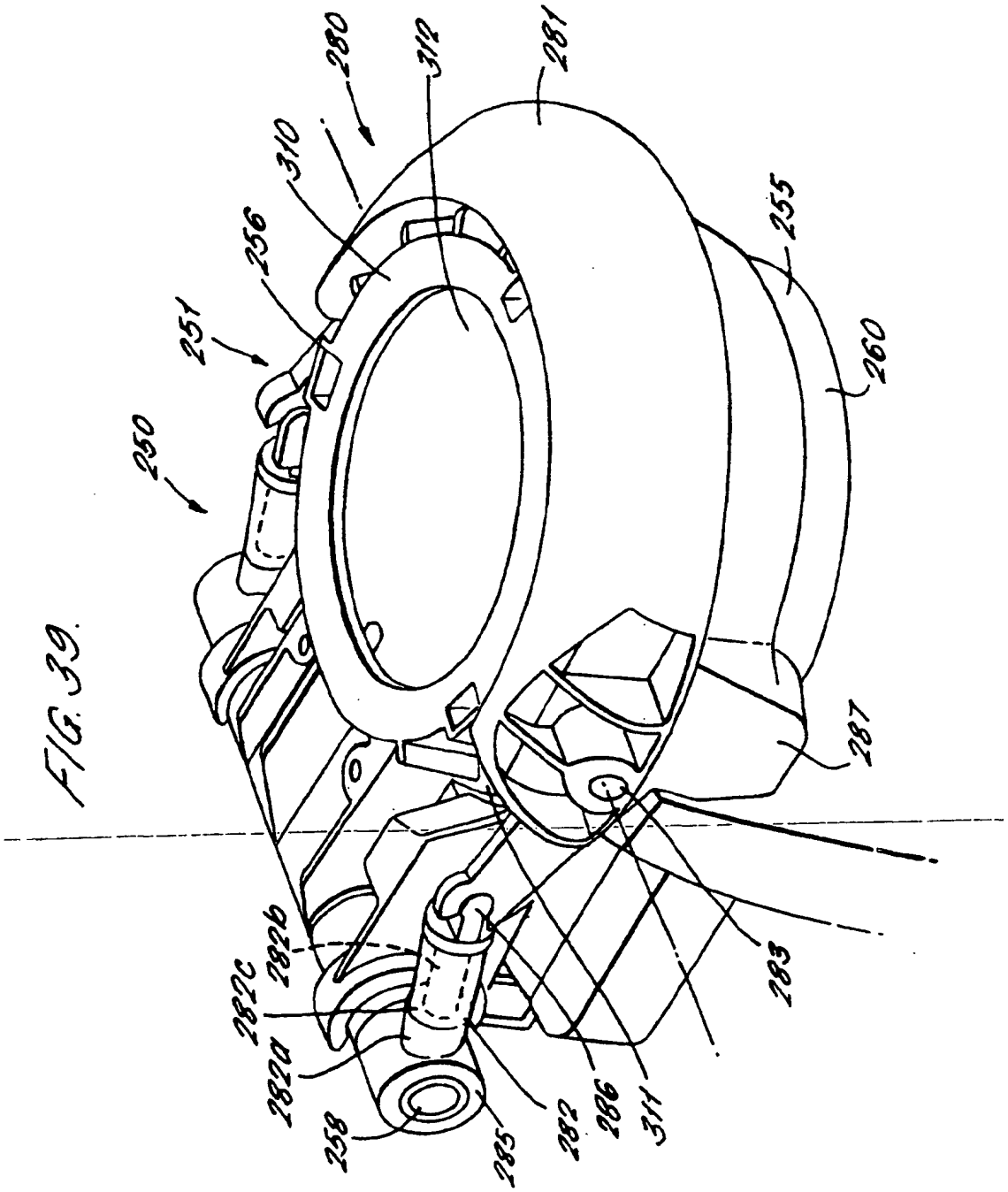
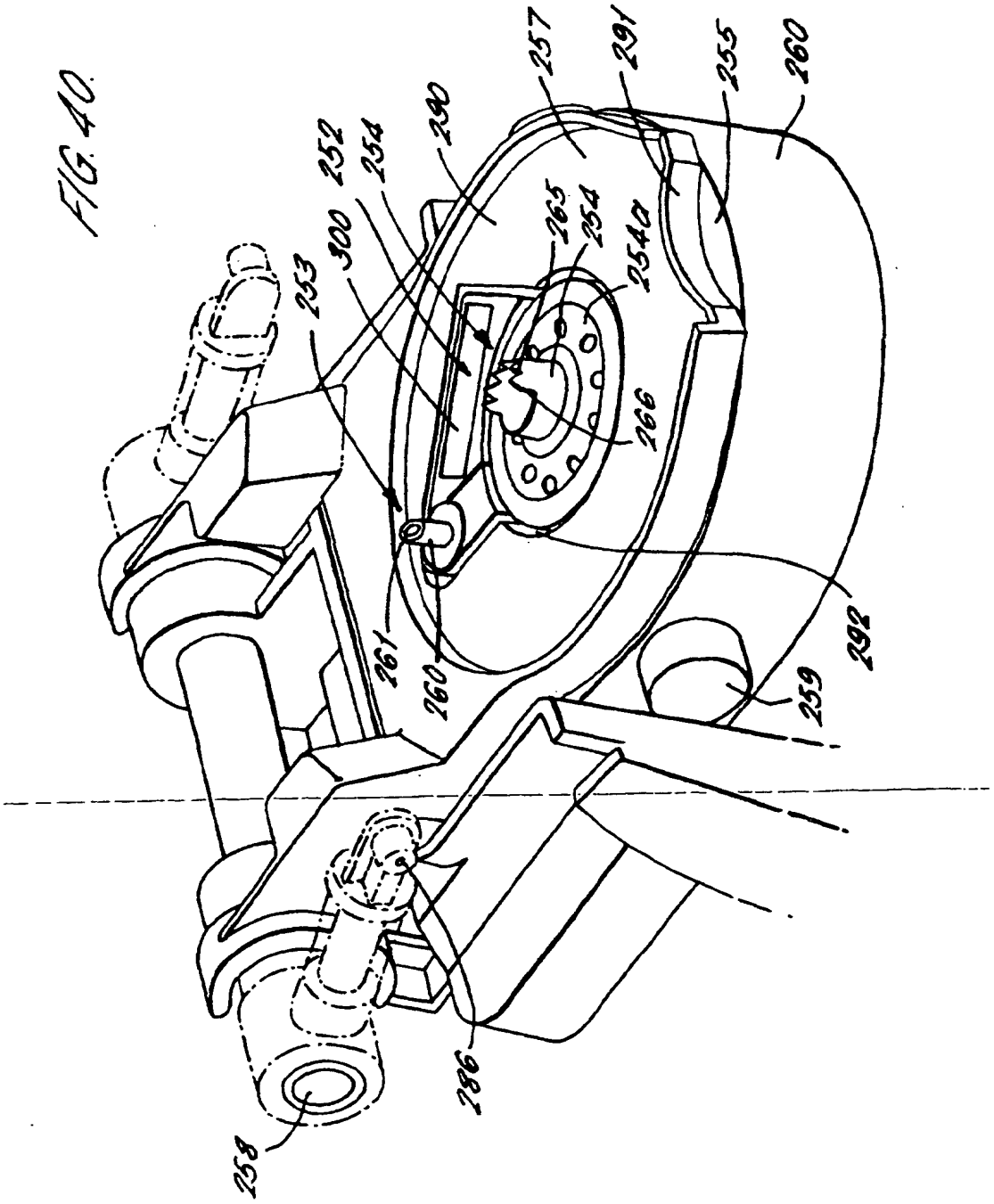


FIG. 39.

K-FEE SYSTEM GMBH, EX2009, page 1859
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 40.



K-FEE SYSTEM GMBH, EX2009, page 1860
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

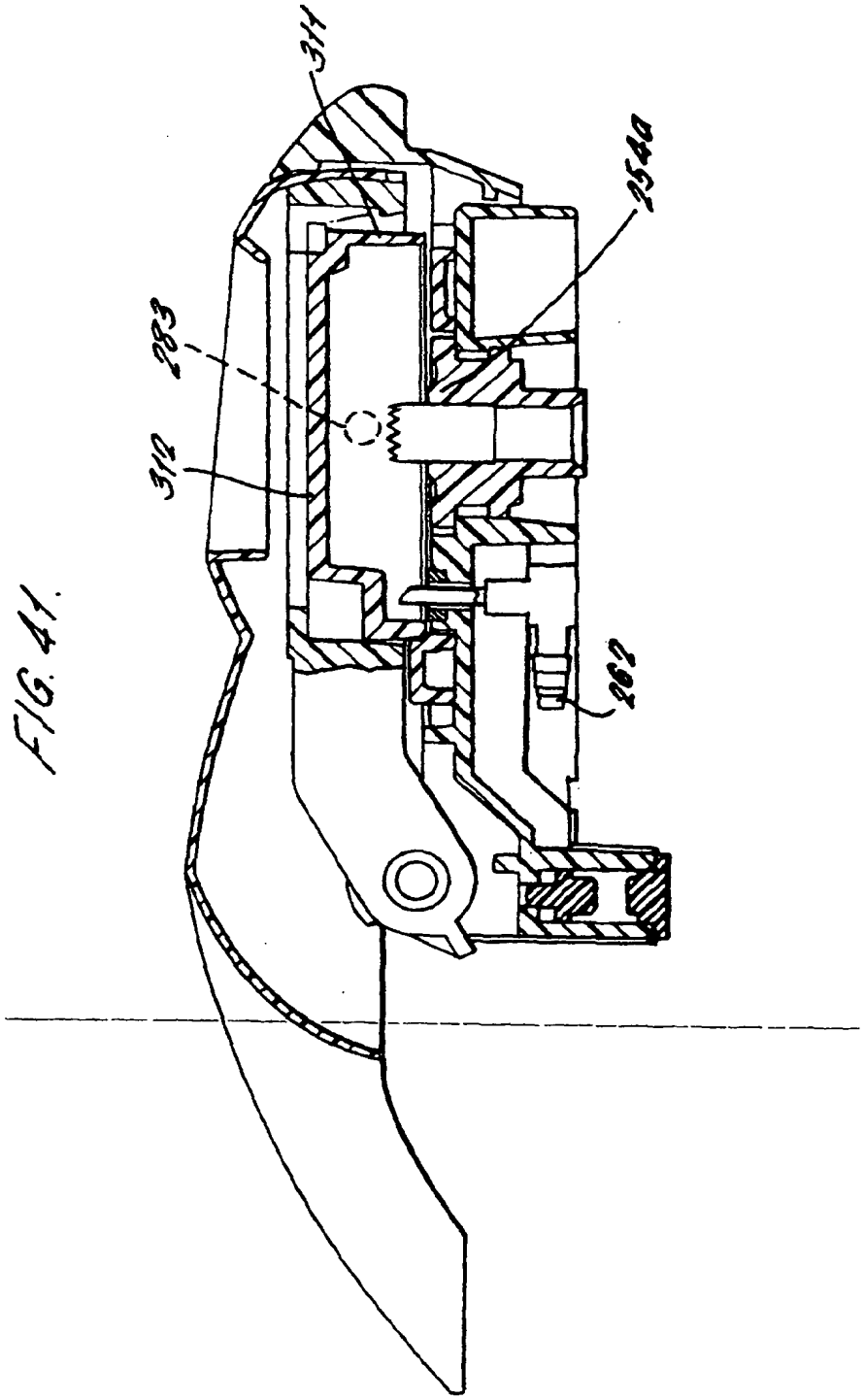
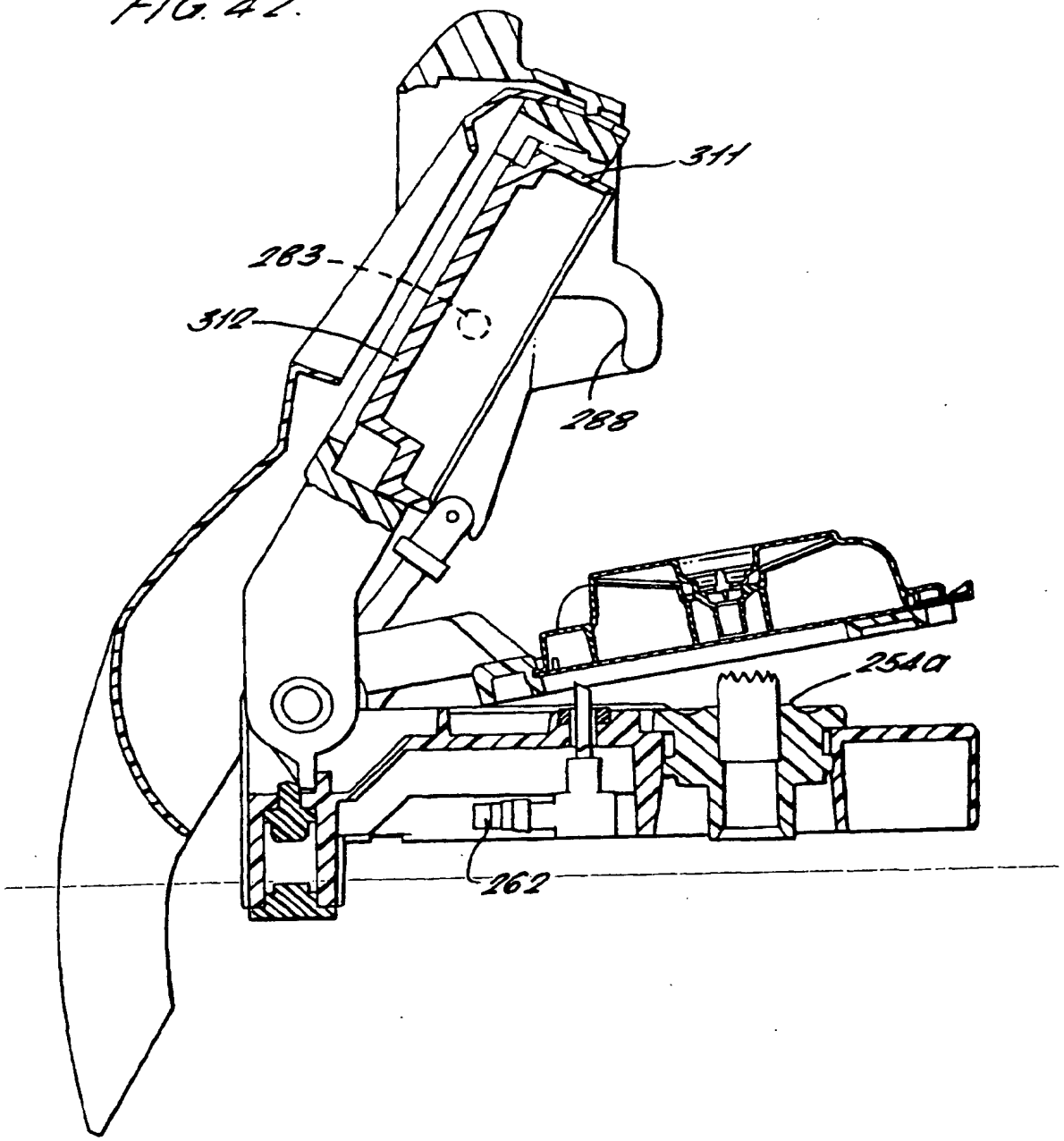


FIG. 41.

K-FEE SYSTEM GMBH, EX2009, page 1861
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 42.



K-FEE SYSTEM GMBH, EX2009, page 1862
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

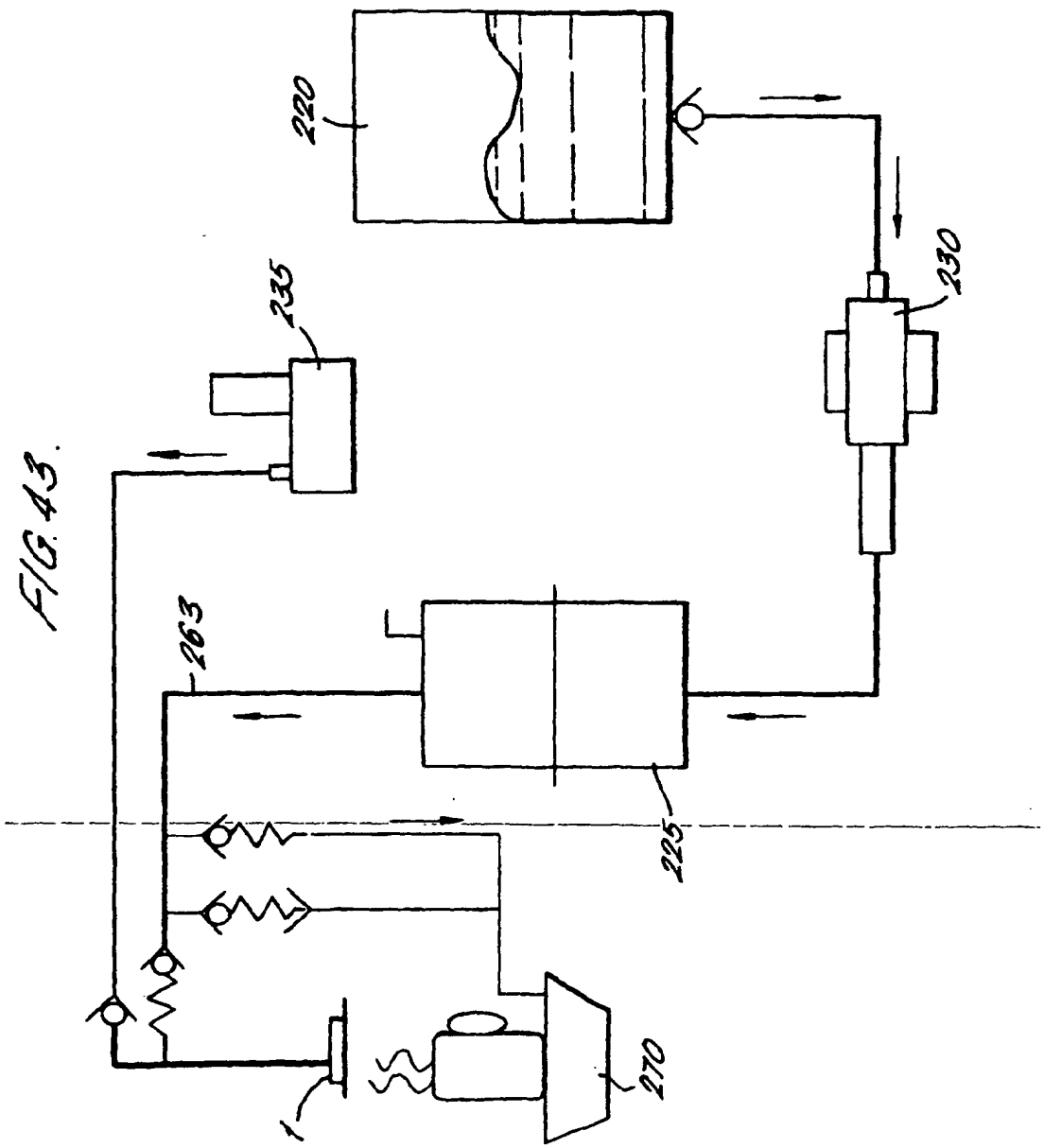


FIG. 43.

K-FEE SYSTEM GMBH, EX2009, page 1863
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 44a.

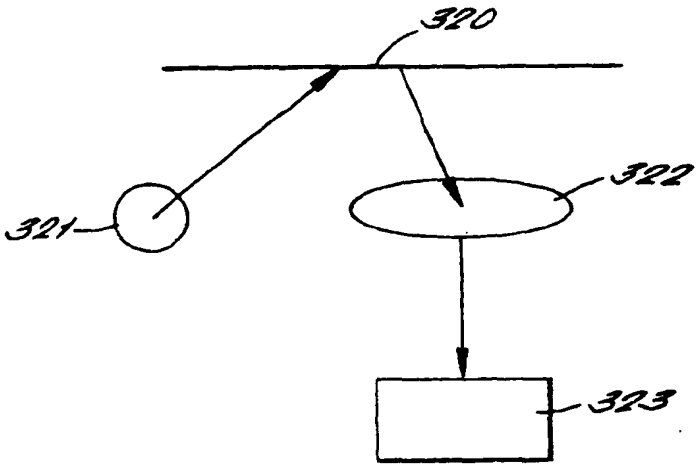
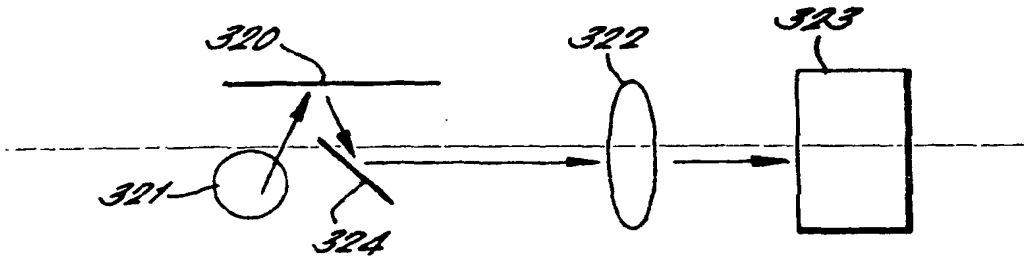
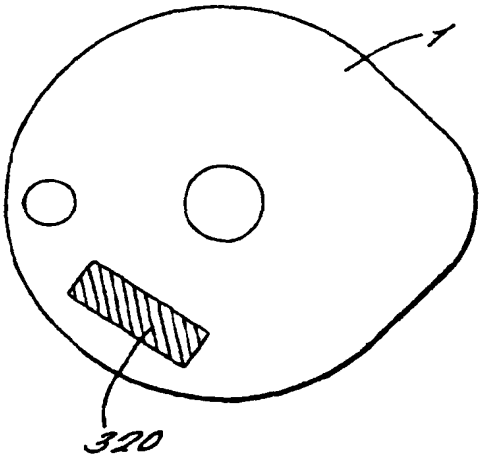


FIG. 44b.



K-FEE SYSTEM GMBH, EX2009, page 1864
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 45.



K-FEE SYSTEM GMBH, EX2009, page 1865
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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71/12			71/00	Ｐ	

審査請求　未請求　請求項の数２　ＯＬ　（全　６　頁）

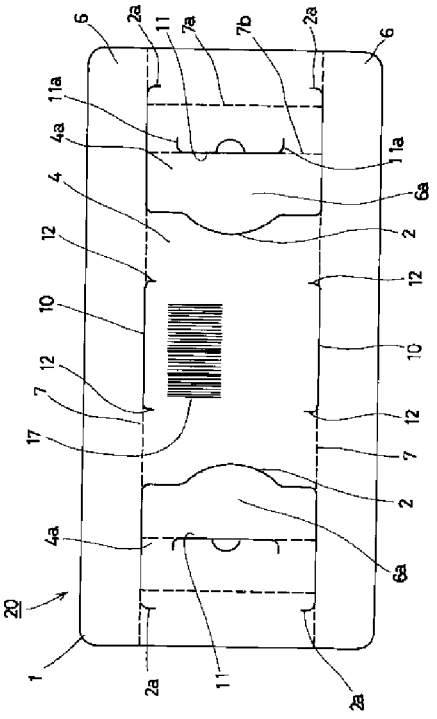
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(22)出願日　平成７年(1995)９月８日

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(54)【発明の名称】　つば付き容器用ホルダー

(57)【要約】
【課題】　複数のつば付き容器をまとめて保持することができると同時に容器に設けられたバーコード等の識別表示の誤読を防止できるつば付き容器用ホルダーを提供することを課題とする。
【解決手段】　天板部4 の一方の対向する側縁部から側板部6 が折り目7 を介して屈曲自在にそれぞれ延設されたシート状のホルダー本体1 を備え、該ホルダー本体1 内に複数個のつば付の容器3 のつば部3aを係止できるように折り目7 に沿ってつば部係止部10が形成されたつば付き容器用ホルダーにおいて、前記天板部4 の他方の対向する側縁部の下方に補助側板部6aが形成され、側板部6 及び補助側板部6aによって前記容器3 の側周面に設けられたの識別表示16の少なくとも一部が被覆されるべくホルダー本体1 が形成されていることを解決手段として有する。



K-FEE SYSTEM GMBH, EX2009, page 1866
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

【特許請求の範囲】
【請求項１】　天板部(4) の一方の対向する側縁部から側板部(6) が折り目(7) を介して屈曲自在にそれぞれ延設されたシート状のホルダー本体(1) を備え、該ホルダー本体(1) 内に複数個のつば付の容器(3) のつば部(3a)を係止できるように折り目(7) に沿ってつば部係止部(10)が形成されたつば付き容器用ホルダーにおいて、前記天板部(4) の他方の対向する側縁部の下方に補助側板部(6a)が形成され、側板部(6) 及び補助側板部(6a)によって前記容器(3) の側周面に設けられたの識別表示(16)の少なくとも一部が被覆されるべくホルダー本体(1) が形成されていることを特徴とするつば付き容器用ホルダー。
【請求項２】　前記天面部(4) の両端部に切り込み(2) が形成され、該切り込み(2) に囲まれた折り曲げ片(4a)がそれぞれ外側に向かって折り曲げられ、且つ該折り曲げ片(4a)の先端部が下方に折り曲げられることによって前記補助側板部(6a)が形成されてなる請求項１に記載のつば付き容器用ホルダー。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、ヨーグルトや即席麺等の物品を収納するつば部を有するカップ状の容器を複数個まとめて集積包装し、集積状態にて把持することが可能な容器用ホルダーに関する。
【０００２】
【従来の技術】従来、ヨーグルトや即席麺等が収納されたつば付きのカップ状の容器を、複数個をまとめて集積包装するために、図６（イ）（ロ）に示すようなカップホルダーが使用されていた。即ち、紙製のシート体からなる矩形状の天板部50の長手方向の両側方を折り目53から折り曲げて側板部51を形成し、該折り目53沿いに容器のつば部を内側から嵌入できるような切り欠き58を設けたホルダー本体55内に、つば部58を有する容器56を図６（ロ）に示すように前記両側板部51の間に複数個収納し、前記切り欠き58から各容器56のつば部57を突出させて容器56を係止させることによって、各容器56を集積包装するものであり、店頭等において複数個の商品をまとめて取引、販売するのに便利である。
【０００３】
【発明が解決しようとする課題】このようなカップホルダーに収納される容器56は、個々に取引、販売されることもあるため、各容器56の外面に個々の商品の価格を表示したバーコード等の光学的識別表示59が設けられていると同時に、前記ホルダー本体55には複数の商品をまとめた包装体の価格が同様のバーコード等の光学的識別表示60が設けられている。
【０００４】従来のカップホルダーを装着して包装体として販売する場合に、側板部51が形成されているホルダー本体55の長手方向の側方部に各容器のバーコード59が位置した場合には、該側板部51によって個々の商品のバーコードは被覆されるため光学的読み取り装置によって読み取りされることはなく、ホルダー本体１に表示された複数の商品の値段を表示したバーコード60のみを読み取ることができる。
【０００５】しかし、短手方向の側方部には側板部51が存在しないため、該部分においては容器56の側周面のバーコード59は露出することになり（図６（ロ）参照）、レジ等で誤って各単品の容器のバーコード59を読み取ってしまいトラブルが発生するおそれがあった。
【０００６】本発明は、上記従来の問題点に鑑みてなされたもので、複数のつば付き容器をまとめて保持することができると同時に容器に設けられたバーコード等の識別表示の誤読を防止できるつば付き容器用ホルダーに関する。
【０００７】
【課題を解決するための手段】
（構成）本発明は上記課題を解決するためになされたもので、その解決するための手段としては、天板部4 の一方の対向する側縁部から側板部6 が折り目7 を介して屈曲自在にそれぞれ延設されたシート状のホルダー本体1 を備え、該ホルダー本体1 内に複数個のつば付の容器3 のつば部3aを係止できるように折り目7 に沿ってつば部係止部10が形成されたつば付き容器用ホルダーにおいて、前記天板部4 の他方の対向する側縁部の下方に補助側板部6aが形成され、側板部6 及び補助側板部6aによって前記容器3 の側周面に設けられたの識別表示16の少なくとも一部が被覆されるべくホルダー本体1 が形成されていることに特徴を有する。
【０００８】（作用）本発明のつば付き容器ホルダーは、ホルダー本体１の矩形状の天面部４の一方の対向する側縁からは側板部６が形成され、他方の対向する側縁からは補助側板部6aが形成されているため天板部４のすべての側縁部から側板部６及び補助側板部6aが形成され、ホルダー本体１に保持された容器３の側周面に設けられた識別表示16を該側板部６及び補助側板部6aによって確実に被覆することができ、識別表示16の誤読を防止することができる。
【０００９】また、前記天面部４に形成された切り込み２から該切り込み２に囲まれた折り曲げ片4aが外側に向かって折り曲げられ、且つ該折り曲げ片4aの先端部が容器3の側周面に沿って下方に折り曲げられて補助側板部6aが形成された場合には、天面部４の一部から補助側板部6aを形成することができるため、ホルダー本体１の面積を少なくすることができる。
【００１０】
【発明の実施の形態】以下、本発明の実施の形態を図面に従って説明していく。図１乃至図４に示す１は、カップ状のつば付き容器を集積包装するための紙製シートからなるホルダー本体である。該ホルダー本体１には、矩

K-FEE SYSTEM GMBH, EX2009, page 1867
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

形状の天面部４とその長手方向の両側縁に折り目７を介して屈曲自在に延設された一対の側板部6,6 が形成されている。

【００１１】該天面部４上面の中央部には、価格等を表示するバーコード17が、直接印刷または、バーコード17が印刷されたシート等が接着することによって設けられている。

【００１２】２は天面部４の両端部に形成された一対の切り込みであり、該切り込み２に囲まれた天板部４の一部分は折り曲げ片4aとして形成される。該切り込み２は、それぞれ折り目７に沿って形成された対向する直線状の切り込み線と、該両切り込み線を連接するように天面部４の短手方向に形成された曲線状の切り込み線からなり、折り目７沿いに形成された切り込み線の端部はそれぞれ天板部４の内側を向くように内向切り込み2aが形成されている。

【００１３】折り曲げ片4aには、天面部4 の短手方向の辺と平行になるように２条の折り曲げ線7a,7b が形成され、内側に形成された第２折り曲げ線7b沿いにはホルダー本体１に保持される容器３のつば部3aの一部が嵌入可能な係止切り欠き11が形成され、該係止切り欠き11の中央部は半円形の凹部が形成されている。係止切り欠き11の両端部11a は僅かに天面部４の外側に向かって切り込まれている。

【００１４】折り曲げ片4aは、図５（イ）に示すように、外側の第１折り曲げ線7aから天面部４の下面側から外側に向かって折り曲げられ、さらに図５（ロ）に示すように第２折り曲げ線7bから下方に折り曲げられる。

【００１５】天面部４の下面には、図３に示すように第１折り曲げ線7aから折り曲げられた折り曲げ片4aが重合され、さらに第２折り曲げ線7bから下方に折り曲げられた折り曲げ片4aの先端部は、天面部４の短手方向の側縁部より下方に補助側板部6aとして形成される。

【００１６】また、折り曲げ片4aをこのように折り曲げた場合に、前記第２折り曲げ線7b沿いに形成された係止切り欠き11の両端部11a は、図５（ロ）に示すようにホルダー本体１の内側を向くことになる。

【００１７】８は、前記折り曲げ片4aが折り曲げられることによって天面部４の両端部に形成された窓部である。該窓部８ごしに、ホルダー本体１に保持された容器３の上面部が図２に示すように目視することができる。

【００１８】10は、天面部４の中央部の前記折り目７沿いに対向して形成されたつば部係止部としての一対のつば部係止切り欠きで、該つば部係止切り欠き10の両端部12が天板部４の内側に向かって入り込むように形成され、該係止切り欠き10にはホルダー本体１の中央部に保持される容器３のつば部3aを嵌入して係止可能なように形成されている。

【００１９】次に、このような構成からなるつば付き容器用ホルダー20によって複数（本実施の形態では３個）のつば付きの容器３を保持する場合について説明する。まず、図２に示すようなつば部3aを有するカップ状の容器３をホルダー本体１の一方の端部に保持する場合には、図３に示すように保持する容器３のつば部3aの外側の部分を、前記第２折り曲げ線7b沿いに形成された係止切り欠き11に内側から挿入して外側に突出させる。

【００２０】このとき、係止切り欠き11の両端部11a はホルダー本体１の内向きに切り込まれているため、図３に示すように、両端部11a の間の折り曲げ片4aの端縁部13と係止切り欠き11の間につば部3aが挟持される。

【００２１】また、ホルダー本体１の折り目７側に位置するつば部3aは、図２に示すように前記窓部８の周縁部から上面に突出させるが、この時、切り込み２の両端部2aが天板部４の内面側に切り込まれている形状であるため、図４に示すように該両端部2a間に位置する天板部４の端縁部14によって上からつば部3aが押圧され、容器3は確実に保持される。

【００２２】次に、天面部４の中央に容器３を保持する場合には、容器3 のつば部3aを折り目７沿いに形成されたつば部用係止部10に内側から嵌入し外側に突出させてホルダー本体１に保持させる。

【００２３】このつば部係止部10の両端部12も内向きになるように切り込まれているため、該両端部12間の天板部４の端縁部15によってつば部3aは上から押圧されて固定される（図２参照）。

【００２４】さらに、ホルダー本体１の他方の端部に保持される容器３も前記の一方の端部に容器３を保持するのと同様の方法で容器３を保持させて、図２に示すように３個の容器３をホルダー本体１に保持させる。

【００２５】このようにホルダー本体１に容器３が保持された包装体21を店頭等において購入する場合に、例えば、図２に示すように容器３の側周面に各容器３ごとの値段がバーコード16で表示されている場合にも、側板部６及び補助側板部6aによって容器３の側周面は確実に被覆され、レジ等において誤って各容器３のバーコード16を光学的読み取り装置が読み取るおそれがなく、ホルダー本体１の上面に設けられた包装体20のバーコード17のみを読み取ることができ、バーコードの誤読によるトラブル発生が防止できる。

【００２６】また、天面部４には前記窓部８が形成されているため、ホルダー本体１の上面から保持された容器３の上面を目視することができ、容器３の上面にデザイン等が施されている場合には、これらを効果的に表示させることができる。

【００２７】さらに、天面部４の両端部においては、天面部４の下面に折り曲げ片4aが重ねられているため、１枚のシートから天面部４が形成される場合に比してホルダー本体１の両端部を強固に形成することができ、また天面部４と重合部が２重になった該両端部が保持された容器３の上面から押圧することによって容器３を固定す

K-FEE SYSTEM GMBH, EX2009, page 1868
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

るため、より確実に容器３を保持できる。

【００２８】また、第１、第２折り曲げ線7a,7b からそれぞれ折り曲げ片4aを折り曲げることによって補助側板部6aが形成され、さらに該第２折り曲げ線7b沿いの係止切り欠き11に容器３のつば部3aを係止するため、天板部４の側縁部から単に折り曲げられている場合よりも補助側板部6aは外側に開きにくく、確実に容器３の側周面を被覆することができる。

【００２９】尚、上記実施の形態では補助側板部6a,6aを天板部４に形成した一対の切り込み2,2 から折り曲げることによって形成したが、例えば天面部４の両端に別体のシート片を設けることによって補助側板部6a,6a を形成したり、また天面部４の短手方向の両側縁に折り目を介して補助側板部を延設してもよい。要は、ホルダー本体１に保持される容器３の周面に設けられた識別表示16が確実に被覆されるような側板部６及び補助側板部6aが形成されていればよい。

【００３０】また、上記実施の形態においては紙製のシート体からホルダー本体１を形成したが、ホルダー本体１の材質としてはこれに限定されることなく、合成樹脂シート等であってもよい。

【００３１】

【発明の効果】本発明のつば付き容器用ホルダーは、ホルダー本体に複数保持された各容器の周面に設けられた識別表示を、ホルダー本体の周囲に設けられた側板部及び補助側板部によって確実に被覆できるため、レジ等において容器の周面に設けられたバーコード等の識別表示を誤って読み取り装置等によって読み取り、トラブルが発生することを防止できる。また、各容器の周面を確実に保持することができるため、容器の脱落等を防止することができる。

【００３２】また、ホルダー本体の天板部に切り込みを形成し、該切り込みから天板部の一部を外側及び下方に折り曲げることによって補助側板部を形成した場合には、天板部の一部から補助側板部が形成されるため、ホルダー本体を少量の材料から形成することができ材料コストを低廉にすることができ経済的であるとともに、ホルダー本体を強固に形成でき、容器をより一層確実に保持することができる。

【図面の簡単な説明】

【図１】本発明のつば付き容器用ホルダーの一形態を示す正面図。

【図２】本発明のつば付き容器用ホルダーの使用状態を示す斜視図。

【図３】図２のＡ－Ａ線要部拡大断面図。

【図４】図２の要部側面図。

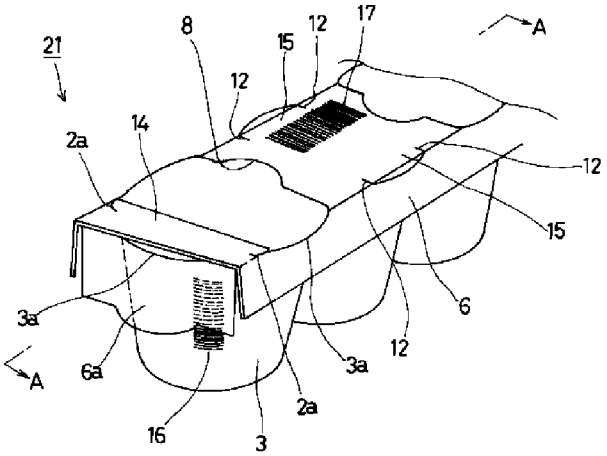
【図５】（イ）は第１折り曲げ線から折り曲げ片を折り曲げた状態を示す要部斜視図、（ロ）は第２折り曲げ線から折り曲げ片を折り曲げた状態を示す要部斜視図。

【図６】（イ）は従来のつば付き容器用ホルダーの一形態を示す正面図、（ロ）は従来のつば付き容器用ホルダーの使用状態を示す要部斜視図。

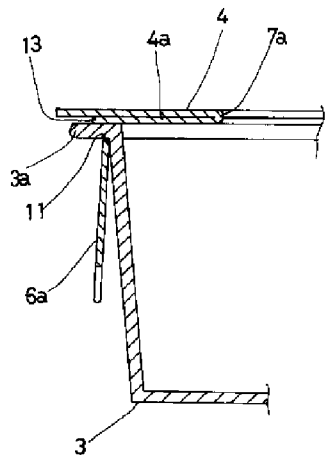
【符号の説明】

1　ホルダー本体
2　切り込み
3　容器
3a　つば部
4　天面部
4a　折り曲げ片
6　側板部
6a　補助側板部
10　つば部係止切り欠き（つば部係止部）
16　識別表示

【図２】

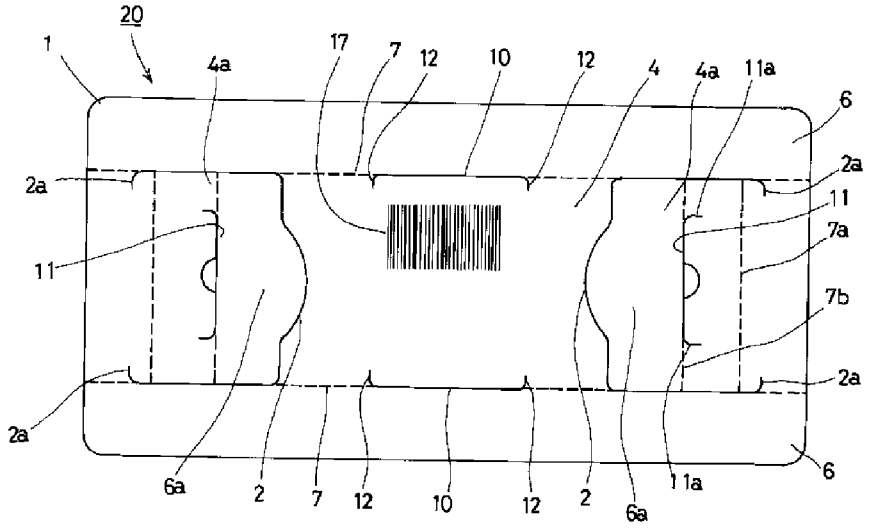


【図３】

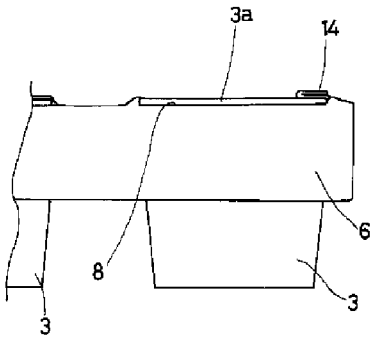


K-FEE SYSTEM GMBH, EX2009, page 1869
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

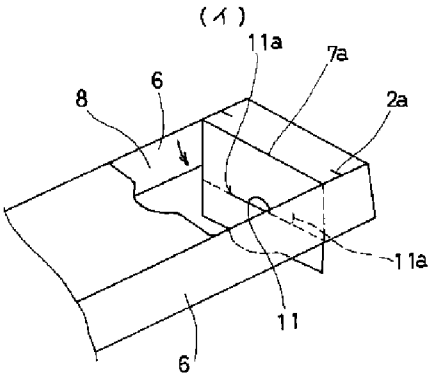
【図１】

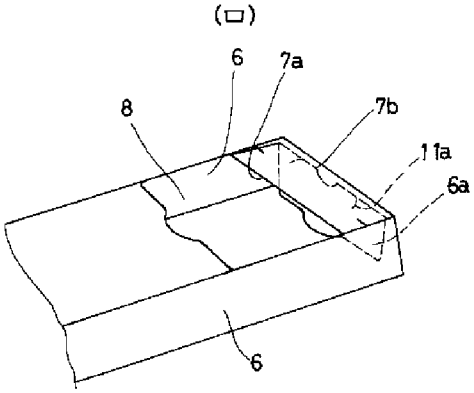


【図４】



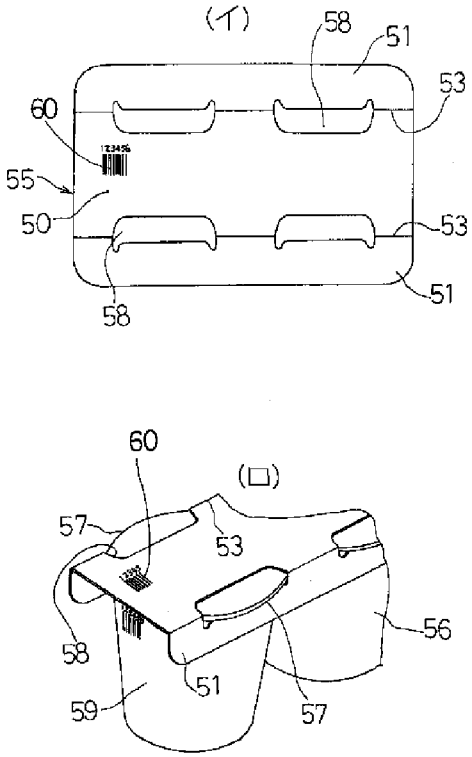
【図５】





K-FEE SYSTEM GMBH, EX2009, page 1870
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

【図６】



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

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(54) **Heat-insulating paper container and method for producing the same**

Waermeisolierender Behaelter aus Papier und Verfahren zu seiner Herstellung

Récipient en papier à isolation thermique et son procédé de fabrication

(84) Designated Contracting States:
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(56) References cited:
EP-A- 0 659 647
US-A- 3 931 380
US-A- 4 435 344

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EP 0 765 821 B1

K-FEE SYSTEM GMBH, EX2009, page 1872
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Description

Background of the Invention

[0001] This invention relates to a heat-insulating paper container having a foamed layer of a thermoplastic synthetic resin film on the outer wall surface of the body member. More particularly, the invention relates to a paper container having a foamed heat-insulating layer that is suppressed in foaming in selected areas.

[0002] Several types of heat-insulating containers have been used commercially to pack hot liquids. A polystyrene foam heat-insulating container is one example. This is produced by a process comprising the addition of a foaming agent to polystyrene, casting the mixture into a mold, heating the resin under pressure to foam it, and removing the shaped article from the mold. The container thus produced has outstanding heat-insulating properties but, on the other hand, it needs reconsiderations from the viewpoint of saving petroleum resources or increasing the efficiency of incinerating waste containers. As a further problem, a curved printing press or a stamp printing press is required to print on the outer surfaces of polystyrene foam heat-insulating containers since printing can only be effected after individual cups have been shaped. Thus, the polystyrene foam containers have suffered the disadvantage of low printability.

[0003] Another type of heat-insulating paper containers are such that the outer side wall of the body member is entirely surrounded by a corrugated paper jacket. The process of manufacturing such container involves additional steps of forming the corrugated paper jacket and bonding it to the outer surface of the side wall of the body member. This type of containers have various other defects. First, letters, figures or other symbols are printed on the corrugated surface and the resulting deformed letters or patterns do not have good aesthetic appeal to consumers. Secondly, the jacket is bonded to the side wall of the body member in such a manner that only the valley ridges contact the side wall and the bond between the jacket and the side wall is so weak that the two will easily separate. Thirdly, containers having the corrugated jacket are not suitable for nesting and, hence, need a large area of storage.

[0004] Still another type of heat-insulating paper containers have a "dual structure" wherein an inner cup is given a different taper than an outer cup to form a heat-insulating air layer in the space between the two cups. The two cups are made integral by curling their respective upper edges into a brim. Containers of this type have very good printability since the outer cup has a smooth-surfaced outer side wall. On the other hand, the two cups are prone to separation. A further defect is that the dual structure generally contributes to high manufacturing cost.

[0005] Unexamined Published Japanese Patent Application (kokai) Sho 57-110439 (see also related document US 4 435 344), which is incorporated herein by reference, teaches a heat-insulating paper container consisting of a body member and a bottom panel member, characterized in that at least one surface of the body member is coated or laminated with a foamed heat-insulating layer of a thermoplastic synthetic resin film whereas the other surface of the body member is coated or laminated with a thermoplastic synthetic resin film, a foamed heat-insulating layer of said thermoplastic synthetic resin film or an aluminum foil. According to the teaching of that patent, the water in the paper is vaporized upon heating, causing the thermoplastic synthetic resin film on the surface to foam. The container under consideration has the advantage that it exhibits fairly good heat-insulating property and that it can be manufactured at low cost by a simple process.

[0006] This approach, however, has its own limitations due to the fact that th foaming of the thermoplastic synthetic resin film is solely dependent on the water content of the paper. First, the thermoplastic synthetic resin film will not foam adequately if the quality control of the paper is poor and if its water content is low; second, high water content is advantageous for the purpose of film foaming but, on the other hand, the mechanical strength of the container may deteriorate; thirdly, even if successful foaming is done, the thickness of the foam layer is uniform and cannot be adjusted from one portion to another.

[0007] Under the circumstances, the present inventors previously invented a heat-insulting paper container having a foamed layer that differed in thickness from one portion to another (see Fig. 4, in which the container is generally indicated at 1) and applied for patent on that invention in Japanese Patent Application No. Hei 5-346302 (see also related document EP 659 647), filed December 22, 1994, which is incorporated herein by reference. As shown in Fig. 4, the container 1 consists basically of a body member 3 and a bottom panel member 5. The body member 3 has a printed area 9 provided on the outer surface by an organic solvent based ink near the brim 7 and the bottom panel member 5. The body member 3 also has a foamed heat-insulating layer 11 which entirely covers its outer surface including the printed areas 9. As shown, the foamed heat-insulating layer 11 over the printed areas 9 is thicker than the foamed heat-insulating layer 11 over the non-printed areas. The foamed heat-insulating layer 11 may typically be formed of a thermoplastic synthetic resin such as polyethylene.

[0008] However, this container had several disadvantages. First, to form the heat-insulating layer, the outer surface of the body member had to be foamed throughout but then it became undulated. With such containers, users (who are going to drink the liquid contents) may occasionally feel "grainy" when their lower lip touches the part of a container which is immediately under the brim. Secondly, if the laminated thermoplastic synthetic resin film carries a POS bar code printed on the outer surface, the foaming of the film may deform or distort the bar code, thereby adversely affecting

K-FEE SYSTEM GMBH, EX2009, page 1873
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the accuracy of reading with a bar code reader. Thirdly, if a bar code is printed on the paper surface of the body member, the foaming of the film will reduce the sharpness of the bar code, thereby causing a reading error. In order to solve these problems, the present inventors filed Japanese Patent Application Hei 6-284125 (see also related document EP 659 647), in which they proposed that an unfoamed portion be provided in desired areas of the outer surface of the body member.

[0009] Fig. 5 illustrates a method of providing such an unfoamed area and it consists of providing at least one continuous or discontinuous slit 20 in a selected area of the film side where foaming is to be effected. The slit 20 is preferably deep enough to penetrate the film 10 to reach the paper 17. The function of the slits 20 is as follows: when water evaporates from within the heated paper, the vapor will escape to the air atmosphere via the slits 20, thereby preventing the film from being foamed in the area where the slits are cut, with the result that the unfoamed area 22 forms.

[0010] Fig. 6 illustrates another method of providing the unfoamed area. In the illustrated case, this is accomplished by coating a specified width of an anti-evaporation layer 70 in an area beneath the brim of the container. The anti-evaporation layer 70 will insure that the water in the paper and the solvent components of ink will not evaporate from the paper and it is desirably formed of water-vapor impermeable, aqueous coating materials that are capable of efficient film formation, as exemplified by KREHALONTEX DO-818 of Kureha Chemical Industry Co., Ltd. and CLEARCOAT LA723-B1 of Hoechst Gosei K.K. As shown in Fig. 6, the laminated film lying above the anti-evaporation layer 70 coated on the paper surface 17 will not foam at all and retains its initial thickness. On the other hand, the film lying in areas where no such anti-evaporation layer is applied is foamed by the water in the paper to form a foamed heat insulating layer 11. The foaming action is particularly great in the film lying above the printed layer 9 since the solvents in the latter will accelerate foaming, and the resulting foamed, heat-insulating layer 11 is sufficiently thick.

[0011] As it turned out, however, these method have their own problems. First, in order to implement the method of forming slits as shown in Fig. 5, special equipment and steps are required for cutting slits and this increases the manufacturing cost of containers. Second, the method of providing the anti-evaporation layer 70 (Fig. 6) requires that a paint for this layer be applied to the same area as where a design has been provided by printing and, as a result, the previously applied ink will redissolve in the solvent components of the paint to cause color fading. Thirdly, the anti-evaporation layer is made of a resin component the primary objective of which is to suppress the foaming of the laminate film 10, so it tends to adhere only insufficiently to the surfacing film, causing the foam cells to move towards, rather than away from, the area where the paint has been applied. Fourthly, the paint which is applied to the already printed area increases the thickness of that area so greatly that uneven pressure will be exerted to cause "blocking" as the web is rewound on a take up roll.

Summary of the Invention

[0012] An object, therefore, of the present invention is to provide a paper container having a foamed, heat-insulating layer, in which the foaming of selected areas has been suppressed by a positive and yet simple procedure.

[0013] This object of the invention can be attained by a heat-insulating paper container comprising a body member and a bottom panel member, characterized in that at least part of the outer surface of said body member is coated with a paint containing 5 wt% - 40 wt% of a synthetic resin component and that the foaming of a thermoplastic synthetic resin film is suppressed in that area of the outer surface of said body member which has been coated with said resin component containing paint whereas a foamed heat-insulating layer of the thermoplastic synthetic resin film is provided in the other areas of the outer surface of said body member.

[0014] The term "foaming-suppressed" as used herein means not only the state in which the thermoplastic synthetic resin film laminated on the outer surface of the body member is not foamed at all but also the state in which said film is foamed to such an extent that it will not cause any unpleasant feeling when the lower lip contacts the foaming-suppressed area or that the bar code printed in that area will not be read incorrectly. The mount of foaming that meets these requirements is generally less than 40% of complete foaming but to assure the reading of bar codes without errors, the degree of foaming is preferably no more than 30% of the complete foaming.

[0015] Thus, the heat-insulating paper container of the invention is characterized in that the area coated with the paint containing 5 - 40 wt% of a synthetic resin component is suppressed in foaming whereas a foamed, heat-insulating layer is provided in the other areas where the paint has not been applied. In other words, the paint containing 5 - 40 wt% of the synthetic resin component is capable of controlling the degree of foaming of the synthetic resin film laminated on the outer surface of the body member. Therefore, this paint may preliminarily be applied to those areas where the synthetic resin film is desirably left unfoamed, such as the area just beneath the brim of the container or the area to be provided with a bar code by printing and this is effective in forming the desired area which is suppressed in foaming.

K-FEE SYSTEM GMBH, EX2009, page 1874
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Brief Description of the Drawings

[0016]

Fig. 1 is a simplified cross section of an example of the heat-insulating paper container of the invention which is foaming-suppressed in selected areas;
Fig. 2 is a diagrammatic partial enlarged cross section of an area of the container shown in Fig. 1 that is near one of the areas which are suppressed in foaming;
Fig. 3 is a characteristic diagram showing how the foaming of a synthetic resin film is affected by the type and concentration of the resin component in the foam suppressing paint;
Fig. 4 is a diagrammatic cross section of an example of the heat-insulating paper container that is described in the specification of Japanese Patent Application Hei 5-346302 and that has a foamed, heat-insulating layer of different thicknesses in different areas (prior art);
Fig. 5 is a diagrammatic cross section showing a method of providing unfoamed areas on the body of the container shown in Fig. 4 (prior art);
Fig. 6 is a diagrammatic cross section showing another method of providing unfoamed areas on the body of the container shown in Fig. 4 (prior art);
Fig. 7 is a characteristic diagram showing the relationship between the resin content of the foam-suppressing paint and the thickness of the foamed, heat-insulating layer; and
Fig. 8 is a characteristic diagram showing the relationship between the content of the resin component in the foam-suppressing paint and the blow ratio of the film.

Detailed Description of the Invention

[0017] Fig. 1 is a simplified cross section of an example of the heat-insulating paper container of the invention. The container generally indicated by 1 consists basically of a body member 3 and a bottom panel member 5. The body member 3 has a synthetic resin containing paint coated on the outer surface in areas near the brim 7 and the bottom panel member 5 to provide foaming-suppressed portions 24. The container also has a foamed, heat-insulating layer 11 provided in different thicknesses in different areas to surround the entire part of the side wall of the body member 3. As shown, the foaming-suppressed portions 24 provided by the coating of the synthetic resin containing paint are much thinner than the foamed, heat-insulating layer 11.

[0018] The inner surface of the body member 3 is covered with a film 13 which is made of either a thermoplastic synthetic resin such as polyethylene or an aluminum foil. The inner lining of the body member 3 is necessary both for preventing the penetration of liquid contents into the paper and for assuring that the water in the paper will not evaporate directly into the air atmosphere during heating of the fabricated container. Total loss of the water in the paper may potentially result in a failure to foam the thermoplastic synthetic resin film on the outer surface of the body member 3. The inner surface of the bottom panel member 5 is laminated with a thermoplastic resin 15 to attain the same purpose as just described above (preventing the permeation of liquids into the paper). Indicated by 17 is the paper sheet.

[0019] Fig. 2 is a partial enlarged cross section of the foaming suppressed portion 24 of the container shown in Fig. 1. The thermoplastic synthetic resin film 10 which is laminated on the outer surface of the body member 3 has a coat 26 formed in a selected area by application of the synthetic resin containing paint. The coat 26 effectively suppresses subsequent foaming of the underlying thermoplastic synthetic resin film 10, thereby providing the foaming-suppressed portion 24. The mechanism by which the synthetic resin containing coat 26 suppresses the foaming of the thermoplastic synthetic resin film 10 is speculated to be as follows. If the synthetic resin component of the coat 26 as applied over the surface of the film 10 is more heat-resistant than the latter, it will not expand during subsequent heating. In other words, the coat 26 fails to expand together with the film 10, which will crack or split, leaving no air pockets that are necessary for its foaming. Another important factor that should be considered is the concentration of the synthetic resin component of the foaming-suppressing paint. As its concentration increases, the strength of the resin coat also increases and if it is so strong that it will no longer expand together with the film 10, the latter again fails to foam.

[0020] Various synthetic resins may be incorporated in the paint for use in suppressing the foaming of the thermoplastic synthetic resin film laminated over the outer surface of the body member and they include, for example, alkyd/nitrocellulose mixtures, nitrocellulose, polyurethanes, a vinyl chloride/vinyl acetate mixture, aqueous polyacrylic resins, polyamide-based resins, chlorinated polyolefins, chlorinated polyolefin/rosin mixtures and solvent-containing acryl-based resins. These resins may be used either alone or in admixtures.

[0021] These resin components are incorporated in amounts ranging from 5 to 40 wt%, preferably from 10 to 30 wt%, of the total weight of the paint. If the resin content is less than 5 wt%, the paint is so thin that not only considerable difficulty is encountered in coating operations but also the desired suppression of foaming cannot be accomplished. If the resin content is more than 40 wt%, the paint becomes so viscous that it cannot be transferred smoothly during

K-FEE SYSTEM GMBH, EX2009, page 1875
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

application, particularly when this is done by rollers as in gravure coating and reverse roll coating. In addition, insufficient scraping with doctor blades or the clogging of sprays will occur and these also preclude the performance of efficient coating operations.

[0022] The paint used in the invention to suppress the foaming of the thermoplastic synthetic resin film contains solvents for the purpose of promoting the dispersion of the resin component and controlling the flow of the paint. When the paint is applied by gravure coating, the solvents assure smooth transfer of the paint onto the surface, thereby improving its "wettability". The solvents for the paint may be incorporated in such amounts that, when taken together with the resin component and any other additives (if any, such as pigments and various aids), they make a total of 100 wt%. Consider, for example, the case where neither pigments nor additives are used and the paint is solely composed of the resin component and a solvent; if the resin component is incorporated in amounts of 5 - 40 wt%, the solvent is incorporated in amounts of 95 - 60 wt%. The solvents may be either aqueous or organic or mixtures of aqueous and organic types. Exemplary solvents include water, acetone, methyl acetate, methyl ethyl ketone, isopropyl acetate, ethyl alcohol, dibutyl acetate, n-butyl acetate, isobutyl alcohol, toluene and xylene. If two or more of these solvents are to be used, compatibility with the resin component must be assured by attaining a good balance between solubility and wettability in consideration of the solubility parameter (SP). In practice, the ease of drying the applied coat must also be taken into account and, hence, the boiling points of the respective solvents and their relative evaporation rates are also important factors. With all these factors taken into consideration, two or more solvents may be selected as appropriate for combined use.

[0023] The coating weight of the synthetic resin containing paint is not limited to any particular value but it may generally range from 1.0 g/m^2 to 10 g/m^2, preferably from 2 to 7 g/m^2, on a dry weight basis. If the paint is applied in amounts within these ranges, a foam-suppressed coat 26 is provided which, after drying, has a thickness in the range from 1 μm to 10 μm. If the dry thickness of the coat 26 is less than 1 μm, the desired suppression of foaming is not achieved. If, on the other hand, the dry thickness of the coat 26 exceeds 10 μm, its foam suppressing effect is saturated and only diseconomy will result. The thickness of the coat 26 varies with the content of the synthetic resin in the paint. For example, the higher the content of the synthetic resin, the thinner the coat 26 that can be formed.

[0024] The method of applying the synthetic resin containing paint is not limited to any particular types and various applicators may be employed, such as knife coaters, spray coaters, kiss roll coaters, squeeze roll coaters, gravure coaters, reverse roll coaters, bar coaters, curtain coaters and air-knife coaters. The method of drying the applied paint also is not limited to any particular types and any well-known techniques may be employed, such as drying with cold or warm air.

[0025] The heat-insulating container of the invention can be fabricated by means of a conventional cup-forming machine. First, a paper sheet for making the container body member is unrolled and subjected to printing in desired areas. Bar codes and any other necessary information may be printed at this stage. Registering and other necessary printing jobs can be done by conventional means or procedures. In the next step, the thusly printed paper sheet is extrusion-laminated with a film of thermoplastic synthetic resin such as polyethylene. The other side (where no printing has been done) of the paper sheet is also laminated with a thermoplastic synthetic resin film or an aluminum foil. A paper sheet for making the bottom panel member is laminated with a thermoplastic synthetic resin film on one side only. Thereafter, the synthetic resin containing paint to be described below in detail is applied to specified areas of that side of the paper sheet which has been laminated with the thermoplastic synthetic resin film and which is to provide the outer surface of the body member. Alternatively, the synthetic resin containing paint may be applied onto selected areas of the outer surface of the body member after the latter has been assembled with the bottom panel member to fabricate a container. A blank is cut from each of the paper sheets. Using a conventional cup-forming machine, the two blanks are fabricated into a container with the blank for the body member being oriented in such a way that the areas coated with the synthetic resin containing paint will face outward whereas the blank for the bottom panel member is oriented in such a way that the film laminated side will face inward. The fabricated container is then subjected to a heat treatment. The thus produced heat-insulating paper container is generally indicated by 1 in Fig. 1 and it has not only a foamed, heat-insulating layer of varying thickness but is also suppressed in foaming in desired areas.

[0026] The method of providing a foamed, heat-insulating layer of varying thickness is disclosed in the specification of Japanese Patent Application Hei 5-346302, supra and a part of the description in that patent is hereby cited as reference. To provide a thick foamed, heat-insulating layer as in the case described above, an organic solvent based ink has to be preliminarily applied onto the paper sheet 17 to form a printed layer. The ink to be used in printing is not limited to any particular types but inks of such a type that very small amounts of solvent components will remain in the printed surface (more specifically, the paper) are preferred from the viewpoint of accelerated film foaming. Common ink solvents such as acetone, ethyl acetate, methanol, isopropyl alcohol, ethanol, toluene, xylene, methyl ethyl ketone, methyl isobutyl ketone, butanol, propylene glycol, monomethyl ether acetate, ethyl cellosolve, etc. may be used in admixture. To insure efficient foaming, small amounts of ink solvents should remain even after both surfaces of the body member have been laminated with thermoplastic synthetic resin films. Desirable from this viewpoint are inks that contain large amounts of toluene, methyl ethyl ketone, methyl isobutyl ketone and other solvents that are less prone

K-FEE SYSTEM GMBH, EX2009, page 1876
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

to evaporation during drying on a printing press or at the stage of lamination with thermoplastic synthetic resin films. Such less vaporizing solvents are preferably contained in at least 10%, more preferably 20 - 50%. It should, however, be noted that the relative proportions of solvents must be determined in due consideration of printability since the ink containing those solvents is to be used for the printing purpose.

[0027] Thermoplastic synthetic resin films that may be used in the invention are typically formed of polyethylenes, polypropylenes, polyvinyl chlorides, polystyrenes, polyesters, nylons, etc. The film to be laminated on the outer surface of the body member 3 must have a lower softening point than the film to be laminated on the inner surface. Take, for example, the case of laminating both sides of the body member 3 with a polyethylene film; the film on the outer surface must be a low-density polyethylene and the film on the inner surface must be a medium- or high-density polyethylene.

[0028] The thickness of the film to be laminated on the body member 3 is not limited to any particular values but it should preferably have the necessary and sufficient thickness to form a desired thickness of foamed heat-insulating layer 11 by foaming the film laminated on the outer surface of the body member. Take, for example, the case of laminating a low-density polyethylene film on the outer surface of the body member 3; the thickness of this film is typically in the range from 25 to 60 μm. Thicker films may be used but then the underlying printed patterns are sometimes difficult to see through the films. The thickness of the film to be laminated on the inner surface of the body member 3 is not limited to any particular values as long as it is necessary and sufficient to ensure resistance to liquid permeation. The exact value of the thickness that meets this requirement is variable and can appropriately be determined by the skilled artisan in accordance with the specific type of film that is selected for use.

[0029] The paper sheet to be used in producing the heat-insulating container of the invention has preferably a basis weight in the range from 100 g/m^2 to 400 g/m^2. It is also preferred that the paper sheet has a water content within the range from about 3% to about 10%.

[0030] The heating temperature and time will vary with the type of the paper sheet and the thermoplastic synthetic resin film used; generally, the heating temperature varies from about 110°C and the heating time varies from about 20 seconds to about 4 minutes. An optimal combination of heating temperature and time can appropriately be determined by the skilled artisan in accordance with the specific type of film used.

[0031] Any heating means such as hot air, electric heat or microwaves can be used. Heating by hot air or electric heat in a tunnel having transporting means such as a conveyor has the advantage of accomplishing mass production at low cost.

[0032] Needless to say, foaming-suppressed portions may also be provided on a paper container having a foamed, heat-insulating layer of a uniform thickness. A heat-insulating paper container of this type is disclosed in commonly assigned Unexamined Published Japanese Patent Application (kokai) Sho 57-110439, supra. It should particularly be noted that if a color pigment is incorporated in the synthetic resin containing paint, the latter can also be used as printing ink. Therefore, by using this ink to print letters, symbols and patterns on the surface of the laminated film, one can insure that foaming is suppressed in the printed areas after foaming the laminated film, with the printed letters, symbols and patterns remaining substantially the same as before the foaming was done. As a result, the printed letters, symbols and patterns can assure clear visibility without suffering from any defects such as deformation, distortion, blurring and pinholes.

[0033] The following examples are provided for the purpose of further illustrating the advantages of the heat-insulating container of the invention but are in no way to be taken as limiting.

Example 1

[0034] A paper sheet having a basis weight of 230 g/m^2 (water content: 7.9%) was extrusion-laminated on one side with a low-density polyethylene in a thickness of 40 μm. The other side of the paper sheet was extrusion-laminated with a high-density polyethylene in a thickness of 20 μm. The side of the paper laminated with the low-density polyethylene film was coated with paints containing various synthetic resin components in concentrations ranging from 5 wt% to 40 wt%. The solvents were isopropyl alcohol, ethyl acetate, toluene and methyl ethyl ketone in respective proportions of 10:40:30:20 on a percent basis. The paper sheet laminated with polyethylene on both sides had an overall thickness of 0.340 mm. Sample pieces were blanked out of the two-side laminated paper sheet, put into a conveyor oven and heated at 120°C for 120 sec. A foamed heat-insulating layer was provided only on the outer surface of the low-density polyethylene film lamination. Each sample piece had an overall thickness of 0.826 mm including the foamed heat-insulating layer. The relationship between the thickness of the foamed heat-insulating layer and each of the type and concentration of the specific synthetic resin component in the paint is shown in Fig. 3, from which one can understand that vinyl chloride/vinyl acetate base synthetic resins exhibited an outstanding foam-suppressing effect when they were used at concentrations within the range from 20 to 30 wt%. It is also clear from Fig. 3 that the other synthetic resins employed displayed the desired foam-suppressing effect at concentrations within the range from 10 to 40 wt%.

K-FEE SYSTEM GMBH, EX2009, page 1877
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Example 2

[0035] The synthetic resin containing, foam-suppressing paint of the invention was applied to the body member of a container in areas where bar codes were printed and after foaming the underlying film lamination, the bar codes were read with a bar code reader and the accuracy of reading was checked for varying degrees of foaming suppression. The experimental procedures were as follows.

[0036] Bar codes were printed in three sizes on a paper sheet having a basis weight of 230 g/m^2 (water content: 8.0%); the three sizes were large (1.5), medium (1.2) and small (the figures in parentheses represent the relative sizes of bar codes, with the size of the small bar code being taken as unity). One side of the paper sheet was then extrusion-laminated with a low-density polyethylene in a thickness of 60 μm. The other side of the paper sheet was extrusion-laminated with a high-density polyethylene in a thickness of 20 μm. The foam-suppressing paint used a vinyl chloride-vinyl acetate copolymer as the synthetic resin component, which was dispersed in a solvent system consisting of isopropyl alcohol (10%), ethyl acetate (40%), toluene (30%) and methyl ethyl ketone (20%). The paint was applied onto the film lamination in those areas of the sample paper sheet which were printed with bar codes; the concentration of the synthetic resin was varied at 30.0, 22.5, 15.0, 7.5, 3.8 and 1.9 wt%. For each concentration, 10 blanks were provided per sample and subjected to a heat treatment at 120°C for 120 sec. Thereafter, the bar codes were read with a bar code reader and 10 readings were done for each blank to determine the accuracy of reading, which was evaluated by checking to see if the bar code could be read off by a single scan with the bar code reader which was pressed against the bar code surface at such an angle that it was perpendicular as measured with the eye. The bar code reader was TBR-4000 of TOKEN LTD. The results are shown in Table 1 as they are related to the bar code size and the concentration of the synthetic resin component in the paint. The figures in Table 1 represent the number of correct readings that could be done when each sample was subjected to 100 scans with the bar code reader.

Table 1

Bar code size	Concentration of Synthetic Resin, %						
	30.0	22.5	15.0	7.5	3.8	1.9	Uncoated
Large (1.5)	100	100	100	100	100	99	61
Medium (1.2)	100	100	100	100	100	90	18
Small (1)	100	100	100	100	91	39	2

[0037] When the film lamination was foamed without applying the synthetic resin containing foam-suppressing paint, the accuracy of reading with the bar code reader was as low as 61% even when the bar code was of the large size (1.5) and it decreased to 18% on the medium size (1.2); for the small size (1), the accuracy was 2%, which was equivalent to substantial illegibility. This would be entirely due to the presence of the foamed, heat-insulating layer in the area where bar codes were printed. In contrast, the bar codes over which the synthetic resin containing foam-suppressing paint of the invention was coated could successfully be read off irrespective of their size and 100% accuracy was assured in the resin concentration range from 30.0 wt% to 7.5 wt%.

[0038] Fig. 7 is a characteristic diagram showing the thickness of the foamed layer in the samples prepared under the conditions described in the preceding paragraph as it varied with the concentration of the resin component in the foam-suppressing foam-suppressing paint. The sample having no coating of the paint had an overall thickness of 0.786 mm including the foamed, heat-insulating layer. The thickness of the sample was 0.458 mm before foaming. As is clear from Fig. 7, the thickness of the foamed, heat-insulating layer decreased with the increasing concentration of the resin component. In other words, the foaming of the film lamination was suppressed more effectively as the concentration of the resin component in the paint increased.

[0039] The relationship between the concentration of the resin component and the blow ratio of the film lamination is shown in Fig. 8 on the basis of the data shown in Fig. 7. The blow ratio was expressed in relative terms, with the value for the non-application of the foam-suppressing paint being taken as 100% (= 0.786 mm as the overall thickness of the sample including the foamed, heat-insulating layer). As Table 1 shows, when the resin content was 7.5 wt%, there occurred no errors in the reading of bar codes irrespective of their size and, according to Fig. 8, the blow ratio corresponding to the resin content of 7.5 wt% is 29%. It can therefore be concluded that in order to insure error-free bar code reading, the foaming of the film lamination must be suppressed to 30% and below of the complete level of foaming.

[0040] As described on the foregoing pages, the synthetic resin containing foam-suppressing paint of the invention is applied to selected areas of the body member of a container and this insures that even if the fabricated container is heated to foam the thermoplastic synthetic resin film laminated over the outer surface of the body member, the foaming

K-FEE SYSTEM GMBH, EX2009, page 1878
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

of the film under the areas where the foam-suppressing paint has been applied can effectively be suppressed. As a result, bar codes and other pieces of information that are printed in areas under the coat of the paint can be read off without any errors. If the paint is applied to the circumference of the area just beneath the brim of the container, the foaming of the film laminated in that area is sufficiently suppressed that it will not cause any "grainy" feel to the lower lip in contact with that area but provides the same feel as a smooth-surfaced film.

Claims

1. A heat-insulating paper container comprising a body member (3) and a bottom panel member (5), characterised in that at least part of the outer surface of said body member (3) is coated with a paint containing 5 to 40 wt% of a synthetic resin component and that the foaming of a thermoplastic synthetic resin film (10) is suppressed in that area (24) of the outer surface of said body member which has been coated with said resin component containing paint such that the amount of foaming is less than 40% of complete foaming whereas a foamed heat-insulating layer (11) of the thermoplastic resin film is provided in the other areas of the outer surface of said body member.

2. A process for producing a heat-insulating paper container comprising the steps of

   laminating one side of a paper sheet with a thermoplastic synthetic resin film (10),
   coating a selected area of said film lamination with a paint containing 5 to 40 wt% of a synthetic resin component,
   blanking a body member (3) and a bottom panel member (5) from said paper sheet,
   fabricating the two members (3, 5) into a container, and
   heating said container so that said thermoplastic synthetic resin film (10) is foamed, thereby providing a foamed heat-insulating layer (11) on the outer surface of said body member (3) whereas foaming is suppressed in that area (24) of the outer surface of the body member (3) which corresponds to the area which has been coated with said synthetic resin component containing paint such that the amount of foaming is less than 40% of complete foaming.

3. The container of claim 1, or the process of claim 2, wherein the synthetic resin component is selected from the group consisting of alkyd-nitrocellulose copolymers, nitrocellulose, polyurethanes, a vinyl chloride-vinyl acetate copolymer, aqueous acrylic resins, polyamide-based resins, chlorinated polyolefins, chlorinated polyolefin-resin copolymers and solvent-base acrylic resins and is contained in an amount of 10 to 30 wt% of the paint.

4. The container or process of claim 3, wherein the synthetic resin component is a vinyl chloride-vinyl acetate copolymer.

5. The container of claim 1, 3 or 4, or the process of any of claims 2 to 4, wherein said foaming-suppressed portion (24) is provided as a continuous band of a specified width beneath the brim (7) of the container.

6. The container of any of claims 1 and 3 to 5, or the process of any of claims 2 to 5, wherein a bar code is printed in a selected area of the body member and said foaming-suppressed portion (24) is provided in the corresponding area large enough to cover said bar code.

7. The container of any of claims 1 and 3 to 6, or the process of any of claims 2 to 6, wherein said paint further contains an appropriate amount of a pigment and/or a colour dye, such that a letter, a symbol, a geometric figure and/or any other patterned portion that is provided by printing with said paint provides said foam-suppressed portion (24).

8. The container of any of claims 1 and 3 to 7, wherein the foamed heat-insulating layer (11) on the outer surface of the body member (3) has a substantially uniform thickness.

9. The container of any of claims 1 and 3 to 8, wherein the foamed heat-insulating layer (11) on the outer surface of the body member (3) consists of a thick portion and a less thick portion.

10. The container of claim 9, wherein said thick portion of the foamed heat-insulating layer (11) is provided in the upper half of the body member (3) in an area near the brim (7).

K-FEE SYSTEM GMBH, EX2009, page 1879
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

11. The container of any of claims 1 and 3 to 10, wherein at least the inner surface of the body member (3) is laminated either with a thermoplastic synthetic resin film (13) having a higher softening point than the thermoplastic synthetic resin film (10) laminated on the outer surface of the body member, or with an aluminium foil.

Patentansprüche

1. Wärmeisolierender Papierbehälter, der ein Seitenwandteil (3) und eine Bodenscheibe (5) umfaßt, dadurch **gekennzeichnet,** daß mindestens ein Teil der Außenfläche des Seitenwandteils (3) mit einer Farbe beschichtet ist, die 5 bis 40 Gew-% einer synthetischen Harzkomponente enthält, und daß das Schäumen eines thermoplastischen synthetischen Harzfilmes (10) in dem Bereich (24) der Außenfläche vom Seitenwandteil, der mit der eine Harzkomponente enthaltenden Farbe beschichtet ist, unterdrückt ist, so daß die Schaummenge weniger als 40% des vollständigen Schaumes beträgt, wobei eine geschäumte wärmeisolierende Schicht (11) des thermoplastischen Harzfilmes in den anderen Bereichen der Außenfläche des Seitenwandteils geschaffen wird.

2. Verfahren zur Herstellung eines wärmeisolierenden Papierbehälters, die Schritte umfassend;

   Laminieren einer Seite eines Papierbogens mit einem thermoplastischen synthetischen Harzfilm (10),
   Beschichten eines bestimmten Bereiches der Filmlaminierung mit einer Farbe, die 5 bis 40 Gew-% einer synthetischen Harzkomponente enthält,
   Ausschneiden eines Seitenwandteils (3) und einer Bodenscheibe (5) aus dem Papierbogen,
   Herstellen eines Behälters aus den beiden Teilen (3, 5) und
   Erwärmen des Behälters, so daß der thermoplastische synthetische Harzfilm (10) geschäumt wird, und dabei eine geschäumte wärmeisolierende Schicht (11) an der Außenoberfläche des Seitenwandteils (3) entsteht, wobei das Schäumen im Bereich (24) der Außenfläche des Seitenwandteils (3) unterdrückt ist, der dem Bereich entspricht, der mit der die synthetische Harzkomponente enthaltenden Farbe beschichtet worden ist, so daß das Schaummenge weniger als 40% des vollständigen Schaumes beträgt.

3. Behälter nach Anspruch 1 oder Verfahren nach Anspruch 2, bei dem die synthetische Harzkomponente aus der Gruppe gewählt ist, die aus Alkyd-Nitrocellulose Kopolymeren, Nitrocellulose, Polyurethanen, einem Vinylchlorid-Vinlyacetat Kopolymer, wässrigen Akrylharzen, Harzen auf Polyamidbasis, chlorierten Polyolefinen, chlorierten Polyolefinharz Kopolymeren und Akrylharzen auf Lösemittelbasis besteht und die mit einem Anteil von 10 bis 30 Gew-% in der Farbe enthalten ist.

4. Behälter oder Verfahren nach Anspruch 3, bei dem die synthetische Harzkomponente ein Vinylchlorid-Vinylacetat Kopolymer ist.

5. Behälter nach Anspruch 1, 3 oder 4 oder Verfahren nach einem der Ansprüche 2 bis 4, bei dem der schaumunterdrückte Abschnitt (24) als ein durchgehendes Band einer bestimmten Breite neben dem Rand (7) des Behälters verläuft.

6. Behälter nach einem der Ansprüche 1 und 3 bis 5 oder Verfahren nach einem der Ansprüche 2 bis 5, bei dem ein Barcode in einem ausgewählten Bereich des Seitenwandteils aufgedruckt ist und der schaumunterdrückte Abschnitt (24) in dem zugehören Bereich genügend groß vorgesehen ist, um den Barcode abzudecken.

7. Behälter nach einem der Ansprüche 1 und 3 bis 6 oder Verfahren nach einem der Ansprüche 2 bis 6, bei dem die Farbe weiterhin eine passende Menge eines Pigmentes und/oder eines Farbstoffes enthält, so daß ein Buchstabe, ein Symbol, eine geometrische Figur und/oder irgendein anderer gemusterter Bereich, der durch Drucken mit der Farbe vorgesehen wird, den schaumunterdrückten Abschnitt (24) darstellt.

8. Behälter nach einem der Ansprüche 1 und 3 bis 7, bei dem die geschäumte wärmeisolierende Schicht (11) an der Außenfläche des Seitenwandteils (3) eine im wesentlichen gleiche Dicke aufweist.

9. Behälter nach einem der Ansprüche 1 und 3 bis 8, bei dem die geschäumte wärmeisolierende Schicht (11) auf der Außenfläche des Seitenwandteils (3) aus einem dickeren und einem weniger dicken Abschnitt besteht.

10. Behälter nach Anspruch 9, bei dem der dickere Abschnitt der geschäumten wärmeisolierenden Schicht (11) in der oberen Hälfte des Seitenwandteils (3) nahe dem Rand (7) vorgesehen ist.

K-FEE SYSTEM GMBH, EX2009, page 1880
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

11. Behälter nach einem der Ansprüche 1 und 3 bis 10, bei dem mindestens die innere Oberfläche des Seitenwandteils (3) entweder mit einem thermoplastischen synthetischen Harzfilm (13) mit einem höheren Weichpunkt als der des thermoplastischen synthetischen Harzfilmes (10), der auf die Außenfläche des Seitenwandteils laminiert ist, oder mit einer Aluminiumfolie laminiert ist.

Revendications

1. Récipient en papier calorifuge comprenant un élément formant le corps (3) et un élément formant le panneau de fond (5), caractérisé en ce qu'au moins une partie de la surface extérieure dudit élément formant le corps (3) est revêtue avec une peinture contenant 5 à 40% en poids d'un composant en résine synthétique et que l'expansion du film (10) de résine synthétique thermoplastique est supprimée dans la région (24) de la surface extérieure dudit élément formant le corps qui a été revêtu avec ladite peinture contenant le composant en résine de façon à ce que l'expansion représente moins de 40% de l'expansion complète, tandis qu'une couche expansée calorifuge (11) d'un film en résine thermoplastique est pourvue sur les autres régions de la surface extérieure dudit élément formant le corps.

2. Procédé de production d'un récipient en papier calorifuge comprenant les étapes :

   de laminage sur une face d'une feuille de papier d'un film en résine synthétique thermoplastique (10),
   de revêtement d'une région choisie dudit film laminé avec une peinture contenant de 5 à 40% en poids d'un composant en type résine synthétique,
   de découpage d'un élément formant le corps (3) et d'un élément formant le panneau de fond (5) dans ladite feuille de papier,
   de transformation de deux éléments (3, 5) en un récipient, et
   de chauffage dudit récipient de manière à expanser ledit film en résine synthétique thermoplastique (10), pour fournir ainsi sur la surface extérieure dudit élément formant le corps (3), une couche expansée calorifuge (11) tandis que l'expansion est supprimée dans la région (24) de la surface extérieure de l'élément formant le corps (3) qui correspond à la région qui a été revêtue avec ladite peinture contenant le composant en type résine synthétique de façon à ce que l'expansion représente moins de 40% de l'expansion complète.

3. Récipient selon la revendication 1, ou procédé selon la revendication 2, dans lequel le composant en résine synthétique est choisi dans le groupe constitué par les copolymères alkyde-nitrocellulose, la nitrocellulose, les polyuréthannes, un copolymère chlorure de vinyle-acétate de vinyle, les résines acryliques aqueuses, les résines à base de polyamide, les polyoléfines chlorées, les copolymères d'une polyoléfine chlorée-résine et les résines acryliques à base d'un solvant et est présent en une proportion de 10 à 30% de la peinture.

4. Récipient ou procédé selon la revendication 3, dans lequel le composant en type résine synthétique est un copolymère chlorure de vinyle-acétate de vinyle.

5. Récipient selon la revendication 1, 3 ou 4, ou procédé selon l'une quelconque des revendications 2 à 4, dans lequel ladite partie dans laquelle l'expansion est supprimée (24) se trouve sous la forme d'une bande continue de largeur déterminée au dessous du rebord (7) du récipient.

6. Récipient selon l'une quelconque des revendications 1 et 3 à 5, ou procédé selon l'une quelconque des revendications 2 à 5, dans lequel un code barres est imprimé dans une région choisie de l'élément formant le corps et ladite partie dans laquelle l'expansion est supprimée (24) se trouve dans la région correspondante de largeur suffisante pour couvrir ledit code barres.

7. Récipient selon l'une quelconque des revendications 1 et 3 à 6, ou procédé selon l'une quelconque des revendications 2 à 6, dans lequel ladite peinture contient en outre une quantité appropriée d'un pigment et/ou d'un colorant, de sorte qu'une lettre, un symbole, une figure géométrique et/ou n'importe quelle autre partie formant un motif qui est obtenue par impression avec ladite peinture forme ladite partie dans laquelle l'expansion est supprimée (24).

8. Récipient selon l'une quelconque des revendications 1 et 3 à 7, dans lequel la couche expansée calorifuge (11) sur la surface extérieure de l'élément formant le corps (3) présente une épaisseur sensiblement uniforme.

9. Récipient selon l'une quelconque des revendications 1 et 3 à 8, dans lequel la couche expansée calorifuge (11)

K-FEE SYSTEM GMBH, EX2009, page 1881
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

sur la surface extérieure de l'élément formant le corps (3) est constituée d'une partie épaisse et d'une partie moins épaisse.

10. Récipient selon la revendication 9, dans lequel ladite partie épaisse de la couche expansée calorifuge (11) se trouve dans la moitié supérieure de l'élément formant le corps (3) dans une région voisine du rebord (7).

11. Récipient selon l'une quelconque des revendications 1 et 3 à 10, dans lequel au moins la surface intérieure de l'élément formant le corps (3), est laminée soit avec un film en résine synthétique thermoplastique (13) présentant un point de ramollissement supérieur à celui du film en résine synthétique thermoplastique (10) laminé sur la surface extérieure de l'élément formant le corps, soit avec une feuille d'aluminium.

K-FEE SYSTEM GMBH, EX2009, page 1882
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG.1

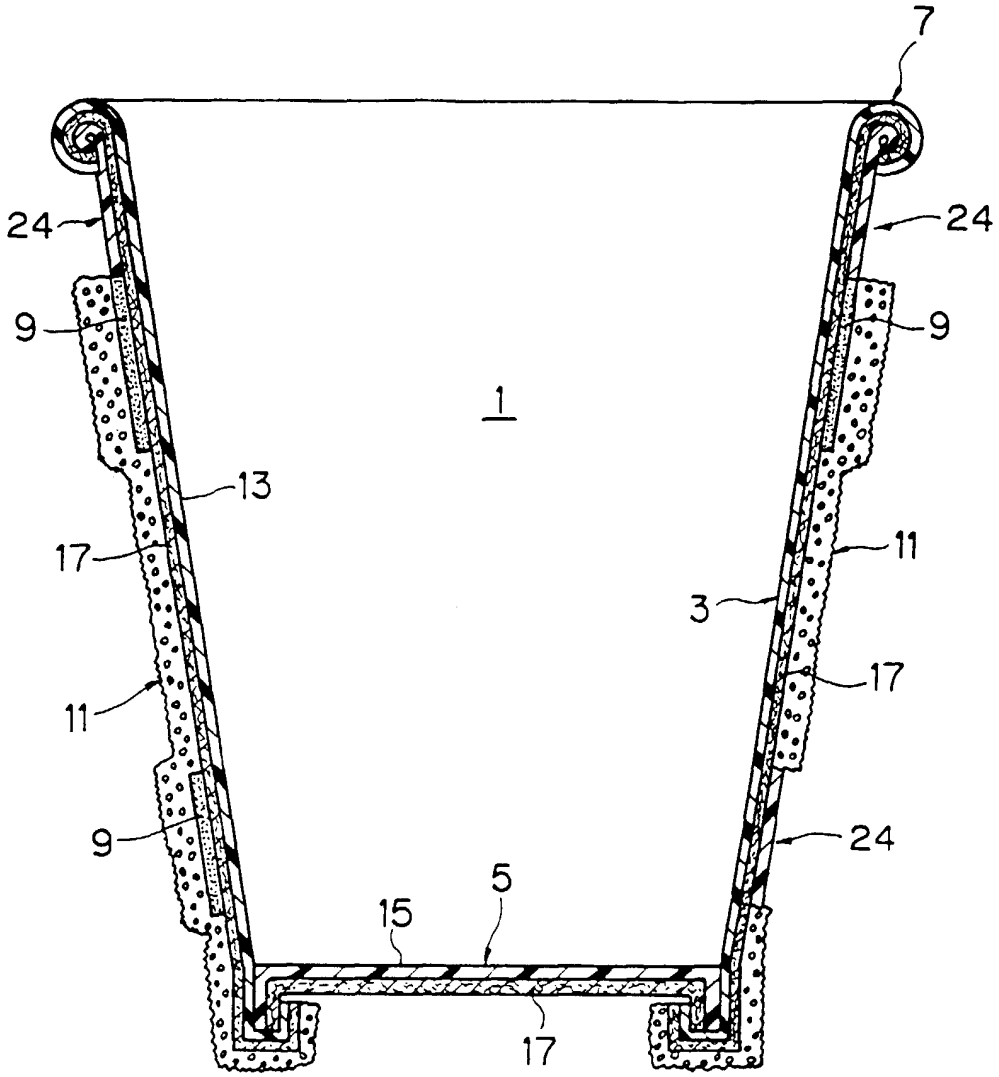
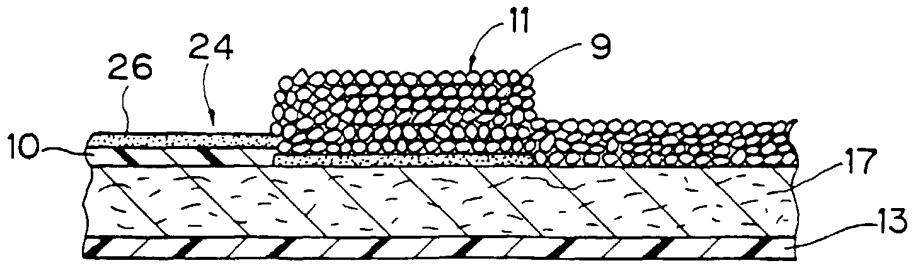
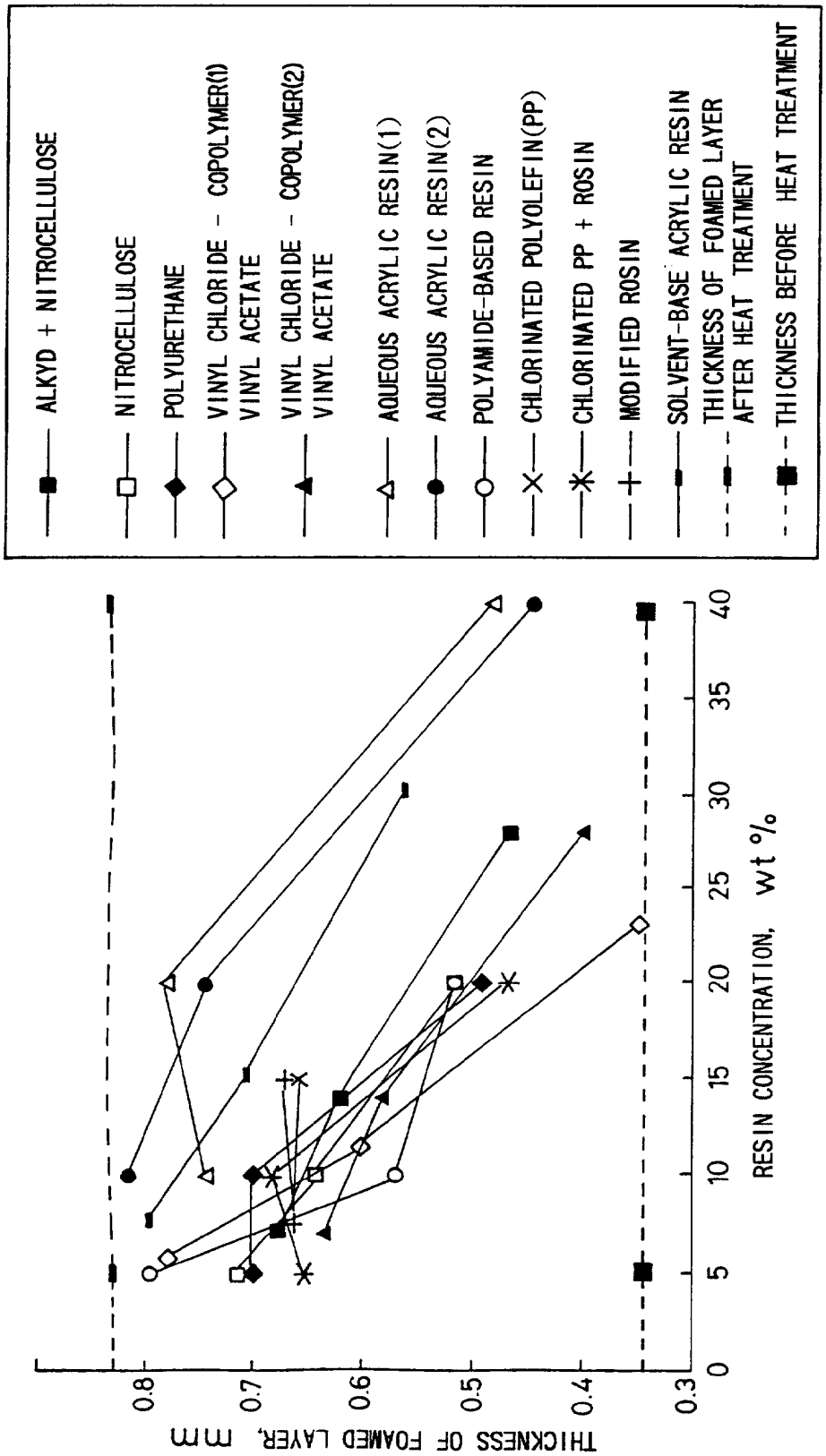


FIG.2



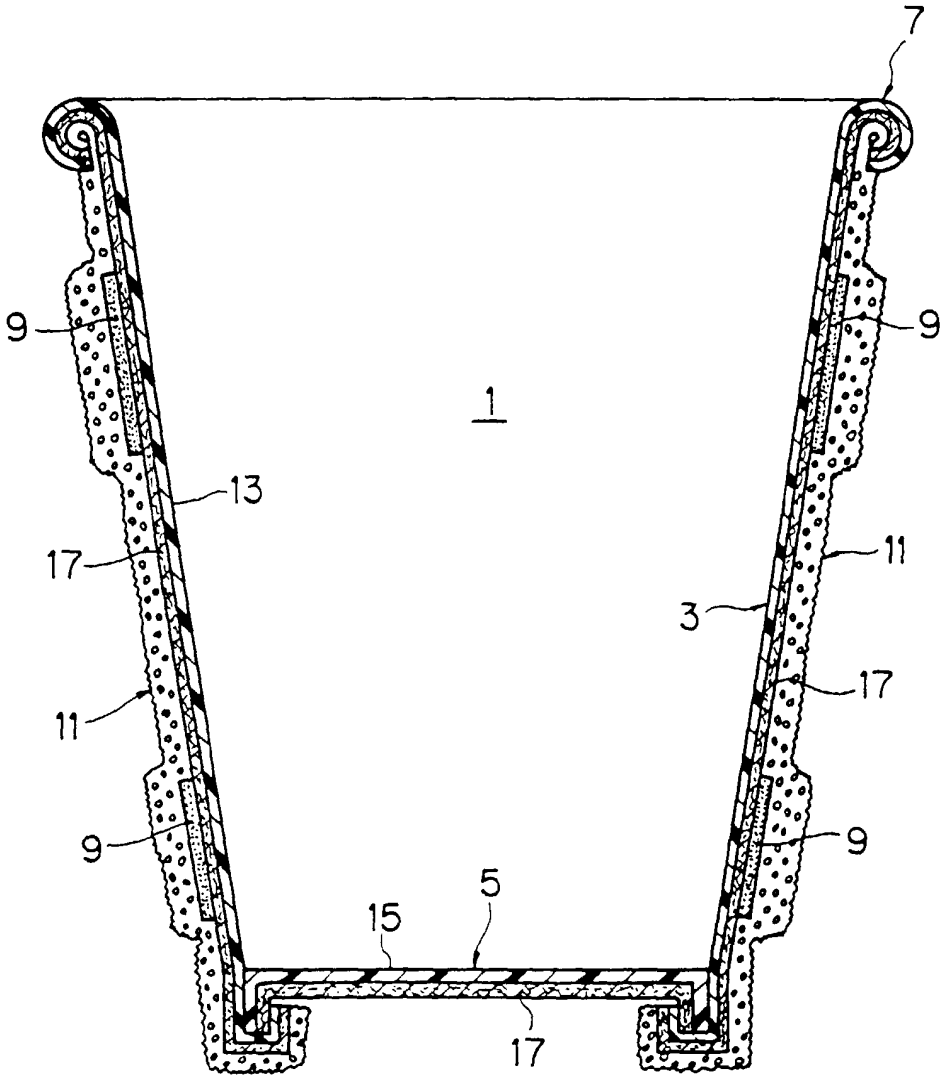
K-FEE SYSTEM GMBH, EX2009, page 1883
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG.3



K-FEE SYSTEM GMBH, EX2009, page 1884
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

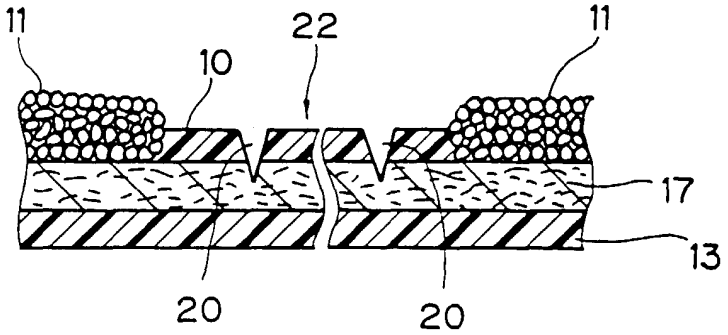
FIG. 4



(prior art)

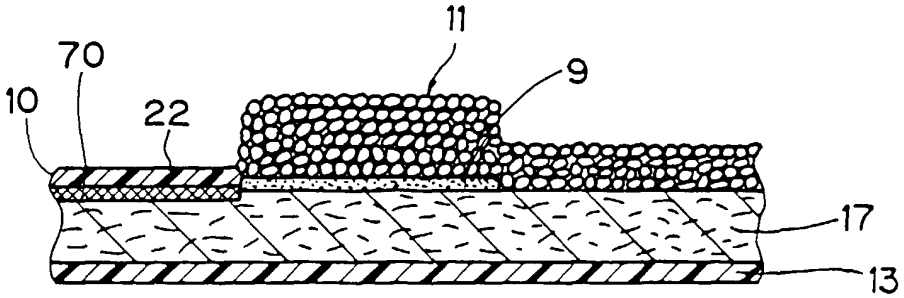
K-FEE SYSTEM GMBH, EX2009, page 1885
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 5



(prior art)

FIG. 6



(prior art)

K-FEE SYSTEM GMBH, EX2009, page 1886
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

FIG. 7

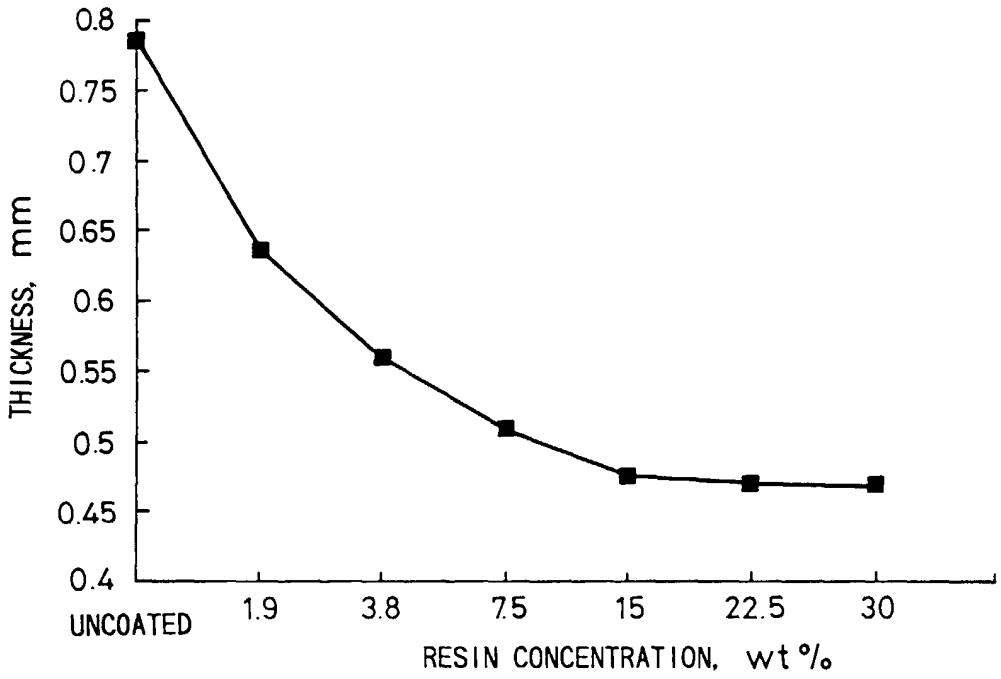
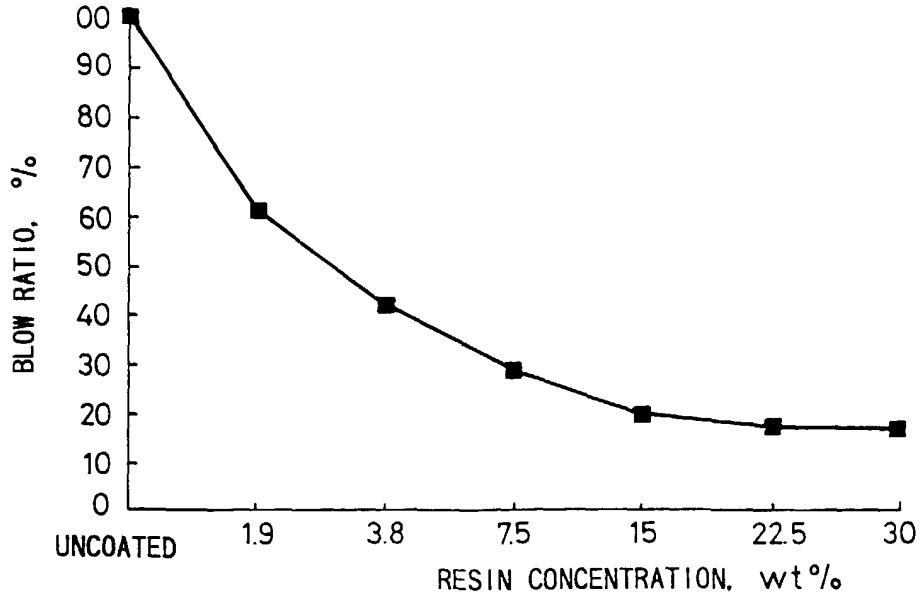


FIG. 8



K-FEE SYSTEM GMBH, EX2009, page 1887
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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WO 2005/122851 (29.12.2005 Gazette 2005/52)

(54) SYSTEM FOR PREPARING PORTIONS OF A BEVERAGE SUITABLE FOR CONSUMPTION

SYSTEM ZUR ZUBEREITUNG VON VERZEHRBEREITEN PORTIONEN EINES GETRÄNKS

SYSTEME DE PREPARATION DE BOISSONS

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WO-A-02/28241
FR-A- 2 842 090
US-A- 5 242 702

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EP 1 781 151 B1

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K-FEE SYSTEM GMBH, EX2009, page 1888
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Description

[0001] The invention relates to a system for preparing portions of a beverage suitable for consumption, comprising an apparatus for preparing the beverage and a closed and form-retaining holder removably received in the apparatus, which holder is at least filled with a product to be dissolved and/or diluted such as a concentrate, the apparatus being provided with a liquid device for dispensing a fluid under pressure, comprising at least one liquid such as water and, optionally, a gas such as steam or air, a receiving space in which the holder is received and at least one probe provided with at least one channel which, on the one side, is in fluid communication with the liquid device and which, on the other side, terminates in at least one outflow opening of the probe, a wall of the holder being manufactured from a fluid-tight material such as a plastic and/or a metal, while, on a first side of the holder, the wall is manufactured such that it can be punctured, the apparatus being designed for puncturing the wall on the first side and for moving the probe and the holder relative to each other so that in use, the probe can pierce through the first side of the holder, whereupon the at least one outflow opening reaches into the holder, the system being further provided with opening means for obtaining, in use, an outlet opening at the holder for dispensing the ready beverage while, in use, the fluid is supplied by the liquid device to the at least one channel for generating at least one jet of the fluid from the at least one outflow opening of the probe in the holder for dissolving and/or diluting the product whereupon the ready beverage flows from the at least one outlet opening.

[0002] Such a system is known per se from US patent 6,079,315.

[0003] Here, the product to be dissolved and/or to be diluted can consist of a coffee concentrate for preparing coffee. An important advantage of such a system is that the holders are manufactured from a fluid-tight and form-retaining material. In this example, fluid-tight implies that liquid and air cannot flow or diffuse through a wall of the holder. This has as important advantage that the content of the holder remains fresh until the holder is placed in the apparatus and, on the one side, is opened for receiving the probe and, on the other side, is opened for dispensing the ready beverage via the outlet opening. Consequently, the ready beverage itself will also be completely fresh. The form-retaining character of the holder has as an advantage that it is easy to handle for a user. A drawback of the known system is that the characteristic properties of the ready beverage can only be modified by modifying the product to be dissolved itself. As a result, the system is limited in its use and, moreover, it is not always possible to obtain ready beverage which, depending on the type of beverage, can be completely optimized in conformity with the desires of a user. If the concentrate involves, for instance, a lemonade concentrate, it is preferred that the ready lemonade beverage has hardly any or no froth. If, however, the concentrate involves coffee concentrate, it may be preferred, depending on the desire of the user, that the ready coffee beverage is provided with a layer of froth.

[0004] French patent publication FR-A- 2 842 090 discloses a cartridge-operated coffee-machine, having means for supplying hot water to an infusion head adapted to receive at least two different cartridges. The different cartridges each include at least one planar seat surface, means for communicating to the supply means the product contained inside the cartridges so as to obtain a beverage, and means for directing the beverage exiting from the cartridge towards a beverage collecting receptacle. The infusion head has a support with at least one pocket forming a housing for at least the two different cartridges. This known coffee machine has its pocket comprising a single peripheral seat common to several cartridges of different seat diameters, one or more portions of the outer rim of the peripheral seat form an indexing vertical wall common to the cartridges. This know coffee maker further includes three probes that, in use, are adapted to pierce through a side of a respective holder. One of the probes inserts to a deeper level than the other probe in the same holder and serves the preparation of a beverage by dissolving. The remaining probe is associated with a different holder and with the other probe has a reduced depth of insertion for preparing a beverage by extraction. Each probe is connected to its own water supply means that can be activated independently. No manual or automatic means is disclosed for determining or accomplishing settings in a predetermined manner.

[0005] In a non-pre-published, older patent application, represented by EP-A-1 510 160, a purely mechanical detection means is described. The detection means of this older patent application is not a code reader, but rather a dome that lowers to a first position in which it rests with a lower edge on an extended peripheral flange of a cartridge and in a second position in which it can lower beyond the level of an alternative cartridge that has a smaller peripheral flange. In this device injection of water into a holder can be accomplished according to two different modes of operation only. These different modes of operation are either for dissolving or extracting a product that is contained in the holder. With this arrangement it is only possible to distinguish between two different cartridges and it is not possible to supply a signal to a control means.

[0006] A prior art system according to the preambule of claim 1 and a corresponding apparatus is known from document WO 02/074144 A2.

[0007] It is an object of the invention to meet inter alia the above-mentioned limitation.

Accordingly, while beverage preparing systems are known in which the apparatus further comprises control means, while the apparatus is further designed to set, under control of the control means, at least one setting of the jet in a predetermined manner, as desired from a plurality of setting possibilities, for determining, in ad-

K-FEE SYSTEM GMBH, EX2009, page 1889
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

vance, characteristic properties of the ready beverage such as, for instance, the amount of froth that is obtained with the ready beverage through impact of the jet on an inside of the holder and/or on the product and/or on the fluid previously supplied to the holder, the at least one setting of the jet comprising the direction of the at least one jet, the position of the at least one jet, the flow rate of the at least one jet, the flow velocity of the at least one jet and/or the number of jets, the invention is in particular characterized in that the holder is provided with a code and the apparatus with a code reader connected to the control means for reading the code of the holder and to supply the read code to the control means by means of a signal, while the control means are designed for providing the at least one setting of at least any one of the direction of the at least one jet, the position of the at least one jet, the flow rate of the at least one jet, the flow velocity of the at least one jet and the number of the jets on the basis of the read-out code, in that the at least one probe is provided with at least one second outflow opening, while the apparatus is designed to generate, under control of the control means, in a settable manner, at least one of a first jet of the fluid in the holder, with the aid of the first outflow opening and a second jet of the fluid, with the aid of the second outflow opening, and in that the at least one probe is designed to close off and release, under the control of the control means, the first outflow opening in a settable manner and to close off and release the second outflow opening in a settable manner.

[0008] As the apparatus can set, i.e. can vary, under control of the control means, at least one of the above-mentioned settings at wish from a plurality of setting possibilities, presently, in a predetermined manner, specific characteristic properties of the beverage can be determined while here, specifically, properties of the beverage are involved which not only depend on the product to the dissolved and/or to be diluted as such. In case the product involves a lemonade, it can be arranged such that the jet strikes on a sidewall of the holder at an angle which deviates strongly from a normal of the sidewall at the location the jet strikes. As a result, little or no froth will be formed in the ready beverage. If, by contrast, it is intended that froth is formed, the jet can strike on a sidewall of the holder for instance at least virtually perpendicularly, or it can be provided that the jet strikes on an amount of ready beverage which is already present in the holder and which has not yet drained from the holder via the outlet opening. It is also conceivable that the amount of froth be varied by varying the flow velocity of the at least one jet and/or the flow rate of the at least one jet. Also, the number of jets can be varied for varying the characteristic properties of the beverage. As, after use, the form-retaining holder can be replaced with a new holder, contamination can be prevented. This holds in particular when, in use, the at least one probe does not directly contact the product, i.e. does not reach into the product. More particularly, it holds that the apparatus is designed to set, under control of the control means, the position of the probe within the holder at wish from a plurality of setting possibilities, for setting the direction of the at least one jet in the predetermined manner. However, it may also hold that the probe is provided with a first channel which is connected on the one side to the liquid device and which terminates on the other side in the first outflow opening, and a second channel which is connected on the one side to the liquid device and which terminates on the other side in the second outflow opening, while the apparatus is designed to supply, under control of the control means, in a settable manner with the aid of the liquid device, the fluid to the first a channel and/or to the second channel.. Preferably, it holds that the system is designed to set the temperature of the fluid, under control of the control means, at wish from a plurality of setting possibilities. In this manner, on the one side, for instance a cold lemonade can be prepared, preferably without froth and, on the other side, a cup of hot coffee can be prepared, optionally with froth.

[0009] It further holds that the system is designed to set, under control of the control means, at wish from a plurality of setting possibilities, the amount of fluid which is dispensed for preparing a portion of the ready beverage. What can be achieved as a result thereof is, for instance, that the lemonade has a predetermined strong or less strong taste. All this holds completely analogously for, for instance, coffee.

[0010] Thus, in a predetermined manner, the characteristic properties of the beverage can be set. If the holder is filled with, for instance, a coffee concentrate which is optimally suited for preparing café crema, the code of the holder can contain information for the benefit of the apparatus so that the apparatus can set the apparatus optimally for preparing the café crema. If, however, the holder is filled with, for instance, a concentrate for lemonade where it is not desired to obtain froth and where the beverage is intended to be cold, the code can contain information which is read by the apparatus so that the apparatus is set such that a lemonade is prepared without froth and which, moreover, is cold. The code can also be determinative of setting the amount of fluid which is dispensed for preparing a portion of the ready beverage. Consequently, the strength of the flavour of the beverage is set. The advantage is that the user who inserts a particular holder into the apparatus, needs not concern himself about the further settings of the apparatus. The apparatus is set such that the ready beverage has the characteristic properties for the user.

[0011] In particular, it holds that the holder is punctured with the aid of the probe. However, this is not required. It is also conceivable, for that matter, that the apparatus is further provided with a movable element for puncturing the holder under control of the control means before the probe can be inserted through the first side of the holder. According to a highly advanced embodiment, it holds that the receiving space and the holder are geared to each other such that the holder can be received in the receiving space on at least one predetermined position. The ad-

K-FEE SYSTEM GMBH, EX2009, page 1890
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

vantage thereof is that a user cannot make a mistake when positioning the holder in the apparatus. Consequently, the cooperation between apparatus and holder is always optimal. More particularly, it holds here that the wall of the holder is provided with a holder recess and/or a holder projection and a wall of the receiving space is provided with a receiving space projection reaching into the holder recess and/or a receiving space recess with the holder projection reaching into the receiving space recess. It further holds in particular that an upper side of the receiving space abuts virtually completely against the first side of the holder. Preferably, it holds here that the apparatus is provided with a switch that is energized by the first side of the holder. Here, it is then preferred that the control means are connected to the switch while the control means ensure that the liquid device is not activated when the switch is not energized. This entails that a holder, or a wrong holder not belonging to the system, is incorrectly placed into the apparatus while the switch is not energized and no beverage can be prepared. If, conversely, this would be the case, the apparatus could, for instance, become damaged when the holder is punctured by means of the probe or the movable element.

[0012] The code of the holder can be provided at the holder in various manners. Here, for instance a barcode can be conceived, an electromagnetic identification label or perhaps a specific external form of the holder.

[0013] The invention furthermore relates to an apparatus of the above-mentioned system and a holder of the above-mentioned system.

[0014] The invention will presently be further elucidated on the basis of possible embodiments in the drawing. In the drawing:

Fig. 1a shows a side view of a holder;
Fig. 1b shows a top plan view of the holder of Fig. 1a in the direction of the arrow R of Fig. 1a;
Fig. 1c shows a possible bottom view of the holder of Fig. 1a in the direction of the arrow T of Fig. 1a;
Fig. 1d shows an alternative possible bottom view of the holder of Fig. 1a in the direction of the arrow T of Fig. 1a;
Fig. 2a shows a cross-section of a holder which is placed in a receiving space of an apparatus according to the invention;
Fig. 2b shows a side view of the receiving space and the holder according to Fig. 2a in the direction of the arrow Z of Fig. 2a;
Fig. 2c shows a cross section of the holder and the receiving space of the system according to the invention;
Fig. 2d shows a bottom view of the holder and the receiving space of Fig. 2a in a direction of the arrow O of Fig. 2a;
Fig. 3a is a possible embodiment of a system not forming part of the invention such as claimed which is provided with a receiving space and a holder according to Figs. 1 and 2;
Fig. 3b shows the system according to Fig. 3a in use;
Fig. 3c shows the system according to Fig. 3a in use;
Fig. 3d shows an alternative embodiment of the system according to Fig. 3a in use, also not forming part of the invention such as claimed;
Fig. 3e shows an alternative embodiment of the Figure of the system according to Fig. 3a in use, according to the invention;
Fig. 3f shows an alternative embodiment of the system according to Fig. 3a in use, also not forming part of the invention such as claimed; and
Fig. 3g shows an alternative embodiment of the system according to Fig. 3a also not forming part of the invention such as claimed.

[0015] In Fig. 3a, reference numeral 1 indicates a possible embodiment of the system for preparing portions of a beverage suitable for consumption not forming part of the present the invention. The system comprises an apparatus 2 for preparing the beverage and a closed holder 4 removably received in the apparatus, which holder is at least filled with a product 6 to be dissolved and/or to be diluted such as a concentrate. The apparatus 2 is provided with a liquid device 8 for dispensing fluid under pressure. In this example, the fluid involved is water. Here, the liquid device can consist of an apparatus known per se comprising, for instance, a boiler and a pump for dispensing hot water under pressure. The boiler may also be designed such that it is also possible to vary the temperature of the boiler for dispensing hot water, tepid water, et cetera.

[0016] The apparatus is further provided with a receiving space 10 in which the holder can be removably received. In the example, the holder 4 is provided with a form-retaining bottom 12 manufactured from plastic and with an upstanding sidewall 14 manufactured from the same form-retaining material (see Fig. 1a). In this example, an upper wall 16 of the holder is manufactured from a thin-walled plastic material in which weakened zones 18A and 18B are provided (to be further elucidated). Further, in this example, in the bottom 12, a deepened portion 20 is provided. Further, in this example, the holder is provided at its upper side with a continuous flange 22 (see Fig. 1a). Further, in this example, the holder is provided with a groove or recess 24 reaching from top to bottom.

[0017] As can be seen in Fig. 2a, the receiving space 10 is provided with a bottom 26 on which the holder 4 rests. The receiving space 10 is further provided with an upper wall 28 situated just above the upper wall 16 of the holder 4. In the bottom 26 of the receiving space 10, a slit 30 is provided which enables the holder to be slid into and from the receiving space 10. The receiving space is further provided with an upstanding sidewall 32 which, in this example, has the shape of a half cylinder extending through an angle of 180°, measured in the plane of the bottom 26 of the holder. The sidewall 32 is provided with a vertically extending protrusion 34 reaching into the

K-FEE SYSTEM GMBH, EX2009, page 1891
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

groove 24 of the holder. The sidewall is further provided with a horizontal groove 36 extending through an angle of 180° in tangential direction of the upstanding sidewall 32 and in which the flange 22 of the holder is received. As the upstanding sidewall 32 extends in tangential direction through an angle of 180°, the cylindrical holder 4 can be slid into and from the receiving space 10. Here, the slit 30 provides space for the deepened portion 20 of the holder. As the flange 22, with the exception of the location of the groove 36, is wider than the inside diameter of the upstanding sidewall 32, the holder 10 cannot be received upside down in the receiving space. Further, the cooperation between the protrusion 34 and the groove 36 ensures that the holder, viewed in tangential direction of the holder, can only be slid into the receiving space 10 in one manner. All this entails that the holder 4 can only be received in the receiving space 10 in one manner. The position of the holder 4 within the receiving space 10 is thus defined.

[0018] The apparatus according to Fig. 3a is further provided with a first probe 38.1 and a second probe 38.2. Before the apparatus is used, the first and second probe 38.1 and 38.2 are situated just above the upper wall 16 of the holder 4. The apparatus 2 is further provided with a first drive 40.1 for moving the first probe 38.1 up and down, and a second drive 40.2 for moving the second probe 38.2 up and down. In this example, both the first probe 38.1 and the second probe 38.2 are needle-shaped. The first probe is provided with a channel 42.1 which, the one side, by means of a first tube 44.1, is in fluid communication with the liquid device 8 and which, on the other side, terminates in an outflow opening 46.1 situated adjacent the bottom side of the probe 38.1. The second probe 38.2 is also provided with a second channel 42.2 which, on the one side, is in fluid communication with the liquid device 8 by means of a second tube 44.2, and which terminates on the other side in an outflow opening 46.2

[0019] The system is further also provided with opening means for obtaining, in use, an outlet opening at the holder for dispensing a ready beverage. In this example it therefore holds that the outlet opening formed provides a free passage so that the beverage can flow from the holder under the influence of gravity when the outlet opening has been provided. In this example, the opening means are provided with a moveable knife 48 belonging to the apparatus, which, by means of a drive 50 of the apparatus, can be moved horizontally to and fro in the direction of the arrow 52. The apparatus is further provided with control means 54 which comprise, in this example, a microprocessor 56 for controlling the liquid device 8, the drives 40.1 and 40.2 and the drive 50.

[0020] The operation of the system according to Fig. 3a described up to this point is as follows.

[0021] For the purpose of preparing for instance coffee, a holder 4 is slid into the receiving space 10 in an unambiguous manner as set forth hereinabove on the basis of Figs. 1, 2, and 3a. Then, a user energizes for instance a switch 58 of the control means 54 for activating the apparatus 2. Via a control signal S, the control means cause the first drive 40.1 to move the first probe 38.1 downwards. A point 60.1 of the first probe, in this example designed to be sharp, touches the upper wall 16 at a location which is enclosed by the weakened zone 18A. As a result of the force exerted in downward direction by the probe 38.1 on this area of upper wall 16, the upper wall 16 will tear at the location of the weakened zone 18A whereupon this part is folded inward and the probe is received, at least partly, in an inside space 62 of the holder 4. In this example, the control means 54 are further provided which schematically indicated input means 61 with which a user can indicate that he wants to prepare a beverage with froth. The result thereof is that via the control signal S, the control means 54 also activate the second drive 40.2 for moving the second probe 38.2 downwards. The second probe will touch the upper wall 16 with its point 60.2 at a position which is enclosed by the second weakened zone 18B which will then tear open after which the second probe 38.2 too will reach into the inside space 62 of the holder 4.

[0022] Then, the control means will activate the liquid device 8 by means of the control signal $\hat{S}$ in order that the liquid device 8 will start supplying hot water under pressure to the tube 44.1 and the tube 44.2. This situation is shown in Fig. 3b. In the example, the outflow opening 46.1 is provided at a side of the probe 38.1. The result is that via the outflow opening 46.1 a jet of water 64.1 is dispensed in an obliquely upward direction. This jet of water will strike the inside of the upstanding sidewall of the holder to then, depending on the force of the water jet, be reflected by the inside of the upstanding sidewall and then flow downwards in the holder so that the hot water will start to mix with the concentrate 6. By contrast, at the second probe 38.2, the outflow opening 46.2 is provided such that a jet of water 64.2 is generated which is directed downwards. The result is that this jet 64.2 will strike on the concentrate and any water in which the concentrate may have already (partly) dissolved and which is present on the bottom 12 of the holder. Consequently, air will be beaten into the beverage to be prepared. This air may for instance be the air which was already present in the holder or air flowing into the holder via the openings provided by the probes in the upper wall. It is also possible that the fluid which is supplied through the first and/or second probe also comprises a gas such as air for obtaining froth. For instance, just after the control means 54 have activated the liquid device 8, the control means 54 will activate the drive 50 by means of the control signal S, resulting in that the small knife 48 is moved from the position as shown in Fig. 3a to the right in the direction of the arrow 52. As a result, a part of the deepened portion 20 will be cut off. Then, under control of the control means 52, the drive 50 is driven such that the knife returns to it original position. The situation which then applies is shown in Fig. 3b. Presently, the remaining part of the deepened portion 20 forms an outlet opening 66 of the

K-FEE SYSTEM GMBH, EX2009, page 1892
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

holder. The result is that the ready beverage is dispensed from the holder under the influence of gravity and can be collected in a cup placed thereunder. When the provision of the outlet opening 66 is carried out at a moment that, in this example, a relatively large part of the beverage to be prepared has already been prepared and is present in the holder 4, a suitable amount of froth will already have formed and the largest part of the concentrate will already have been diluted homogeneously. When the provision of the outlet opening is carried out earlier, the outflow from the holder will start sooner so that the jet of the second probe strikes on a lower level of the beverage so that less froth can be beaten in. Some time after the outlet opening 66 has been formed, the control means 54 will deactivate the liquid device 8 so that no more hot water is supplied to the first and second probes. Then, the holder 4 can drain completely whereupon the process is terminated. After this, the control means 54 will activate the drives 40.1 and 40.2 in order that the first and second probes are moved back again, upwards in their original position as shown in Fig. 3a. Then, the holder can be taken from the receiving space of the apparatus and be thrown away. The apparatus is now ready to receive a new holder which is filled with, for instance, a concentrate for preparing lemonade. If lemonade is to be prepared, the control means 54 can for instance use only the first probe 38.1 for supplying water to the holder. In that case, the control means 54 will furthermore ensure that with the aid of the liquid device 8, unheated water is dispensed, in this example more specifically only to the tube 44.1. What it amounts to is that, in this example, for preparing lemonade, the first probe 38.1 is moved downwards until it reaches into the holder while the second probe 38.2 remains at a position as shown in Fig. 3a. The second probe is then situated in a position as shown in Fig. 3b. Then, with the aid of the liquid device 8, cold water is supplied to the tube 44.1 for preparing the lemonade. However, providing the outlet opening 66 is carried out completely analogously to what is described hereinabove concerning coffee. The fact that lemonade is to be prepared can, once more, be inputted by a user by means of the input means 61 at the control means 54. If, conversely, it is intended that much froth is formed, this can also be inputted at the control means 54. The control means 54 can then for instance provide that for the preparation of, for instance, coffee only the second probe 38.2 is used. The first probe 38.1 then remains in the position shown in Fig. 3a while the second probe 38.2 is manipulated to the position shown in Fig. 3b, where now, under control of by the control means 54, only hot water is supplied to the tube 44.2 with the aid of the liquid device. This results in that all the water that is supplied to the holder spouts in downward direction. Therefore, all this water will be used for obtaining froth so that relatively much froth is generated, at least more froth than when the total amount for preparing a portion of ready beverage is supplied to the holder divided over the two probes 38.1 and 38.2. In this example, the first jet is directed obliquely upwards. However, the first jet can also have a downward sloping direction. In both cases in this example, the first jet is directed towards a sidewall of the holder with the first jet striking the sidewall. The first jet can also have a direction obliquely upwards such that it strikes the top wall 16. In this example, the second jet is directed towards the bottom so that in use, it strikes the product. Preferably, it holds that the second jet is directed at least virtually vertically downwards and that the first jet comprises a speed component in horizontal direction towards the sidewall and a speed component in vertical direction to the bottom. The direction of such a first jet is shown in dotted lines in Fig. 2b and indicated with reference numeral 64.1'.

[0023] As, after use, the form-retaining holder can be replaced with a new holder, contamination can be prevented. This holds in particular when, in use, the at least one probe does not directly contact the product, i.e. does not reach into the product.

[0024] By contrast, it is further possible, as indicated in Fig. 3c, that for instance the second probe 38.2, in use, is not slid downwards over its entire length. Conversely, in the situation shown in Fig. 3b, this is the case. In the situation shown in Fig. 3b, this entails that when the holder is slowly filled with the ready beverage, sooner or later, the ready beverage will have reached the level of the outflow opening 46.2. As a result thereof, the jet will no longer strike on a fluid surface of the ready beverage so that no more air is beaten in. However, if, in use, the second probe 38.2 is at a higher level, i.e. at a different position than shown in Fig. 3b, more air will be beaten in because it takes longer before the liquid level in the holder reaches the second outflow opening 46.2. Moreover, it may be so that the liquid level does not reach this at all when the outlet opening 66 is formed relatively early and the holder starts to drain. It is also possible, in addition to the height of the second probe 38, to also set the orientation of the second probe 38.2. In this example, as shown in Fig. 3c, the probe 38.2 is clamped on two sides by two wheels 68.1 and 68.2. Each wheel can be moved separately by means of a second drive 44.2 and a third drive 44.3. For movement in downward direction, the wheels 68.1 and 68.2 are driven in the opposite direction. When the probe has reached, for instance, the position as shown in Fig. 3c, the probe can be tilted according to the direction of the arrow 70 in Fig. 3c by moving the wheels in the same direction, or stopping one of the wheels and moving the other wheel. Evidently, all this is once more carried out by the control means 54 by means of the control signal S. By thus varying the direction of the probe and the height, once more, characteristic properties of the beverage, such as the amount of froth which is beaten in, can be modified.

[0025] In Fig. 3d, an embodiment of a system is shown which, to a large extent, corresponds to the system according to Fig. 3a. One difference with the system according to Fig. 3a is that with the system according to Fig. 3d, the second probe 38.2 is of relatively short de-

K-FEE SYSTEM GMBH, EX2009, page 1893
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

sign. As the upper side of the receiving space, in this example the upper wall 28, virtually abuts against a first side of the holder, as is also the case in Fig. 1, which first side is manufactured such that it can be punctured, in this example the upper side 16 of the holder 4 with the weakened zones 18A and 18B is involved, it holds that, in use, the outflow opening 46.2 of the second probe 38.2 is situated to both first sides (the upper wall 28) of the holder 4. In this manner, in this example, the jet 64.2 can be formed in downward direction from a position which lies at a maximum distance from a bottom 12 of the holder 4.

[0026] In Fig. 3e, an embodiment is shown of an apparatus 2 according to the invention which is provided with a holder 4 as described with reference to Figs. 3a - 3c. Presently, contrary to the apparatus of Fig. 3a, the apparatus 2 is provided with only one probe 38.1 which can be moved upwards and downwards by means of the drive 40.1 as discussed in relation to the probe 38.1 of Fig. 3a. In this example, the probe 38.1 is provided with a first channel 42.1.1 which is connected on the one side to the liquid device 8 by means of a tube 44.1.1 and which terminates on the other side in a first outflow opening 46.1.1 of the probe 38.1. The probe 38.1 is further provided with a second channel 42.1.1 which, on the one side, is in fluid communication with the liquid device 8 by means of a hose 44.1.2, and, on the other side, terminates in a second outflow opening 46.1.2.

[0027] The apparatus is designed to supply fluid, under the control of the controlling means 54, in a settable manner with the aid of the liquid device 8, to the first channel and/or to the second channel. When the fluid is supplied by means of the tube 44.1.1 to the first channel 42.1.1, a jet 64.1.1 is generated which, again, is directed obliquely upward. When water is supplied under pressure to the second tube 44.1.2, from the outflow opening 46.1.2, a second jet 64.1.1 is generated which is directed downwards. Thus, at will, an upward directed jet or a downward directed jet can be generated for setting characteristic properties of the beverage. Evidently, here, also the height of the probe 38.1 can be set as discussed in relation to Fig. 3c for the second probe 38.2 and, furthermore, the orientation of the probe can be set according to the direction of the arrow 70 as also discussed for the probe 38.2 with reference to Fig. 3c.

[0028] For each of the embodiments outlined here not forming part of the invention, it holds that the holder can further be provided with a code and the apparatus with a code reader 72 connected to the control device for reading the code of the holder. For the embodiment according to the invention, it holds that the holder is further provided with a code and the apparatus with a code reader 72 connected to control device for reading the code of the holder. In this example, the holder 4 is for instance provided with an electromagnetic responder known per se in which a readable code is stored. The code reader 72 generates an electromagnetic interrogation field while the electromagnetic responder 74 of the holder reacts when it is brought into the interrogation field by transmitting the code stored in the responder 74. The thus read code is supplied to the control means 54 by means of a signal $\hat{Q}$. On the basis of this code, the control means can automatically determine and apply the above-discussed settings. For instance, on the basis of the code, the temperature of the water dispensed by the liquid device 8 can be determined and set. It can also be determined which of the probes 38.1 and 38.2 will be used for dispensing water to the holder. Therefore, the code can determine that either the probe 38.1 or the probe 38.2, or both probes 38.1 and 38.2 move downwards. In addition, the code can determine whether water is supplied to the tube 44.1 or to the tube 44.2, or to both tubes 44.1 and 44.2. This holds for the embodiments discussed with reference to Figs. 3a - 3d. The code can also determine how much water is supplied to the holder for the preparation of a portion of the beverage. Furthermore, it can be determined how much water per probe 38.1 and 38.2 is supplied to the holder on the basis of the code. Also, on the basis of the code, the orientation of the probe 38.2 in the direction of the arrow 70 can be determined.

[0029] Also the flow rate of the jet 64.1 or of the jet 64.2 can be determined by the code. The same holds for the flow velocity of the jets 64.1 and 64.2. All this can be set by means of the code. Naturally, it is not excluded that all this is also inputted manually at the control means 54. Therefore, the apparatus is provided with control means while the apparatus is further designed to set, under control of the control means, the direction of the at least one jet, the position of the at least one jet, the flow rate of the at least one jet, the flow velocity of the at least one jet and/or the number of jets in a predetermined manner, for in advance setting the characteristic properties of the ready beverage, such as, for instance, the amount of froth that is obtained with the ready beverage through impact of the jet on an inside of the holder and/or on the product and/or on the fluid previously supplied to the holder.

[0030] With the system according to the invention and according to Fig. 3e, completely analogously, a code can be read out which determines the possible settings mentioned there such as whether the jet 64.1.1 or the jet 64.1.2, or both jets 64.1.1 and 64.1.2 is or are generated. The code can also determine the direction of the jet. The code can also determine the height at which the probe 38.1 must be and which orientation the probe should then assume (the direction of the probe 38.1 can be set as discussed for the probe 38.2 in Fig. 3c). To put it briefly, the position of the probe 38.1 within the holder can be determined by the code. This also holds for the flow rate and the flow velocity of the respective jets as discussed hereinabove.

[0031] Therefore, the code can be determinative of the setting of the amount of froth of the ready beverage. The code can also be determinative of the setting of the amount of fluid which is dispensed for preparing a portion of the ready beverage. The code can further be determi-

K-FEE SYSTEM GMBH, EX2009, page 1894
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

native of the setting the temperature of the fluid. Such possibilities each fall within the framework of the invention such as defined by the claims. In each of the embodiments outlined hereinabove, it furthermore holds that the code can be determinative of the moment at which the liquid device 8 starts dispensing water under pressure and the moment at which the drive 50 is activated for providing the outlet opening 66 with the aid of the knife 48.

[0032] It further holds in each of the embodiments outlined hereinabove that the apparatus is further provided with a switch 76 which is energized when a holder 4 is slid into the receiving space 10. In this example, the holder is energized by said first side, i.e. by the upper wall 16 of the holder. When the switch is energized, this is transmitted to the control means 54 by means of the switch signal P_A. The control means 54 therefore detect an energizing of the switch 76. If the switch 76 is not energized, in this example, the control means 54 will ensure that the liquid device 8 and the drives 40.1, 40.2 and 50 are not activated. The fact is that in that case, no holder is received in the receiving space, or a holder that does not fit. The holder may, for that matter, be to narrow or not high enough.

[0033] Presently, on the basis of Fig. 3f, a system is described which corresponds to a large extent to the system according to Fig. 3a. Only the differences will be indicated further. In the apparatus according to Fig. 3f, the probe 38.1 is of curved design. Consequently, when the drive 40.1 is driven, the probe will travel a path along a segment of a circle. In Fig. 3f, this segment of a circle is indicated in a dotted line with reference numeral 78. The result is that when the probe 38.1 is inserted into the holder, as shown in Fig. 3f where the outflow opening 46.1 is provided at the free end of the probe 38.1, a jet 64.1 in horizontal direction is generated. In this example, the probe 38.2 is designed such that by means of an outflow opening 46.2 provided at the free end of the probe 38.2, a vertically downward directed jet 64.2 is generated.

[0034] The holder of Fig. 3f is further provided with a slightly modified deepened portion 20. The holder is provided with a valve 80, the apparatus being further provided with energizing means 50.1, 50.2, 82, 84 for opening the valve under control of the control means 54, for obtaining the outlet opening in the holder. It this example, the valve is designed as a valve which is normally closed, which closes again when the energizing means are deactivated. With this, dripping is prevented when the beverage has been prepared and the holder has at least virtually drained. In this example, the deepened portion 20 is provided with a duck-valve 80 known per se. A bottom view of such a holder with such a duck-valve 80 is shown in Fig. 1d. The duck-valve consists of a cut 82 provided in a bottom 84 of the deepened portion. In Fig. 3f, this cut extends in the plane of the drawing. The apparatus of Fig. 3f is further provided with a first element 83 which can be moved to and fro in the direction of the arrow 52 by means of drive 50.1. The apparatus further comprises a second element 85 which can be moved to and fro in the direction of the arrow 52 by means of the drive 50.2. When the holder 4 has been placed in the receiving space as described on the basis of the preceding Figures, and when the outlet opening 66 is to be formed, the control means 54 ensure that the elements 83 and 85 are moved together with the aid of the drives 50.1 and 50.2. As a result thereof, the deepened portion 20 which is manufactured from flexible material will start to deform such that the cut 82 starts to open. The fact is that the material on both sides of the cut - at least in the middle of the cut - is moved apart. As a result, the outlet opening 66 is formed and the holder 43 can drain as described with reference to Figs. 3a - 3c. Then, by means of the drives 50.1, 50.2, the control means 54 cause the elements 83, 85 to be moved apart so that the duck-valve 80 will close again. In this manner, dripping is prevented.

[0035] Further, is holds that instead of, or in addition to an electromagnetic responder 74, the code can also be provided in the holder in a different manner. For instance, the code of the holder can be formed by a specific external form of the holder while the code reader 86 of the apparatus is designed to recognize this external form. A possible example hereof is outlined on the basis of Fig. 1b. As can be seen in Fig. 1b, the edge 22 may be provided with a number of notches 90 which may or may not have been provided. In this example, ten notches may or may not have been provided. With this, it is therefore possible to provide 2^{10}, that is to say 1096 different codes. Here, as shown in the example of Fig. 2c, the apparatus can be provided with a plurality of ten proximity switches 92, each proximity switch being used to determine whether on the respective position where a notch 90 may have been formed a notch has actually been formed. As the bulge 34 is received in the groove 36, it is ensured that the proximity switches 92 and the optional notches 90 lie diametrically opposite each other. Each of the proximity switches is connected to the control means 54 so that the control means 54 can determine the respective code on the basis notches 90, detected or not detected by the proximity switches 92. On the basis of the code, the settings mentioned as described hereinabove can be applied with the apparatus.

[0036] All these variants are understood to fall within the framework of the invention such as defined by the claims. With the systems according to Figs. 3a - 3f, it may for instance hold that the first jet 64.1 and the second jet 64.2 have mutually different directions. In particular, it holds that the first jet is directed towards the sidewall 14 of the holder and strikes the sidewall, and that the second jet is directed towards the bottom 12 and, in use, directly strikes the product 6. It also holds in particular that the second jet is directed downwards at least virtually vertically and that the first jet comprises a speed component in horizontal direction towards the sidewall and a velocity component in vertical direction towards the bottom.

[0037] The invention is not limited in any manner to

K-FEE SYSTEM GMBH, EX2009, page 1895
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

the above-outlined embodiments and is defined by the claims. For instance, the holder and/or the receiving wall can also assume other shapes. It is also possible that the upper wall 16 of the holder is not formed from plastic but is manufactured from, for instance, a thin-walled metal material. In that example, the weakened zones 18A 18B mentioned may be omitted because there, the probes can easily puncture the respective material. What is more, the weakened zones 18A and 18B can also be omitted with the apparatuses outlined hereinabove when the upper wall 16 is manufactured from plastic. Then, it is of importance that the point of the probes is designed sufficiently sharp and that the upper wall 16 is sufficiently thin-walled. In the embodiments outlined hereinabove, the upper wall 16 is punctured by means of the probes themselves. Naturally, it is also possible that another element than the probes 38.1 and 38.2 puncture the upper wall 16. For instance, the apparatus may be provided with a movable element, in the example of Fig. 3g, not forming part of the invention such as claimed, an outside tube 100, for puncturing the holder, under control of the control means 54, before the probe 38.1 can be pierced through the first side of the holder. In this example, the outside tube 100 is driven with the aid of a drive 102. By means of the first drive 40.1, the probe 38.1 is moved up and downwards when the outside tube 100 has provided an opening thereto in the upper wall 16. The probe may be of a type as discussed in Fig. 3e. Also, two probes 38.1, 38.2 can be used which are each received in the outside tube 100 for puncturing the holder at two different positions. In the exemplary embodiment outlined hereinabove, the control means 54 are of electronic design and are provided with a microprocessor 56. However, it is also conceivable that the control means are of mechanical design. If further holds with the apparatus according to Figs. 3a - 3d, not forming part of the invention such as claimed, and with the apparatus according to Fig. 3f, not forming part of the invention such as claimed, that the apparatus is provided with cutting means for providing, under control of the control means 54, the outlet opening in the holder. However, it is also conceivable that the opening means in the form of piercing means are used for providing the opening. These piercing means can for instance consist of a pin 110 which is moved in vertical direction with the aid of a drive 112 for piercing an opening in the deepened portion 20 to then be moved back downwards to release the thus formed outlet opening, all this under control of the control means 54 (see Fig. 3g). With each of the above outlined variants, it is also conceivable that instead of water, a different liquid such as milk is dispensed by the liquid device 8. The liquid device may also dispense a gas, such as air, oxygen, nitrogen, carbonic acid and the like.

[0038] It is also conceivable that the outflow openings of the desired probe are provided with valves which, for instance under control of the control means, can be (completely or partly) opened and closed. These valves can also be provided in, for instance, one or more of the channels of the probe or in one or more of the tubes connected to the probes.

Claims

1. A system (1) for preparing portions of a beverage suitable for consumption, comprising an apparatus (2) for preparing the beverage and a closed and form-retaining holder (4) removably received in the apparatus, which holder is at least filled with a product (6) to be dissolved and/or to be diluted, the apparatus being provided with a liquid device (8) for dispensing a fluid under pressure, comprising at least one liquid, a receiving space (10) in which the holder is received and at least one probe (38.n) provided with at least one channel (42.n) which, on the one side, is in fluid communication with the liquid device (8) and which, on the other side, terminates in at least one outflow opening (46.n) of the at least one probe (38.n), one wall of the holder being manufactured from a fluid-tight material, while, on a first side of the holder, the wall is manufactured such that it can be punctured, the apparatus (2) being designed for puncturing the wall on the first side and for moving the at least one probe (38.n) and the holder (4) relative to each other so that in use, the at least one probe can pierce through the first side of the holder, whereupon the at least one outflow opening (46.n) reaches into the holder, the system being further provided with opening means (48) for obtaining, in use, an outlet opening (66) at the holder for dispensing the ready beverage while, in use, the fluid is supplied by the liquid device to the at least one channel for generating at least one jet (64.n) of the fluid from the at least one outflow opening of the at least one probe in the holder for at least one of dissolving and diluting the product whereupon the ready beverage flows from the outlet opening, wherein the apparatus is further provided with control means (54), while the apparatus is further designed to set, under control of the control means, at least one setting of the at least one jet in a predetermined manner, as desired from a plurality of setting possibilities for determining, in advance, characteristic properties of the ready beverage, the at least one setting of the at least one jet comprising at least one of the direction of the at least one jet, the position of the at least one jet, the flow rate of the at least one jet, the flow velocity of the at least one jet, and the number of jets, the holder (4) being provided with a code and the apparatus with a code reader (72; 86; 92) connected to the control means for reading the code of the holder and to supply the read code to the control means (54) by means of a signal, while the control means are designed for providing the at least one setting of at least any one of the direction of the at least one jet, the position of the at least one jet, the flow rate

K-FEE SYSTEM GMBH, EX2009, page 1896
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

of the at least one jet, the flow velocity of the at least one jet and the number of the jets on the basis of the read-out code, **characterized in that in that** the at least one probe (38.n) is provided with at least one second outflow opening (46.n), while the apparatus is designed to generate, under control of the control means, in a settable manner, at least one of a first jet (64.n) of the fluid in the holder, with the aid of the first outflow opening and a second jet (64.n) of the fluid, with the aid of the second outflow opening, and **in that** the at least one probe (38.n) is designed to close off and release, under the control of the control means, the first outflow opening (46.n) in a settable manner and to close off and release the second outflow opening (46.n) in a settable manner.

2. A system according to claim 1, **characterized in that** the apparatus (2) is designed to set, under control of the control means (54), the position of the at least one probe (38.n) within the holder at wish from a plurality of setting possibilities, for setting the direction of the at least one jet (64.n) in the predetermined manner.

3. A system according to claim 1 or 2, **characterized in that** the at least one probe (38.n) is provided with a first channel (42.n) which is connected on the one side to the liquid device (8) and terminates on the other side in the first outflow opening (46.n) and a second channel (42.n) which is connected on the one side to the liquid device and terminates on the other side in the second outflow opening (46.n), while the apparatus is designed to supply, under control of the control means, in a settable manner, with the aid of the liquid device, the fluid to one of the first channel and the second channel.

4. A system according to any one of the preceding claims, **characterized in that** the system is designed to set the temperature of the fluid, under control of the control means (54), at wish from a plurality of setting possibilities.

5. A system according to claim 4, **characterized in that** the system is designed to set, under control of the control means (54), the temperature of the fluid so that a warm, tepid or cold beverage is obtained.

6. A system according to any one of the preceding claims, **characterized in that** the system is designed to set, under control of the control means (54), at wish from a plurality of setting possibilities, the amount of fluid which is dispensed for preparing a portion of the ready beverage.

7. A system according to claim 1, **characterized in that** the code is determinative of the at least one setting of any one of the direction of the at least one jet, the position of the at least one jet, the flow rate of the at least one jet, the flow velocity of the at least one jet and the number of jets.

8. A system according to claim 1 or 7, **characterized in that** the code is determinative of the setting of the amount of froth with the ready beverage.

9. A system according to claim 6, **characterized in that** the code is determinative of the setting of the amount of fluid which is dispensed for preparing a portion of the ready beverage.

10. A system according to claim 1, **characterized in that** the code is determinative of the setting of the temperature of the fluid.

11. A system according to any one of the preceding claims, **characterized in that**, in use, the holder (4) is punctured with the aid of the at least one probe (38.n).

12. A system according to any one of the preceding claims, **characterized in that** the apparatus (2) is further provided with a moveable element for puncturing the holder under control of the control means (54) before the at least one probe (38.n) can be inserted through the first side of the holder.

13. A system according to any one of the preceding claims, **characterized in that** the apparatus is provided with opening means (48) including one of cutting and piercing means for cutting away or piercing, under control of the control means (54), a part of the holder (4) for providing the outlet opening (66) in the holder when the holder is located in the receiving space.

14. A system according to claims 1 and 13, **characterized in that** the control means (54) activate the openings means for obtaining the outlet opening when, with the aid of the code reading means, the control means reads a code which corresponds to a code stored in the control unit.

15. A system according to any one of the preceding claims, **characterized in that** the receiving space (10) and the holder (4) are geared to each other such that the holder can be received in the receiving space on at least a predetermined position and preferably one predetermined position.

16. A system according to claim 15, **characterized in that** the wall of the holder (4) is provided with one of a holder recess and a holder projection and a wall of the receiving space (10) is provided with a receiving space projection reaching into the holder recess and/or a receiving space recess while the holder pro-

K-FEE SYSTEM GMBH, EX2009, page 1897
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

jection reaches into the receiving space recess.

17. A system according to any one of the preceding claims, **characterized in that** an upper side of the receiving space (10) abuts virtually completely against the first side of the holder (4).

18. A system according to claim 17, **characterized in that** the apparatus is provided with a switch (76) which is energized by the first side of the holder.

19. A system according to claim 18, **characterized in that** the control means (54) are connected to the switch (76) while the control means ensure that the liquid device (8) is not activated when the switch is not energized.

20. A system according to any one of claims 17 - 19, **characterized in that**, in use, the outflow opening (46.n) of the at least one probe (38.n) is situated adjacent the first side in the holder.

21. A system according to any one of the preceding claims, **characterized in that** the outlet opening (66) is situated on a second side of the holder opposite the first side.

22. A system according to any one of claims 1 - 10 or 14, **characterized in that** the code provided on the holder includes one of a bar code, an electromagnetic identification label (74) and a number of notches (90).

23. A system according to claim 22, **characterized in that** the code of the holder is formed by an electromagnetic responded (74), while the code reader (72) is designed for reading out the electromagnetic responder.

24. A system according to any one of the preceding claims, **characterized in that** the holder (4) is provided with a valve (80), while the apparatus is provided with energizing means for, in use and preferably under control of the control means, opening the valve for obtaining the outlet opening in the holder.

25. A system according to claim 24, **characterized in that** the valve (80) is a valve which is normally closed, which closes again when the energizing means are deactivated.

26. A system according to claim 25, **characterized in that** the valve (80) comprises a duck-valve while the energizing means are provided with pressure means for, in use, compressing the duck-valve for obtaining the outlet opening.

27. A system according to any one of the preceding claims, **characterized in that** the control means (54) are provided with a microprocessor (56).

28. A system according to any one of the preceding claims, **characterized in that** the outlet opening (66) formed provides a free passage so that the beverage can flow from the holder (4) under the influence of gravity when the outlet opening has been provided.

29. A system according to claim 1, **characterized in that**, under control of the control means (54), the at least one jet (64.n) is directed towards one of a bottom of the holder and a sidewall of the holder.

30. A system according to claim 1 or 2, **characterized in that** the first jet (64.n) and the second jet (64.n) have mutually different directions.

31. A system according to claim 30, **characterized in that** the first jet (64.n) is directed towards a sidewall of the holder and strikes the sidewall and that the second jet (64.n) is directed towards a bottom of the holder and, in use, directly strikes the product.

32. A system according to claim 30 or 31, **characterized in that** the second jet (64.n) is directed downwards at least virtually vertically and that the first jet (64.n) comprises a speed component in horizontal direction towards the sidewall and a speed component in vertical direction to the bottom.

33. A system according to any one of the preceding claims, **characterized in that** the apparatus (2) is further designed to set in reaction to a control signal from the control means (54) any one of the direction of the at least one jet (64.n), the position of the at least one jet, the flow rate of the at least one jet, the flow velocity of the at least one jet and the number of jets (64.n).

34. The apparatus (2) of the system (1) according to any one of the preceding claims.

Patentansprüche

1. System (1) zur Herstellung von Portionen eines verzehrbereiten Getränks, mit einem Gerät (2) zur Zubereitung des Getränks und einem geschlossenen und formbeständigen, entnehmbar in dem Gerät aufgenommenen Halter (4), wobei der Halter zumindest mit einem aufzulösenden und/oder zu verdünnenden Produkt (6) gefüllt ist, wobei das Gerät mit einer Flüssigkeitsvorrichtung (8) zum Ausgeben eines druckbeaufschlagten Fluids versehen ist, die mindestens eine Flüssigkeit aufweist, einem Aufnahmeraum (10), in dem der Halter aufgenommen ist, und

K-FEE SYSTEM GMBH, EX2009, page 1898
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

mindestens einer Sonde (38.n), die mit mindestens einem Kanal (42.n) versehen ist, der auf der einen Seite in Fluidverbindung mit der Flüssigkeitsvorrichtung (8) steht, und der auf der anderen Seite in mindestens einer Ausströmöffnung (46.n) der mindestens einen Sonde (38.n) mündet, wobei eine Wand des Halters aus einem fluiddichten Material besteht, während die Wand auf einer ersten Seite des Halters derart ausgebildet ist, dass sie durchstechbar ist, wobei das Gerät (2) ausgebildet ist, um die Wand auf der ersten Seite zu durchstechen und die mindestens eine Sonde (38.n) und den Halter (4) relativ zueinander zu bewegen, so dass im Gebrauch die mindestens eine Sonde die erste Seite des Halters durchstechen kann, woraufhin die mindestens eine Ausströmöffnung (46.n) in den Halter reicht, wobei das System ferner mit einer Öffnungseinrichtung (48) versehen ist, um im Gebrauch eine Auslassöffnung (66) an dem Halter für das Ausgeben des fertigen Getränks zu erhalten, während im Gebrauch das Fluid von der Flüssigkeitsvorrichtung dem mindestens einen Kanal zugeführt wird, um mindestens einen Strahl (64.n) des Fluids aus der mindestens einen Ausströmöffnung der mindestens einen Sonde in dem Halter zum Auflösen und/oder Verdünnen des Produkts zu erzeugen, woraufhin das fertige Getränk aus der Auslassöffnung fließt, wobei das Gerät ferner mit einer Steuereinrichtung (54) versehen ist, wobei das Gerät derart ausgebildet ist, dass es unter Steuerung durch die Steuereinrichtung mindestens eine Einstellung des mindestens einen Strahls auf eine vorbestimmte Weise gemäß einer Auswahl unter mehreren Einstellmöglichkeiten zur vorab erfolgenden Bestimmung charakteristischer Eigenschaften des fertigen Getränks einstellt, wobei die mindestens eine Einstellung des mindestens einen Strahls die Richtung des mindestens einen Strahls und/oder die Position des mindestens einen Strahls und/oder die Durchflussrate des mindestens einen Strahls und/oder die Anzahl der Strahlen betrifft, wobei der Halter (4) mit einem Code und das Gerät mit einem Codeleser (72; 86; 92) versehen ist, der mit der Steuereinrichtung zum Lesen des Codes des Halters und zum Liefern des gelesenen Codes an die Steuereinrichtung (54) mittels eines Signals verbunden ist, wobei die Steuereinrichtung dazu ausgebildet ist, die mindestens eine Einstellung bezüglich der Richtung des mindestens einen Strahls und/oder der Position des mindestens einen Strahls und/oder der Durchflussrate des mindestens einen Strahls und/oder der Anzahl der Strahlen auf der Basis des ausgelesenen Codes bereitzustellen, **dadurch gekennzeichnet, dass** die mindestens eine Sonde (38.n) mit mindestens einer zweiten Ausströmöffnung (46.n) versehen ist, wobei das Gerät derart ausgebildet ist, dass es unter Steuerung durch die Steuerungseinrichtung in einstellbarer Weise einen ersten Strahl (64.n) des Fluids in dem Halter mit Hilfe der ersten Ausströmöffnung und einen zweiten Strahl (64.n) des Fluids mit Hilfe der zweiten Ausströmöffnung erzeugt, und dass die mindestens eine Sonde (38.n) derart ausgebildet ist, dass sie unter Steuerung durch die Steuereinrichtung die erste Ausströmöffnung (46.n) in einstellbarer Weise schließt und freigibt und die zweite Ausströmöffnung (46.n) in einstellbarer Weise schließt und freigibt.

2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** das Gerät (2) derart ausgebildet ist, dass es unter Steuerung durch die Steuereinrichtung (54) die Position der mindestens einen Sonde (38.n) in dem Halter unter mehreren Einstellmöglichkeiten nach Wunsch einstellt, um die Richtung des mindestens einen Strahls (64.n) in der vorbestimmten Weise einzustellen.

3. System nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die mindestens eine Sonde (38.n) mit einem ersten Kanal (42.n), der auf der einen Seite mit der Flüssigkeitsvorrichtung (8) verbunden ist und auf der anderen Seite in der ersten Ausströmöffnung (46.n) mündet, und einen zweiten Kanal (42.n) aufweist, der auf der einen Seite mit der Flüssigkeitsvorrichtung verbunden ist und auf der anderen Seite in der zweiten Ausströmöffnung (46.n) mündet, wobei das Gerät derart ausgebildet ist, dass es unter Steuerung durch die Steuereinrichtung in einstellbarer Weise das Fluid mit Hilfe der Flüssigkeitsvorrichtung dem ersten oder dem zweiten Kanal zuführt.

4. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das System derart ausgebildet ist, dass es die Temperatur des Fluids unter Steuerung durch die Steuereinrichtung (54) unter mehreren Einstellmöglichkeiten nach Wunsch einstellt.

5. System nach Anspruch 4, **dadurch gekennzeichnet, dass** das System derart ausgebildet ist, dass es unter Steuerung durch die Steuereinrichtung (54) die Temperatur des Fluids derart einstellt, dass ein warmes, lauwarmes oder kaltes Getränk erhalten wird.

6. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das System derart ausgebildet ist, dass es unter Steuerung durch die Steuereinrichtung (54) die Menge des Fluids, die zur Zubereitung einer Portion des fertigen Getränks ausgegeben wird, unter mehreren Einstellmöglichkeiten nach Wunsch einstellt.

7. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der Code die mindestens eine Einstellung bezüglich der Richtung des mindestens einen

K-FEE SYSTEM GMBH, EX2009, page 1899
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Strahls und/oder der Position des mindestens einen Strahls und/oder der Durchflussrate des mindestens einen Strahls und/oder der Strömungsgeschwindigkeit des mindestens einen Strahls und/oder der Anzahl der Strahlen bestimmt.

8. System nach Anspruch 1 oder 7, **dadurch gekennzeichnet, dass** der Code die Einstellung der Schaummenge des fertigen Getränks bestimmt.

9. System nach Anspruch 6, **dadurch gekennzeichnet, dass** der Code die Einstellung der Fluidmenge, die zur Zubereitung einer Portion des fertigen Getränks ausgegeben wird, bestimmt.

10. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der Code die Einstellung der Temperatur des Fluids bestimmt.

11. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Halter (4) im Gebrauch mit Hilfe der mindestens einen Sonde (38.n) durchstochen wird.

12. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gerät (2) ferner mit einem bewegbaren Element versehen ist, um den Halter unter Steuerung durch die Steuereinrichtung (54) zu durchstechen, bevor die mindestens eine Sonde (38.n) durch die erste Seite des Halters eingeführt werden kann.

13. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gerät mit einer Öffnungseinrichtung (48) versehen ist, die eine Schneid- oder Durchstecheinrichtung aufweist, um, bei in dem Aufnahmeraum befindlichem Halter, unter Steuerung durch die Steuereinrichtung (54) einen Teil des Halters (4) zur Bildung der Auslassöffnung in dem Halter wegzuschneiden oder zu durchstechen.

14. System nach den Ansprüchen 1 und 13, **dadurch gekennzeichnet, dass** die Steuereinrichtung (54) die Öffnungseinrichtung aktiviert, um die Auslassöffnung zu erhalten, wenn die Steuereinrichtung mit Hilfe der Codeleseeinrichtung einen Code liest, welcher einem in der Steuereinheit gespeicherten Code entspricht.

15. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Aufnahmeraum (10) und der Halter (4) derart aufeinander abgestimmt sind, dass der Halter in dem Aufnahmeraum an zumindest einer vorbestimmten Position und vorzugsweise an einer vorbestimmten Position aufnehmbar ist.

16. System nach Anspruch 15, **dadurch gekennzeichnet, dass** die Wand des Halters (4) mit einer Halterausnehmung oder einem Haltervorsprung versehen ist und eine Wand des Aufnahmeraums (10) mit einem in die Halterausnehmung reichenden Aufnahmeraumvorsprung und/oder einer Aufnahmeraumausnehmung versehen, wobei der Haltervorsprung in die Aufnahmeraumausnehmung reicht.

17. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Oberseite des Aufnahmeraums (10) praktisch vollständig an der ersten Seite des Halters (4) anliegt.

18. System nach Anspruch 17, **dadurch gekennzeichnet, dass** das Gerät mit einem Schalter (76) versehen ist, welcher durch die erste Seite des Halters aktiviert wird.

19. System nach Anspruch 18, **dadurch gekennzeichnet, dass** die Steuereinrichtung (54) mit dem Schalter (76) verbunden ist, wobei die Steuereinrichtung gewährleistet, dass die Flüssigkeitsvorrichtung (8) nicht aktiviert ist, wenn der Schalter nicht aktiviert ist.

20. System nach einem der Ansprüche 17-19, **dadurch gekennzeichnet, dass** die Ausströmöffnung (46.n) der mindestens einen Sonde (38.n) im Gebrauch nahe der ersten Seite des Halters angeordnet ist.

21. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Auslassöffnung (66) auf einer der ersten Seite gegenüberliegenden zweiten Seite des Halters angeordnet ist.

22. System nach einem der Ansprüche 1-10 oder 14, **dadurch gekennzeichnet, dass** der an dem Halter vorgesehene Code die Verwendung eines Strichcodes, eines elektromagnetischen Identifizierungsetiketts (74) und einer Anzahl von Kerben (90) umfasst.

23. System nach Anspruch 22, **dadurch gekennzeichnet, dass** der Code des Halters durch eine elektromagnetischen Responder (74) gebildet ist, wobei der Codeleser (72) zum Auslesen des elektromagnetischen Responders ausgebildet ist.

24. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Halter (4) mit einem Ventil (80) versehen ist, wobei das Gerät mit einer Einschalteinrichtung versehen ist, um im Gebrauch und vorzugsweise unter Steuerung durch die Steuereinrichtung das Ventil zum Erhalten der Auslassöffnung in dem Halter zu öffnen.

25. System nach Anspruch 24, **dadurch gekennzeichnet, dass** das Ventil (80) ein normalerweise ge-

K-FEE SYSTEM GMBH, EX2009, page 1900
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

schlossenes Ventil ist, das sich wieder schließt, wenn die Einschalteinrichtung deaktiviert wird.

26. System nach Anspruch 25, **dadurch gekennzeichnet, dass** das Ventil (80) ein Entenschnabelventil aufweist, wobei die Einschalteinrichtung mit einer Druckeinrichtung versehen ist, um im Gebrauch das Entenschnabelventil zum Erhalten der Auslassöffnung zusammenzudrücken.

27. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Steuereinrichtung (54) mit einem Mikroprozessor (56) versehen ist.

28. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die gebildete Auslassöffnung (66) einen freien Durchlass bietet, so dass das Getränk unter Schwerkraftwirkung aus dem Halter (4) fließen kann, wenn die Auslassöffnung gebildet ist.

29. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der mindestens eine Strahl (64.n) unter Steuerung durch die Steuereinrichtung (54) in Richtung des Bodens des Halters oder einer Seitenwand des Halters gerichtet ist.

30. System nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der erste Strahl (64.n) und der zweite Strahl (64.n) voneinander verschiedene Richtungen aufweisen.

31. System nach Anspruch 30, **dadurch gekennzeichnet, dass** der erste Strahl (64.n) in Richtung einer Seitenwand des Halters gerichtet ist und auf die Seitenwand trifft, und dass der zweite Strahl (64.n) in Richtung des Bodens des Halters gerichtet ist und im Gebrauch direkt auf das Produkt trifft.

32. System nach Anspruch 30 oder 31, **dadurch gekennzeichnet, dass** der zweite Strahl (64.n) zumindest praktisch vertikal nach unten gerichtet ist, und dass der erste Strahl (64.n) eine horizontale Geschwindigkeitskomponente in Richtung der Seitenwand und eine vertikale Geschwindigkeitskomponente in Richtung des Bodens aufweist.

33. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gerät (2) ferner derart ausgebildet ist, dass es in Reaktion auf ein Steuersignal der Steuereinrichtung (54) die Richtung des mindestens einen Strahls (64.n) und/oder die Position des mindestens einen Strahls und/oder die Durchflussrate des mindestens einen Strahls und/oder die Strömungsgeschwindigkeit des mindestens einen Strahls und/oder die Anzahl der Strahlen (64.n) einstellt.

34. Gerät (2) des Systems (1) nach einem der vorhergehenden Ansprüche.

Revendications

1. Un système (1) pour préparer des portions d'une boisson convenant à la consommation, comprenant un appareil (2) pour préparer la boisson et un boîtier (4), fermé et conservant sa forme, logé de manière amovible dans l'appareil, ledit boîtier étant au moins rempli avec un produit (6) à dissoudre et/ou à diluer, l'appareil étant muni d'un dispositif à liquide (8) pour distribuer un fluide sous pression, comprenant au moins un liquide, un espace de réception (10) dans lequel le boîtier est logé, et au moins une sonde (38.n) munie d'au moins un canal (42.n) qui, d'une part, est en communication hydraulique avec le dispositif à liquide (8) et qui, d'autre part, s'achève en au moins une ouverture de sortie d'écoulement (46.n) de la au moins une sonde (38.n), une paroi du boîtier étant fabriquée en un matériau étanche aux fluides, tandis que, sur un premier côté du boîtier, la paroi est fabriquée de manière à pouvoir être perforée, l'appareil (2) étant conçu pour perforation de la paroi sur le premier côté et pour déplacer la au moins une sonde (38.n) et le boîtier (4) par rapport à chaque autre de manière que, en utilisation, la au moins une sonde puisse percer à travers le premier côté du boîtier, à la suite de quoi la au moins une ouverture de sortie d'écoulement (46.n) pénètre dans le boîtier, le système étant en outre muni de moyens d'ouverture (48) pour obtenir, en utilisation, une ouverture de sortie (66) au niveau du boîtier, pour distribuer la boisson prête tandis que, en utilisation, le fluide est fourni par le dispositif à liquide au au moins un canal pour générer au moins un jet (64.n) du fluide à partir de la au moins une ouverture de sortie d'écoulement de la au moins une sonde, dans le boîtier, pour au moins l'une d'une dissolution et d'une dilution du produit, à la suite de quoi la boisson prête s'écoule de l'ouverture de sortie, dans lequel l'appareil est en outre muni de moyens de commande (54), tandis que l'appareil est en outre conçu pour fixer, sous la commande des moyens de commande, au moins un réglage du au moins un jet d'une manière prédéterminée, tel que souhaité parmi une pluralité de possibilités de réglages, pour déterminer, à l'avance, des propriétés caractéristiques de la boisson prête, le au moins un réglage du au moins un jet comprenant au moins l'une de la direction du au moins un jet, la position du au moins un jet, le débit d'écoulement du au moins un jet, la vitesse d'écoulement du au moins un jet, et le nombre de jets, le boîtier (4) étant muni d'un code et l'appareil étant muni d'un lecteur de code (72 ; 86 ; 92), connecté aux moyens de commande, pour lire le code du boîtier et pour fournir le code lu aux moyens de

K-FEE SYSTEM GMBH, EX2009, page 1901
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

commande (54) à l'aide d'un signal, tandis que les moyens de commande sont conçus pour fournir le au moins un réglage d'au moins l'une quelconque de la direction du au moins un jet, de la position du au moins un jet, du débit d'écoulement du au moins un jet, de la vitesse d'écoulement du au moins un jet, et du nombre de jets, sur la base du code ayant été lu, **caractérisé en ce que** la au moins une sonde (38.n) est munie d'au moins une deuxième ouverture de sortie d'écoulement (46.n), tandis que l'appareil est conçu pour générer, sous la commande des moyens de commande, d'une manière réglable, au moins l'un d'un premier jet (64.n) du fluide dans le boîtier, à l'aide de la première ouverture de sortie d'écoulement, et d'un deuxième jet (64.n) du fluide, à l'aide de la deuxième ouverture de sortie d'écoulement, et **en ce que** la au moins une sonde (38.n) est conçue pour fermer et libérer, sous la commande des moyens de commande, la première ouverture d'écoulement (46.n) d'une manière réglable et pour fermer et libérer la deuxième ouverture de sortie d'écoulement (46.n), d'une manière réglable.

2. Le système selon la revendication 1, **caractérisé en ce que** l'appareil (2) est conçu pour fixer, sous la commande des moyens de commande (54), la position de la au moins une sonde (38.n) à l'intérieur du boîtier, à volonté, parmi une pluralité de possibilités de réglage, pour régler la direction du au moins un jet (64.n) de la manière prédéterminée.

3. Le système selon la revendication 1 ou 2, **caractérisé en ce que** la au moins une sonde (38.n) est munie d'un premier canal (42.n) connecté, sur un côté, au dispositif à liquide (8) et s'achevant, de l'autre côté, en la première ouverture de sortie d'écoulement (46.n), et d'un deuxième canal (42.n), connecté, sur un côté, au dispositif à liquide et s'achevant, de l'autre côté, en la deuxième ouverture de sortie d'écoulement (46.n), tandis que l'appareil est conçu pour fournir, sous la commande des moyens de commande, d'une manière réglable, à l'aide du dispositif à liquide, le fluide à l'un du premier canal et du deuxième canal.

4. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le système est conçu pour fixer la température du fluide, sous la commande des moyens de commande (54), à volonté parmi une pluralité de possibilités de réglage.

5. Le système selon la revendication 4, **caractérisé en ce que** le système est conçu pour fixer, sous la commande des moyens de commande (54), la température du fluide de manière à obtenir une boisson chaude, tiède ou froide.

6. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le système est conçu pour fixer, sous la commande des moyens de commande (54), à volonté parmi une pluralité de possibilités de réglage, la quantité de fluide distribué pour préparation d'une portion de la boisson prête.

7. Le système selon la revendication 1, **caractérisé en ce que** le code détermine au moins un réglage d'une quelconque parmi la direction du au moins un jet, la position du au moins un jet, le débit d'écoulement du au moins un jet, la vitesse d'écoulement du au moins un jet et le nombre de jets.

8. Le système selon la revendication 1 ou 7, **caractérisé en ce que** le code détermine du réglage de la quantité de mousse ou écume avec là boisson prête.

9. Le système selon la revendication 6, **caractérisé en ce que** le code détermine du réglage de la quantité de fluide distribué pour préparer une portion de la boisson prête.

10. Le système selon la revendication 1, **caractérisé en ce que** le code détermine du réglage de la température du fluide.

11. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que**, en utilisation, le boîtier (4) est perforé à l'aide de la au moins une sonde (38.n).

12. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'appareil (2) est en outre muni d'un élément déplaçable pour perforer le boîtier sous la commande des moyens de commande (54), avant que la au moins une sonde (38.n) puisse être insérée à travers le premier côté du boîtier.

13. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'appareil est muni de moyens d'ouverture (48) incluant l'un parmi des moyens de découpage et de percement pour enlever par découpe, ou percer, sous la commande des moyens de commande (54), une partie du boîtier (4), pour produire l'ouverture de sortie (66) dans le boîtier, lorsque le boîtier est situé dans l'espace de réception.

14. Le système selon les revendications 1 et 13, **caractérisé en ce que** les moyens de commande (54) activent les moyens d'ouverture pour obtenir l'ouverture de sortie lorsque, à l'aide des moyens de lecture de code, les moyens de commande lisent un code correspondant à un code stocké en mémoire dans l'unité de commande.

K-FEE SYSTEM GMBH, EX2009, page 1902
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

15. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'espace de réception (10) et le boîtier (4) sont liés l'un par rapport à l'autre de manière que le boîtier puisse être logé dans l'espace de réception, en au moins une position prédéterminée et, de préférence, en une position prédéterminée.

16. Le système selon la revendication 15, **caractérisé en ce que** la paroi du boîtier (4) est munie d'une cavité de boîtier et d'une saillie de boîtier, et une paroi de l'espace de réception (10) est munie d'une saillie d'espace de réception, arrivant dans la cavité de boîtier et/ou d'une cavité d'espace de réception, tandis que la saillie de boîtier arrive dans la cavité d'espace de réception.

17. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une face supérieure de l'espace de réception (10) vient en butée virtuellement complètement contre la première face du boîtier (4).

18. Le système selon la revendication 17, **caractérisé en ce que** l'appareil est muni d'un commutateur (78), actionné à l'aide de la première face du boîtier.

19. Le système selon la revendication 18, **caractérisé en ce que** les moyens de commande (54) sont connectés au commutateur (76), tandis que les moyens de commande assurent que le dispositif à liquide (8) n'est pas activé lorsque le commutateur n'est pas actionné.

20. Le système selon l'une quelconque des revendications 17 à 19, **caractérisé en ce que**, en utilisation, l'ouverture de sortie d'écoulement (46.n) de la au moins une sonde (38.n) est située de manière adjacente au premier côté du boîtier.

21. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'ouverture de sortie (66) est située sur un deuxième côté du boîtier, opposé au premier côté.

22. Le système selon l'une quelconque des revendications 1 à 10 ou 14, **caractérisé en ce que** le code prévu sur le boîtier comprend l'un parmi un code à barres, une étiquette d'identification électromagnétique (74) et une pluralité d'encoches (90).

23. Le système selon la revendication 22, **caractérisé en ce que** le code du boîtier est formé par un répondeur électromagnétique (74), tandis que le lecteur de code (72) est conçu pour lire le répondeur électromagnétique.

24. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le boîtier (4) est muni d'une soupape (80), tandis que l'appareil est muni de moyens d'actionnement pour, en utilisation et de préférence sous la commande des moyens de commande, ouvrir la soupape pour obtenir l'ouverture de sortie dans le boîtier.

25. Le système selon la revendication 24, **caractérisé en ce que** la soupape (80) est une soupape normalement fermée, qui se referme lorsque les moyens d'actionnement sont désactivés.

26. Le système selon la revendication 25, **caractérisé en ce que** la soupape (80) comprend une soupape à bec de canard, tandis que les moyens d'actionnement sont munis de moyens à pression pour, en utilisation, compresser la soupape à bec de canard pour obtenir l'ouverture de sortie.

27. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de commande (54) sont munis d'un microprocesseur (58).

28. Le système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'ouverture de sortie (66) formée offre un passage libre, de manière que la boisson puisse s'écouler à partir du boîtier (4), sous l'influence de la gravité, lorsque l'ouverture de sortie a été prévue.

29. Le système selon la revendication 1, **caractérisé en ce que**, sous la commande des moyens de commande (54), le au moins un jet (64.n) est dirigé vers l'un d'un fond du boîtier et une paroi latérale du boîtier.

30. Le système selon la revendication 1 ou 28, **caractérisé en ce que** le premier jet (64.n) et le deuxième jet (64.n) ont des directions mutuellement différentes.

31. Le système selon la revendication 30, **caractérisé en ce que** le premier jet (64.n) est dirigé vers une paroi latérale du boîtier et touche la paroi latérale, et le deuxième jet (64.n) est dirigé vers un fond du boîtier et, en utilisation, touche directement le produit.

32. Le système selon la revendication 30 ou 31, **caractérisé en ce que** le deuxième jet (64.n) est dirigé vers le bas, au moins virtuellement verticalement, et **en ce que** le premier jet (64.n) présente une composante de vitesse en direction horizontale, vers la paroi latérale, et une composante de vitesse en direction verticale, vers le fond.

33. Le système selon l'une quelconque des revendica-

K-FEE SYSTEM GMBH, EX2009, page 1903
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

tions précédentes, **caractérisé en ce que** l'appareil (2) est en outre conçu pour, en réaction à un signal de commande provenant des moyens de commande (54), fixer l'une quelconque parmi la direction du au moins un jet (64.n), la position du au moins un jet, le débit d'écoulement du au moins un jet, la vitesse d'écoulement du au moins un jet et le nombre de jets (64.n).

34. L'appareil (2) du système (1) selon l'une quelconque des revendications précédentes.

K-FEE SYSTEM GMBH, EX2009, page 1904
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

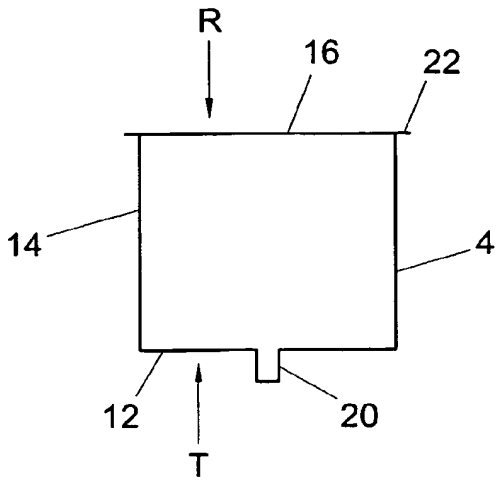


FIG. 1a

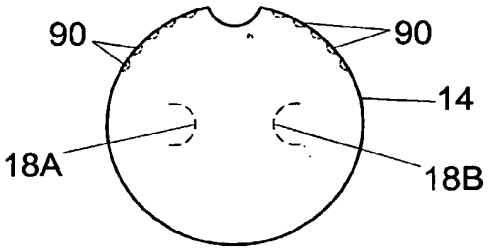


FIG. 1b

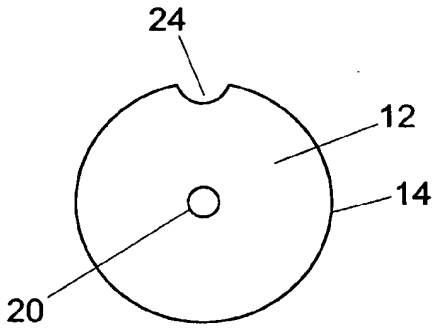


FIG. 1c

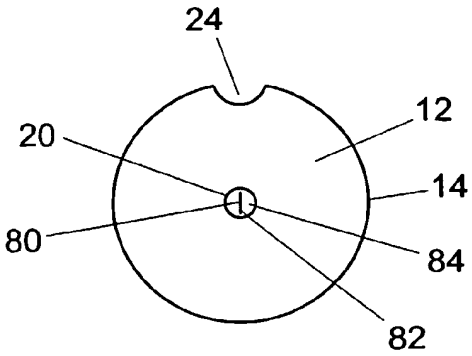


FIG. 1d

K-FEE SYSTEM GMBH, EX2009, page 1905
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

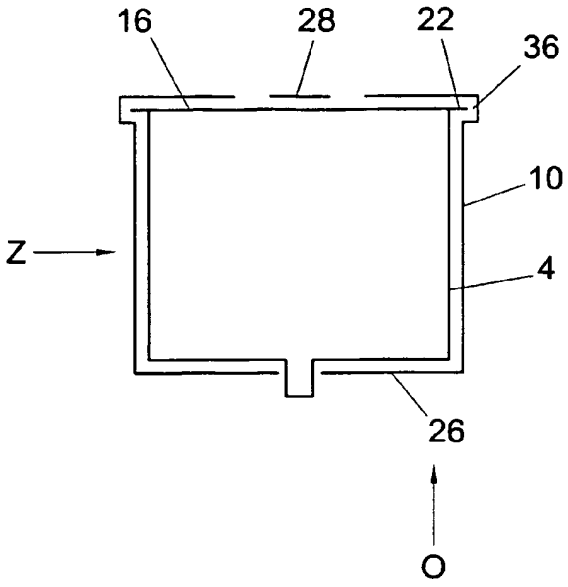


FIG. 2a

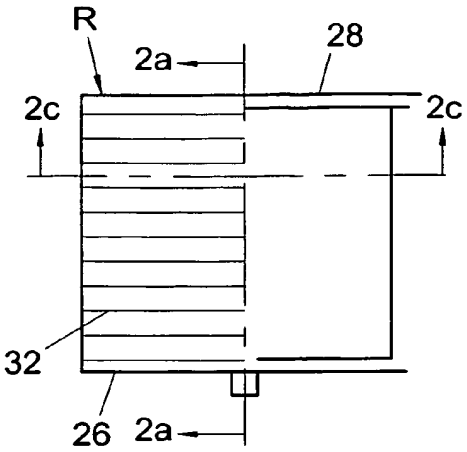


FIG. 2b

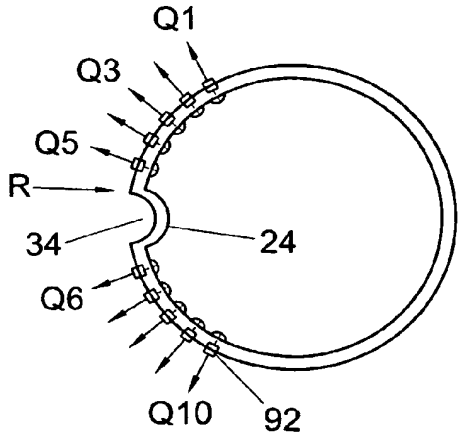


FIG. 2c

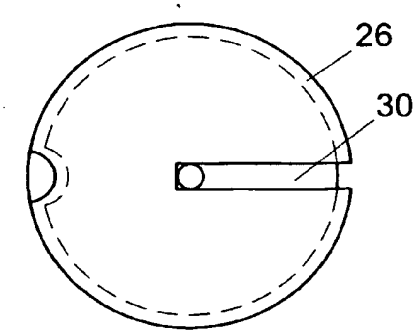


FIG. 2d

K-FEE SYSTEM GMBH, EX2009, page 1906
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

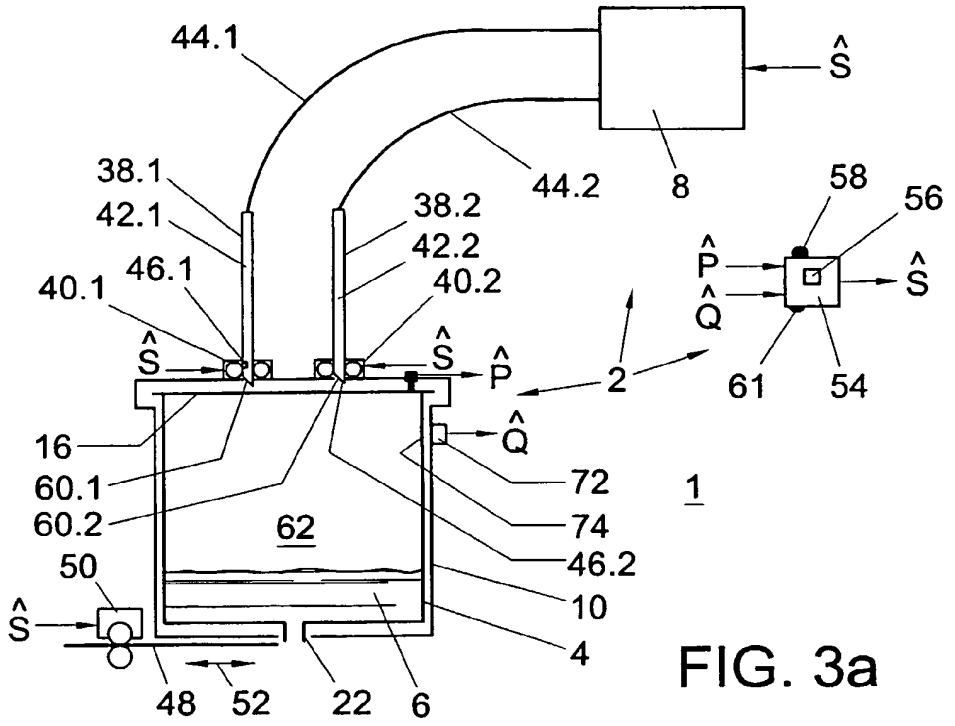


FIG. 3a

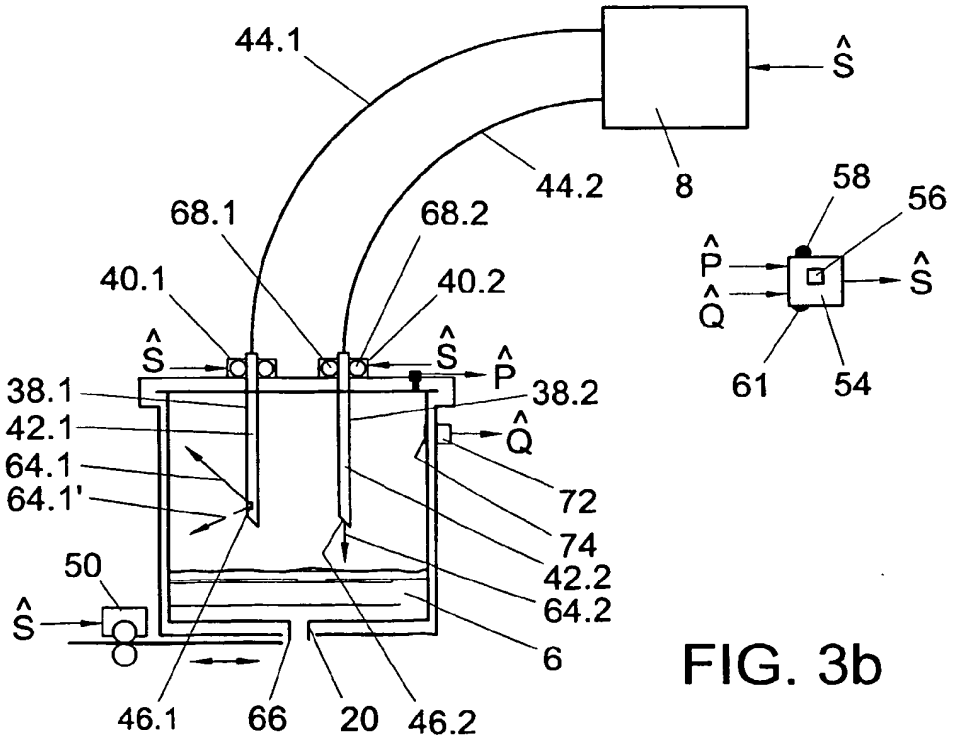


FIG. 3b

K-FEE SYSTEM GMBH, EX2009, page 1907
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

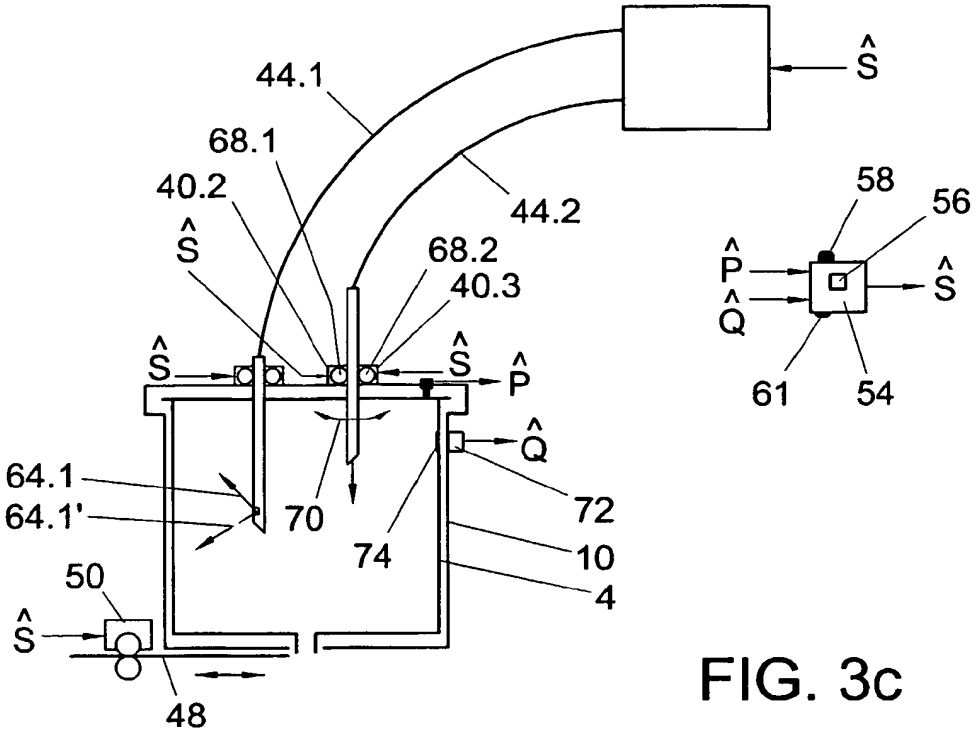


FIG. 3c

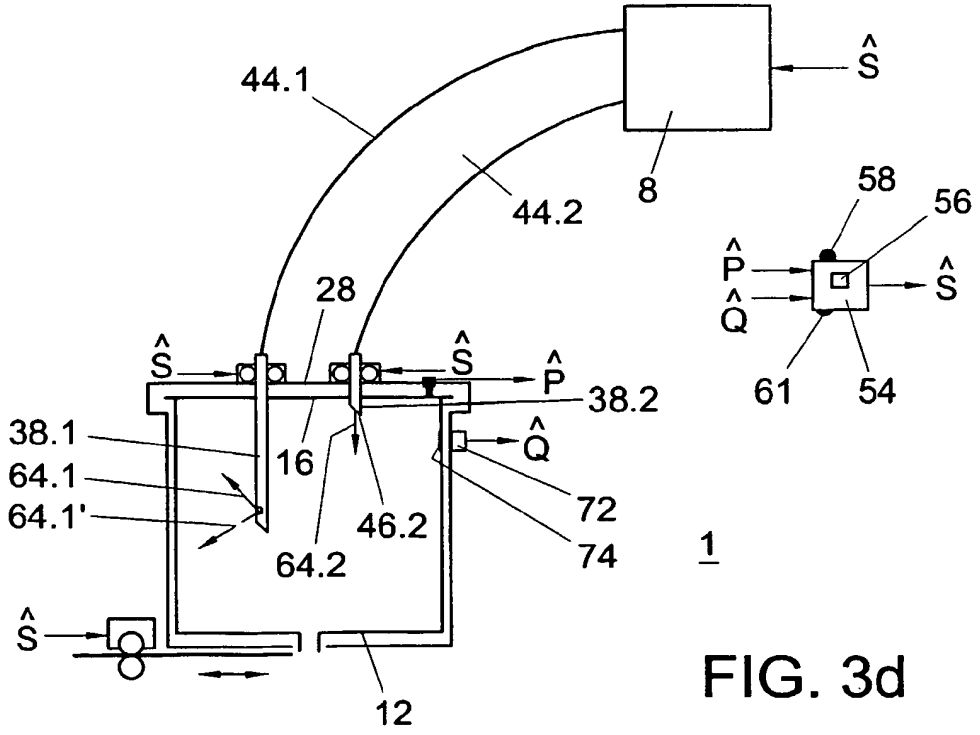


FIG. 3d

K-FEE SYSTEM GMBH, EX2009, page 1908
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

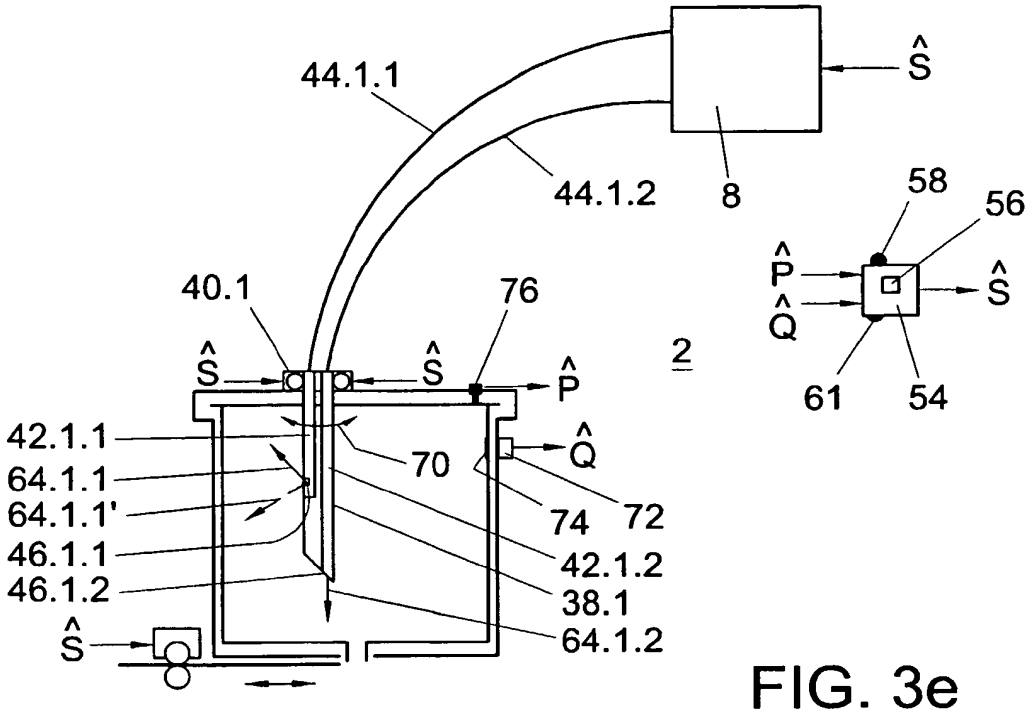


FIG. 3e

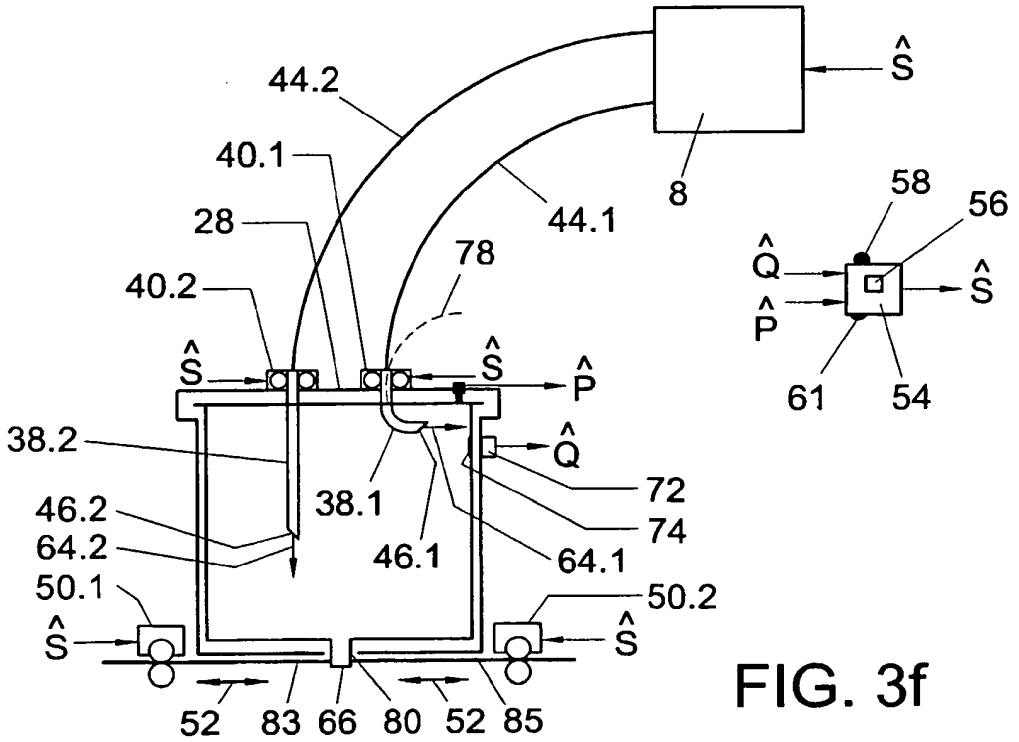


FIG. 3f

K-FEE SYSTEM GMBH, EX2009, page 1909
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

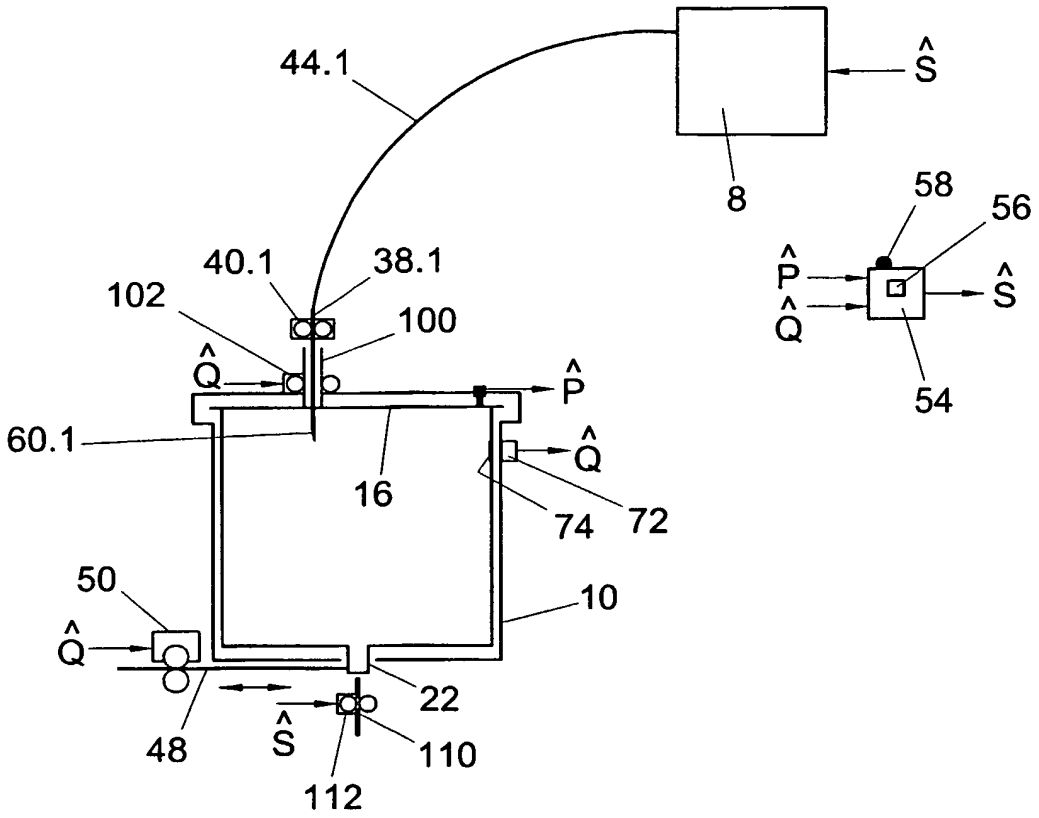


FIG. 3g

K-FEE SYSTEM GMBH, EX2009, page 1910
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

REFERENCES CITED IN THE DESCRIPTION

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K-FEE SYSTEM GMBH, EX2009, page 1911
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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Ｇ０７Ｆ　13/00		Ｇ０７Ｆ　13/00	Ｃ　３Ｅ０４７
13/06	１０３	13/06	１０３

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(21)出願番号　特願2000－62357(P2000－62357)

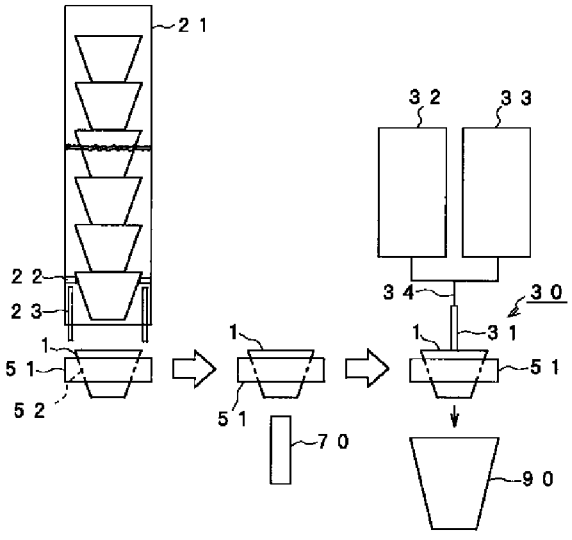
(22)出願日　平成12年３月７日(2000.3.7)

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最終頁に続く

(54)【発明の名称】　飲料自動販売機

(57)【要約】　（修正有）
【課題】誤商品及び誤調理商品の販売を確実に防止すると共に、事前の調理データの設定作業を省くことができる飲料自動販売機を提供する。
【解決手段】　複数種類の原料容器１に識別データ及び調理データを含むバーコードを種別に付し、販売動作時に飲料を抽出しようとする原料容器１のバーコードを飲料抽出前にバーコードリーダ７０で読み取り、当該原料容器１の種類を特定すると共に、当該原料容器１がユーザによって選択された種類のものであるか否かを判定する。種類が一致しない場合は販売動作を中止すると共に、当該原料容器１を容器保管部に保管し、後に改めて販売に供する。種類が一致した場合は、取得した調理データに基づき、当該原料容器１内に給湯し、砂糖、クリーム等を添加して飲料を作成する。



K-FEE SYSTEM GMBH, EX2009, page 1912
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

【特許請求の範囲】
【請求項１】　複数種類の粉末原料を種別に収容する複数種類の原料容器を用い、販売動作時に一の原料容器内に給湯又は給水して飲料を抽出する飲料自動販売機において、
販売動作時に飲料を抽出しようとする原料容器の種類を識別し、当該原料容器の種類がユーザによって選択されたものであるか否かを判定する容器識別手段を備え、
前記容器識別手段は原料容器に付加した識別情報と該識別情報を読み取る識別情報読み取り装置とを含むことを特徴とする飲料自動販売機。
【請求項２】　前記識別情報は原料容器の種別の調理データを含むことを特徴とする請求項１記載の飲料自動販売機。
【請求項３】　前記容器識別手段によって、選択された種類ではないと判定された原料容器を保管する容器保管部を備えたことを特徴とする請求項１又は２記載の飲料自動販売機。
【請求項４】　販売動作時に飲料を抽出しようとする原料容器を保持させる可動体を介して当該原料容器を搬送する容器搬送機構を備え、
前記識別情報読み取り装置を前記可動体に付設したことを特徴とする請求項１～３のいずれか記載の飲料自動販売機。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、コーヒー粉、ココア粉、茶粉等の粉末原料が収容された原料容器から飲料を抽出して販売する飲料自動販売機に関するものである。
【０００２】
【従来の技術】従来から、予め飲料一杯分の粉末原料をカートリッジあるいはパッケージ等と称されるフィルタ機能付きの原料容器に封入し、この原料容器内にノズルを介して給湯あるいは給水して飲料を抽出し、これをカップに入れて販売するカップ式飲料自動販売機が知られている。かかる飲料自動販売機は、多数の原料容器を種別に、即ち、収容された粉末原料の種類別に一列に積み重ねて収納する複数の円筒状の容器収納庫と、上記ノズルが設けられる飲料抽出部と、販売動作時に一の容器収納庫から搬出される一の原料容器を飲料抽出部に搬送する容器搬送機構とを備えており、容器搬送機構は容器収納庫から搬出される原料容器を保持させる可動体を有し、この可動体を介して原料容器を搬送するように構成されている。
【０００３】販売に先立ち、各容器収納庫、及び各容器収納庫に収納すべき原料容器の各種類は自動販売機表部に備わる複数の商品選択ボタンと一対一で対応付けられ、オペレータはこの対応付けデータを操作パネル等を介して制御部のメモリに格納すると共に、かかる対応付けに従って各容器収納庫に所定種類の原料容器を装填する。また、各種の原料容器に対しては、例えば、給湯量、給水量、一次給湯と二次給湯との間の蒸らし時間、砂糖やクリーム等の添加量等の調理方法が種別にきめ細かく設定され、かかる調理方法も調理データとして原料容器の各種類に対応付けられ、オペレータによって制御部のメモリに入力・設定される。
【０００４】そして、ユーザが一の商品選択ボタンを押すと、商品選択信号に対応する一の容器収納庫直下に上記可動体が搬送され、該容器収納庫内最下位の原料容器が可動体に受け渡されて保持され、次いで、該原料容器は上記飲料抽出部に搬送され、ここで所定の調理方法に従って飲料が作成されるようになっている。
【０００５】
【発明が解決しようとする課題】しかしながら、上記従来の飲料自動販売機では、オペレータによる原料容器の装填ミスあるいは調理データの設定ミスによってユーザに誤商品あるいは誤調理商品が販売されたり、また、原料容器の種別の調理データの設定作業が非常に面倒であるといった問題があった。
【０００６】本発明の目的は、以上の問題点に鑑み、誤商品及び誤調理商品の販売を確実に防止すると共に、事前の調理データの設定作業を省くことができる飲料自動販売機を提供することにある。
【０００７】
【課題を解決するための手段】上記課題を解決するため、請求項１に係る本発明では、複数種類の粉末原料を種別に収容する複数種類の原料容器を用い、販売動作時に一の原料容器内に給湯又は給水して飲料を抽出する飲料自動販売機において、販売動作時に飲料を抽出しようとする原料容器の種類を識別し、当該原料容器の種類がユーザによって選択されたものであるか否かを判定する容器識別手段を備え、前記容器識別手段は原料容器に付加した識別情報と該識別情報を読み取る識別情報読み取り装置とを含むことを特徴としている。
【０００８】請求項１に係る本発明によれば、容器識別手段によって、飲料を抽出しようとする原料容器の種類とユーザが選択した原料容器の種類とが一致するか否かを飲料抽出前に確認することができるため、両者が一致しない場合は販売動作を中止するようにして、ユーザに対する誤商品の販売を確実に防止することができる。
【０００９】請求項２に係る本発明では、請求項１に係る本発明において、前記識別情報は原料容器の種別の調理データを含むことを特徴としている。請求項２の本発明によれば、識別情報に原料容器の種類の識別データの他、原料容器の種別の調理データを盛り込み、これを原料容器の種類の識別・判定時に識別情報読み取り装置を介して取得するようにして、調理データの設定ミスに伴う誤調理商品の販売を確実に防止すると共に、調理データの設定作業を省くことができる。

【００１０】請求項３に係る本発明では、請求項１又は２に係る本発明において、前記容器識別手段によって、選択された種類ではないと判定された原料容器を保管する容器保管部を備えたことを特徴としている。請求項３に係る本発明によれば、飲料を抽出しようとする原料容器の種類とユーザが選択した原料容器の種類とが一致しない場合、当該原料容器を容器保管部に保管するようにして、当該原料容器を後に改めて販売に供することができる。

【００１１】請求項４に係る本発明では、請求項１～３のいずれかに係る本発明において、販売動作時に飲料を抽出しようとする原料容器を保持させる可動体を介して当該原料容器を搬送する容器搬送機構を備え、前記識別情報読み取り装置を前記可動体に付設したことを特徴としている。請求項４に係る本発明によれば、販売動作時に飲料を抽出しようとする原料容器を可動体に保持させる前、即ち、当該原料容器を原料容器が収納される容器収納部から搬出する前において、当該原料容器の識別情報を可動体に付設した識別情報読み取り装置によって読み取り、原料容器の種類の識別・判定を行うことができる。

【００１２】

【発明の実施の形態】図１～図７は本発明に係る飲料自動販売機の一実施形態を概略的に示すもので、図１は原料容器の下方からの斜視図、図２は飲料自動販売機の全体斜視図、図３は飲料自動機内の要部を示す斜視図、図４は図３の平面説明図、図５は制御系統のブロック図、図６は販売動作のフローチャート、図７は販売動作の工程説明図である。

【００１３】本実施形態に係る飲料自動販売機１０は、粉末原料としての一例として六種類のコーヒ粉等が飲料一杯分ずつ種別に収容された六種類の原料容器１を用いて飲料を作成・販売するものである。原料容器１の底部中央には、図１に示すように、識別情報としてのバーコード３が種別に印刷されており、このバーコード３には、原料容器１の種類の識別データと原料容器１の種別の調理データとが盛り込まれている。

【００１４】飲料自動販売機１０は、図２に示すように、自動販売機本体１０ａと自動販売機本体１０ａの前部を開閉する扉体１０ｂとを備えており、扉体１０ｂの表部には、一例として六種類の商品見本１１と、各商品見本１１に一対一で対応し、ユーザが所望の商品を選択するために押す商品選択ボタン１２と、ユーザが商品としてのカップ入り飲料を取り出すシャッタ付きの商品取り出し口１３とが設けられている。

【００１５】自動販売機本体１０ａの内部には、図３、図４及び図７に示すように、多数の原料容器１を収納する容器収納部２０と、一の原料容器１内にノズル３１を介して給湯又は給水して飲料を抽出する飲料抽出部３０と、飲料抽出後の原料容器１を廃棄する容器廃棄部４０と、販売動作時に容器収納部２０から搬出される一の原料容器１を可動体５１を介して飲料抽出部３０へ、次いで容器廃棄部４０へと搬送する容器搬送機構５０と、容器搬送機構５０の制御等を行うマイクロコンピュータ構成の制御部６０（図５参照）とを備えている。また、容器収納部２０と飲料抽出部３０との間には識別情報読み取り装置としてのバーコードリーダ７０が上方を指向されて設置されている。更にまた、後述する原料容器１の種類の識別・判定によって所定の種類のものではないと判定された原料容器１を一時的に保管する容器保管部８０が適所に設けられている。

【００１６】容器収納部２０は容器収納庫としての円筒状の収納筒２１を一例として６塔有しており、各収納筒２１には原料容器１が種別に上下一列に積み重ねられて収納される。各収納筒２１にはまた、図７に示すように、最下位の原料容器１をその鍔２（図１参照）を介して係止する係止部材２２と、可動体５１によって上昇され、係止部材２２の係止を一時的に解除させる昇降部材２３とが設けらている。

【００１７】また図７に示すように、飲料抽出部３０において、ノズル３１は湯タンク３２及び冷水源３３と湯水パイプ３４を介して連通されており、湯水パイプ３４は下流側にて合流した後、ノズル３１に接続される。尚、図示はしないが、湯水パイプ３４には電磁弁、液体ポンプ等が介設されている。

【００１８】容器廃棄部４０は上方を開放する容器から成り、また、容器保管部８０も容器廃棄部４０の容器に比べ小容積の容器から成る。

【００１９】容器搬送機構５０は、原料容器１を開口５２に受け入れて保持する上述した可動体５１と、可動体５１を水平方向及び鉛直方向に移動させるためのＸ方向搬送体５３、Ｙ方向搬送体５４及びＺ方向搬送体５５とから基本的に構成されている。Ｚ方向搬送体５５は、箱状のＺ方向本体５５ａと、Ｚ方向本体５５ａ内に配設される周知のカム機構（図示せず）と、該カム機構を制御部６０からの駆動指令に基づいて駆動し、可動体５１をＺ方向本体５５ａに対し昇降させるＺ方向駆動モータ５５ｂ（図５参照）とを備えている。Ｙ方向搬送体５４は、Ｙ方向に長尺なＹ方向フレーム体５４ａと、Ｙ方向フレーム体５４ａ内に配設される周知のベルト機構（図示せず）と、該ベルト機構を制御部６０の駆動指令に基づいて駆動して、Ｚ方向本体５５ａ及び可動体５１をＹ方向フレーム体５４ａの長手方向（Ｙ方向）に沿って搬送させるＹ方向駆動モータ５４ｂ（図５参照）とを備えている。Ｘ方向搬送体５３はＹ方向搬送体５４とほぼ同様の構成であり、Ｘ方向に長尺で自動販売機本体１０ａ内の適所に固設されるＸ方向フレーム体５３ａと、Ｘ方向フレーム体５３ａ内に配設される周知のベルト機構（図示せず）と、該ベルト機構を制御部６０の駆動指令に基づいて駆動して、Ｙ方向フレーム体５４ａ、Ｚ方向

本体５５ａ及び可動体５１をＸ方向フレーム体５４ａの長手方向（Ｘ方向）に沿って搬送させるＸ方向駆動モータ５３ｂ（図5参照）とを備えている。

【００２０】次に、図6及び図7を参照しながら飲料自動販売機１０の販売動作を説明する。尚、販売に先立ち、各商品選択ボタン１２と各収納筒２１及び原料容器１の各種類との対応付けデータが制御部６０のメモリに格納される。

【００２１】販売待機状態（Ｓ１）からユーザがいずれかの商品選択ボタン１２を押すと（Ｓ２）、商品選択信号が制御部６０に送られる。これにより制御部６０はＸ方向駆動モータ５３ｂ及びＹ方向駆動モータ５４ｂを駆動して、販売待機位置にある可動体５１を商品選択信号に対応する収納筒（以下「選択収納筒」という。）２１の直下へと移動させる（Ｓ３）。次いで、選択収納筒２１から次のようにして一の原料容器１が搬出される（Ｓ４）。即ち、制御部６０はＺ方向駆動モータ５５ｂを駆動して、選択収納筒２１直下の可動体５１を上昇させる。この可動体５１の上昇によって昇降部材２３（図7参照）が上昇し、係止部材２３による最下位の原料容器１の係止が一時的に解除され、これにより該原料容器１が落下し、可動体５１の開口５２に受け入れらて保持される。その後、可動体５１は降下される。

【００２２】次いで、可動体５１はバーコードリーダ７０の真上まで搬送され、ここで原料容器１の種類の識別・判定（Ｓ５）が次のように行われる。即ち、原料容器１底部のバーコード３をバーコードリーダ７０が読み取り、かかる読み取り信号は制御部６０に送られる。制御部６０はバーコード３の識別データを解読して、原料容器１の種類を特定すると共に、この特定した種類がユーザによって選択されたものであるか否かを判定する。そして、種類が不一致の場合、可動体５１は容器保管部８０上に搬送され、ここで原料容器１を容器保管部８０内へ放出・落下させる（Ｓ７）。これと同時に当該販売は中止され（Ｓ８）、これにより料金はユーザに返却され、当該商品選択ボタン１２には売り切れ表示が点灯する。また可動体５１は容器保管部８０上から販売待機位置へと戻される。容器保管部８０内の原料容器１は後に取り出され、再び販売に供される。尚、図示はしないが、可動体５１は一対の半割体から構成され、各半割体をＺ方向搬送体５５のカム機構の動作を介して引き離すことにより、開口５２が拡大して、原料容器１を放出できるようになっている。

【００２３】一方、上記（Ｓ５）の識別・判定において、原料容器１がユーザの選択した種類のものであると判定された場合、可動体５１は飲料抽出部３０に水平搬送された後、上昇され、これにより原料容器１内にノズル３１の先端部が気密に入り込む。次いで、制御部６０が上記識別・判定時にバーコード３からバーコードリーダ７０を介して取得した調理データに基づき、原料容器１内にノズル３１を介して給湯又は／及び給水（湯と冷水とを所定割合にて同時に供給する場合もある。）が行われ、飲料が抽出される（Ｓ９）。かかる抽出飲料は、原料容器１直下に搬送・セットされる紙製のカップ９０（図7参照）に受け入れられる。この際にはまた、カップ９０に対し、砂糖、クリーム、発砲ミルク、クラッシュアイス等が調理データに従って適宜添加され、所定の飲料が作成される。このカップ入り飲料は商品取り口１３に搬送され、ユーザに提供される。一方、可動体５１は降下された後、容器破棄部４０上に搬送され、ここで飲料抽出後の滓入りの原料容器１が放出・廃棄される（Ｓ１０）。

【００２４】以上の実施形態では、原料容器１の識別・判定（Ｓ５）によって選択種類と不一致とされた原料容器１を容器保管部８０にて保管するようにしたが、このような原料容器１を容器破棄部４０に廃棄するようにしてもよい。また、原料容器１の調理データを含む識別情報の取得形態としては、バーコード３－バコードリーダ７０に限らず、例えば、記号、数字等を用いたコードを原料容器１に付し、これを光センサ、イメージセンサ等によって光学的に読み取ったり、原料容器１にＦＲＩＤ（Radio Frequency IDentification；無線周波による非接触自動識別技術）チップを内臓し、これをリーダライタによって動作させて所定の情報を読み取るようにしてもよい。

【００２５】以上の実施形態ではまた、原料容器１を収納筒２１から搬出した後にその種類の識別・判定を行ったが、バーコードリーダ７０を可動体５１に付設することにより、可動体５１が原料容器１を受け取るべく選択収納筒２１に搬送された直後において、選択収納筒２１内最下位にある原料容器１のバーコード３を読み取るようにして、収納筒２１搬出前の原料容器１に対し種類の識別・判定を行うことができる。

【００２６】

【発明の効果】以上述べたように、請求項１に係る本発明によれば、容器識別手段によって、飲料を抽出しようとする原料容器の種類とユーザが選択した原料容器の種類とが一致するか否かを飲料抽出前に確認することができるため、両者が一致しない場合は販売動作を中止するようにして、原料容器の装填ミス等を起因とする誤商品の販売を確実に防止することができる。

【００２７】請求項２の本発明によれば、識別情報に原料容器の種類の識別データの他、原料容器の種別の調理データを盛り込み、これを原料容器の種類の識別・判定時に識別情報読み取り装置を介して取得することにより、調理データの設定ミスを起因とする誤調理商品の販売を確実に防止すると共に、面倒な調理データの設定作業を省くことができる。

【００２８】請求項３に係る本発明によれば、飲料を抽出しようとする原料容器の種類とユーザが選択した原料

容器の種類とが一致しない場合、当該原料容器を容器保管部に一時的に保管するようにして、当該原料容器を後に改めて販売に供するようにすることができる。

【００２９】請求項４に係る本発明によれば、販売動作時に飲料を抽出しようとする原料容器を可動体に保持させる前、即ち、当該原料容器を原料容器が収納される容器収納部から搬出する前において、当該原料容器の識別情報を可動体に付設した識別情報読み取り装置によって読み取り、原料容器の種類の識別・判定を行うことができる。

【図面の簡単な説明】

【図１】原料容器の下方からの斜視図

【図２】飲料自動販売機の全体概略斜視図

【図３】自動販売機本体内の要部を概略的に示す斜視説明図

【図４】図３の平面説明図

【図５】制御系統を略示するブロック図

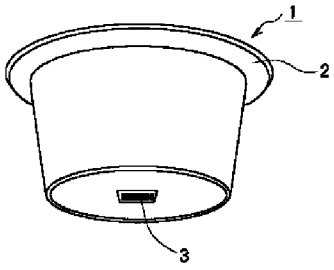
【図６】販売動作のフローチャート

【図７】販売動作の概略工程説明図

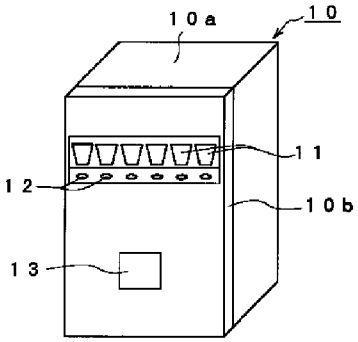
【符号の説明】

１…原料容器、３…バーコード、１０…飲料自動販売機、１２…商品選択ボタン、２０…容器収納部、２１…収納筒、３０…飲料抽出部、３１…ノズル、５０…容器搬送機構、５１…可動体、５３…Ｘ方向搬送体、５４…Ｙ方向搬送体、５５…Ｚ方向搬送体、６０…制御部、７０…バーコードリーダ、８０…容器廃棄部

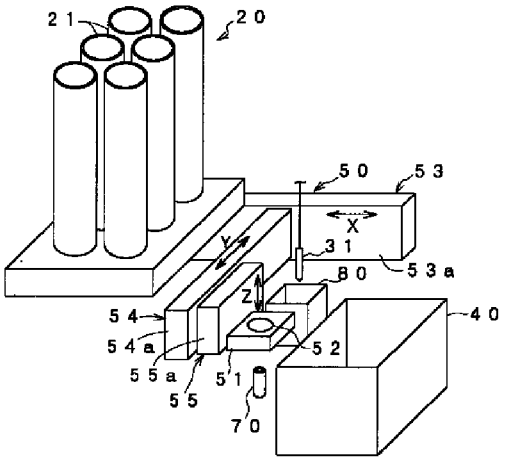
【図１】



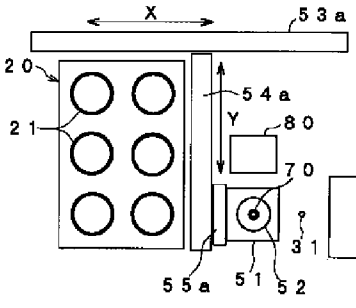
【図２】



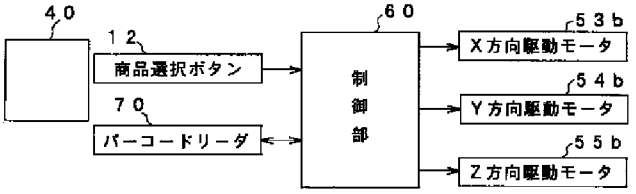
【図３】



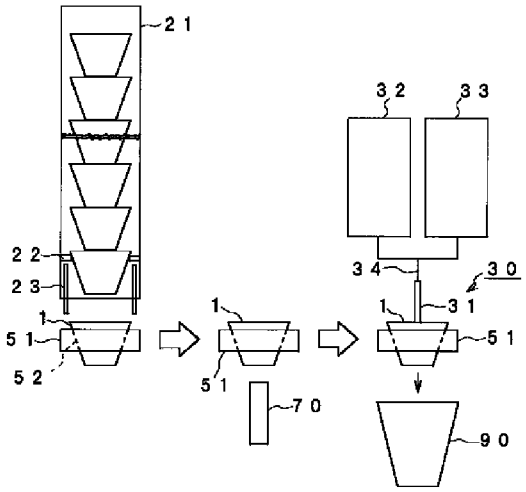
【図４】



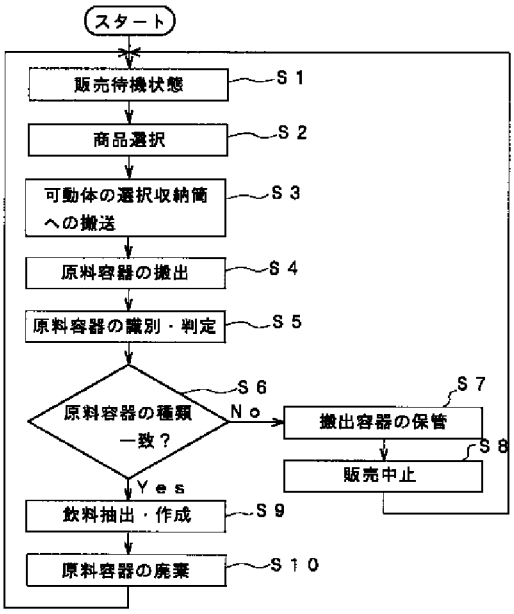
【図５】



【図6】



【図7】



フロントページの続き

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(54) Comestible containing packages.

(57) A sealed package (1) containing one or more powder, paste or liquid comestible ingredients and being formed from substantially air- and water-impermeable materials, which package comprises an inlet (12) an outlet (3) a compartment (2) containing one or more powder, paste or liquid comestible ingredients, a channel (11) communicating with the inlet for the entry of a fluid medium into the package, which channel extends along at least a part of one side of the said compartment, the channel being separated from the compartment by a wall (14) which has at least one opening (13) formed therein for the entry of the fluid medium into the compartment containing the powder, paste or liquid comestible ingredients, the dimensions of the opening(s) being chosen so that, in use, jetting into the compartment and turbulent flow of the fluid medium in the compartment of the package is acheived.

EP 0 449 533 A1

K-FEE SYSTEM GMBH, EX2009, page 1918
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

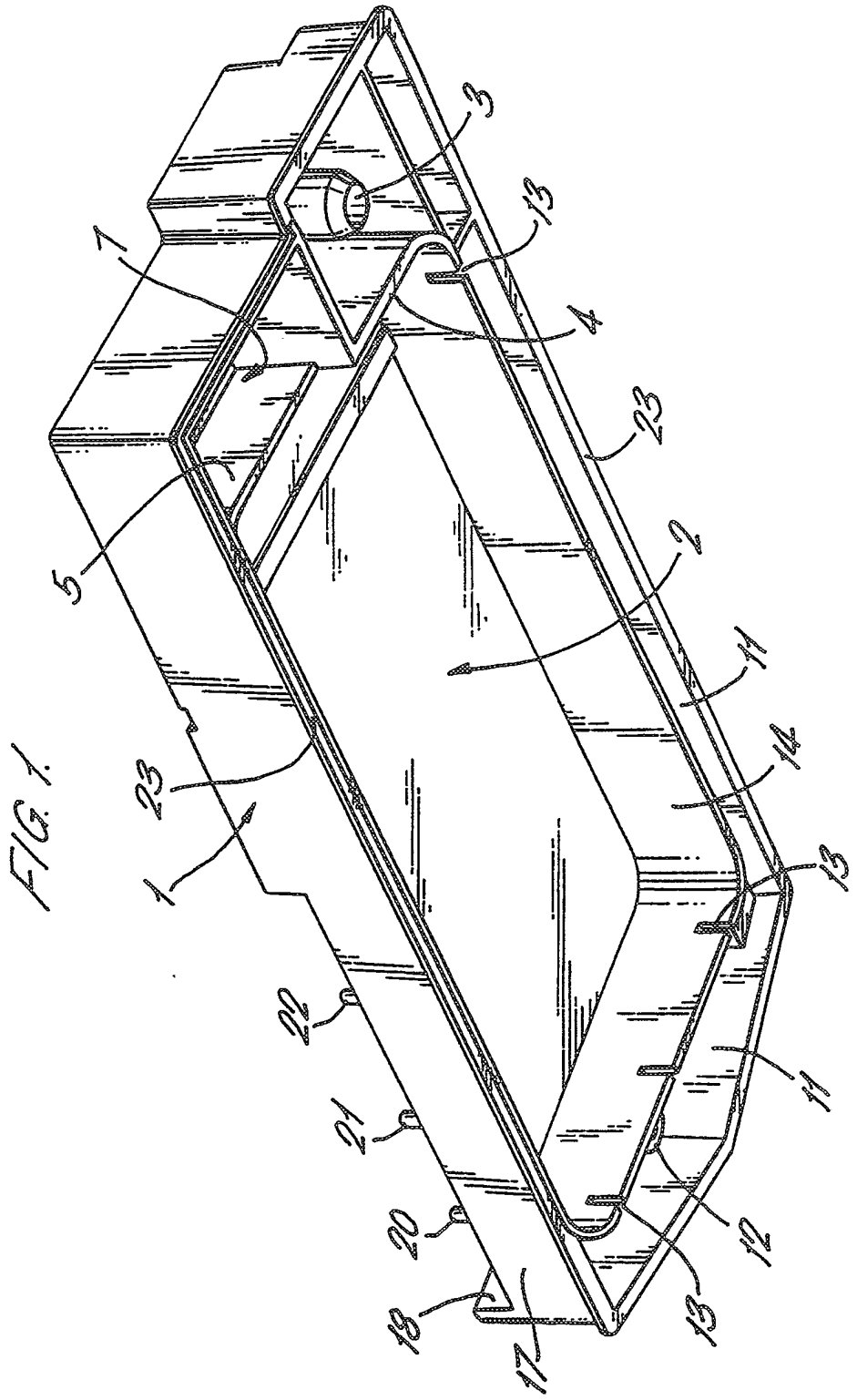


FIG. 1.

The present invention relates to packages containing comestibles and, in particular, to sealed packages which are formed from a substantially air-and water-impermeable material and which contain comestibles, preferably 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 powder, paste or liquid beverage preparation ingredients such as powdered chocolate, powdered coffee or powdered soup. The powdered beverage preparation ingredients are thus usually soluble and dissolve in the water introduced into the package thereby to form the beverage. However, problems may be encountered when the packages contain one or more powdered beverage preparation ingredients because the powdered beverage preparation are often difficult to dissolve rapidly in the course of preparation of the beverage.

Packages which contain comestibles other than beverage preparation ingredients, for example mustard powder or paste and powders or pastes for the preparation of sweet or savoury sauces are also known.

We have now developed a modified package containing one or more powder, paste or liquid comestibles which has an improved water entry system which facilitates the rapid dissolution and/or slurrying of the comestibles.

Accordingly, the present invention provides a sealed package containing one or more powder, paste or liquid comestible ingredients and being formed from substantially air- and water-impermeable materials, which package comprises an inlet, an outlet, a compartment containing one or more powder, paste or liquid comestible ingredients, a channel communicating with the inlet for the entry of a fluid medium into the package, which channel extends along at least a part of one side of the said compartment, the channel being separated from the compartment by a wall which has at least one restricted opening formed therein for the entry of the fluid medium into the compartment containing the powder, paste or liquid comestible ingredients, the dimensions of the opening(s) being chosen so that, in use, jetting into the compartment and turbulent flow of the fluid medium in the compartment of the package is acheived.

The channel formed between the wall of the package and the compartment preferably extends along at least one side of the compartment containing the powdered comestible ingredients, more preferably along two sides of the compartment containing the powder, paste or liquid comestible ingredients.

Preferably the restricted openings comprise a plurality of elongate slots formed in the wall which separates the compartment containing the powder, paste or liquid comestible ingredients from the channel. The ratio of the length of the slot or slots to the width thereof is preferably in the range of from 5:1 to 10:1. A particular preferred slot for use with water under a pressure of about 10^5Pa is a slot having a length of about 3.5 mm and a width of about 0.5 mm.

The fluid medium which is introduced into the packages of the present invention will generally be water for those packages containing powdered ingredients for the preparation of beverages. It will be appreciated, however, that for the preparation of salad cream and various sauces, such as tomato sauce, other liquid media may be used, for example an oil/water or vinegar/water mixture as appropriate. For the preparation of carbonated beverages the fluid medium will be carbonated water. The fluid medium is introduced into the package under pressure, for example a pressure of about 10^5Pa.

The packages of the present invention are preferably packages which contain one or more powdered

K-FEE SYSTEM GMBH, EX2009, page 1920
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

beverage preparation ingredients and the invention will be more fully described hereinbelow with reference to such packages.

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 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.

The present invention also includes within its scope a method for the preparation of a comestible from a sealed package containing one or more powder, paste or liquid comestible ingredients located in a compartment of the package, which method comprises introducing a fluid medium suitable for the preparation of the comestible under pressure into the package through an inlet formed therein, causing the fluid medium to enter the compartment containing the powder, paste or liquid comestible ingredients as one or more jets and/or as a turbulent flow, thereby effecting dissolution and/or slurrying of the powder, liquid or paste comestible ingredients, and collecting the comestible 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 fluid medium into the package. For the preparation of beverages from powdered beverage preparation ingredients the fluid medium introduced into the package will be water and/or air.

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 a powder, paste or liquid comestible, preferably one or more powdered beverage preparation ingredients, for example, powdered chocolate, powdered soup, powdered coffee, 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

K-FEE SYSTEM GMBH, EX2009, page 1921
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of part of a beverage package of the invention; and

Figure 2 is a top plan view of the beverage package of Figure 1.

Referring to Figures 1 and 2, 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 powdered beverage preparation ingredient or ingredients are contained. The package body has an outlet nozzle 3 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. An extension 5 of wall 4 separates the compartment 2 from a chamber 7 which is positioned between the said compartment 2 and the outlet nozzle 3. As best shown in Figure 2, a flap 8 covers the chamber 7 and thereby prevents any powder which migrates from compartment 2 entering outlet nozzle 3. The flap 8 is joined along edge 9 thereof to a turned over portion of outside wall 10 of the container. The other three edges of the flap are in close proximity to the other walls of the chamber 7, but are not attached thereto. The flap 8 is constructed from a thin plastics material which is substantial enough to resist the weight of the powdered ingredient(s) before the capsule is used. The flap 8 is attached by flap edge 9 to the turned over portion of wall 10 and may be formed either by moulding a fine gap around the flap, or by shearing the flap on three sides as a post-moulding operation.

In use of the beverage package as shown in Figures 1 and 2 the bottom of the package 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 for the lower outer edge 23 of the package 1. 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 a channel 11 surrounding two sides of the compartment 2 containing the beverage ingredients. The water, which is under pressure, is forced through a plurality of elongate slots 13 formed in the wall 14 which separates channel 11 from compartment 2. The slots 13 as shown in Figure 1 are each approximately 0.5 mm wide and 3.5 mm long. The slots 13 act to restrict the flow of water under pressure through them and give rise to jetting into the compartment and turbulent flow of the water in the compartment 2. The jetting and turbulent flow effects a mixing and dissolution of the beverage preparation ingredients. In the arrangement as shown in Figure 1, three slots 13 are spaced at intervals along the short arm of wall 14 adjacent the inlet 12 and a single slot is positioned in the long arm of wall 14 at the end of channel 11 remote from the inlet 12. The water entering through the three slots 13 in the short arm of wall 14 penetrates the compartment 2 containing the beverage preparation ingredients and preferably will enter this compartment as jets of water with an associated turbulence around the edges thereof. The jetting/turbulence acts to wash the powder away from the slots and avoids the powder merely wetting and forming agglomerates. The water entering through the single slot 13 in the long arm of wall 14 assists in washing away any powder near to the outlet area and in the general circulation of water in the package. The beverage so-formed, or the mixture of beverage ingredient(s) and water, then passes through a slit 15, formed between the bottom of wall 5 and the aluminium foil or laminated foil sealing the bottom of the package, into chamber 7. The pressure of the beverage, or the mixture of beverage ingredient(s) and water causes the flap 8 to be displaced by the flow thereof and the beverage then flows into outlet nozzle 3 which is opened by piercing or cutting the material which covers it. The beverage is then collected in a cup or other receptacle placed below the outlet nozzle 3. It will be understood that the velocity of the water entering the package will be chosen so that the desired jetting and turbulent flow of water into and in the package is achieved. Using the package as illustrated in Figures 1 and 2 it is possible to prepare 160 ml of chocolate from powdered chocolate in 20 seconds by passing water at a pressure of 10^5Pa through the package.

The beverage package as illustrated in Figures 1 to 2 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 15 moulded along one side wall of compartment 2. The teeth 15 have recesses 16 formed therebetween. These teeth 15 are intended to enable the beverage package to be driven through a beverage preparation machine by the engagement of the teeth 15 with the tooth of a cam (not shown). The side wall 17 of the beverage package has an elongate recess 18 formed therein near to the leading end 19 of the package.

As the package is driven into the beverage preparation machine the elongate recess 18 is sensed as the side edge of the package passes beneath a sensing arm (not shown). The elongate recess has a plurality of upstanding pegs 20,21,22 located therein and as the package is driven into the machine by the engagement of the teeth 15 with the tooth of a cam, the sensor senses the presence or absence of upstanding pegs 20,21,22.

If one or more of pegs 20,21,22 is not present the

K-FEE SYSTEM GMBH, EX2009, page 1922
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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 20,21,22 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 the pegs 20,21,22 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

It will be understood that the presence of one or more further pegs at the top of package wall 17 would provide 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, an outlet 3 formed 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.

Although the present invention has been described with specific reference to the preparation of beverages from powdered beverage preparation ingredients, it is to be understood that the invention is not limited to packages containing only powdered beverage ingredients, but also includes within its scope packages containing other powder, paste or liquid comestibles.

Claims

1. A sealed package containing one or more powder, paste or liquid comestible ingredients and being formed from substantially air- and water-impermeable materials, which package comprises an inlet, an outlet, a compartment containing one or more powder, paste or liquid comestible ingredients, a channel communicating with the inlet for the entry of a fluid medium into the package, which channel extends along at least a part of one side of the said compartment, the channel being separated from the compartment by a wall which has at least one opening formed therein for the entry of the fluid medium into the compartment containing the powder, paste or liquid comestible ingredients, the dimensions of the opening(s) being chosen so that, in use, jetting into the compartment and turbulent flow of the fluid medium in the compartment of the package is acheived.

2. A package as claimed in claim 1 wherein the inlet and/or the outlet is covered by a substantially air- and water-impermeable material prior to the formation, in use, of the inlet or outlet in the package.

3. A package as claimed in claim 1 wherein the inlet and/or the outlet is closed by a plug prior to the formation, in use, of the inlet or outlet in the package.

4. A package as claimed in any one of the preceding claims wherein the channel extends along at least one side of the compartment containing the comestible ingredients.

5. A package as claimed in claim 4 wherein the channel extends along two sides of the compartment containing the comestible ingredients.

6. A package as claimed in any one of the preceding claims wherein the restricted openings comprise a plurality of elongate slots formed in the wall which separates the compartment containing the comestible ingredients from the channel.

7. A package as claimed in claim 6 wherein the ratio of the length of the slot or slots to the width thereof is in the range of from 5:1 to 10:1.

8. A package as claimed in claim 7 wherein the length of the slot or slots is about 3.5 mm and the width of the slot or slots is 0.5 mm.

9. A package as claimed in any one of the preceding claims wherein the powder, paste or liquid ingredient or ingredients are beverage preparation

K-FEE SYSTEM GMBH, EX2009, page 1923
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

ingredients.

10. 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 liquid medium into the package.

11. A package as claimed in claim 10 wherein the recognition means comprises one or more surface features formed in the body of the package.

12. A package as claimed in claim 10 wherein the recognition means comprises a bar code.

13. A package as claimed in claim 10 wherein the recognition means comprises a pattern of holes formed in the body of the package.

14. A package as claimed in claim 10 wherein the recognition means comprises a pattern of contrasting tones or colours.

15. A package as claimed in claim 10 wherein the recognition means comprises one or more strips of a magnetic material.

16. A package as claimed in claim 10 wherein the recognition means comprises an inductive device.

17. A package as claimed in claim 10 wherein the recognition means comprises a plurality of electrically conductive means.

18. A method for the preparation of a comestible from a sealed package containing one or more powder, paste or liquid comestible ingredients located in a compartment of the package, which method comprises introducing a fluid medium suitable for the preparation of the comestible under pressure into the package through an inlet formed therein, causing the fluid medium to enter the compartment containing the powder, paste or liquid comestible ingredients as one or more jets and/or as a turbulent flow, thereby effecting dissolution and/or slurrying of the comestible ingredients, and collecting the comestible from an outlet formed in the package.

19. A method as claimed in claim 18 wherein the inlet and/or outlet in the package is/are formed by means of a piercing and cutting tool.

20. A method as claimed in claim 18 or claim 19 wherein the fluid medium is water, a water/oil mixture, a vinegar/oil mixture or carbonated water.

21. A method as claimed in any one of claims 18 to 20 wherein the fluid medium is introduced into the package at a pressure of at least 10^5Pa.

22. A method as claimed in any one of claims 18 to 21 wherein the jetting and/or turbulent flow of the fluid medium into the compartment containing the powder, paste or liquid comestible ingredients is achieved by causing the fluid to flow through one or more openings into the said compartment.

23. A method as claimed in claim 22 wherein the openings are elongate slots.

K-FEE SYSTEM GMBH, EX2009, page 1924
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

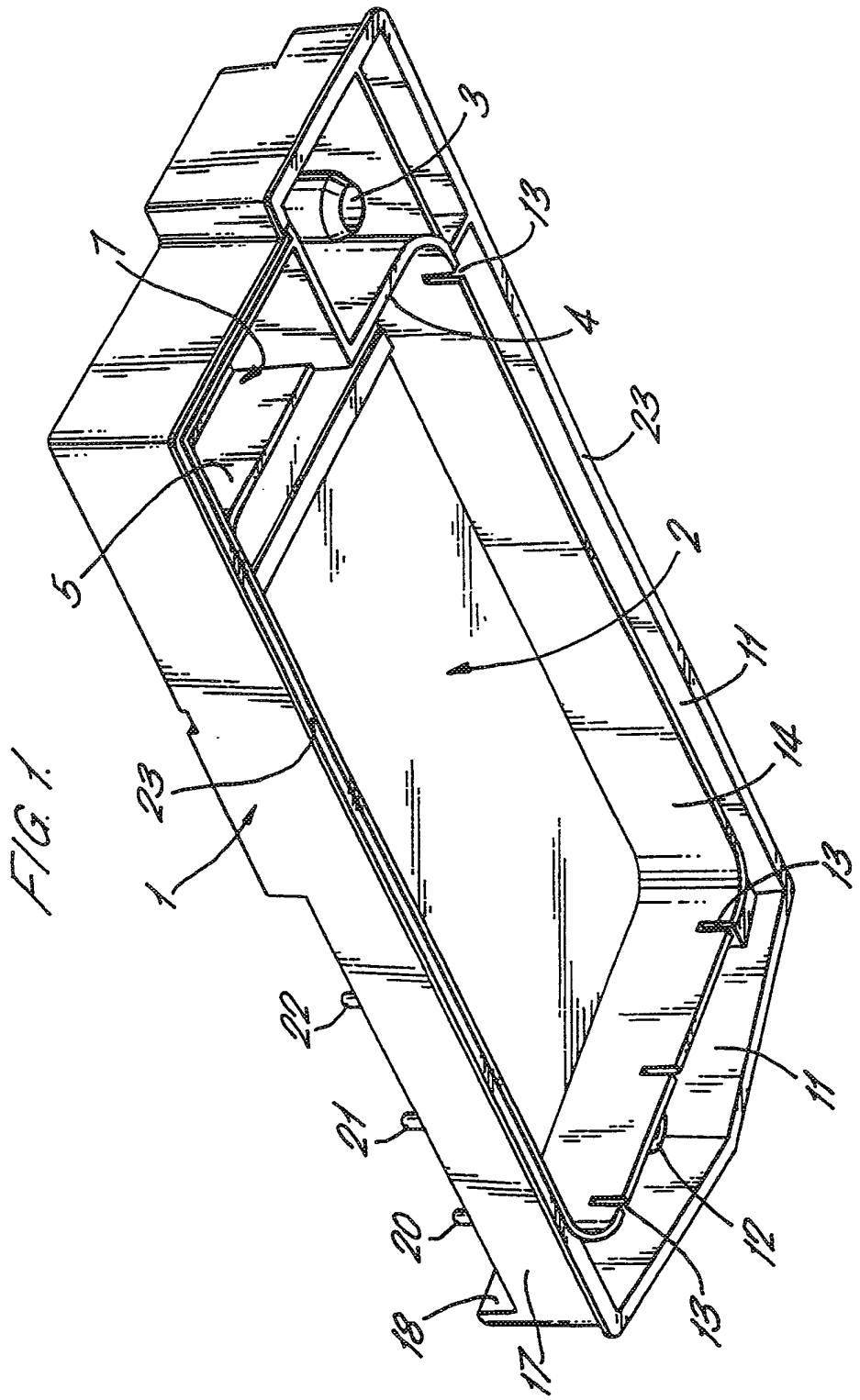


FIG. 1.

K-FEE SYSTEM GMBH, EX2009, page 1925
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

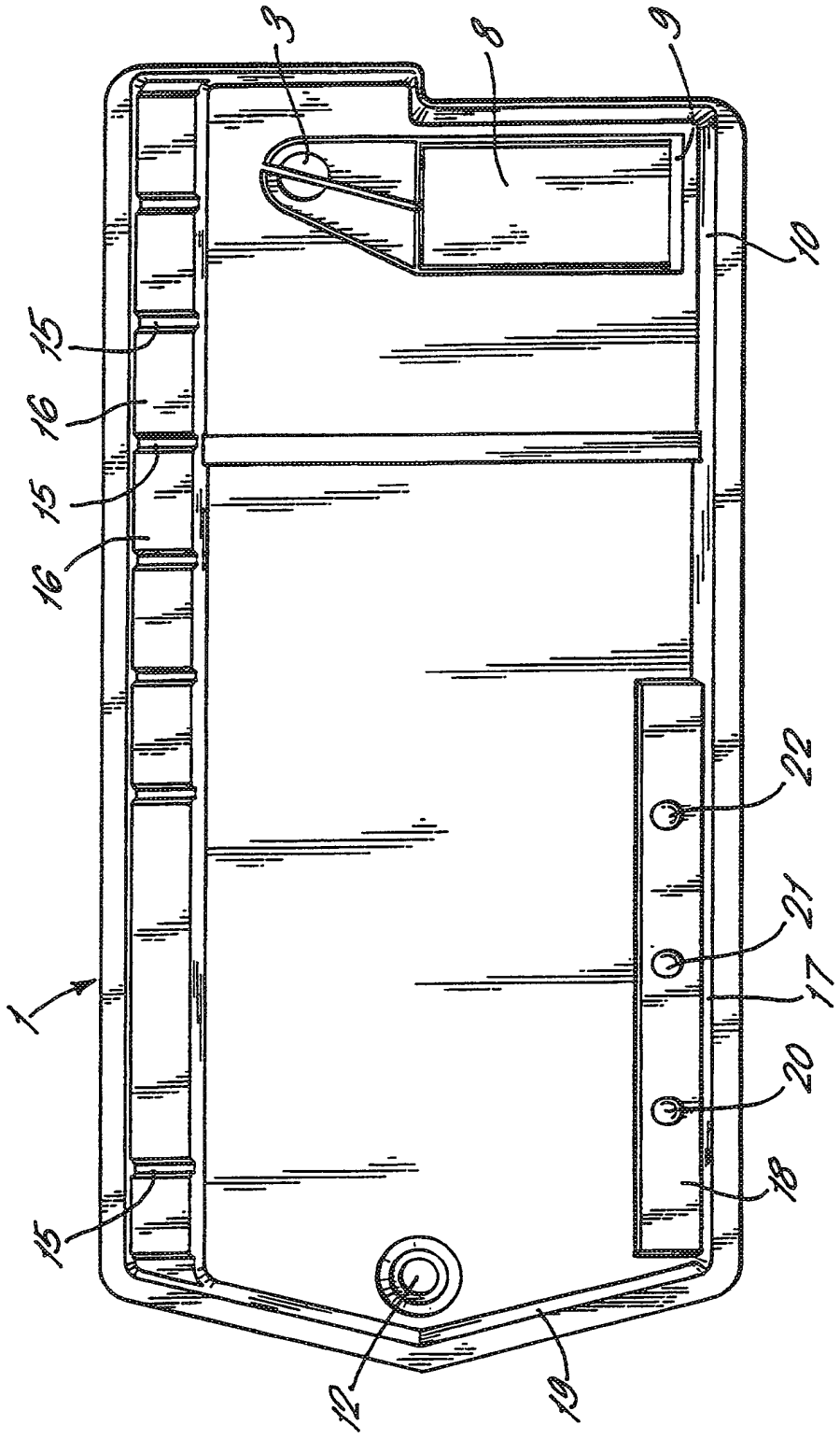


FIG. 2.

K-FEE SYSTEM GMBH, EX2009, page 1926
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2539

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)
D,X D,Y	EP-A-0272922 (GENERAL FOODS LIMITED) * the whole document *	1, 2, 4, 5, 9, 18 19-22	B65D81/00
D,Y	EP-A-0334572 (GENERAL FOODS LIMITED) * the whole document *	19-22	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	02 JULY 1991	SMITH C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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K-FEE SYSTEM GMBH, EX2009, page 1927
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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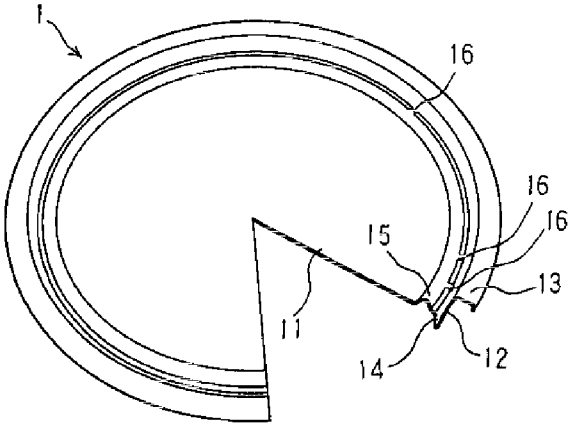
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(54)【発明の名称】　識別マーク付き缶蓋およびその成形方法

(57)【要約】
【課題】　カウンターシンク部やビード部のようなパネル補強部を備えた缶蓋について、製造工場や製造ラインなどを識別するための識別マークを、余り目立つことなく、しかも、上方から一目で確認できるものにすると共に、そのような識別マークを、専用の装置や工程を必要とすることなく、また、缶蓋の内外面に損傷を与えるようなことなく施すことができるようにする。
【解決手段】　略円板状のパネル部１１に対して補強のための環状溝１４，又は環状突起１５，或いはその両方１４，１５が形成されている缶蓋１において、環状溝１４又は環状突起１５の縁部で、その円周方向の所望位置に、金属面の凹凸による識別マーク１６を施す。



K-FEE SYSTEM GMBH, EX2009, page 1928
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

【特許請求の範囲】
【請求項１】　略円板状のパネル部に対して補強のための環状溝，又は環状突起，或いはその両方が形成されている缶蓋において、環状溝又は環状突起の縁部で、その円周方向の所望位置に、金属面の凹凸による識別マークが施されていることを特徴とする識別マーク付き缶蓋。
【請求項２】　フランジカール部の内側に形成された逆円錐筒状のチャックウォール部と略円板状のパネル部との間に、補強用の環状溝であるカウンターシンク部が形成され、カウンターシンク部と僅かに間隔を置いたパネル部の周辺部分に、補強用の環状突起であるビード部が形成されている缶蓋において、カウンターシンク部とビード部の間で、その円周方向の所望位置に、識別マークが凹設されていることを特徴とする請求項１に記載の識別マーク付き缶蓋。
【請求項３】　略円板状のパネル部の外側に逆円錐筒状のチャックウォール部とフランジカール部が成形されている状態から、パネル部を缶蓋上面側に押圧することにより、パネル部とチャックウォール部の間にカウンターシンク部を成形するのに際して、パネル部を押圧する金型部品と、その押圧力をパネル部を介して受ける金型部品とに対して、両方の金型部品の間に挟み込まれるパネル部の周辺部分を噛み込むように、両方の金型部品の対向面の一方に環状の凸部を、他方に環状の凹部をそれぞれ形成しておくと共に、パネル部を押圧する金型部品の角部に対して、その円周方向の所望の位置に、角部を部分的に切り欠くような溝状の凹部を形成しておくことで、カウンターシンク部の成形に先立って、金型部品同士の噛み込みにより補強用のビード部を成形してから、カウンターシンク部の成形時に、金型部品の角部に切り欠かれた凹部に缶蓋の金属材料を引き込むことで、識別マークを成形していることを特徴とする識別マーク付き缶蓋の成形方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、容器の製造工場や製造ラインなどを識別するための識別マークが施された缶蓋に関し、特に、パネル部に対して補強用の環状溝や環状突起が形成されていて識別マークが施されている缶蓋と、そのような缶蓋において識別マークを効果的に成形するための方法とに関する。
【０００２】
【従来の技術】飲料や食品を内容物とする缶詰では、製品の中に不良品が発見されたときに、その缶詰が製造された工場や製造ラインを簡単に知ることができて適正に対処できるように、缶詰製造に関する情報を底蓋に表示するということが従来から行われていると共に、容器自体に起因する不良品が発生した場合に備えて、前記のような缶詰情報とは別に、容器自体の製造工場や製造ラインなどを識別するために、製造容器に関する情報を識別マークとして缶容器に施しておくということが従来から行われていて、そのような識別マークを缶蓋（上蓋や底蓋として缶胴の端部に巻締固着される缶の端板部）のパネル部や巻締部などに施すということも従来から公知となっている（例えば、特公平２－３７３０８号公報，特公昭５５－３６５４２号公報等参照）。
【０００３】一方、炭酸飲料やビールを内容物とする缶詰や、内容物の充填時に液体窒素を滴下した飲料缶詰など、缶の内圧が高い正内圧缶（陽圧缶）では、アルミニウム材料による缶蓋の耐圧強度を向上させるために、略円板状のパネル部の外側に逆円錐筒状のチャックウォール部を介してフランジカール部が形成された所謂フラットシェルに対し、そのパネル部とチャックウォール部の間に、補強のための環状溝であるカウンターシンク部を形成するということが従来から一般的に行われており、更に、そのようなカウンターシンク部を備えた缶蓋に対して、カウンターシンク部と僅かに間隔を置いたパネル部の周辺部分に、補強のためのビード部を環状に形成するということも従来公知となっている（例えば、米国特許第３４１７８９８号明細書参照）。
【０００４】
【発明が解決しようとする課題】ところで、上記のように補強のためにカウンターシンク部やビード部が形成されている缶蓋に対して、容器（特に缶蓋自体）の製造工場や製造ラインなどを識別するための識別マークを施す場合、そのような識別マークは余り目立たず且つ識別し易いようにすることが好ましいが、例えば、特公平２－３７３０８号公報に示すように、缶蓋のパネル部に印字で識別マークを施すと、缶詰情報のマークと誤認されることがないようにするために、識別マークを施すための専用の印字装置や印字工程や特別な識別工程が必要となることから、製造コストが上昇することとなる。
【０００５】一方、パネル部に識別マークを刻印すると缶蓋の内面塗装に亀裂や剥離などの損傷を与える虞があることから、例えば、特公昭５５－３６５４２号公報に示すように、缶蓋の巻締工程等においてロールやチャックにより巻締部の外面側又は内面側に識別マークを刻印したり、或いは、巻締部の外面側又は内面側となる予定の位置に予め刻印や印刷等により識別マークを予め施すような場合、識別マークは余り目立たなくなるが、上方から（上面視で）一目で識別マークを確認することはできず、側方（又は斜め上方）からでは見る位置によって識別マークを確認できないことがある。
【０００６】また、巻締部となる予定の位置に予め刻印や印刷をするための装置や工程が必要となったり、巻締工程でロールやチャックにより刻印するにしても、刻印用の特別なロールやチャックを使用しなければならず、しかも、何れにしても刻印による場合は、缶蓋の外面塗装を損傷することで錆を誘発するような虞がある。
【０００７】本発明は、上記のような問題の解消を課題

とするものであり、具体的には、カウンターシンク部やビード部のようなパネル補強部を備えた缶蓋について、容器の製造工場や製造ラインなどを識別するための識別マークを、余り目立つことなく、しかも、上方から一目で確認できるようにすると共に、そのような識別マークを、専用の装置や工程を必要とすることなく、また、缶蓋の内外面に損傷を与えることなく施すことができるようにすることを課題とするものである。

【０００８】

【課題を解決するための手段】本発明は、上記のような課題を解決するために、上記の請求項１に記載したように、略円板状のパネル部に対して補強のための環状溝，又は環状突起，或いはその両方が形成されている缶蓋において、環状溝又は環状突起の縁部で、その円周方向の所望位置に、金属面の凹凸による識別マークを施すことを特徴とするものである。

【０００９】そのような識別マーク付き缶蓋によれば、環状溝や環状突起の縁部に対して金属面の凹凸による識別マークを施していることにより、環状溝や環状突起の凹凸に目が奪われることで識別マークが目立つようなことがなく、しかも、上方から識別マークを一目で確認することができると共に、缶蓋の成形工程において、環状溝や環状突起を成形する際に、それらを成形するための金型部品を用いて識別マークを成形することが可能となる。

【００１０】すなわち、例えば、上記の請求項２に記載した缶蓋を成形するために、上記の請求項３に記載した成形方法を適用したような場合、突出した工具で識別マークを刻印して成形するようなことなく、缶蓋の成形工程で環状溝や環状突起を成形するための金型部品によって、該金型部品の凹部に缶蓋の金属材料を引き込むように識別マークを成形することができるため、識別マークのための専用の装置や工程を必要とすることなく、また、缶蓋の内外面に損傷を与えることなく、金属面の凹凸による識別マークを缶蓋に施すことができる。

【００１１】

【発明の実施の形態】以下、本発明の識別マーク付き缶蓋およびその成形方法の実施形態について、図面に基づいて詳細に説明する。なお、図１は、本発明の識別マーク付き缶蓋の一実施形態を示すものであって、図２は、そのような缶蓋について（Ａ）上方から（上面視で）見た状態と、（Ｂ）図ＡのＢ－Ｂ線に沿った縦断面と、（Ｃ）図ＡのＣ－Ｃ線に沿った縦断面とを示すものである。また、図１に示した缶蓋の成形方法について、図３（Ａ），（Ｂ）は、ビード部が成形される時の状態を示し、図４（Ａ），（Ｂ）は、カウンターシンク部と識別マークが成形された時の状態を示すものである。

【００１２】本実施形態の缶蓋１は、例えば、両面に０．０２ｍｍ厚のポリブチレンテレフタレート樹脂とポリエチレンテレフタレート樹脂との混合樹脂フィルムを熱融着させたアルミニウム合金（５１８２－Ｈ３９）製で板厚が０．３０５ｍｍの金属板等のような製缶用の薄い金属板を材料として、該金属板をブランクに裁断してプレス成形されたものであり、フランジカール部の裏側に有機高分子製のシール剤が塗布されてから、缶の底蓋又は上蓋として缶胴の開口端部に巻締固着されるものである。

【００１３】缶蓋１には、図１に示すように、中央部で略円板状のパネル部１１と、フランジカール部１３の内側に形成された逆円錐筒状のチャックウォール部１２と間に、補強用の環状溝であるカウンターシンク部１４が形成されていると共に、このカウンターシンク部１４と僅かに間隔を置いて、パネル部１１の周辺部分に、補強用の環状突起であるビード部１５が形成されており、更に、カウンターシンク部１４とビード部１５の間で、その円周方向の所望位置に、容器（缶蓋）の製造工場や製造ラインやパンチ番号などを識別するための識別マーク１６が凹設されている。

【００１４】すなわち、本実施形態では、識別マーク１６は、図２（Ａ）に示すように、カウンターシンク部１４とビード部１５の間の部分に円周方向で間隔を置いて複数（図示したものでは３箇所）施されており、それぞれの識別マーク１６は、図２（Ｂ）に示すような他の部分と比べて、図２（Ｃ）に示すように、カウンターシンク部１４とビード部１５の間の角部を落とすように凹設されていて、この識別マーク１６の数や位置（間隔）を所望のものとすることによって、容器（缶蓋）を製造した工場や製造ラインやパンチ番号などを特定できるようにしている。

【００１５】上記のようにカウンターシンク部１４とビード部１５の間の部分に識別マーク１６が凹設されている本実施形態の缶蓋１を成形するに際して、その識別マーク１６を成形するための方法について、図３および図４により以下に説明する。

【００１６】図３（Ａ）は、金属板のブランクからフラットシェル（カウンターシンク部やビード部の無いパネル部がフラットな缶蓋）が成形された状態を示すもので、ダイカッター２１とパンチコアリング２２とノックアウトリング２３とショルダーサポート２４とパネルフォームリング２５とで挟み込まれることにより、平坦なパネル部１１の外側に逆円錐筒状のチャックウォール部１２とフランジカール部１３が一体的に成形されている。

【００１７】なお、パネルフォームリング２５と、これに対向するパンチコア２６には、それぞれの対向面に対して、パネルフォームリング２５の周辺部分に環状の凹部２５ａが形成されており、パンチコア２６の周辺部分に環状の凸部２６ａが形成されていて、更に、パンチコア２６の角部には、その円周方向の所望位置に、該角部を部分的に切り欠くような溝状の凹部２６ｂが形成され

ている。

【００１８】そのような状態から、パンチコア２６を下降させることにより、先ず、図３（Ｂ）に示すように、パネルフォームリング２５とパンチコア２６の間に挟み込まれたパネル部１１が、パンチコア２６により押圧されることで、パンチコア２６の側に形成された環状の凸部２６ａとパネルフォームリング２５の側に形成された環状の凹部２５ａとに噛み込まれて、パネル部１１の周辺部分にビード部１５が環状に成形される。

【００１９】そして、パネル部１１の周辺部分にビード部１５が環状に成形された状態から、更に、パネルフォームリング２５を押し下げるようにパンチコア２６を下降させることにより、パンチコア２６とパネルフォームリング２５の間に挟み込まれたパネル部１１が押し下げられる（缶蓋上面側に押圧される）のに対して、パネル部１１の押し下げにより缶蓋全体が下方に移動しようとするのをノックアウトリング２３とショルダーサポート２４が受け止めて阻止していることで、図４（Ａ）に示すように、パネル部１１の押し下げに連れてその外周部が折り返されて、パネル部１１とチャックウォール部１２の間にカウンターシンク部１４が成形される。

【００２０】そのようなカウンターシンク部の成形時において、パンチコア２６の角部の大部分では、図４（Ａ）に示すように、カウンターシンク部１４とビード部１５の間の部分は、パネルフォームリング２５とパンチコア２６により挟持されていることから、パネル部１１の押し下げに連れて変形するようなことはなく、図２（Ｂ）に示すような状態に成形されるのに対して、パンチコア２６の角部に凹部２６ｂが切り欠かれている部分では、図４（Ｂ）に示すように、カウンターシンク部１４とビード部１５の間の部分は、パネル部１１の押し下げに連れて凹部２６ｂ内に引き込まれるように変形することとなり、その結果、図２（Ｃ）に示すように、カウンターシンク部１４の内縁部に対して識別マーク１６が凹設されることとなる。

【００２１】上記のようにカウンターシンク部１４の内縁部（カウンターシンク部１４とビード部１５の間の部分）に識別マーク１６が凹設されている本実施形態の缶蓋１によれば、カウンターシンク部１４やビード部１５の凹凸に目が奪われることで識別マーク１６が目立つようなことはなく、しかも、上方から識別マーク１６を一目で確認することができる。

【００２２】また、カウンターシンク部１４を成形するための金型部品であるパンチコア２６に対して、その角部の所望位置に凹部（溝部）２６ｂを形成しておくだけで、カウンターシンク部１４の成形時に、専用の工具や工程を必要とすることなく識別マーク１６を成形することが可能になると共に、突出した工具で刻印するのではなく、凹部（溝部）２６ｂへの金属材料の引き込みにより識別マーク１６を成形できることで、缶蓋の内外面に損傷を与えることなく識別マーク１６を凹設することが可能となる。

【００２３】特に、本実施形態では、缶蓋１には、カウンターシンク部１４と僅かに間隔を置いて、補強用の環状突起であるビード部１５が形成されており、そのような缶蓋１を成形する際には、カウンターシンク部１４の成形に先立って、パンチコア２６側の凸部２６ａとパネルフォームリング２５側の凹部２５ａとの噛み込みによりビード部１５を成形している。

【００２４】それにより、識別マーク１６が凹設される時のパンチコア２６の凹部（溝部）２６ｂへの金属材料の引き込みが、既にビード部１５の成形時から始まって、カウンターシンク部１４の成形時には、ビード部１５から識別マーク１６の溝底が直線的に続くように引き込まれることで、金属材料の引き込みによる識別マーク１６の成形が効果的に行われると共に、識別マーク１６の成形時に缶蓋の内外面に損傷を与えるということを一層効果的に防止することができる。

【００２５】以上、本発明の識別マーク付き缶蓋およびその成形方法について一実施形態により説明したが、本発明は、上記のような実施形態に限定されるものではなく、例えば、上記の実施形態に示した缶蓋はカウンターシンク部とビード部の両方を備えたものであるが、カウンターシンク部とビード部の何れか一方のみを有する缶蓋として、カウンターシンク部又はビード部の縁部に識別マークを施すように実施することも可能である等、適宜設計変更可能なものであることはいうまでもない。

【００２６】

【発明の効果】以上説明したような本発明の識別マーク付き缶蓋によれば、製造工場や製造ラインなどを識別するための識別マークを、余り目立たせることなく、しかも、上方から一目で確認することができると共に、専用の装置や工程を必要とすることなく、また、缶蓋の内外面に損傷を与えるようなことなく、缶蓋に識別マークを施すことが可能となる。更に、そのような缶蓋を成形するための本発明の成形方法によれば、識別マークの成形をより効果的に行うことができる。

【図面の簡単な説明】

【図１】本発明の識別マーク付き缶蓋の一実施形態を示す部分切欠き斜視図。

【図２】図１に示した缶蓋の（Ａ）上面図、（Ｂ）図AのＢ－Ｂ線に沿った縦断面図、および（Ｃ）図AのＣ－Ｃ線に沿った縦断面図。

【図３】図１に示した缶蓋のビード部の成形について、（Ａ）ビード部が成形される前の状態と、（Ｂ）ビード部が成形された時の状態とをそれぞれ示す縦断面図。

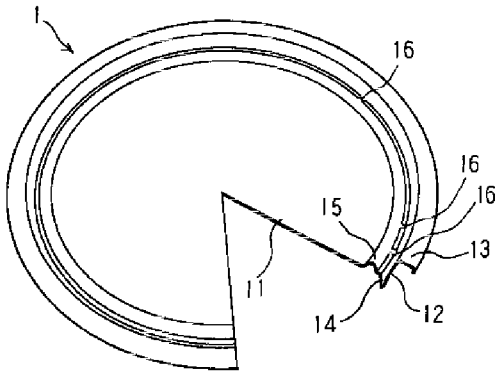
【図４】図１に示した缶蓋のカウンターシンク部の成形について、（Ａ）識別マークが成形されない部分と、（Ｂ）識別マークが成形される部分とをそれぞれ示す縦断面図。

K-FEE SYSTEM GMBH, EX2009, page 1931
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

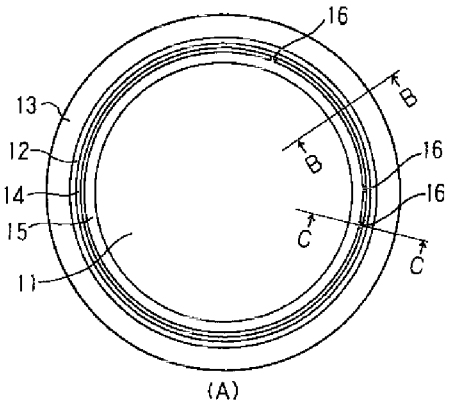
【符号の説明】

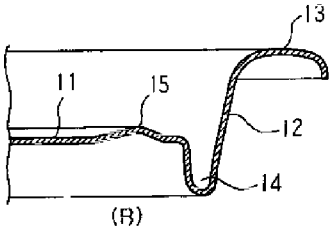
1	缶蓋
11	パネル部
12	チャックウォール部
13	フランジカール部
14	カウンターシンク部（補強のための環状溝）
15	ビード部（補強のための環状突起）
16	識別マーク
26	パンチコア（パネル部を押圧する金型部品）
26b	（パンチコアの角部の）溝状の凹部

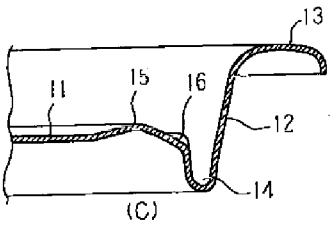
【図1】



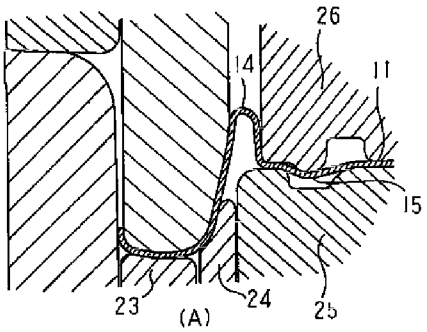
【図2】

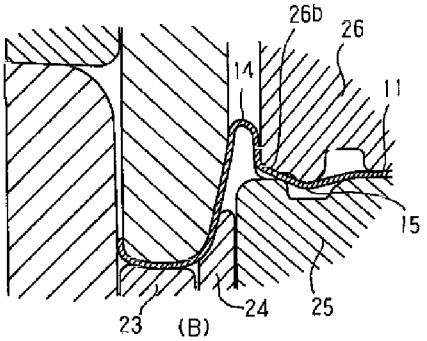






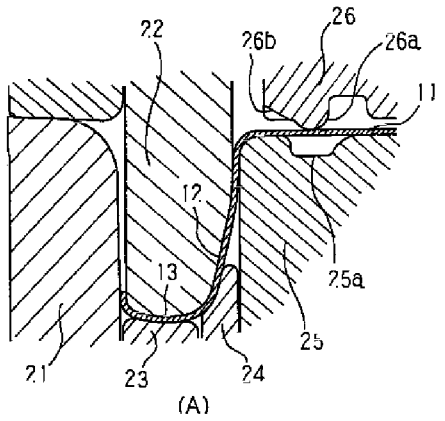
【図4】



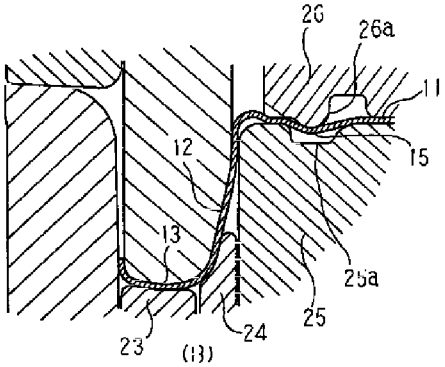


K-FEE SYSTEM GMBH, EX2009, page 1932
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

【図3】



(A)



(B)

フロントページの続き

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(54) **IMPROVEMENTS RELATING TO CONTAINERS**

VERBESSERUNGEN IN VERBAND MIT BEHÄLTERN

AMELIORATIONS APPORTEES A DES RESERVOIRS

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AU-B- 522 005
US-A- 5 266 257

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EP 0 868 295 B1

K-FEE SYSTEM GMBH, EX2009, page 1934
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Description

[0001] This invention relates to containers and is primarily concerned with those which have closure members which fit inside an opening and which can be turned to lock in place.

[0002] This requires an internal thread or some form of undercut, and with a moulded construction there are consequently manufacturing problems which are costly and difficult to overcome. Indeed they are sometimes considered impossible. Tool costs are high, and one either has to arrange for unscrewing a core from the newly formed thread or undercut or else collapsing the core sufficiently to permit its withdrawal. It has been attempted simply to pull the core out directly, forcing the plastics aside, but this often damages the plastics.

[0003] EP-A-0329883 describes a container with a spout concentrically within an annular wall formed with an internal screw thread. The skirt of a cap with an external screw thread provides the closure, entering between the spout and wall and screwing into place.

[0004] The body of the container is formed by blow moulding part of a plastics tube trapped between two separable mould halves. But above the neck the remaining part of the tube is compression moulded to its ultimate shape by the blow pin and a surrounding sleeve, the latter forming the internal screw thread. There is only one way of releasing the finished container, and that is by unscrewing it from the sleeve.

[0005] AU-A-522005 also describes moulded plastics containers with screw-threaded necks. These are thin walled, so that the thread is external and internal. Externally, the mould is in two parts for release, while internally there is a very elaborate multi-part assembly that wedges the plastics radially outwardly and forms the internal thread. This has to be collapsed inwardly again for withdrawal.

[0006] It is the aim of this invention to enable a container with an internally threaded neck to be manufactured more easily.

[0007] According to one aspect of the present invention there is provided a method of making a container to which entry is via an opening having a detent for positively retaining a closure member within that opening, the material of the container being susceptible to deformation when heated, wherein in a first stage an embryo container is formed as a closed end tube with an outward generally radial flange at its mouth, part of the upper surface of which flange is to provide the inside of the opening, the detent being simultaneously formed as a projection from or depression in said surface, and wherein in a second stage the outer peripheral portion of the flange is held fast while the tube, at an elevated temperature, is expanded by differential pressure, this drawing down the inner portion of the flange and transforming said upper surface from an upwardly facing one into a passage providing the opening with the detent.

[0008] It will be assumed hereafter that both the embryo and finished container are in an upright attitude with the opening uppermost.

[0009] The formation of the embryo container in the first stage is conveniently by injection moulding in a two part mould one part of which has a core subsequently extractable through said opening, while the transformation from embryo to finished container in the second stage is preferably by blow moulding via the opening, although at least some of the distortion or stretching inherent in the process could be achieved mechanically.

[0010] The detent in the embryo container may be a spiral or part-spiral to form screw threading in the finished container. Alternatively, the detent could be at least one L-shaped indentation to form the female part of a bayonet fitting, or at least one stud to form the male part of a bayonet fitting. In another version, the detent is an annular ring formation to retain a ball, as used for roll-on deodorants for example.

[0011] In the preferred form, the embryo container also has a generally cylindrical flange at the periphery of the radial flange projecting downwardly to surround the opening end of the tube. The under surface of the inner portion of the radial flange, when that is deformed downwardly and outwardly by the tube expansion, may cooperate with the inside of the cylindrical flange. In the finished container they bond together. The spiral (if that is the detent) becomes a screw thread on the inside of the opening.

[0012] With this arrangement, and if the material of the container is transparent, a data band can be provided on the inside of the cylindrical flange of the embryo container to be legible therethrough, the band being made captive by the deformed portion of the radial flange.

[0013] Conveniently, the outer peripheral portion of the flange is a rim projecting beyond the cylindrical flange, its underside providing means for locating the embryo container during the blow moulding while its inside provides a seat for a blow pin.

[0014] For a better understanding of the invention, one embodiment will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is an axial section of a preform of a container with a blow pin in position,
Figure 2 is a plan view of the preform,
Figure 3 is an axial section of a container in a mould having been expanded by blow moulding from the preform of Figure 1, and
Figure 4 is an axial section of the finished, released container.

[0015] A preform 1 or embryo container is of plastics material made by injection moulding. Its shape is such that it will simply require two mould parts which can be parted axially to release the preform when it has set. There are no undercuts to complicate the mould.

[0016] In more detail, the preform has a test-tube like body 2 and an outwardly extending ring 3 at the mouth

K-FEE SYSTEM GMBH, EX2009, page 1935
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

of the body 2. This ring includes a radial flange 4 stepped on the underside to be thicker over the radially inner annular portion, and having a spiral rib 5 on its upper face. At the outer periphery of the flange 4 there is a further, cylindrical flange 6 projecting downwardly to form a skirt around the upper portion of the body 2. Above this a rim 7 steps upwardly and outwardly, having a slightly coned inner surface 8. This provides a seat for a blow pin 9.

[0017] After injection moulding, the body is transferred to a blow mould while still hot. The blow mould comprises two halves 10 and 11 and a base insert or punt 12. The rim 7 rests on the edge of the cavity formed by the halves 10 and 11 and the flange 6 fits snugly in the mouth of that cavity. These parts are cooled quicker than the rest and so solidify enough to provide firm support and location. The blow pin 9 seals against the surface 8, its end face just above the spiral rib 5 so that the upper face of the flange will be subject to pressurised air introduced during blow moulding. The contact of the blow pin with the plastics material contributes to the local cooling and solidification. With the preform thus trapped, air under pressure is introduced to expand the still soft remainder of the body 2. During this expansion, the flange 4 will be forced down about its junction with the flange 6 and rim 7 so that it becomes generally cylindrical, being urged against the inside of the flange 6. It then flows around the underside of that flange 6 to meet the wall of the blow mould cavity. The rest of the body 2 expands as shown in Figure 3, and when the material has cooled, the mould parts are separated and the completed container as shown in Figure 4 is released. The heat is such that where two plastics surfaces have been urged together, they become effectively homogeneous.

[0018] During this process, the spiral rib 5 has become a screw thread, projecting into the mouth of the container.

[0019] The transformation of the flange 4 from its initial to its cylindrical form could be carried out mechanically, especially if the detent is not a projecting rib or stud but an inset groove. For example an insert could thrust down within the body 2, or even the blow pin 9 might be extended to press down on the flange as it is inserted. That insert could then be withdrawn, and the final shaping achieved by blow moulding.

[0020] The sealing together of the flanges 4 and 6 affords means of secure identification when the plastics material is transparent. A band 13, indicated in broken lines in Figure 4, can be placed around the inside of the flange 6, carrying data such as a company name, product details or a bar code to be legible through the flange 6. After blow moulding, this band will be securely sealed within the plastics material, and will be impossible to remove without destruction of the container.

[0021] Suitable plastics materials include polyvinyl chloride, high density polythene, polypropylene, or polyethylene terepthalate (P.E.T.) in either crystalline or amorphous form. It should also be possible to apply the method to glass containers, and may even by feasible with certain metals, such as aluminium.

[0022] While blow moulding is expected to be the preferred method of expansion, aided by mechanical stretching for large containers, it may be possible to achieve the same effect by suction moulding.

Claims

1. A method of making a container to which entry is via an opening having a detent (5) for positively retaining a closure member within that opening, the material of the container being susceptible to deformation when heated, characterised in that in a first stage an embryo container (1) is formed as a closed end tube (2) with an outward, generally radial flange (4, 7) at its mouth, part of the upper surface of which flange is to provide the inside of the opening, the detent (5) being simultaneously formed as a projection from or depression in said surface, and in that in a second stage the outer peripheral portion (7) of the flange is held fast while the tube (2), at an elevated temperature, is expanded by differential pressure, this drawing down and forcing outwardly the inner portion (4) of the flange and transforming said upper surface from an upwardly facing one into a passage providing the opening with the detent (5).

2. A method of making a container as claimed in Claim 1, characterised in that the formation of the embryo container (1) in the first stage is by moulding in a two part mould one of which has a core subsequently extractable through said opening.

3. A method of making a container as claimed in Claim 2, characterised in that the formation of the embryo container is by injection moulding.

4. A method of making a container as claimed in Claim 1, 2 or 3, characterised in that the transformation from embryo to finished container in the second stage is by blow moulding via the opening.

5. A method of making a container as claimed in any preceding claim, characterised in that the detent (5) in the embryo container is a spiral or part spiral to form screw threading in the finished container.

6. A method of making a container as claimed in any one of Claims 1 to 4, characterised in that the detent is at least one L-shaped indentation to form part of a bayonet fitting.

7. A method of making a container as claimed in any one of Claims 1 to 4, characterised in that the detent is at least one stud to form part of a bayonet fitting.

K-FEE SYSTEM GMBH, EX2009, page 1936
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

8. A method of making a container as claimed in any one of Claims 1 to 4, characterised in that the detent is an annular ring formation for the retention of a roller ball.

9. A method of making a container as claimed in any preceding Claim, characterised in that the embryo container (1) has a generally cylindrical flange (6) on the radial flange (4, 7) projecting downwardly to surround the opening end of the tube (2).

10. A method of making a container as claimed in Claim 9, characterised in that the under surface of the inner portion (4) of the radial flange, when that is deformed downwardly and outwardly by the tube expansion, co-operates with the inside of the cylindrical flange (6).

11. A method of making a container as claimed in Claim 10, characterized in that in the finished container said under surface bonds to the cylindrical flange (6).

12. A method of making a container as claimed in Claim 10 or 11, characterised in that the material of the container is transparent and a data band is provided on the inside of the cylindrical flange (6) of the embryo container to be legible therethrough, the band being made captive by the deformed portion of the radial flange (4).

13. A method of making a container as claimed in any one of Claims 9 to 12 as appendant to Claim 4, characterised in that the outer peripheral portion of the flange is a stepped up rim (7) projecting beyond the cylindrical flange (6), its underside providing means for locating the embryo container (1) during the blow moulding while its inside (8) provides a seat for a blow pin.

Patentansprüche

1. Verfahren zum Herstellen eines Behälters, zu dem der Zugang über eine Öffnung mit einem Sperrglied (5) zum zwangsläufigen Festhalten eines Verschlußglieds innerhalb der Öffnung erfolgt, wobei das Material des Behälters in erhitztem Zustand verformbar ist, dadurch gekennzeichnet, daß man in einem ersten Verfahrensschritt eine Behältervorform (1) als Rohr (2) mit geschlossenem Ende und mit einem auswärts gerichteten allgemein radialen Flansch (4, 7) an seiner Mündung bildet, wobei ein Teil der Oberseite dieses Flanschs die Innenseite der Öffnung ergeben soll und man das Sperrglied (5) gleichzeitig als Vorsprung von oder Vertiefung in dieser Oberseite bildet, und daß man in einem zweiten Verfahrensschritt den äußeren Umfangsteil (7) des Flanschs festhält, während man das Rohr (2) bei erhöhter Temperatur durch differenziellen Druck zur Expansion bringt, was den inneren Teil (4) des Flanschs nach unten zieht und nach außen drückt und die Oberseite von einer nach oben gerichteten Fläche in einen Durchgang umformt, der die Öffnung mit dem Sperrglied (5) ergibt.

2. Verfahren zum Herstellen eines Behälters nach Anspruch 1, dadurch gekennzeichnet, daß man die Behältervorform (1) im ersten Schritt durch Guß in einer zweiteiligen Form herstellt, von der einer der Teile einen Kern aufweist, der anschließend durch die Öffnung herausziehbar ist.

3. Verfahren zum Herstellen eines Behälters nach Anspruch 2, dadurch gekennzeichnet, daß man die Behältervorform (1) im Spritzguß herstellt.

4. Verfahren zum Herstellen eines Behälters nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß die Umformung von der Vorform zum fertigen Behälter im zweiten Verfahrensschritt durch Blasformung über die Öffnung erfolgt.

5. Verfahren zum Herstellen eines Behälters nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Sperrglied (5) in der Vorform eine Spirale oder Teilspirale zum Bilden eines Schraubgewindes im fertigen Behälter ist.

6. Verfahren zum Herstellen eines Behälters nach einem der Ansprüche 1 bis 4 dadurch gekennzeichnet, daß das Sperrglied wenigstens ein L-förmiger Einschnitt zum Bilden eines Teils eines Bajonettverschlusses ist.

7. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß das Sperrglied wenigstens ein Vorsprung zum Bilden eines Teils eines Bajonettverschlusses ist.

8. Verfahren zum Herstellen eines Behälters nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß das Sperrglied eine Kreisringstruktur zum Halten einer Rollerkugel ist.

9. Verfahren zum Herstellen eines Behälters nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Behältervorform (1) am radialen Flansch (4, 7) einen allgemein zylindrischen Flansch (6) hat, der nach unten absteht und das Öffnungsende des Rohrs (2) umgibt.

10. Verfahren zum Herstellen eines Behälters nach Anspruch 9, dadurch gekennzeichnet, daß die Unterseite des inneren Teils (4) des radialen Flanschs, wenn dieser durch die Rohrexpansion nach unten und außen deformiert wird, mit der

K-FEE SYSTEM GMBH, EX2009, page 1937
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

Innenseite des zylindrischen Flanschs (6) zusammenwirkt.

11. Verfahren zum Herstellen eines Behälters nach Anspruch 10, dadurch gekennzeichnet, daß beim fertigen Behälter diese Unterseite mit dem zylindrischen Flansch (6) verbunden ist.

12. Verfahren zum Herstellen eines Behälters nach Anspruch 10 oder 11, dadurch gekennzeichnet, daß das Material des Behälters transparent ist und man an der Innenseite des zylindrischen Flanschs (6) der Behältervorform ein Datenband anordnet, das durch diesen Flansch hindurch lesbar ist und das durch den verformten Teil des radialen Flanschs (4) eingeschlossen wird.

13. Verfahren zum Herstellen eines Behälters nach einem der auf Anspruch 4 rückbezogenen Ansprüche 9 bis 12, dadurch gekennzeichnet, daß der äußere Umfangsteil des Flanschs ein nach oben gestufter Rand (7) ist, der über den zylindrischen Flansch (6) hinaus vorsteht und dessen Unterseite eine Einrichtung zum Positionieren der Behältervorform (1) während des Blasformens bildet, während seine Innenseite (8) einen Sitz für einen Ausblasstift darstellt.

Revendications

1. Procédé de fabrication d'un récipient dans lequel une entrée se fait par une ouverture comportant un organe de maintien (5) destiné à retenir efficacement un élément de fermeture dans cette ouverture, la matière du récipient étant susceptible de se déformer lorsqu'elle est chauffée, caractérisé en ce qu'au cours d'une première étape un récipient (1) à l'état embryonnaire est réalisé sous la forme d'un tube (2) comportant une extrémité fermée et un rebord extérieur sensiblement radial (4, 7) au niveau de son goulot, rebord dont une partie de la surface supérieure est destinée à définir l'intérieur de l'ouverture, l'organe de maintien (5) étant formé simultanément sous la forme d'une protubérance ou d'un creux sur ladite surface, et en ce qu'au cours d'une seconde étape la partie périphérique extérieure (7) du rebord est maintenue bloquée pendant que le tube (2) est élargi à une température élevée sous l'effet d'une pression différentielle, ceci abaissant et étirant vers l'extérieur la partie intérieure (4) du rebord et transformant ladite surface supérieure d'une surface tournée vers le haut en un passage définissant l'ouverture munie de l'organe de maintien (5).

2. Procédé de fabrication d'un récipient, tel que défini dans la revendication 1, caractérisé en ce que la formation du récipient (1) à l'état embryonnaire au cours de la première étape est réalisée par un moulage dans un moule en deux parties dont l'une comporte un noyau qui peut ensuite être extrait à travers l'ouverture.

3. Procédé de fabrication d'un récipient, tel que défini dans la revendication 2, caractérisé en ce que la formation du récipient à l'état embryonnaire est réalisée par un moulage par injection.

4. Procédé de fabrication d'un récipient, tel que défini dans la revendication 1, 2 ou 3, caractérisé en ce que la transformation du récipient de l'état embryonnaire à l'état fini au cours de la seconde étape est réalisée par un moulage par soufflage par l'intermédiaire de l'ouverture.

5. Procédé de fabrication d'un récipient, tel que défini dans l'une quelconque des revendications précédentes, caractérisé en ce que l'organe de maintien (5) dans le récipient à l'état embryonnaire est une spirale ou une spirale partielle destinée à former un filetage dans le récipient fini.

6. Procédé de fabrication d'un récipient, tel que défini dans l'une quelconque des revendications 1 à 4, caractérisé en ce que l'organe de maintien consiste en au moins un renfoncement en forme de L destiné à faire partie d'un assemblage à baïonnette.

7. Procédé de fabrication d'un récipient, tel que défini dans l'une quelconque des revendications 1 à 4, caractérisé en ce que l'organe de maintien consiste en au moins un ergot destiné à faire partie d'un assemblage à baïonnette.

8. Procédé de fabrication d'un récipient, tel que défini dans l'une quelconque des revendications 1 à 4, caractérisé en ce que l'organe de maintien consiste en la formation d'un anneau circulaire destiné à retenir une bille de roulement.

9. Procédé de fabrication d'un récipient, tel que défini dans l'une quelconque des revendications précédentes, caractérisé en ce que le récipient (1) à l'état embryonnaire comporte sur son rebord radial (4, 7) une collerette sensiblement cylindrique (6) qui fait saillie vers le bas pour entourer l'extrémité ouverte du tube (2).

10. Procédé de fabrication d'un récipient, tel que défini dans la revendication 9, caractérisé en ce que la surface de dessous de la partie intérieure (4) du rebord radial, lorsque celle-ci est déformée vers le bas et vers l'extérieur par l'élargissement du tube, coopère avec l'intérieur de la collerette cylindrique (6).

K-FEE SYSTEM GMBH, EX2009, page 1938
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

11. Procédé de fabrication d'un récipient, tel que défini dans la revendication 10, caractérisé en ce que dans le récipient fini ladite surface de dessous adhère à la collerette cylindrique (6).

12. Procédé de fabrication d'un récipient, tel que défini dans la revendication 10 ou 11, caractérisé en ce que la matière du récipient est transparente, et en ce qu'une bande comportant des informations est prévue sur la face intérieure de la collerette cylindrique (6) du récipient à l'état embryonnaire pour pouvoir être lue à travers celle-ci, la bande étant rendue captive par la partie déformée du rebord radial (4).

13. Procédé de fabrication d'un récipient, tel que défini dans l'une quelconque des revendications 9 à 12, lorsqu'elles sont dépendantes de la revendication 4, caractérisé en ce que la partie périphérique extérieure du rebord est une bordure étagée (7) qui fait saillie au-delà de la collerette cylindrique (6) et dont la face de dessous définit des moyens permettant de positionner le récipient (1) à l'état embryonnaire au cours du moulage par soufflage, tandis que sa face intérieure (8) définit un appui pour une broche de soufflage.

K-FEE SYSTEM GMBH, EX2009, page 1939
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

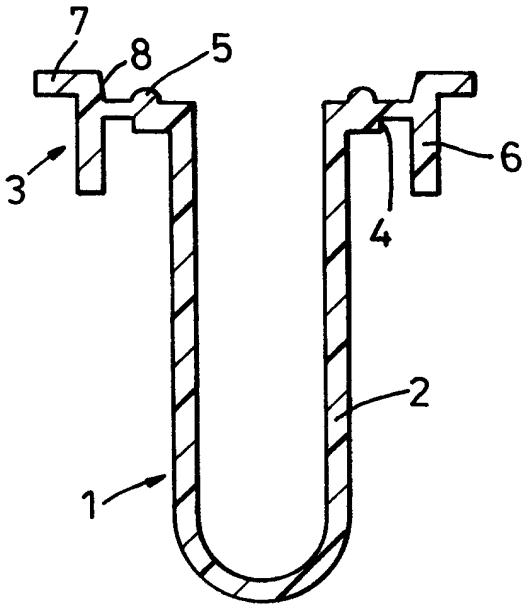


Fig. 1

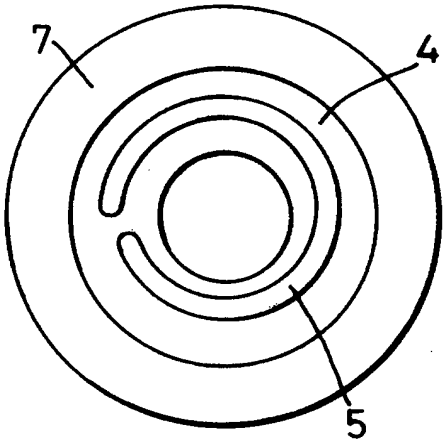


Fig. 2

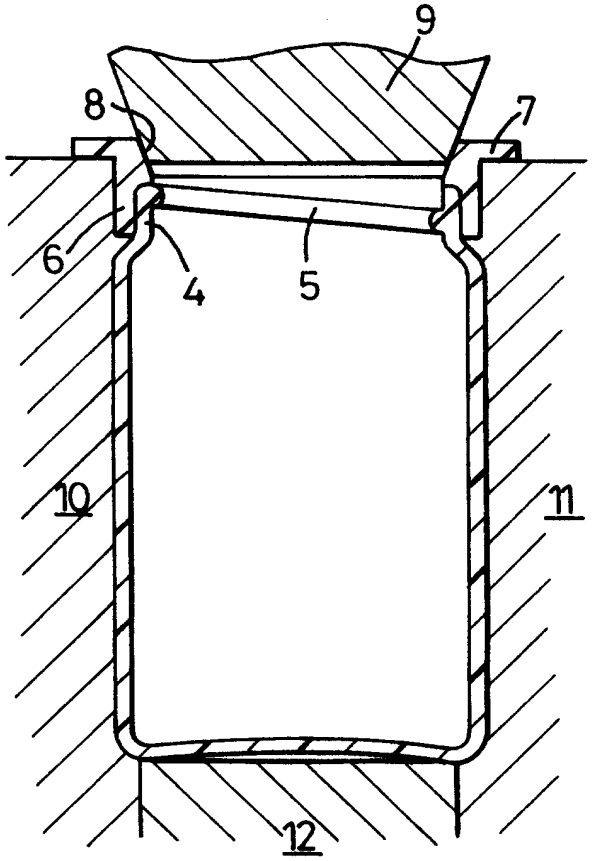


Fig. 3

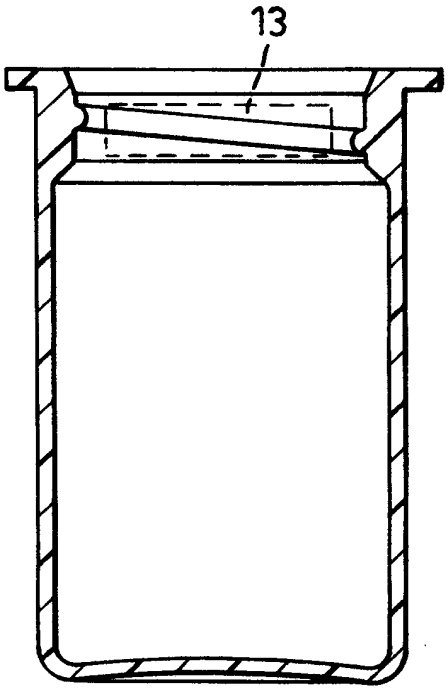


Fig. 4

K-FEE SYSTEM GMBH, EX2009, page 1940
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

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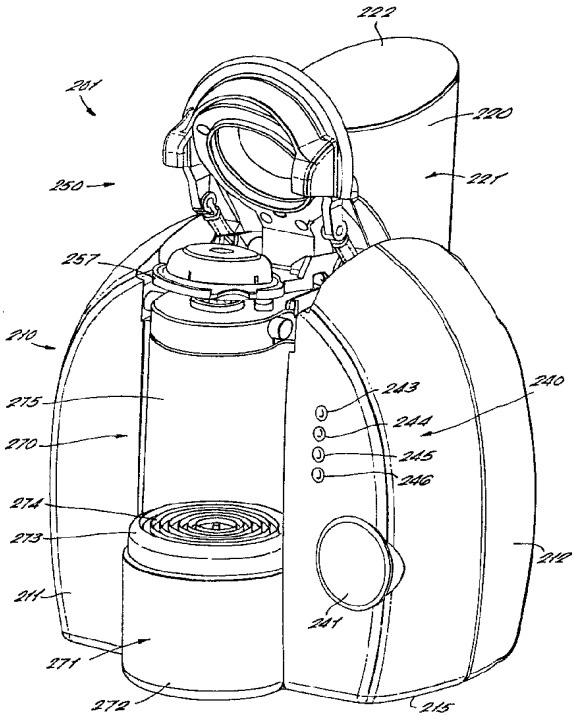
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[Continued on next page]

(54) Title: AN INSERT, A MACHINE AND A SYSTEM FOR THE PREPARATION OF BEVERAGES



(57) Abstract: An insert (400) for use in a beverage preparation machine (201) of a type comprising a brew head (250) comprising an upwardly directed inlet (253) for supplying water to the brew head (250) and a downwardly directed outlet (250) for outflow of beverage produced by the machine (201). The insert (400) comprises, or is adapted to contain in use, a quantity of beverage ingredients in a brewing volume. A lower surface of the insert (400) comprises an inlet (405) and an outlet (404) arranged to communicate respectively with the inlet (253) and outlet (254) of the brew head (250) of the beverage preparation machine (201) when the insert (100) is inserted into the machine such that, in use, water from the inlet (253) of the brew head (250) passes upwardly through the inlet (405) of the insert (400) into the brewing volume and such that beverage produced from the water and the quantity of beverage ingredients passes downwardly through the outlet (404) of the insert (100) to flow out of the outlet (254) of the brew head (250). The lower surface of the insert (400) further comprises a RFID or barcode (320) which, in use, is readable by a RFID or barcode reader of the beverage preparation machine (201) for controlling operation of the beverage preparation machine (201), wherein the barcode (320) or RFID is located on the lower surface of the insert (400) such that a line joining the outlet (404) of the insert (400) to a centre of the barcode (320) or RFID and a line joining the outlet (404) of the insert (400) to the inlet (405) of the insert (400) separated by a minimum angular separation of greater than 70 degrees.

WO 2005/079638 A1

K-FEE SYSTEM GMBH, EX2009, page 1941
NESPRESSO USA, INC. v. K-FEE SYSTEM GMBH
IPR2023-00502, U.S. PATENT 10,994,923

SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

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AN INSERT, A MACHINE AND A SYSTEM FOR THE PREPARATION OF BEVERAGES

The present invention relates to an insert, a machine and a system for the preparation of beverages.

It is known to provide machines and systems for the preparation of beverages such as coffee, tea and chocolate. Typically, in such systems the beverage ingredients are used either in a loose form or contained in a container. It is known in some machines to use flexible containers, such as filter paper bags containing roast and ground coffee or leaf tea. It is also known in other machines to use containers in the form of cartridges which may be rigid, semi-rigid, or flexible and which are pierced during preparation of the beverage. In both cases, the machine for use with such containers is specially adapted to receive a particular design of container in a brew head and to pass water and/or steam through the container to prepare a beverage which is then dispensed. Such beverage preparation machine may be used in commercial or domestic markets. In the domestic market consumers may not wish to use separate machines when preparing beverages from different beverage ingredient containing containers or, indeed, loose beverage ingredients. It is therefore an object of the present invention to provide an insert, a beverage preparation machine and a beverage preparation system which allows consumers to use a variety of containers or loose ingredients in a single beverage preparation machine. In one aspect, it is an object of the present invention to provide an insert for a beverage preparation machine which is primarily designed for use with cartridges, whether rigid, semi-rigid or flexible, that allows the beverage preparation

machine to dispense beverage ingredients from flexible containers such as filter bags.

Accordingly, the present invention provides an insert for use in a beverage preparation machine of a type comprising a brew head comprising an upwardly directed inlet for supplying water to the brew head and a downwardly directed outlet for outflow of beverage produced by the machine, the insert comprising, or being adapted to contain in use, a quantity of beverage ingredients in a brewing volume, a lower surface of the insert comprising an inlet and an outlet arranged to communicate respectively with the inlet and outlet of the brew head of the beverage preparation machine when the insert is inserted into the machine such that, in use, water from the inlet of the brew head passes upwardly through the inlet of the insert into the brewing volume and such that beverage produced from the water and the quantity of beverage ingredients passes downwardly through the outlet of the insert to flow out of the outlet of the brew head, characterised in that the lower surface of the insert further comprises a barcode or RFID which, in use, is readable by a barcode or RFID reader of the beverage preparation machine for controlling operation of the beverage preparation machine, wherein the barcode or RFID is located on the lower surface of the insert such that a line joining the outlet of the insert to a centre of the barcode and a line joining the outlet of the insert to the inlet of the insert separated by a minimum angular separation of greater than 70 degrees.

Advantageously, it has been found that this minimum angular separation of the barcode or RFID from the inlet improves the accuracy of the reading of the barcode or RFID by the recognition means of the machine. Firstly, the

separation results in any distortion of the inlet area having a minimal affect on the region of the barcode or RFID. Secondly, it has been found that there may be a small degree of leakage of fluid from the inlet area during dispensation since dispensation occurs at pressure. This fluid may spread, in particular due to capillary effect between the insert and a brew head of the machine, leading to partial obfuscation of the barcode or RFID by the fluid resulting in a greater chance of the barcode or RFID being misread. With the barcode or RFID separated by an angle of greater than 70 degrees it has been found that this problem does not occur.

Preferably, the line joining the outlet of the insert to the centre of the barcode or RFID and the line joining the outlet of the insert to the inlet of the insert subtend an angle of greater than or equal to 85 degrees.

Preferably the outlet is located at a centre or near a centre of the lower surface of the insert. The barcode or RFID is preferably located at or near a periphery of the lower surface.

The insert may be disc-shaped.

The insert may be a cartridge. The cartridge may be rigid or semi-rigid. The lower surface may be a laminate. In this case, the inlet and outlet of the cartridge may be portions of the lower surface which are opened for transportation, in use, by piercing the lower surface. Alternatively, the insert may define a receptacle for receiving loose beverage ingredients. Alternatively, the insert may define a receptacle for receiving a container of beverage ingredients, wherein the container comprises filtering means. In one aspect, the container is formed at

least in part from filter paper or filtering membrane. For example, the container may be a filter bag.

The inlet and outlet of the insert may be open. Alternatively, the inlet and outlet of the insert may be closed prior to use by means of a frangible membrane. The frangible membrane may comprise a tear-off portion.

The insert may be reusable.

The inlet of the insert, outlet of the insert and barcode or RFID may be coplanar. Alternatively, the inlet of the insert, outlet of the insert and barcode or RFID may not be coplanar.

Preferably, the insert further comprises means for preventing rotation of the insert in the brew head after insertion of the insert and closing of the brew head. The means for preventing rotation may comprise an externally directed handle or tab portion.

The externally directed handle or tab portion may be located substantially diametrically opposite the inlet of the insert.

The present invention also provides a beverage preparation system comprising a beverage preparation machine and an insert for use in said machine, said insert being as described above.

The beverage preparation machine may comprise a brew head comprising an upwardly directed inlet for supplying water to the brew head, a downwardly directed outlet for outflow of beverage produced by the machine and a barcode or RFID reader having a window in the brew head through which signals may be transmitted, wherein a line joining the outlet of the machine to a centre of the window and a line joining the outlet of the machine to the inlet of the machine subtend an angle of greater than 70 degrees.

Preferably the line joining the outlet of the machine to the centre of the window and the line joining the outlet of the machine to the inlet of the machine subtends an angle of greater than or equal to 85 degrees.

Preferably the outlet of the beverage preparation machine is located at or near a centre of the brew head.

Preferably the barcode reader or RFID reader window is located at or near a periphery of the brew head.

The brew head may comprise a mount for receiving the insert so as to prevent relative rotation of the insert and the brew head once the brew head is closed.

The mount may comprise a recess or opening for receiving an externally directed handle or tab portion of the insert. The mount may comprise an opening through which the inlet of the brew head, outlet of the brew head and barcode reader or RFID reader window are accessible.

The brew head may comprise a cavity for receiving the insert wherein one of the insert and cavity comprises a key and the other of the insert and cavity comprises a recess, wherein interengagement of the key and recess prevents relative rotation of the insert and the brew head once the brew head is closed.

The insert of the present invention may contain or be loaded with one or more beverage ingredients suitable for the formation of a beverage product. The beverage product may be, for example, one of coffee, tea, chocolate or a dairy-based beverage including milk. The beverage ingredients may be powdered, ground, leaf-based or liquid. The beverage ingredients may be insoluble or soluble. Examples include roast and ground coffee, leaf tea, powdered chocolate and soup, liquid milk-based beverages, carbonated drinks and concentrated fruit juices.

In the following description the terms "upper" and "lower" and equivalents will be used to describe the relational positioning of features of the invention. The terms "upper" and "lower" and equivalents should be understood to refer to the insert (or other components) in its normal orientation for insertion into the beverage preparation machine and subsequent dispensing. In addition, the terms "inner" and "outer" and equivalents will be used to describe the relational positioning of features of the invention. The terms "inner" and "outer" and equivalents should be understood to refer to relative positions in the insert (or other components) being, respectively, nearer or further from a centre or major axis X of the insert (or other component).

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

Figure 1a is a front perspective view of a beverage preparation machine of the present invention;

Figure 1b is a front perspective view of the machine of Figure 1a with a brew head in an open position;

Figure 2 is a rear perspective view of the machine of Figure 1a with some parts omitted for clarity;

Figure 3 is another rear perspective view of the machine of Figure 1a with some parts omitted for clarity;

Figure 4 is a perspective view of the brew head of the machine of Figure 1a with some parts omitted for clarity;

Figure 5 is another perspective view of the brew head of the machine of Figure 1a with some parts omitted for clarity;

Figure 6 is a cross-sectional view of the brew head in a closed position;

Figure 7 is a cross-sectional view of the brew head in an open position illustrated containing an insert in the form of a cartridge of the present invention;

Figure 8 is a schematic layout of the machine of Figure 1a;

Figure 9a and 9b are schematic layouts of first and second code recognition means for the machine of Figure 1a; and

Figure 10 is a plan view of a beverage cartridge of the present invention comprising a barcode;

Figure 11 is cross-sectional drawing of an outer member of a cartridge of the present invention which may be used in the beverage preparation machine of the present invention;

Figure 12 is a cross-sectional drawing of a detail of the outer member of Figure 11 showing an inwardly directed cylindrical extension;

Figure 13 is a cross-sectional drawing of a detail of the outer member of Figure 11 showing a slot;

Figure 14 is a perspective view from above of the outer member of Figure 11;

Figure 15 is a perspective view from above of the outer member of Figure 11 in an inverted orientation;

Figure 16 is a plan view from above of the outer member of Figure 11;

Figure 17 is a cross-sectional drawing of an inner member of the cartridge;

Figure 18 is a perspective view from above of the inner member of Figure 17;

Figure 19 is a perspective view from above of the inner member of Figure 17 in an inverted orientation;

Figure 20 is a plan view from above of the inner member of Figure 17;

Figure 21 is a cross-sectional drawing of the cartridge in an assembled condition;

Figure 22 is a perspective view from above of another embodiment of insert according to the present invention showing upper and lower parts thereof separated;

Figure 23 is a perspective view from below of the lower part of the insert of Figure 22;

Figure 24 is a perspective view from above of the insert of Figure 22 showing the upper and lower parts sealed together; and

Figure 25 is a cross-sectional view of the brew head of the beverage preparation machine in an open position illustrated accommodating the insert of Figure 22.

Beverage Preparation System

A beverage preparation machine 201 of the beverage preparation system of the present invention is shown in Figures 1a to 9b. The beverage preparation machine 201 generally comprises a housing 210 containing a water tank 220, a water heater 225, a water pump 230, an air compressor 235, a control processor, a user interface 240 and a brew head 250. The brew head 250 in turn generally comprises a holder 251, recognition means 252 and inlet and outlet piercers 253, 254.

The beverage preparation machine 201 is designed to be capable of dispensing beverage ingredients from inserts in the form of cartridges 1 such as that illustrated in Figures 10 to 21 and also from inserts 400 such as that shown in Figures 22 to 25 which are loaded in use with beverage ingredients in loose form or packaged in other types of

containers, such as flexible bags. To aid understanding of the comprehensive and flexible operation of the beverage preparation machine an example of an insert in the form of the cartridge 1 will first be described and its use in the beverage preparation machine 201 explained before the insert 400 and its use is described.

Cartridge for use in the system

As shown in Figure 10 to 21, the cartridge 1 generally comprises an outer member 2, an inner member 3 and a laminate 5. The outer member 2, inner member 3 and laminate 5 are assembled to form the cartridge 1 which has an interior 120 for containing one or more beverage ingredients, an inlet 121, an outlet 122 and a beverage flow path linking the inlet 121 to the outlet 122 and which passes through the interior 120. The inlet 121 and outlet 122 are initially sealed by the laminate 5 and are opened in use by piercing or cutting of the laminate 5. The beverage flow path is defined by spatial inter-relationships between the outer member 2, inner member 3 and laminate 5 as discussed below. Other components may optionally be included in the cartridge 1, such as a filter 4, as will be described further below.

The cartridge 1 is particularly designed for use in dispensing filtered products such as roast and ground coffee or leaf tea. However, the cartridge 1 may be used with other products such as chocolate, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

As can be seen from Figure 15, the overall shape of the cartridge 1 is generally circular or disc-shaped with the diameter of the cartridge 1 being significantly greater than

its height. A major axis X passes through the centre of the outer member as shown in Figure 11. Typically the overall diameter of the outer member 2 is 74.5 mm ±6mm and the overall height is 16 mm ±3mm. Typically the volume of the cartridge 1 when assembled is 30.2 ml ±20%.

The outer member 2 generally comprises a bowl-shaped shell 10 having a curved annular wall 13, a closed top 11 and an open bottom 12. The diameter of the outer member 2 is smaller at the top 11 compared to the diameter at the bottom 12, resulting from a flaring of the annular wall 13 as one traverses from the closed top 11 to the open bottom 12. The annular wall 13 and closed bottom 11 together define a receptacle having an interior 34.

A hollow inwardly directed cylindrical extension 18 is provided in the closed top 11 centred on the major axis X. As more clearly shown in Figure 12, the cylindrical extension 18 comprises a stepped profile having first, second and third portions 19, 20 and 21. The first portion 19 is right circular cylindrical. The second portion 20 is frusto-conical in shape and is inwardly tapered. The third portion 21 is another right circular cylinder and is closed off by a lower face 31. The diameter of the first, second and third portion 19, 20 and 21 incrementally decreases such that the diameter of the cylindrical extension 18 decreases as one traverses from the top 11 to the closed lower face 31 of the cylindrical extension 18. A generally horizontal shoulder 32 is formed on the cylindrical extension 18 at the junction between the second and third portions 20 and 21.

An outwardly extending shoulder 33 is formed in the outer member 2 towards the bottom 12. The outwardly extending shoulder 33 forms a secondary wall 15 co-axial with the annular wall 13 so as to define an annular track

forming a manifold 16 between the secondary wall 15 and the annular wall 13. The manifold 16 passes around the circumference of the outer member 2. A series of slots 17 are provided in the annular wall 13 level with the manifold 16 to provide gas and liquid communication between the manifold 16 and the interior 34 of the outer member 2. As shown in Figure 13, the slots 17 comprise vertical slits in the annular wall 13. Between 20 and 40 slots are provided. In the embodiment shown thirty-seven slots 17 are provided generally equi-spaced around the circumference of the manifold 16. The slots 17 are preferably between 1.4 and 1.8 mm in length. Typically the length of each slot is 1.6 mm representing 10% of the overall height of the outer member 2. The width of each slot is between 0.25 and 0.35 mm. Typically, the width of each slot is 0.3 mm. The width of the slots 17 is sufficiently narrow to prevent the beverage ingredients passing therethrough into the manifold 16 either during storage or in use.

An inlet chamber 26 is formed in the outer member 2 at the periphery of the outer member 2. A cylindrical wall 27 is provided, as most clearly shown in Figure 15, which defines the inlet chamber 26 within, and partitions the inlet chamber 26 from, the interior 34 of the outer member 2. The cylindrical wall 27 has a closed upper face 28 which is formed on a plane perpendicular to the major axis X and an open lower end 29 co-planar with the bottom 12 of the outer member 2. The inlet chamber 26 communicates with the manifold 16 via two slots 30 as shown in Figure 11. Alternatively, between one and four slots may be used to communicate between the manifold 16 and the inlet chamber 26.

A lower end of the outwardly extending shoulder 33 is provided with an outwardly extending flange 35 which extends perpendicularly to the major axis X. Typically the flange 35 has a width of between 2 and 4 mm. A portion of the flange 35 is enlarged to form a handle 24 by which the outer member 2 may be held. The handle 24 is provided with an upturned rim 25 to improve grip.

The outer member 2 is formed as a single integral piece from high density polyethylene, polypropylene, polystyrene, polyester, or a laminate of two or more of these materials. A suitable polypropylene is the range of polymers available from DSM UK Limited (Redditch, United Kingdom). The outer member may be opaque, transparent or translucent. The manufacturing process may be injection moulding.

The inner member 3 as shown in Figures 17 to 20, comprises an annular frame 41 and a downwardly extending cylindrical funnel 40. A major axis X passes through the centre of the inner member 3 as shown in Figure 17.

As best shown in Figure 18, the annular frame 41 comprises an outer rim 51 and an inner hub 52 joined by ten equi-spaced radial spokes 53. The inner hub 52 is integral with and extends from the cylindrical funnel 40. Filtration apertures 55 are formed in the annular frame 41 between the radial spokes 53. A filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The filter is preferably made from a material with a high wet strength, for example a non-woven fibre material of polyester. Other materials which may be used include a water-impermeable 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 plastic materials into the cellulosic material renders the cellulosic material heat-sealable. The filter 4 may also be treated or coated with a material which is activated by heat and/or pressure so that it can be sealed to the annular frame 41 in this way.

As shown in the cross-sectional profile of Figure 17, the inner hub 52 is located at a lower position than the outer rim 51, resulting in the annular frame 41 having a sloping lower profile.

The upper surface of each spoke 53 is provided with an upstanding web 54 which divides a void space above the annular frame 41 into a plurality of passages 57. Each passage 57 is bounded on either side by a web 54 and on a lower face by the filter 4. The passages 57 extend from the outer rim 51 downwardly towards, and open into, the cylindrical funnel 40 at openings 56 defined by the inner extremities of the webs 54.

The cylindrical funnel 40 comprises an outer tube 42 surrounding an inner discharge spout 43. The outer tube 42 forms the exterior of the cylindrical funnel 40. The discharge spout 43 is joined to the outer tube 42 at an upper end of the discharge spout 43 by means of an annular flange 47. The discharge spout 43 comprises an inlet 45 at an upper end which communicates with the openings 56 of the passages 57 and an outlet 44 at a lower end through which the prepared beverage is discharged into a cup or other receptacle. The discharge spout 43 comprises a frusto-conical portion 48 at an upper end and a cylindrical portion 58 at a lower end. The cylindrical portion 58 may have a slight taper such that it narrows towards the outlet 44. The frusto-conical portion 48 helps to channel beverage from the passages 57 down towards the outlet 44 without inducing

turbulence to the beverage. An upper surface of the frusto-conical portion 48 is provided with four support webs 49 equi-spaced around the circumference of the cylindrical funnel 40. The support webs 49 define channels 50 therebetween. The upper edges of the support webs 49 are level with one another and perpendicular to the major axis X.

The inner member 3 may be formed as a single integral piece from polypropylene or a similar material as described above and by injection moulding in the same manner as the outer member 2.

Alternatively, the inner member 3 and/or the outer member 2 may be made from a biodegradable polymer. Examples of suitable materials include degradable polyethylene (for example, SPITEK supplied by Symphony Environmental, Borehamwood, United Kingdom), biodegradable polyester amide (for example, BAK 1095 supplied by Symphony Environmental), poly lactic acids (PLA supplied by Cargil, Minnesota, USA), starch-based polymers, cellulose derivatives and polypeptides.

The laminate 5 is formed from two layers, a first layer of aluminium and a second layer of cast polypropylene. The aluminium layer is between 0.02 and 0.07 mm in thickness. The cast polypropylene layer is between 0.025 and 0.065 mm in thickness. In one embodiment the aluminium layer is 0.06 mm and the polypropylene layer is 0.025 mm thick. This laminate is particularly advantageous as it has a high resistance to curling during assembly. As a result the laminate 5 may be pre-cut to the correct size and shape and subsequently transferred to the assembly station on the production line without undergoing distortion. Consequently, the laminate 5 is particularly well suited to welding. Other

laminate materials may be used including PET/Aluminium/PP, PE/EVOH/PP, PET/metallised/PP and Aluminium/PP laminates. Roll laminate stock may be used instead of die cut stock.

The cartridge 1 may be closed by a rigid or semi-rigid lid instead of a flexible laminate.

Assembly of the cartridge 1 involves the following steps:

a) the inner member 3 is inserted into the outer member 2;

b) the filter 4 is cut to shape and placed onto the inner member 3 so to be received over the cylindrical funnel 40 and come to rest against the annular frame 41;

c) the inner member 3, outer member 2 and filter 4 are joined by ultrasonic welding;

d) the cartridge 1 is filled with one or more beverage ingredients;

e) the laminate 5 is affixed to the outer member 2.

These steps will be discussed in greater detail below.

The outer member 2 is orientated with the open bottom 12 directed upwards. The inner member 3 is then inserted into the outer member 2 with the outer rim 51 being received as a loose fit in an axial extension 14 at top 11 of the cartridge 1. The cylindrical extension 18 of the outer member 2 is at the same time received in the upper portion of the cylindrical funnel 40 of the inner member 3. The third portion 21 of the cylindrical extension 18 is seated inside the cylindrical funnel 40 with the closed lower face 31 of the cylindrical extension 18 bearing against the support webs 49 of the inner member 3. The filter 4 is then placed over the inner member 3 such that the filter material contacts the annular rim 51. An ultrasonic welding process

is then used to join the filter 4 to the inner member 3 and at the same time, and in the same process step, the inner member 3 to the outer member 2. The inner member 3 and filter 4 are welded around the outer rim 51. The inner member 3 and outer member 2 are joined by means of weld lines around the outer rim 51 and also the upper edges of the webs 54.

As shown most clearly in Figure 21, the outer member 2 and inner member 3 when joined together define a void space 130 in the interior 120 below the annular flange 41 and exterior the cylindrical funnel 40 which forms a filtration chamber. The filtration chamber 130 and passages 57 above the annular frame 41 are separated by the filter paper 4.

The filtration chamber 130 contains the one or more beverage ingredients 200. The one or more beverage ingredients are packed into the filtration chamber 130. For a filtered style beverage the ingredient is typically roast and ground coffee or leaf tea. The density of packing of the beverage ingredients in the filtration chamber 130 can be varied as desired. Typically, for a filtered coffee product the filtration chamber contains between 5.0 and 10.2 grams of roast and ground coffee in a filtration bed of thickness of typically 5 to 14 mm. Optionally, the interior 120 may contain one or more bodies, such as spheres, which are freely movable within the interior 120 to aid mixing by inducing turbulence and breaking down deposits of beverage ingredients during discharge of the beverage.

The laminate 5 is then affixed to the outer member 2 by forming a weld 126 around the periphery of the laminate 5 to join the laminate 5 to the lower surface of the outwardly extending flange 35. The weld 126 is extended to seal the laminate 5 against the lower edge of the cylindrical wall 27

of the inlet chamber 26. Further, a weld 125 is formed between the laminate 5 and the lower edge of the outer tube 42 of the cylindrical funnel 40. The laminate 5 forms the lower wall of the filtration chamber 130 and also seals the inlet chamber 26 and cylindrical funnel 40. However, a small gap 123 exists prior to dispensation between the laminate 5 and the lower edge of the discharge spout 43. A variety of welding methods may be used, such as heat and ultrasonic welding, depending on the material characteristics of the laminate 5.

Advantageously, the inner member 3 spans between the outer member 2 and the laminate 5. The inner member 3 is formed from a material of relative rigidity, such as polypropylene. As such, the inner member 3 forms a load-bearing member that acts to keep the laminate 5 and outer member 2 spaced apart when the cartridge 1 is compressed. It is preferred that the cartridge 1 is subjected to a compressive load of between 130 and 280N in use. The compressive force acts to prevent the cartridge failing under internal pressurisation and also serves to squeeze the inner member 3 and outer member 2 together. This ensures that the internal dimensions of passageways and apertures in the cartridge 1 are fixed and unable to change during pressurisation of the cartridge 1.

To use the cartridge 1 it is first inserted into the beverage preparation machine and the inlet 121 and outlet 122 are opened by piercing members of the beverage preparation machine which perforate and fold back the laminate 5. An aqueous medium, typically water, under pressure enters the cartridge 1 through the inlet 121 into the inlet chamber 26 at a pressure of between 0.1-2.0 bar. From there the water is directed to flow through the slots

30 and round the manifold 16 and into the filtration chamber 130 of the cartridge 1 through the plurality of slots 17. The water is forced radially inwardly through the filtration chamber 130 and mixes with the beverage ingredients 200 contained therein. The water is at the same time forced upwardly through the beverage ingredients. The beverage formed by passage of the water through the beverage ingredients passes through the filter 4 and filtration apertures 55 into the passages 57 lying above the annular frame 41. The sealing of the filter 4 onto the spokes 53 and the welding of the rim 51 with the outer member 2 ensures that there are no short-circuits and all the beverage has to pass through the filter 4.

The beverage then flows downwardly along the radial passages 57 formed between the webs 54 and through the openings 56 and into the cylindrical funnel 40. The beverage passes along the channels 50 between the support webs 47 and down the discharge spout 43 to the outlet 44 where the beverage is discharged into a receptacle such as a cup.

Preferably, the beverage preparation machine comprises an air purge facility, wherein compressed air is forced through the cartridge 1 at the end of the dispense cycle to flush out the remaining beverage into the receptacle.

In accordance with the present invention, the cartridge 1 is provided on the laminate with a barcode 320 as shown in Figure 10. The barcode 320 is formed from a plurality of bars of contrasting colour. Preferably the bars are black on a white background to maximise the contrast. The barcode 320 is not required to conform to a published standard but a standard format for barcodes, such as EAN-13, UPC-A, or Interleaf 2 of 5 may be used.

As shown in Figure 10, the barcode 320 is specifically located relative to the inlet 121 and the outlet 122 of the cartridge 1. As will be noted from the description of the cartridge 1 above, the inlet 121 and outlet 122 may simply comprise portions of the laminate 5 which in use will be perforated by the piercers of the machine as described below. There is no requirement for the inlet and outlet to be marked on the laminate and these are shown in Figure 10 for illustrative purposes. According to the present invention, the barcode 320 and inlet 121 of the cartridge 1 are separated by a minimum angular distance. A line 328 may be defined extending from the centre of the cartridge 1 through the centre of the barcode 320. In addition, a line 329 may be defined extending from the centre of the cartridge 1 through the centre of inlet 121. According to the present invention, the angle α subtended by these two lines is greater than 70 degrees. Preferably the angle α is greater than or equal to 85 degrees. Where the outlet 122 is at the centre of the cartridge 1 as in the illustrated embodiment the lines 328 and 329 extend from a centre of the outlet 122 to the barcode 320 and inlet 121 respectively. Advantageously, it has been found that this minimum angular separation of the barcode 320 from the inlet 121 improves the accuracy of the reading of the barcode 320 by the recognition means of the machine as described below. This is believed to be for two reasons. Firstly, the separation results in any distortion of the inlet area of the laminate on piercing of the laminate 5 having a minimal affect on the laminate in the region of the barcode 320. Secondly, it has been found that there may be a small degree of leakage of fluid from the inlet area of the cartridge 1 during dispensation since dispensation occurs at pressure. This

fluid may spread, in particular due to capillary effect between the laminate and the brew head 250, leading to partial obfuscation of the barcode 320 by the fluid resulting in a greater chance of the barcode 320 being misread. With the barcode 320 separated by an angle of greater than 70 degrees it has been found that this problem does not occur. In an alternative embodiment the barcode 320 is replaced by a RFID code, located in the same manner as described above.

Preferably, the barcode 320 is also located near a periphery of the laminate 5 so as to separate the barcode 320 from the outlet 122 so as to avoid distortion of the barcode 320 on piercing of the outlet 122.

The cartridge 1 described above is given as an example of one type of cartridge that may bear a barcode 320 in accordance with the present invention. Other cartridges of a similar type may be provided for dispensing other beverage types, for example foamed milk, espresso-style coffee, chocolate, each of which in accordance with the present invention is provided with a barcode or RFID 320 as described above.

Beverage Preparation Machine

As shown in Figure 1a the housing 210 contains and holds in position the other components of the machine 201. The housing 210 preferably made in whole or in part from a robust plastics material such as ABS. Alternatively, the housing 210 can be made in whole or in part from a metallic material such as stainless steel or aluminium. The housing 210 preferably comprises a clam-shell design having a front half 211 and a rear half 212 which allow access during assembly for fitting of the machine 201 components and can

afterwards be joined together to define an interior 213 of the housing 210. The rear half 212 provides a recess 214 for the attachment of the water tank 220. The housing 210 is formed with means, such as detents, abutments, bosses and threaded portions, for retaining the components of the machine 201 in position without the need for a separate chassis. This reduces the overall cost and weight of the machine 201. A base 215 of the housing 210 is preferably provided with feet for standing the machine thereon in a stable manner. Alternatively, the base 215 itself may have a shape forming a stable support.

The front half 211 of the housing 210 comprises a dispense station 270 where dispensation of the beverage takes place. The dispense station 270 comprises a receptacle stand 271 having a hollow interior forming a drip tray 272. An upper surface 273 of the receptacle stand is provided with a grill 274 on which the receptacle is positioned. The drip tray 272 is removable from the housing 210 to ease emptying of the collected water. A recess 275 is formed in the front half of the housing 210 above the receptacle stand 271 to accommodate the dimensions of the receptacle.

The brew head 250 is located towards the top of the housing 210 above the receptacle stand as shown in Figures 1a and 1b. Preferably, the height of the grill 274 relative to the brew head 250 can be adjusted to accommodate different sizes of receptacle. It is preferred that the receptacle is as close to the brew head 250 as possible, whilst still allowing the receptacle to be inserted and withdrawn from the dispense station 270, so as to minimise the height that the dispensed beverage has to descend before contacting the receptacle. This acts to minimise spraying

and splashing of the beverage and minimise loss of entrained air bubbles where these are present. Preferably receptacles of between 70mm and 110 mm in height can be inserted between the grill 274 and brew head 250.

The machine user interface 240 is located on the front of the housing 210 and comprises a start/stop button 241, and a plurality of status indicators 243-246.

The status indicators 243-246 preferably include a light emitting diode (LED) 243 to indicate readiness of the machine 201, a LED 244 to indicate if an error has occurred in the machine 201 operation, and one or more LEDs 245-256 to indicate whether the machine 201 is operating in manual or automatic modes. The LEDs 243-246 may be controlled to illuminate at a constant intensity, to flash intermittently, or both depending on the status of the machine 201. The LEDs 243-246 may have a variety of colours including green, red and yellow.

The start/stop button 241 controls commencement of the dispense cycle and is a manually operated push-button, switch or similar.

A volume adjustment control may be provided to allow a user of the machine 201 to manually adjust the volume of the delivered beverage without altering the other operating characteristics. Preferably the volume adjustment control allows an adjustment in volume of plus or minus 20%. The volume adjustment control may be a rotary knob, a linear slider, a digital readout with increment and decrement buttons, or similar. More typically, volume is controlled by a user operating the start/stop button 241.

A manual power switch (not shown) may be provided on the machine 201. Alternatively, power supply can be

controlled simply by insertion or removal or the power supply plug from the mains power supply.

The water tank 220 is located to the rear of the housing 210 and is connected to the rear half 212 of the housing 210. The water tank 220 comprises a generally cylindrical body 221 which may be right circular or a frustum as desired for aesthetic reasons. The tank comprises an inlet for filling the tank with water which is closed off in use by a manually removable lid 222. An outlet is provided towards a lower end of the tank which communicates with the water pump 230. The water tank 220 may be made from a transparent or translucent material to allow a consumer to view the quantity of water remaining in the tank. Alternatively, the water tank 220 may be made from an opaque material but have provided a viewing window therein. In addition, or in place of the above, the water tank 220 may be provided with a low level sensor which prevents operation of the water pump 230 and optionally triggers a warning indicator, such as an LED, when the water level in the tank descends to a preselected level. The water tank 220 preferably has an internal capacity of approximately 1.5 litres.

The water pump 230 is operatively connected between the water tank 220 and the water heater 225 as shown schematically in Figure 8 and is controlled by the control processor. The pump provides a maximum flow rate of 900 ml/min of water at a maximum pressure of 2.5 bar. Preferably, in normal use, the pressure will be limited to 2 bar. The flow rate of water through the machine 201 can be controlled by the control processor to be a percentage of the maximum flow rate of the pump by cycle chopping the electrical supply to the pump. Preferably the pump can be

driven at any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100% of the maximum rated flow rate. The accuracy of the volume of water pumped is preferably + or – 5% leading to a + or – 5% accuracy in the final volume of the dispensed beverage. A suitable pump is the Evolution (RTM) EP8 pump produced by Ulka S.r.l. (Pavia, Italy). A volumetric flow sensor (not shown) is preferably provided in the flow line either upstream or downstream of the water pump 230. Preferably, the volumetric flow sensor is a rotary sensor.

The water heater 225 is located in the interior of the housing 210. The heater 225 has a power rating of 1550 W and is able to heat water received from the water pump 230 from a starting temperature of approximately 20 °C to an operating temperature of around 85 °C in under 1 minute. Preferably the dwell time between the end of one dispense cycle and the heater 225 being able to commence a subsequent dispense cycle is less than 10 seconds. The heater maintains the selected temperature to within + or – 2 °C during the dispense cycle. The water for the dispense cycle may be delivered to the brew head 250 at 83 °C or 93 °C. The heater 225 is able to quickly adjust the delivery temperature to either 83 °C or 93 °C from a nominal water temperature of 85 °C. The heater 225 comprises an over-temperature cut-off which shuts off the heater if the temperature exceeds 98 °C. Water output from the heater 225 is fed to the brew head 250 by means of a three-way valve. If the pressure of the water flow is acceptable the water is passed to the cartridge 1. If the pressure is below or above predetermined limits then the water is diverted by means of the three-way valve into the drip tray recovery receptacle 270.

The air compressor 235 is operatively connected to the brew head 250 by means of a one-way valve and controlled by the control processor. The air compressor 235 provides a maximum flow rate of air of 500 ml/min at 1.0 bar. In use a working volume of 35 ml is pressurised to 2.0 bar. Preferably, the air compressor 235 can produce two flow rates: a fast (or maximum) flow rate and a slow flow rate.

The control processor of the beverage preparation machine 201 comprises a processing module and a memory. The control processor is operatively connected to, and controls operation of, the water heater 225, water pump 230, air compressor 235 and user interface 240.

The memory of the control processor includes one or more variables for one or more operational parameters for the beverage preparation machine 201. The operational parameters are the temperature of the water passed through the beverage cartridge 1 during the operating stage, the speed of charging the beverage cartridge 1, the presence or otherwise of a soak step, the total dispensed volume of the beverage, the flow rate of the water during the discharge stage, and the flow rate and period of the purge stage.

The variables for the operational parameters are stored in the memory. The cartridge 1 comprises a code provided on or in the cartridge 1 representing the operational parameters required for optimal dispensation of the beverage in that cartridge 1. The code is in binary format and comprises a plurality of data bits corresponding to the variables stored in the control processor memory.

The brew head 250 is shown in Figures 4 to 7. The holder 251 of the brew head 250 comprises a fixed lower part 255, a rotatable upper part 256 and a pivotable cartridge mount 257 positioned inbetween the fixed lower part 255 and

the rotatable upper part 256. The upper part 256, lower part 255 and cartridge mount 257 are rotated about a common hinge axis 258. Figures 4 to 7 show the holder 251 with some components of the machine 201 omitted for clarity.

The rotatable upper part 256 and pivotable cartridge mount 257 are moved relative to the fixed lower part 255 by means of a clamping mechanism 280. The clamping mechanism 280 comprises a clamping lever having first and second members or parts 281 and 282. The first part 281 of the clamping lever comprises a U-shaped arm which is pivotably mounted to the upper part 256 at two first pivot points 283, one on each side of the holder 251.

The second part of the clamping lever comprises two over-centre arms 282, one on each side of the holder 251 which are each pivotably mounted to the upper part 256 at a second pivot point 285 located on the hinge axis 258 coupling the upper part 256 to the fixed lower part 255. Each over-centre arm 282 is a reciprocal member comprising a cylinder 282a, a stem 282b and a resilient sleeve 282c. The cylinder 282a has an internal bore and is rotatably mounted at one end at the hinge axis 258. A first end of the stem 282b is slidingly received in the bore of the cylinder 282a. The opposite end of the stem 282b is rotatably mounted to the U-shaped arm 281 at a third pivot point 286. The third pivot points 286 are unconnected to, and freely moveable relative to, the upper part 256 and lower part 255. The resilient sleeve 282c is mounted externally on the stem 282b and extends, in use, between abutment surfaces on the cylinder 282a and stem 282b. The resilient sleeve 282c accommodates shortening of the over-centre arm 282 but biases the over-centre arm 282 into an extended configuration. Movement of the third pivot points 286

towards and away from the hinge axis 258 is thus possible by relative movement of the stems 282b in the cylinders 282a. The resilient sleeves 282c are preferably formed from silicone. Whilst the illustrated embodiment uses two over-centre arms 282, it will be apparent that the closure mechanism my be configured with only one over-centre arm 282.

The U-shaped arm 281 extends around the front of the holder 251 and comprises two downwardly dependant hook members 287, one on each side of the holder 251, each comprising a cam surface 288 facing the hinge axis 258. The fixed lower part 255 of the holder 251 is provided with two bosses 259, or detents, located one on each side of the lower part 255 at or near a front edge 260 thereof aligned generally with the hook members 287.

As shown in Figure 4, the U-shaped arm 281 may be formed from a one piece plastics moulding comprising an ergonomic hand grip and the hook members 287 integral to the arm.

The cartridge mount 257 is rotatably mounted between the upper and lower parts 255, 256 of the holder 251. The mount 257 is provided with a substantially circular recess 290 which receives in use the beverage cartridge 1. The recess 290 includes an irregularity 291 for accommodating the handle portion 24 of the beverage cartridge 1 which also acts to prevent rotation of the beverage cartridge 1 in the holder 251. The cartridge mount 257 is sprung relative to the fixed lower part 255 such that in the open position, as shown in Figure 7, the cartridge mount 257 is biased out of contact with the fixed lower part 255 so that the cartridge mount 257 is moved out of contact with the outlet and inlet piercer members 254, 253. The cartridge mount 257 is

provided with an aperture 292 for receiving therethrough the inlet and outlet piercers 253, 254 and a head 300 of the cartridge recognition means 252 when the cartridge mount 257 is moved into the closed position.

The upper part 255 comprises a generally circular body 310 housing a circular viewing window 312 through which a consumer can view the beverage cartridge 1 during a dispense cycle and also visually confirm whether a cartridge 1 is loaded in the machine 201. The viewing window 312 is cup-shaped having a downwardly directed rim 311. The viewing window 312 is able to move axially relative to the body 310 of the upper part 255. One arrangement of accomplishing the relative movement is to provide a wave spring (not shown), or similar resilient means such as a rubberised ring, positioned between the viewing window 312 and the circular body 310. In an alternative arrangement, a series of helical compression springs (not shown) are provided extending between the viewing window 312 and the body 310. In both cases the resilient means allows the viewing window 312 to move axially relative to the circular body 310 by a small degree.

When the holder 251 is in the closed position, the viewing window 312 bears against the beverage cartridge 1 biasing it against the lower part 256. In one arrangement, the rim 311 of the viewing window contacts and bears against the flange 35 of the beverage cartridge. At the same time the window 312 contacts the closed top 11 of the cartridge 1. In an alternative arrangement, only the viewing window 312 contacts the closed top 11 of the cartridge 1, and there is no bearing contact between the rim 311 and the flange 35. The pressure exerted by the rim 311 on the flange 35 and/or

by the window 312 on the closed top 11 ensures a fluid tight seal between the cartridge 1 and the holder 251.

The lower part 255 comprises the inlet and outlet piercers 253, 254 and the head 300 of the cartridge recognition means 252. The inlet piercer 253 comprises a hollow needle-like tube 260 having a sharpened end 261 for perforating the laminate 5 of the beverage cartridge 1 in use. The inlet piercer 253 is in fluid communication with a water conduit 262 as shown in Figure 7 which passes through the lower part 255 and is connected to an outlet conduit 263 of the water heater 225. The outlet piercer 254 is similar in type to the outlet piercer described in the applicant's European patents EP 0 389 141 and EP 0 334 572 and comprises an open ended cylinder 264 of circular or D-shaped cross-section having dimensions larger than the discharge spout 43. An arcuate portion 265 of the upper end of the outlet piercer 254 is serrated to pierce and eventually cut the laminate of the beverage cartridge 1. The remainder of the upper end is cut back longitudinally of the cylinder at least to the base of the teeth 266 of the serrated portion to fold or pull the cut laminate 5 away from the outlet aperture before the beverage is dispensed therethrough. The outlet piercer 254 pierces the laminate 5 externally of the discharge spout 43 and when the cartridge mount 257 is in the closed position, rests in the annulus between the discharge spout 43 and the outer wall 42 of the discharge funnel 40. The outlet piercer 254 folds back the cut laminate 105 into the annulus. Thereby both the outlet piercer 254 and the cut laminate 105 are held out of the way of the discharged beverage.

The outlet piercer 254 is surrounded by a ledge 254a which is raised relative to its surroundings by 0.5mm.

Advantageously, the outlet piercer 254 is removable from the lower part 255 to enable it to be thoroughly cleaned, for example, in a dishwasher. The removable outlet piercer 254 is received in a recess 267 in the lower part 255 where it is seated. The inlet piercer 253 and/or the outlet piercer 254 may be made of a metal, such as stainless steel, or from a plastics material. Advantageously, the use of plastic cutting elements is enabled by use of a laminate 5 which is able to be punctured and cut by a non-metallic material. Consequently, the piercers 253, 254 can be made less sharp which lowers the risk of injury to the consumer. In addition, plastic piercing elements are not prone to rust. Preferably, the inlet piercer 253 and the outlet piercer 24 are formed as a single, integral unit which is removable from the lower part 255.

In accordance with the present invention, the inlet piercer 253 is located at a specific angular distance from a window of the cartridge recognition means head 300. A line 326 may be defined extending from the centre of the brew head 250 through the centre of the window of the recognition means 252. In addition, a line 327 may be defined extending from the centre of the brew head 250 through the centre of inlet piercer 253. According to the present invention, the angle α subtended by these two lines is greater than 70 degrees. Preferably the angle α is greater than or equal to 85 degrees. Where the outlet piercer 254 is at the centre of the brew head 250 as in the illustrated embodiment the lines 326 and 327 extend from a centre of the outlet piercer 254 to the window and inlet piercer respectively.

In use, the upper part 256 of the holder 251 is movable from an open position in which it is orientated vertically or towards the vertical as shown in Figure 1b, to a closed

position in which it is orientated substantially horizontally and in interengagement with the fixed lower part 255 and cartridge mount 257. The upper part 256 is moved from the open to the closed positions by operation of the clamping lever. To close the upper part 256 a user takes hold of the clamping lever by the U-shaped arm 281 and pulls downwards. Consequently, the upper part 256 rotates which first brings the rim 311 of the viewing window 312 into contact with the flange 35 of the beverage cartridge 1 in the cartridge mount 257 and/or the window 312 itself into contact with the closed top 11 of the cartridge 1. Continued rotation of the upper part 256 rotates the upper part 256 and cartridge mount 257 down into contact with the lower part 255. Further rotation of the U-shaped arm 281 causes the U-shaped arm 281 to rotate relative to the upper part 256 and the lower part 255 resulting in the hook members 287 of the upper part 256 engaging the bosses 259 of the lower part 255 with the cam surface 288 riding over the bosses 259. During this last stage of rotation the cartridge 1 is compressed between the cartridge mount 257 and the viewing window 312. As a result, the viewing window 312 is moved axially relative to the circular body 310 of the upper part 256 against the bias of the wave spring or helical springs. This movement allows for a take up of tolerances in the beverage cartridge 1 and beverage preparation machine and ensures that the amount of compressive force applied to the cartridge is kept within an acceptable range. The clamping force of the mechanism as moderated by the action of the wave spring or helical springs ensures a clamping pressure on the cartridge. For the arrangement where bearing pressure is applied to both the flange 35 and the closed top 11 of the cartridge 1, it has been found that a pressure of

between 130 and 280N is required. Preferably the force is approximately 200N. A force less than about 130N does not provide an adequate seal, whilst a force greater than about 280N leads to plastic failure of the components of the cartridge 1. For the arrangement where bearing pressure is applied only to the closed top 11 of the cartridge 1 it has been found that a pressure of between 50N and 280N is required. It will be noted that a lower pressure level is possible with this arrangement without a deleterious effect on the sealing of the cartridge 1. During closure of the brew head the laminate 5 of the cartridge 1 is tensioned as it is brought into contact with the ledge 254a surrounding the outlet piercer 254 which causes the laminate 5 to flex out of plane as the distal end of the outer tube 42 of the cylindrical funnel is moved upwardly by 0.5mm relative to the flange 35. This movement also ensures that the great majority of the compressive force applied to the cartridge acts through the central region of the cartridge 1 through the load-bearing inner member 3. In the closed position the cartridge 1 may thus be clamped around the flange 35 by means of the rim 311 of the viewing window 312 and is always firmly clamped between the closed top 11 of the cartridge and the outer tube 42 of the inner member 3 by contact with the viewing window 312 and the ledge 254a. These clamping forces help prevent failure of the cartridge 1 during pressurisation and also ensure that the inner member 3 and outer member 2 are fully seated relative to one another and thus that all internal passageways and apertures remain at their intended dimensions even during internal pressurisation.

An imaginary datum line can be drawn between the first and second pivot points 283, 285 of the holder 251. As can

be seen in Figure 7, in the open position the third pivot points 286 are located on the side of the datum line nearest the fixed lower part 255. As the upper part 256 reaches the closed position, the third pivot points 286 of the clamping lever pass through the datum line joining the first and second pivot points 283, 285 to the opposite side of the line, furthest from the fixed lower part 255. Consequently, the U-shaped arm 281 'snaps through' from a first stable position to a second stable position. The snap through action is accommodated by shortening of the over-centre arms 282 and consequential compression of the resilient sleeves 282c. Once the third pivot points 286 are past the imaginary datum line then recovery of the resilient sleeves 282c acts to continue the motion of the third pivot points 286 away from the imaginary datum line. The clamping lever thus has a bi-stable operation in that the lever is stable in the open or closed positions but unstable at the point when the third pivot points 286 lie on the imaginary datum line joining the first and second pivot points 283, 285. Thus, the snap-through action of the clamping lever provides a positive closure mechanism which leads to a definite closure action wherein in the final stages of the clamping lever's rotation, the snap-through action of the U-shaped arm 281 and second arms 284 forces the hook members 287 firmly into engagement with the bosses 259. In addition, the resilient sleeves 282c provide a resistance to re-opening of the upper part 256 since a minimum force is required to compress the sleeves 282c sufficiently to move the third pivot points 286 back into line with the datum line joining the first and second pivot points 283, 285. Advantageously, the interengagement of the hook members 287 and the bosses 259 prevents separation of the upper and

lower parts other than by rotation of the clamping lever. This is useful in preventing opening of the brew head 250 during operation when the brew head 250 is subject to internal pressurisation.

The purpose of the recognition means 252 is to allow the machine 201 to recognise the type of beverage cartridge 1 that has been inserted and to adjust one or more operational parameters accordingly. In a typical embodiment, the recognition means 252 comprises an optical barcode reader which reads the printed barcode 320 provided on the laminate 5 of the beverage cartridge 1 as shown in Figure 10 and discussed above. The optical barcode reader comprises one or more LEDs 321 to illuminate the barcode 320, a focusing lens 322 to acquire an image of the barcode, a charge coupled device (CCD) 323 for producing an electrical signal representative of the acquired image and support circuitry for the LEDs and CCD. The space in the lower part for accommodating the barcode reader is limited. A mirror or mirrors 324 may be used to reflect the light from the LEDs 321 to a focussing lens which is not located in the lower part 255. Schematic arrangements are shown in Figures 9a and 9b. The lower part 255 comprises an aperture 326 which is the same size as the barcode 320 on the beverage cartridge 1. The aperture 326 is closed by a window, preferably glass, which can transmit the signals produced by the barcode reader. In use the electrical signals produced are decoded by signal processing software and the results forwarded to the control processor. The software can recognise whether the read of the barcode contained errors, although the occurrence of these is minimised as described above by specific location of the barcode 320 relative to the inlet. The barcode 320 may be rescanned a number of

times before an error message is presented to the consumer. If the machine 201 is unable to read the barcode the consumer is able to use the beverage cartridge 1 to dispense a beverage using a manual mode of operation. Alternatively, an RFID reader is provided to read an RFID located on the cartridge 1.

The brew head 250 may also include a cartridge sensor for detecting whether a cartridge is present in the holder 251.

The brew head 250 may also include a lock sensor which detects whether the holder 251 is properly closed. Preferably the lock sensor comprises a micro-switch which is triggered when the holder 251 is closed and locked. Preferably the cartridge sensor and lock sensor are connected in series such that the output of both sensors must be satisfactory, i.e. cartridge present and mechanism locked, before the dispense cycle can be commenced.

Operation of the machine 201 comprises insertion of a beverage cartridge 1 into the brew head 250, carrying out a dispense cycle in which the beverage is dispensed and removal of the cartridge 1 from the machine.

The operational behaviour of the machine 201 is determined by software embedded in the control processor.

To insert the cartridge 1 the holder 251 is opened as described above to expose the cartridge mount 257. The cartridge 1 is then placed on the cartridge mount 257 received within the recess 290 such that the handle 24 of the cartridge is located in the irregularity 291. The optical or magnetic barcode 320 or RFID of the cartridge 1 is orientated directly above the aperture 326 in the cartridge mount 257. The holder 251 is then closed by operation of the clamping lever as described above. During

closure the inlet and outlet piercers 253, 254 pierce the laminate 5 of the cartridge 1 to form the cartridge inlet 121 and outlet 122. As described above the laminate 5 cut by the outlet piercer 254 is folded up into the annulus surrounding the discharge spout 43. When closed the holder 251 grips the cartridge 1 around the rim 35 between the cartridge mount 257 and the upper part 256 and/or between the window 311 and the top 11 of the cartridge 1 to form a fluid tight seal of sufficient integrity to withstand the pressures developed during the dispense cycle.

To commence the operating cycle the consumer operates the start/stop button 241.

The operating cycle comprises the steps of cartridge recognition and the discharge cycle.

Cartridge recognition is performed by the optical recognition means 252 as described above assuming that the outputs from the cartridge sensor and lock sensor are satisfactory. Once the barcode 320 or RFID has been decoded the operational parameters of the machine 201 are adjusted by the control processor. The discharge cycle is then automatically commenced.

The discharge cycle has four main stages, not all of which are used for all beverage types:

(i) Pre-wet
(ii) Pause
(iii) Brew/Mixing
(iv) Purge

In the pre-wet stage the cartridge 1 is charged with water from the water storage tank 220 by means of the water pump 230. The charging with water causes the beverage ingredients 200 in the filtration chamber 130 to be wetted. The charging may take place at a "fast" flow rate of 600

ml/min or a "slow" flow rate of 325 ml/min. The slow charging rate is particularly useful for cartridges containing viscous liquid beverage ingredients where the ingredients require some dilution before they are able to be pumped at a higher volume flow rate. The volume of water injected into the cartridge 1 is selected to ensure that water or beverage does not drip out of the cartridge outlet 122 during this stage.

The pause stage allows the beverage ingredients 200 to soak in the water injected during the pre-wet stage for a predetermined period of time. Both the pre-wetting and soaking stages are known to increase the yield of the extractibles from the beverage ingredients 200 and to improve the end flavour of the beverage. Pre-wetting and soaking are particularly used where the beverage ingredients are roast and ground coffee.

In the brew/mixing stage water is passed through the cartridge 1 in order to produce the beverage from the beverage ingredients 200. The temperature of the water is determined by the control processor which sends instructions to the water heater 225 to heat the water passing from the water tank 220 to the brew head 250. Water enters the lower part 255 of the holder 251 through the conduit 262 via the inlet valve and the inlet piercer 253 into the inlet chamber 126 of the beverage cartridge 1. Brewing and/or mixing and subsequent dispensing of the beverage from the beverage cartridge 1 is as described above with reference to the versions of the beverage cartridge 1.

The air purge comprises the blowing of pressurised air through the beverage preparation machine and the beverage cartridge 1 to ensure that all beverage is dispensed and that the flow path is cleared ready for dispensing another

beverage. The air purge does not commence immediately on cessation of the brew/mixing stage to allow for the majority of the fluid to clear the flow path. This prevents an unacceptable spike in internal pressure on commencement of the air purge.

In normal operation a user manually stops the machine 201 by operating the start/stop button 241.

Once the operating cycle has been completed the consumer removes the cartridge 1 by opening the holder 251 and manually removing and disposing of the cartridge. Alternatively, the machine 201 may be provided with an automatic ejection mechanism for removing the cartridge automatically on opening the holder 251.

Insert for use in the system

As described above, the machine 201 of the present invention may also be used with other inserts not necessarily of a cartridge form. An example of another suitable form of insert will now be described.

The insert 400 comprises an upper part 401 and a lower part 402. The upper part 401 in the illustrated embodiment is generally in the form of the outer member 2 described above with reference to the cartridge 1. However, it will be apparent that other shapes and forms of upper part may be used. The upper part 401 does not contain an inner member but is substantially hollow having a downwardly directed opening 409. Sealing means in the form of a rubberised or elastomeric 'O' ring 403 is inserted or attached to a rim of the opening 409 of the upper part 401. The O-ring 403 may be releasable or permanently attached to the upper part 401. Alternatively, the O-ring 402 may be attached to the lower part 402.

The lower part 402 is generally in the form of the mount 257 described above. In particular, the lower part 402 comprises a generally planer portion having a circular recess 408 for receiving the upper part 401 as will be described below. In addition, the lower part 402 comprises two dependent legs 407 having C-shaped clipping means 406 at their distil ends for attachment to the pivot axis of the beverage preparation machine 201 in the same manner as described above for attachment of the mount 257 of the beverage preparation machine 201. The lower part 402 is provided with an inlet aperture 405 near a periphery of the recess 408 and an outlet aperture 404 at a centre of the recess 408. Figure 23 illustrates the underneath view of the lower part 402 of the insert 400. As shown, the inlet aperture 405 may be surrounded by a dished recess. Alternatively, the inlet aperture 405 may be a simple hole in a flat planar surface. The lower surface 417 of the lower part 402 is also provided with a recess 415 for receiving a barcode or RFID for reading by the barcode reader or RFID reader of the beverage preparation machine 201 in the same manner as the reading of the barcode or RFID of the cartridge 1 as described above. Alternatively, the barcode or RFID may be applied directly to the lower surface 417 of the lower part 402 without the need for a recess 415. In particular, in accordance with the present invention, and as with the cartridge 1 described above, the barcode 320 or RFID and inlet aperture 405 of the insert 400 are separated by a minimum angular distance. A line 328 may be defined extending from the centre of the insert 400 through the centre of the barcode 320 or RFID. In addition, a line 329 may be defined extending from the centre of the insert 400 through the centre of inlet aperture 405. According to the

present invention, the angle α subtended by these two lines is greater than 70 degrees. Preferably the angle α is greater than or equal to 85 degrees.

The outlet aperture 404 of the lower part 402 is provided with a downwardly dependent cylindrical extension 410 which, as shown in Figure 25 is accommodated on closure of the brew head by removing the removable inlet and outlet piercers 253, 254.

In use, the upper part 401 and lower part 402 of the insert 400 are sealed together as shown in Figure 24 to define a brewing volume in between having an inlet provided by the inlet aperture 405 of the lower part 402 and an outlet provided by the outlet aperture 404 of the lower part 402. It will be appreciated that the inlet to the brewing volume is upwardly directed and the outlet from the brewing volume is downwardly directed.

When the upper part 401 and lower part 402 are sealed together, the 'O' ring 403 provides a peripheral seal surrounding the brewing volume to prevent leakage of fluid at the extremities of the insert 400.

As shown in Figure 25, the insert 400 may be inserted into the beverage preparation machine of the type described above in place of the rotatable mount 257 and the removable inlet and outlet piercers 253, 254. As with the mount 257, the insert 400 is rotatable about the pivot access of the beverage preparation machine.

In use, a quantity of beverage ingredients is loaded into the brewing volume defined by the insert 400 by placing the beverage ingredients between the upper part 401 and lower part 402 and then placing the upper part 401 and lower part 402 together so as to seal the brewing volume by means of the 'O' ring 403. This loading operation may take place

before or after the insert 400 is removably attached to the beverage preparation machine. Preferably, the lower part 402 of the insert 400 remains attached to the beverage preparation machine 201 and the user loads the quantity of beverage ingredients onto the lower part 402 and then places the upper part 401 on top of the lower part 402 in the recess 408 to define and seal the brewing volume.

Operation of the closure mechanism of the beverage preparation machine is exactly the same as described above. In particular, it should be noted that on closure of the closure mechanism the brew head applies a downward pressure on the upper part 401 of the insert 400 to hold the upper part 401 and lower part 402 together to create the seal therebetween. The pressure may be applied to the upper part 401 by the top portion of the viewing window 311 or by the downwardly dependent rim of the viewing window dependent on the construction of the upper part 401. In addition, the downwardly directed pressure applied by the closure mechanism of the beverage preparation machine seals the lower part 402 of the insert 400 against the fixed lower part 255 of the brew head ensuring a seal between the inlet aperture 405 of the lower part 402 and the upwardly directed inlet of the brew head to ensure that water does not leak during dispensation at this point. Preferably the lower part 255 of the brew head 250 at the inlet is provided with a rubberised seal 420 which stands slightly proud of the plane of the lower part 255 to create an improved seal between the upwardly directed inlet and the lower surface 417 of the lower part 402 of the insert 400.

The quantity of beverage ingredients loaded into the brewing volume of the insert 400 may be loose or may be contained in a container such as a flexible filter bag made

of filter paper. Use of a filter bag has the advantage that loading of the beverage ingredients is very quick and removal of the beverage ingredients after dispensation is made easier.

During dispensation the beverage preparation machine injects water upwardly into the brewing volume from the upwardly directed inlet of the brew head 250. The water mixes with the quantity of beverage ingredients held in the brewing volume and the resulting beverage is dispensed downwardly through the outlet aperture 404 into a receptacle situated below the brew head 250. Other aspects of the operation of the beverage preparation machine are as described above in respect of operation of the cartridge. In particular, the recognition means of the beverage preparation machine may be used to read a barcode or RFID situated on the lower surface of the lower part 402, preferably in the recess 415.

The insert 400 has been described particularly for use with beverage ingredients contained in containers such as filter bags. As indicated, the beverage ingredients may alternatively be in a loose form. In this case, a separate filter may be provided in the insert 400 to prevent discharge of beverage ingredient residue. A preferred arrangement is for a planer filter to be placed across the upper extremity of the outlet aperture 404 of the lower part 402.

It will be appreciated that it will be advantageous that the upper part 401 of the insert 400 is rigid or semi-rigid in order to be able to transfer the downward pressure created by the closure mechanism to the seal 403 to ensure a good seal between the upper part 401 and lower part 402 of the insert 400.