(12) STANDARD PATENT (11) Application No. **AU 2013329854 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Beverage machine

(51) International Patent Classification(s)
A47J 31/36 (2006.01)

(21) Application No: **2013329854** (22) Date of Filing: **2013.07.03**

(87) WIPO No: **WO14/056642**

(30) Priority Data

(31) Number	(32) Date	(33) Country
12187762.5	**2012.10.09**	**EP**

(43) Publication Date: **2014.04.17**
(44) Accepted Journal Date: **2017.11.16**

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(56) Related Art
WO 2006/013124 A1
EP 1859714 B1
EP 2103236 B1
EP 2205133 B1
WO 2012/025258 A1

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 April 2014 (17.04.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/056642 A1

(51) International Patent Classification:
A47J 31/36 (2006.01)

(21) International Application Number:
PCT/EP2013/064003

(22) International Filing Date:
3 July 2013 (03.07.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12187762.5 9 October 2012 (09.10.2012) EP

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

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

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

— *of inventorship (Rule 4.17(iv))*

Published:

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

(54) Title: BEVERAGE MACHINE

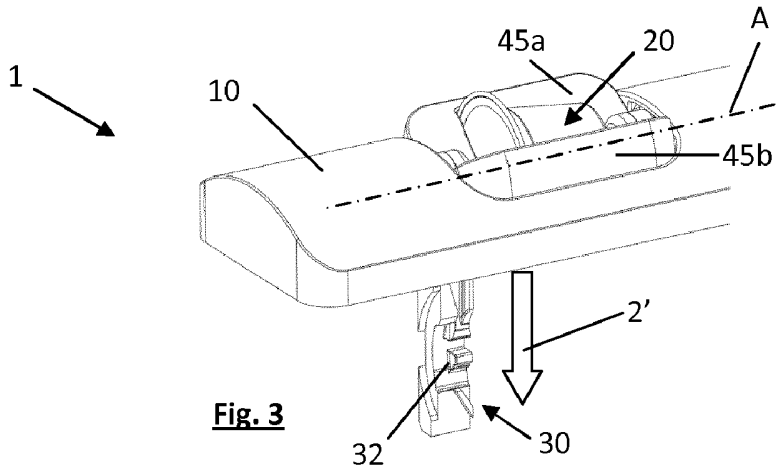

Fig. 3

(57) Abstract: A machine (1) for preparing a beverage from an ingredient capsule (20), comprises: an ingredient capsule processing module (15) having a chamber (16,17) for processing the capsule therein; a passage (2) for a transfer of the capsule to the chamber; and a capsule positioner (40) having at least one member (45a, 45b) that is pivotable about a pivoting axis (A) from a position for receiving and holding the capsule to a position for releasing the capsule into the passage (2). The pivoting axis extends through an area (44') occupied by the capsule when held by the pivotable member(s).

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BEVERAGE MACHINE

Field of the Invention

The field of the invention pertains to beverage preparation machines, in particular using capsules of an ingredient of the beverage to be prepared, such as beverage preparation machines having a passage for inserting a beverage ingredient into the machine, in particular an ingredient supplied in the form of a preportioned ingredient capsule, and a member for covering and uncovering the passage to allow insertion of a capsule into the passage, as desirable during normal use of the machine.

For the purpose of the present description, a "beverage" is meant to include any human-consumable liquid substance, such as tea, coffee, hot or cold chocolate, milk, soup, baby food, etc… A "capsule" is meant to include any pre-portioned beverage ingredient, such as a flavouring ingredient, within an enclosing packaging of any material, in particular an airtight packaging, e.g. plastic, aluminium, recyclable and/or biodegradable packagings, and of any shape and structure, including soft pods or rigid cartridges containing the ingredient.

Background Art

Certain beverage preparation machines use capsules containing ingredients to be extracted or to be dissolved and/or ingredients that are stored and 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.

An example of a machine for preparing a beverage from a flavouring concentrate that is contained in a reservoir and that is mixed with a liquid from another reservoir is disclosed in US 2003/0200871.

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.

Brewing devices have been developed to facilitate insertion of a "fresh" capsule and removal of the capsule upon use. Typically, the brewing devices comprise two parts relatively movable from a configuration for inserting/removing a capsule to a configuration for brewing the ingredient in the capsule.

The actuation of the movable part of the brewing device may be motorized. Such a system is for example disclosed in EP 1 767 129. In this case, the user does not have to provide any manual effort to open or close the brewing device. The brewing device has a capsule insertion passage provided with a safety door assembled to the movable part of the brewing device via a switch for detecting an undesired presence of a finger in the passage during closure and prevent injuries by squeezing. Further motorized brewing devices are disclosed in WO 2012/025258, WO 2012/025259, WO 2012/093108 and in PCT/EP12/073324.

The actuation of the movable part of the brewing device may be manual. WO 2009/043630 discloses a beverage preparation machine including a brewing unit having a front part with a passage having a mouth for inserting a capsule into the brewing unit. The front part is arranged

to telescope out of the machine's housing for uncovering the passage for inserting a capsule into the brewing unit and telescopes into the brewing unit for sliding the passage under the housing and thus covering the passage by the housing. A pivotable arched handle is configured for driving the front part manually. In another embodiment, the telescoping front part is helicoidally movable about an axis perpendicular to the capsule insertion passage and parallel to the passage's mouth, the mouth of the passage being delimited by the telescoping front part and sliding with the front part under the machine's outermost housing by which it is covered in the closed position and uncovered in the open position.

WO 2005/004683 and WO 2007/135136 disclose a device comprising a frame, a fixed holding part for the capsule, a movable holding part which is mounted relative to the frame in a sliding relationship, one or two knuckle joint mechanisms that provide a mechanical system which enables to close in a steady and fluid-tight manner the holding parts about the capsule while also resisting to the counter-force acting while re-opening and generated by the internal brewing pressure, and a handle for directly levering the knuckle joint mechanism. Such a device forms a simple assembly enabling insertion of the capsule by vertical fall through a passage in the frame and removal of the used capsule in the same direction as the insertion direction. The handle is in the form of a lever that is manually pivotable about an end thereof adjacent the machine's housing. In the closed position, the handle may be pivoted down against the machine's housing and over the capsule inlet passage to cover it. In the open position, the handle is pivoted up away from the capsule inlet passage to uncover this passage. Hence, in addition to moving the holding part, the handle serves to cover and uncover the passage for the capsule. The manual force required to move the movable parts varies during closure

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and opening of the machine and depends on the dimensional tolerances of the capsules used, the positioning of the capsule and the temperature of the brewing unit. Further covers for covering and uncovering such a passage for the capsule are disclosed WO 2012/093107 and PCT/EP13/054006.

WO 2012/126971 discloses yet another cover for covering and uncovering such a passage. In this document, the cover is pivotable about a pivoting axis that is generally parallel to the insertion direction and/or that is generally perpendicular to the mouth of the ingredient passage. The ingredient mouth and the ingredient passage can be configured to receive and guide an ingredient capsule, the passage and the mouth having a slide for guiding a guiding flange of the capsule to the ingredient processing module. The cover can have a planar portion that covers and uncovers the ingredient passage, the planar cover portion being arranged to pivot generally in its own plane. The cover may have a cover opening, such as a window, pivotable: over the passage to permit insertion of the ingredient through the opening into the ingredient processing module via the passage; and away from the passage to prevent insertion of said ingredient through the opening into the processing module.

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

Summary of the Invention

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

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It is an object of a preferred embodiment of the present invention to provide a machine for preparing a beverage that has a compact positioner adapted to receive and hold an ingredient capsule and to feed such a capsule to a beverage processing module.

According to a first aspect, the present invention provides a machine for preparing a beverage from an ingredient capsule, comprising:

- an ingredient capsule processing module having a chamber for processing said capsule therein;
- a passage for a transfer of said capsule to the chamber; and
- a capsule positioner having at least one member that is pivotable about a pivoting axis from a position for receiving and holding said capsule to a position for releasing said capsule into the passage,

wherein said pivoting axis extends through an area occupied by said capsule when held by said at least one member.

According to a second aspect, the present invention provides a method of inserting an ingredient capsule into the processing module of the machine defined in any one of the preceding claims, for preparing a beverage from the capsule, comprising the steps of:

- receiving and holding the capsule by said at least one pivotable member of the capsule positioner whereby the pivoting axis extends through the held capsule;
- pivoting said at least one member about the pivoting axis to the position for releasing said capsule and releasing said capsule into the passage; and

- transferring the capsule via the passage to the chamber of the processing module.

According to a third aspect, the present invention provides a combination of a machine and a capsule, wherein the machine and the capsule are arranged to carry out the method according to the second aspect and/or wherein the machine is a machine according to the first aspect and wherein the capsule can be held by the capsule positioner so that the pivoting axis extends through the capsule.

According to a fourth aspect, the present invention provides a capsule when used:

- in a machine according to the first aspect;
- in a machine according to a method according to the second aspect; or
- to provide a combination according to the third aspect.

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise", "comprising", and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

The invention relates to a machine for preparing a beverage from at least one ingredient capsule and dispensing such prepared beverage. For instance, the machine is a coffee, tea, chocolate, cacao, milk or soup preparation machine. In particular, the machine is arranged for preparing within a processing module a

beverage by passing hot or cold water or another liquid through a capsule containing an ingredient, such as a flavouring ingredient, of the beverage to be prepared, such as ground coffee or tea or chocolate or cacao or milk powder.

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. For instance, a predetermined amount of beverage is formed and dispensed on user-request, which corresponds to a serving. The volume of such a serving may be in the range of 25 to 200 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 150 ml per serving.

Typically, the ingredient is contained in a capsule having an aluminium or plastic or paper enclosure and supplied within the capsule to the processing module of the machine.

In particular, the machine comprises: an ingredient capsule processing module having a chamber for processing the capsule therein; a passage for a transfer of the capsule to the chamber; and a capsule positioner having at least one member that is pivotable about a pivoting axis from a position for receiving and holding the capsule (the first position) to a position for releasing the capsule (the second position) into the passage.

The passage can be generally upright so that the capsule is movable in the passage under the effect of gravity. The passage may comprise an insertion portion

guiding the capsule to the chamber of the processing module and an evacuation portion guiding the capsule away from the chamber of the processing module. The capsule positioner is normally associated with the insertion portion. The passage is normally adjacent to capsule positioner.

Typically, the beverage preparation machine comprises a stationary structure, such as a housing and/or a frame. The structure may be arranged to rest on a support surface such as a table. The passage may be stationary relative to the structure.

For instance, the passage extends from the processing module towards the capsule positioner at an outer face of the structure, e.g. outer housing. In other words, the processing module can be at a distance from the outside of the machine, in particular from a machine's outer housing surface. The passage may be any kind of arrangement for passing a capsule from the capsule positioner to the processing module.

The passage can have a mouth for the insertion of the capsule which then passes from the mouth along the passage, along an insertion direction, to the processing module. The mouth is formed by an end portion of the passage and can be adjacent the capsule positioner. Hence the passage is generally parallel to the insertion direction. The mouth of the passage, i.e. the opening through which the ingredient is inserted into the passage, can have a notional or virtual mouth area or mouth plane (typically delimited by the boundaries of an end of the passage) through which the capsule is inserted. This notional mouth area or plane is usually generally perpendicular to the passage, i.e. perpendicular to the insertion direction, or it may be at a non-perpendicular angle thereto, usually of more than 45 deg, e.g. from 60 or 75 to less than 90 deg.

The processing module can have a configuration for processing the ingredient capsule and a configuration of transfer of the ingredient capsule, e.g. insertion of the capsule into the processing module and/or removal of the capsule from the processing module, in particular into a waste ingredient collector.

The machine can comprise a motor for driving the processing module: from a configuration for processing the ingredient capsule; to an open configuration for inserting such capsule into the processing module and/or removing said capsule therefrom; and/or vice versa.

The processing module typically has a first assembly and a second assembly movable relative to the first assembly from a position for housing therein a capsule to a transfer position for inserting a capsule into the processing module and/or for evacuation thereof from the processing module. Examples of such processing modules are disclosed in EP 1 859 714, EP 2 103 236, EP 2 205 133, WO 2012/025258, PCT/EP12/073324 and in the references cited therein. The first and second relatively movable assemblies may be relatively movable manually, semi-automatically and/or automatically, in particular by an electric motor. In the context of the present invention, "assembly" may refer to a single component assembling different functions, e.g. mechanical guiding function, mechanical holding function, mechanical piercing function, flow function, pressure function, etc…, and/or refer to a plurality of components assembling the desired function(s). The second assembly of the processing module can be made movable relative to the first assembly and relative to the stationary structure. The first assembly may be stationary relative to the structure or movable thereto. The second assembly can be arranged to move in a direction, in particular an arched and/or linear direction. Typically, the first and second assemblies in their processing position delimit a chamber for housing the ingredient capsule, such as tea

or coffee or chocolate or powder milk capsule. The ingredient processing module may include an upstream fluid circuit for delivering a carrier liquid, such as water, into the chamber and a downstream fluid circuit having a beverage outlet for delivering from the chamber the beverage formed by the carrier liquid that is flavoured by the beverage (flavouring) ingredient of the capsule.

At least one of the first and second assemblies may be connected to the at least one pivotable member so that a relative movement of the first and second assemblies causes movement of the pivotable member(s), and/or vice-versa. The first and second assemblies can be connected to the pivotable member(s) by at least one of:

- a data processing link, such as an electric control unit in particular a unit controlling at least one automatic actuator actuating at least one of the first and second assemblies and the pivotable member(s), the actuator being optionally selected from electric, hydraulic and/or pneumatic actuators, such as one or more electric motors;
- a mechanical movement transmission, in particular comprising at least one of: gears, e.g. wheels and racks, such as spur and/or friction gears; cam followers and cams; cranks and crank shafts; and
- a magnetic movement transmission, in particular comprising an electromagnet and/or a permanent magnet.

Relative movement of the first and second assemblies into the closed position may cause movement of the pivotable member(s) into its receiving and holding position, and/or vice versa. Relative movement of the first and second assemblies into the open position can cause movement of the pivotable member(s) into its releasing position, and/or vice versa.

For instance, the assemblies are moved into one position manually or by a powered actuator and then moved

into another position by a return spring that is stressed by the movement into the first position. Likewise, the pivotable member(s) may be pivoted manually, semi-automatically and/or automatically.

The pivotable member(s) may be associated with an automatic return device for driving the member(s) into a stable position, in particular into the receiving and holding position and/or into the releasing position. The automatic return device may be a bistable device for driving the pivotable member(s) into two different positions, in particular into the receiving and holding position and into the releasing position.

Manual or semi-manual/automatic actuation of the pirvotable member(s) may be direct or indirect, i.e. a user may directly actuate the member(s), e.g. pushing or pulling the member(s), or actuate a distant part that is connected to the member(s), e.g. via a mechanical transfer mechanism such as a gear, belt or cam system. The member(s) may have a shape that allows a user, e.g. via the hand or one or more fingers, to manually seize it or push it for moving it between the receiving and holding position and the releasing position during normal use. For example the member(s) has/have a portion with a surface structure or composition, in particular an anti-skid surface that provides friction against a human hand to reduce the necessary gripping force needed to achieve a reliable user-control of the member(s).

The pivotable member(s) may form a user-interface, in particular a user-interface for controlling the ingredient processing module.

In accordance with the invention, the pivoting axis of the at least one pivotable member extends through an area occupied by the capsule when held by the at least one member.

Such an area can be delimited, at least in part, by a capsule reception and holding recess formed by the at

least one pivotable member. For instance, such a pivotable member can be in the shape and mounted like a swing, the recess being for instance delimited by the base (seat) and suspending arms of the swing and the pivoting axis being located on the suspending arms at a distance of the seat.

For example, the pivoting axis of the at least one pivotable member extends: generally perpendicularly to a transfer direction of the capsule along the passage; and/or generally parallelly to a machine housing at the capsule positioner. Alternatively, the pivoting axis may extend generally parallelly to the passage or generally perpendicularly to a machine housing.

In an embodiment, at least one pivotable member may form a shell, in particular a shell that is pivotally mounted at an extremity or two extremities of the shell.

At least one pivotable member can be located:

- in its member position for receiving and holding the capsule, between the capsule-occupiable area and the passage; and
- in its member position for releasing the capsule into the passage, sideways this area and passage and/or above this area.

As opposed to prior art covering handles, e.g. as disclosed in WO 2007/135136, which are pivotable between a position extending along the machine housing to cover the passage and a position angled away therefrom to uncover the passage, the machine of the present invention does not need a significant volume of free space adjacent the machine's housing for the pivoting of the cover. Moreover, such prior art pivotable handles do not receive and hold ingredient capsules. Similar considerations apply to WO 2012/126971 wherein a capsule is moved around by a capsule positioner on top of the beverage machine before being released to the machine's processing module.

At least one pivotable member may delimit at least part of a seat for receiving and holding the capsule. Such a seat can have a shape configured to generally match a shape of the capsule. The shape of the seat may be configured to bring the capsule in the right orientation for the insertion and processing of the ingredient capsule, e.g. to discriminate the appropriate orientation of an asymmetric capsule at insertion.

For instance, the seat has a shape that is generally conical or cylindrical to match a correspondingly shaped capsule body. The seat may have guides arranged to match a correspondingly shaped capsule flange, in particular a rim of a lid closing a capsule body. The capsule positioner may include a pair of pivotable members delimiting at least part of the seat. For example, the members are pivotable in opposite directions about the pivoting axis.

The capsule may have a guiding flange, e.g. a rim, and 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. The guiding flange may be deformed during the guiding process, e.g. urged beyond reference members or stop members.

Suitable examples of capsules and capsule handling mechanisms retrofittable inside the beverage machine of the invention are disclosed in EP 1 859 714, EP 2 103 236, EP 2 205 133, WO 2012/025258, PCT/EP12/073324 and in the references cited therein.

In an embodiment, the machine comprise guiding means for guiding the capsule in the passage, optionally the guiding means comprising guide members guiding a capsule flange and/or being associated with stop members for stopping the capsule, in particular stopping the capsule flange, in a position for being handled by the processing

module. Typically, the processing modules has two assemblies relatively movable between an open spaced apart position and a closed moved together position, the capsule when stopped by the stopping members being enclosed by the two assemblies relatively moving from their open to their closed position.

The capsule positioner can have a seat that includes guides for guiding the capsule, in particular a flange thereof, into the guiding means in the passage.

In an embodiment, the capsule positioner and the passage and the processing module are adapted to handle a capsule of a first type and of a second type. The capsule positioner may include a first guide for guiding a flange of the first capsule type and a second guide for guiding a flange of the second capsule type. The processing module can include assemblies adapted for an insertion of a capsule of a first type and of a second type when the assemblies are in an open position, the processing module being arranged to adapt the configuration of the assemblies or of the brewing chamber according to a size of the capsule. Examples of such processing modules are disclosed in co-pending applications EP 2012187716.1, EP 2012187717.9, EP 2012187718.7, EP 2012197961.1 and EP 2012189153.5.

Hence, the beverage preparation machine with the processing module may be adapted for processing capsules of a first type having a first size and capsules of a second type having a second size. The capsule positioner being adapted to hold a capsule of the first or the second type. The beverage preparation machine may further comprise a size sensing arrangement configured to:

- detect a presence of a capsule in the positioner;
- determine a size information by measuring a size of said detected capsule and comparing said measured size to the first and the second size;
- send the size information to the processing module.

In particular, the first and the second type of capsules have different dimensions and/or volumes for containing the ingredient. The machine may be adapted to handle more than two types of capsules.

Consequently, the user only needs to put a capsule of the first or the second type in the positioner for preparing a beverage and the machine can be configured to automatically handle the transfer of the capsule from the capsule positioner to the processing module and/or the processing parameters for the capsule. This simple, quick and intuitive gesture does not require the user to provide the information of the type of capsule he has chosen. The processing module, knowing the type of capsule that the user has positioned into the positioner, can use this information for adapting/configuring itself for handling this kind of capsule, and/or to adapt the preparation process according to this information, for example by adjusting the volume of water used according to the type of capsule. Moreover, the positioner can be placed outside the processing module, in particular outside a brewing unit of the ingredient processing module, and preferably in a position where it is visible and accessible to the user, so that the latter may have a visual feedback. Consequently, if an object is received by the positioner and is not detected as a capsule, the user can more easily remove it from the positioner. The level of safety of the machine is thus improved.

In particular, the size sensing arrangement may be adapted to detect the presence of a capsule in the positionner by receiving or reading information from the capsule, and/or by measuring at least one of the following characteristic of the capsule: spectral property, colour, electrical property, resistivity, capacitance, electromagnetic property, magnetic induced field, mechanical property, geometry, weight, identifying information, code bar, emitted or reflected signal.

In particular, the size sensing arrangement may be configured to detect a presence of a capsule in the positioner by detecting if a metallic object is present in the positioner.

The size sensing arrangement may comprise an inductive detection arrangement configured to detect a presence of a capsule in the positioner by producing with a sensing element an electro-magnetical field in the positioner and by detecting variations of said electro-magnetical field induced by the presence of a capsule of the first or the second type.

The size sensing arrangement may comprise a length-detection unit for determining the size information. In an embodiment the length-detection unit comprises a light-receiving device and a light-emitting device, both positioned in the capsule positioner so as that:

- a light, emitted by the light-emitting device, is reflected by a capsule of the second type when such a capsule is positioned in the positioner, and is being received by the light-receiving device;
- a light, emitted by the light-emitting device, is not reflected by a capsule of the first type when such capsule is positioned in the positioner, and/or is not being received by the light-receiving device.

In an embodiment, the size sensing arrangement may comprise a size-detection arrangement configured to determine the size information by determining a profile and/or a curvature and/or a shape of a part of a capsule positioned in the positioner, using a geometrical size sensing element for identifying whether said profile and/or said curvature and/or said shape correspond(s) to a part of a capsule of the first type or to a part of a capsule of the second type.

More particularly, the size sensing arrangement may comprise an inductive size-detection arrangement configured to determine the size information by producing

with a size sensing element an electro-magnetical field in the positioner and by detecting variations of said electro-magnetical field induced by the presence of a capsule of the first or the second type, and by identifying whether said variations are induced by a capsule of the first type or by a capsule of the second type. For example, the inductive size-detection arrangement may comprise a field emitting element for producing an electro-magnetical field in the positioner, and a first field receiving element and a second field receiving element, the inductive size-detection arrangement being configured to determine the size information by producing with the field emitting element an electro-magnetical field in the positioner and by detecting variations of said electro-magnetical field observed on the first and the second field receiving element induced by the presence of a capsule of the first or the second type, and by identifying whether said variations are induced by a capsule of the first type or by a capsule of the second type.

The processing module may be configured to prepare a beverage according to parameters adapted to, or depending of, the size information.

The capsule positioner may be located above the processing module and the passage. For instance, the capsule positioner, the ingredient processing module and the passage are configured so that the capsule can be driven by gravity from the capsule positioner to the processing module.

The machine can comprise a machine housing, the capsule positioner being located at a top part of the machine housing.

The machine typically includes a control unit, in particular a unit for controlling the processing module. The pivotable member(s) may form or be part of a user-interface in data communication with the control unit,

optionally the pivotable member(s) comprising or being associated with a sensor connected to the control unit for sensing a position of the pivotable member(s) such as a sensor selected from an electro-mechanical switch sensor, a magnetic sensor, an electromagnetic sensor and an optical sensor. The control unit may comprise a power management module arranged to power the control unit and optionally further electric components, such as a user-interface and/or a thermal conditioner in particular a heater, when the control unit is unpowered or in standby state and the cover moved, in particular into the uncovering position.

The machine may have a control unit for controlling the processing module, the control unit being arranged to initiate automatically beverage preparation when the ingredient capsule is inserted into the processing module and the pivotable member(s) is/are moved into the releasing position. Insertion of the ingredient capsule into the module may be detected by any system, e.g. as known in the art such as an optical detection. The pivotable member(s) may also be used as a main switch to power the machine.

The machine may comprise a lock for locking the pivotable member(s) when an ingredient capsule is being processed in the processing module or when a service cycle is being carried out. The lock may be a hard lock, e.g. a mechanical lock interfering with the motion of the pivotable member(s), and/or a soft lock, e.g. a program controlling an actuator connected to the pivotable member(s) to bring and/or maintain the pivotable member(s) in a desired position.

The pivotable member(s) may be configured to interrupt ingredient processing in the module when the pivotable member(s) is actuated away from its position during ingredient processing, e.g. manually or (semi-) automatically.

The pivotable member(s) can be arranged to confine fluid within the passage. Typically, the pivotable member(s) may form a safety barrier to prevent liquid or vapour projections outside the passage during or at the end of ingredient processing in the processing module.

The pivotable member(s) may include one or more small through-openings for allowing the release of vapour and avoid accumulation of moisture under the member(s) during or at the end of ingredient processing in the processing module. Additionally or alternatively, a periphery of the member(s) may delimit part of openings through which such vapour may be released during or at the end of ingredient processing in the processing module.

The processing module can be configured to circulate automatically a mixing and/or infusion liquid to the ingredient when the first and second assembly reach the processing position, e.g. the closed position.

Hence, a beverage machine with a simple and space-saving capsule positioner for supplying a capsule to a processing module can be provided to:

- control the access to the capsule insertion passage and the processing module;
- act as a user-interface to control the operation of the machine; and/or
- prevent undersirable user operations, e.g. open the ingredient processing module in the course of processing.

Another aspect of the invention concerns a method of inserting an ingredient capsule into the processing module of such a machine as well as a method for preparing a beverage from a capsule in such a machine.

While or even before the processing module is processing an ingredient capsule for preparing a beverage, the capsule positioner may be arranged so that

it is able to move back into its receiving and holding position and to receive properly an ingredient capsule for a subsequent beverage preparation. The proper and early prepositioning of the capsule may reduce the time needed to empty and refill the processing module between two beverage preparations. Of course, it is also possible to mount an ingredient feeder such as a reservoir, e.g. a cartridge of capsules, on the capsule positioner so that a series of successive beverage servings can be prepared, e.g. automatically or semi-automatically, without having to manually position individual capsules for their insertion into the processing module.

A further aspect of the invention concerns a combination of a machine and a capsule.

Yet another aspect of the invention concerns the use of a capsule for the above described machine, methods or combination.

Brief Description of the Drawings

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

- Figures 1 to 4 illustrate an operative sequence of a positioner of a partly shown beverage preparation machine according to the invention; and

- Figure 5a, 5b, 5c, 5d and 5e are detailed views of a capsule positioner of a beverage preparation machine according to the invention.

Detailed description

Figures 1 to 4 illustrate an exemplary embodiment of part of a beverage preparation machine 1 in accordance with the invention. Machine 1 has a capsule positioner 40 which is illustrated in different configurations in Figs 1 to 4. In Fig. 1, positioner 40 is ready to receive a

capsule 20. In Fig. 2, positioner 40 has received and holds capsule 20. In Fig. 4, positioner 40 is shown in a configuration in which it has released capsule 20. Fig. 3 illustrates an intermediate configuration between Figs 2 and 4.

Machine 1 includes: a capsule ingredient processing module 15, as schematically illustrated in Fig. 4. Processing module 15 is associated with a passage 2 for the transfer of a capsule 20 along a direction 2' from positioner 40 to processing module 15.

Capsule 20 is of the type described above under the header "field of the invention". Capsule 20 may have a container-body 21, e.g. a generally cup-shaped body, having a flange 23 at a rim of body 21 to which a lid 22 is attached, in particular sealed, as illustrated in Fig. 4. Suitable capsules are for example disclosed in EP 0 512 468 und EP 0 512 470.

As schematically illustrated in Fig. 4, module 15 can have a chamber formed by a closure of assemblies 16,17 for receiving and housing therein capsule 20 supplied into machine 1 via passage 2. Processing module 15 may be configured to circulate a liquid into the chamber, typically for mixing with the ingredient in particular for brewing the capsule's ingredient. For instance, the chamber is delimited by a first assembly 16, e.g. an upstream assembly, and a second assembly 17, e.g. a downstream assembly. For instance, one assembly 16 is a water injection assembly and another assembly is a beverage dispensing assembly 17. For example, assembly 16 forms a cage for receiving capsule 20 and assembly 17 forms a beverage delivery plate associated with a beverage outlet (not shown). In Fig. 4, assemblies 16,17 are shown in their spaced apart open position prior to enclosing or capturing capsule 20.

The chamber 16,17 may be configured for holding and housing a capsule 20 containing a flavouring ingredient,

such as tea or coffee or chocolate or powder milk. As mentioned above.

A flavoured beverage may be prepared by circulating a carrier liquid, such as water, into the ingredient chamber to flavour the liquid by exposure to the flavouring ingredient held in chamber 16,17.

First and second assemblies 16,17 can be relatively movable between a processing configuration for housing therein capsule 20 and a transfer configuration for inserting such capsule into processing module 15 and/or for evacuation thereof from processing module 15. An automatic ingredient recognition system may be used to parameterize and adjust the processing of the capsule automatically in line with the recognized capsule type.

When closed capsules 20 of flavouring ingredients are used, first and second assemblies 17,17 delimiting the ingredient chamber may include a capsule opener such as blades and/or a tearing tool, e.g. a plate with a tearing profile, for instance as known from Nespresso™ machines. See for example EP 0 512 468 und EP 0 512 470.

Beverage machine 1 typically includes one or more of the following components:

a) Processing module 15, e.g. a fluid circuit including a brewing unit 16,17, delimiting in the processing position the chamber for receiving and housing ingredient capsule 20 and for guiding via an inlet an incoming flow of liquid for flavouring thereof, such as water, through this ingredient to a beverage outlet;

b) an in-line heater 18 for heating this flow of liquid to be supplied to ingredient capsule 20;

c) a pump 19 for pumping liquid through in-line heater 18;

d) one or more fluid connecting members for guiding liquid from a source of liquid, such as tank of

liquid (upstream pump 19 - not shown); a fluid tube extending to heater 18 from pump 19 being schematically shown in Fig. 4;

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 in-line heater 18 and pump 19 and possibly brewing unit 16,17 and capsule positioner 40; and/or

f) one or more sensors for sensing at least one characteristic selected from characteristics of processing module 15, in-line heater 18, pump 19, capsule positioner 40, capsule 20, 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.

In particular, processing module 15 includes or is connected to an upstream fluid arrangement, e.g. incorporating a liquid driver, such as a pump 19, and a thermal conditioner, such as a heater 18, for circulating thermally conditioned liquid, such as water, from a source, e.g. a liquid reservoir, into the ingredient processing chamber. Examples of upstream fluid arrangements are disclosed in WO 2009/074550 and in WO 2009/130099. The heater may be a thermoblock or an on demand heater (ODH), for instance an ODH type disclosed in EP 1 253 844, EP 1 380 243 and EP 1 809 151.

Examples of suitable brewing units delimiting brewing chambers and suitable capsule management are for example disclosed in WO 2005/004683, WO2007/135136 and WO 2009/043630, which are hereby incorporated by way of reference. Suitable fluid circuits of processing modules are for instance disclosed in WO 2009/074550 and WO 2009/130099, which are hereby incorporated by way of

reference. Control unit configurations and connections are for example disclosed in WO 2009/043851 and WO 2009/043865.

Moreover, processing module 15 typically includes a downstream fluid arrangement leading into an outlet for dispensing beverage to a user, e.g. to an area for placing a user-cup or a user-mug, the beverage formed in the brewing chamber containing the ingredient mixed with the circulating liquid. The dispensing area may be delimited at the bottom by a support surface for holding a user cup or mug. Such support surfaces are well known in the art, e.g. as disclosed in EP 1 867 260 and WO 2009/074557.

In the particular embodiment illustrated in Figs 1 to 4, machine 1 (partly illustrated) has a housing 10, capsule positioner 40 being located at a top part of housing 10.

Machine 1 includes a capsule positioner 40 having at least one member 45a,45b that is pivotable about a pivoting axis A from a position for receiving capsule 20 (Fig. 1) and holding capsule 20 (Fig. 2) to a position for releasing capsule 20 (Fig. 4) into passage 2. Pivoting axis A extends through an area 44' occupied by capsule 20 when held by pivotable member(s) 45a,45b, as illustrated in Figs 1 to 3. Pivoting axis A of pivotable member(s) may extend: generally perpendicularly to a transfer direction 2' of capsule 20 along passage 2; and/or generally parallelly to machine housing 10 at capsule positioner 40. Alternatively, Pivoting axis A may extend generally parallelly to the passage or generally perpendicularly to the machine housing (not shown). Area 44' can be delimited, at least in part, by a capsule reception and holding recess 44 formed by the at least one pivotable member 45a,45b. For instance, pivotable member 45a,45b can be in the shape of and mounted like a swing, recess 44 being for instance delimited by the base (seat) and suspending arms of the swing; and pivoting

axis A being at a location 45a',45a'';45b',45b'' of the suspending arms at a distance of the seat.

As illustrated in Figs 1 to 4, at least one pivotable member 45a,45b may delimit at least part of a seat 44 for receiving and holding capsule 20. Seat 44 can have a shape configured to generally match a shape of capsule 20. For instance, seat 44 has a shape that is generally conical or cylindrical to match a correspondingly shaped capsule body 21. Furthermore, seat 44 may have guides 45c,45d arranged to match a correspondingly shaped capsule flange 23, in particular a rim 23 of a capsule body 21 which is joined to a lid 22 closing body 21 (Fig. 4).

For example, capsule positioner 40 comprises a pair of pivotable members 45a,45b delimiting at least part of seat 44. Members 45a,45b may be pivotable in opposite pivoting direction about pivoting axis A.

Pivotable member(s) 45a,54b may form a shell, in particular a shell pivotally mounted at one or two extremities 45a',45a'';45b',45b'' of the shell.

At least one pivotable member 45a,54b can be located: in its member position for receiving and holding capsule 20, between area 44' and passage 20; and in its position for releasing capsule 20 into passage 2, above area 44' and/or sideways said area 44' and passage 20.

As illustrated in Figs 1 to 4, machine 1 can comprise guiding means 30 for guiding the capsule 20 in passage 2. Guiding means may comprise guide members 31 that are dimensioned to guide capsule flange 23 and/or that are associated with stop members 32 for stopping capsule 20, in particular stopping capsule flange 23, in a position for being handled by processing module 15.

Guide members 31 may be associated with at least one of assemblies 16,17. For instance, guide members have a connecter, e.g. a receiving recess 33, for securing at

least one of assemblies 16,17, for example a generally plate-shaped assembly 17, as shown in Figs 1 and 4.

Typically guide members 31 are part of or delimit part of passage 2. Capsule positioner 40 can have a seat 44 that has guides 45c,45d for guiding capsule 20, in particular a flange 23 of capsule 20, into guiding means 30 in passage 2.

Capsule positioner 40 and passage 2 and processing module 15 can be adapted to handle a capsule 20 of a first type and of a second type. For instance:

- capsule positioner 40 has a first guide 45c for guiding a flange of the first capsule type and a second guide 45d for guiding a flange of the second capsule type; and/or
- processing module 15 includes assemblies 16,17 adapted for an insertion of capsule 20 of a first type and of a second type when the assemblies are in an open position, processing module 15 being arranged to adapt the configuration of assemblies 16,17 or of brewing chamber 16,17 according to a size of capsule 20.

Figs 1 to 4 illustrate how a large capsule 20 is received, held and released from capsule positioner 40, capsule flange 23 being received by guides 45c; the flange of a short capsule (not shown) could be received in guides 45d. Processing module 15 should then be so adapted that assemblies and chamber 15,16 are adjusted to the dimensions of the large or small capsule, for instance as taught in co-pending applications EP 2012187716.1, EP 2012187717.9, EP 2012187718.7, EP 2012197961.1 and EP 2012189153.5.

capsule positioner 40 can be located above processing module 15 and passage 2. Optionally, capsule positioner 40, processing module 15 and passage 2 are configured so that capsule 20 can be driven by gravity from capsule positioner 40 to processing module 15.

As illustrated in the sequence of Figs 1 to 4, capsule 20 may be inserted into processing module 15 of machine 1 in the following manner:

- capsule 20 is received and held by pivotable member(s) 45a,45b of capsule positioner 40 whereby pivoting axis A extends through held capsule 20 (Figs 1 and 2);
- member(s) 45a,45b is/are pivoted about pivoting axis A to the position for releasing capsule 20 (Fig. 3) and capsule 20 is released into the passage 2; thereafter
- capsule 20 is transferred via the passage 2 (Fig. 4) to chamber 16,17 of processing module 15.

Capsule 20 can be immobilized in guide 31 on stop members 32, for example flange 23 of capsule 20 rest on stop members 32 to immobilize capsule 20. In this position, capsule 20 is in position to be handled by processing module 15.

A beverage can be prepared after transferring the capsule 20 to the chamber 16,17 of processing module 15, for example by capturing or enclosing capsule 20 by assemblies 16,17 that are relatively moved from an open position (schematically shown in Fig. 4) to a closed position (not shown).

In Figs 5a to 5e, in which the same numeric references designate the generally same or similar elements, an exemplary embodiment of capsule positioner 40 is shown in greater details.

Capsule seat 44 formed by pivotable members 45a,45 is mounted in a frame 42 that may integral with housing 10 of beverage machine 1 (not shown in Figs 5a to 5e). Alternatively, the capsule seat may be a separate part mounted to housing 10 of beverage machine 1 (not shown in Figs 5a to 5e). Capsule positioner 40 has two movable pivotable members in the shape of shells 45a,45b forming the base of capsule seat 44 when capsule positioner 40 is in the position illustrated in Figs 5a to 5d. The two

movable shells 45a,45b may be provided with notches 45c for guiding the introduction and the positioning of a capsule 2 into seat 44. The shells may be displaced by a motorized mechanism 46 to switch the position illustrated in Figs 5a to 5d, i.e. a capsule receiving and holding position, and the transitional position illustrated in Fig. 5e before reaching the capsule releasing position. More particularly, each shell may be rotated along a longitudinal axis A by motorized mechanism 46 to move each shell around capsule 20 from below capsule 20 to above capsule 20 so as to allow capsule 20 to be released from seat 44, for example by allowing capsule 20 to fall down into brewing unit formed of assemblies 16,17 through passage 2. Typically, capsule positioner 40 is positioned at the upper part of housing 10 of beverage machine 1 to let a capsule fall into the passage 20 under the effect of gravity, when capsule positioner 40 is brought into its capsule releasing position. Alternatively, the shells may be mechanically linked by a mechanical coupling means with or associated with a movable part of brewing unit 16,17 so as to switch between the receiving and holding position and the releasing position depending on whether brewing unit 16,17 is open or closed or moving between these two states. Guides 45c formed in the shells and surrounding capsule seat 44, are disposed to ease the positioning of capsule 20 by a user when capsule positioner 40 is in the receiving and holding position, and/or to improve the holding of capsule 20 in seat 44. Moreover, guides 45c may be arranged to guide the movement of capsule 20 when capsule positioner 40 is switched to its releasing position, and to prevent a capsule 20 inserted into seat 44 to be translated within capsule positioner 40, for example when capsule positioner 40 is switched from the receiving and holding position to the releasing position.

Beverage machine 1 may comprise a capsule-length detector 47 and/or a sensor 48 for sensing the position

of pivotable member 45a. Capsule detector 47 can be adapted to detect the presence on capsule seat 44 of capsule 20 and to identify whether the detected capsule is of a first or a second type different to the first type. More particularly, the capsule-length detector may be configured to determine the type of the capsule according to the length of the capsule. For example, the capsule-length detector may be configured to detect the presence of a metallic capsule in the seat, and then, determine if the detected capsule is of the first type or the second type by checking if the maximum length of said capsule along its axis of symmetry is sensibly equal to a first length L1 or to a second length L2 corresponding respectively to the first capsule type and second capsule type. Such a detection is for example disclosed in greater details in co-pending application EP 2012187762.5.

Unlike the embodiment shown in Figs 1 to 4, capsule positioner 40 shown in Figs 5a to 5e is configured to receive capsules of different length having the same flange size. Hence, only one type of guides 45c in seat 44 is needed to receive the different capsule types.

Machine 1 may have a collector receptacle (not shown) for collecting used ingredient capsules, such as tea leaves or ground coffee within used capsules, and waste liquid. Collector receptacle may be insertable, e.g. slidable, into a cavity formed in machine 1 and removable therefrom for servicing, e.g. emptying the solids and/or liquids contained therein.

Further details of such a machine 1, in particular relating to the processing module, beverage outlet, control unit and the motorization are for example disclosed in WO 2012/025258 and WO 2012/072758, which are hereby incorporated by way of reference.

Claims

1. A machine for preparing a beverage from an ingredient capsule, comprising:

- an ingredient capsule processing module having a chamber for processing said capsule therein;
- a passage for a transfer of said capsule to the chamber; and
- a capsule positioner having at least one member that is pivotable about a pivoting axis from a position for receiving and holding said capsule to a position for releasing said capsule into the passage,

wherein said pivoting axis extends through an area occupied by said capsule when held by said at least one member.

2. The machine of claim 1, wherein said at least one pivotable member delimits at least part of a seat for receiving and holding said capsule.

3. The machine of claim 2, wherein the seat has a shape configured to generally match a shape of said capsule.

4. The machine of claim 3, wherein the seat has a shape that is generally conical or cylindrical to match a correspondingly shaped body of said capsule.

5. The machine of claim 2 or 3, wherein the seat has guides arranged to match a correspondingly shaped capsule flange.

6. The machine of claim 5, wherein said guides arranged to match a correspondingly shaped capsule flange is a rim of a capsule body which is joined to a lid closing the body.

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7. The machine of any one of claims 2 to 6, wherein the capsule positioner comprises a pair of pivotable members delimiting at least part of the seat.

8. The machine of claim 7, wherein the members are pivotable in opposite directions about the pivoting axis.

9. The machine of any one of the preceding claims, wherein said at least one pivotable member forms a shell.

10. The machine of claim 9, wherein said shell is pivotally mounted at one or two extremities.

11. The machine of any one of the preceding claims, wherein said at least one pivotable member is located:

- in its member position for receiving and holding said capsule, between said area and the passage; and
- in its member position for releasing said capsule into the passage, sideways said area and passage and/or above said area.

12. The machine of any one of the preceding claims, which comprise guiding means for guiding the capsule in the passage, optionally the guiding means comprising guide members guiding a capsule flange and/or being associated with stop members for stopping said capsule in a position for being handled by the processing module.

13. The machine of claim 12, wherein said guiding means comprising said guide members guiding said capsule flange and/or being associated with stop members for stopping said capsule are for stopping the capsule flange in a position for being handled by the processing module.

14. The machine of claim 12 or 13, wherein the capsule positioner has a seat that has guides for guiding said capsule into the guiding means in the passage.

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15. The machine of claim 14, wherein the capsule positioner has a seat that has guides for guiding said capsule flange into the guiding means in the passage.

16. The machine of any one of the preceding claims, wherein the capsule positioner and the passage and the ingredient processing module are adapted to handle a capsule of a first type and of a second type, optionally:

- the capsule positioner comprising a first guide for guiding a flange of the first capsule type and a second guide for guiding a flange of the second capsule type; and/or
- the processing module comprising assemblies adapted for a selective insertion of a capsule of a first type or of a second type when the assemblies are in an open position, the processing module being arranged to adapt the configuration of the assemblies and/or of the brewing chamber according to the type of the inserted capsule.

17. The machine of any one of the preceding claims, wherein the capsule positioner is located above the ingredient processing module and the passage, optionally the capsule positioner, the ingredient processing module and the passage are configured so that said capsule can be driven by gravity from the capsule positioner to the processing module.

18. The machine of any one of the preceding claims, wherein the pivoting axis of the at least one pivotable member extends:

- generally perpendicularly to a transfer direction of said capsule along the passage; and/or
- generally parallelly to a machine housing at the capsule positioner generally parallelly to the passage,

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or the pivoting axis extends generally perpendicularly to a machine housing.

19. The machine of any one of the preceding claims, which comprises a machine housing, the capsule positioner being located at a top part of the machine housing.

20. A method of inserting an ingredient capsule into the processing module of the machine defined in any one of the preceding claims, for preparing a beverage from the capsule, comprising the steps of:

- receiving and holding the capsule by said at least one pivotable member of the capsule positioner whereby the pivoting axis extends through the held capsule;
- pivoting said at least one member about the pivoting axis to the position for releasing said capsule and releasing said capsule into the passage; and
- transferring the capsule via the passage to the chamber of the processing module.

21. The method of claim 1620 wherein a beverage is prepared after transferring the capsule to the chamber of the processing module.

22. A combination of a machine and a capsule, wherein the machine and the capsule are arranged to carry out the method defined in claim 20 or 21 and/or wherein the machine is a machine as defined in any one of claims 1 to 19 and wherein the capsule can be held by the capsule positioner so that the pivoting axis extends through the capsule.

23. A capsule when used:

- in a machine as defined in any one of claims 1 to 19;
- in a machine according to a method as defined in claim 20 or 21; or
- to provide a combination as defined in claim 22.

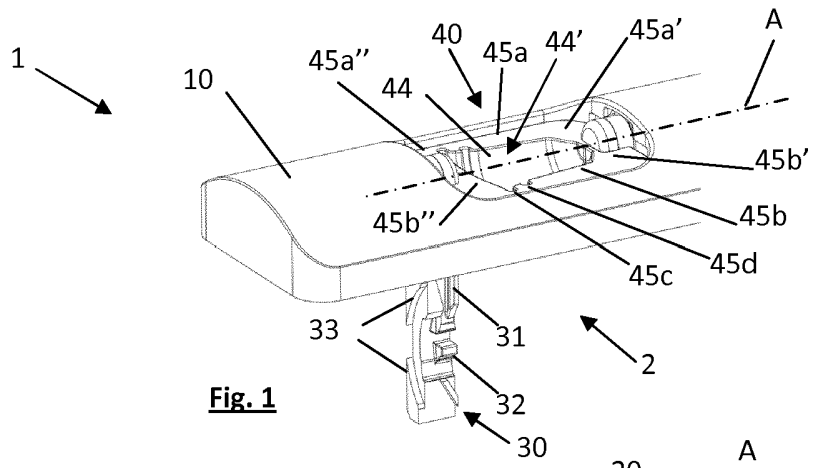

Fig. 1

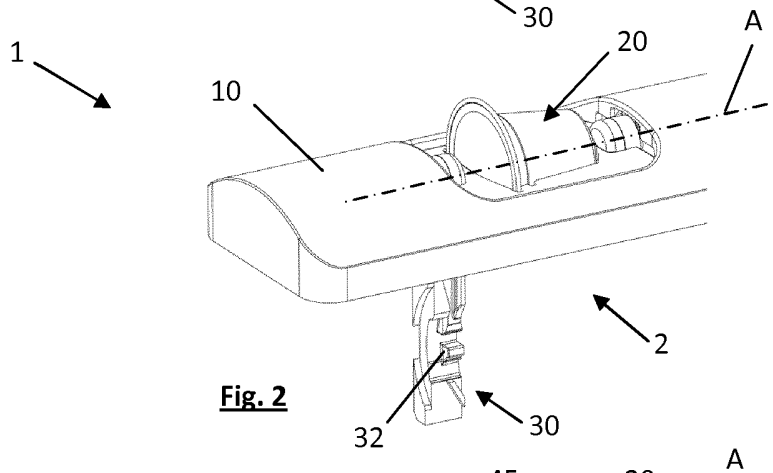

Fig. 2

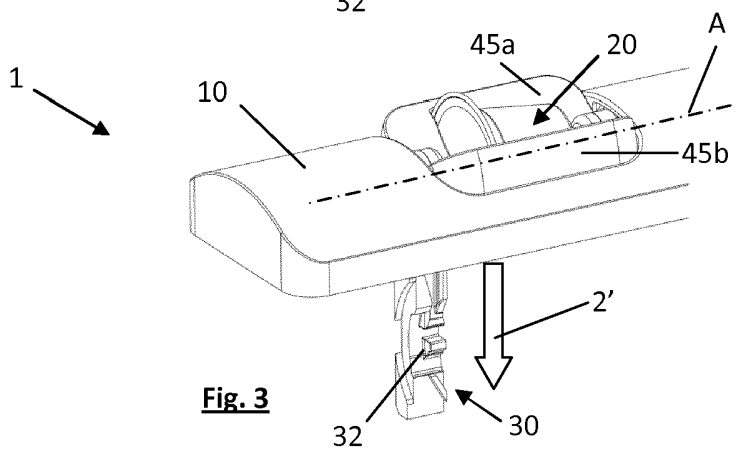

Fig. 3

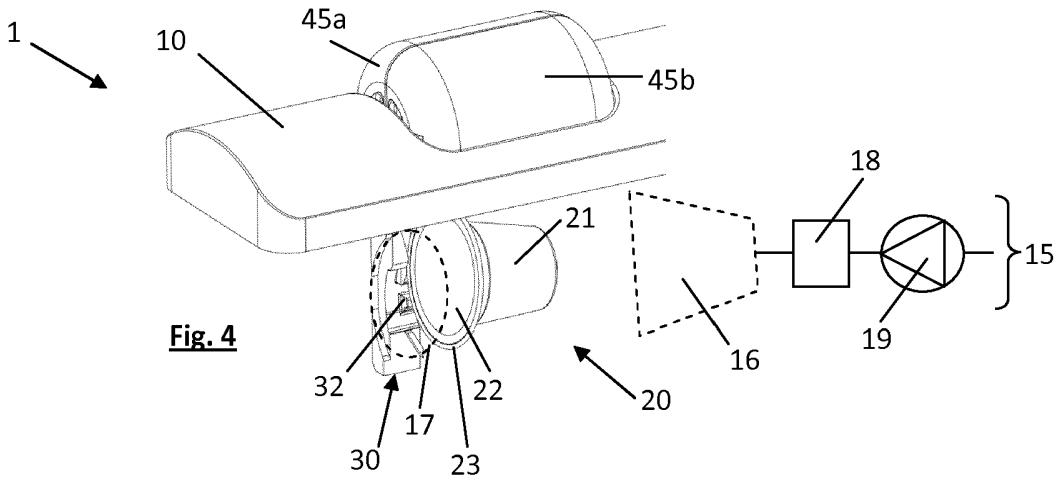

Fig. 4

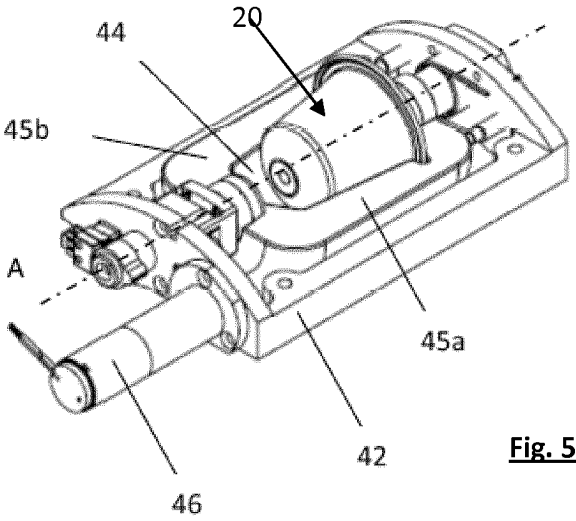

Fig. 5a

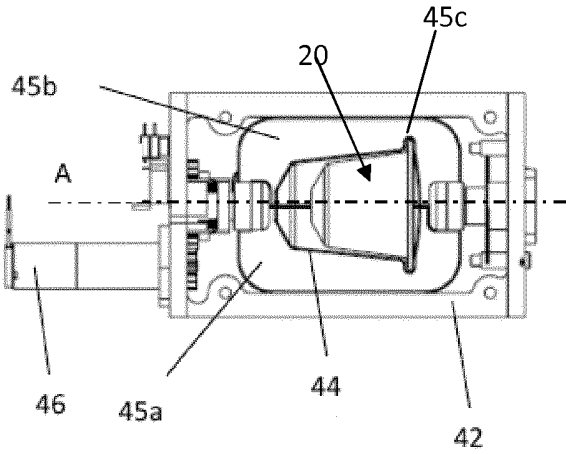

Fig. 5b

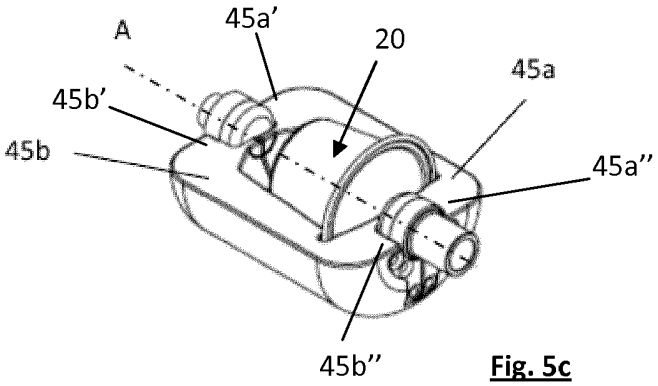

Fig. 5c

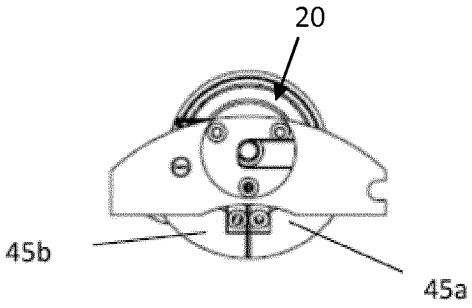

Fig. 5d

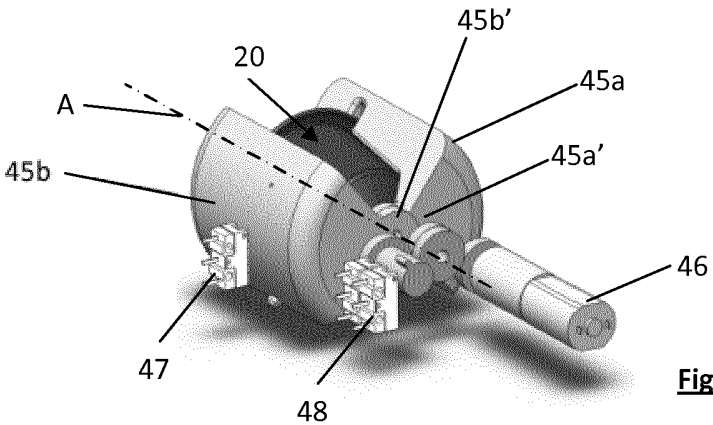

Fig. 5e