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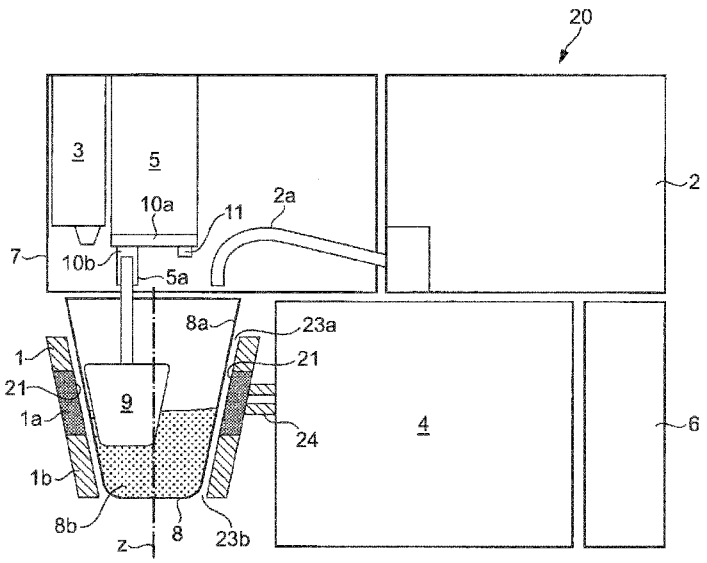

FIG. 1

(57) Abstract: The present invention relates to a machine (20) for the preparation of a cooled food product such as a frozen or chilled confectionary, the machine comprising a receiving seat (1) for accommodating an essentially cup-shaped container (8), a heat exchange element (1a) for cooling the product when the container is placed in the machine (20), and recognition means (11) for interacting with identification means (14) provided on an outer surface of the container (8), the recognition means (11) being connected to driving means (5) of the machine and designed for being selectively rotated about a central axis (Z) of the seat for accommodating the container (8).

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System and method for preparing a cooled food product with container recognition means

Field of the invention

The present invention is directed to a system and method for processing a food product in order to prepare a preferably cooled food product such as a frozen or chilled confectionary, the system comprising a machine and a container for holding ingredients. In particular, the invention relates to an enhanced system comprising recognition means for sensing an identification means provided on the container of the system.

Background of the invention

In the domain of food and drink processing machines, devices are known by means of which a cooled food product such as an ice cream or a chilled dairy product may be prepared by mixing the ingredients in a dedicated vessel, and cooling the mixture for a predefined amount of time. This preparation procedure has however several drawbacks. In particular, all the ingredients must be initially mixed, the volume of such machines corresponds usually to five or more serving portions of the same flavor and the time necessary for preparation is about half an hour. Moreover, the ingredients necessary for the preparation come in contact with a large number of parts of the preparation machine (e.g. a stirrer, tanks, or a dispenser), which all have to be cleaned.

A demand that is becoming a standard in this technical field is to minimize the necessary cleaning operations after the preparation. One way to ensure a fully clean preparation of the product consists in avoiding any product transfer by both processing and delivering the product in its initial container. Therefore, devices have been developed which are suitable for preparing a single-serving of a cooled product by means of initial ingredients provided within a dedicated container.

WO 2010/149509 for example relates to a system for preparing a frozen confectionary, the system comprising a cylindrical container designed for being inserted into a preparation device, said container comprising at least one scraper arranged movable within the container and said container containing ingredients for producing a frozen confection when being cooled and moved. The device of the system comprises a cylindrically formed container holder being equipped with a heat exchange surface designed for being in tight contact with the container when being placed in the container holder.

Such containers may contain different ingredients and/or different amounts of the same ingredients for which the preparation process has to be preferably adapted by the machine in order to obtain an optimal result. Therefore, recognition systems were developed which enable the identification of a particular container in the device using mechanical, optical or magnetic sensors.

WO 2012/010470 for example relates to a system for preparing a beverage by means of centrifugation and comprises means for sensing a capsule inserted into the

machine and adapting the processing parameters such as a rotational speed and liquid supply to the capsule as a function of the particular type of capsule inserted into the device. Thereby, the device comprises a rod sliding in a shaft and passing through a hole of the inner face of the bottom of a receiving means of the machine, the device further comprising means for measuring the position of the end of the rod in the shaft, which varies e.g. dependent on the particular size of the capsule. A drawback of such recognition system is the requirement of a relatively large axial space for the mechanical rod extending vertically within the receiving means of the machine.

Another possible solution for recognition means is the provision of graphic information such as a for example a barcode provided on a top or side surface of the container or capsule and which is arranged for being read by a dedicated sensor of the preparation machine.

In case of rotational-symmetric capsules or containers for being placed in receiving means of dedicated preparation machines however, the rotational orientation of the container with respect to the machine may differ each time the consumer places the container in the receiving means of the device, which may thus negatively affect the recognition of the identification means on the container.

Therefore, in view of the available prior art, a reliable system for identifying such identification means on a container being placed within the preparation machine is sought after. Thereby, it is particularly desired to provide a simple and reliable solution without

significantly increasing the complexity and the manufacturing costs of the food preparation system.

Object and summary of the invention

The present invention seeks to address the above-described problems. The invention also aims at other objects and particularly the solution of other problems as will appear in the rest of the present description.

In a first aspect, the invention relates to a machine for the preparation of a cooled food product such as a frozen or chilled confectionary, the machine comprising a receiving seat for accommodating an essentially cup-shaped container, a heat exchange element and a cooling unit arranged for lowering the temperature of the product container in the container placed in the receiving seat and recognition means for interacting with identification means provided on an outer surface of the container, the recognition means being connected to driving means of the machine and designed for being selectively rotated about a central axis of the seat for accommodating the container.

According to a preferred aspect of the invention, the heat exchange element has a heat exchange contact surface arranged to be in contact with at least the side wall of the container when the container is placed in the machine. Accordingly an effective and rapid lowering of the temperature is made possible by heat conduction while reducing the heat loss between the heat exchange element and the container.

According to the invention, the recognition means of the machine are connected to a provided driving means of the machine, which thus enables a relative rotation of the recognition means with respect to the container when being placed within the receiving seat of the machine. Accordingly, a reliable recognition of identification means that are provided on the preferably rotational-symmetric container is enabled, irrespective of the rotational orientation of the container when being placed within the machine by a consumer.

In a preferred embodiment, the driving means comprise a rotating member arranged for rotating about the rotational axis of the receiving seat of the machine. The rotating member is preferably arranged for supporting a stirring member of the machine. The stirring member can connected to the machine in a removable manner and may optionally serve as a spoon for convenient consumption of the cooled food product once finished.

Accordingly, the recognition means of the machine are connected to already provided driving means for holding a stirring member of the preparation machine and thus, the provision of additional driving means such as an electric motor connected to a mechanical fixture holding a dedicated sensor for the recognition means is prevented. Hence, a solution without significantly increasing the mechanical complexity and manufacturing costs of the machine is provided.

The rotating member of the driving means may be rotated selectively about the central axis of the seat of the machine in a positive or negative direction. The driving

means may comprise an electric motor connected to a control unit of the machine. A control unit of the machine connected to the driving means may adjust the rotational speed ω_1 of the driving means and/or the rotating member. The rotational speed ω_1 is preferably adjustable between 0 and 300 rpm, more preferably between 0 and 90 rpm.

In a preferred embodiment, the recognition means are preferably designed for recognizing identification means provided e.g. circularly about a rotational axis of the container.

The recognition means of the machine are preferably designed for reading the identification means of the container during rotation of the driving means.

In a preferred embodiment, the recognition means comprise at least one sensor for detecting identification means on the container. The sensor may comprise an optical sensor designed for reading an optical code such as a barcode from a surface of the container. The sensor may however as well be an electric, inductive, magnetic, or mechanic sensor suitable for interacting with identification means provided on the container.

In a preferred embodiment, the recognition means further comprise a ring member designed for being selectively driven about the central axis of the seat of the machine by the driving means, dependent on the rotational speed of the driving means. Thereby, the ring member preferably supports the sensor of the recognition means.

In a preferred embodiment, the ring member of the recognition means is connected to the driving means by coupling means arranged to selectively provide a frictional engagement between the ring member and the driving means respectively the rotating member of the driving means, dependent on the rotational speed and/or the direction of rotation of the driving means. Accordingly, a movement of the ring member supporting the sensor of the recognition means may be selectively obtained dependent on the rotational speed and/or the rotational direction of the driving means.

The coupling means preferably comprise a spring member designed for biasing a frictional element such as e.g. a ball member against a surface of the driving means or the ring member in an initial rest position of the coupling means. Accordingly, a rotational movement of the driving means respectively the rotating member thereof beyond a predefined threshold value of the rotational speed leads to a frictional disengagement between the rotating member of the driving means and the ring member. Hence, the ring member holding the sensor is preferably only driven at a relatively low rotational speed of the driving means, while at a relatively higher rotational speed, at which for example stirring of a food product within the container is carried out by means of the driving means, the ring member is not actively driven by the driving means. Accordingly, movement of the recognition means is only provided during reading of the identification means from the container, while during the normal food preparation process, a movement of the recognition means is prevented. Therefore, negative wear-out effects of the parts of the recognition system are minimized.

In an alternative embodiment, the coupling means may as well be arranged between the ring member and the driving means such that in an initial rest position of the coupling means, the frictional element of the coupling, such as e.g. the ball member, is not or not fully biased against the ring element. Accordingly, in case the rotational speed of the driving means respectively of the rotating member thereof exceeds a predefined threshold value, frictional engagement between the ring member and the driving means is enabled, thereby leading to a rotation of the ring member only at a relatively higher rotational speed of the driving means.

In a preferred embodiment, the ring member is adapted for being rotated by the driving means about a predefined limited angular amplitude. Thereby, the limited angular amplitude relates to the possible angular movement of the ring member with respect to the seat of the machine and/or the driving means. According to such an embodiment, the connection of a sensor arranged on the ring member is facilitated as a connection to the sensor can be obtained directly via e.g. electric wires and thus, no indirect connection via e.g. slip rings is required, which would increase the complexity and may negatively affect the reliability of the recognition means.

The machine and/or the recognition means respectively the ring member thereof may comprise a stopping mechanism, which limits the angular amplitude of the ring member. For example, the ring member may comprise a protruding element for engaging dedicated stop members of the machine, which members limit the rotational movement of the ring member.

In a preferred embodiment, the machine comprises a control unit connected at least to the recognition means of the machine and to the driving means. Thereby, the control unit is preferably designed to control at least the direction and amount of the rotational speed of the driving means and/or provide a rotational velocity pattern for the preparation of a food product within the container in response to information read by the recognition means from the container.

The control unit of the machine is preferably further designed to control and adapt the operation of the heat exchange element of the machine in response to information read by the recognition means from the container. In particular, an on/off state as well as the cooling rate respectively cooling output may be controlled.

The heat exchange element of the machine is preferably integrally formed with the receiving means respectively the seat for accommodating the container in the machine. The heat exchange element is preferably an evaporator connected to a cooling circuit of the machine. Thereby, the heat exchange element is preferably an essentially annular element designed to connect to an outer circumferential wall of a dedicated container.

In a second aspect, the invention relates to a system comprising a machine as described above and a container comprising identification means that are preferably arranged on an external surface of the container. The identification means are preferably arranged about a rotational axis thereof.

The container is preferably a single-use container that provides an initial packaging for a predefined amount of ingredients. Further, the container is also designed for being used as process container, i.e. as container in which the frozen confectionary is prepared, as well as enjoy container, i.e. as container from which the consumer may directly consume the resulting frozen confectionary.

The term "single-use container" when used in the present invention encompasses any container suitable for being disposed after being used for the preparation of the single-portion of cooled product. Thereby, the containers are preferably recyclable.

The term "cooled food product" within this application is intended to refer to different types of cooled, chilled or at least partially frozen food product. Non limiting examples are whipped yoghurt, milk smoothie, coffee latté, ice cream, sorbet, sherbet, water ice, frozen yogurt, frozen dairy, soft ice, Mellorine, granitas, frozen custard, non-dairy frozen confection, milk ice, ice lolly, gelato or frozen jelly, or chilled desserts such as mousses, or milk shakes.

The "cooling power" is generally obtained by adjusting the speed of the compressor and by varying the opening of the expansion valve positioned between the compressor and the evaporator in the cooling circuit.

The container comprises a body which is preferably a single-wall member forming a cavity for the ingredients. The body of the container is preferably made from metal

such as aluminium or steel and/or plastic material. The body may as well be at least partially made from biodegradable material. It is preferable that the thickness of the body is small enough to ensure the cooling of the product in an acceptable time. In particular, the thickness of the body is preferably between 1 and 5mm.

In a preferred embodiment, the body of the container has an inverted conical or curved shape. The container is preferably rotational symmetric about a central axis X of the body of the container.

The identification means of the container are preferably distributed circularly around the rotational axis of the container.

The identification means may comprise a plurality of identical portions repeatedly provided within a respective repetition angle (α_{rep}). Thereby, the identical portions relate to areas on the external surface of the container containing the same information. These identical portions are preferably arc-shaped and arranged about a rotational axis of the container. The repetition angle (α_{rep}) relates to the angle that is enclosed by the outer boundaries of each art-shaped portion with respect to the rotational axis of the container. The repetition angle (α_{rep}) is preferably between 10 and 90°, more preferably between 10 and 45°, even more preferably between 10 and 25°

In a preferred embodiment, the recognition means of the system are designed for being rotated about a limited sensing angle ($\alpha_{sensing}$), which is larger than the

repetition angle (α_{rep}). Preferably, the sensing angle ($\alpha_{sensing}$) of the recognition means is at least twice the repetition angle (α_{rep}) of the identification means on the container. Accordingly, irrespective of the rotational orientation of the container upon placement in the seat of the production machine by the consumer, the rotation of the recognition means about the predefined sensing angle ($\alpha_{sensing}$) is large enough in order to successfully recognize and identify the information provided by the identification means on the container.

In a preferred embodiment, the identification means is arranged on a lid member and/or a rim portion of the container. Thereby, the identification is preferably orientated circularly about the rotational axis of the container.

In a further aspect, the invention relates to a method for reading identification means from a surface of a container during a preparation of a cooled food product by cooling and stirring the product in the container by the machine, the method comprising the steps of:

- placing a container into receiving means of a preparation machine,
- rotating recognition means connected to driving means of the preparation machine about a rotational axis of the container,
- the recognition means being designed for reading identification means provided on an outer surface of the container during rotation of the driving means.

In a preferred embodiment, the method further comprises the step of rotating the recognition means about a limited angular amplitude having a sensing angle ($\alpha_{sensing}$), which is larger than a repetition angle (α_{rep}) relating to an arc-shaped portion of the identification means on the container. Preferably, the sensing angle ($\alpha_{sensing}$) of the recognition means is at least twice the repetition angle (α_{rep}) of the identification means on the container.

The reading of the identification means is preferably carried out when the recognition means are rotated about a predefined limited sensing angle ($\alpha_{sensing}$). Reading of the identification means from the container is preferably carried out before or after the rotational speed ω_1 of the driving means or of a rotating member thereof reaches a predefined value.

In a particular preferred embodiment, reading of the identification means from the container is carried out before the driving means reach a predetermined threshold value of the rotational speed ω_1, at which the recognition means are disengaged from being driven by the driving means.

In a preferred embodiment, the method further comprises the step of alternating the rotational direction of the driving means during and/or after the food preparation process for zeroing the position of the recognition means respectively for bringing the recognition means into an initial starting position with respect to the driving means. The initial starting position of the recognition means refers to a rotational position in which the recognition means may be rotated about a predefined

limited sensing angle ($\alpha_{sensing}$) in a preferred direction with regards to the driving means.

The method may further comprise the step of alternating the rotational direction of the driving means during and/or preferably after each food preparation process in order to enable a reading operation of the recognition means during a respective alternating rotation of the recognition means about the limited sensing angle ($\alpha_{sensing}$).

The invention further relates to a single-use container for being identified during the preparation of a cooled food product in a machine by the method of the invention wherein the container contains ingredients for the preparation of a cooled food product and comprises identification means arranged about a rotational axis (X) of the container.

The identification means preferably contains information related to the preparation of the cooled food product communicable to the machine to enable the control unit to adapt the preparation parameters in particular the rotational velocities of the stirring means, the cooling power of the cooling unit and optionally the amount of injected air, as a function of the sensed product temperature, optionally the product viscosity and overrun.

Preferably, the identification means comprises a plurality of identical portion repeatedly provided within a respective repetition angle. More preferably, the repetition angle (α_{rep}) is configured to be smaller than

the sensing angle of the recognition means rotated about a limited angular amplitude of the machine.

Brief description of the drawings

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

Fig. 1 shows a schematic drawing of the system for preparing a cooled food product according to the invention.

Fig. 2a to 2c relate to a preferred embodiment of a container of the system according to the present invention, whereby figure 2b is an enlarged figure of a rim portion of the container depicted in figure 2a.

Fig. 3 relates to a schematic drawing of a preferred embodiment of the recognition means of the system being connected to driving means of the machine.

Fig. 4 relates to a schematic drawing of another preferred embodiment of the recognition means comprising a ring member connected to the driving means of the machine.

Fig. 5a to 5d relates to a preferred embodiment of the recognition means comprising coupling means for

connecting the ring member to the driving means of the machine.

Fig. 6 relates to a schematic top view of a preferred embodiment of the ring member of the recognition means being equipped with stopping means for providing a limited angular amplitude of the ring member.

Fig. 7a and 7b relates to a preferred relationship between the rotational speed of the driving means of the machine and the angular position of the recognition means during a preparation process for a food product.

Detailed description of the figures

Figure 1 relates to a preferred embodiment of a system according to the present invention comprising a single-use container 8 and a machine 20 designed for preparing a cooled food product such as a frozen or chilled confectionary by means of the container 8.

The machine 20 preferably comprises a receiving seat 1 for receiving the container 8 therein. Thereby, the receiving seat 1 preferably comprises an insert opening 23a in which the container 8 may be placed, as well as a lower opening 23b.

The receiving means 1 are preferably formed as an annular ring portion. The receiving seat 1 preferably comprises a V-shaped or truncated conical geometrical form when seen

in sectional side view. The receiving seat 8 is preferably connected to a housing of the machine 20 by dedicated support means 24. According to such an embodiment, containers 8 of different sizes respectively volumes may be supported by the receiving seat 1.

The machine 20 further comprises a cooling unit 4 connected to a heat exchange element 1a that is preferably connected to or integrally formed with the receiving means 1 of the machine 20. The heat exchange element 1a is preferably an evaporator connected to the cooling unit 4 of the machine. The heat exchange element 1a preferably serves as a heat exchanger that withdraws the heat energy from the container 8 and its enclosed food product.

The heat exchange element 1a preferably comprises an inner geometrical shape complementary to a side wall 8a of the container 8. Thereby, an inner heat exchange contact surface 21 of the heat exchange element 1a is preferably shaped to be adjacent to an outer surface of a side wall 8a of the container 8 when the container is placed in the receiving seat 1.

The heat exchange element 1a is further of a material which provides excellent heat transfer properties, such as e.g. metal. Accordingly, an enhanced heat transfer between the container 8 and the heat exchange element 1a is enabled.

As shown in figure 1, the container receiving seat 1 is preferably only partially composed of the heat exchange element 1a. The receiving means 1 may further comprise a thermally insulating portion 1b that is preferably formed

of a material with a lower thermal heat capacity, such as e.g. a polymer.

The cooling unit 4 of the machine 20 is adapted to cool the heat exchange element 1a. Since the heat exchange element 1a comprises excellent heat conductivity, the wall 8a of the container 8 is cooled accordingly. The cooling unit 4 can comprise any refrigeration and/or circulatory heat transfer system to cool the heat exchange element 1a, the side wall 8a of the container 8 and consequently a food product 8b within the container 8. In general, the cooling unit comprises a cooling circuit using a refrigeration gas (e.g., R404A) with a compressor, an evaporator and an expansion valve positioned between the compressor and the evaporator. Therefore, it is possible to control the cooling power of the cooling unit by adjusting the pump's speed of the compressor which transports the gas and the opening of the expansion valve.

The machine 20 preferably further comprises a liquid tank 2 for holding liquid such as e.g. water and a dedicated pump. The liquid tank 2 is preferably connected to liquid dispensing means 2a for providing liquid to the container 8 when being placed within the receiving means 1a of the machine 20.

The machine 20 may comprise a topping tank 3 and an associated valve or pump (not shown) for providing toppings in solid or liquid form to the product 8b within the container 8. The toppings may be liquid coulis, liquid chocolate, caramel or solid products like crisps, flakes, chocolate bits. Additionally, the toppings may be

liquefied by means of an additionally provided heating source such as e.g. melted chocolate.

The machine 20 comprises a driving means 5 adapted for rotating at least one rotating member 10a thereof about a rotational axis Z of the receiving seat 1 of the machine, respectively about the rotational axis X of the container 8 when being placed in the receiving seat 1 of the machine 20.

The driving means 5 is preferably designed to connect to and support a stirring member 9 within the container 8. For this reason, the driving means 5 is preferably equipped with connection means 5a designed for selectively connecting to the stirring member 9.

The driving means 5 may further comprise a second rotating member 10b arranged to rotate the stirring member 9 about a vertical axis preferably arranged parallel to the rotational axis Z of the receiving means 1.

The machine 20 further comprises recognition means 11 that are preferably arranged to be rotated about the rotational axis Z of the receiving means 1 respectively about the rotational axis X of the container 8 when being placed in the receiving means 1.

The recognition means 11 are preferably connected to the driving means 5. As in depicted in figure 1, the recognition means 11 may be connected to the rotating member 10a of the driving means 5. The recognition means 11 are preferably arranged offset with respect to the rotational axis Z of the receiving means. Hence, rotation

of the rotating member 10a of the driving means 5 about the rotational axis Z leads to a rotation of the recognition means 11 about the rotational axis Z. Accordingly, identification means 14 (see figures 2a to 2c) such as e.g. a barcode arranged circularly at a surface of the container 8 may be recognized and read by the recognition means 11.

The machine 20 further comprises a control unit 6 for controlling the operations of the components of the machine. The control unit 6 is preferably designed to control at least a movement of the driving means 5 and/or the performance of the heat exchange element 1a during the preparation of the food product. The control unit 6 is preferably connected to the recognition means 11 in order to control the operation of the driving means 5 and/or of the heat exchange element 1a in response to the information read from the particular container 8 by the recognition means 11.

The machine is thus adapted for controlling the food preparation parameters such as in particular the temperature of the heat exchange element 1a and the rotational speed of the driving means 5 respectively of rotating members 10a and/or 10b connected to the driving means 5, and thus the rotational speed of the stirring member 9 within the container 8, in response to information read by the recognition means 11 from the container 8.

The topping tank 3 and the driving means 5 are preferably mounted on a mobile structure 7 of the machine in order to allow the insertion and removal of the container 8 into

and from the container receiving means 1. The mobile structure 7 is thus adapted to be moved relatively to the rest of a housing of the machine 20 from a closing position (shown in figure 1) to an open position (not shown). Thereby, the movement of the mobile structure 7 with respect to the rest of the machine 20 may be rotation or translation.

Figure 2a shows a preferred embodiment of the container 8 for being placed into the receiving seat 1 of the machine 20. The container 8 is preferably rotational symmetric about axis X. The container 8 preferably comprises a body 8c providing a cavity for holding food ingredients 8b as shown in figure 1. The container 8 preferably further comprises a lid member 19 connected to the body 8c of the container.

The container 8 may further comprise a rim portion 16 that extends from an upper part of the container body 8c. The rim portion 16 preferably a flange-like rim portion protruding to the side of the container body 8c.

The rim portion 16 may comprise a curled outer end portion 16a as indicated in figure 2b. The lid member 19 may be connected to the rim portion 16 and/or to the curled outer end portion 16a by a welding or adhesion process.

The container 8 further comprises an identification member 14 (see figure 2c) arranged on an outer surface of the container 8. The identification member 14 is preferably arranged circularly around the rotational axis X of the container 8.

In the preferred embodiment according to figure 2c, the identification member 14 may be arranged on the top surface respectively on the lid member 19 of the container 8 and/or on the rim portion 16 of the container.

As indicated by arrows A in figure 2b, the identification member 14 may be arranged on the (preferably flat) upper surface of the rim portion 16 and/or an upper or lateral side surface of the curled rim portion 16a. Alternatively, the identification member 14, may be arranged on the (preferably flat) lower surface of the rim portion 16 and/or the lower surface of the curled rim portion 16a, as indicated by arrows B. Furthermore, the identification means 14 may as well be arranged at the outer surface 8c of the side wall 8c of the container as indicated by arrow C in figure 2a.

The identification means 14 may be any identification member suitable for carrying information and for interacting with a dedicated sensor of the recognition means 11 arranged on the machine 20. The identification means 14 may be an optical code such as a barcode or an electric, inductive, magnetic or mechanic identification member.

In a preferred embodiment as shown in figure 2c, the identification means 14 is an optical barcode suitable for being read by an optical sensor 12 of the recognition means 11. The identification means 14 preferably comprise a plurality of portions 14a carrying identical information and being arranged about the rotational axis X of the container 8. The portions 14a are preferably arc-shaped portions of which the outer boundary portions enclose a

repetition angle α_{rep}. The repetition angle α_{rep} preferably lies between 10 and 90°, more preferably between 10 and 45°, even more preferably between 10 and 25°. The angle is proportional to the quantity of data which is necessary to be communicated to the device. During the rotation of the recognition means 11 about at least a limited angular amplitude comprising a sensing angle $\alpha_{Sensing}$ as indicated in figure 2c, a reliable reading operation of the information contained by the identification means 14 is enabled. The sensing angle $\alpha_{Sensing}$ is preferably larger than the repetition angle α_{rep}. More preferably, the sensing angle $\alpha_{Sensing}$ is at least 1.5 times, at least 2 times larger than the repetition angle α_{rep}. As a result, the start of the each repetition or sequence can be correctly detected by the device.

Figure 3 relates to a preferred embodiment of the present invention, whereby the recognition means 11 and the sensor 12 thereof are fixedly connected to the rotating member 10a of the driving means 5 of the machine. Thereby, the rotating member 10a of the driving means 5 and thus, also the recognition means 11 is arranged for being driven about a rotational speed ω_1. The control unit 6 of the machine 20 preferably controls the rotational speed ω1 of the rotating member 10a.

As shown in figure 3, the rotating member 10a is preferably designed for supporting and rotating a stirring member 9 within the container 8 when being placed in the machine. The stirring member provides aeration to the product and prevent frozen product from settling on the inner surface of the container.

The driving means 5 may further comprise an additional second rotating member 10b which is also connected to the stirring member 9 and which preferably enables a rotation of the stirring member 9 about its rotational axis Y. Thereby, the second rotating member 10b may be driven at a different rotational speed ω_2, which is preferably higher than the rotational speed ω_1 of the rotating member 10a. The second rotating member 10b may also be driven in a direction opposite to the direction of the first rotating member.

Figure 4 relates to another preferred embodiment of the invention, wherein the recognition means 11 further comprise a ring member 13 that is connected to the driving means 5, in particular to the rotating member 10a thereof. The ring member 13 is preferably concentrically arranged with respect to the rotating member 10a. The ring member 13 may be arranged at the outer circumference of the rotating member 10a. The ring member 13 may be made from plastic and/or aluminium material. The sensor 12 of the recognition means 11 is preferably arranged at a lower surface of the ring member 13 such as to interact with an identification means 14 provided on an upper surface of the container 8 such as on the lid member 19 and/or the rim portion 16 of the container 8, when being placed in the receiving seat 1 of the machine.

Figures 5a to 5d show another preferred arrangement, wherein the recognition means 11 further comprise a coupling means 15. The coupling means 15 are arranged between the ring member 13 and the rotating member 10a, in order to selectively drive the ring member 13 dependent on the rotational speed ω_1 of the rotating member 10a.

The coupling means 15 may comprise a spring member 15a and a friction element such as a ball member 15b, which is biased by the spring member 15a against an outer surface 17 of the ring member 13 in an initial connected state of the coupling means 15 as depicted in figures 5a to 5c.

The coupling means 15 are preferably supported within a recess 16 of the rotating member 10a. A rotation of the rotating member 10a leads to a centrifugal force acting on the ball member 15b of the coupling means and thus to a force in a direction against the biasing force of the spring member (see arrows E in figure 5d), which increases with increasing rotational speed. In case the rotational speed ω_1 (see arrow D in figure 5d) of the rotating member 10a reaches a predefined threshold value, a disengagement of the coupling means 15 from the outer surface 17 of the ring member 13 is obtained, as shown in figure 5d. Therefore, at a rotational speed ω_1 that is equal to or larger than said threshold value, the ring member 13 is not actively driven by the rotating member 10a and the driving means 5.

As shown in figure 6, the ring member 13 may be equipped with an outwardly extending protrusion 18a designed for interacting with stopping means 18b of the machine. Accordingly, the ring member 13 is arranged for being rotated only about a predefined limited angular amplitude. The limited angular amplitude preferably corresponds to the sensing angle $\alpha_{sensing}$ at which the ring member 13 is able to rotate with respect to the driving means 5 respectively the rotating member 10a thereof. The angular amplitude is preferably arranged to be at least 1.5 to

twice the repetition angle α_{rep} of the identification means 14 provided on the container 8. In particular, the angular amplitude (or sensing angle $\alpha_{sensing}$) is preferably comprised between 45 and 180 degrees, most preferably between 50 and 120 degrees; while the repetition angle $\alpha_{repetition}$ is comprised between 10 and 90 degrees, more preferably between 10 and 45 degrees.

This preferred relationship between the repetition angle α_{rep} of the identification means 14 and the sensing angle $\alpha_{sensing}$ of the recognition means 11 is also depicted in figure 2c. Hence, in case the recognition means 11 are arranged to be rotated about a limited predefined sensing angle $\alpha_{sensing}$, a reliable detection of the information provided on the container 8 is enabled, irrespective of the individual rotational orientation of the container 8 upon placement into the machine 20.

In order to enable at least a rotation of the recognition means 11 about the predefined sensing angle $\alpha_{sensing}$, the recognition means is to be arranged in an initial starting position before reading the identification means 14 on the container 8. In particular, the starting position refers to a position at which the protrusion 18a of the ring member 13 is in contact with one of the stopping means 18b of the machine.

In order to ensure that the ring member 13 being only able to rotate about a limited angular amplitude is rotated by the driving means 5 at least about the predefined sensing angle $\alpha_{sensing}$, the angular position of the ring member 13 may be zeroed at the end or the beginning of each recipe respectively food preparation process. This may be

obtained by rotating the ring member 13 in an opposite direction at least about the sensing angle $\alpha_{sensing}$ (see figure 7a).

As shown in figure 7a, the reading (see reference "r" in figure 7a) of the identification means 14 from the container 8 takes place during rotation of the recognition means 11 about the sensing angle $\alpha_{sensing}$, as the rotational speed ω_1 of the rotating member 10a starts to increase. Once the recognition means 11 were rotated about the predefined sensing angle $\alpha_{sensing}$, the recognition means 11 stay in this angular end position. Thereby, preparation of the food product within the container 8 is carried out, during which the driving means provide a rotation of the stirring member 9 within the container 8 (see reference "s" in figure 7a). The rotational speed ω_1 of the rotating member 10a may be constant or varied by the control unit 6 during this preparation process. Thereby, the coupling means 15 may disengage the recognition means 11 from being driven by the driving means 5 in case the rotational speed ω_1 of the rotating member 10a exceeds a predefined threshold value, as previously described.

After the preparation process, zeroing (see reference "z" in figure 7a) of the recognition means 11 is carried out by rotating the driving means 5 and the rotating member 10a in an opposite direction as during the food preparation process "s", in order to bring the ring member 13 of the recognition means 11 back into the initial starting position.

An alternative embodiment for the food preparation process is depicted in figure 7b. Thereby, by contrast to the

process according to figure 7a, the direction of rotation of the driving means 5 and the rotating member 10a is changed after each preparation process. Thereby, in accordance with the process according to figure 7a, an initial reading phase (see reference "r" in figure 7b) of the identification means 14 from the container 8 takes place during rotation of the recognition means 11 about the sensing angle $\alpha_{sensing}$, as the rotational speed ω_1 of the rotating member 10a starts to increase. Once the recognition means 11 were rotated about the predefined sensing angle $\alpha_{sensing}$, the recognition means 11 stay in this angular end position. Thereby, preparation of the food product within the container 8 is carried out, during which the driving means provide a rotation of the stirring member 9 within the container 8 (see reference "s" in figure 7b). At the end of the preparation process, the driving means 5 stop, whereby the ring member of the recognition means 11 will remain in this angular end position. At the next preparation process, the driving means 5 will be controlled to provide a rotation of the rotating member 10a and thus of the recognition means 11 in an opposite rotational direction having a rotational speed - ω_1, such that the recognition means 11 are rotated about at least the sensing angle $-\alpha_{sensing}$, at the beginning of this next preparation process.

Accordingly, alternation of the rotational direction of the driving means 5 during and/or preferably after each food preparation process may be provided in order to enable a reading operation of the recognition means 11 during a respective alternating rotation of the recognition means 11 about the limited sensing angle $\alpha_{sensing}$.

Example 1

In the following, the basic working principle of the machine for preparation of food product will be explained with respect to a recipe for vanilla ice cream.

First, the mobile structure 7 of the machine 20 (see figure 1) is brought into its open position in which a container 8 from which a lid member provided to close a central opening 8c of the container 8 has been removed is inserted in the receiving seat1. In the open position, the stirring means 9 may be manually connected to stirring unit 5 of the machine. The mobile structure 7 is then brought into its closed position in which the stirring unit 5 and the topping tank 3 are lowered towards the container 8. In this position, the stirring means 9 are brought into a position adjacent to and contacting the inner freezing surface 12a of the container 8.

In a first fast foaming phase, cooling of the food product within the container is obtained via the control unit 6 setting the cooling power of the heat exchange element to 100%. The stirring member 9 is rotated within the container by means of the driving means 25 about axis Z at ω_1 = 800rpm. Further, the second driving means 26 is controlled to rotate the stirring member 9 at the same time but lower speed, about axis X at ω_2= - 60rpm.

Accordingly, the product is simultaneously cooled, stirred and scraped within the container 8. This movement is continued for maximum 120 seconds or until a predefined threshold value for a torque at the stirring member 9 is

detected by torque sensor 27b at the first driving means 25.

In a second preparation phase, the rotational speed is lowered to avoid overflow of the product 8b within the container 8. Thereby, ω_1 is set to 400rpm and ω_2 is held at -60rpm. The cooling power of cooling means 1a is kept at 100% of its maximal cooling power.

This setting is applied for maximum 120 seconds or until a predefined torque value is detected by torque sensor 27b, while at the same time the final temperature is about -10°C, detected by a dedicated temperature sensor of the machine.

The mobile structure 7 of the machine 20 is then brought into its open position such that the container 8 may be removed from the receiving means 1. Thereby, the stirring unit 5 may disconnect from the stirring means 9. A user may then retrieve the container 8 from the receiving means 1 of the machine.

Example 2

This example refers to a preparation for whipped yoghurt, wherein in a first preparation phase a relatively higher velocity of the stirring member 9 is provided.

In particular, rotational velocity ω_1 is set to 1200rpm, while rotational velocity ω_2 is set to -30 rpm. The cooling power of the heat exchange element 1a is set to 100%. This setting is applied for maximum 120 seconds or until temperature of the product is detected to be about +4°C.

In a second preparation phase, the rotational velocities ω_1,ω_2 are kept constant (compared to the first phase) and the cooling power is reduced to 30%. This setting is applied for maximum 120 seconds or until a predefined torque value is detected by torque sensor 27b.

Example 3

This example 3 refers to the preparation of a milk smoothie, wherein in a first preparation phase a relatively slow stirring of the stirring means 9 is applied in order to avoid splashes of the originally liquid product. Thereby, ω_1 is set to 400 rpm, while rotational velocity ω_2 is set to -30 rpm. The cooling power of the heat exchange element is set to 100%. This setting is applied for maximum 120 seconds or until the temperature of the product is below 6°C.

In a second preparation phase, ω_1 is set to 800 rpm, while rotational velocity ω_2 is set to -60 rpm. The cooling power is kept at 100%. Accordingly, a relatively fast foaming and cooling of the product is applied. This setting is applied for a maximum of 120 seconds or until the temperature is about +2°C.

In a third preparation phase, ω_1 and ω_2 are kept constant (compared to the second phase), while cooling power of the cooling unit is reduced to 30%. This setting is applied for a maximum of 120 seconds or until a predefined torque value is detected by torque sensor 27b.

In general, the identification means 14 of the container comprises information to enable the control unit to adapt the preparation parameters. It generally comprises a simple product reference code, which enables the identification of the associated recipe that is stored in a memory of the control unit.

The aforesaid parameters may comprise one or more of product temperature, product viscosity, overrun and combinations thereof and/or any one of output parameters amongst: rotational velocities, cooling power rate, an air injection related parameter and combinations thereof.

During the preparation process of the above-outlined examples, liquid or solid toppings may be added from the topping tank 3 to the main product within the container 8. This may take place close to the end of the preparation process such that liquid toppings will create an appealing

visual swirl for the consumer and solid toppings will remain crispy.

The present invention enables the effective preparation of a cold food product such as aerated frozen or chilled confectionery, which can be freshly prepared in single portions within the initial container that serves at the same time as process and enjoy container.

With the present invention it is further possible to prepare several different types of such products in a short time. Since the container is dispensable and does not need to be cleaned, the handling is simplified and the need for cleaning is reduced.

Claims

1. A machine (20) for the preparation of a cooled food product the machine comprising:
   - a receiving seat (1) for accommodating a container (8),
   - a heat exchange element (1a) and a cooling unit (4) arranged for lowering the temperature of a product contained in the container placed in the receiving seat (1), and
   - recognition means (11) for interacting with identification means (14) provided on an outer surface of the container (8), the recognition means (11) being connected to driving means (5) of the machine and designed for being rotated about a central axis (Z) of the seat (1) accommodating the container (8).

2. The machine according to claim 1, wherein the heat exchange element (1a) has a heat exchange contact surface (21) arranged to be in contact with at least the side wall (8a) of the container (8) when the container is placed in the machine (20).

3. The machine according to claims 1 or 2, wherein the driving means (5) comprise a rotating member (10a) designed for being rotated about the rotational axis (Z) and designed for supporting a stirring member (9) of the machine.

4. The machine according to any of claims 1 to 3, wherein the recognition means (11) comprise a sensor (12) for reading identification means (14) on the container (8).

5. The machine according to any of claims 1 to 4, wherein the recognition means (11) comprise a ring member (13) designed for being driven about the central axis (Z) by the driving means (5) dependent on the rotational speed (ω_1) of the driving means (5).

6. The machine according to claim 5, wherein the ring member (13) is connected to the driving means (5) by coupling means (15) arranged to provide a frictional engagement between the ring member (13) and the driving means (5).

7. The machine according to claim 6, wherein the coupling means (15) comprise a spring member (15a) and a ball member (15b) for being biased against the ring member (13) in an initial rest position of the coupling means.

8. The machine according to any of claims 5 to 7, wherein the ring member (13) is adapted for being rotated by the driving means (5) about a predefined limited angular amplitude ($\alpha_{sensing}$).

9. A system comprising a machine (20) according to any of the preceding claims and a container (8) comprising identification means (14) arranged about a rotational axis (X) of the container (8).

10. The system according to claim 9, wherein the identification means (14) are distributed circularly around the rotational axis (X) of the container (8) and comprises a plurality of identical portions (14a) repeatedly provided within a respective repetition angle (α_{rep}) and wherein the recognition means (11) are designed for being rotated about a limited angular amplitude of sensing angle ($\alpha_{sensing}$) which is larger than the repetition angle (α_{rep}) of the identification means (14).

11. The system according to any of claims 9 to 10, wherein the identification means (14) is a barcode arranged on a lid member (19) of the container (8).

12. A method for reading an identification means (14) from a surface of a container (8) during a preparation of a cooled food product by cooling and stirring the product in the container by the machine the method comprising the steps of:
placing a container (8) into receiving means (1) of a preparation machine (20),
rotating recognition means (11) connected to driving means (5) of the preparation machine (20) about a rotational axis (X) of the container (8),
the recognition means (11) being designed for interacting with identification means (14) provided on an outer surface of the container (8) during rotation of the driving means (5).

13. The method of claim 12, further comprising the step of rotating the recognition means (11) about a limited angular amplitude having a sensing angle ($\alpha_{sensing}$) that

is larger than a repetition angle (α_{rep}) relating to an arc-shaped portion (14a) of the identification means (14) on the container (8).

14. Single-use container for being identified during the preparation of a cooled food product in a machine (20) by the method according to any of claims 12 to 15, wherein the container contains ingredients for the preparation of a cooled food product and comprises identification means (14) arranged about a rotational axis (X) of the container.

15. Container according to claim 14, wherein the identification means (14) contains information related to the preparation of the cooled food product communicable to the machine to enable the control unit to adapt the preparation parameters in particular the rotation velocities of the stirring means, the cooling power of the cooling unit and the amount of injected air, as a function of the sensed product temperature, optionally the product viscosity and overrun.

16. Container according to claims 14 or 15, wherein the identification means (14) comprises a plurality of identical portion (14a) repeatedly provided within a respective repetition angle (α_{rep}).

17. Container according to claim 16, wherein said repetition angle (αrep) is configured to be smaller than the sensing angle of the recognition means (11) rotated about a limited angular amplitude of the machine.

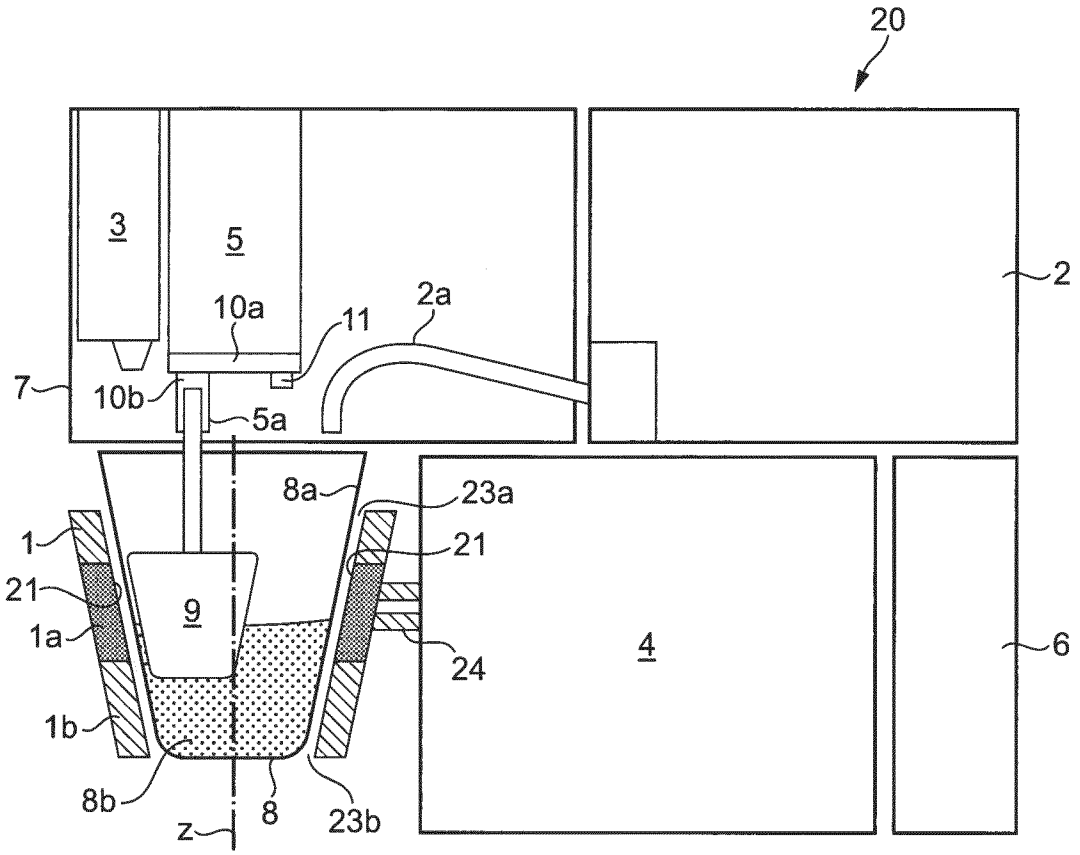

FIG. 1

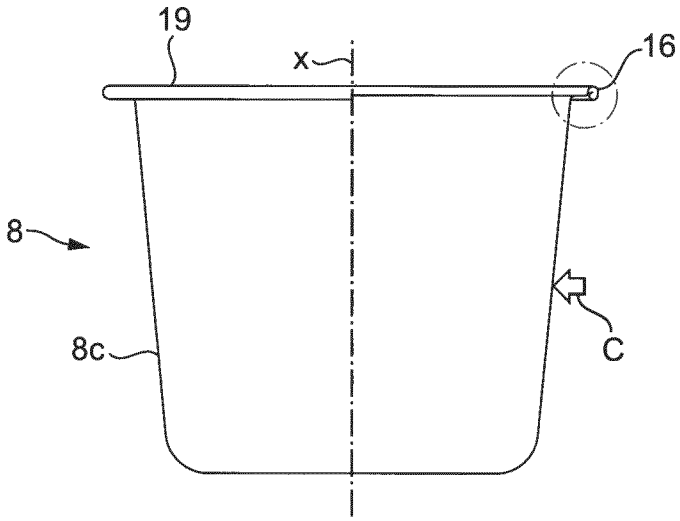

FIG. 2a

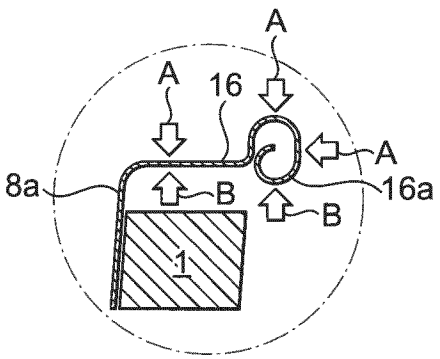

FIG. 2b

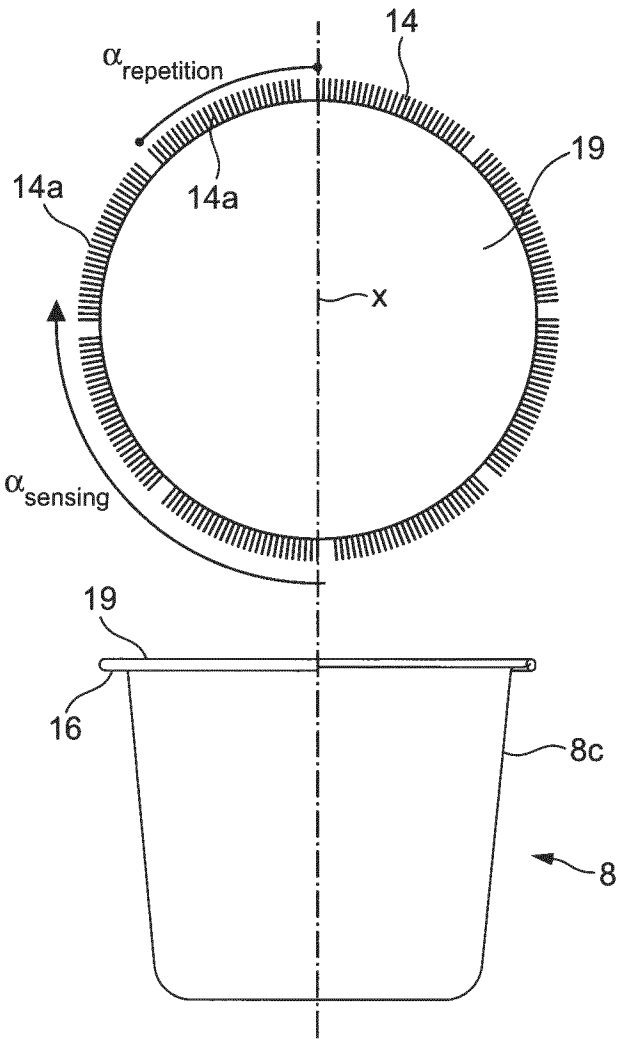

FIG. 2c

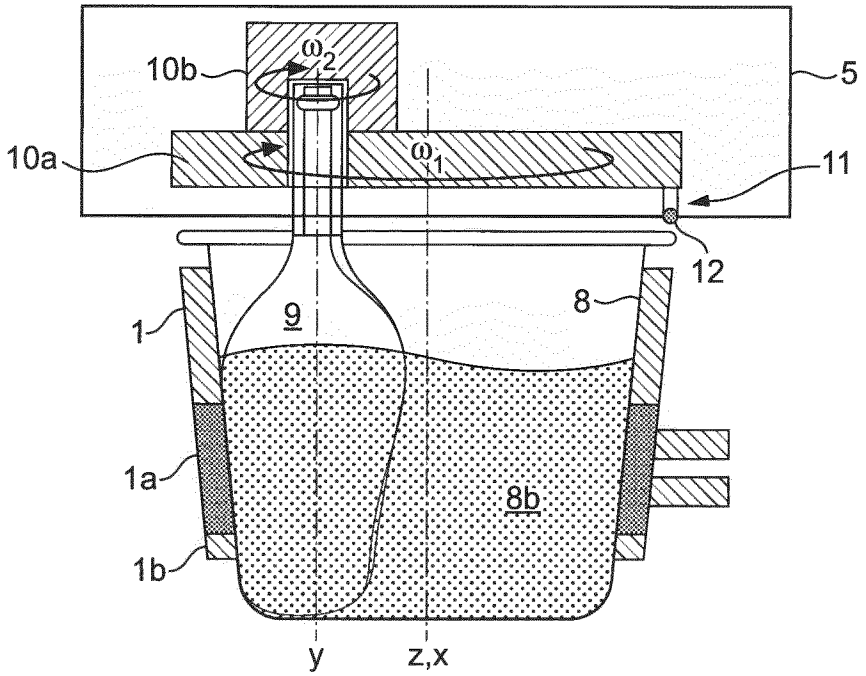
10b
ω2
5
10a
ω1
11
12
1
9
8
1a
8b
1b
y
z,x

FIG. 3

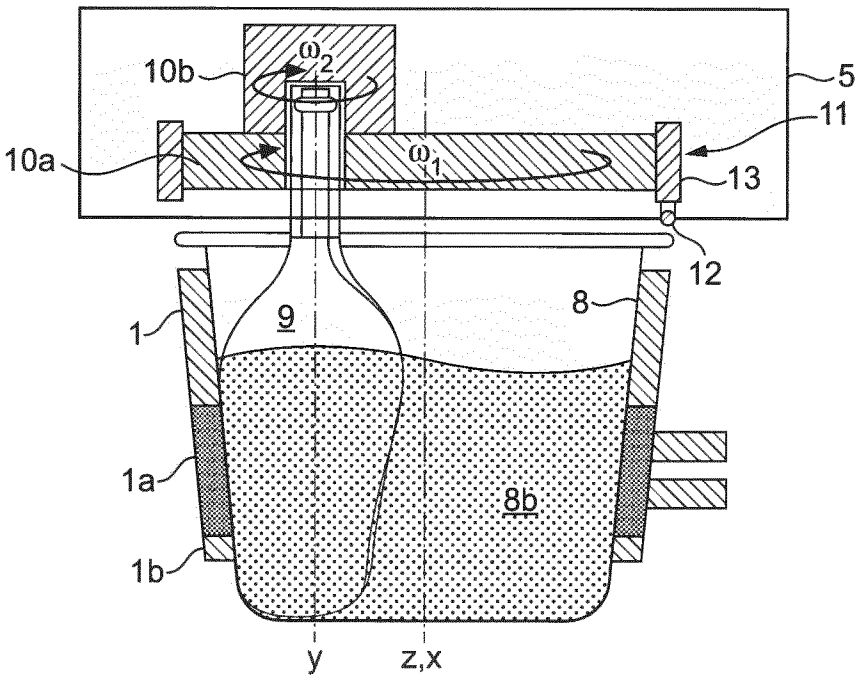
10b
ω2
5
11
10a
ω1
13
12
1
9
8
1a
8b
1b
y
z,x

FIG. 4

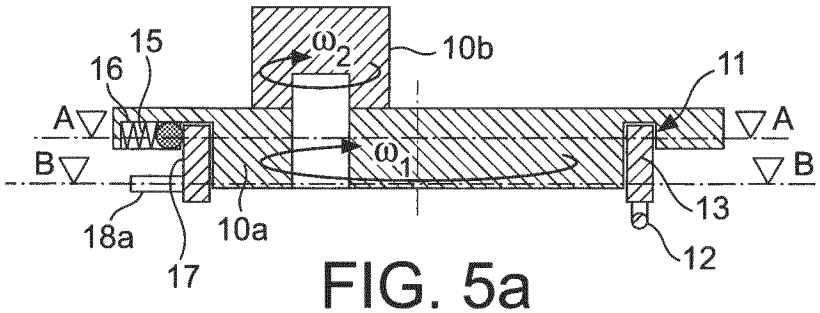

FIG. 5a

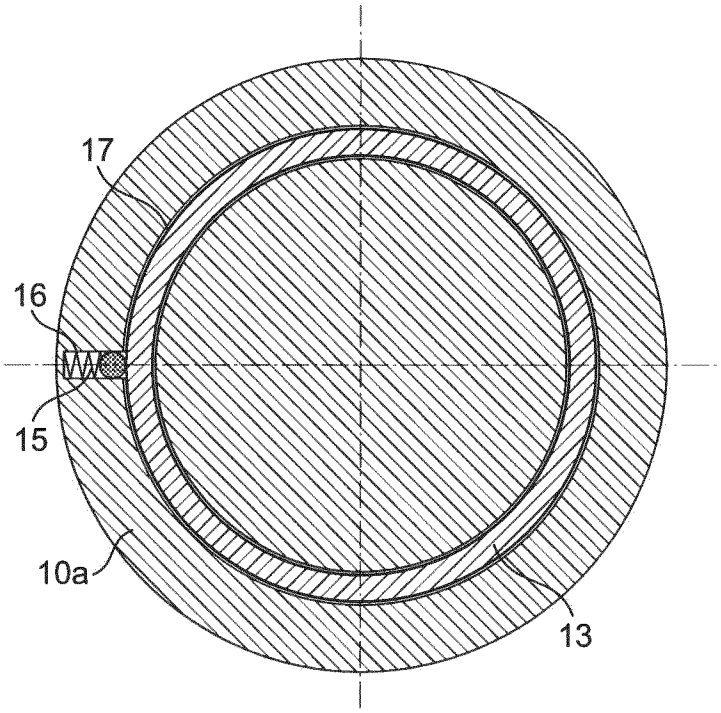

FIG. 5b

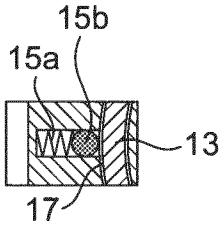

FIG. 5c

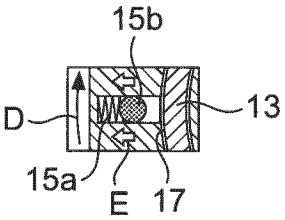

FIG. 5d

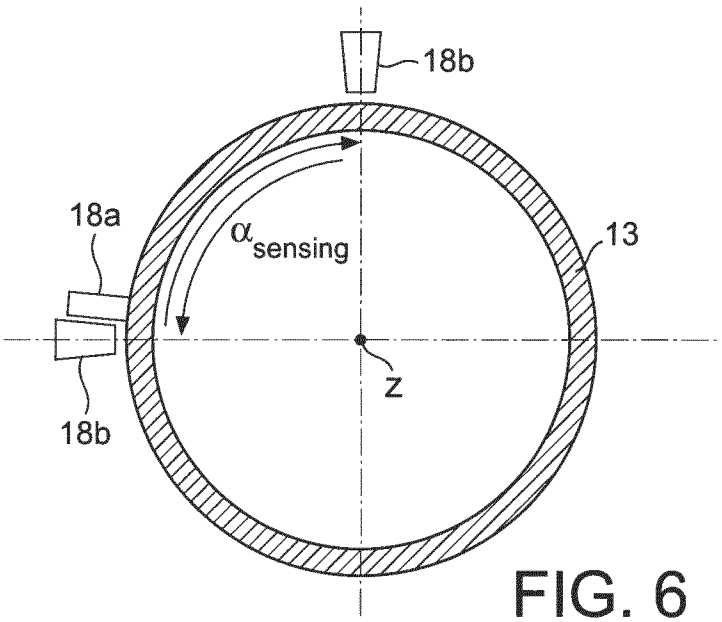

FIG. 6

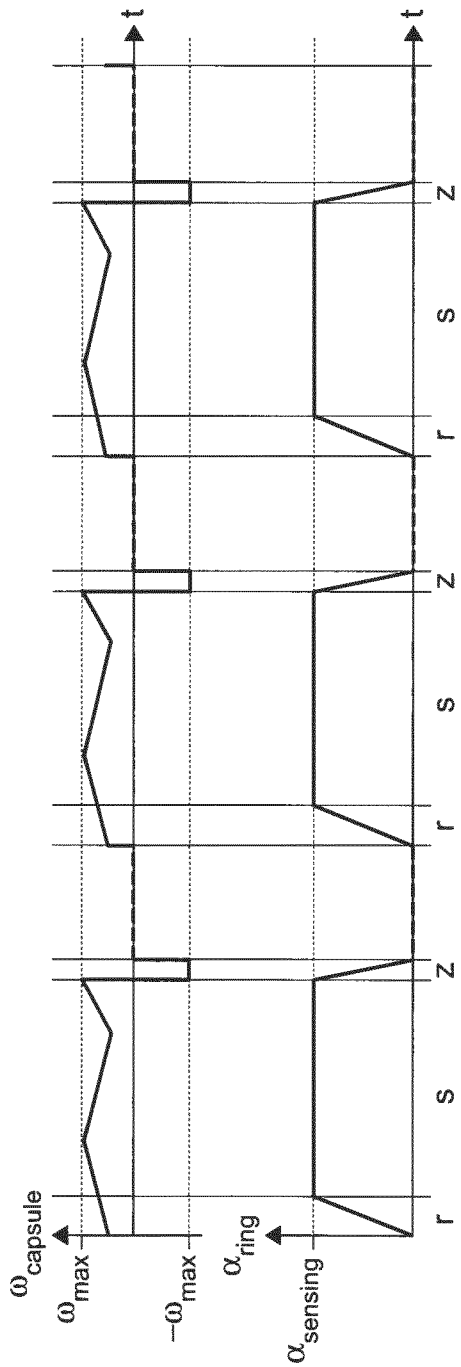
ω capsule
ω max
−ω max
α ring
α sensing
t
r
s
z

FIG. 7a

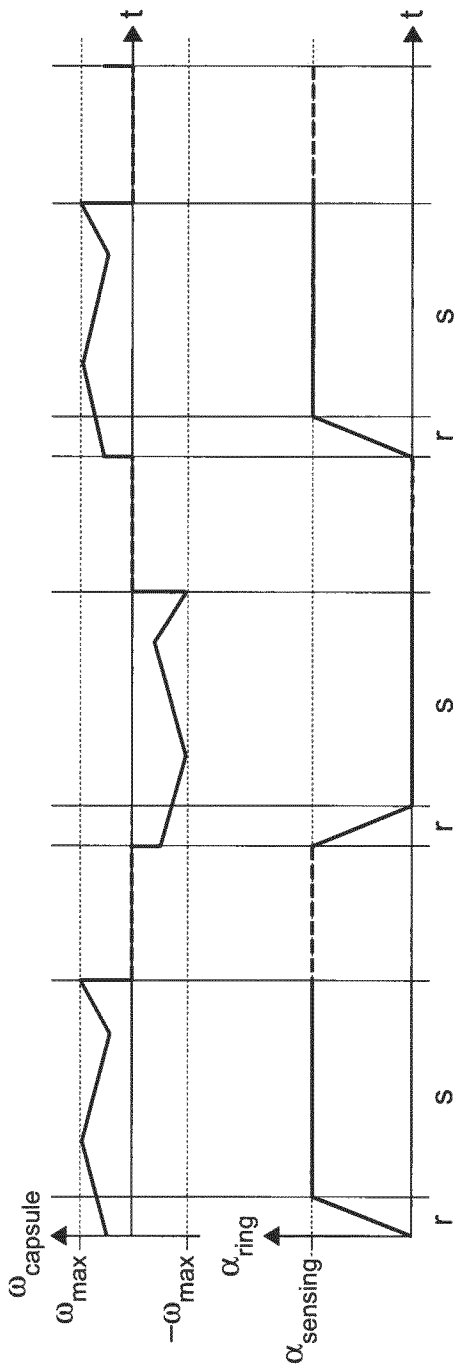
ω capsule
ω max
−ω max
α ring
α sensing
t
r
s

FIG. 7b

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/073195

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23G9/08 A23G9/12 A23G9/22 B65D85/78
ADD. G06K7/10

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23G B65D G06K A47J

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 363 746 A (GORDON ELLIS D [US]) 15 November 1994 (1994-11-15) column 1, lines 9-21 column 4, lines 21-64 column 5, lines 9-12 column 6, lines 9-23, 44-45, 51-68 column 7, lines 4-10, 42-50 column 8, lines 1-13, 32-33 column 9, lines 26-28, 47-62 column 10, lines 55-61, 61-68 column 11, lines 13-50 claims 1-4, 7, 20; figures 1-3, 5, 6, 8-10 ----- -/--	1-4,9, 11,12, 14,15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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

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

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 February 2015	12/02/2015

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

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/073195

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/073195

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