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FANKHAUSER et al.(10) **Pub. No.: US 2025/0261784 A1**(43) **Pub. Date: Aug. 21, 2025**(54) **CENTRIFUGAL CHAMBER WITH CAPSULE
POSITIONING GUIDE****Publication Classification**(51) **Int. Cl.***A47J 31/22* (2006.01)*A47J 31/36* (2006.01)*A47J 31/40* (2006.01)(52) **U.S. Cl.**CPC *A47J 31/22* (2013.01); *A47J 31/3633*(2013.01); *A47J 31/3638* (2013.01); *A47J**31/407* (2013.01)(71) Applicant: **SOCIÉTÉ DES PRODUITS NESTLÉ**
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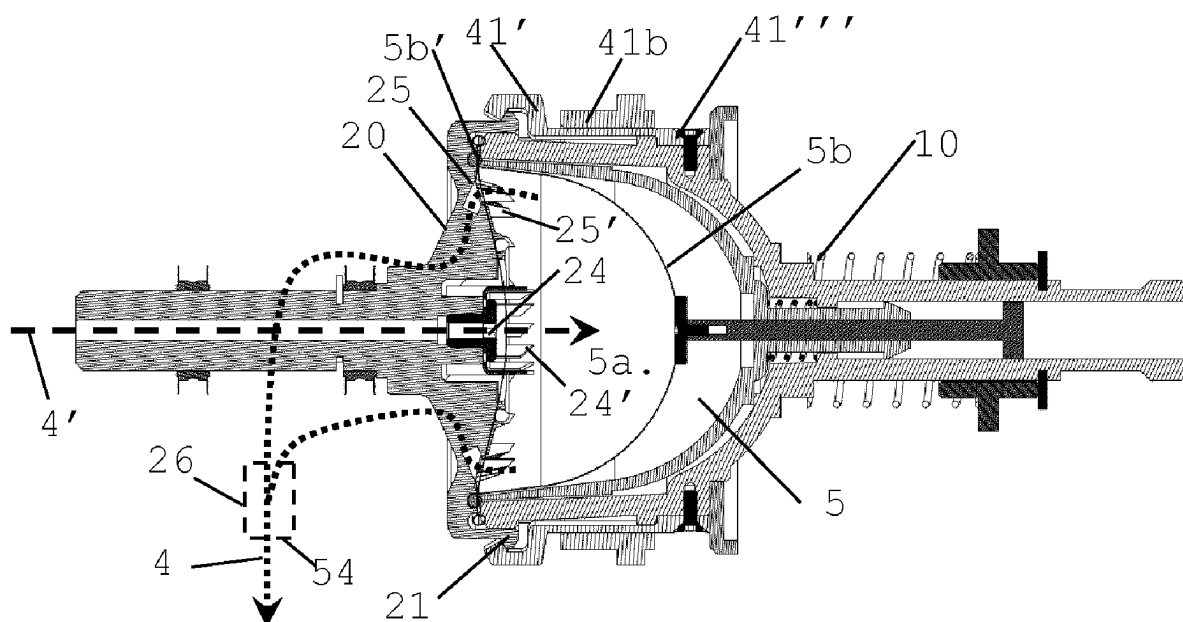
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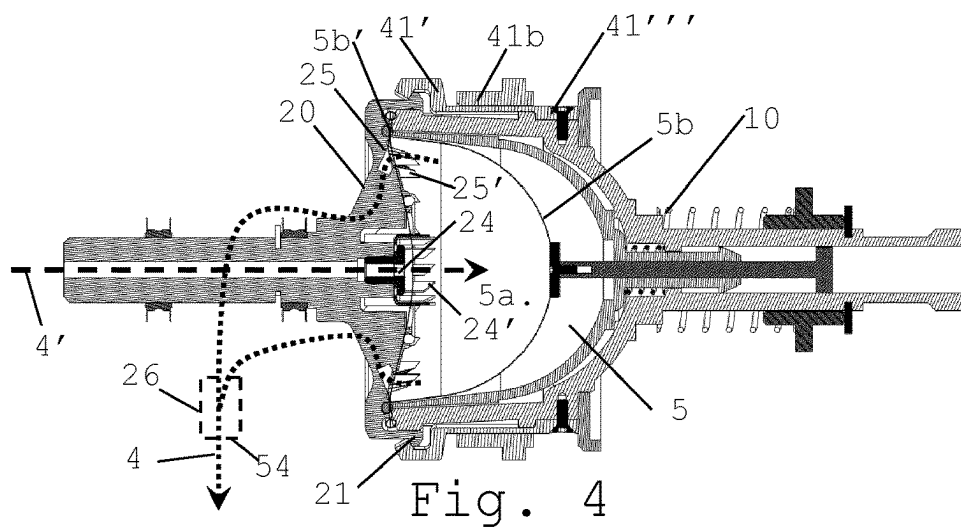
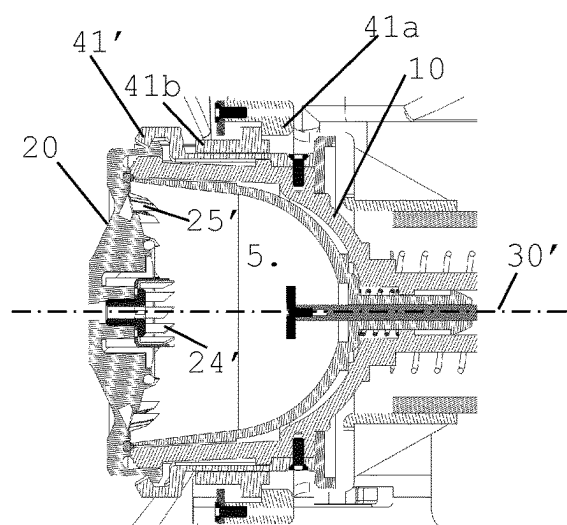
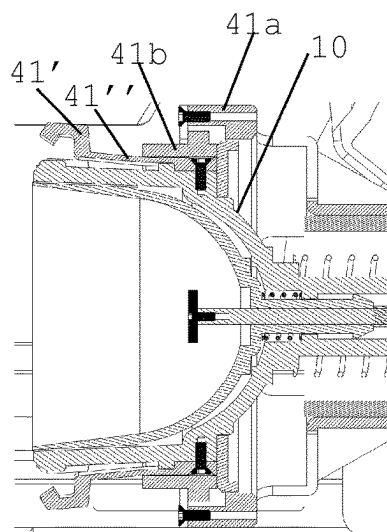
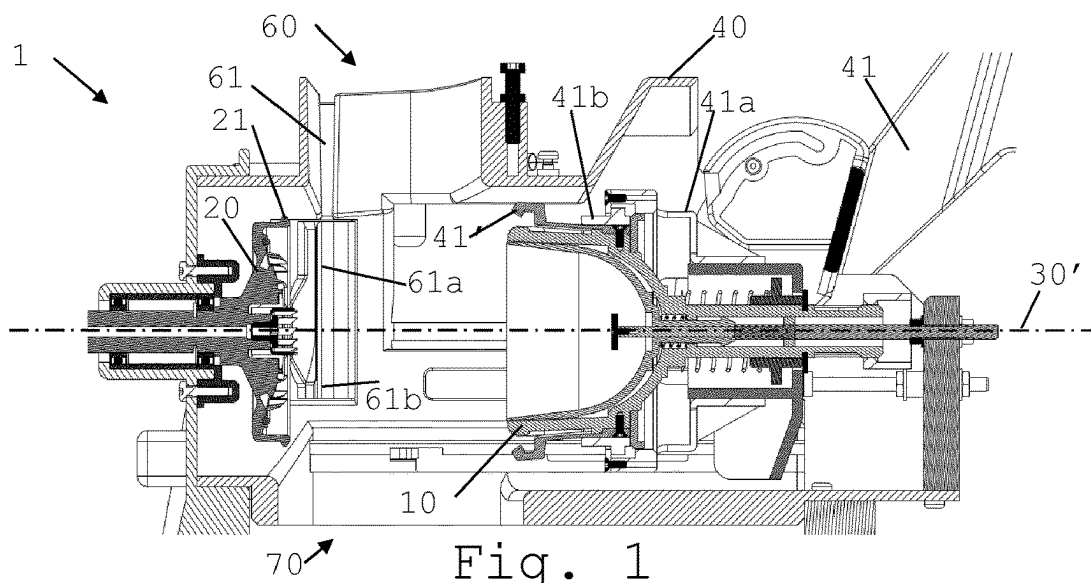
Apr. 14, 2022 (EP) 22168290.9

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ABSTRACT

A machine (1) is configured for preparing a beverage (4) from a flavouring ingredient (5a) supplied within a capsule (5b) in a processing cavity (5) by mixing it with water (4') and centrifuging them about a processing axis (30'). The machine (1) has a handling system (10, 20) including a first ingredient handler (10) and a second ingredient handler (20) that are movable one relative to the other from a capsule transfer configuration to an capsule processing configuration. The machine has a capsule supply passage (60) provided with a capsule guide (61, 61a). The guide (61, 61a) is associated with a capsule stop (61b) to immobilize the supplied capsule (5b) between the first and second ingredient handlers (10, 20). The guide is integral with or fixed to an elastic arm (61c) to be movable towards and away from the processing axis (30') between a capsule immobilization position and a release position.





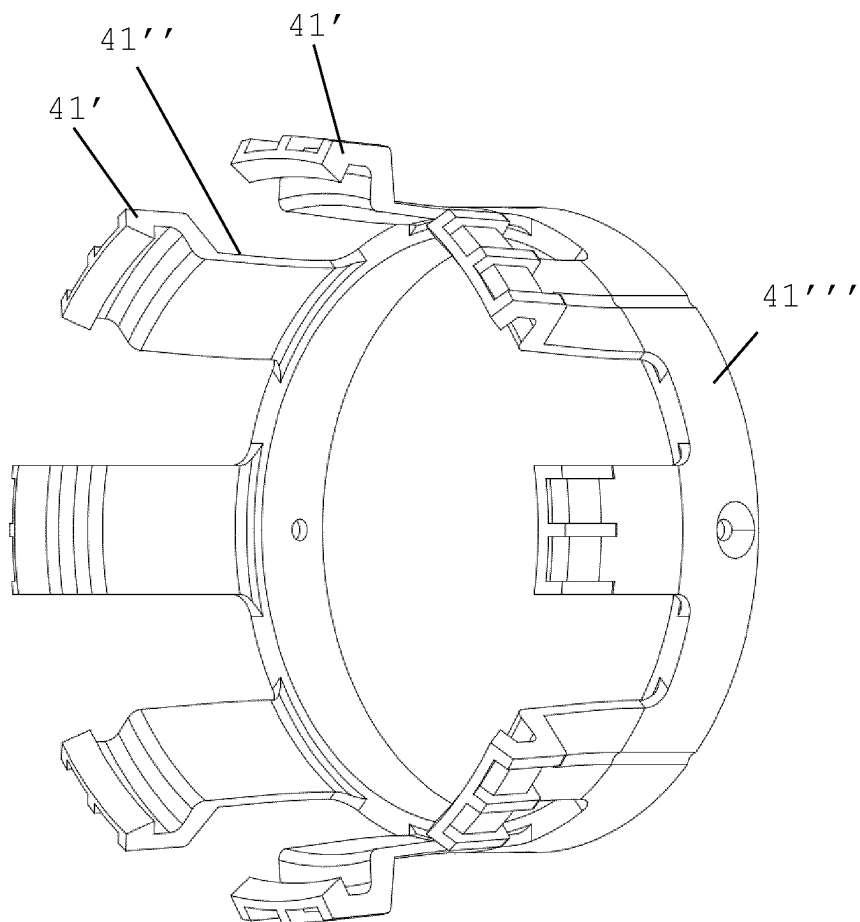


Fig. 5

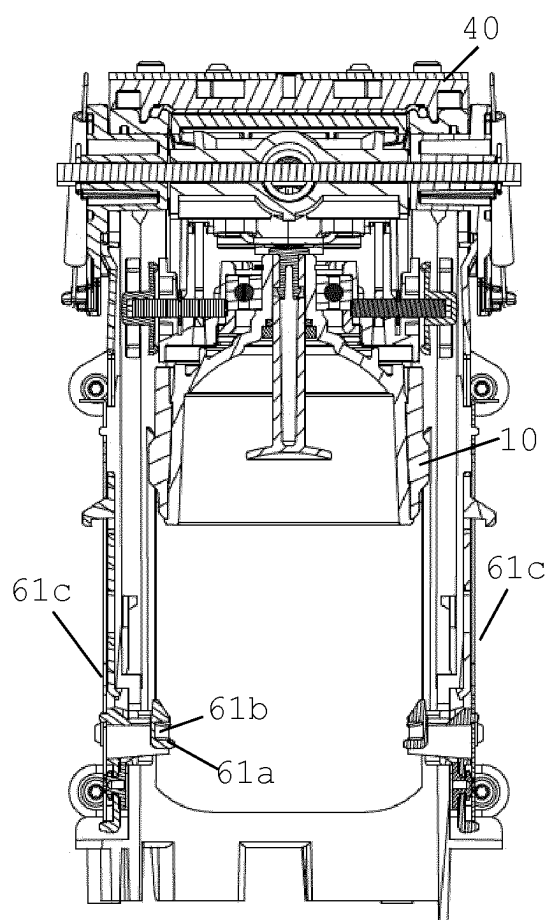


Fig. 6

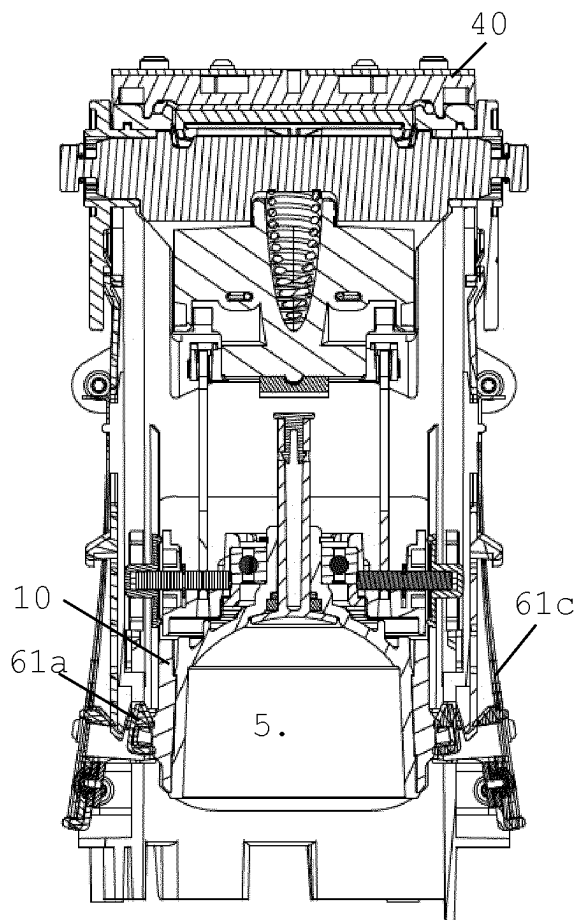


Fig. 7

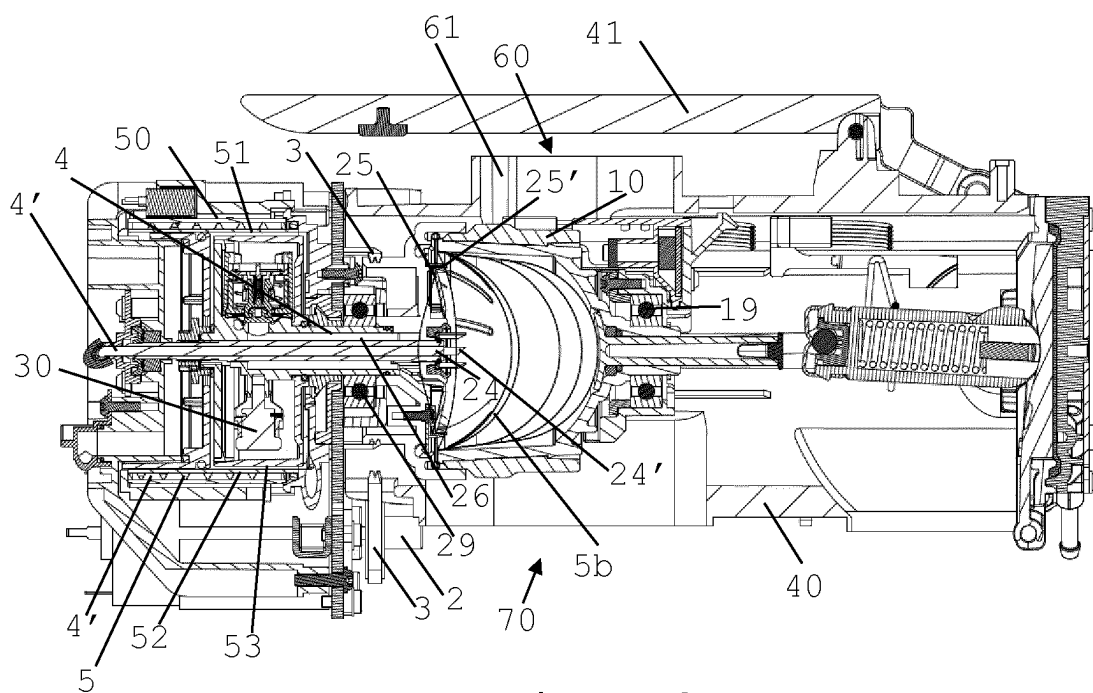
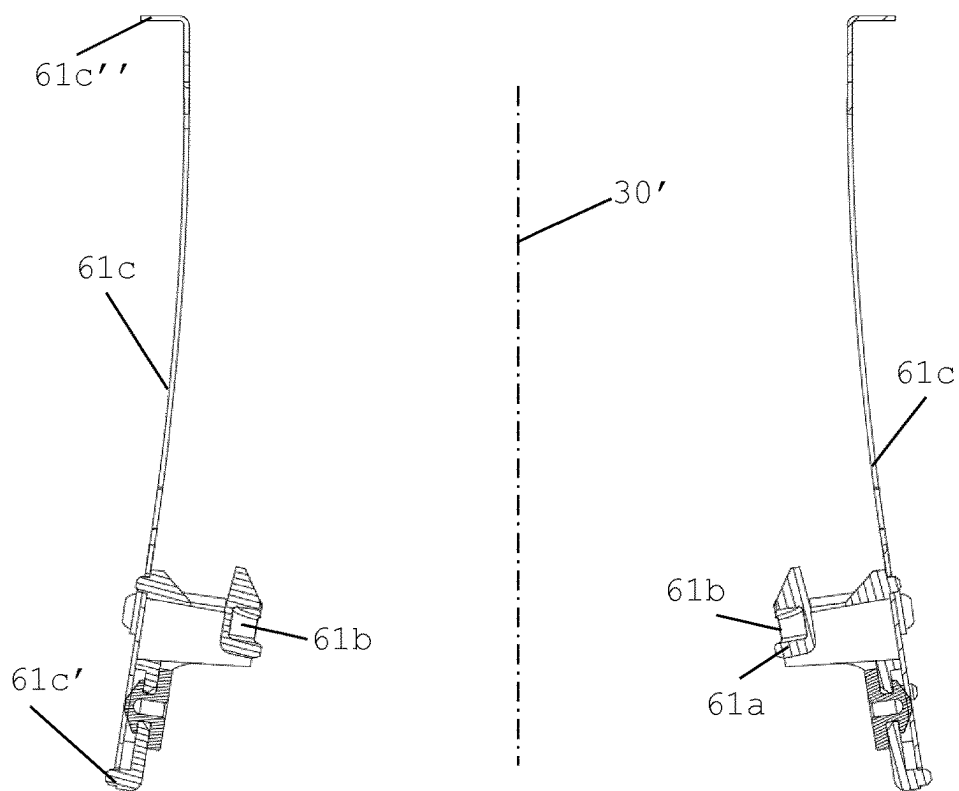
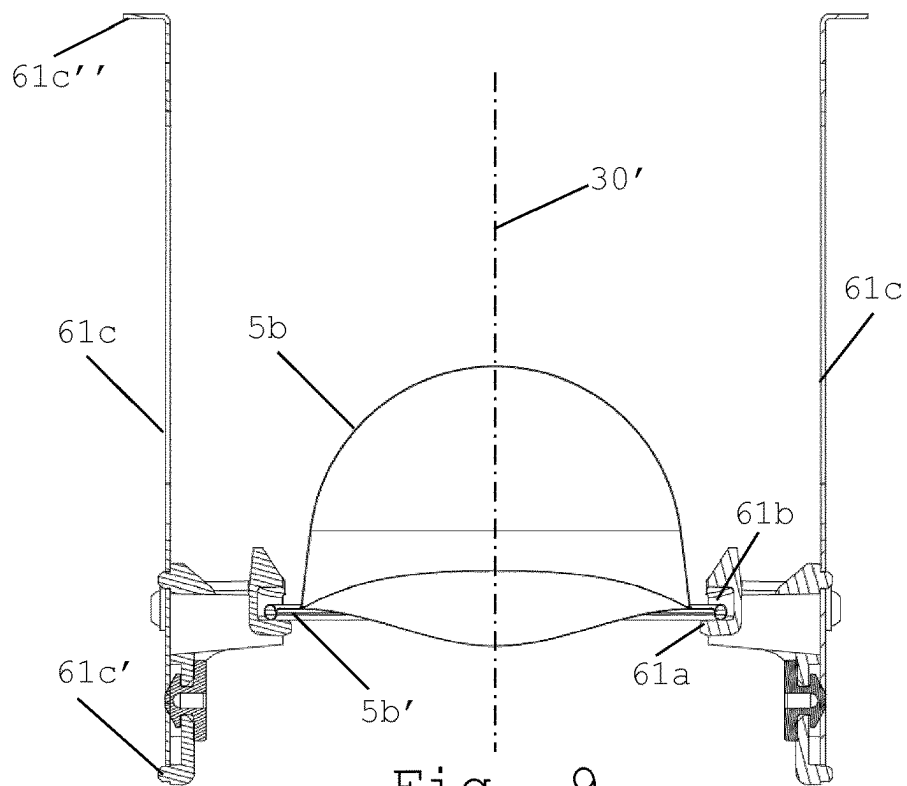


Fig. 8



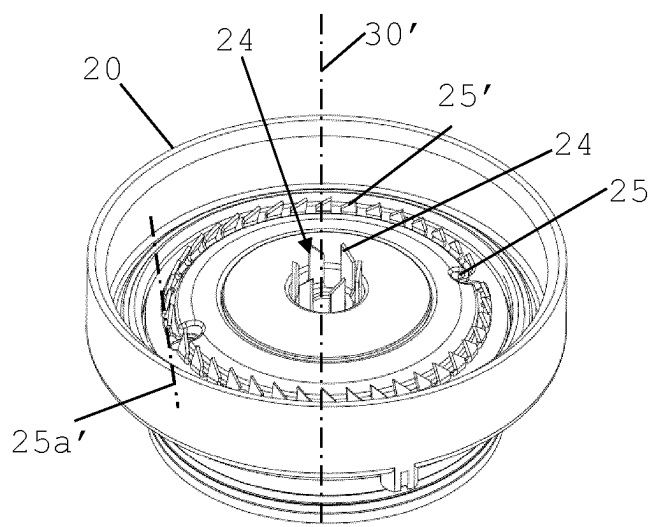


Fig. 11

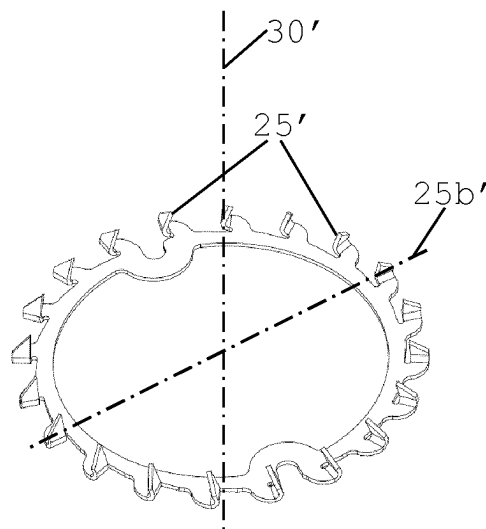


Fig. 12

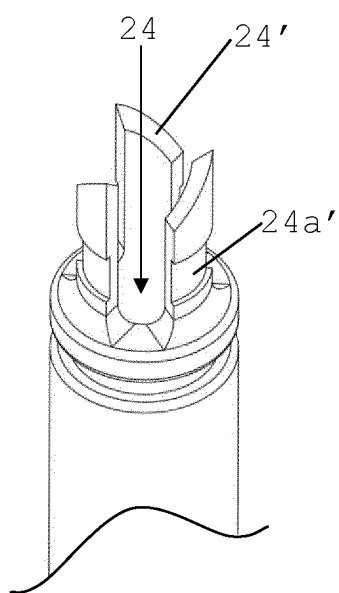


Fig. 13

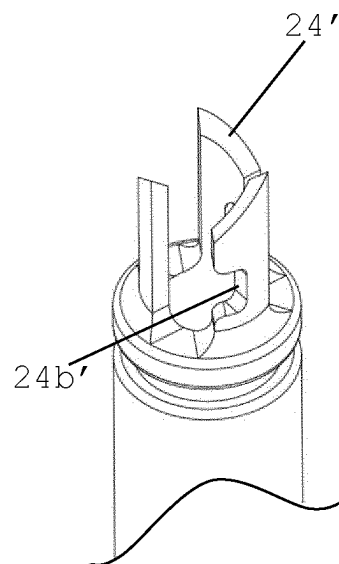


Fig. 14

CENTRIFUGAL CHAMBER WITH CAPSULE POSITIONING GUIDE

FIELD OF THE INVENTION

[0001] The field of the invention pertains to beverage preparation machines by centrifuging capsules containing an ingredient of the beverage to be prepared.

[0002] For the purpose of the present description, a “beverage” is meant to include any human-consumable liquid substance, such tea, coffee, as hot or cold chocolate, milk, soup, baby food, etc. . . . A “capsule” is meant to include any container such as a packaging for containing a pre-portioned beverage ingredient, e.g. a flavouring ingredient, the packaging forming an enclosure of any material, in particular an airtight or pervious material, porous or non-porous material, e.g. plastic, aluminium, recyclable and/or biodegradable packagings, and of any shape and structure, including soft pods or rigid cartridges for containing the ingredient.

BACKGROUND ART

[0003] Certain beverage preparation machines use capsules containing ingredients to be extracted or to be dissolved and/or ingredients are and that stored dosed automatically in the machine or else are added at the time of preparation of the drink. Some beverage machines possess filling means that include a pump for liquid, usually water, which pumps the liquid from a source of water that is cold or indeed heated through heating means, e.g. a thermoblock or the like.

[0004] Especially in the field of coffee preparation, machines have been widely developed in which a capsule containing beverage ingredients is inserted in a brewing device. The brewing device is tightly closed about the capsule, water is injected at the first face of the capsule, the beverage is produced in the closed volume of the capsule and a brewed beverage can be drained from a second face of the capsule and collected into a receptacle such as a cup or glass.

[0005] Brewing devices have been developed to facilitate insertion of a “fresh” capsule and removal of the capsule upon use. Examples of such brewing devices are disclosed in EP 1 646 305, 1 767 129, WO 2009/043630, WO 2005/004683 and WO 2007/135136, WO 2014/056821. It is known to secure brewing chambers using a hook system, as for example disclosed WO in 2006/005755 and WO 2006/005756.

[0006] The opening of capsules using a capsule opener is for example known from EP 0 512 470, EP 2 068 684, WO 02/00073, WO 02/35977, U.S. Pat. Nos. 3,260,190, 5,649, 472, CH 605 293, EP 512 468, EP 242 556, WO 2014/076041, WO 2015/022342, WO 2015/022344, WO 2015/022345 and WO 2015/144356.

[0007] The preparation of a beverage by using centrifugation is also known. Examples of centrifugation processes and corresponding devices are disclosed in WO 2008/148601, WO2008/148650, U.S. Pat. No. 5,566,605, WO 2013/007776, WO 2013/007779 and WO 2013/007780.

[0008] It has also been proposed to facilitate the handling of capsules by systems for extracting them, in particular by motorizing the opening and/or of closure the extraction system for inserting and/or removing a of such systems are for example capsule. Examples disclosed in EP 1 767 129, WO 2009/113035, WO 2012/025258, WO 2012/025259,

WO 2012/041605, WO 2013/127476, WO 2014/096122, WO 2014/096123 and EP2015185946.9.

[0009] Beverage preparation by centrifugation includes: providing a beverage (flavoring) ingredient, e.g. as powder and/or leaves, in a capsule; circulating liquid into the capsule and rotating the capsule at sufficient speed to ensure interaction of the liquid with the ingredient while creating a gradient of pressure of liquid in the capsule. Such pressure increases gradually from the centre towards the periphery of the capsule. As liquid traverses the ingredient, e.g. coffee bed, extraction of the ingredient, e.g. coffee compounds, takes place and a liquid extract is obtained that flows out at the periphery of the capsule. Examples of such systems are disclosed in WO 2008/148601, WO 2013/007776, WO 2013/007779, WO 2013/007780, WO 2017/046294, WO 2017/068134 and WO 2017/202746. WO 2021/122502 discloses a centrifugal beverage machine with a rotatable valve arrangement for controlling a flow of water towards a centrifugal beverage mixing chamber. The capsule can be secured between facing capsule handlers that are secured by a fastening device, e.g. as disclosed in WO 2012/007293, WO 2013/007776, WO 2013/007779, WO 2013/007780 and WO 2014/102048.

[0010] WO 2008/148646 WO and 2008/148650 describe a beverage preparation device wherein a flow restriction is created downstream of the receptacle, in particular a capsule, for example, by a valve which opens or enlarges under the pressure created by the centrifuged liquid leaving the receptacle. The higher the rotational speed, the more the valve opens or enlarges. The valve can be formed by a mobile restriction part of the device which is elastically urged against a rim portion of the capsule. In 2017/068134 WO the centrifugal brewing chamber is fitted with an outlet valve that can be controlled by an inertia body of the machine rotating with the centrifugal brewing chamber. The valve leads into a collector forming a crema chamber in which the beverage upon undergoing a pressure drop at the valve is refined for dispensing into a user-reipient, e.g. a cup or a mug. Such collection chamber is typically arranged around the centrifugal brewing chamber, as for example disclosed in WO 2020/201469.

[0011] Capsule centrifugation to prepare coffee has been commercialized under the brand VERTUO® by NES-PRESSO®.

[0012] It has been proposed to prepare beverages by centrifugation along a horizontal axis.

[0013] WO 2015/173123 and WO 2015/173124 disclose a centrifugal brewing chamber formed between two enclosing parts that are relatively translatable between an open position and a closed position. The enclosing parts cooperate with a pair of jaws that are movable between a capsule holding position to hold a capsule between the enclosing parts in the open position and a capsule release position to release the capsule. The jaws are actuated by a first actuator and a second actuator that are activated by the enclosing parts during their the relative translation. The jaws guide a capsule into a position between the enclosing parts in the open position and immobilize the capsule thereinbetween. Then, when the enclosing parts are translated together to enclose the capsule, the jaws release the capsule so that the brewing chamber is formed about the capsule. The enclosing parts are rotated about a horizontal axis to centrifuge the capsule for preparing the beverage with the ingredient in the capsule. At the end of beverage preparation, centrifugation

stops the and enclosing parts are relatively translated to the open position whereby the used capsule is allowed to drop from the enclosing parts. Then the jaws are brought back into their capsule holding position. Further centrifugal beverage machines are disclosed in EP2021201687.7, EP2021202356.8, EP2021216919.7, EP2021216927.0, EP2021216930.4, EP 21216965.0, EP2021216970.0 and EP2021216976.7.

SUMMARY OF THE INVENTION

[0014] The invention relates to a machine for preparing a beverage from at least one ingredient. Normally such beverage is then dispensed to a user, e.g. to a user-cup or user-mug.

[0015] For instance, s a coffee, tea, the machine chocolate, cacao, milk or soup preparation machine. For example, the machine is arranged for preparing within a beverage processing module that includes an ingredient holder, a beverage by passing hot or cold water or another liquid through the ingredient held in the holder, such as a flavouring ingredient, of the beverage to be prepared, such as ground coffee or tea or chocolate or cacao or milk powder.

[0016] Such beverage preparation typically includes the mixing of a plurality of beverage ingredients, e.g. water and milk powder, and/or the infusion of a beverage ingredient, such as an infusion of ground coffee or tea with water. One or more of such ingredients may be supplied in loose and/or agglomerate powder form and/or in liquid form, in particular in a concentrate form. A carrier or diluent liquid, e.g. water, may be mixed with such ingredient to form the beverage. Typically, a predetermined amount of beverage is formed and dispensed on user-request, which corresponds to a portion (e.g. a serving). The volume of such a serving may be in the range of 15 to 1000 ml such as 25 to 600 ml for instance 40 to 250 ml, e.g. the volume for filling a cup or mug, depending on the type of beverage. Formed and dispensed beverages may be selected from ristrettos, espressos, lungos, cappuccinos, café latte, americano coffees, teas, etc For example, a coffee machine may be configured for dispensing espressos, e.g. an adjustable volume of 20 to 60 ml per serving, and/or for dispensing lungos, e.g. a volume in the range of 70 to 200 ml per serving, and/or for dispensing americanos, e.g. a volume in the range of 150 to 750 ml.

[0017] An aspect of the invention relates to a machine for preparing a beverage from a flavouring ingredient, supplied within a capsule in a processing cavity. The ingredient is mixed with water in the capsule. The ingredient and water are centrifugally driven about a processing axis to form the beverage.

[0018] The centrifugation process for preparing a beverage is known for example from EP 2 000 062, EP 2 155 020, EP 2 152 128, WO 2008/148646, WO 2009/106175, WO 2009/106589, WO 2010/026045, WO 2010/026053, WO 2010/066736, WO 2008/148650, WO 2008/148834, WO 2010/066705, WO 2010/063644, WO 2011/023711, WO 2014/096122 or WO 2014/096123.

[0019] Typically, the machine includes one or more of the following components:

[0020] a) a fluid system in fluid communication with the flavouring ingredient during beverage preparation;

[0021] b) a thermal conditioner, such as in-line heater and/or cooler, for thermally conditioning a flow of liquid circulated to the flavouring ingredient or a batch

thermal conditioner for circulating thermally conditioned liquid from the batch conditioner to the flavouring ingredient;

[0022] c) a liquid driver, such as a pump, for driving liquid to the flavouring ingredient, in particular a low pressure pump e.g. within the range of 1 to 5 bar, such as 1.5 to 3 bar;

[0023] d) a motor for driving the flavouring ingredient in rotation during beverage preparation;

[0024] e) an electric control unit, in particular comprising a printed circuit board (PCB), for receiving instructions from a user via an input user-interface and for controlling the thermal conditioner, liquid driver and motor(s); and

[0025] f) one or more sensors for sensing least at one characteristic selected from characteristics of fluid system, the thermal conditioner, the liquid driver, a liquid tank, an ingredient collector, a flow of the liquid (e.g. by a flowmeter), a pressure of the liquid and a temperature of the liquid, and for communicating such characteristic(s) to the control unit.

[0026] The abovementioned capsule may have a body containing the ingredient and a peripherally projecting flange, e.g. a body in the shape of a cup and a lid covering the mouth of the cup and extending beyond the mouth to form the peripherally projecting flange.

[0027] The capsule may have a body that is symmetric or asymmetric, conical or frusto-conical or cylindrical or spherical or hemispherical or frusto-spherical, containing the ingredient, e.g. ground coffee, tea or cacao or another beverage ingredient.

[0028] The capsule may be of the type described above under the header “field of the invention”. The capsule may be a capsule that has a container-body, e.g. a generally cup-shaped or hemispherical or hemi-ellipsoidal body, having a flange to which a cover lid (or membrane) is attached, in particular sealed. Typically the capsule contains a beverage ingredient. Examples of suitable capsules are disclosed in WO 2008/148601, WO 2008/148604, WO 2008/148646, WO 2008/148650, WO 2008/148656, WO 2008/148834, WO 2011/141532, WO 2011/141535, WO 2013/072297, WO 2013/072239, WO 2013/072326, WO be of the variety 2015/044400. The capsule may commercialised by Nespresso under the brand Vertuo.

[0029] The machine has a rotatable ingredient handling system for holding and rotating about the processing axis the flavouring ingredient contained within the abovementioned capsule and water during centrifugation. The ingredient handling system has at least one beverage outlet and at least one water inlet for supplying the water to the flavouring ingredient, e.g. within the abovementioned capsule.

[0030] The handling system includes a first ingredient handler and a second ingredient handler that are movable one relative to the other from:

[0031] an ingredient transfer configuration for receiving the flavouring ingredient by the first and second capsule handlers and/or releasing such ingredient from the first and second ingredient handlers; to

[0032] an ingredient processing configuration for centrifuging the flavouring ingredient and the water by rotation about the processing axis;

[0033] and vice versa.

[0034] Upon processing, the ingredient, e.g. contained in a capsule, may be collected in an ingredient (or ingredient

capsule) collector downstream the handling system, as for example disclosed in WO 2009/074559 or WO 2009/135869.

[0035] The machine has a handler actuator, such as a motor or a user-handle, configured to relatively move the first and second capsule handlers between the transfer and the processing configurations, e.g. via a knee lever.

[0036] The machine has a machine frame and/or housing which is stationary when the ingredient handling system is rotated for centrifugation and which supports the ingredient handling system. For example, the first and second handlers are mounted in rotation on the frame and/or housing via one or more bearings, such as ball bearings.

[0037] The machine frame and/or housing delimits an ingredient supply passage configured to allow supply by gravity of the ingredient within the capsule towards the rotatable ingredient handling system and a waste evacuation passage configured to allow an evacuation by gravity of waste, e.g. the capsule upon use, from the rotatable ingredient handling system.

[0038] The supply passage is provided with a guide for guiding the capsule. The guide is configured to cooperate with a complementary capsule shape e.g. a capsule flange. The guide forms for example a recess and/or a rail. The guide is associated with a capsule stop configured to immobilize the capsule guided by the guide at a level between the first and second ingredient handlers, e.g. substantially coaxially with the processing axis. The stop, e.g. a capsule retainer, may be fixed to or integral with the guide.

[0039] The guide or a portion thereof is mounted movably towards and away from the processing axis.

[0040] The supply passage can be provided with two such guides facing each other so that the capsule is guided between the guides.

[0041] The guide or a portion thereof is integral with or fixed to an elastic arm movable, e.g. movable by flexion, between an immobilization position for immobilizing the capsule at the level between the first and second ingredient handlers by the stop and a release position for releasing the capsule from the stop.

[0042] The stop may be configured to be urged into the holding position or into the release position by at least one of the first and second ingredient handlers movably mounted relative to the stop.

[0043] The stop can be located at or towards one end of the elastic arm, the elastic arm having an opposite end at or towards which opposite end the arm is secured to the machine frame and/or housing or to the rotatable ingredient handling system.

[0044] The elastic arm can be: substantially wire-shaped and/or blade-shaped; and/or made of metal, e.g. steel, and/or plastic material.

[0045] The machine may include at least one fastener movable selectively into a fastening position to fasten together the first and second capsule handlers in the processing configuration and into an unfastening position in which the first and second capsule handlers are movable from the processing configuration to the transfer configuration and/or vice versa. The fastener may be actuated by the handler actuator into the fastening position and/or into the unfastening position. The fastener is for example biased into the fastening position or into the unfastening position, e.g. by an elastic member, such as elongated arm.

[0046] The handler actuator can be angularly stationary relative to the frame and/or housing about the processing axis when the ingredient handling system is rotated for centrifugation.

[0047] The fastener can be angularly stationary relative to the first ingredient handler and/or second ingredient handler about the processing axis, e.g. when the ingredient handling system is rotated for centrifugation.

[0048] The machine may include a fastener lock configured to lock the fastener in the fastening position and to unlock the fastener such that the fastener moves and/or is movable into the unfastening position. For example, the fastener lock is angularly stationary relative to the fastener about the processing axis, e.g. when the ingredient handling system is rotated for centrifugation.

[0049] The handler actuator can be configured to drive the fastener lock from:

[0050] a fastener unlocking position into a fastener locking position once the first and second capsule handlers have been relatively moved by the handler actuator into the processing configuration; and/or

[0051] a fastener locking position into a fastener unlocking position before the first and second capsule handlers are relatively moved by the handler actuator out of the processing configuration towards the transfer configuration.

[0052] The handler actuator may be configured to drive the fastener lock via a transmission is that angularly stationary relative to the frame and/or housing about the processing axis when the ingredient handling system is rotated for centrifugation. For example, the transmission is movable in translation to drive the fastener lock between its fastener unlocking position and its fastener locking position, e.g. the transmission being movable in parallel to the processing axis.

[0053] The fastener can be integral with or mounted on one the first and second capsule handlers and can cooperate with a fastener receiver that is integral with or mounted on the other of the first and second capsule handlers. The fastener can have a substantial hook shape and the fastener receiver can have a substantial hook cooperation shape.

[0054] The Machine may include a plurality of fasteners distributed around the processing axis, e.g. peripherally about at least one of the first and second capsule handlers. For example, the fasteners are integral with or fixed to or assembled to a base

[0055] The base may extend peripherally at least partly around one of the first and second capsule handlers.

[0056] The base may be connected to the fasteners by at least one corresponding elastic member. For example, each fastener is connected to the base by a corresponding elastic member, each elastic member connecting to the base one, two or at most three fasteners.

[0057] The handler actuator can be configured to relatively move the first and second capsule handlers and/or actuate the fastener, when present via the abovementioned transmission, via a connection that includes at least one of: a gear connection, a lever connection, a cam follower and cam connection, and a magnetic connection.

[0058] The machine can include a beverage passage, e.g. a beverage conduit, in fluid communication with the beverage outlet, the passage being configured to guide the beverage from the outlet towards a beverage dispensing outlet. For example, the passage is associated with a valve, such as

a centrifugal and/or electric valve, for controlling the flow and/or the pressure of the beverage along the beverage passage.

[0059] The machine can include a beverage conditioner delimiting a conditioning cavity, e.g. between two surfaces that are movable relatively to one another e.g. rotatably movable. The conditioning cavity can be fluidically connected with the beverage passage. The conditioning cavity may be configured to refine the beverage supplied from the beverage outlet via the beverage passage. For example, the valve is fluidically located between the beverage outlet and the conditioning cavity.

[0060] The frame and/or housing may include or be fixed to a bottom configured to rest on a support surface external to such machine when the ingredient handling system is rotated about the processing axis for centrifugation. Typically, the external support surface is formed by a table top. The processing axis may be at an angle relative to such bottom in the range of 0° to 60°, for instance of 0° to 45°, such as of 0° to 30°, e.g. of 0° to 15°, typically of substantially 0°.

[0061] The frame and/or housing can support a motor that is connected to the ingredient handling system, for instance connected directly or via a transmission, such as at least one of belts e.g. toothed belts, gears e.g. spur gears, and connecting rods.

[0062] One or more of the beverage outlet(s) and the water inlet(s) may be associated with one or more capsule openers, such as capsule piercers.

[0063] The processing cavity can have a plurality of beverage outlets peripherally arranged at the processing cavity about the central processing axis and/or can have the water inlet located at the processing cavity on or adjacent to the processing axis.

[0064] The invention also relates to a system combining a machine as described above and the abovementioned capsule containing the flavouring ingredient.

[0065] Another aspect of the invention relates to a method in a machine (as described above) the of preparing beverage from the flavouring ingredient supplied within the capsule into the machine.

[0066] The method includes the steps of:

[0067] supplying the capsule via the supply passage by guiding the capsule along the guide to the level between the first and second ingredient handlers;

[0068] immobilizing the capsule by the capsule stop between the first and second ingredient handlers in the transfer configuration;

[0069] relatively moving the first and second ingredient handlers with the capsule into the ingredient processing configuration by actuation by the handler actuator;

[0070] moving the elastic arm from the immobilization position to the release position so as to release the capsule from the stop, for example during or at the end of relatively moving of the first and second ingredient handlers with the capsule into the ingredient processing configuration, and optionally the elastic arm being therefor actuated by the first and/or second ingredient handlers;

[0071] feeding the water via the water inlet into the capsule in the processing cavity and centrifuging the flavouring ingredient with the water and forming the beverage;

[0072] releasing the beverage from said capsule via the beverage passage; and

[0073] relatively moving the first and second ingredient handlers into the ingredient transfer configuration and evacuating the capsule.

[0074] A further aspect of the invention relates to a use of a capsule as the above described capsule for:

[0075] being handled by a machine as described above;

[0076] implementing the system as described above; or

[0077] carrying out the method as described above.

[0078] In the framework of such use the capsule can:

[0079] be immobilized by the stop between the first and second ingredient handlers in the transfer configuration;

[0080] be brought with the first and second ingredient handlers into the ingredient processing configuration by relatively moving the handlers into the ingredient processing configuration;

[0081] be released from the stop by moving the elastic arm from the immobilization position to the release position, for example during or at the end of relatively moving of the first and second ingredient handlers with the capsule into the ingredient processing configuration, and optionally the elastic arm being therefor actuated by the first and/or second ingredient handlers;

[0082] be supplied with the water by feeding via the water inlet into the capsule in the processing cavity, the flavouring ingredient with the water being centrifuged and forming said beverage;

[0083] release the beverage via the beverage passage; and

[0084] be released from the first and second handlers by relatively moving the first and second ingredient handlers from the ingredient processing configuration to the ingredient transfer configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0085] The invention will now be described with reference to the schematic drawings, wherein:

[0086] FIG. 1 is a cross-sectional side view of part of a machine that has a rotatable ingredient handling system and at least one guide with a capsule stop according to an embodiment of the invention;

[0087] FIG. 2 is a cross-sectional side view of part of the handling system of the machine of FIG. 1, the handling system being in the ingredient transfer configuration;

[0088] FIG. 3 is a cross-sectional side view of part of the handling system of the machine of FIG. 1, the handling system being in the ingredient processing configuration without any ingredient capsule;

[0089] FIG. 4 is a cross-sectional side view of the handling system of the machine of FIG. 1, the handling system being in the ingredient processing configuration with an ingredient capsule;

[0090] FIG. 5 is a perspective view of fasteners of the machine of FIG. 1;

[0091] FIG. 6 is a cross-sectional view from above of the handling system of the machine of FIG. 1, the handling system having a pair of guides in the immobilization position, each guide being associated with a capsule stop according to an embodiment of the invention;

[0092] FIG. 7 is a cross-sectional view from above of the handling system of the machine of FIG. 1, the handling system being in the processing configuration without any ingredient capsule;

[0093] FIG. 8 is a cross-sectional side view of the of part of the machine of FIG. 1, the handling system being in the ingredient processing configuration and holding a capsule, the machine having a beverage conditioner and a thermal conditioner;

[0094] FIG. 9 shows the guides in the immobilization position of the machine shown in FIG. 6 with a capsule;

[0095] FIG. 10 shows the guides in the release position of the machine shown in FIGS. 7 and 8 without a capsule;

[0096] FIG. 11 is a perspective view of an ingredient handler fitted with beverage outlets and corresponding capsule openers as well as a water inlet with corresponding capsule openers, the capsule openers of the beverage outlets being bent towards the processing axis to provide openings increased in size in the capsule at the level of the openers;

[0097] FIG. 12 is a perspective view of several capsule openers (alternative to the ones shown in FIG. 11) to be associated with one or more beverage outlets, the capsule openers being bent tangentially about the processing axis to provide openings increased in size in the capsule at the level of the openers;

[0098] FIG. 13 is a perspective view of several capsule openers (alternative to the ones shown in FIG. 11) associated with a water inlet, the capsule openers having a radially narrowed cross-section at a level of a capsule upon opening of the capsule to provide openings increased in size in the capsule at the level of the openers; and

[0099] FIG. 14 is a perspective view of several capsule openers (alternative to the ones shown in FIGS. 11 and 13) associated with a water inlet, the capsule openers having a tangentially narrowed cross-section at a level of a capsule upon opening of the capsule to provide openings increased in size in the capsule at the level of the openers.

DETAILED DESCRIPTION

[0100] FIGS. 1 to 14 illustrate an exemplary embodiment of part of a machine 1 in accordance with the invention as well as components and variations thereof.

[0101] Machine 1 is configured for preparing a beverage 4 from a flavouring ingredient 5a supplied within a capsule 5b in a processing cavity 5. Ingredient 5a is mixed with water 4' in capsule 5b. Ingredient 5a and water 4' are centrifugally driven about a processing axis 30' to form beverage 4.

[0102] Machine 1 includes a rotatable ingredient handling system 10, 20 for holding capsule 5b and rotating flavouring ingredient 5a and water during centrifugation about processing axis 30'. Ingredient handling system 10, 20 has at least one beverage outlet 25 and at least one water inlet 24 for supplying water 4' to ingredient 5a. System 10, 20 has a first ingredient handler 10 and a second ingredient handler 20 that are movable one relative to the other from:

[0103] an ingredient transfer configuration for receiving ingredient 5a within capsule 5b by first and second capsule handlers 10, 20 and/or releasing capsule 5b from first and second ingredient handlers 10, 20; to

[0104] an ingredient processing configuration for centrifuging ingredient 5a and water 4' within capsule 5b by rotation about processing axis 30';

[0105] and vice versa.

[0106] Machine 1 has a handler actuator 41, such as a motor or a user-handle, configured to relatively move first and second capsule handlers 10, 20 between the transfer and the processing configurations.

[0107] Machine 1 includes a machine frame and/or housing 40 which is stationary when ingredient handling system 10, 20 is rotated for centrifugation and which supports the ingredient handling system 10, 20.

[0108] First and second handlers 10, 20 may be mounted in rotation on frame and/or housing 40 via one or more bearings 19, 29, such as ball bearings.

[0109] Machine frame and/or housing 40 delimits an ingredient supply passage 60 configured to allow supply by gravity of ingredient 5a within capsule 5b towards rotatable ingredient handling system 10, 20 and a waste evacuation passage 70 configured to allow an evacuation by gravity of waste, e.g. used capsule 5b, from rotatable ingredient handling system 10, 20.

[0110] Supply passage 60 is provided with a guide 61, 61a for guiding capsule 5b. Guide 61, 61a is configured to cooperate with a complementary capsule shape e.g. a capsule flange 5b'. Guide 61, 61a may form a recess and/or a rail.

[0111] Guide 61, 61a is associated with a capsule stop 61b, e.g. a capsule retainer, configured to immobilize capsule 5b (typically when guided by guide 61, 61a) at a level between first and second ingredient handlers 10, 20 e.g. substantially coaxially with the processing axis 30'. For example, a stop 61b is fixed to or integral with the guide 61, 61a.

[0112] Guide or a portion 61a thereof is mounted movably towards and away from processing axis 30'.

[0113] Supply passage 60 can be provided with two such guides 61, 61a facing each other so that capsule 5b is guided between guides 61, 61a. For instance, capsule 5b is provided with flange 5b' that is circular and that diametrically spaces guides 61, 61a apart.

[0114] Guide or a portion 61a thereof is integral with or fixed to an elastic arm 61c movable, e.g. movable by flexion, between immobilization an position for immobilizing capsule 5b at the level between first and second ingredient handlers 10, 20 by stop 61b and a release position for releasing capsule 5b from stop 61b.

[0115] In the immobilization position, capsule 5b may have a central axis that is substantially colinear with a central axis of the first and second ingredient handlers 10, 20 in the transfer configuration, e.g. with the processing axis 30', or that is non-colinear relative to a central axis of first the and second ingredient handlers 10, 20 in the transfer configuration.

[0116] In the first instance (colinear central axis), the first and second ingredient handler 10, 20 may be brought into their processing configuration without substantial recentring of the capsule central axis and with or without displacing capsule 5b along the handlers central axis. In the second instance (non-colinear central axis), the first and second ingredient handler 10, 20 may substantially recentre capsule 5b and its central axis relative to the handlers central axis while handlers 5b are brought into their processing configuration.

[0117] Stop 61b can be configured to be urged into the holding position or into the release position by at least one of first and second ingredient handlers 10, 20 movably mounted relative to stop 61b.

[0118] Stop 61b may be located at or towards one end 61c' of elastic arm 61c, elastic arm 61c having an opposite end 61c'' at or towards which opposite end 61c' arm 61c is secured to machine frame and/or housing 40 or to rotatable ingredient handling system 10, 20.

[0119] Elastic arm 61c can be: substantially wire-shaped and/or blade-shaped; and/or made of metal, e.g. steel, and/or plastic material.

[0120] Machine 1 may include at least one fastener 41' movable selectively into a fastening position to fasten together first and second capsule handlers 10, 20 in the processing configuration and into an unfastening position in which first and second capsule handlers 10, 20 are movable from the processing configuration to the transfer configuration and/or vice versa. Fastener 41' may be actuated by handler actuator 41 into the fastening position and/or into the unfastening position. Fastener 41' can be for example biased into fastening position or into the unfastening position e.g. by an elastic member 41'' e.g. elongated arm.

[0121] Handler actuator 41 may be angularly stationary relative to frame and/or housing 40 about processing axis 30' when ingredient handling system 10, 20 is rotated for centrifugation.

[0122] Fastener 41' can be angularly stationary relative to first ingredient handler 10 and/or second ingredient handler 20 about processing axis 30', e.g. when ingredient handling system 10, 20 is rotated for centrifugation.

[0123] Machine 1 may include a fastener lock 41b configured to lock fastener 41' in the fastening position and to unlock fastener 41' such that fastener 41' moves and/or is movable into the unfastening position. For instance, fastener lock 41b is angularly stationary relative to fastener 41' about processing axis 30' e.g. when the ingredient handling system 10, 20 is rotated for centrifugation.

[0124] Handler actuator 41 can be configured to drive fastener lock 41b from:

[0125] a fastener unlocking position into a fastener locking position once first and second capsule handlers 10, 20 have been relatively moved by handler actuator 41 into the processing configuration; and/or

[0126] a fastener locking position into a fastener unlocking position before first and second capsule handlers 10, 20 are relatively moved by handler actuator 41 out of the processing configuration towards the transfer configuration.

[0127] Handler actuator 41 may be configured to drive fastener lock transmission 41b via a 41a that is angularly stationary relative to frame and/or housing 40 about processing axis 30' when ingredient handling system for 10, 20 is rotated centrifugation. For example, transmission 41a is movable in translation to drive fastener lock 41b between its fastener unlocking position and its fastener locking position, e.g. transmission 41a being movable in parallel to processing axis 30'.

[0128] Fastener 41' may be integral with or mounted on one of first and second capsule handlers 10, 20 and may cooperate with a fastener receiver 21 that is integral with or mounted on the other of first and second capsule handlers 10, 20. Fastener 41' may have a substantial hook shape and fastener receiver 21 may have a substantial hook cooperation shape.

[0129] Machine 1 may include a plurality of fasteners 41' distributed around the processing axis 30', e.g. peripherally

about at least one of the first and second capsule handlers 10, 20. Fasteners 41' may be integral with or fixed to or assembled to a base 41'''.

[0130] Base 41''' can extend peripherally at least partly around one of first and second capsule handlers 10, 20.

[0131] Base 41''' may be connected to fasteners 41' by at least one corresponding elastic member 41''. For example, each fastener 41' is connected to base 41''' by a corresponding elastic member 41'' whereby each elastic member 41'' connects to base 41''' one, two or at most three fasteners 41'.

[0132] Handler actuator 41 can be configured to relatively move first and second capsule handlers 10, 20 and/or actuate fastener 41', when present via transmission 41a, via a connection comprising at least one of: a gear connection, a lever connection, a cam follower and cam connection, and a magnetic connection.

[0133] Machine 1 may have a beverage passage 26, e.g. a beverage conduit, in fluid communication with beverage outlet 25, passage 26 being configured to guide beverage 4 from outlet 25 towards a beverage dispensing outlet 54. Passage 26 can be associated with a valve 30, such as a centrifugal and/or electric valve, for controlling the flow and/or the pressure of beverage 4 along beverage passage 26.

[0134] Machine 1 may include a beverage conditioner 50 delimiting a conditioning cavity 51, e.g. between two surfaces 52, 53 that are movable relatively to one another conditioning cavity 51 being e.g. rotatably movable, fluidically connected with beverage passage 26. Conditioning cavity 51 may be configured to refine beverage 4 supplied from beverage outlet 25 via beverage passage 26. For example, valve 30 is fluidically located between beverage outlet 25 and conditioning cavity 51.

[0135] The frame and/or housing may comprise or be fixed to a bottom configured to rest on a support surface external to such machine 1 when ingredient handling system 10, 20 is rotated about processing axis 30' for centrifugation, e.g. an external support surface formed by a table top. Processing axis 30' may be at an angle relative to such bottom in the range of 0° to 60°, for instance of 0° to 45°, such as of 0° to 30°, e.g. of 0° to 15°, typically of substantially 0°.

[0136] The frame and/or housing can support a motor 2 that is connected to ingredient handling system 10, 20, for example connected directly or via a transmission 3 such as at least one of belts e.g. toothed belts, gears e.g. spur gears, and connecting rods.

[0137] One or more of beverage outlet(s) 25 and water inlet(s) 24 can be associated with one or more capsule openers 24', 25', such as capsule piercers 24', 25'.

[0138] Processing cavity 5 may have a plurality of beverage outlets 25 peripherally arranged at processing cavity 5 about central processing axis 30'.

[0139] Processing cavity 5 can have water inlet 24 located at cavity 5 on or adjacent to processing axis 30'.

[0140] During operation beverage 4 can be prepared in machine 1 from flavouring ingredient 5a supplied within capsule 5b into machine 1 by the following steps:

[0141] Capsule 5b is supplied via the supply passage 60 by guiding capsule 5b along guide 61, 61a to the level between first and second ingredient handlers 10, 20.

[0142] Capsule 5b is immobilized by capsule stop 61b between first and second ingredient handlers 10, 20 in the transfer configuration.

[0143] First and second ingredient handlers with 10, 20 capsule 5b are relatively moved into the ingredient processing configuration by actuation by handler actuator 41.

[0144] Elastic arm 61c is moved from the immobilization position to the release position, whereby capsule 5b is released from stop 61b, for example during or at the end of relatively moving first and second ingredient handlers into 10, 20 the processing configuration, optionally elastic arm 61c being therefor actuated by first and/or second ingredient handlers 10, 20.

[0145] Water 4' is fed via water inlet 24 into capsule 5b in processing cavity 5 and flavouring ingredient 5a is centrifuged with water 4' and beverage 4 is formed.

[0146] Beverage 4 is released from capsule 5b via beverage passage 26.

[0147] First and second ingredient handlers 10, 20 are relatively moved ingredient transfer into the configuration and capsule 5b is evacuated.

1. A machine for preparing a beverage from a flavouring ingredient supplied within a capsule in a processing cavity by mixing said ingredient with water in said capsule and centrifugally driving such ingredient and said water about a processing axis to form said beverage, such machine comprising:

a rotatable ingredient handling system for holding said capsule and rotating said flavouring ingredient and water during centrifugation about the processing axis, the ingredient handling system having at least one beverage outlet and at least one water inlet for supplying said water to said ingredient, the system having a first ingredient handler and a second ingredient handler that are movable one relative to the other from:

an ingredient transfer configuration for receiving said ingredient within said capsule by the first and second capsule handlers and/or releasing said capsule from the first and second ingredient handlers; to

an ingredient processing configuration for centrifuging said ingredient and water within said capsule by rotation about the processing axis;

and vice versa;

a handler actuator, such as a motor or a user-handle, configured to relatively move the first and second capsule handlers between the transfer and the processing configurations; and

a machine frame and/or housing which is stationary when the ingredient handling system is rotated for centrifugation and which supports the ingredient handling system,

the machine frame and/or housing delimiting an ingredient supply passage configured to allow supply by gravity of said ingredient within said capsule towards the rotatable ingredient handling system and a waste evacuation passage configured to allow an evacuation by gravity of waste,

the supply passage being provided with a guide for guiding said capsule, the guide being configured to cooperate with a complementary capsule shape, the guide forming for instance a recess and/or a rail, the guide being associated with a capsule stop configured to immobilize said capsule at a level between the first and second ingredient handlers, the guide or a portion thereof being mounted movably towards and away from the processing axis,

the guide or a portion thereof is integral with or fixed to an elastic arm movable between an immobilization position for immobilizing said capsule at the level between the first and second ingredient handlers by the stop and a release position for releasing said capsule from said stop.

2. The machine of claim 1, wherein the stop is configured to be urged into the holding position or into the release position by at least one of the first and second ingredient handlers movably mounted relative to the stop.

3. The machine of claim 1, where the stop is located at or towards one end of the elastic arm, the elastic arm having an opposite end at or towards which opposite end the arm is secured to the machine frame and/or housing or to the rotatable ingredient handling system.

4. The machine of claim 1, wherein the elastic arm is: substantially wire-shaped and/or blade-shaped.

5. The machine of claim 1, which comprises at least one fastener movable selectively into a fastening position to fasten together the first and second capsule handlers in the processing configuration and into an unfastening position in which the first and second capsule handlers are movable from the processing configuration to the transfer configuration and/or vice versa, the fastener being actuated by the handler actuator into the fastening position and/or into the unfastening position, the fastener being for example biased into the fastening position or into the unfastening position.

6. The machine of claim 5, which comprises a fastener lock configured to lock the fastener in the fastening position and to unlock the fastener such that the fastener moves and/or is movable into the unfastening position.

7. The machine of claim 6, wherein the handler actuator is configured to drive the fastener lock from:

a fastener unlocking position into a fastener locking position once the first and second capsule handlers have been relatively moved by the handler actuator into the processing configuration; and/or

a fastener locking position into a fastener unlocking position before the first and second capsule handlers are relatively moved by the handler actuator out of the processing configuration towards the transfer configuration.

8. The machine of claim 5, wherein the handler actuator is configured to drive the fastener lock via a transmission that is angularly stationary relative to the frame and/or housing about the processing axis when the ingredient handling system is rotated for centrifugation.

9. The machine of claim 5, which comprises a plurality of fasteners distributed around the processing axis.

10. The machine of claim 1, which comprises a beverage passage, the passage being configured to guide said beverage from the outlet towards a beverage dispensing outlet.

11. The machine of claim 10, which comprises a beverage conditioner delimiting a conditioning cavity, the conditioning cavity being configured to refine said beverage supplied from the beverage outlet via the beverage passage, the valve being for instance fluidically located between the beverage outlet and the conditioning cavity.

12. The machine of claim 1, wherein:

the frame and/or housing comprises or is fixed to a bottom configured to rest on a support surface external to such machine when the ingredient handling system is rotated

about the processing axis for centrifugation, the processing axis being at an angle relative to such bottom in the range of 0° to 60°.

13. A system comprising a machine for preparing a beverage from a flavouring ingredient supplied within a capsule in a processing cavity by mixing said ingredient with water in said capsule and centrifugally driving such ingredient and said water about a processing axis to form said beverage, such machine comprising:

- a rotatable ingredient handling system for holding said capsule and rotating said flavouring ingredient and water during centrifugation about the processing axis, the ingredient handling system having at least one beverage outlet and at least one water inlet for supplying said water to said ingredient, the system having a first ingredient handler and a second ingredient handler that are movable one relative to the other from:

- an ingredient transfer configuration for receiving said ingredient within said capsule by the first and second capsule handlers and/or releasing said capsule from the first and second ingredient handlers; to

- an ingredient processing configuration for centrifuging said ingredient and water within said capsule by rotation about the processing axis;

and vice versa;

- a handler actuator, such as a motor or a user-handle, configured to relatively move the first and second capsule handlers between the transfer and the processing configurations; and

- a machine frame and/or housing which is stationary when the ingredient handling system is rotated for centrifugation and which supports the ingredient handling system,

- the machine frame and/or housing delimiting an ingredient supply passage configured to allow supply by gravity of said ingredient within said capsule towards the rotatable ingredient handling system and a waste evacuation passage configured to allow an evacuation by gravity of waste,

- the supply passage being provided with a guide for guiding said capsule, the guide being configured to cooperate with a complementary capsule shape, the guide forming for instance a recess and/or a rail, the guide being associated with a capsule stop configured to immobilize said capsule at a level between the first and second ingredient handlers, the guide or a portion thereof being mounted movably towards and away from the processing axis,

- the guide or a portion thereof is integral with or fixed to an elastic arm movable between an immobilization position for immobilizing said capsule at the level between the first and second ingredient handlers by the stop and a release position for releasing said capsule from said stop and said capsule containing said flavouring ingredient.

14. A method of preparing in a machine a beverage from a flavouring ingredient supplied within a capsule in a processing cavity by mixing said ingredient with water in said capsule and centrifugally driving such ingredient and said water about a processing axis to form said beverage, such machine comprising:

- a rotatable ingredient handling system for holding said capsule and rotating said flavouring ingredient and water during centrifugation about the processing axis,

- the ingredient handling system having at least one beverage outlet and at least one water inlet for supplying said water to said ingredient, the system having a first ingredient handler and a second ingredient handler that are movable one relative to the other from:

- an ingredient transfer configuration for receiving said ingredient within said capsule by the first and second capsule handlers and/or releasing said capsule from the first and second ingredient handlers; to

- an ingredient processing configuration for centrifuging said ingredient and water within said capsule by rotation about the processing axis;

and vice versa;

- a handler actuator, such as a motor or a user-handle, configured to relatively move the first and second capsule handlers between the transfer and the processing configurations; and

- a machine frame and/or housing which is stationary when the ingredient handling system is rotated for centrifugation and which supports the ingredient handling system,

- the machine frame and/or housing delimiting an ingredient supply passage configured to allow supply by gravity of said ingredient within said capsule towards the rotatable ingredient handling system and a waste evacuation passage configured to allow an evacuation by gravity of waste,

- the supply passage being provided with a guide for guiding said capsule, the guide being configured to cooperate with a complementary capsule shape, the guide forming for instance a recess and/or a rail, the guide being associated with a capsule stop configured to immobilize said capsule at a level between the first and second ingredient handlers, the guide or a portion thereof being mounted movably towards and away from the processing axis,

- the guide or a portion thereof is integral with or fixed to an elastic arm movable between an immobilization position for immobilizing said capsule at the level between the first and second ingredient handlers by the stop and a release position for releasing said capsule from said stop, said beverage from said flavouring ingredient supplied within said capsule into the machine, the method comprising:

- supplying the capsule via the supply passage by guiding the capsule along the guide to the level between the first and second ingredient handlers;

- immobilizing said capsule by the capsule stop between the first and second ingredient handlers in the transfer configuration;

- relatively moving the first and second ingredient handlers with said capsule into the ingredient processing configuration by actuation by the handler actuator;

- moving the elastic arm from the immobilization position to the release position, whereby the capsule is released from the stop, for example during or at the end of relatively moving of the first and second ingredient handlers with said capsule into the ingredient processing configuration;

- feeding said water via the water inlet into said capsule in the processing cavity and centrifuging the flavouring ingredient with the water and forming said beverage;
- releasing the beverage from said capsule via the beverage passage; and

relatively moving the first and second ingredient handlers
into the ingredient transfer configuration and evacuat-
ing said capsule.

15. (canceled)

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